ANNUAL REPORT ON THE ENVIRONMENT

CHAPTER IV

WATER RESOURCES

IV. WATER RESOURCES

A. ECOLOGICAL OVERVIEW

Water resources include streams, ponds, lakes and groundwater. These resources serve as sources of drinking water, recreation, stormwater conveyance and habitat for numerous organisms. These water bodies can be impacted significantly by land disturbances and surface runoff. Over the past decade, Fairfax County has demonstrated a strong commitment to restore and protect its water resources through a variety of management efforts and public outreach initiatives. Unless water resources are managed properly, increasing demands put on watersheds, such as rapid development, can create many problems.

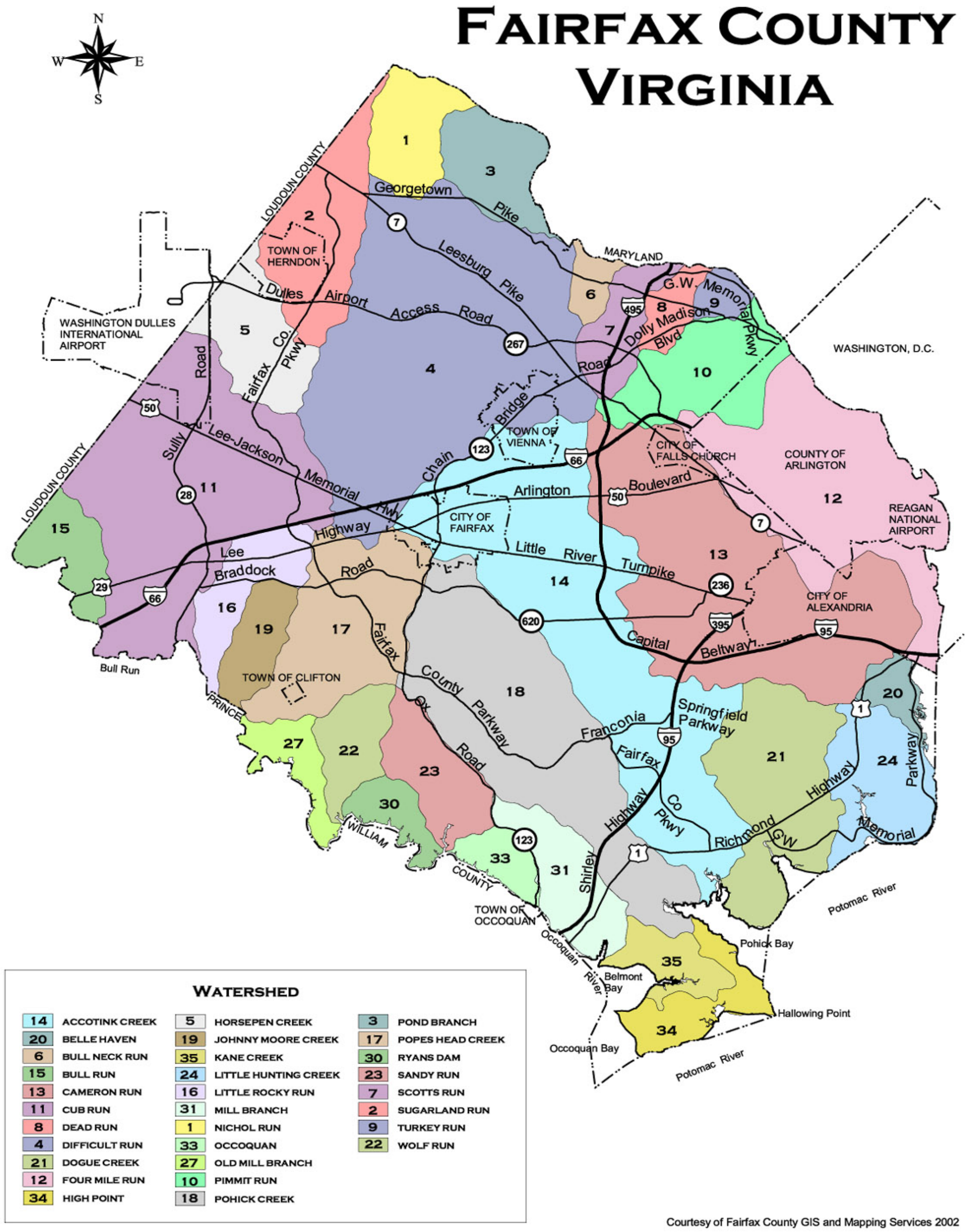
1. Watersheds

A watershed is a discrete area of land that drains to a common stream, river system or larger body of water. Watersheds include both surface water and groundwater. Everyone lives in a watershed. Large watersheds typically have sub-watersheds. There are 30 separate watersheds in Fairfax County (Figure IV-1). The largest watershed is Difficult Run (58 square miles) with ten streams that drain into the main stream, Difficult Run, which, in turn, drains into the Potomac River. The Potomac River watershed is a sub-watershed of an even larger watershed, the Chesapeake Bay watershed, which has an area of 64,000 square miles and includes portions of the states of New York, Pennsylvania, Delaware, West Virginia, Maryland and Virginia as well as the District of Columbia. All Fairfax County streams are in the Potomac River watershed and subsequently the Chesapeake Bay watershed.

2. Streams

Fairfax County is criss-crossed by a number of streams, often called runs or creeks. These streams are important aquatic habitats. Rainfall soaks into the earth and drains to low points in the surrounding land, and then emerges from the ground as seeps, springs and trickling headwaters. These small streams join with others in the same drainage area to create a stream system. There is a natural progression in size from the smallest tributaries to the largest rivers into which they eventually flow. Perennial streams flow throughout the year and intermittent streams flow only part of the year. There are approximately 860 miles of perennial streams in Fairfax County. One-third of the land in the Fairfax County Park system, approximately 7,000 acres, is comprised of stream valleys. These stream valleys are significant corridors for wildlife and the county trails system.

Figure IV-1: Fairfax County Watershed Map



The bottom, or bed, of a stream can consist of boulders, cobbles, gravel, sand and/or silt. The type and amount of substrate in a stream makes up the in-stream habitat. Within a stream are shallow, fast flowing areas called riffles. Dissolved oxygen levels are high because water is flowing over rocks, mixing air into the tumbling water. Alternating with riffles are deeper pools and runs where flows slow and particles of inorganic and organic matter fall to the bottom and oxygen levels are reduced. Streams support a diverse community of plants and animals that spend all or part of their life cycles in the water.

The aquatic food chain begins with leaves and other decaying plant and animal material called detritus. These materials are carried into the stream from the surrounding forests and fields by wind and water runoff. Aquatic vegetation such as algae is also an important food source. Benthic (bottom–dwelling) macro (large) invertebrates (without a back-bone) eat this organic matter. Benthic macroinvertebrates include aquatic insect larvae such as stoneflies, mayflies, caddisflies and true flies as well as snails, clams, aquatic worms and crustaceans such as crayfish. Fish, birds and other streamside wildlife, such as frogs, salamanders and small mammals, eat these macroinvertebrates.

3. Riparian Buffers

The area of trees and other types of vegetation adjacent to and lining the banks of streams is called a stream buffer or a riparian area. These areas are essential for healthy streams. The temperature in a stream greatly affects how much oxygen it can hold. Since cooler water holds more oxygen, shade providing trees and vegetation are vital along the edges of streams to help maintain cooler water temperatures so the water will hold more oxygen.

Tree cover provides food and shelter when leaves and branches fall into a stream. Streamside forests offer food, nesting sites and protection to a great diversity of wildlife, including birds, turtles, beaver and snakes. Tree roots help stabilize stream banks and provide cover for fish, crayfish and aquatic insects. Riparian areas help slow down and filter runoff. Excess nutrients carried in runoff are absorbed by vegetation.

B. IMPACTS ON WATER RESOURCES

1. Point and Nonpoint Source Pollution

Water pollution originates from either nonpoint or point sources. Nonpoint sources include surface runoff, atmospheric deposition and groundwater flow. Because of their diffuse and intermittent nature, nonpoint source pollution is difficult to control. Nonpoint source pollutant loads are greatest following rainfall and high flow events. A significant part of the nonpoint source load consists of nutrients, including nitrogen and phosphorus (organic matter, fertilizer), which stimulates algal growth. Other nonpoint source pollutants are sediment (from erosion, construction sites, eroded stream banks, road sand), toxics (oil, paint, pesticides, chemicals and metals), pathogens and bacteria (animal waste, failing septic systems and leaking sewer systems) and trash.

Point sources are specific locations that discharge pollutants such as a discharge pipe. Because they are relatively constant and provide a steady flow of pollutants, they are easier to monitor and control. In the Potomac River watershed, most point sources are wastewater treatment plants or industrial discharges. Unlike nonpoint sources, point sources contribute relatively small portions of the nutrient loads during high flows and the majority during low flows.

2. The Effect of Imperviousness

As development occurs, natural areas that once had vegetative cover capable of absorbing water and filtering pollutants are replaced by impervious surfaces such as roads, driveways and buildings. With the increase in impervious surface and loss of vegetative cover, there is a concurrent increase in the amount and speed of stormwater runoff flowing into streams. Increased uncontrolled runoff causes stream erosion, resulting in scouring, down cutting and over-widening of stream channels and loss of streamside vegetation. Loss of shade results in increased water temperatures. During summer storms, runoff from heated impervious surfaces also raises water temperatures. In urban and suburban watersheds, rain flows off impervious surfaces such as parking lots and highways, carrying oil and other automobile wastes into streams. When stream channels become incised from down cutting, they become disconnected from their floodplains. Water cannot get out of the banks onto the adjacent floodplain where flows can be dissipated and drop their sediment loads. High flows stay in the channel, resulting in increased erosion. Silt and sediment from erosion smother the stream bottom and destroy in-stream habitat for sensitive benthic macroinvertebrates.

Simultaneously, this results in an increased number of floods in downstream areas, due to the increased volume of water. Over time, increased erosion, flooding and sediment deposition leads to habitat loss, water quality problems and damage to utilities and infrastructure.

C. SURFACE WATER MONITORING AND ANALYSES

The Fairfax County Department of Public Works and Environmental Services, Fairfax County Park Authority, Virginia Department of Environmental Quality, local water treatment plants and other organizations regularly conduct water quality monitoring and testing. The Northern Virginia Soil and Water Conservation District also collects monitoring information through its volunteer water quality monitoring programs. All of these data help provide a comprehensive understanding of the condition and health of Fairfax County’s water resources.

1. Countywide Watershed and Stream Assessments

a. Stream Protection Strategy Baseline Study

The Stream Protection Strategy Baseline Study, published in 2001, provides a holistic ecological base-line assessment of county streams. The study provides information on fish taxa, benthic macroinvertebrates, general evaluation of watershed and stream features and calculations of the percent impervious cover within each watershed. The Stream Protection Strategy Baseline Study can be viewed online at: www.fairfaxcounty.gov/dpwes/environmental/sps_main.htm.

b. 2011 Annual Report on Fairfax County's Streams (now the Stormwater Status Report)

i. Overview of Biological Monitoring

This report provides data from sampling efforts conducted in 2011 and documents overall stream conditions based on the health of fish and benthic macroinvertebrate communities. In addition, the potential human health risk associated with wading or swimming in streams is assessed based on analyses of *E. coli* bacteria.

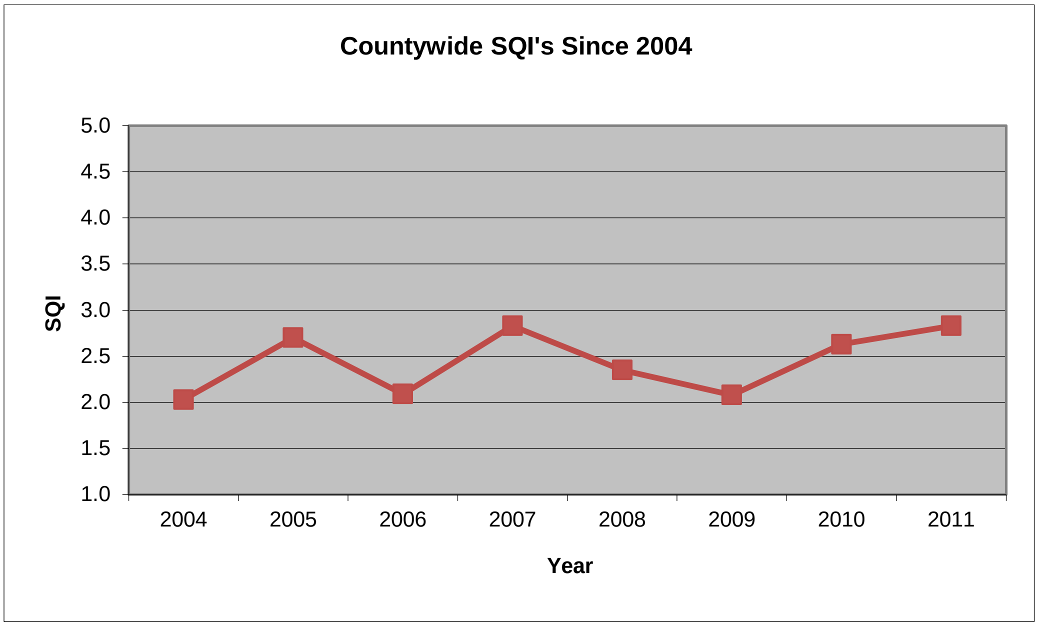
The Fairfax County biological stream monitoring program includes an annual sampling of fish and macroinvertebrate communities in wadeable, non-tidal freshwater streams. Countywide biological monitoring is conducted using a probabilistic design approach, whereby statistically valid inferences may be made 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 (generally, four times annually). Water quality and stream habitat characteristics are evaluated. The previous year's annual stream reports are available online at http://www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.

A total of 53 sites were sampled in 2011: the 40 sites randomly selected described above plus 11 Piedmont reference locations in Prince William National Forest Park and two Coastal Plain reference sites in the Kane Creek watershed of Fairfax County. Results from the 40 randomly selected sites suggest that approximately 67 percent of the county's waterways are in "Fair" to "Very Poor" condition based on a decrease in biological integrity of streams and 47% are in "Fair" to "Very Poor" based on fish sampling in 15 streams. The 2011 Stream Quality Index shows an increase in overall stream quality from 2010 (Figure IV-2). This index will be reported annually to evaluate long-term trends in the overall health of streams. Over the past eight 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.

The 2011 Stormwater Status Report states the following:

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.

Figure IV-2 Trends in the Countywide Stream Quality Index



For the last six 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 [figure IV-2].

The monitoring program is part of the framework to establish a baseline to evaluate future changes in watershed conditions. Monitoring results from 2008 through 2011 were reported in Fairfax County Stormwater Status Reports, which may be viewed at
http://www.fairfaxcounty.gov/dpwes/stormwater/stormwater_status.htm.

Monitoring results from 2005 through 2007 may be found in Annual Reports on Fairfax County Streams at http://www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm.

In 2011, the Stormwater Planning Division completed its eighth year collecting data for the bacteria monitoring program since acquiring the program from the Fairfax County Health Department. However, the collection of bacteria data was temporarily suspended in 2011 during which time the program was re-evaluated in light of pending regulatory requirements. In January 2012, sampling efforts resumed.

Normally, to determine levels of *E. coli* in county streams, grab samples of stream water are 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, *E. coli*, nitrate and total phosphorous; samples are processed at the Fairfax County Health Department laboratory. The remaining chemical parameters are recorded in the field using a handheld multi-probe water quality meter.

According to the Virginia Department of Environmental Quality, 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 were not conducted in 2011, the geometric mean standard could not be applied this year. Therefore, in 2011, the percent of Fairfax County's bacteria monitoring locations that were below VDEQ's standard of 235 units per 100 ml of water could not be determined.

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.

Fairfax County addresses one source of bacteria, pet waste, through public education. As a member of the Northern Virginia Clean Water Partners, Fairfax County continues to support the regional stormwater education campaign. In 2011, the Clean Water Partners aired three public service announcements, including one about proper disposal of pet waste, on five radio stations 174 times, reaching an estimated 967,000 listeners. Clean Water Partners surveyed 500 Northern Virginia residents and found that of the one-third of respondents who recalled hearing or seeing their public service announcements, five percent pick up pet waste more often.

The partners created the Northern Virginia Dog Blog in 2010, which features interesting articles about dogs and weaves into the articles a message about picking up pet waste. In 2011, Clean Water Partners, through the Dog Blog, sponsored a "Wag Your Words essay contest" attracting 2,300 participants and a dog trivia quiz attracting 700 respondents. The partners' Only Rain website, at www.onlyrain.org, includes links to the Dog Blog.

ii. Dry and Wet Weather Screening

In 2011, the county selected 101 outfalls in its Municipal Separate Storm Sewer System for dry weather screening and recorded physical parameters at each outfall. Water was found to be flowing at 48 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, 15 required follow-up investigations because they exceeded the allowable limit for at least one pollutant. Upon retesting these sites, 12 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 each site, recording observations of flowing water and land use and testing the water where flow was found. This procedure was followed all the way up the network of storm sewer pipes until the source was found or there was no flowing water.

As reported in the 2011 Stormwater Status Report:

> *Two of the track downs had very minimal flow that did not allow track downs to be conducted. Two of the track downs resulted in finding that restrooms were connected to the stormwater system instead of the sanitary system. One of these sites in Reston had a business office's restrooms linked to the stormwater network. Another site in Vienna had two separate office buildings with illicit connections to the same MS4 outfall. The first of these two buildings had an entire restaurant connected to the stormwater network and a washing machine from a drycleaners while the second building had a hair salon. SWPD is working closely with Fairfax County's Wastewater Division, Health Department and Code Compliance Division to resolve these connections. The sources of flow for the remaining eight sites are still under investigation. These sites mostly consist of outfalls with high levels of conductivity and/or fluoride levels and low flow levels with no solids. Plans to resolve these locations include using video cameras in the stormwater pipes and follow up visits in an attempt to locate the sources of the discharge.*

In 2010, the county solicited a proposal to review and update its Wet Weather Screening and Industrial High Risk Monitoring program. The updated plan will identify wet weather screening locations by ranking sites according to a land use code, other factors and the potential to contribute pollutants to the MS4.

Manholes or outfalls at the selected sites were screened in 2011 for pollutants in accordance with the criteria established in the permit and the updated plan.

c. Physical Stream Assessment

Completed in 2004, the Stream Physical Assessment Study provides field reconnaissance data for the county's watershed management plans including information on habitat conditions, impacts on streams, general stream characteristics and geomorphic classification of stream type. The Countywide Stream Assessment can be obtained by going to http://www.fairfaxcounty.gov/dpwes/stormwater/psa-update.htm or by contacting the Fairfax County Stormwater Planning Division at 703-324-5500.

d. Perennial Stream Mapping

In 2003, the Board of Supervisors adopted a revised Chesapeake Bay Preservation Ordinance in order to comply with amendments to the state's Chesapeake Bay Preservation Area Designation and Management Regulations. The ordinance incorporated changes to the designation criteria for Resource Protection Areas to include water bodies with perennial flow, resulting in a significant expansion to the county's RPAs. Fairfax County's Chesapeake Bay Preservation Ordinance is available on-line at: http://www.fairfaxcounty.gov/dpwes/environmental/cbay/.

On November 17, 2003, based on the Perennial Streams Identification and Mapping program conducted by staff of the Department of Public Works and Environmental Services, the Board of Supervisors adopted new Chesapeake Bay Resource Protection Area maps, increasing the amount of stream miles protected by 52 percent (from 520 to 860 miles).

In 2004, the Quality Assurance/Quality Control Study of the Perennial Streams Identification and Mapping was conducted. A total of 10 percent of the streams initially surveyed between 2002 and 2003 were selected for the QA/QC study. The results of the QA/QC Study were presented to the Board of Supervisors in 2005 along with revised Chesapeake Bay Preservation Area Maps, which were approved.

The Fairfax County Stream Classification Protocol, Field Data Sheets, QA/QC study and the county's revised map of Chesapeake Bay Preservation Areas are available online at: www.fairfaxcounty.gov/dpwes/watersheds/perennial.htm.

e. USGS Monitoring Network

In June 2007, a joint funding agreement between the DPWES Stormwater Planning Division and the United States Geological Survey was signed by the Board of Supervisors. This agreement established a study designed to be an ongoing, long-term (5-10 year) monitoring effort to describe countywide conditions and trends in water-quality (e.g. nutrients and sediment) and water-quantity. Ultimately, the information gathered will be used to evaluate the benefits of projects implemented under the watershed planning program.

The monitoring network designed to fulfill the objectives of the study consists of four automated continuous water-resources monitoring stations and 10 less-intensely monitored sites. The automated stations were constructed in 2007 and achieved full operational capability in 2008. Instruments at these stations collect stream flow 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.

Data for this study are compiled based on the USGS "Water Year," which for 2011 ran from October 1, 2010 through September 30, 2011.

