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 human activities such as 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.

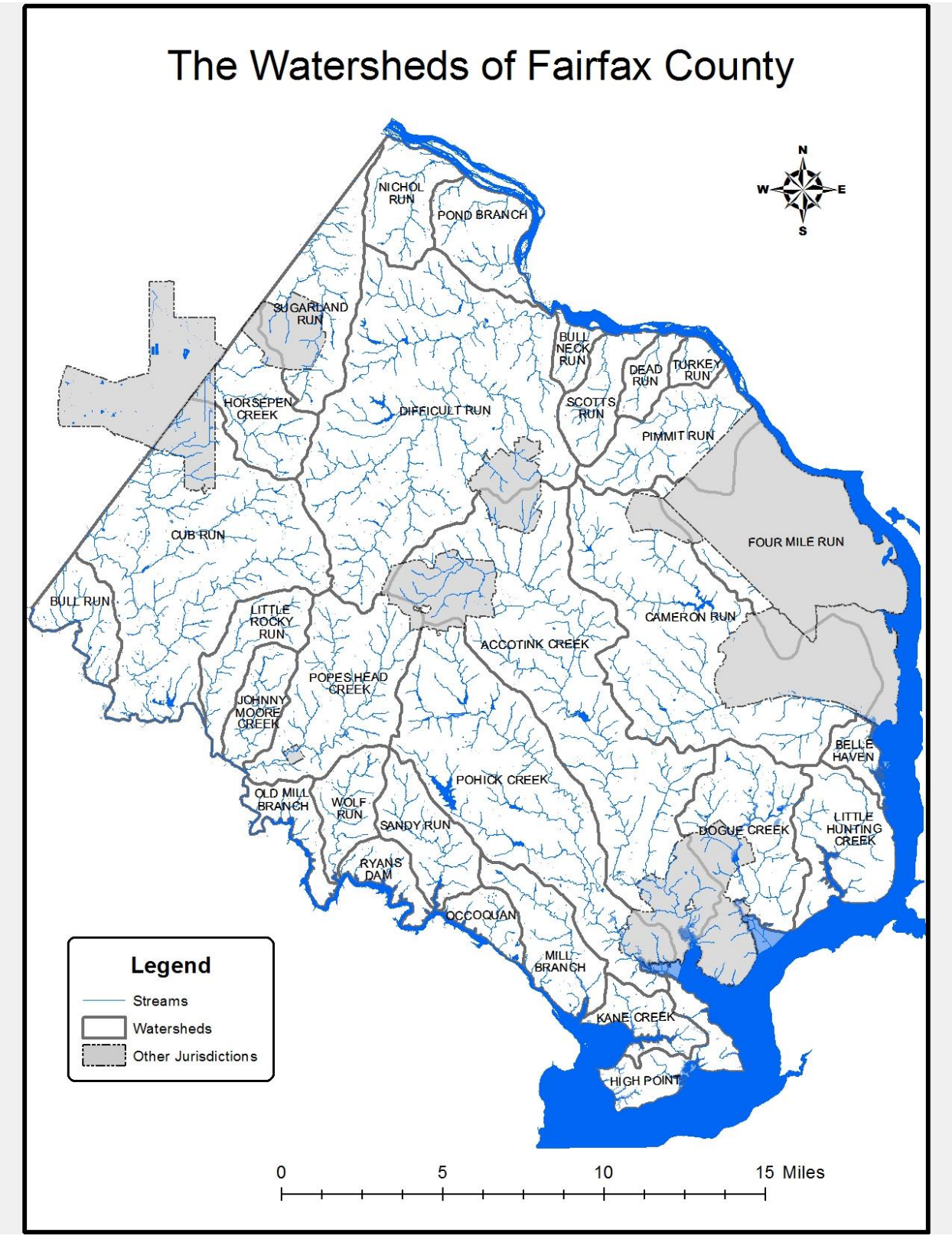
1. Watersheds

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. Watersheds nest within one another, with large watersheds typically having 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 drained 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 typically 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.