As reported in the 2011 Stormwater Status Report:

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.*

- *Information about this project can be found online at http://va.water.usgs.gov/projects/ffx_co_monitoring.htm.*

Discrete Collection

- *Grab samples were collected monthly at all 14 monitoring stations, resulting in 204 samples collected and analyzed (including QA samples). Water level and water-quality parameters 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 144 samples that were analyzed for the same suite of nutrients and suspended sediment concentration as the monthly grab samples.*

- *A total of 116 manual streamflow measurements were made across the 14 sites to support the maintenance of the streamflow rating curve for each site.*

- *High water marks were located and surveyed to determine maximum water surface elevations during Tropical Storm Lee at the 14 monitoring stations. These water-surface elevations will be used to compute peak discharge values from this tropical storm.*

Interpretation of water-quality conditions and trends requires multiple years of data for statistically rigorous evaluation; thus, thorough analyses are not yet available for this study. . . .

Preliminary evaluations of general patterns in water-quality conditions have been conducted. Results of these evaluations demonstrate that the nutrient and sediment yields from streams in Fairfax County are comparable with yields measured in other urban/suburban areas of the eastern United States. These evaluations will be furthered to explore relations between environmental setting, land use and water-quality conditions. Interpretation of water-quality conditions and trends requires multiple years of data for statistically rigorous evaluation; thus, thorough analyses are not yet available for this study.

2. Volunteer Water Quality Monitoring Programs

The Northern Virginia Soil and Water Conservation District 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 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, 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 45 volunteers collected data at 21 sites four times during 2011. In addition, 34 public stream monitoring workshops and field trips were held throughout the county and 619 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.

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 it submits data on Reston streams to NVSWCD. Currently, 11 sites are monitored by 24 volunteers.

A monthly *Watershed Calendar*, listing training and other events of interest, is emailed to 973 recipients. More information can be found at www.fairfaxcounty.gov/nvswcd/monitoring.htm. Information about the NVSWCD volunteer monitoring program can be found at http://www.fairfaxcounty.gov/nvswcd/monitoring.htm.

3. Fairfax County Park Authority Stream Monitoring

Several Resource Management sites participate in the county stream quality monitoring program directly, as well as through training and sponsoring volunteer monitors. 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.

Update on water quality monitoring project in Huntley Meadows Park

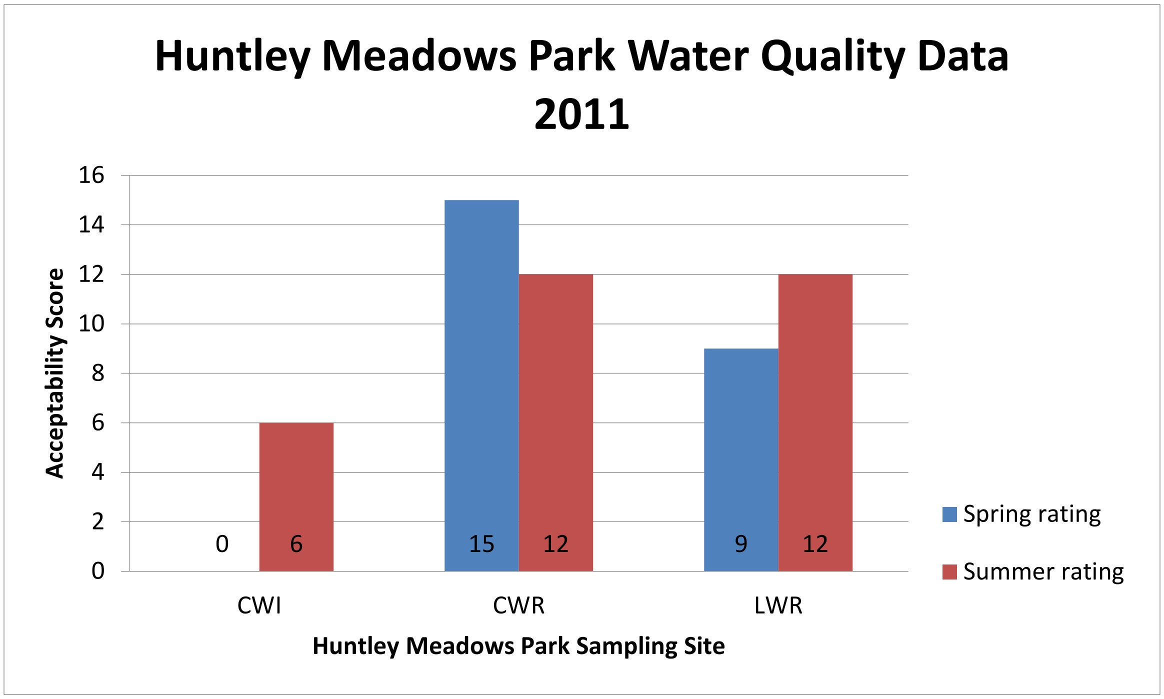
Huntley Meadows Park staff conducted water quality monitoring at three sample sites in 2011. All three sites were sampled in both the spring and summer. During years prior to 2011, six sites were sampled, three on Dogue Creek and three on Barnyard Run. However, in 2011, the Watershed Planning & Assessment Branch of the Department of Public Works and Environmental Services took over the analysis of Dogue Creek. Huntley Meadows Park staff will continue sampling the three sample sites along East Barnyard Run. The analysis conducted by the WP&AB of DPWES is a much more complex and detailed assessment than done by site staff at Huntley Meadows Park. The Dogue Creek data are included in the DWPES stream monitoring annual report. The Rapid Bio-assessment II monitoring protocol was used at all three remaining sites sampled by Huntley Meadows Park staff.

Results

Water Quality scores (Figure IV-3) are based on the numbers and tolerance levels of the macroinvertebrate families collected during sampling: 0 to 8 are unacceptable; 9 to 13 are partially acceptable; and 14 to 24 are acceptable. The Barnyard Run watershed includes the Central Wetland, and samples were collected at three different locations:

the Central Wetland Inflow (CWI), the Central Wetland Reservoir (CWR) and the Lower Wetland Reservoir (LWR). All three sites were sampled twice in 2011. Scores for all sites spring and summer are as follows: CWI scored 0 and 6 respectively, CWR scored 15 and 12 respectively, and LWR scored 9 and 12 respectively.

Figure IV-3: Huntley Meadows Park Water Quality Data



Source: Fairfax County Department of Public Works and Environmental Services.

4. Virginia Department of Environmental Quality

a. Overview

VDEQ performs long-term trend monitoring at 29 stations in 21 water bodies that are either in Fairfax County or border the county:

- 12 stations are long term, trend monitoring stations.
- Biological monitoring data were collected at three stations.
- Four stations were sampled to collect data to assist in the development of the Potomac Tributary TMDL.

b. Probabilistic Biomonitoring and Chemical Monitoring Program in Virginia Non-Tidal Streams

VDEQ's probabilistic monitoring program began in spring 2000. This program consists of three sampling components: a thorough examination of the benthic macroinvertebrate community utilizing the EPA's Rapid Bioassessment Protocols; sampling a full suite of chemical parameters in water and sediment; and a physical habitat evaluation at each station. The stations are biologically sampled twice a year. Chemical sampling is performed each spring and fall in conjunction with biological monitoring. The physical habitat evaluation is conducted each fall when the biological monitoring is performed. In 2011, DEQ sampled two freshwater probabilistic stations in Fairfax County, Pohick Creek (1aPOH008.54) and Pimmit Run (1aPIM001.89). Since 2004, as part of the probabilistic program, VDEQ has participated in a grant study with the National Academy of Sciences to collect data on periphyton/algae in freshwater systems. Samples for that study are collected at every probabilistic monitoring station each fall.

5. Potomac River Monitoring

a. Metropolitan Washington Council of Governments Chain Bridge Monitoring Program

Since 1983, the Metropolitan Washington Council of Governments has contracted with the Occoquan Watershed Monitoring Laboratory to operate the Chain Bridge monitoring station on the Potomac River. The purpose of this monitoring station is to measure water quality in the Potomac River as it crosses the fall line and enters the Potomac estuary. Parameters collected include dissolved oxygen, biological oxygen demand, turbidity, temperature, conductivity, total suspended solids, fecal and total coliform bacteria, chlorophyll-a and nutrients.

The Chain Bridge monitoring station consists of an automated sampler that simultaneously monitors the river stage at Little Falls while directly sampling at Chain Bridge, about 1.5 miles downstream, in response to changes in river flow volume. Base and storm event samples are taken throughout the year.

b. Potomac River Water Quality Monitoring

COG continues to serve as the water quality monitoring coordinator and regional repository for water quality and wastewater data in the Washington metropolitan region, as it has for more than two decades. Presently, COG serves as a repository for physical/chemical water quality data, hydro-meteorological data and wastewater loadings for the COG region, as produced by federal, state, and local government agencies. This includes data from 99 stations on the main stem of the Potomac River and the mouths of its tributaries (Point of Rocks to Point Lookout) and 46 stations in the Anacostia watershed. In addition, more than 33 wastewater treatment plants send their monthly discharge monitoring reports and monthly operating reports to COG. COG supplements these data with flow gage data from the USGS and meteorological data from the National Weather Service.

c. Virginia Department of Environmental Quality Monitoring in the Tidal Potomac

VDEQ's Northern Regional Office initiated a long-term water quality monitoring project in the Occoquan River tidal embayment in spring 2005. To better characterize the water quality in the Occoquan River tidal embayment, water quality measurements were made using fixed continuous monitors and grab samples. The water quality monitoring for this study was conducted from April to October 2005. The primary objective of this study was to collect monitoring data throughout the warm season to better characterize the water quality and provide detailed monitoring data to support the development of a Total Maximum Daily Load for pH. A secondary objective of this study was to provide continuous monitoring data to enable a more accurate assessment of the Chesapeake Bay water quality criteria for dissolved oxygen, water clarity and chlorophyll.

In 2007, VDEQ initiated monitoring in the tidal embayment of Pohick Creek. The monitoring period for these areas was conducted from April to October 2007. Data for all of the long-term water quality monitoring deployments were collected using YSI Model 6600 EDS multi-meters. These instruments were configured to measure and store water temperature, pH, dissolved oxygen, turbidity and chlorophyll measurements in fifteen-minute increments. In addition to the continuous monitoring with these meters, water column grab sampling, light attenuation and Secchi depth measurements were performed at each of the stations where the continuous monitors were deployed. Continuous monitoring was continued at the Pohick Bay station in 2008 and 2009.

6. Update on Potomac River Water Quality

The tidal section of the Potomac River is affected by many sources of pollution. With rapid population growth in the region over the past century, the Potomac River has faced water quality problems such as bacterial contamination, low dissolved oxygen and nuisance algal blooms. The implementation of secondary and advanced wastewater treatment in the National Capital Region has resulted in significant improvements in water quality and ecological conditions in the Potomac Estuary, including healthy dissolved oxygen levels, reduced nuisance algal blooms and the return of important living resources such as largemouth bass and submerged aquatic vegetation.

Results from a summer 2010 news release reviewing (http://water.usgs.gov/nrp/highlights/potomac_update.html) an 18-year study of submerged aquatic vegetation in the tidal Potomac River concluded the following:

- Native SAV cover increased tenfold from 288 to 3,081 acres.
- The overall area covered by SAV in the Potomac (both native and exotic) more than doubled since 1990, increasing from 4,207 to 8,441 acres.

- The diversity of SAV has increased. In 1990 the exotic hydrilla was 10 times more abundant than any other species. In 2007 the abundance of the seven most frequently occurring species were more evenly matched.
- In 1990, more than 80% of the total SAV was hydrilla; in 2007 hydrilla declined to 20%.
- Results suggest declining fitness of exotic species relative to native species during restoration.

The study was supported by: the USGS National Research Program; the U.S. Army Corps of Engineers, Baltimore; the Metropolitan Washington Council of Government's Aquatic Plant Management Program; and the Fisheries Division of the District of Columbia Department of Health.

The United States Geological Survey monitors water-quality on the Potomac River at Chain Bridge as part of the Chesapeake Bay River Input Monitoring Program.

7. Occoquan River

The Occoquan River straddles the southern border of Fairfax County and the northern border of Prince William County. The river has been dammed near the town of Occoquan. The Occoquan Reservoir, created by the damming, serves as one of two primary sources of drinking water for Fairfax Water, which operates a facility along, and withdraws water from, the reservoir. Because of its use as a drinking water source, water quality in the reservoir is highly monitored and water from a sewage treatment plant upstream of the reservoir is carefully treated.

a. Occoquan Watershed Monitoring Laboratory

The Occoquan Watershed Monitoring Laboratory has administered a comprehensive hydrologic and water quality monitoring program in the Occoquan Watershed since 1972. The program is jointly funded by Fairfax Water and the six jurisdictions within the watershed. OWML operates nine automated stream monitoring and flow gauging stations located on the major tributary streams of the watershed. These stations record stream flow and automatically collect flow-weighted composite water samples during storm events. Under base flow (non-storm flow) conditions, samples are collected weekly during the spring, summer, and fall seasons, and biweekly in the winter. In late 2006, additional equipment was installed at the stream monitoring station on Bull Run at Virginia Route 28 to continuously monitor dissolved oxygen, temperature, pH, conductance, turbidity and nitrate in the stream. Seven stations in the Occoquan Reservoir are sampled on the same weekly/biweekly schedule. OWML also operates thirteen rain gage stations in the watershed, and two weather stations, including one which provides solar radiation data.

The Lake Manassas watershed monitoring program is funded by the City of Manassas; it has seven stream and eight lake stations at which water and sediment samples are taken. Lake Manassas is currently considered to be a moderately enriched lake.

Synthetic organic compounds have been monitored quarterly in the Occoquan Watershed since 1982. The program is funded by the Fairfax County Health Department and was established under the recommendation of EQAC. Initially, the program monitored water samples, but added quarterly sediment and semi-annual fish samples at stations within the Occoquan Reservoir. The Lake Manassas program, likewise, funds the monitoring of SOCs in the Lake Manassas watershed.

In 2011, as in 2010 but unlike in previous years, atrazine was not the most frequently detected SOC. It was only detected in four samples, and only once above the detection limit but below the MCL (maximum contaminant level). The year 2011 would be characterized as a good year with respect to the detection of SOCs, as not much was found at all. All samples of fish (seven bass and one catfish) and sediment (35 samples) were found to not have anything of concern in them. A few phthalates, which are ubiquitous, were detected above the detection limits, but were well below any levels of concern.

Amongst water samples, one sample taken on March 23, 2011, in Bull Run just above the reservoir, and one taken in Lake Manassas on April 7, 2011, were found to have heptachlor epoxide concentrations of 0.34 and 1.70 µg/L (micrograms per liter), respectively. Another sample in Lake Manassas, taken on December 13, 2011, had 0.44 µg/L of heptachlor epoxide and 0.28 µg/L of heptachlor. In the case of heptachlor, the concentration was below the MCL value of 0.4 µg/L. The MCL for heptachlor epoxide, which is an oxidation product of the insecticide heptachlor and is typically found in soils after application, is 0.2 µg/L. Samples taken later in the year were not found to contain any of the compound. It is found occasionally, probably as a result of application of heptachlor and subsequent flushing into water after a rain event, and might be of concern if it were detected with any regularity at any particular location.

The nematicide terbufos (trade names Counter and Contraven) was found in six samples from the March 22, 2011, sampling. Two of these were in the Occoquan Reservoir (concentrations of 4.15 µg/L near the dam and 1.16 µg/L just below Ryan's dam), one was in Occoquan Creek just below the Lake Jackson dam (4.39 µg/L), one in Cedar Run (3.76 µg/L), one in Broad Run below Lake Manassas (3.76 µg/L) and one in Bull Run just above the Occoquan Reservoir (3.96 µg/L). There is no MCL for terbufos, but there is a lifetime health advisory level of 0.9 µg/L. Although these values are all above the lifetime health advisory level, the level itself is calculated based on a 2 liters/day consumption of water by a 70-kg adult. This is the only time that terbufos has been detected above the detection limit in at least 10 years. Therefore, this one-time detection is not really a concern.

It should be kept in mind that MCL concentration values are typically set for lifetime exposures in finished drinking water, and occasional measurements exceeding those values for compounds used in the watershed are not unexpected. However, such measurements are useful to detect trends (should they develop) as indicators of fundamental changes in historical conditions. No such trends have as yet been detected for monitored constituents.

It is fair to say that the general condition of the waters of the Occoquan Watershed with respect to SOCs is good. Most compounds are either not detected at all or are detected at concentrations below the detection limit.

Based on other water quality trends in the Occoquan Reservoir, although the reservoir continues to be enriched with respect to nutrients, water quality has remained stable. As is to be expected, there are variations due to weather and precipitation patterns. The OWML monitoring program serves as a means of providing advance notice should any conditions deteriorate, whether in the short or the long term.

It should be noted that due to budget constraints, the water quality monitoring programs at OWML that are funded either wholly or partially by Fairfax County have been flat-funded for the last five years. OWML managed to preserve the full monitoring program in the first four of these years mainly because staff salaries were frozen for three years, and the purchase of badly-needed replacement laboratory equipment was postponed. This year, however, the basic Occoquan Reservoir program and OWML must institute a reduction of some stream and reservoir data collection activities by up to 25%. OWML intends to attempt to preserve the SOC monitoring program at its full scope for another year, but reductions will have to be made in the future absent any restoration of funding at a level commensurate with full program operations.

OWML works on many other projects within the region that have a water focus. The Potomac regional monitoring program, where OWML operates an automated station at Chain Bridge, is performed for the Metropolitan Washington Council of Governments and has been in continuous operation since 1982.

Over the last decade, OWML staff has developed a complexly linked watershed and reservoir water quality model for the Occoquan Watershed (including Lake Manassas and the Occoquan Reservoir). The model replaced a mainframe model that was developed in the early 1980s, and the simulation period currently extends from 1988 to 2007. The model is updated to reflect changing land use as the data become available, and improvements to the model are incorporated as new data or research come available. It is anticipated that the next update, incorporating land use data from 2008-2012, will be completed in the first half of 2013. Both the watershed and reservoir components of the model have been used to provide simulations to support reservoir and/or water quality management decisions.

OWML has had a website (www.owml.vt.edu) for some years now, where stakeholders could access near-real-time field data at various stream sites. This website is currently being updated, with a new version expected to be available in early 2013.

8. Kingstowne Monitoring and Stream Restoration

In 1999, the Department of Public Works and Environmental Services, the Northern Virginia Soil and Water Conservation District, the USDA Natural Resources Conservation Service, the Friends of Huntley Meadows and the Citizens Alliance to Save Huntley formed a partnership to restore a stream in the Kingstowne area, with the help of a grant from the Virginia Department of Conservation and Recreation. The Kingstowne stream is a tributary of Dogue Creek, receives runoff from a 70 acre watershed and is upstream of Huntley Meadows Park.

The Kingstowne Environmental Monitoring Program established two stations along Dogue Creek (referred to as the "Kingstowne" and "South Van Dorn Street" monitoring stations) to assess the effectiveness of controls at trapping sediment and phosphorus in stormwater runoff from the Kingstowne development and to inform the partners of detrimental effects of upstream development on Huntley Meadows Park. Though estimates of annual sediment and phosphorus loads fluctuated from year to year, the monitoring data showed reductions in both constituents over the long term. As of 2010, the estimated long-term average sediment removal efficiency of controls was 82.9 percent. The mean annual phosphorus removal efficiency in 2010 was 34.2 percent.

Calendar year 2010 concludes water quality sampling at Kingstowne and South Van Dorn station to fulfill USACE permit requirements and monitoring and maintenance plan goals.

9. Gunston Cove Aquatic Monitoring Program

Gunston Cove is an embayment of the tidal freshwater Potomac River located in Fairfax County, about 12 mi (20 km) downstream of the I-95/I-495 Woodrow Wilson bridge. The cove receives treated wastewater from the Noman M. Cole, Jr. Pollution Control Plant and inflow from Pohick and Accotink Creeks, which drain much of central and southern Fairfax County. The cove is bordered on the north by Fort Belvoir and on the south by Mason Neck. Due to its tidal nature and shallowness, the cove does not seasonally stratify vertically, and its water mixes gradually with the adjacent tidal Potomac River mainstem.

The primary objective of this George Mason University program is to determine the status of the ecological communities and physical-chemical environment in the

Gunston Cove area of the tidal Potomac for evaluation of long-term trends. This helps provide the basis for well-grounded management strategies to improve water quality and biotic resources in the tidal Potomac. Data from Gunston Cove and the nearby Potomac River, collected since 1984, provide valuable information regarding long-term trends; this information will aid in the continued management of the watershed and point source inputs.

Data from the 2010 report (November 2011) generally reinforced the major trends that were reported in previous years. First, phytoplankton algae populations in Gunston Cove have shown a clear pattern of decline since 1989 (although chlorophyll values increased somewhat in 2008). Accompanying this decline have been more normal levels of pH and dissolved oxygen, increased water clarity and a virtual cessation of cyanobacteria blooms such as *Microcystis*. The increased water clarity has brought the rebound of submerged aquatic vegetation, which provides increased habitat value for fish and fish food organisms. The SAV also filters nutrients and sediments and itself will inhibit the overgrowth of phytoplankton algae. This trend is undoubtedly the result of phosphorus removal practices that were initiated in the late 1970s at the Noman M. Cole, Jr. wastewater treatment plant. This lag period of 10-15 years between phosphorus control and phytoplankton decline has been observed in many freshwater systems, resulting at least partially from sediment loading to the water column, which can continue for a number of years. Gunston Cove is now an internationally recognized case study for ecosystem recovery due to the actions that were taken and the subsequent monitoring to validate the response.

In short, due to the strong management efforts of the county and the robust monitoring program, Gunston Cove has proven an extremely valuable case study in eutrophication recovery for the Chesapeake Bay region and even internationally.

For a copy of the "Ecological Study of the Gunston Cove 2010" Final Report, use http://digilib.gmu.edu:8080/dspace/bitstream/1920/7401/1/GCExecSummary2010.pdf, or contact R. Christian Jones, Professor and Project Director at George Mason University.

10. Total Maximum Daily Loads

Under the Clean Water Act, states are required to monitor water quality and assess compliance with water quality standards every two years. 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. If monitoring data indicate that a water body does not meet water quality standards, the water body is listed as impaired and a Total Maximum Daily Load must be developed. A Total Maximum Daily Load is a watershed-specific plan for bringing an impaired water body into compliance with the Clean Water Act goals. A 1999 Consent Decree required the state to develop TMDL plans for all impaired streams listed on the 1998 303(d) Impaired Waters List by 2010.

VDEQ is currently developing bacteria TMDLs for the Sugarland, Mine and Pimmit Run watersheds (note: Mine Run, which is included in the area subject to Fairfax County's Nichols Run and Pond Branch Watershed Management Plan, is located in the Great Falls area). The TMDLs were scheduled to have been finalized in early 2012. There were no TMDLs completed in 2011.

a. Fairfax County Stream TMDLs

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

Bacteria (Fecal Coliform and/or E. coli):
- Accotink Creek.
- Four Mile Run.
- Bull Run (includes Cub, Johnny Moore and Little Rocky Runs).
- Pope's Head Creek.
- Difficult Run.
- Hunting Creek (includes Cameron Run and Holmes Run).

Sediment (Benthic Impairment):
- Bull Run (includes Cub, Johnny Moore and Little Rocky Runs).
- Pope's Head Creek.
- Difficult Run.

Polychlorinated biphenyls--PCBs:
- Tidal Potomac (includes Accotink Creek, Belmont Bay, Dogue Creek, Four Mile Run, Gunston Cove, Hunting Creek, Little Hunting Creek, Occoquan River and Pohick Creek).

Water Quality Assessments are performed by the Virginia Department of Environmental Quality and are available at: http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments.aspx.

EPA established the Accotink Creek benthic TMDL in April 2011. While sediment was identified as the pollutant of concern that is causing the benthic impairment, EPA used flow as a surrogate for sediment in establishing the TMDL. The TMDL calls for a 48.4% overall reduction in instream flows in Accotink Creek.

b. Accotink Creek TMDL

Accotink Creek was first listed as impaired on the 1996 303(d) List of Impaired Waters for not meeting the aquatic life use due to poor health in the benthic biological community. This impaired segment of Accotink Creek stretches from the confluence of Calamo Branch with Accotink Creek and extends downstream to the start of the tidal waters of Accotink Bay (7.35 miles). This segment was listed in Attachment A, Category 1 (Waters Listed on Part 1 of Virginia's 1998 303(d) Report) of the 1999 Consent Decree. An additional segment of Accotink Creek was listed as impaired on the 2008 303(d) List of Impaired Waters for not meeting the aquatic life use. This impairment extends from the confluence with an unnamed tributary to Accotink Creek, located in the upstream corridor of Ranger Park, and continues downstream until the confluence with Daniels Run (0.85 miles).

The TMDL study identified sedimentation caused by excessive storm water runoff is the primary stressor impacting benthic invertebrates in the biologically impaired segments of the Accotink Creek watershed. Habitat scores indicate decreased habitat quality in the impaired segments due to sedimentation and increased runoff from the surrounding urban environment. In addition to impacting aquatic life, stormwater runoff has drastically modified the hydrological characteristics of Accotink Creek as a result of increased urbanization and development. The watershed is characterized by a very flashy hydrology, caused by large rates of storm water runoff and increase flow velocity. Overall, the magnitude of the one-year, 24-hour storm water flow rate in the Accotink Creek watershed must be reduced by 48.4% to meet the established TMDL endpoint. The county is currently contesting this designation of a flow TMDL with EPA and is requesting a sediment TMDL be issued instead.

c. Four Mile Run TMDL

Due to high levels of fecal coliform bacteria, Four Mile Run was listed in 1996 and 1998 on the 303(d) Impaired Waters List. Although only the very upper reaches of Four Mile Run are located in Fairfax County, it is important to note the existence of a TMDL study for Four Mile Run and the participation of Fairfax County in the Four Mile Run TMDL study and implementation plan.

The Four Mile Run Fecal Coliform Study, which identified the sources of fecal coliform bacteria in the watershed using DNA testing, was completed in 2000. The study found that waterfowl contribute almost one-third (31 percent) of those bacteria that could be matched. Eighteen percent of the bacteria originated from humans, 13 percent from dogs, six percent from deer, 19 percent from raccoons and 13 percent from other sources. Bacteria from humans appear to be highly localized. There were indications that, without regard to specific host animals, *E. coli* bacteria seem to regenerate, through cloning, within the storm drains and stream sediments, which in turn perpetuates bacteria levels.

In 2002, the bacteria TMDL study for Four Mile Run developed by the Northern Virginia Regional Commission and the Virginia Department of Environmental Quality was approved by the EPA. NVRC, under a grant from VDEQ, worked with four jurisdictions (Fairfax and Arlington counties and the cities of Falls Church and Alexandria) to develop an implementation plan for the TMDL study. Completed in 2004, the plan focuses on reducing bacteria contamination from human and pet sources in the watershed and includes several initiatives from community outreach efforts to large capital projects. The plan can be viewed on-line at: http://www.novaregion.org/index.asp?nid=394.

NVRC continues to evaluate the impact of drainage modification projects in the Four Mile Run Watershed and ensures that the projects do not increase peaks discharges in the lower Four Mile Run. As a part of this program, updated GIS data are being compiled with the intent of updating the Four Mile Run Computer Model. NVRC also supported the U.S. Geological Survey to provide continuous stage, flow and precipitation data at the Shirlington Road bridge station and tidal stage data at the Rt. 1 Bridge station on Four Mile Run.

d. Hunting Creek, Cameron Run, Holmes Run – Bacteria TMDLs completed in 2010

Hunting Creek was listed as impaired for bacteria in Virginia's 2008 305(b)/303(d) Water Quality Assessment Integrated Report (VDEQ, 2008) due to exceedances of the state's water quality criteria for *E. coli* bacteria. The segment was first listed as impaired for fecal coliform bacteria on Virginia's 1998 303(d) List, and was included in Attachment A of the 1999 Consent Decree. Cameron Run was listed as impaired for bacteria in Virginia's 2008 305(b)/303(d) Water Quality Assessment Integrated Report (VDEQ, 2008) due to exceedances of the state's water quality criteria for *E. coli* bacteria. The segment was first listed as impaired for *E. coli* bacteria on Virginia's 2006 Integrated List. Holmes Run was listed as impaired for bacteria in Virginia's 2008 305(b)/303(d) Water Quality Assessment Integrated Report (VDEQ, 2008) due to exceedances of the state's water quality criteria for *E. coli* bacteria. The segment was first listed as impaired for fecal coliform bacteria on Virginia's 2004 Integrated List.

All three impaired segments are located within the Potomac River basin (USGS Cataloging Unit 02070010) in the City of Alexandria and Fairfax County, Virginia. The impaired segment of Holmes Run extends from the confluence of Holmes Run and Backlick Run upstream to the mouth of Lake Barcroft, covering approximately 3.58 miles. The impaired segment of Cameron Run extends from the head of tide at approximately the Route 611/241 (Telegraph Road) bridge crossing, upstream to the confluence of Holmes Run and Backlick Run, covering approximately 2.08 miles. The impaired segment of Hunting Creek extends from the confluence with the Potomac River at the state boundary, to the upstream limit of tidal waters at the Route 611/241 (Telegraph Road) bridge crossing, covering approximately 0.526 mi^2.

In order to meet the *E. coli* geometric mean water quality criterion of 126 cfu/100 ml, the following bacteria reductions are required for Holmes Run and Cameron Run:

- 100% reduction of the human sources (failed septic systems and sanitary sewer overflows).
- 83% reduction of the edge-of-stream loadings from runoff, interflow and groundwater discharge.
- 50% reduction of the direct instream loading from wildlife.

In order to meet the *E. coli* geometric mean water quality criterion of 126 cfu/100 ml in Hunting Creek, the following bacteria reduction are required:

- 100% reduction of the human sources (failed septic systems and sanitary sewer overflows).
- 83% reduction of the edge-of-stream loadings from runoff, interflow and groundwater discharge in non-tidal Cameron Run.
- 98% reduction of the edge-of-stream loadings from runoff, interflow and groundwater discharge in Hooff Run.
- 50% reduction of the direct instream loading from wildlife.
- 80% reduction of the load from City of Alexandria's combined sewer overflow Outfall 002.
- 80% reduction of the load from City of Alexandria's CSO Outfalls 003 and Outfall 004.

This TMDL was approved by EPA on November 10, 2010.

e. Potomac River Tributaries – Bacteria TMDL

A PCB TMDL has been established for the Tidal Potomac River. Information on TMDL development in Virginia is available on VDEQ's website: http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment.aspx

Several streams in Fairfax County have been identified as impaired on the Clean Water Act §303(d) list for not supporting the primary contact recreation use due to elevated levels of *E. coli* bacteria. Portions of Sugarland Run, Mine Run and Pimmit Run are included in the Potomac River Tributaries Bacteria TMDL. The impaired portion of Sugarland Run extends from the confluence with Folly Lick Branch downstream to the confluence with the Potomac River. The impaired reach of Mine Run extends from the confluence with an unnamed tributary to Mine Run downstream to the confluence with the Potomac River. The impaired portion of Pimmit Run extends from the headwaters of Pimmit Run downstream to the confluence with the Potomac River.

A draft TMDL was presented at the final public meeting in December 2011. In order to meet the *E. coli* geometric mean water quality criterion of 126 cfu/100 ml, the draft TMDL identified the following bacteria reductions:

Sugarland Run:
- 100% reduction of failed septic systems.
- 100% reduction of direct deposition of livestock waste into the stream.
- 96.6% reduction of nonpoint source agricultural loads.
- 96.6% reduction of nonpoint source urban loads.

Mine Run:
- 100% reduction of failed septic systems.
- 100% reduction of direct deposition of livestock waste into the stream.
- 78.5% reduction of nonpoint source agricultural loads.
- 78.5% reduction of nonpoint source urban loads.

Pimmit Run:
- 100% reduction of failed septic systems.
- 100% reduction of direct deposition of livestock waste into the stream.
- 99.2% reduction of nonpoint source agricultural loads.
- 99.2% reduction of nonpoint source urban loads.

The draft TMDL has not yet been finalized.

f. Chesapeake Bay TMDL

EPA established the Chesapeake Bay TMDL in December 2010. In order to provide reasonable assurance that the Chesapeake Bay TMDL can be achieved, EPA is requiring states and the District of Columbia to develop Watershed Implementation Plans that document how each jurisdiction will partner with federal and local governments to achieve and maintain water quality standards. Phase I of the Virginia WIP was approved by EPA in December 2010 and established target loads by sector and watershed. The final Phase II WIP was submitted to EPA on March 30, 2012 and does not include explicit allocations to local communities due to issues identified with using the Chesapeake Bay Watershed Model at the local scale. The WIP does include local strategies aggregated at the state scale and organized by source sector (agriculture, urban/suburban, on-sire wastewater, forest lands and resource extraction). Implementation of the urban/suburban strategies will take place through permits in MS4 communities, including Fairfax County.

Information on the Chesapeake Bay TMDL is available on EPA's website at: http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/index.html.

Information on Virginia's WIP process is available on VDEQ's website at: http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay/ChesapeakeBayWatershedImplementationPlan.aspx.

g. Public Participation in the TMDL Process

Public participation is a key component of the TMDL process in Virginia. Public meetings are held at the onset and closure of each TMDL project. Anyone is welcome to attend these meetings. Meetings are advertised through several methods, including published notices in the Virginia Register, announcements in the community calendar of local newspapers, fliers posted at public locations throughout the impaired watershed and through e-mail distribution lists. The purpose of the public meetings is to educate the community about the TMDL process and allow the public to ask questions and provide feedback on how to improve the project. Any questions relating to the TMDL process should be directed to the TMDL Coordinator at the Northern Regional Office of VDEQ: http://www.deq.virginia.gov/Locations/NorthernRegionalOffice.aspx.

11. Pond and Lake Monitoring and Management

There are a number of significantly sized private and public ponds and lakes throughout the county. All ponds and lakes in Fairfax County are man-made by excavation and/or the damming of streams. Most of these ponds and lakes serve as stormwater management facilities for developments and have houses along their shorelines. There are also numerous smaller ponds associated with commercial developments, golf courses or farm properties. These open water impoundments provide habitat for a number of aquatic organisms and waterfowl as well as recreational opportunities for humans. Due to increased runoff from development and in-stream bank erosion, these water bodies are often subject to heavy sedimentation, which requires frequent dredging in order to maintain pond or lake depth. Heavy nutrient loading results in large algal blooms during warmer months. Other problems that plague urban ponds and lakes include thermal stratification, reduced water clarity, decreased dissolved oxygen levels, trash and nuisance invasive vegetation.

a. Reston Lakes

The Reston Association, the homeowners association for the planned community of Reston, has an active watershed and lake management program. Four lakes, Audubon, Anne, Thoreau and Newport, as well as two ponds, Bright and Butler, are monitored. Dissolved oxygen, dissolved oxygen saturation, temperature, pH, conductivity, total phosphorus, Secchi depth transparency, chlorophyll a, phytoplankton and zooplankton are monitored. Fecal coliform and E. coli bacteria testing have been conducted in Lake Audubon for annual swimming events. Detailed monitoring information and data can be found in the 2011 Reston Lakes Annual Monitoring Report. This report and other information about Reston's lakes can be obtained by contacting RA's watershed supervisor at 703-435-6560 or visiting the website: https://www.reston.org/ParksRecreationEvents/Nature/NaturalResources/Watershed/LakeReport/Default.aspx?qenc=HzT9ACzZbNs%3d&fqenc=IuyzM7YCiw0lLHyFP%2b9FHw%3d%3d.

Purple loosestrife, a noxious weed in Virginia, was well established at Lake Newport and was discovered on the other three lakes in 2008. In 2012, RA staff continued the massive removal of purple loosestrife from the shoreline at all four lakes. RA also removed the large miscanthus ornamental grasses from the dam at Lake Newport to prevent their seeds from propagating the down-slope dam and natural area surrounding the lake.

In 2011, Lake Thoreau's west cove was dredged and treated to control the spread of yellow floating heart. In summer 2012, Lake Thoreau experienced dramatic growth of aquatic plants including Eurasian Watermilfoil, Yellow Floating Heart (both non-native invasive plants) and Floating Leaved Pondweed, which was the most prevalent. The Floating Leaved Pondweed is a native plant and is typically a beneficial plant for fish habitat and waterfowl food. The Eurasian Watermilfoil is a non-native plant of high concern.

RA's management strategy included treating for Eurasian Watermilfoil, Yellow Floating Heart and Floating Leaved Pondweed along the shoreline and other impacted areas in June 2012, contracting with a licensed aquatic herbicide company, Aquatic Environmental Consultants, Inc., to do the treatment. AEC applied three different herbicides to target the different plants over the course of one day.

RA treats Lake Anne monthly in the summer to prevent blue green algae blooms. Lake Anne is the oldest lake and has been treated since 2005. Lake Anne's concrete riser structure was repaired in winter 2011.

b. Pohick Watershed Lakes

The six Pohick watershed lakes (Barton, Braddock, Huntsman, Mercer, Royal and Woodglen) are inspected annually for dam structure but are not monitored for biological or chemical parameters.

c. Lake Barcroft

The Lake Barcroft Watershed Improvement District is a local taxing district authorized under Virginia law for conservation purposes. The WID is responsible for the management of Lake Barcroft and regularly monitors water quality. Due to sediment loading the lake is in need of dredging. Given the significant amount of sediment that needs to be removed, there are continuous concerns with the lack of adequate local disposal areas. For more information about Lake Barcroft, contact the Operations Director at 703-820-1300 or see the website: www.lakebarcroft.org.

d. Lake Accotink

Lake Accotink is owned and managed by the Fairfax County Park Authority and is a key feature of Lake Accotink Park. The lake was originally created by construction of a dam across Accotink Creek in 1918. The existing dam was constructed in 1943. Similar to other urban lakes and ponds, Lake Accotink has been impacted significantly by accelerated sedimentation, which has reduced the average depth of the lake to less than four feet. Project funding in the amount of $6.15 million was included in the 1998 Park Bond Program to dredge the lake and make repairs to the dam.

In September 2005, the Park Authority Board approved a contract award to Mobile Dredging and Pumping to hydraulically dredge 161,000 cubic yards of silt from Lake Accotink and pump the material to a property owned by Virginia Concrete for dewatering and disposal. The Department of Public Works and Environmental Services is overseeing the construction contract because of its past experience on other similar type projects.

Mobilization began in October 2005 and the 2.8 mile long slurry pipe line installation was completed in June 2006. Dredging began in July 2006. The project also includes expanding and enhancing existing wetlands. At the Park Authority's request, DPWES performed a preliminary evaluation to determine if the Virginia Concrete disposal site could accommodate additional dredge material above the 161,000 cubic yards currently specified in the contract. Based on this review, up to 204,000 cubic yards of material can be disposed of at the Virginia Concrete site, and DPWES agreed to provide $1,545,000 in additional funding to dredge and dispose of 43,000 additional cubic yards. In June 2006, a major storm caused a significant amount of silt to flow into the marina area, reducing water depth. In combination with the drought conditions, boat access from the marina to the main lake channel has been limited. DPWES has agreed that a portion of the additional 43,000 cubic yards of dredge material could be reprogrammed for dredging in the vicinity of the marina, reducing the dredge amount at the top end of the lake by an estimated 10,000 cubic yards.

Approximately, 195,000 cubic yards of material was removed by project completion in September 2008.

Lake Accotink Dam

The Department of Public Works and Environmental Services completed major repair work on the embankment and spillway in November 2010, and DPWES is currently preparing a technical application package that must be approved by the Virginia Department of Conservation and Recreation before a regular Operations and Maintenance certificate will be issued for the dam.

The Fairfax County Park Authority currently has a conditional O&M certificate from DCR that expires on November 30, 2012. In order to receive a regular O&M certificate, the Park Authority must submit an updated certification package for the dam prepared in accordance with the most current state impoundment structure regulations (enacted in 2011). As part of that submission package, the Park

Authority has been asked to demonstrate that a Spillway Design Flood reduction is warranted based on an Incremental Damage Analysis. To satisfy DCR's submission requirements, DPWES will be hiring a consultant to prepare the updated certification package and perform the Incremental Damage Analysis to establish the required Spillway Design Flood.

It is not certain at this time that the Incremental Damage Analysis completed under the new regulations will allow the Spillway Design Flood to be reduced below the full Probable Maximum Flood. The spillway's current capacity is approximately 0.6 of the Probable Maximum Flood. DPWES is therefore recommending that the Park Authority pursue obtaining a regular O&M certificate under the state's "Special Criteria" for reduced Spillway Design Flood requirements for existing high hazard dams. Under the "Special Criteria" regulations, the Spillway Design Flood can be based on flows resulting from the 0.6 Probable Maximum Flood storm rather than the 0.9 Probable Maximum Flood storm if certain conditions are met. The conditions include daily monitoring, annual inspections by a professional engineer and adequate insurance to cover the costs of downstream property losses that may result from a dam failure.

e. Twin Lakes—North Twin Lake Dam

The Fairfax County Park Authority completed a Capital Improvement Project to repair the North Twin Lake dam at Twin Lakes Golf Course. The scope of repair work included: demolishing the existing bridges, spillway structure and outfall channel; raising the dam embankment elevation approximately five feet; and constructing a new concrete spillway structure, armor earthen emergency spillway, outfall channel and cart bridge. The repair work was required by the Virginia Department of Conservation and Recreation in order for DCR to issue the Park Authority a regular operations and maintenance permit for the dam. The repair work was completed satisfactorily in January 2012 and the design engineer is now preparing the application and as-built drawings required by DCR to obtain a regular O&M permit.

12. Groundwater Monitoring

The United States Geological Survey maintains a series of wells throughout the nation to monitor groundwater levels and drought. Two wells are located in Virginia; one such well (Site 385638077220101) in Fairfax County has been maintained since 1976. This well provides continuous real-time data that is used to assess ground water levels. Information on this well is available on-line at: http://groundwaterwatch.usgs.gov.

With respect to leaking underground storage tanks, in FY 2012, there were 102 new release cases investigated by the Virginia Department of Environmental Quality. As of June 2012, there were a total number of 2,937 cases from years past, of which only 65 remain open.