Figure IV-2: A Healthy Stream

Figure IV-3: Components of a healthy stream

Lakesuperiorstreams. 2009. LakeSuperiorStreams: Community Partnerships For Understanding Water Quality and Stormwater Impacts at the Head of the Great Lakes (http://lakesuperiorstreams.org). University of Minnesota-Duluth, Duluth, MN 55812.

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 zone. 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.

Figure IV-4: An Unhealthy Stream

Photo provided by the Fairfax County Department of Public Works and Environmental Services.

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. 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, the amount of stormwater runoff increases and it flows into streams more quickly. Increased uncontrolled runoff causes stream erosion, resulting in scouring, down cutting and over-widening of stream channels and loss of streamside vegetation. 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. 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.

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 lead to habitat loss, water quality problems and damage to utilities and infrastructure.

2. Point and Nonpoint Source Pollution Treatment and Management

Water pollution originates from either nonpoint or point sources.

Point sources are specific locations, such as discharge pipes, where pollutants can enter a waterway. In the Potomac River watershed, most point sources are wastewater treatment plants or industrial discharges. Wastewater treatment facilities have significant infrastructure in pipes and pumping stations that must be maintained rigorously to ensure that no wastewater effluent leaks into the soil or surface waters. Because they are gravity fed, pipes carrying raw sewage to treatment facilities often are found near or below streams. Because of effective wastewater treatment, point sources are not, however, the largest source of water pollution in Fairfax County.

Nonpoint sources include surface runoff, atmospheric deposition and groundwater flow. Because of its 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 stimulate algal growth. Other nonpoint source pollutants are sediment (from erosion, construction sites, eroded stream banks and road sand), toxics (oil, paint, pesticides, chemicals and metals), pathogens and bacteria (animal waste, failing septic systems and leaking sewer systems) and trash. In areas with buildings, roads and parking lots, the water flows over these surfaces into storm drains. Storm drains lead to streams, not to a wastewater treatment facility. Anything that goes down a storm drain goes directly to the nearest stream. Stormwater is also treated by either constructing facilities that capture the rainfall on site and infiltrate it into the ground or by conveyances and facilities that carry the water off site to facilities that treat and release the water into streams or lakes. The purpose of stormwater management is to manage both the quality and quantity of water coming off sites with increased impervious surfaces. Management removes pollutants and controls volume to reduce flooding and the erosive quality of increased water flow on streambanks and bottoms.

C. SURFACE WATER MONITORING AND ANALYSES

The Fairfax County Department of Public Works and Environmental Services (DPWES), Fairfax County Park Authority, Virginia Department of Environmental Quality (VDEQ), U.S. Geological Survey (USGS) and local water treatment plants and other organizations regularly conduct water quality monitoring and testing. The Northern Virginia Soil and Water Conservation District (NVSWCD) 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. The county collects data that is system wide, specific watershed-wide and has had some that focuses on some specific stormwater treatment methods to monitor their effectiveness.

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 baseline 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.

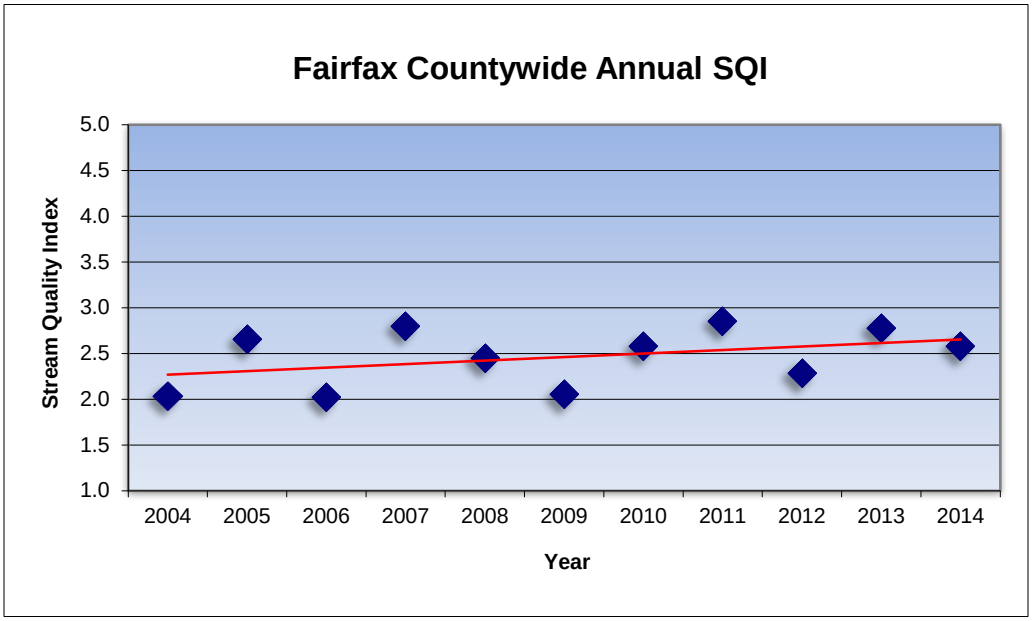
b. 2014 Annual Report on Fairfax County's Streams (now the Stormwater Status Report)

i. Overview of Biological Monitoring

This report provides data from sampling efforts conducted in 2014 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 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 and for *E. coli* bacteria. Water quality and stream habitat characteristics are also evaluated. The previous year's annual stream reports are available online at www.fairfaxcounty.gov/dpwes/stormwater/stormwater_status.htm and www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm. Figure IV-5 presents a summary of trends in a countywide Stream Quality Index.

Figure IV-5: Trends in the Countywide Stream Quality Index



Source: 2014 Fairfax County Stormwater Status Report, August 2015

A total of 53 sites were sampled in 2014: the 40 sites randomly selected in Fairfax County 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. Of the 40 sites selected, all were sampled for macroinvertebrates and 17 were sampled for fish. Additionally, fish were sampled at six Piedmont reference sites. (Only those sites with a drainage area greater than 300 acres are sampled for fish; headwater streams have few fish.) Results from the 40 randomly selected sites suggest that approximately 52.5 percent of the county's waterways are in "Poor" to "Very Poor" condition based on a macroinvertebrate sampling and 58 percent are in "Poor " to "Very Poor" based on fish sampling. 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 10 years, a small increase in the benthic Index of Biological Integrity scores is suggested. As future sampling results are added, this small trending may emerge more clearly.** The index is reported annually to evaluate long-term trends in the overall health of streams. As more data are reported annually, emerging trends can be identified with greater certainty.

The 2014 Stormwater Status Report states the following:

The monitoring program is part of the framework to establish a baseline to evaluate future changes in watershed conditions. Monitoring results from 2008 through 2014 were reported in Fairfax County Stormwater Status Reports, which may be viewed at 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 www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm.

ii. Bacterial Monitoring

In 2014, the Stormwater Planning Division completed its eleventh year collecting data for the bacteria monitoring program since acquiring the program from the Fairfax County Health Department.

To determine levels of *E. coli* in county streams, grab samples of stream water were taken at 40 sites in 20 watersheds throughout the county. Staff collected samples four times during the year. Sites are normally sampled four times during the year for the bacteria, *E. coli*. Samples are processed at the Fairfax County Health Department laboratory.

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.*

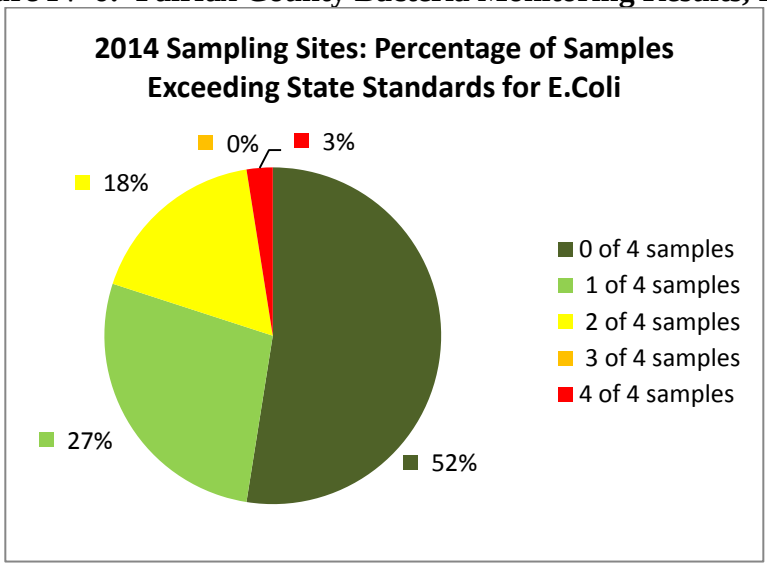
In 2014, 52 percent of Fairfax County's bacteria monitoring locations were consistently below VDEQ's standard of 235 units per 100 ml of water (Figure IV-6). Fairfax County staff concurs with officials from VDEQ and the Virginia Department of Health, who caution that it is impossible to guarantee that any natural body of water is free of risk from disease-causing organisms or injury.