13. Stream Restoration and Ecosystem Function

The Hydroecology of Flowing Waters group in the National Research Program of the United States Geological Survey is currently conducting a study on two streams in Fairfax County to evaluate the effects of stream restoration on stream ecosystem functioning at low levels of the food chain. By changing the morphology of the stream, restoration activities change the distribution of habitats for primary producers and consumers and the amount of time it takes water to move through those habitats. Restoration activities also change the quantity of light reaching the stream, altering the amount of primary production by algae. Both factors influence the balance between the production and respiration of organic matter, which in turn strongly influences food web structure and water chemistry. The USGS study focuses on obtaining a fundamental understanding of the linkage between flow, the transport of sediment and organic matter, the physical structure of the stream and the resulting production and respiration of organic matter in a restored section of Accotink Creek, compared to an unrestored section of Upper Difficult Run. Initial efforts are under way to understand how spatial differences in the physical characteristics of these streams control spatial differences in primary production and respiration. Future efforts will involve laboratory and numerical modeling studies to determine how storm flows influence these processes. The study is not yet completed.

D. WATERSHED MANAGEMENT

1. Watershed Master Plans

Between 2003 and 2011, the Stormwater Planning Division of the Fairfax County Department of Public Works and Environmental Services undertook a planning initiative to develop a series of watershed management plans. The plans were developed with the assistance of the community through public meetings and individual plan stakeholder groups. A total of 13 plans, which cover all 30 county watersheds, were developed and adopted by the Board of Supervisors. From this planning effort, more than 1,700 structural and non-structural projects were proposed to help restore and protect our vital natural resources. The overarching goals for the watershed plans are:

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

In November 2011, the county provided a status update of the watershed planning and the broader stormwater management programs to the public. The number of projects selected each year for implementation will be determined as part of the annual budget process. Efforts to include implementation of non-structural projects and policy recommendations from the watershed plans are ongoing.

2. Restoration Efforts

a. Department of Public Works and Environmental Services Stream Restoration and Stabilization Projects

i. Stormwater capital projects

In 2011, the county and its partners continued to implement stormwater management-related capital projects, including seven flood mitigation projects, more than 15 stormwater management facility retrofits, seven low impact development projects and five stream restoration and stream stabilization projects. Staff continued to monitor the quantity and quality of runoff from three innovative stormwater management systems throughout the county. Flood insurance premiums dropped in 2010 for residents of Fairfax County who have or may purchase flood insurance on their properties in Special Flood Hazard Areas due to an improved rating from the Federal Emergency Management Agency.

ii. Stream and outfall improvements

In 2011, the county completed five stream restoration or stabilization projects including one with non-profit organization and volunteer assistance. Among these:

- Flatlick Confluence Stream Restoration: Stabilization and enhancement of approximately 1,400 linear feet of Flatlick Branch at the confluence with Cub Run in the Cub Run watershed. Natural channel design principles and structural features were used to restore a highly eroded reach of the stream along Fairfax County Park Authority property and the Chantilly National Golf Course and Country Club. Elements of the design included installation of engineered riffles, stone cross vanes, stone J-hooks, stone toe protection, root wads, large woody debris, encapsulated soil lifts and native vegetation. The project improved water quality and habitat through restoration of ecological form and function to the stream corridor. Implementation of the project required close coordination with the commercial land owner, the FCPA and the Upper Occoquan Service Authority. Survey and relocation of native freshwater mussels was also implemented by this project.

- Schneider Branch Stream Restoration: Natural channel design principles and structural features were used to restore approximately 900 linear feet of Schneider Branch along FCPA and Board of Supervisors property. Elements of the design included installation of engineered riffles, stone cross vanes, stone J-hooks, stone toe protection, root wads, large woody debris, off-line wetlands and native vegetation. The project also included replacement of a failing roadway bridge culvert to maintain access to the Maintenance and Stormwater Management Division's Dulles Maintenance Facility. The project improved water quality and habitat through restoration of ecological form and function in the stream corridor.

- Little Pimmit Run: This project stabilized 100 linear feet of stream bank and 70 linear feet of drainage channel using J-hook rock vanes, floodplain benching, step pools and revegetation.

- Hunters Branch Outfall: This project stabilized an eroding outfall on an Accotink Creek tributary. In addition, the project improved water quality by providing a series of step pool sequences intended to increase the residence time of water to allow sediment and pollutants in the runoff to settle out in the pools.

- Kingstowne II: This project restored 2,500 linear feet of stream channel using natural channel design with stilling basins (plunge pools) at culvert outfall locations, step-pools, step-runs and rock cross vanes. A raised stream bed was reconnected to the floodplain and a revegetated buffer was installed, all of which resulted in protection for aquatic life, an exposed gas line and the surrounding community.

iii. Detention basin retrofits

Fifteen detention basins throughout the county were retrofitted for enhanced detention/retention and improved water quality. In addition, new riser structures and sediment forebays help to facilitate maintenance efforts. Specially designed seed mixes enhance basin function and vegetation longevity with native species.

iv. Water quality retrofits

Seven locations were retrofit employing various techniques for water quality, including rain gardens, a green roof, pervious pavement and water quality swales. These locations include county-owned property such as schools, parks and a library.

b. Riparian Buffer Restoration

i. Cross County Trail projects

Two sections of restoration of the Cross County Trail (both in Section 4 in Wakefield Park) that include stream restoration/riparian buffer restoration are:

Mockingbird Drive Bridge

Design is underway for a new bridge to replace an existing fair-weather crossing near Mockingbird Drive. The project will include 900 LF of asphalt paving for an existing gravel trail section and restoration of about 60 LF of eroding stream bank. Approximately 80% of the project is funded with a Recreational Trail Program Grant.

Wakefield Park Improvements

Design is underway for a project to upgrade two fair weather crossings in Wakefield Park to fiberglass bridges, and repair the undermined footing on a steel frame bridge. This process will include about 50 LF of stream bank restoration. Approximately 350 LF of an existing dirt trail in Americana Park will be paved with asphalt.

ii. Other projects

Two stream restoration projects were completed on parkland in 2011: The Schneider Branch and Flatlick Branch stream stabilization projects, both in Cub Run Stream Valley Park each address approximately 1,000 linear feet of stream. The projects were designed to address long standing problems with the stability of the stream banks; erosion was threatening park infrastructure and resulting in degraded stream conditions. The restorations included: rock walls; rock cross-vanes; j-hook weirs and rock deflectors; and graded banks stabilized with natural fiber matting and native plants to control stream grades, guide flow patterns away from banks where erosion might occur and improve stream habitat. Funding for the projects was supplied by the Department of Public Works and Environmental Services. Construction began in winter 2010 and was completed in summer 2011. Restoration planting for the projects was completed in fall 2011.

The Fairfax County Park Authority continues to maintain and monitor the previous riparian buffer enhancement projects installed in the last six 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. In 2011, the county's partner organization, Earth Sangha, maintained and enhanced riparian plantings at Roundtree Park, Rutherford Park and Rocky Run (Awbrey Patent). Earth Sangha also donated 100 trees that were planted by volunteers in Pohick Creek Stream Valley Park. Park Authority staff completed additional planting projects in the Resource Protection Area; these projects were unrelated to the county's buffer planting program. Examples of such projects in 2011 included: the planting of 130 native shrubs, grasses and forbs by an elementary school class with 55 students, parents and teachers at Annandale District Park; and the planting of 65 native trees along Turkeycock Run in Green Spring Gardens Park.

The Fairfax County Park Authority, Fairfax ReLeaf and the Virginia Department of Forestry hosted independent stream buffer restorations in the county in 2011.

In 2011, Fairfax ReLeaf planted 3,880 trees and distributed 1,185 additional trees in Fairfax County.

c. Huntley Meadows Park

In June 2006, the Fairfax County Park Authority and DPWES completed a stream stabilization and stormwater control improvement project on Barnyard Run above Huntley Meadows Park. The project involved creating a number of step pools in the stream to reduce energy and erosive force and stabilization of several hundred feet of stream bank using bioengineering techniques and native plant seedlings. In 2007, additional live stakes, tublings and biologs were installed to further stabilize banks. Maintenance of construction access points continued in 2007.

In 2007, the county began working on the plan for Huntley Meadows Wetland Restoration project. The goal of the project is to restore the wetland to its previous, more water-filled condition with the aid of an earthen berm, water control structure and several wetland pools. The project is ongoing. Information about the project can be found on-line at: http://www.friendsofhuntleymeadows.org/News%20and%20Events/Wetland%20Restoration%20Project/HuntleyMeadows-ProjectSummary-final/HuntleyMeadows-ProjectSummary-final.pdf.

d. Reston

Reston's multi-year stream restoration project is under way. Reston Association continues to work with Northern Virginia Stream Restoration, L.C., managed by Wetland Studies and Solutions, Inc., to help coordinate the Reston stream mitigation bank. The project is implementing the recommended stream restoration projects outlined in the Reston Watershed Management Plan. A team of regulatory agencies, including the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality, oversees the progress of the bank.

The groundbreaking for Phase I, which covers 14 miles of stream, occurred on Feb. 12, 2008. As of June 2012, approximately eight miles of stream in the Snakeden Branch, The Glade and Colvin Run watersheds have been restored, fully funded by the Northern Virginia Stream Restoration, L.C.
Engineering design plans are under way for the remaining six miles of stream restoration. Construction of the approved plans will depend on the economy and mitigation credit sales with a goal of beginning in late 2013. For more information on the stream restoration project in Reston visit: http://reston.wetlandstudies.com or www.reston.org.

e. Little Pimmit Run

In June 2007, the Northern Virginia Soil and Water Conservation District completed the Little Pimmit Run Stream Restoration project. The project involved a public-private partnership that used natural stream channel design and innovative techniques to restore 675 feet of a severely degraded stream segment. It also protected three threatened sanitary sewer lines that are parallel to and crossing the stream. Nearby homeowners assumed two-thirds of the cost for design and construction of the project, which is located primarily within parkland. NVSWCD partnered with an engineering firm to design and oversee the project. Other partners, in addition to the homeowners, included the Park Authority, DPWES-Wastewater Collection Division, the Dranesville District Supervisor and Angler Environmental Construction. The design included two stacked stone walls to bankfull height, five j-hooks to control and direct flow, bankfull benches, riffles and pools throughout the segment, an integrated trail crossing, floodplain and upland grading and planting with native grasses, shrubs and trees.

Since completion, the restored channel functions as designed and successfully conveys stormwater flows. The neighbors are exploring how they can help with stewardship of the project, including the riparian buffer. Both the stream and riparian habitats are improving, and the trail users enjoy the new stream crossing.

3. Flood Remediation/Reduction Programs

a. Belle Haven Watershed Flood Damage Reduction Study

In September 2003, Hurricane Isabel caused $1.6 billion in damages statewide, more than $10 million of which occurred in Alexandria and Fairfax County. A tidal surge from the Potomac River that was nine feet in height inundated Old Town Alexandria and the Belle View neighborhood of Fairfax, resulting in "State of Emergency" declarations. In Fairfax County, the New Alexandria and Belle View communities experienced severe flooding from the tidal surge, which damaged more than 200 structures. Both neighborhoods are located in the Special Flood Hazard Area and are vulnerable to future flooding. The SFHA is the Federal Emergency Management Agency's defined 100-year floodplain. The U.S. Army Corp of Engineers, on behalf of Fairfax County, worked to determine if there were technically-feasible and cost-effective flood damage reduction alternatives for the Belle Haven watershed. To reduce flood damages throughout the entire study area, it was determined that a floodwall/levee combination, with a pumping station for interior drainage, may be feasible. The USACE study evaluated such structural options as levees and flood walls and such flood proofing alternatives as raising and modifying structures. A preliminary investigation was completed and five percent concept-level design alternatives were developed. The USACE is continuing to address National Park Service and community concerns; in February 2012, the agency updated cost estimates and cost benefit ratios for several floodwall/levee alignments, the most expensive alternative being approximately $35 million.

b. Huntington Flood Remediation Project

In June 2006, the Huntington community experienced devastating flooding from Cameron Run which affected more than 160 homes. The flood waters exceeded the Federal Emergency Management Agency 100-year floodplain elevation by approximately three feet. The community also experienced additional flooding in September 2011. Fairfax County contracted the United States Army Corps of Engineers to determine the contributing factors of the flooding and to develop a design to protect the Huntington community. The USACE completed 65 percent flood mitigation plans in April 2009, which included a levee along Cameron Run. The estimated cost for the levee project is $30 million. In an effort to identify funding to complete the project, on May 22, 2012, the Fairfax County Board of Supervisors approved the 2012 Bond Referenda, which included a referendum on whether the county should be authorized to issue $30 million in bonds to construct this project. This referendum will be held on November 6, 2012.

4. Support Programs

a. Northern Virginia Soil and Water Conservation District

The Northern Virginia Soil and Water Conservation District is a political subdivision of the Commonwealth of Virginia that has the same boundaries as Fairfax County. The district's goal is to promote clean streams and protected natural resources. NVSWCD works to lessen the impacts of urban/suburban activities on land and water resources in Fairfax County by working with government agencies, industry and the general public and providing technical assistance and outreach programs.

NVSWCD provides information, educational programs, volunteer opportunities and newsletters to residents on many aspects of water quality, erosion and drainage, nonpoint source pollution and stream health. NVSWCD reviews and provides comments to the county's Department of Planning and Zoning on rezoning and special exception applications, with particular attention to the properties of soils, the potential for erosion, the impact on drainage, stormwater management and the surrounding land uses and environment. The District has partnered with many groups to implement several stream restoration and low impact development projects.

In 2011, NVSWCD coordinated, with neighboring jurisdictions, a regional rain barrel initiative for Northern Virginia. Eleven "build- your-own" rain barrel workshops and three pre-made rain barrel sales were held in Northern Virginia.

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 2011. NVSWCD presented three rain garden workshops during 2011. The workshops covered rain garden function, design, location, costs, construction, maintenance, planting and materials. The workshops were attended by 78 county residents and industry professionals. Reston Association also installed a rain garden at the Millennium cluster, a group of single-family, townhouse and multifamily dwellings in a community.

In addition, NVSWCD organized the Watershed Friendly Garden Tour in June 2011, showcasing low impact development practices including green roofs, porous pavers, rain gardens, composting, rain barrels, native species, wildlife habitat and more, inspiring visitors to adopt these practices in their own yards and schools.

In 2011, NVSWCD developed soil and water quality conservation plans for 26 parcels on 443 acres, which included 10,655 linear feet of Resource Protection Areas. The RPAs included 2,250 linear feet of new vegetated buffers and 8,405 linear feet of re-planned buffers. Three of the plans were prepared for landowners to help meet the requirements for renewing the Agricultural and Forestal District status of their properties, under the county program administered by the Fairfax County Department of Planning and Zoning.

b. Virginia Department of Forestry

In 2011, the Virginia Department of Forestry partnered with volunteers from organizations such as Fairfax ReLeaf, Eagle Scouts, Homeowner Associations and school groups and completed 16 community tree plantings in the county. Volunteers donated over 1,000 hours and planted 1,538 trees in these 16 events. Seven of the tree plantings were along streams and 1,525 feet of riparian buffer were added.

In an attempt to expand outreach and education and planting efforts, the Department of Forestry initiated a Tree Stewards program. The Tree Stewards program is designed to create a cadre of trained volunteers to lead community tree plantings and provide information on the benefits and care of trees.

The Virginia Department of Forestry 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 2011, VDOF completed three Agricultural and Forestal management plans. Stream management zones were noted on these plans and efforts were made to include buffers from the agricultural uses. The protection of forest cover and water quality were both promoted in the plans.

VDOF also writes Stewardship Plans for forestland owners and Neighborhood Forest Management Plans for Homeowners and Civic Associations. As a matter of course, these plans include an assessment of water quality issues such as erosion, pet waste and fertilizer use. The Department of Forestry wrote one Neighborhood

Forest Management Plan covering a 90-acre condominium complex built entirely within a Resource Protection Area.

c. Reston Association

RA is actively involved in public education and innovative approaches to erosion and drainage control. Examples of watershed management practices in Reston include: water quality monitoring; stream bank and shoreline stabilization; erosion abatement; fisheries monitoring; algae and invasive aquatic weed control; waterfowl management; trash removal; dredging; and riparian buffer restoration.

In 2011, Reston continued marking 200 storm drains with the message **"No Dumping, Drains to Difficult Run"** or "Sugarland Run." The storm drain marking project is part of the countywide initiative to educate residents on the impact of non-point source pollution.

5. Reston Storm Water Trail

The Reston Association received a grant for $8,500 from the Chesapeake Bay License Plate fund, $4,000 from Fairfax Water and a donation from Deloitte LP to implement a self-guided Storm Water Trail in Reston that serves as a guide to help community associations, residents and youth to better understand stormwater management. It also encourages individuals to implement at least one of the demonstrated techniques to protect water quality from nonpoint source pollution and to buffer storm runoff. The Stormwater Trail is complete and established.

The Storm Water Trail includes best management practices and low impact development techniques, including an infiltration sidewalk that uses porous paver bricks. Also included is a rain garden that collects water from the gutter and downspouts at Brown's Chapel; it filters the water through a mixture of sand, topsoil and leaf mulch before conveying the drainage into a gravel layer, a drainage swale, a garden planted with native species that grow well in the Northern Virginia area which require little maintenance and a rain barrel that will be used to collect and conserve rainwater to be used to water the gardens in between rainstorms.

The Storm Water Trail helps satisfy the goal outlined in Reston's watershed plan of expanding environmental education opportunities in the watersheds of Reston. On-site controls have been implemented that include low impact development technologies to reduce stormwater runoff volumes and peak flows and to implement best management practices and retrofits to take advantage of natural storm water infiltration that is provided in natural stream valleys.

Reston's watershed master plan is available online at: https://www.reston.org/ParksRecreationEvents/Nature/NaturalResources/Watershed/WatershedMasterplan/Default.aspx?qenc=HzT9ACzZbNs%3d&fqenc=nvONwrgxjZ6oyRuamln6yw%3d%3d.

6. Organized Countywide Stream Cleanups

In 2011, the multi-agency trash workgroup (consisting of representatives from the Stormwater Planning Division, Division of Solid Waste, Northern Virginia Soil and Water Conservation District and Clean Fairfax Council) began developing a Trash Assessment for Improved Environments stream condition assessment form for Fairfax County. Similar to rapid assessment methods used to inventory the physical condition of stream habitats, the TAFIE approach can provide visual estimates of certain characteristics (such as amount of visible trash, threats to human health and wildlife and evidence of illegal dumping) and describe the overall condition of a particular location. The goal is to develop and make available a more rigorous method of evaluating the pre- and post-cleanup condition of a stream cleanup site that is easily understood by volunteers and to use the resulting information to guide future litter control and outreach efforts. The TAFIE worksheet and the accompanying guidance were field tested at several stream cleanup sites in 2011; feedback from these events was used to refine and clarify the worksheet and instructions for use. In 2012, the TAFIE form and guidance will be made available to schools, scout troops, and other stream cleanup groups.

The county continued to work with and support the following organizations that coordinate large and small-scale volunteer cleanups:

- Clean Fairfax Council.
- The Alice Ferguson Foundation (Potomac River Watershed Cleanup).
- Clean Virginia Waterways (International Coastal Cleanup).

Clean Fairfax Council documented the following metrics regarding litter and clean-up activities that it organized:

- Report a Litterer reports (via anonymous fill-in form at Clean Fairfax website or the Report a Litterer hotline) – 102.
- Total number of clean up events either planned or supported – 75.
- Total number of volunteers at clean up events – 1,630.
- Total number of volunteer hours – 8,050.
- Cubic yards of garbage collected – 720.

The county continued to provide support and staff for various stream and river cleanup events. In spring 2011, approximately 76 sites were established throughout the county for the Alice Ferguson Foundation's annual Potomac River Watershed Cleanup. Cleanups were conducted at numerous state, county and local parks, schools, the county wastewater treatment plant and other locations. These cleanups were advertised in publications such as 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, Fairfax County Park Authority and the Northern Virginia Soil and Water Conservation District participated in these cleanups. More than 1,734 volunteers removed 1,713 bags of trash and litter, 200 tires, 1,883 cigarette butts, 8,559 plastic shopping bags and 31,750 plastic bottles from Fairfax County streams. All told, over 27.96 tons of trash were collected.

According to Clean Virginia Waterways, a total of 1,022 volunteers participated in the International Coastal Cleanup in Fairfax County during September and October 2011. More than 57.5 stream and shoreline miles were cleaned, and 19,478 pounds of trash and marine debris were removed. Food wrappers and containers, litter from recreational activities and fast food consumption (i.e. cups, plates, forks, etc.) and plastic bags were the most commonly collected trash items in the county.

The county continued to promote the "Adopt a Stream" program. The Stormwater Planning Division distributed copies of its Floatables Monitoring Program Brochure to various public offices and during educational activities and outreach events throughout the county. The brochure was also made available on the county Stream Litter website: http://www.fairfaxcounty.gov/dpwes/stormwater/streamlitter.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 county website) and return the completed form to the county. Cleanup data submitted to the county are entered in the Floatables database.

In April Reston Association participated in the **Potomac River Watershed Cleanup** where 121 volunteers collected a total of 132 bags and over a ton of loose trash from Snakeden Branch, Colvin Run and the stream behind Stevenage Road.

In June, RA participated in the **Clean the Bay Day**, hosting three **Lake Cleanups** on Lake Audubon, Lake Thoreau, and Lake Anne where 60 people got on boats or walked to clean approximately six miles of shoreline in Reston. In October, RA hosted the **Fall Stream Watershed Cleanup** where 43 volunteers collected a total of 96 bags of trash. Of those bags, 39 were full of recycling material and were brought to local recycling center.