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

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

Past annual reports on Fairfax County streams and monitoring methods are available on the Stream Quality Assessment Program page at www.fairfaxcounty.gov/dpwes/stormwater/streams/assessment.htm.

Figure IV-6: Fairfax County Bacteria Monitoring Results, 2014



Source: 2014 Fairfax County Stormwater Status Report, August 2015

iii. Dry and Wet Weather Screening

In 2014, the county selected 102 outfalls in its Municipal Separate Storm Sewer System (MS4) for dry weather screening and recorded physical parameters at each outfall. Water was found to be flowing at 47 of the outfalls and was tested for a range of pollutants (ammonia, conductivity, surfactants, fluoride, pH, phenol, copper and temperature) using field test kits. Of the outfalls tested, three required follow-up investigations because they exceeded the allowable limit for at least one pollutant. Upon retesting these sites, none of the sites continued to exceed the screening criteria and further testing was not necessary.

In 2014, the county solicited a proposal to review and update its Wet Weather Screening program. The previously developed "Wet Weather Site Selection and Screening Plan" (2006) was replaced and Wet Weather Screening was conducted during 2014 using this new protocol, "Fairfax County Wet Weather Screening Program Plan" (2014). This updated plan will monitor a suite of 12 targeted sites during 40 storm events between 2014 and 2018. Every year two sites will be monitored quarterly for the analytes listed in the Wet Weather Screening Program Plan and for metals. The preliminary water quality analysis indicates that the runoff from the two sites sampled in 2014 is not a significant source of pollutants to the MS4. These sites were identified in industrial and commercial areas and ranked according to the county land use code, potential to contribute pollutants to the MS4 and information gathered from field reconnaissance.

c. Stream Physical Assessment

Completed in 2004, the Stream Physical Assessment study provides baseline 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. This countywide stream assessment can be obtained by going to www.fairfaxcounty.gov/dpwes/stormwater/psa-update.htm or by contacting the Fairfax County Stormwater Planning Division at 703-324-5500, TTY 711.

d. Long Term Monitoring Stations

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

In 2014, storm event sampling continued at the two monitoring sites, Henderson Road in the Occoquan watershed and Kingsley Avenue in Vienna, in accordance with Fairfax County's Watershed Water Quality Monitoring Program (2003). Samples were tested for concentrations of nine constituents, including measurements of total suspended solids, total dissolved solids, ammonia and nitrogen, phosphorus and two bacteria, E. coli and Fecal streptococcus.

These data will be incorporated with other data to give a more complete picture of stream conditions.

e. U.S. Geological Survey 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 (five to 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 and stormwater management program and to characterize urban and suburban streams.

This base network now is comprised of five automated stations and 15 less-intensely monitored sites. 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 hourly to a USGS Web page. These automated stations also capture storm event samples to be analyzed for sediment and nutrient concentrations. Additionally, samples are collected monthly at all 20 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 2014 ran from October 1, 2013 through September 30, 2014.