E. STORMWATER MANAGEMENT, ENFORCEMENT AND INSPECTIONS

1. VPDES Municipal Separate Storm Sewer System Permit

Fairfax County's Virginia Pollutant Discharge Elimination System Municipal Separate Storm Sewer System permit (known as the "MS4 permit") requires the county to prevent the discharge of pollutants such as oil, fertilizer, pet waste and trash from the stormwater management system into waterways to the maximum extent practicable.

The permit also prohibits non-stormwater discharges into the storm drain system, such as from illicit sanitary sewer connections or illegal dumping. It also requires storm event monitoring and assessment of the effectiveness of stormwater controls being used in the county.

The MS4 permit is issued to the county as a whole and elements of the stormwater management program are implemented by a broad range of county agencies and partners. The Stormwater Planning Division and the Maintenance and Stormwater Management Division manage the majority of stormwater management program elements, including comprehensive watershed management planning, long term biological monitoring, infrastructure mapping, inspections and maintenance, retrofitting developed areas with water quality control facilities and public outreach and education. Inspections of privately owned stormwater management facilities are conducted on a regular basis (every five years). Water quality is monitored at selected storm sewer outfalls four times per year (seasonally). Outfalls are monitored during dry weather to determine the presence of illicit discharges.

The Virginia Department of Conservation and Recreation took over administration of the MS4 permit program as part of the Virginia Stormwater Management Program in 2005. In July 2006, the county submitted its MS4 permit reapplication to DCR. The county's current MS4 permit expired in January 2007; however, the county is operating under an administrative continuance of the existing permit while the county and state work on reissuing the permit. County staff has been working with DCR and other municipalities on clarification of the new permit requirements. In April 2011, the county responded to DCR's fifth preliminary draft permit. The latest preliminary draft includes incorporation of Fairfax County Public Schools into the countywide permit, as well as new requirements related to MS4 program plan updates, watershed management plans, inventory control, nutrient management plans, industrial and high risk runoff stormwater management at county facilities, monitoring, public outreach, employee training and development of TMDL action plans.

On June 8-9, 2011, EPA Region 3 representatives and their consultants conducted an on-site compliance inspection of the county's MS4 program. The inspection focused on Structural and Source Controls, Construction Site Runoff, Industrial and High Risk Runoff and Illicit Discharge and Improper Disposal components of the permit program. Representatives of the Department of Public Works and Environmental Services, Department of Vehicle Services, Fire and Rescue Department, Fairfax County Park Authority, Health Department, Department of Transportation and the County Attorney's Office participated in the inspection. To date, the county has not received a formal report on the results of the inspection.

The county is working diligently with the state to obtain a new permit. Fairfax County MS4 annual reports can be viewed on-line at: www.fairfaxcounty.gov/dpwes/stormwater/ms4permit.htm.

2. Regional Stormwater Management Pond Program

Since the early 1980s, the county's Public Facilities Manual has included a provision that encourages the concept of regional stormwater management. As opportunities arose, major developers and county staff pursued regional stormwater management primarily through the development process. A plan identifying the most appropriate locations for regional facilities was needed to improve this process.

The Regional Pond Subcommittee, an ad hoc subcommittee of the Fairfax County Environmental Coordinating Committee, reviewed the county's stormwater management plan and developed recommendations. The Board of Supervisors tasked the subcommittee in January 2002 to examine the role of regional ponds as well as other alternative types of stormwater controls as watershed management tools. The report, which identified 61 recommendations to improve Fairfax County's stormwater management program and to clarify the role of regional ponds, was submitted to and accepted by the Board of Supervisors. The Regional Stormwater Management Plan is being replaced as countywide watershed management plans are being implemented.

Although innovative stormwater management practices are being explored and applied throughout the county, construction of regional ponds continues to be an option used by the county to retrofit areas needing stormwater controls.

3. Stormwater Management Facilities and Infrastructure

Fairfax County maintains more than 1,460 stormwater management facilities (which are inspected annually), 1,500 miles of pipe, 45,000 inlets and manholes and over 100 miles of manmade channels. The county usually inspects one-fifth of the over 3,600 privately maintained stormwater facilities every year.

The Maintenance and Stormwater Management Division of the Department of Public Works and Environmental Services inspects and maintains all county-owned and operated stormwater management facilities and Best Management Practice facilities and infrastructure. Pond inspections occur on a biannual basis and are balanced by fiscal year, which complies with the permit requirement to inspect all county-maintained facilities at least once during the term of the permit.

MSMD inspects and oversees private maintenance agreements for privately-owned stormwater management facilities. In 2011, MSMD inspected 1,156 of the 1,465 county-maintained stormwater management and BMP facilities at least once. MSMD inspected 616 of the 3,611 privately-maintained facilities in 2011.

In 2011, MSMD continued its maintenance program for county stormwater management facilities. Maintenance can include repairs to stormwater management facility structures and removal of sediment. During 2011, the county cleaned and/or mowed 1,259 dam embankments, including 52 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 helps keep the facility functioning properly by conveying water and performing the BMP function as designed. The county completed 2,259 work orders, including: un-blocking stormwater management ponds and pipes to avoid flooding or damaging infrastructure; channel and pond cleaning; mowing; weeding; planting; outfall repair; stream restoration and bank stabilization; trail maintenance; graffiti removal; snow removal; sign repairs/installation; and responses to complaints. The agency saw a significant increase in the number of complaint-driven work orders due to the effects of Tropical Storm Lee.

In addition to routine maintenance inspections, county staff with expertise in dam design and construction continues to perform annual inspections of 19 state-regulated, DPWES-owned dams in the county to identify any safety or operational items in need of corrective action and to ensure that the dams satisfy state safety requirements. A work program was established and implemented to correct deficiencies and address maintenance items discovered during inspections. Critical items such as the stability of the dam embankment and the function of the water control structures are addressed on a priority basis, while routine items, such as mowing, are scheduled five times per year.

As the stormwater management concept continues to shift its focus from flood control to water quality and environmental enhancements, the county's public maintenance inventory of low impact development facilities has grown to 177 facilities, including: bioretention gardens; green roofs; permeable pavers; vegetated swales; tree box filters; and infiltration trenches.

During 2011, MSMD continued implementation of its infrastructure inspection and rehabilitation program. Staff inspected 850 pipe segments and 15,000 storm structures with video and photo documentation. Under the rehabilitation program, more than 17 miles of pipe were videoed, documenting the existing structural and service conditions of the interior of the storm system. These efforts represent 319 miles, or 21.2 percent of the storm drainage network, being screened through walking and/or video documentation for obvious deficiencies. The inventory continues to be assessed for ongoing repair of identified deficiencies. In addition, more than 4,700 feet (0.91 miles) 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

In addition to stormwater management and storm drain infrastructure assessments and maintenance, MSMD: removes snow and performs street sweeping operations on county facilities; responds to flooding complaints; maintains county trails; performs graffiti removal; mows the grass on blighted properties; and maintains an electronic database of facilities including plans, maps, inspection reports, and maintenance history. Many emergencies are responded to in the middle of the night and most fixes take place with minimal disruption to Fairfax County residents' daily lives.

Much of the stormwater infrastructure in Fairfax County is reaching the end of its useful life; as the system ages it will be critical to maintain adequate inspection and rehabilitation programs to avoid infrastructure failures and ensure the functionality of stormwater treatment systems. In addition, it is critical for MSMD to implement cost effective solutions such as trenchless pipe replacement technologies, naturalizing stormwater management facilities and creating efficiencies through partnerships with other county agencies such as Fairfax County Public Schools and the Park Authority.

MSMD is increasing its stormwater management infrastructure replacement program, has created a more comprehensive LID maintenance program and continues to rehabilitate a number of older stormwater management dams and other critical facility components. In addition, MSMD and the Department of Code Compliance are continuing to enhance the private stormwater facility enforcement program to ensure all non-functional stormwater facilities are restored to their original design.

4. Low Impact Development Techniques

a. Overview

Environmentally sensitive site design and low impact development practices serve to minimize impervious cover and replicate natural hydrologic conditions. The county recommends and encourages "Better Site Design" development techniques and LID practices be used to the full extent allowed by the county's Public Facilities Manual.

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

Six low impact development practices (bioretention basins and filters, vegetated swales, tree box filters, vegetated roofs, permeable paving and reforestation) were developed for inclusion in the Public Facilities Manual in 2006. In 2007, the Board of Supervisors adopted the amendments. The county is continuing its work with the Engineers and Surveyors Institute, Northern Virginia Regional Commission and other local jurisdictions on developing a design and construction standards manual for LID applications. The manual will be recommended for adoption into the county's PFM.

b. 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 receiving streams unless it is intercepted by a stormwater management facility. 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 in the Government Center complex. A bioretention filter and basin, a rain garden and permeable pavement blocks with underground gravel 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 building site is located on the roof of the garage structure and demonstrates three types of vegetated roof on a 5,633 square foot area.

The reports for monitoring in 2008, 2009 and 2010 were finalized in 2011. The conclusions are as follows:

- Providence rain garden – An average of 80.5 percent of the rainfall that fell within the 0.83 acres that drains to the bioretention facility was captured. This water eventually infiltrated into the ground or evapotranspirated into the atmosphere. The average storm was 2.31 inches of rain and an average of 1.86 inches of rain was retained. Phosphorus, nitrate and total suspended sediment normalized loadings (grams per inch of rain) were reduced by 32 percent, 77 percent and 90 percent respectively.

- Cub Run RECenter rain garden – Rain events less than 0.44 inches of rain did not result in any bioretention outfall runoff. In larger events, runoff was dependent on rainfall rate, rainfall duration and antecedent dry time, and in some cases up to one inch of rain was retained. The temperature of effluent when compared to that from the parking lot was lowered by an average of 2.76^{o}F. Pollutant load (grams) reduction of phosphorus, nitrate and total suspended sediment was 51 percent, 81 percent and 95 percent respectively.

- Herrity Garage green roof –The green roof typically retained at least the first one-half inch of rain and in some cases retained over an inch of rain. The green roof only received water directly from the rain; no runoff entered the green roof system. Pollutant load reduction is dependent on volume reduction. A control section of the parking structure, equal in area to that of the green roof, was also monitored to compare the runoff load from the green roof to that from the parking area. The pollutant load (grams) reductions of phosphorus, nitrate and total suspended sediment were 17 percent, 27 percent and 86 percent respectively. The majority of the TSS runoff from the control section of the parking lot was from atmospheric deposition of "dirt" on the surface that washed off when it rained. Green roofs can be an exporter of phosphorus, nitrate and TSS when they are new; however, when they have gone through one or two growth seasons this no longer occurs or is minimized. The pollutant load reduction percentages apply to the difference between what is in the runoff from the green roof and the runoff from the control side of the parking structure. Green roofs do not filter water that passes through them; they act as a sponge and retain rain that falls on them, later releasing the water to the atmosphere through evapotranspiration. In addition, green roofs reduce the heat island effects seen in typical roofs, provide cooling to the building and have a longer life, thus reducing roof maintenance costs.

LID Education and Outreach

Several tours have been conducted to educate other agencies, groups, and residents:

- Presentation to Fairfax County Department of Transportation.

- April 22, 2011 - DPWES Tour. This was a tour of several recently completed stream restoration projects, aimed at teaching DPWES employees about stream restoration and the environment.

- May 4, 2011 **–** Department of Management and Budget Tour. This was tour for financial staff supporting the stormwater program to learn about stream restoration projects the county is performing.

- May 13, 2011 - DPWES Director Tour. This was a tour for senior managers to see first-hand the environmental projects that have recently been completed.

- June 14, 2011 - DPZ Tour. This was the first in a series of tours to educate Department of Planning and Zoning staff on innovative stormwater techniques. This tour focused on vegetated roof and extended detention dry ponds techniques.

- May 4, 2011 - Coalition for Smarter Growth Tour. This was a tour for interested residents to see firsthand the effects of inadequate/or infective stormwater management. Residents were shown, first-hand, the impacts on streams and outfalls. The tour ended at the Sherwood Hall Library project, highlighting practices like rain gardens, tree-box filters and porous pavers and explaining the environmental benefits of these techniques.

Stormwater Planning staff attended a stream workshop hosted by the U.S. Army Corps of Engineers. The three-day workshop expanded on the various natural channel design techniques that can be used. The workshop also provided some education on the wildlife that can inhabit potential projects.

Green Golf Course at Pohick Bay

The Pohick Bay Regional Park Golf Course on Mason Neck gained recertification as an Audubon Cooperative Sanctuary with Audubon International, with a case study on water conservation and irrigation audit after its irrigation system replacement. The golf course also was designated by the Groundwater Foundation as a Groundwater Guardian Green Site. Pohick Bay is the first golf course in Virginia to achieve this designation and one of only 140 in the country. The Groundwater Foundation provides education and community-based action programs that creatively involve individuals, communities, public and private entities in groundwater conservation and protection. The program recognizes good stewards of groundwater by encouraging managers and superintendents of highly-managed green spaces to implement, measure and document their groundwater-friendly practices. The Pohick Bay Golf Course collects data and documents the environmental impact of its groundwater-friendly practices, such as pounds of fertilizer saved annually by using lower input plants, gallons of water saved annually by using low water/maintenance plant materials, amounts of toxic substances disposed of properly and other related items. Education is built in to the GG Green Site program, with the park documenting its internal education efforts for site staff and external education for site visitors.

5. Erosion and Sediment Control

DPWES continues to make improvements to the county's erosion and sediment control program, resulting in a greater emphasis and a higher quality of inspection services. DPWES developed a quality assurance program and trained field specialists on how to handle erosion and sediment control violations. DPWES also developed a prioritized inspection program, in accordance with guidelines established by the Virginia Department of Conservation and Recreation, that will consider slope, soil type, proximity to streams and extents of buffer areas to determine an overall rating for any given site. In March 2008, the Virginia Department of Conservation and Recreation approved the county's program, finding it to be "fully consistent with the requirements of the Virginia Erosion and Sediment Control Law and Regulations."

In 2011, a total of 758 E&S plans for projects that would disturb a land area of 2,500 square feet or more were submitted and approved for construction. Written reports listing these individual sites were provided on a monthly basis to Virginia Department of Conservation and Recreation.

In 2011, 27,849 E&S inspections were performed through the county's Alternative Inspection Program on all sites under construction. Those E&S inspections represent 57.4 percent of the 48,496 total site inspections that were performed by Site Development and Inspection Division personnel. The site inspections total also includes 2,198 projects that were inspected for purposes other than strictly E&S control (e.g., pre- construction, streets, sanitary sewer, storm sewer, and project release).

In 2011 the Site Development and Inspection Division wrote 905 "2030" E&S control reports, which identify the E&S control deficiencies developers must correct within five days. Failure to comply within the specified time frame can result in issuance of a violation to the developer. SDID issued 86 violations in 2011 and 76 of those were later cleared. The remaining ten violations are extended until the required corrections are made or court action is initiated. SDID held 198 escrows for either landscaping or stabilization issues.

The Land Disturbance and Post Occupancy Branch of LDS investigated 184 complaints alleging violations of Fairfax County's Erosion and Sediment Control Ordinance (Chapter 104). The branch also investigated 46 complaints alleging violations of the county's Chesapeake Bay Preservation Ordinance (Chapter 118 of the County Code). Of the total complaints, 180 were instances where there was either no violation or there was timely compliance if a violation was cited. The other 50 complaint investigations led to the branch undertaking criminal proceedings to ensure compliance, with some proceedings resulting in fines issued by the court.

6. Illicit Discharges

The Fire and Rescue Department's Fire and Hazardous Materials Investigative Services section aggressively enforces County Code Chapters 62, 105 and 106 in conjunction with the Department of Public Works and Environmental Services and the Department of Planning and Zoning. HMIS also issues criminal citations during investigations of hazardous materials incidents. Chapter 62 establishes that the Fire Marshall and all permitted members of the Fire Marshall's staff have police powers to investigate and prosecute certain offenses, including environmental crimes and offenses related to storage, use and transportation of hazardous materials and hazardous waste. Chapters 105 and 106 contain provisions that address illicit discharges to state waters and the county's storm drainage system. Procedural Memorandum No. 71-01, Illegal Dump Site Investigation, Response, and Cleanup, outlines the process of follow-up action for non-emergency incidents of illegal dumping; establishes action under County Code Chapter 46, Health or Safety Menaces; and provides referrals for action on complaints that are neither public health hazards nor regulated.

In 2011, HMIS received 585 complaints. Of the 326 complaints that involved the actual release of various petroleum or chemical substances, 232 involved the release of either diesel fuel (27), home heating fuel oil (80), gasoline (33), motor oil (37), or hydraulic oil (55). Other releases investigated involved antifreeze, paint, sewage, wastewater discharges, water treatment chemicals and mercury. Storm drains were involved in 58 of the releases.

Programs that can help to prevent, detect and eliminate illicit discharge of sanitary wastes into the MS4 are implemented and documented in the Wastewater Management business area of DPWES. The Sanitary Sewer Infiltration Abatement Program conducts wastewater flow measurements and analyses to identify areas of the wastewater collection system with excessive inflow/infiltration problems and uses closed circuit television to inspect trunk sewer mains in an effort to specifically identify defective sewer lines for repair and rehabilitation. In 2011, 198.25 miles of old sewer lines and 7.84 miles of new sewer lines were inspected, resulting in the identification of sanitary sewer lines and manholes needing repair and rehabilitation. In 2011, 30.83

miles (162,763 feet) of sanitary sewer lines were rehabilitated, bringing the total length of sewer lines repaired over the past ten years to 211.15 miles (1,114,868 feet).

The Sanitary Sewer Extension and Improvement Program addresses pollution abatement and public health considerations by providing sanitary sewer service to areas identified by the Department of Health as having non-repairable, malfunctioning septic systems. In 2011, one Extension and Improvement project was completed, consisting of 703 linear feet of eight-inch sanitary sewer and sanitary sewer connections for seven existing homes.

7. Wetlands Impacts

In 2011, the Northern Regional Office of the Virginia Department of Environmental Quality had 67 active general permits, 12 active individual permits and two applications for permits that would impact surface waters in Fairfax County. Compensation for impacts to surface waters is usually provided through the purchase of bank credits and on-site stream restoration or riparian buffer enhancement.

F. WASTEWATER TREATMENT

Wastewater is primarily treated two ways in Fairfax County. In most cases it is collected from homes and commercial sites and carried through the sanitary sewer pipe system to large treatment facilities that release the treated waters into local waterways. For a small percentage of Fairfax County residents, wastewater is treated on-site via septic systems where the water infiltrates into ground and ultimately reaches groundwater.

1. Treatment Facilities

a. Upper Occoquan Service Authority

The following information has been provided by UOSA:

UOSA operates an advanced water reclamation facility in Centerville, Virginia and serves the western portions of Fairfax and Prince William counties, as well as the cities of Manassas and Manassas Park. The water reclamation plant includes primary-secondary treatment followed by advanced waste treatment processes: chemical clarification, two-stage recarbonation with intermediate settling, multimedia filtration, granular activated carbon adsorption, chlorination for disinfection and dechlorination. The plant's rated capacity is 54 million gallons per day.

UOSA operates under a Virginia Pollutant Discharge Elimination System Permit, which is issued by the Virginia Department of Environmental Quality. The permit limits and 2011 plant performance are listed in Table IV-1.

Table IV-1. UOSA Permit Requirements and 2011 Performance		
Parameter	**Limit**	**Performance**
Flow	54 mgd	32.2 mgd
Fecal Coliform	<2n/100 mLs	<1n/100 mLs
Chemical oxygen demand	10.0 mg/l	<2.7mg/l
Turbidity	0.5 NTU	<0.1 NTU
Total Suspended Solids	1.0 mg/l	<0.1 mg/l
Total Phosphorus	0.1 mg/l	<0.1 mg/l
Surfactants	0.1 mg/l	0.038 mg/l
Total Kjeldahl Nitrogen	1.0 mg/l	0.25 mg/l
Dissolved Oxygen	>5.0 mg/l	>7. 0mg/l
Dechlorination Chlorine Residual (mg/l)	Non detect	Non detect

Source: Upper Occoquan Service Authority

The influent highest rolling 30-day flow was observed during the 30-day rolling period ending on March 28, 2011 at 37.5 mgd. The UOSA Plant continues to produce high quality reclaimed water.

UOSA produces and treats two types of residuals: biosolids from conventional treatment and lime solids from chemical treatment. UOSA produces Exceptional Quality biosolids utilizing a dryer-pelletizer process. EQ biosolids have commercial potential in the agricultural and horticultural markets. As back up to the EQ biosolids process, UOSA produces Class B biosolids through a combination of digestion and dewatering followed by lime stabilization. Class B biosolids are applied to agricultural land. Thickened lime residuals are gravity thickened and dewatered on the recessed chamber filter presses. All lime solids are landfilled on site in a permitted industrial landfill owned by UOSA. UOSA's lime solids are registered with the Virginia Department of Agriculture and Consumer Services as an industrial co-product for use as a soil amendment. However, because agricultural lands are located in areas far away from UOSA, their distribution is not currently cost effective.

b. Noman M. Cole Jr. Pollution Control Plant

The NMCPCP, located in Lorton, is a 67 million gallon per day advanced wastewater treatment facility that incorporates preliminary, primary, secondary and tertiary treatment processes to remove pollutants from wastewater. The original plant, which began operation in 1970 at a treatment capacity of 18 million gallons a day, has undergone three capacity and process upgrades to meet more stringent water quality standards. After treatment, the wastewater is discharged into Pohick Creek, a tributary of Gunston Cove and the Potomac River. The plant operates under a VPDES permit. The plant is required to meet effluent discharge quality limits established by the Virginia Department of Environmental Quality. Table IV-2 presents the facility's performance and current effluent monthly limitations.