As reported in the 2014 Stormwater Status Report:

Continuous Data Collection

- *Continuous water quality and stream flow data were collected at the five intensive monitoring stations throughout the water year with no significant interruptions in data collection.*
- *Stream flow data were collected at five minute intervals, resulting in as many as 105,000 measurements per year.*
- *Continuous water quality data (water temperature, specific conductance, pH, and turbidity) were collected at 15-minute intervals, resulting in as many as 35,000 measurements per year.*

- *All data collected can be accessed online at http://va.water.usgs.gov/fairfax.*

Discrete Data Collection

- *Grab samples were collected monthly at all 20 monitoring stations, resulting in 264 samples collected and analyzed (including QA [quality assurance] samples). Water level and water quality parameters were measured at the time of sampling. Samples were further analyzed for nutrients and suspended sediment concentration.*
- *Storm event samples were collected using automated samplers at the five intensive monitoring stations. These samples were collected in response to elevated turbidity and stream flow conditions during storms, resulting in the collection of 212 samples that were analyzed for the same suite of nutrients and suspended sediment concentration as the monthly grab samples.*
- *Sixty-eight manual stream flow measurements were made across the 20 sites to support the maintenance of the stream flow rating curve for each site.*

A report summarizing the data collected at the original 14 station network through the first five years of the study (2007-2012) has been published by the USGS (Streamflow, Water Quality, and Aquatic Macroinvertebrates of Selected Streams in Fairfax County, Virginia, 2007–12 By John D. Jastram). This can be found at: http://pubs.usgs.gov/sir/2014/5073/.

2. Virginia Department of Environmental Quality

In 2014, VDEQ conducted water quality monitoring at total of 16 stations, on 14 different waterbodies, in or on the border of Fairfax County:

- 13 stations were long term, trend monitoring stations.
- Biological monitoring data were collected at no stations.
- No stations were sampled to collect data to assist for the development of Total Maximum Daily Loads (TMDLs).

The list of monitoring stations sampled in Fairfax County in 2014, including location information, is presented in Table IV-1.

3. Volunteer Water Quality Monitoring Programs

In 2014, the Northern Virginia Soil and Water Conservation District (NVSWCD) continued its successful volunteer stream monitoring program. This program supplements the county's stream bioassessment program. The data collected support the findings of the county's program and help to provide trend data. The data can also alert staff to emerging problems. Trained volunteers assess the ecological health of streams using the enhanced Virginia Save Our Streams (SOS) protocol (www.vasos.org/). Monitoring includes biological and chemical aspects and a physical habitat assessment. NVSWCD provides training, equipment, support, data processing and quality control.

Table IV-1
Water Quality Monitoring Stations, Virginia Department of Environmental Quality

Monitoring Station	Stream Name	Latitude	Longitude	Location
1AACO014.57	Accotink Creek	38.811111	-77.230556	Rt. 620 (Braddock Rd)
1ABUL016.31	Bull Run	38.823889	-77.504444	Rt. 29/211 (Lee Hwy)
1ACAM002.92	Cameron Run	38.804472	-77.106361	Eisenhower Avenue
1ACUB002.61	Cub Run	38.821133	-77.465931	Rt. 658 (Compton Rd)
1ADIF000.86	Difficult Run	38.975833	-77.246111	Rt. 193 (Georgetown Pike)
1ADOU000.60	Dogue Creek	38.697778	-77.121111	Across from the Mt. Vernon Yacht Club
1AHUT000.01	Hunting Creek	38.789722	-77.051667	G.W. Parkway
1ALIF000.19	Little Hunting Creek	38.712778	-77.074722	G.W. Parkway
1AMAE000.21	Massey Creek	38.661361	-77.224056	Near Mouth of Creek
1AOCC002.47	Occoquan River (Belmont Bay)	38.640389	-77.219417	Daymarker #6 (Red), off Sandy Point
1APOE002.00	Popes Head Creek	38.781667	-77.388333	Rt. 645 (Clifton Rd.)
1APOH000.93	Pohick Creek	38.671250	-77.148139	Off Gunston Hall
1APOH002.32	Pohick Creek	38.680278	-77.169167	Across from red brick house (Pohick Bay)
1APOH005.36	Pohick Creek	38.701111	-77.210000	Rt. 1 (Jefferson Davis Hwy)
1ASUG004.42	Sugarland Run	39.013181	-77.368467	Rt. 7 (Leesburg Pike)
1AWOT002.36	Wolftrap Creek	38.940861	-77.266917	Rt. 676 (Trap Rd)

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. Throughout FY 2015, 17 sites continued to be monitored by 21 active certified volunteers. In order to attract new recruits, NVSWCD held nine training sessions for 142 potential new volunteers. In addition, six special monitoring field trips were provided to 93 students with the Northern Virginia Community College.