Table IV-2 NMCPCP Permit Requirements and 2011 Performance Averages		
Parameter	**Limit**	**Performance**
Flow	67 mgd	40.58 mgd
$CBOD_5$	5 mg/l	< 2 mg/l
Suspended Solids	6 mg/l	2.3 mg/l
Total Phosphorus	0.18 mg/l	0.09 mg/l
Chlorine Residual	0.008 mg/l	< 0.008 mg/l
Dissolved Oxygen	6.0 mg/l (minimum)	8.6 mg/l
pH	6.0-9.0 (range)	7.0
E. coli Bacteria	126/100mls*	< 1/100mls*
Ammonia Nitrogen	1.0 – 2.2 mg/l (seasonal)	< 0.1 mg/l
Total Nitrogen (Annual)	7 mg/l	4.77 mg/L

*Geometric mean

Source: Fairfax County Department of Public Works and Environmental Services

In 2011, 56,724 wet tons of sludge were generated and incinerated. Inert ash from the process was disposed of in a monofill at the county's I-95 campus.

Water Reuse Project

The purpose of the project is to provide treated effluent that can be used by various users in lieu of potable water as allowed by state regulations. The Water Reuse project includes the design and construction of approximately 20,000 linear feet of water reuse main, an elevated water tank, a pump station upgrade at the Treatment Plant, a wastewater pump station upgrade at the county's Energy/Resource Recovery Facility, an irrigation pump station upgrade at the Laurel Hill Park Golf Course and an irrigation system at the Lower Potomac ball fields. The project will reduce the treatment plant effluent discharge into Pohick Creek by providing approximately 560 million gallons per year to E/RRF for use in its cooling towers and approximately 24 million gallons per year to the Lower Potomac ball fields and Laurel Hill Park golf course for irrigation purposes, for a total of 584 million gallons per year. The notice to proceed on the reuse project was issued on December 23, 2009. The project is expected to go online in 2012

2. On-Site Sewage Disposal Systems

a. Overview

An estimated 21,600 homes and business are served by on-site sewage disposal systems in Fairfax County. There were 54 new alternative onsite sewage systems approved in 2011, bringing the total number of alternative systems in Fairfax County to 678. These systems require regulating the operation and maintenance on the part of the home owner. It is required that each of these systems be inspected annually by a licensed operator and a report be filed with the Health Department. Regulations for these systems went into effect December 7, 2011. The Health

Department plans to send notices to all owners of these systems in 2012; the notices will outline the requirements resulting from these regulations.

The county's Health Department reported that in 2011, 98 New Sewage Disposal Permits were issued for single family residences. There were 103 new sewage disposal systems installed--52 percent were alternative type systems and 45 percent were conventional systems (The remaining three percent were approval of alternative discharging systems and pump and haul operations.) Approximately 799 sewage disposal system repair permits were issued; repairs ranged from total replacement of the system to minor repairs such as broken piping or pump replacement. There were 5,463 septic tank pumps outs.

The Health Department mailed 14,921 flow diversion valve reminder notices in 2011. 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 2011, 1,831 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 a homeowner fails to comply, a follow-up letter is mailed to him/her informing him/her that action will be taken ensure that the septic tank is pumped out as required.

b. Septic system failures

i. Overview

There are challenges to sustainability of existing onsite sewage disposal systems through proper use, maintenance and upkeep by the homeowner. There remains a concern for future failing septic systems. There are also challenges associated with the increasing reliance on alternative systems.

There are 27 properties permitted for pump & haul as a result of a failing onsite sewage disposal system with no area for replacement or availability of public sewer.

Areas of the county with marginal or highly variable soils that have been deemed unsuitable for onsite sewage disposal systems in the past are now being considered for development utilizing alternative onsite sewage disposal technology. In addition, alternative systems are becoming the norm for developers who want to maximize lot yield from properties that are not served by the sanitary sewer system. Alternative on-site systems require more aggressive maintenance on a regular schedule for the systems to function properly. Some require maintenance contracts as part of the permitting process. Homeowners are really not aware of their responsibilities for maintaining these systems. Education from the private sector and government sector are essential.

To address concerns about the management of onsite sewage disposal systems, Health Department staff and representatives from American Water/Applied Water Management conducted a study to examine the feasibility of establishing an onsite sewage disposal management entity in Fairfax County. If deemed feasible, the entity would be responsible for ensuring that proper and timely system maintenance is performed on all onsite sewage disposal systems. This project was completed in a four phased approach. Phase four of final technical report was provided to Health Department at the beginning of FY 2010. The Health Department has been reviewing the report as to its applicability to legislation approved by the Virginia General Assembly in 2009 and 2010. The legislation specifically required the State Health Department to adopt *Emergency Regulations for Alternative Onsite Sewage Systems* that establish performance requirements, maintenance requirements and reduced vertical soil setbacks distances to restrictions for all Alternative Onsite Sewage Systems. Emergency regulations were adopted on April 7, 2010. These regulations are substantially different from the recommendations of American Water/Applied Water Management. The Health Department is reviewing the regulations and recommendations of the contractor for applicability in Fairfax County.

ii. Summary/Status of present amendments to Chapter 68.1 of the Fairfax County Code

The Regulations for Alternative Onsite Sewage Systems were adopted on December 7, 2011. These "permanent" regulations are similar to the Emergency Regulations with a few major changes based on feedback from engineers, soil consultants, operators, system owners and regulators. The AOSS Regulations set performance standards for the design of new alternative systems, minimum setback requirements from these systems to environmentally sensitive receptors and operation and maintenance requirements. All existing and new alternative systems must be inspected annually, at a minimum, with sampling requirements set for all newly approved systems. Owners and operators of these systems are required to report the results of all inspections and sample events to the Health Department.

iii. Environmental stewardship

The Division of Environmental Health has fact-sheets, brochures and CDs dealing with operating and maintaining sewage disposal systems properly. In addition, Environmental Health Specialists provide presentations to homeowner associations, realtors, schools and other interested persons or organizations on protecting the environment, groundwater and public health through proper operation and maintenance of sewage disposal and water well systems.

3. Sanitary Sewer Maintenance, Repairs and Rehabilitation

The Wastewater Collection Division within the Department of Public Works and Environmental Services manages the county's operation and maintenance program sanitary sewer system which includes:

- Approximately 3,380 miles of gravity sewers and force mains.
- 63 wastewater pumping stations.
- 57 permanent flow metering stations.
- 11 rain gauge stations.
- 135 grinder pump and associated pressure sewer systems.

Closed circuit television inspection is used to inspect trunk sewer mains to identify defective lines in need of repair and/or rehabilitation. In 2011, 198 miles of old sewer lines and eight miles of new sewer lines were inspected using CCTV. All new inspections are recorded in the Enterprise Asset Management system and are used in work order planning and management.

a. Sewer Rehabilitation

Utilization of trenchless technologies for sewer rehabilitation continues to be a major initiative for both gravity and pressure lines. These technologies provide significant cost savings over traditional open cut repairs with the additional benefits of reduced disruption to residents, the surrounding environment and traffic. In 2011, 162,800 linear feet of 8" through 15" diameter sewers were rehabilitated using cured-in-place pipe repair, and 11 dig-ups and 87 trenchless point repairs (top-hats) were completed. Additionally, 47 manholes were rehabilitated. Over the past 10 years, 211.15 miles of sewer lines have been rehabilitated.

b. Sewer Maintenance

The Sewer Maintenance group continues to integrate and optimize the sewer maintenance activities of the Wastewater Collection Division. Staff reviews and evaluates procedures, programs, work completed to date and equipment needs. Staff also plans for any additional work necessary to improve upon WCD's reduction of sewer overflows and backups. Continual adjustments are being made to the inspection and cleaning priorities in order to establish the most effective schedules for the field staff. In 2011, 429 miles of sewer were pressure cleaned, 81 miles were mechanically cleaned using rodders and 504 miles were visually inspected. The work orders are planned and managed using a Web-based asset management system.

G. DRINKING WATER

The county's water supply comes from the Potomac River, the Occoquan Reservoir, Goose Creek, community wells and private wells. Fairfax Water withdraws water from the Potomac River near the James J. Corbalis Water Treatment Plant and from the Occoquan Reservoir at the Frederick F. Griffith Water Treatment Plant. Fairfax Water provides drinking water to most Fairfax County residents. Fairfax Water also provides drinking water to the Prince William County Service Authority, Loudoun Water, Virginia America Water Company (City of Alexandria and Dale City), Town of Herndon, Fort Belvoir and Dulles Airport. The City of Fairfax receives its water from the Goose Creek Reservoir in Loudoun County, and the City of Falls Church buys its drinking water from the Washington Aqueduct's Dalecarlia Plant on the Potomac River.

With the exception of some wells, water must be treated prior to use. Fairfax Water provided 55,704 billion gallons of drinking water in 2011.

Federal regulations require water suppliers to provide annual reports on the quality of the drinking water to their customers through the Consumer Confidence Report Rule. The current Water Quality Report is available for review on the Fairfax Water website at http://www.fairfaxwater.org/water/water.htm.

Table IV-3
Fairfax Water -Water Supply Sources, 2011

Sources	Gallons (in billions)
Occoquan Reservoir (Lorton/Occoquan)	22.529
Potomac (Corbalis)	33,044
Wells	0.000
Purchased	0.048
Untreated	0.083
TOTAL	55.704

Source: Fairfax Water

1. Wells

The Fairfax County Health Department has developed and maintains an extensive data base and GIS layer of all water well systems installed in the county. The Health Department permits and inspects all new well construction, existing well repairs and well abandonments. In 2011, there were 135 new well approvals, 42 well repairs and 117 Water Well Abandonments issued. There were 49 Geothermal Well Permits issued, over 50% of the permits issued.

The Virginia State Health Department Office of Drinking Water regulates 44 public well water supplies in Fairfax County. The operators of these systems are required to conduct quarterly water sampling and analysis.

Fairfax Water no longer operates public wells.

There are approximately 14,000 single family residences and businesses that are served by individual well water supplies in Fairfax County.

2. Source Water Assessments

The 1996 Amendments to the Safe Drinking Water Act provided for source water assessment and protection programs designed to prevent contamination to drinking water. Under SDWA, states are required to develop comprehensive Source Water Assessment Programs that identify areas that supply public tap water, inventory contaminants and assess water system susceptibility to contamination. Fairfax Water has completed an inventory of potential sources of contamination and a survey of land use activities within the Potomac and Occoquan Watersheds.

Fairfax Water's Source Water Assessment is available on-line at: www.fairfaxwater.org.

3. Treatment Facilities

a. Occoquan Reservoir Facilities

The Frederick P. Griffith, Jr., Water Treatment Plant, sourced by the Occoquan Reservoir, came on line in 2006 and has a current capacity of 120 million gallons per day. The plant is designed for an ultimate capacity of 160 mgd. In addition to flocculation and sedimentation, the Griffith Plant includes advanced treatment processes of ozone disinfection and biologically active, deep bed, granular activated carbon filtration. Chloramines are used for final disinfection. Residual solids from the water treatment process flow into a nearby quarry with the decant water being discharged in compliance with a Virginia Pollutant Discharge Elimination System permit

b. Potomac River Facilities

The James J. Corbalis, Jr., Water Treatment Plant, sourced by the Potomac River, has a current capacity of 225 mgd. The plant is designed for an ultimate capacity of 300 mgd. The plant uses ozone as a primary disinfectant, flocculation-sedimentation, biologically active filters with carbon caps and chloramine final disinfection. Residual solids from the water treatment process are dewatered and land applied off site.

4. Drinking Water Quality Monitoring

Federal regulations require water suppliers to provide annual reports on the quality of the drinking water to their customers through the Consumer Confidence Report Rule. The current Water Quality Report is available for review on the Fairfax Water website at www.fairfaxwater.org, and includes much of the following information.

a. Disinfection by-Products

Trihalomethanes are by-products of chlorination water treatment and are suspected carcinogens at elevated levels. The 2011 distribution system averages continue to be below the federally mandated Maximum Contaminant Levels for total trihalomethanes. In addition to the trihalomethanes, haloacetic acid levels, another by-product of chlorination, continue to be below the required maximum contaminant level. The presence of chlorine in drinking water supplies remained below the required Maximum Residual Disinfectant Level.

b. Metals

Fairfax Water also tests for the following regulated elements: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, manganese, magnesium, mercury, nickel, potassium, selenium, silver, sodium, thallium and zinc. The levels of these metals in 2011 continued to be below their MCLs. The concentration levels for unregulated metals were within the expected range. Test results for these and other constituents are available on-line at: http://www.fairfaxwater.org.

c. *Cryptosporidium*

Cryptosporidium is a microbial pathogen sometimes found in surface water throughout the United States. Although filtration removes *Cryptosporidium*, the most commonly used filtration methods cannot guarantee 100 percent removal. Fairfax Water consistently maintains its filtration process in accordance with regulatory guidelines to maximize removal efficiency. Fairfax Water's monitoring indicates the occasional presence of these organisms in the source water. Current test methods do not help determine whether the organisms are dead or if they are capable of causing disease.

Ingestion of Cryptosporidium may cause cryptosporidiosis, an abdominal infection. Symptoms of infection include nausea, diarrhea and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immuno-compromised people, infants, small children and the elderly are at greater risk of developing life-threatening illness. Fairfax Water encourages immuno-compromised individuals to consult their doctors regarding appropriate precautions to take to avoid infection.

Cryptosporidium must be ingested in order to cause disease. It may be spread through means other than drinking water, such as other people, animals, water, swimming pools, fresh food, soils, and any surface that has not been sanitized after exposure to feces.

Fairfax Water has completed monitoring of the Potomac River and Occoquan Reservoir for compliance with the EPA Long Term 2 Enhanced Surface Water Treatment Rule. EPA created this rule to provide for increased protection against microbial pathogens, such as *Cryptosporidium,* in public water systems that use surface water sources. Fairfax Water's monitoring program began in 2004 and involved the collection of two samples from water treatment plant sources each month for a period of two years. Once monitoring for compliance with the LT2ESWTR was complete, Fairfax Water continued to monitor for *Cryptosporidium* at water treatment plant sources.

Under the LT2ESWTR, the average *Cryptosporidium* concentration determines whether additional treatment measures are needed. A *Cryptosporidium* concentration of 0.075 oocysts/Liter will trigger additional water treatment measures. Fairfax Water's raw water *Cryptosporidium* concentrations consistently remain below this threshold.

d. Emerging Water Quality Issues

An emerging water quality issue of particular media interest is a group of compounds including: (1) pharmaceuticals and personal care products; and (2) endocrine disrupting compounds. While the presence of these substances in source and drinking water has been a recent issue of national interest, to date research has not demonstrated an impact on human health from these compounds at the trace levels discovered in drinking water.

There are tens of thousands of compounds that are considered potential endocrine disrupting compounds or pharmaceuticals and personal care products. In establishing a protocol for monitoring these compounds, Fairfax Water carefully considered the most prudent use of its resources when developing the list of compounds to test for in raw and treated water. Fairfax Water looked at influences in the Potomac and Occoquan River watersheds (industrial, agricultural uses, etc.) to determine which compounds are most likely to be present in the raw water. Fairfax Water then looked at the treatment process to determine which compounds would not be readily removed through treatment. Finally, the list was narrowed to look at which compounds can be measured in water. This provided an initial list of 20 compounds that were most likely to be present. In 2010, Fairfax Water again performed a comprehensive review, which included the current project results as an additional part of the database of information. Based on this review, an updated list of 23 compounds is currently being tested on a routine basis.

Fairfax Water tests its source waters, the Potomac River and the Occoquan Reservoir, and its treated water, delivered to homes and businesses. Samples are sent to an independent laboratory specializing in this type of analysis. As expected, trace amounts of a few compounds were found in the Potomac River and Occoquan Reservoir sources. Trace amounts of three compounds were also found in the treated water at a very low frequency. To date, research shows no indication of human health concern at the levels found in Fairfax Water's source or treated waters. To view the results from Fairfax Water's monitoring of these compounds and learn more about emerging water-quality issues, visit the Fairfax Water website at www.fairfaxwater.org (click on Water Quality) or call 703-698-5600, TTY 711.

The analytical methods used in this study have very low detection levels—typically 100 to 1,000 times lower than state and federal standards and guidelines for protecting water quality. Detections, therefore, do not necessarily indicate a concern to human health but rather help to identify the environmental presence of a wide variety of chemicals not commonly monitored in water resources. These findings complement ongoing drinking-water monitoring required by federal and state regulations.

Fairfax Water provides highly advanced treatment for the water served to its customers. A study conducted by the Water Research Foundation concluded that using a combination of ozone and granular activated carbon is very effective in removing broad categories of endocrine disrupting chemicals, personal care products and pharmaceuticals. Fairfax Water uses both ozone and granular activated carbon at both of its treatment plants as part of its multi-barrier water-treatment approach that also includes coagulation, sedimentation, filtration and disinfection. Additional information about Fairfax Water's treatment process and water quality is available at www.fairfaxwater.org/water/index.htm.

e. Special Perchlorate Monitoring Study

Perchlorate is a naturally-occurring as well as a man-made compound. Its presence in drinking water is currently unregulated and utilities are not required to monitor for it. In mid-2007, Fairfax Water began voluntarily participating in an EPA-funded, 12-month non-regulatory perchlorate sampling project for the Potomac River. The EPA initially established a reference dose of 24.5 parts per billion for perchlorate and beginning in 2009 has proposed an interim health advisory of 15 ppb. A reference dose is a scientific estimate of a daily exposure level that is not expected to cause adverse health effects in humans. The reference dose concentration was used in EPA's efforts to address perchlorate in drinking water and to establish the interim health advisory.

The source and treated water samples collected in 2007 and 2008 from Fairfax Water's Potomac River treatment plant showed only trace amounts of perchlorate at levels less than 1.1 parts per billion, far below the EPA reference dose level of 24.5 ppb or the interim health advisory of 15 ppb. Based on EPA's research, the levels of perchlorate observed in the Potomac plant waters are not considered to be a health concern. If you have special health concerns, you may want to get additional information from the EPA at www.epa.gov/safewater/contaminants/unregulated/perchlorate.html or contact the EPA's Safe Drinking Water Hotline at 800-426-4791, TTY 711.

f. Special Hexavalent Chromium Monitoring Study

A report released by the Environmental Working Group in 2010 spurred interest in chromium in drinking water, specifically hexavalent chromium. Chromium is a naturally occurring metal found in soils, plants, rocks, water, and animals.

There are two common forms of chromium: chromium III and chromium VI. Chromium III is an essential human dietary element found in vegetables, meats, fruits, grains and yeast. Chromium VI, also known as hexavalent chromium, is generally produced by industrial processes such as steel manufacturing and pulp mills. It can also be generated by converting natural deposits of chromium III to chromium VI.

Total chromium, which is a measure of the sum of both chromium III and chromium VI, is a regulated compound in drinking water. The current maximum level of total chromium allowed in drinking water is 100 parts per billion. Fairfax Water routinely monitors for total chromium. The tests to date show that our water is consistently below the detection limit of five parts per billion.

In January 2011, Fairfax Water began conducting a special monitoring study by performing quarterly testing for hexavalent chromium in our raw (untreated), finished (treated) and distribution waters. To learn more about the 2011 data results for hexavalent chromium, visit Fairfax Water's website at www.fairfaxwater.org/water/chromium.htm.

g. Tap Water Monitoring

In 2011, Fairfax Water monitored 3,309 taps for coliform bacteria. The monthly monitoring results were within EPA required limits. Fairfax Water also monitored surface source water and finished drinking water for 42 volatile organic compounds and 40 synthetic organic compounds. Low levels of atrazine, simazine, metolachlor, and 2,4-D were detected in the source waters, and none was detected in finished waters. Total trihalomethanes, a subset of volatile organic compounds, as discussed above, were also detected at low levels in the finished water as expected in a chlorinated system.

Fairfax Water has been testing for lead and copper in customer tap samples in accordance with EPA's lead and copper rule since 1992 and has consistently tested below the action level established in the rule. In 2011, the 90th percentile value for lead was 0.80 parts per billion, compared to the EPA action level of 15 ppb. For copper, the 90th percentile value in 2011 was 0.116 part per million, compared to the EPA action level of 1.3 ppm. The next required collection for the EPA lead and copper regulation will occur June – September 2014. Additional information on these programs and more can be found at: www.fairfaxwater.org.

5. Regional Cooperative Water Supply Agreements

In order to protect the Potomac River ecosystem during low flow periods, the three major water utilities in the Metropolitan Washington area developed water allocation agreements for water use during low flow periods. Two upstream dams, Jennings-Randolph on the Potomac River and the Savage River Dam, along with Seneca Lake in Montgomery County, Maryland, are storage facilities for drinking water supplies during low flow periods. While the Potomac River has flows that average above 7,000 million gallons per day, the river has often reached flows well below that, usually in late summer and early fall. The lowest recorded flow in this region was 388 mgd at Little Falls in September during the drought of 1966. This is an adjusted figure that does not include the withdrawal allocation of 290 mgd (e.g., with that adjustment, the flow was actually 98 mgd).

In 1978, the three major metropolitan water utilities, including Fairfax Water, signed the Low Flow Allocation Agreement, which creates a protocol for allocation of water from the Potomac during periods of low water. The current environmental flow recommendations are 300 mgd downstream of Great Falls and 100 mgd downstream of Little Falls. In 2002, the Maryland Department of Natural Resources revisited this issue of the flow level necessary to support aquatic habitat in the Potomac River and was unable to replicate the methodology used to create the present low flow requirements in the agreement. Droughts that occurred in 1999 and 2002 called attention to the concern that these flow regimes, derived by the 1981 study (which was conducted during a period without extreme low flows), needed to be revisited in light of new scientific methods and low-flow information. During the drought of 2002, the Maryland Department of Natural Resource's Power Plant Siting Program assembled teams of biologists from its staff and Versar, Inc, with assistance from Montgomery County, Maryland and the Interstate Commission on the Potomac River Basin, which performed habitat assessments during that year's low flow conditions.

On April 8, 2003, the Maryland Power Plant Research Program and the Interstate Commission on the Potomac River Basin sponsored a one-day workshop with a panel of nationally recognized experts on habitat assessment to investigate and develop methods to evaluate the environmental flow-by requirements. Their conclusion of the present low-flow agreement is that: "Existing biological data and understanding are inadequate to support a specific, quantitative environmental flow-by." At this workshop, members of the special panel collectively considered and debated the various methodologies applicable to the Potomac River to address the flow-by issue. The final product of the workshop is a set of recommendations for 1) the best method or approach, given current financial resource limitations, to address the Potomac Flow-by Study objectives and the level of confidence associated with their recommendations and 2) an alternative long-term method or approach which could better accomplish those objectives, yet might exceed current resources or available data, and recommended guidelines for achieving the objectives in a longer time-frame.

In September 2003, the Maryland Department of Natural Resource's Power Plant Siting Program issued a report entitled Habitat Assessment of the Potomac River From Little Falls to Seneca Pool (Final Document #PPAD-03-1), which provided substantial background information describing the history of current low-flow requirements, a review of the studies conducted to support those requirements and a report on habitat assessment conducted during low-flow conditions in 2002. The assessment included development of a habitat map, a field survey of habitat types and measurements of hydraulic and water quality conditions, spanning the period of July through October 2002 when flows were as low as 151 million gallons per day at the gage at Little Falls Dam.

In November 2004, ICPRB convened an update meeting to discuss recent developments in USGS mussel studies and further defining desired hydrological regimes.

Full reports on these activities can be viewed at: www.esm.versar.com/pprp/potomac/default.htm.

The U.S. Army Corps of Engineers, The Nature Conservancy and the Interstate Commission on the Potomac River Basin are collaborating on a multi-year watershed assessment of the Potomac River basin. The assessment will consider water supply, environmentally sustainable flows, ecosystem protection and restoration, drought preparedness and watershed resource management in the Middle Potomac River watershed in the District of Columbia, Maryland, Pennsylvania, Virginia and West Virginia. The project will describe current and future conditions that are likely to have significant impacts on human and ecological needs within the basin. The assessment will include modeling activities, data gathering and ecological investigations. The goal is to identify key ecological needs, current and future human activities (especially withdrawals, dam operations and land use change), potential effects of climate change on the basin's hydrology and how these might be balanced and mitigated to prevent water use conflicts and ecological degradation of the Potomac River's native species and natural communities in a 50 to 100-year timeframe.

The watershed assessment will investigate the following:

- Surface and groundwater withdrawals.
- Dams and other impoundments.
- Effects of land use change and increase in impervious surfaces on flow.
- Cumulative hydrologic impacts of withdrawals and impoundments.
- Projected changes to water demand in the basin (including consumptive use).
- Condition and flow requirements for the basin's aquatic species and ecosystems.

A symposium hosted by the Nature Conservancy at the National Conservation Training Center in Shepherdstown, West Virginia on September 24-25, 2010 drew together 70 scientists and interested individuals representing a broad spectrum of interest to continue work on the low-flow issue. The final large river flow needs post-workshop report is now available at: http://www.potomacriver.org/2012/sustainableflows/Day2_Monitoring_Potomac_Flow_Workshop_CA.pdf.

A webinar series has been presented, highlighting the different components of the study.

The State Water Control Board's Water Supply Planning Regulation (9 VAC 25-780) requires all cities and counties in the commonwealth to submit water supply plans to the Virginia Department of Environmental Quality. Each water supply plan must include a description of existing water resources and water use, projected demands, a description of water management actions/conservation measures, segment of need for future supplies and alternative analysis and local government resolution approving the plan. Fairfax County is participating in a Regional Water Supply Plan, which is required to be submitted to VDEQ by November 2011.

a. Interstate Commission on the Potomac River Basin Cooperative Water Supply Operations

The ICPRB plays several important roles in providing for the region's current and future water supply needs. The Cooperative Water Supply Operations Section facilitates the agreement among the three major water utilities (including Fairfax Water) that requires water suppliers to coordinate resources during times of low flows in the Potomac River. The Water Resources Section also provides technical water resources management assistance to the jurisdictions throughout the basin. Low flow conditions in the Potomac River in 2010, due to a combination of low summer rainfall, high temperatures and low ground water levels, necessitated release of water from the upstream reservoirs to augment flow in the Potomac River. It is unlikely that releases will be needed for the remainder of 2012.

In October 2007, ICPRB worked with the region's utilities and the U.S. Army Corps of Engineers to conduct several test releases from upstream reservoirs. These test releases provided useful data on how the river behaves during droughts and will help to make drought management activities more efficient in the future.

The ICPRB annually coordinates a weeklong drought management exercise that simulates water management operations and decision making under drought conditions for the Metropolitan Washington area. Annual simulation allows for renewal of coordination procedures with the water suppliers and other agencies, opportunities for public education and outreach and review and improvement of operational tools and procedures.

Information on water supply status, recent streamflow, reservoir storage, water supply outlooks and precipitation maps can be found in the publications section of the ICPRB website, www.potomacriver.org.

Every five years since 1990, the section for Cooperative Water Supply Operations on the Potomac of ICPRB has conducted a 20-year forecast of demand and resource availability on behalf of the three major water utilities in the Washington D.C. Metropolitan Area (including Fairfax Water). The ongoing study has two parts to it. Part one of the study, "Demand and Resource Availability Forecast for Year 2040," contains the most recent demand forecast of future water use, analysis of current resources and evaluation of resource alternatives. The main focus of the study is to assess the ability of the region's water resources to meet the water supply needs of the Washington metropolitan area population as it continues to increase. Different possible climate change scenarios for the region will be evaluated using climate change models and the results will be incorporated into the water utility planning model to better help forecast future demands and the constraints that need to be overcome to meet the demands.

The first part of the 2010 study (released in May 2010) has been finalized; it is available on ICPRB's website:
http://www.potomacriver.org/2012/fs/demandfs.pdf.

Part two of this study, which should be available by December 2012, will address the potential impacts of climate change. Different possible climate change scenarios for the region will be evaluated using climate change models and the results will be incorporated into the water utility planning model to better help forecast future demands and the constraints that need to be overcome to meet the demands.

b. Metropolitan Washington Council of Governments

In response to the droughts of 1998 and 1999, COG brought together a task force in May, 2000 to coordinate regional responses during droughts to reduced availability of drinking water supplies. The plan consists of two components: (1) a year-round plan emphasizing wise water use and conservation; and (2) a water supply and drought awareness and response plan. The Interstate Commission on the Potomac River Basin handles the administration of the coordinated drought response for water withdrawals from the Potomac River and during low flows. Additionally, the Cooperative Water Supply Operations Section works with COG and the Drought Coordination Committee to assist in providing accurate and timely information to residents during low-flow conditions.
http://www.mwcog.org/environment/water/watersupply/current_conditions.asp

The plan includes four conditions of water supply: 1) Normal, focusing on a year-round program emphasizing "Wise Water Use;" 2) Watch, where the Potomac River basin is in a drought of level D1 as defined by the National Oceanographic and Atmospheric Administration; 3) Warning, when combined storage in Jennings

Randolph and Little Seneca reservoirs is at less than 60 percent of capacity, triggering voluntary water use restrictions; and 4) Emergency, when the probability of meeting water supply demands during the following 30 days is 50 percent or less, triggering mandatory water use restrictions. These drought levels were adopted by the COG Board of Directors in June 2000 and represent a concerted effort to coordinate interjurisdictional drought response.

COG is also looking at issues such as effects of chemical environmental pollutants, specifically endocrine disruptors, in the Potomac River and their impacts on wildlife and humans. COG staff organized workshops over the past year that addressed subjects such as endocrine disruptors in the Chesapeake Bay watershed and contaminants of emerging concern in the Potomac and Anacostia Rivers.

COG put forward a report on the effects of climate change in the National Capital Region in November 2008. The issues addressed in the report have a direct impact on the direction of future growth and development in the region. The report also identified potential impacts of climate change on the water resources of the region. It sets forth relevant time lined goals for reduction of greenhouse gas emissions in the region. The report also contains recommendations to help reduce the emissions, which will ultimately help conserve the natural and water resources in the region, in face of the adverse effects of climate change.

In coordination with the water utilities in the Washington area, including Fairfax Water, a Water Emergency Response Plan was develop and completed in 2005, and recently updated in 2009. The Plan provides communication and coordination guidance to area water utilities, local governments, and agencies in the event of a drinking water related emergency. The Plan replaced the 1994 Water Supply Emergency Plan.

c. NVRC Water Supply Plan

The State Water Control Board's Water Supply Planning Regulation (9 VAC 25-780) requires all cities and counties in the commonwealth to submit water supply plans to the Virginia Department of Environmental Quality. Work is under way by more than 20 local governments (including Fairfax County) and the Northern Virginia Regional Commission on the first Northern Virginia Regional Water Supply Plan project. This is the first time that so many local jurisdictions and water supply utilities are working together on a region-wide project and this is the first water supply plan that encompasses all municipalities in Northern Virginia.

The Northern Virginia Regional Water Supply Plan includes information on water sources, water use, water resource conditions, projected water demand, water management actions and an analysis of alternatives, drought and contingency plans in the event of water deficits. The plan also includes water supply projections for the next 30 years. The final draft of the Water Supply plan was submitted to the Virginia Department of Environmental Quality in November 2011. Public meetings

for the plan were held in Fairfax County in February 2012. The Fairfax County Board of Supervisors adopted the plan in February 2012. The report for the Water Supply Plan is available at:
http://www.novaregion.org/index.aspx?NID=1214

6. Lifting the Ban on Uranium Mining

There has been in place in Virginia a ban on uranium mining statewide since 1982. However there are now legislative or/and gubernatorial efforts underway to lift the moratorium.

EQAC received presentations on this issue from Dan Holmes, Director of State Policy with the Piedmont Environmental Council, and Stephen Walz, the Director of Energy Programs at the Northern Virginia Regional Commission and formerly the Director of the Virginia Department of Mines, Minerals and Energy. An area of focus of these presentations were reports on uranium mining in Virginia that had been prepared by the National Academy of Sciences, Fairfax Water, Chmura Analytics, Virginia Beach and RTI Socioeconomic.

The Chmura study indicates that the adverse economic impact under the worst case scenario is significantly greater than corresponding positive impact in the best case scenario. It appears from these studies that future substantive failure of a uranium mining site would require significant economic support from all the residents of Virginia for remediation and potentially contaminate water resources for very significant periods of time.

At this time, the only uranium deposits that appear to be potentially economically viable for mining are in Pittsylvania County, where mining would have no impact on Fairfax County. However, the concern exists that there are other uranium occurrences in Virginia and that past uranium mining lease agreements were established in Fauquier County, within the Occoquan watershed.

The Occoquan Reservoir is one of the county's primary sources of drinking water, and the quality of this drinking water source can be adversely affected by activities occurring within its watershed. There are serious concerns about the lifting of the moratorium in light of numerous and substantial questions and concerns regarding the potential for adverse environmental impacts to Virginia and the Occoquan Reservoir if uranium was to be mined or milled within the Occoquan watershed.

It is EQAC's view that it would be premature to lift the moratorium on uranium mining in Virginia or draft regulations pertaining to uranium mining without first addressing concerns identified by the National Academy of Sciences in its report.

7. Environmental Stewardship

a. Occoquan Shoreline Easement Policy

In December 2005, Fairfax Water adopted a revision to the Occoquan Reservoir Shoreline Easement Policy, which places limits on what may be done within the utility's easement surrounding the reservoir.

Fairfax Water's Occoquan Reservoir Shoreline Easement Policy places limitations on what may be done within the utility's easement surrounding the Reservoir. The policy prohibits construction of any structures other than piers and floats. Removal of any vegetation, storage of fuels or chemicals, application of pesticides and placement of debris are also prohibited in this area. Shoreline stabilization projects are allowed with prior permission from Fairfax Water and pertinent federal, state and local agencies. Vegetative practices are required unless technical considerations justify hardened practices. The policy is intended to protect the Reservoir's riparian buffer. A copy of the policy is available at: http://www.fairfaxwater.org/water/shoreline_easement_policy.htm.

b. Water Supply Stakeholder Outreach Grant Program

Fairfax Water offers grants to qualified organizations that undertake water supply education or watershed protection projects. Projects eligible for grants include educational efforts, source-water protection efforts, water quality monitoring projects and Occoquan Reservoir stabilization projects. The project must address issues within areas served by Fairfax Water or watershed lying in Fairfax, Loudoun, Prince William or Fauquier Counties. Eligible education projects may include seminars, programs or displays on hydrology, water treatment processes, distribution, nonpoint source pollution, erosion and sediment control, water quality monitoring or any related topic. Eligible watershed protection projects may include stream restoration projects, nonpoint source pollution management projects or other activities aimed at improving water quality within Fairfax Water's watershed.

Since beginning the program in 2000, Fairfax Water has awarded 71 water supply stakeholder outreach grants totaling $315,112.

More information about the grant program is available at: www.fairfaxwater.org/outreach/grants.htm

H. REGULATIONS, LAWS AND POLICIES

1. Buffer Protection for Headwater and Intermittent Streams

On February 25, 2008, the Board of Supervisors adopted an amendment to the Policy Plan to strengthen Comprehensive Plan guidance regarding the protection and restoration of streams and associated buffer areas along stream channels upstream of Resource Protection Areas and Environmental Quality Corridors. This new guidance augments the Environmental Quality Corridor policy by explicitly encouraging stream and buffer area protection and restoration in these headwaters areas. On July 27, 2010, the EQC policy was further amended to clarify circumstances under which proposals for disturbances to EQCs should be considered favorably. Both policies have been incorporated within the Environment section of the Policy Plan volume of the Comprehensive Plan, which is available at http://www.fairfaxcounty.gov/dpz/comprehensiveplan/policyplan/environment.pdf.

2. The Virginia Chesapeake Bay Preservation Act and Regulations

The Virginia Chesapeake Bay Preservation Act was passed as part of Virginia's commitment to the second Chesapeake Bay Agreement's goals to reduce nonpoint source phosphorus and nitrogen entering the Bay. In November 2004, the Board of Supervisors adopted an amendment to the Comprehensive Plan to ensure it was consistent with the Act and satisfied all requirements. The amendment included revisions to text in the environment section of the Policy Plan as well as the incorporation of a Chesapeake Bay Supplement. In March 2005, the Chesapeake Bay Local Assistance Board determined that the Comprehensive Plan, as amended, is fully consistent with the Chesapeake Bay Preservation Act and Regulations.

The Chesapeake Bay Exception Review Committee was formed to hear requests for exceptions to the regulations. The committee is comprised of 11 county residents appointed by the Board of Supervisors--one member from each magisterial district and two at-large members. As part of the exception review and approval process, public notice and a public hearing are required. In 2011, the committee heard two exception requests (one was deferred and was heard later the same year); both were approved.

The Chesapeake Bay Program is a cooperative arrangement among three states (Virginia, Pennsylvania and Maryland), the District of Columbia and the federal government (represented by the Environmental Protection Agency) for addressing the protection and restoration of the water quality, habitats and living resources of the Chesapeake Bay and its tributaries. Each state determines how it will meet the various commitments, and the approaches to implementation often vary greatly among states. All streams in Fairfax County are tributaries of the Potomac River, which flows into the Chesapeake Bay.

3. Stormwater Management Regulations (4VAC50-60)

The new regulations (addressing the administration and specifics of stormwater management requirements for land disturbing activities, including local government reviews and inspections for Virginia Stormwater Management Program general permits relating to stormwater runoff from construction sites) were approved by the Virginia Soil and Water Conservation Board on May 24, 2011. The county will have 15 to 21 months following the effective date of the state regulations to adopt a stormwater management program that is consistent with the provisions of the new regulations.

Some of the key changes include:

- New water quality criteria that target a post construction annual phosphorus load of 0.41 lbs/ac/yr for new development.

- Redevelopment projects disturbing one acre or more with no increase in impervious cover must reduce pre-development phosphorus loads by 20%. Redevelopment projects disturbing less than one acre with no increase in impervious cover must reduce pre-development phosphorus loads by 10%. The new development criteria (0.41 lbs/ac/yr) will apply to all new impervious area on a redevelopment site.

- Quantity controls focus on erosion and protection of existing drainage systems and receiving stream channel. The technical criteria are similar to existing county adequate outfall criteria in that they define the limits of analysis (extent of review) and an improvement factor (proportional improvement) for analysis. For certain sites, the county's current adequate outfall criteria will be more stringent.

- The new regulations establish a process for offsite compliance that allows nutrient trading in lieu of onsite controls.

Fairfax County is preparing a Stormwater Management Ordinance in response to these state regulations; the regulations require that this program be effective July 1, 2014.

Many processes, systems, ordinance changes and training of staff and industry, in addition to a written stormwater management ordinance, will need to occur in order for the county to be ready for the effective date. A series of meetings with stakeholders is being held to gather information that will be used in developing the new county ordinance and design and construction standards for stormwater control practices.

The following issue areas have been discussed during small stakeholder group meetings that were held by DPWES in September and October 2012:

<u>Single-Family Home Exemptions</u>

- · The Virginia Code allows an exemption for single-family dwellings disturbing between 2,500 SF and one acre.
- · Considerations – Should the county provide an exemption? If so, what should be the cut off (for instance 5,000 SF or greater)? Are there options other than providing a blanket exemption?

Impacts of Infill Development

- · Concerns were expressed at an earlier stakeholder meeting that infill development can have cumulative impacts on a watershed or localized impacts on surrounding properties.
- · Considerations – What options are available for addressing issues with infill development while recognizing the potential difficulty of implementing controls on these properties?

Adequate Outfall and Detention Requirements

- · New detention provisions in the state regulations eliminate the need for a downstream adequacy review and are less stringent than requirements in the current County Public Facilities Manual. The Virginia Code allows Fairfax County to establish a more stringent standard.
- · Considerations – Should the county retain the more stringent requirements in the current PFM? Is there another way of addressing this issue that is different than the state standard or the PFM?

Impacts on Pro Rata Share Program

- · Participants at the earlier stakeholder meeting asked how the use of the new Runoff Reduction Method would affect pro-rata share calculations, since the methodology addresses water quantity through infiltrating runoff into the soil.
- ·Considerations – Should the pro rata share program be changed as a result of the new regulations? If so, how?

Stormwater Facilities in Residential Areas

- The new state regulations favor implementation of smaller facilities on individual lots. In general, current county practice is to require facilities to be placed on out-lots. However, the new requirements will create a greater number of smaller, distributed facilities, which may create issues and impact lot yield. ·
- Considerations – Should certain facilities be allowed on individual lots? Who would perform maintenance (county versus homeowner association versus property owner)? How would enforcement be handled (maintenance agreement versus other restriction)?

Restrictions on Use of Stormwater Facilities

- The Virginia Code and BMP Clearinghouse list the types of stormwater facilities that may be used to meet requirements. Several state-approved facilities are different than what is in the current county PFM, or there is no equivalent. The county may restrict the use of certain facilities with written justification.
- Considerations – Should the use of certain facilities be restricted? What criteria should the county use to determine which facilities to allow or provisionally allow?

Stormwater Facility Inspections by Owners

- The Virginia Code requires "submission of inspection and maintenance reports" to the county by private stormwater facility operators. Current practice is for the county to perform a compliance inspection every five years.
- Considerations – What is a reasonable inspection and maintenance report frequency? Should it be different for different stormwater facility classifications? What should be the enforcement requirements? Should this requirement only apply to new facilities, or should it be retroactive to existing facilities?

Nutrient Credit Offset Provisions

- The Virginia Code requires the county to allow nutrient offset credits under certain circumstances. The county has the discretion to allow offsets under other circumstances.
- Considerations – What criteria should the county use for allowing offsets? How much does the county want to encourage nutrient offsets versus on-site stormwater facilities?

Additional issues may be submitted to the county by visiting the following website: www.fairfaxcounty.gov/dpwes/stormwaterordinance.htm.

4. New Dam Safety Regulations

The state published the most recent impounding structure (dam) regulations on December 22, 2010, which includes amendments to conform to legislative changes made by the General Assembly. The new regulations further defined the dam classification system, streamlined and improved the hydrologic and hydrologic design requirements for dams and instituted provisions to improve emergency action plans to facilitate responses to dam breaks.