Reston Association (RA) is among the organizations that participate in the monitoring program using the SOS protocol, and it submits data on Reston streams to NVSWCD. Volunteers and RA staff monitor Reston's streams four times a year. They have 15 volunteers collecting data at eleven monitoring sites in Reston.

A monthly *Watershed Calendar*, listing training and other events of interest, is e-mailed to over 1,000 recipients. More information about these events and about the NVSWCD volunteer monitoring program can be found at www.fairfaxcounty.gov/nvswcd/monitoring.htm.

4. Fairfax County Park Authority Stream Monitoring

a. Stream Monitoring in Parks

The Park Authority continues to support volunteer stream monitoring programs through its partnership with the Northern Virginia Soil and Water Conservation District.

During 2014-2015, NVSWCD supported ongoing stream monitoring programs at the following streams, with some sites located on parkland, with sampling conducted primarily by volunteers using the SOS protocol.

- Accotink Creek at Eakin Park.
- Accotink Creek at Lake Accotink.
- Accotink Creek at Wakefield Park.
- Big Rocky Run at E. C. Lawrence Park.
- Big Rocky Run at Greenbriar Park.
- Colvin Run in Lake Fairfax Park.
- Cub Run in Cub Run Stream Valley Park.
- Cub Run at Cub Run Rec Center.
- Difficult Run near Great Falls.
- Difficult Run in Oakton.
- Holmes Run Stream Valley Park below Lake Barcroft.
  Holmes Run Stream Valley Park near Roundtree Park.
- Old Courthouse Spring Branch in Old Courthouse Stream Valley Park, Tysons.
- Little Difficult Run in Fred Crabtree Park.
- Little Pimmit Run in Little Pimmit Run Stream Valley Park.
- Long Branch at Rutherford Park.
- Paul Springs Branch.
- Pike Branch at Jefferson Manor Park.
- Pohick Creek, near the southern end of the Cross County Trail.
- Pohick Creek – Sideburn Branch Tributary at Woodglen Lake Park.
- Popes Head Creek.
- South Run.
- Sugarland Run.
- Wolftrap Creek at Foxstone Park, Vienna.

5. Potomac River Monitoring

a. Overview

The Metropolitan Washington Council of Governments (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 River 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. According to a 2014 COG report, water quality data gathered in the Potomac River estuary over the past 10-15 years paints a picture that defies a simple explanation. There are places in the river where current water quality conditions meet the habitat requirements for living resources, but the trends in these same conditions are worsening. There are other places where water quality conditions do not meet the habitat requirements, but the trends are improving.

COG continues to focus on regional water quality issues, particularly in the upper estuary of the Potomac River. A Potomac River Water Quality fact sheet (www.mwcog.org/environment/water/downloads/Potomac%20WQ%20factsheet_January%202014.pdf) and a summary (www.mwcog.org/uploads/committee-documents/bF1YX1lc20140515151124.pdf) were developed to provide a snapshot of current conditions and an assessment of water quality in the Potomac River. Success stories were highlighted, like the huge investments in improving wastewater treatment over the past thirty years, increased submerged aquatic vegetation and fish populations and decreased occurrences of algal blooms. Yet, COG has emphasized that there is much more to be done to improve the quality of the water in the Potomac River.

COG also continues to enhance its website to provide a user-friendly location for accessing regional data and contact information and to promote the exchange of monitoring data, watershed programs, wastewater and stormwater implementation programs and related activities. A preliminary on-line interactive map has been generated for members' use at www.mwcog.org/environment/water/potomacmap.asp.

b. 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 (OWML) 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 OWML data set, which provides the most comprehensive accounting of pollutant loads at this fall line station, is being used to check the accuracy of the new U. S. Geological Survey method for generating flow-adjusted trends in load and to provide a fuller picture of load trends from the watershed upstream of Chain Bridge.