In 2010, the Virginia Department of Conservation and Recreation finalized a number of guidance documents to assist dam owners and industry professionals to gain a better understanding of the regulations. The guidance documents include information on agricultural exemptions, crediting of certificate fees, dam ownership and roadways on or below dams. DCR continues to develop several other related guidance documents that outline policies on low hazard structures, dam break inundation zone mapping, incremental damage analysis and hazard potential classification.

Virginia Senate Bill 1060, which became effective on July 1, 2011, allows DCR to provide financial assistance for hazard class determination and other engineering requirements to certify a dam under the new impounding structure regulations. It also provides for some flexibility in hazard class determination and permits DCR, through the Virginia Soil and Water Conservation Board, to develop a general permit for the regulation of low hazard dams. DCR is currently processing an amendment to the

Impoundment Structure Regulations to incorporate the requirements of Senate Bill 1060.

Fairfax County DPWES is responsible for the operation and maintenance of 19 state-regulated dams. DPWES continues to work through the Virginia Municipal Stormwater Association to promote improvements to these guidance documents. For further information on the Virginia Impoundment Structures Regulations visit: http://www.dcr.virginia.gov/dam_safety_and_floodplains/index.shtml

5. Summary/Status of Amendments to Chapter 68.1 of the Fairfax County Code on Alternative Septic Systems

In 2008, legislation was passed requiring the Virginia Department of Health to accept designs from professional engineers that are outside the prescribed site, soil and design requirements of the Sewage Handling and Disposal Regulations. Designs must be compliant with standard engineering practice, performance requirements established by the Board of Health, and horizontal setback requirements necessary to protect public health and the environment.

In 2009, legislation was passed directing VDH to adopt Emergency Regulations for Alternative Onsite Sewage Systems (Emergency Regulations) to specifically address three issues relative to alternative onsite sewage systems that are silent in the Sewage Handling and Disposal Regulations: Performance standards for the design of new alternative systems; minimum setback requirements from these systems to environmentally sensitive receptors; and operation and maintenance requirements. The emergency regulations were in effect from April 7, 2010 until October 7, 2011. Legislation was also passed clarifying locality's power to regulate alternative onsite sewage systems by prohibiting their use. Pre-emption clauses in legislation state that the locality shall not prohibit the use of alternative onsite sewage systems and shall not exceed maintenance standards that exceed State requirements.

On December 7, 2011 the Regulations for Alternative Onsite Sewage Systems (Alternative Regulations) were adopted. These "permanent" regulations are similar to the Emergency Regulations with a few major changes based on feedback from engineers, soil consultants, operators, system owners and regulators.

No changes have been made to Chapter 68.1 of the Fairfax County Code while implementing the new policies and procedures resulting from all the recent legislation and the changes to regulation.

I. STEWARDSHIP OPPORTUNITIES

There are numerous actions that county residents can and should take to support water quality protection.

1. Disposal of Household Hazardous Wastes

Medicines, paints and other toxics should NOT be flushed down toilets and should NOT be dumped down storm drains. Instead, they should be taken to one of the county's household hazardous materials collection sites.

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 is responsible for the county's Household Hazardous Waste 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 SWMP has two permanent HHW facilities that are open every weekend and three community events held annually at other locations around the county.

For a list of common household hazardous materials and how to dispose of them, go to http://www.fairfaxcounty.gov/dpwes/trash/disphhw.htm.

2. Septic System Pumpouts

Septic systems must be pumped out every five years—it's the law! Residents with questions or with problems with their septic systems should call the Fairfax County Health Department at 703-246-2201, TTY 711.

3. Yard Management

Residents are encouraged to get soil tests for their yards before fertilizing and then to apply fertilizers and pesticides responsibly. Grass should not be cut to the edge of a stream or pond; instead, a buffer should be left to filter pollutants and provide wildlife habitat.

The Northern Virginia Soil and Water Conservation District can advise homeowners on problems with ponds, eroding streams, drainage, problem soils and other natural resource concerns. More information about managing land for a healthier watershed Is available from the NVSWCD publications "You and Your Land, a Homeowner's Guide for the Potomac River Watershed" (http://www.fairfaxcounty.gov/nvswcd/youyourland/intro.htm) and the "Water Quality Stewardship Guide" (http://www.fairfaxcounty.gov/nvswcd/waterqualitybk.htm).

Advice regarding drainage and erosion problems in yards can be provided by the technical staff of the Northern Virginia Soil and Water Conservation District. NVSWCD can assess the problems and advise on possible solutions. Interested parties can send an e-mail to NVSWCD at https://www.fairfaxcounty.gov/contact/mailform.aspx?ref=9990 or call 703-324-1460.

4. Volunteer Opportunities

There are numerous opportunities throughout the year to participate in stream cleanups, storm drain labeling, volunteer water quality monitoring and tree planting projects. Interested parties can send an e-mail to NVSWCD at https://www.fairfaxcounty.gov/contact/mailform.aspx?ref=9990 or call 703-324-1460. Additionally, DPWES-Stormwater Management provides links to information about these popular volunteer programs on its website at http://www.fairfaxcounty.gov/dpwes/stormwater/. EQAC also commends the efforts of the Alice Ferguson Foundation and encourages residents, employers and employees in Fairfax County to participate in these initiatives. Visit the foundation's website at www.Fergusonfoundation.org for further information.

5. Reporting Violations

Vigilance in reporting activities that threaten water quality is important to the protection of water resources.

Sediment runoff from construction sites can be reported to Fairfax County's Code Enforcement Division at 703-324-1937, TTY 711; e-mail reports can also be filed at https://www.fairfaxcounty.gov/contact/mailform.aspx?ref=70003.

Improper disposal of motor oil, paint or other materials into streams or down storm drains should be reported through a phone call to 911. This is particularly important if the substance being dumped can be identified as motor oil or another toxic substance but also applies to any other substance; assumptions regarding the contents of the materials should not be made. Callers to 911 should be prepared to provide specific information regarding the location and nature of the incident. If the person dumping materials into the stream or storm drain has a vehicle, the tag number should be recorded.

Storm drains are for stormwater only, NOT motor oil, paint, or even grass clippings.

If dumping is not witnessed but is instead suspected, and if no lives or property are in immediate danger, the suspected incident can be reported to the Hazardous Materials and Investigative Services Section of the Fire and Rescue Department at 703-246-4386, TTY 711. If it is unclear as to whether or not there may be a danger to life or property, 911 should be called.

A more comprehensive table addressing how to report environmental crimes is provided immediately following the Scorecard section of this report.

J. ONGOING CONCERNS

1. EQAC commends the county for developing and adopting amendments to the Public Facilities Manual's provision for adequate drainage that require analysis of adequacy of outfalls during the construction phase. This is another enforcement tool that will protect streams during the construction phase. However, EQAC cannot over-emphasize the importance and need for increased monitoring of predevelopment stormwater management controls and for enforcement action to ensure inadequate controls are corrected prior to construction and, if necessary, during construction. It is also important that the county hire the appropriate number of staff to handle the estimated inspection workload.

2. EQAC continues to support the full funding and implementation of the comprehensive countywide watershed management program. EQAC strongly endorses the ongoing work of county staff on the watershed planning and public outreach efforts and the comprehensive stream monitoring program. EQAC continues to support continued assessments of watersheds and development of a stream protection and restoration program that has adequate sustainable funding. EQAC continues to stress that equal importance should be devoted to environmental protection, restoration and monitoring as compared to infrastructure improvement and maintenance.

3. EQAC commends the county for its existing stream protection requirements for perennial streams. EQAC thanks the Board of Supervisors for its efforts to protect intermittent and headwater streams by the establishment of protective buffers. While the end result of the inquiry was NOT to move forward the process did heighten awareness of the importance of intermittent streams.

4. EQAC is pleased to note the MS4 requirement to develop a long-term watershed monitoring program to verify the effectiveness and adequacy of stormwater management goals and identify areas of water quality improvement or degradation is being implemented. While EQAC understands that a comprehensive countywide program to monitor effectiveness can be cost-prohibitive, data are still needed, as it is still unclear as to which structures and requirements are effective and working well.

5. EQAC continues to encourage Fairfax County (the Board of Supervisors, the Planning Commission, the Board of Zoning Appeals, the Fairfax County Park Authority and various county agencies) to coordinate efforts and develop a protocol for assessing the impacts and cumulative effects of land use considerations and decisions on the county's water resources. EQAC urges these groups to use and disseminate information to protect the county's watersheds. EQAC commends the Board of Supervisors for adopting Residential Development Criteria that include supporting the provision of adequate outfall drainage and innovative water quality measures.

6. As sedimentation of stormwater management and other ponds from upstream bank erosion continues, the need to dredge these impoundments becomes more frequent. Owners are having difficulty conducting necessary dredging operations given rising expenses and lack of local, adequate disposal areas. EQAC commends the county for establishing an

interagency work group that explored options, such as creating spoil disposal/recycling areas in various parts of the county to assist private facility owners and help protect water quality. EQAC commends the Stormwater personnel for their continued pursuit of viable solutions to this problem.

7. Given the anticipated increase in the number of small individual low impact development facilities that will be installed throughout the county, EQAC recognizes that the county will have an additional challenge of developing a program to track, inspect and ensure adequate maintenance of these LID facilities.

8. There has been in place in Virginia a ban on uranium mining statewide since 1982. However there are now legislative or/and gubernatorial efforts underway to lift the moratorium. At this time, the only uranium deposits that appear to be potentially economically viable for mining are in Pittsylvania County, where mining would have no impact on Fairfax County. However the concern exists that there are other uranium occurrences in Virginia and that past uranium mining lease agreements were established in Fauquier County, within the Occoquan watershed.

   Because the Occoquan Reservoir is one of the county's primary sources of drinking water, EQAC does have concerns about the lifting of the moratorium in light of numerous and substantial questions and concerns regarding the potential for adverse environmental impacts to Virginia and the Occoquan Reservoir if uranium was to be mined or milled within the Occoquan watershed. It is EQAC's view that it would be premature to lift the moratorium on uranium mining in Virginia or to draft regulations pertaining to uranium mining without first addressing concerns identified by the National Academy of Sciences in its report.

K. COMMENT

1. EQAC commends the Board of Supervisors for its actions of the past few years authorizing one penny of the real estate tax to be dedicated to the stormwater management program. The amount increased from the original amount of $17.9 million for FY 2006 to $22.8 million for FY 2009. In FY 2010 however, this amount decreased to about $10.3 million due to the creation and structuring of the Service District as a funding mechanism halfway through the fiscal year.

   While various maintenance repairs were implemented in FY 2010, the Board of Supervisor's adoption of the FY 2011 stormwater tax district rate of 1.5 cents has allowed the Maintenance and Stormwater Management Division to increase stormwater management infrastructure replacement, create a more comprehensive low impact development maintenance program, and rehabilitate a number of older stormwater management dams and other critical components. Much of the stormwater infrastructure in Fairfax County is reaching the end of its useful life, and as the system ages it will be critical to maintain adequate inspection and rehabilitation programs to avoid infrastructure failures and ensure the functionality of stormwater treatment systems. In addition, it is critical for MSMD to implement cost effective solutions such as trenchless pipe replacement technologies, naturalizing stormwater management facilities and partnering with other county agencies such as Fairfax County Public Schools and the Park Authority to create efficiencies.

The county's existing stormwater conveyance infrastructure includes about 1,500 miles of pipes and paved channels, in addition to over 850 miles of perennial streams and unknown miles of non-perennial streams. The majority of the stormwater control facilities and pipes were constructed 35 years or more ago. Prior to the board providing a dedicated penny to stormwater in FY 06, there had never been consistent funding to proactively inspect or reinvest in these stormwater systems. When the video inspections of the inside of pipes were first undertaken in FY 2007, over 5% of the system was identified as being in a state of failure and another 10% in need of rehabilitation. With the recently adopted stormwater service rate, it is estimated that the reinvestment cycle for stormwater infrastructure has been reduced from well over 1,000 years to around 200 years.

In addition to the conveyance system, the county owns and maintains roughly 1,300 stormwater management facilities ranging from large flood control lakes to LID techniques such as small infiltration swales, tree box filters and rain gardens. Again, prior to providing a dedicated funding source, there was not funding for reinvestment in these LID facilities. Nineteen of the county's stormwater management facilities have dam structures that are regulated by the state. The county must provide rigorous inspection and maintenance of these 19 facilities in order to comply with state requirements. In addition to providing required inspection and maintenance of these facilities, the county must provide significant upgrades to the emergency spillways on one more of its PL-566 dam structures to comply with current state dam safety requirements. The remaining spillway upgrade is scheduled to be constructed as part of the FY 12 stormwater budget. In addition, it is estimated that the sediment accumulating in the five county-maintained PL-566 flood control lakes have a combined annual removal cost of between $750,000 and $1,100,000, which is in addition to removal of the silt that has already accumulated. The current program will begin to restore capacity in these lakes as well as the other stormwater management facilities, and 32,000 cubic yards of sediment were removed from Lake Barton in 2011 as part of this program

In addition to supporting infrastructure reinvestment, the capital program funds critical capital projects from the watershed management plans including: flood mitigations; stormwater management pond retrofits; implementation of low impact development techniques; and stream restorations. It is important to note that these projects are necessary to address current community needs, mitigate the environmental impacts of erosion and comply with the county's current MS4 permit. The benefits of these projects include: reducing property damage due to flooding and erosion; reducing excessive sediment loading caused by erosion; improving the condition of streams; and reducing nutrient loads to the Chesapeake Bay.

The county must meet the federally mandated requirements of its Municipal Separate Storm Sewer System permit. Fairfax County and Fairfax County Public Schools are combining their MS4 responsibilities into a single permit that will be administered by the county. Following development by the state, the new permit will be forwarded to the U.S. Environmental Protection Agency for approval. Recent permits that have been approved or issued for public hearing by the EPA have included aggressive requirements to retrofit significant amounts of impervious area, such as school and county buildings and parking lots, with more effective stormwater controls. We are anticipating that these extensive additional requirements also will be included in the new MS4 permit that is issued to Fairfax County.

It has been estimated that the annual cost to comply with current and anticipated stormwater regulatory requirements and to implement a sustainable infrastructure reinvestment program would likely be between $80 and $100 million/year. One approach to achieve these challenging requirements could be a phased approach that builds capacity over a period of time that can be based on success and experience and should result in a more cost effective and efficient program.

L. RECOMMENDATIONS

1. EQAC recommends that Fairfax County continue to adequately fund and implement its ongoing stormwater program, which includes dam maintenance, infrastructure replacement, water resource monitoring and management, watershed restoration and educational stewardship programs. EQAC realizes the funding for the stormwater program will come entirely from funds generated through the Service District rates. EQAC also realizes that there is a need for increasing capacity within the Department of Public Works and Environmental Services to provide these services.

   EQAC recommends that the Stormwater Service District rate be increased in FY 2014 by a half penny, from a rate of 2.0 cents per $100 assessed real estate value to 2.5 cents per $100. This would, once again, result in more funding for modest watershed improvement programs and a somewhat more realistic infrastructure replacement timeline. We realize that there will likely be a need for additional increases for water quality projects to meet future permit conditions, and for infrastructure reinvestment, as the system is continually growing and aging.

2. Fairfax County is preparing a Stormwater Management Ordinance in response to state regulations requiring localities to adopt ordinances and take over reviews and inspections for Virginia Stormwater Management Program general permits relating to stormwater runoff from construction sites; the program must be effective on July 1, 2014. As the ordinance is developed, EQAC will provide more specific comments. **However, EQAC recommends that this new Stormwater Management Ordinance maximize stream protection and curtail exceptions and waivers that might have an adverse impact on the environment**.

LIST OF REFERENCES

2011 Stormwater Management Status Report on the Multiple Separate Storm Sewer System for Fairfax County, Virginia. Stormwater Planning Division, Department of Public Works and Environmental Services.

2011 Annual Report on Fairfax County's Streams, Stormwater Planning Division, Department of Public Works and Environmental Services.

Alice Ferguson Foundation: on-line data, September 2012.

Audubon Naturalist Society Water Quality Monitoring Brochure

Bacteria Source Tracking and TMDL Development in Accotink Creek, Douglas Moyer & Kenneth Hyer, U.S. Geological Survey, Richmond, VA.

Biology (Fifth Edition), Helena Curtis, 1989, Worth Publishers, Inc.

Ecological Study of Gunston Cove 2010 Report, Department of Environmental Science and Policy, George Mason University, R. Christian Jones, Final Report, November 2011.

Estimating Nonpoint Fecal Coliform Sources in Northern Virginia's Four Mile Run Watershed. George Simmons, Donald Waye, Sue Herbein, Sharon Myers and Ellen Walker.

Fairfax County Coordinating Committee Report, February 4, 2002, Status of Total Maximum Daily Load (TMDL) for Accotink Creek.

Fairfax County Department of Public Works and Environmental Services, Stormwater Planning Division, Perennial Streams Mapping Project Report, 2004.

Fairfax County Department of Public Works and Environmental Services, Stormwater Planning Division, Stormwater Update, Lynn Green, Danielle Wynn, Kate Bennett, Craig Carinci, Don Demetrius, Takisha Cannon, Dave Anglin, June 2012

Fairfax County Department of Public Works and Environmental Services, Wastewater Planning and Monitoring Division, Elaine Schaeffer, Report on Noman M. Cole Plan and Report on Sewer Maintenance July 3, 2012.

Fairfax County Health Department, Suggested Information for the 2010 EQAC Annual Report, Martin Thompson, October 12, 2012

Fairfax County Health Department, Endocrine Disrupting Compounds (EDC): Overview and Status Report, May 14, 2008.

Fairfax County DPWES Land Development Services, Jack W. Weyant, August 24, 2009.

Fairfax County Park Authority, 2010, Charles Smith, Manager, Natural Resource Protection and Management Branch, July 11 2012

Fairfax County Park Authority, Lake Accotink Dredging and Dam Repair Projects - Status Update (Braddock District), December 2007.

Fairfax County Stream Protection Strategy Program, January 2001.

Fairfax Water 2010 EQAC Report on the Environment, Traci Goldberg, Planning Manager, Fairfax Water, June 29, 2012

Fulfilling the Promise: The Occoquan Watershed in the New Millennium (Task Force Recommendations), January 27, 2003.

Interstate Commission on the Potomac River Basin, 2012 Update and Revisions, Sarah Ahmed, October 9, 2010

Metropolitan Washington Council of Governments documents: Regional Wise Water Use Campaign, Water Resources Technical Committee Reports, Chesapeake Bay Policy Committee, Potomac River Submerged aquatic vegetation, Jim Shell, Principal Water Resources Planner, June 30, 2003.

Metropolitan Washington Water Supply and Drought Awareness Response Plan: Potomac River System, Washington Council of Governments Board Task Force on Regional Water Supply, Updated May 2, 2001.

Metropolitan Washington Council of Governments. Comments on Fairfax County's Annual Report on the Environment, submitted by Ted Graham, Water Resources Program Director, July 11, 2008.

Northern Virginia Regional Commission Report, Fecal Coliform TMDL (Total Maximum Daily Load) Development for Four Mile Run, Virginia, Northern Virginia Regional Commission, February 15, 2002.

Northern Virginia Soil and Water Conservation District. Information for EQAC ARE 2012, Diane Hoffman, District Administrator.

Northern Virginia Regional Commission EQAC Update, Aimee Vosper, Director Planning and Environmental Services, August 17, 2010.

Northern Virginia Regional Park Authority, Kate Rudacille, Planning and Development Director, June 15, 2012

Occoquan Watershed Monitoring Lab Report, Adil N. Godrej, PhD, Associate Director and Research Associate Professor OWML, The Via Department of Civil and Environmental Engineering, Virginia Tech, October 12, 2012.

Reston Association EQAC Water Resources Update, Nicki Bellezza, Watershed Supervisor, Report to EQAC June 15, 2012.

United States Geological Survey Office of Groundwater, US Department of the Interior, National Research Program, Hydroecology of Flowing Waters Group and other Departments, Ken Hyer, August 11, 2010.

United States Geological Survey, US Department of the Interior, National Research Program, Nancy Rybicki, August 7, 2010.

Upper Occoquan Sewage Authority Update Report, Thomas Appleman, Regulatory Affairs Coordinator, May 9 2012.

Virginia Department of Conservation and Recreation, Division of Soil and Water, Information for the 2010 EQAC Annual Report, June 18 2010, Kelly Vanover, Regional Manager, Potomac Watershed Office.

Virginia Department of Conservation and Recreation, 2011 Annual Assessment of Local Government Chesapeake Bay Preservation Area Activity

Virginia Department of Environmental Quality, Northern Virginia Regional Office, Jennifer Carlon, June 27, 2012.

Virginia Department of Environmental Quality, Northern Virginia Regional Office, Dawn M. Woodward, Compliance Auditor/Database Manager June 28, 2012.

Virginia Department of Environmental Quality, Northern Virginia Regional Office, Wetland Permit Information, Margaret Quigley, VWP Writer, May 15, 2012.

Virginia Department of Forestry Contribution to the Fairfax County Annual Report on the Environment, James McGlone, Urban Forest Conservationist June 12, 2012.

Virginia Department of Transportation, William Cutler, Assistant District Administrator for Preliminary Engineering July 11, 2012.