6. Potomac Estuary 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 Washington, D.C. metropolitan area 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 an 18-year study of submerged aquatic vegetation in the tidal Potomac River (http://water.usgs.gov/nrp/highlights/potomac_update.html) 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 abundances of the seven most frequently occurring species were more evenly matched.
- In 1990, more than 80 percent of the total SAV was hydrilla; in 2007 hydrilla declined to 20 percent.
- 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 (USACE), Baltimore; the Metropolitan Washington Council of Governments' 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 approximately 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, and 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 (SOCs) have been monitored quarterly in the Occoquan watershed since 1982. The program is funded by the Fairfax County Health Department and was established under a recommendation by EQAC. Water samples at stream and reservoir stations and sediment samples at reservoir stations are monitored quarterly. Fish samples are taken at three reservoir stations semi-annually. The Lake Manassas program, likewise, funds the monitoring of SOCs in the Lake Manassas watershed, but there are no fish samples taken for the Manassas program.

Calendar year 2014 was a reasonably good year for the SOC monitoring program. Few ‘detects’ were found for any compound of concern, and most of those were well below limits of concern. Besides the ubiquitous phthalates, typically found in concentrations much lower than those that might be a cause for concern, atrazine, Dual (metolachlor) and lindane were the compounds detected most often.

Atrazine was detected in Occoquan stream and reservoir samples taken on June 23, 2014. All values were below 1.5 µg/L, which is half of the Maximum Contaminant level (MCL) value. The pattern of detection appears to indicate that the atrazine

originated in the Occoquan creek arm (Cedar Run and Broad Run) of the watershed, which is the more rural area. This makes sense as atrazine is often used to kill cover crops. It was found at stations ST10 (Occoquan Creek below Lake Jackson dam), ST25 (Cedar Run), ST30 (Broad Run below Lake Manassas) and at RE15 (Occoquan Reservoir near Ryan's Dam). At RE30 (Bull Run arm of the Occoquan Reservoir), a low concentration of 0.44 µg/L was detected. Values less than 1 µg/L were detected in the Lake Manassas watershed, as well as in the lake itself, during the sampling run on July 14, 2014.

Dual (metolachlor) was detected at levels of 0.60 µg/L or below at several stations in the June and July sampling runs. There is no MCL for Dual, but there is a lifetime health advisory limit of 100 µg/L, which is more than two orders of magnitude above the values detected, thereby indicating that the concentrations of Dual detected have basically no health significance.

Lindane was also detected at some stream and Occoquan Reservoir stations at concentrations between 1.30-1.50 µg/L in the March 10-11 sampling trip. These concentrations are above the MCL of 0.2 µg/L. Because lindane was not detected at other times of the year, there is little reason for concern, as MCLs are typically set for lifetime exposures.

Finally, there were some detects of petroleum hydrocarbon-related compounds during the March 10-11 sampling run. These compounds were typically detected at concentrations below 1 µg/L. There are no MCLs associated with these compounds, and at the low concentrations found there do not generate concern.

Neither the sediment nor the fish samples showed any particular compound to be above detection limits, and most fell into the category of "not found" (which means that they were not detected at all). Some phthalates were found at low concentrations. This, certainly, continues to be good news, as fish are known concentrators of organic chemicals, and SOCs often accumulate in sediments.

Overall, the results of the SOC monitoring in 2014 show that the watershed conditions with regard to SOCs continues to be good.

General water quality in the Occoquan Reservoir has also remained stable over the years. While the reservoir continues to be enriched with nutrients (eutrophic), the water quality has not deteriorated from what it has been for some time now. The OWML monitoring program serves as a means of providing advance notice should any conditions deteriorate, whether in the short or the long term.

The SOC program is fairly modest, with four samplings per year (one for each season) and fish sampling twice a year. This is more or less the minimum necessary to track conditions in the watershed. The program has been flat funded for many years now, while costs have continued to go up. In program year 2015-16, the approach being taken is to continue the monitoring and stop it when the money is

exhausted. It is time, perhaps, to look at the budget for the program and determine if there are means to get the budget back to where it needs to be.

Updates continue to be made to the OWML website (www.owml.vt.edu), and stakeholders can continue to access near-real-time field data at various stream sites.

8. Gunston Cove Aquatic Monitoring Program

Gunston Cove is an embayment of the tidal freshwater Potomac River located in Fairfax County about 12 miles (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 (NMCPCP) 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. Monitored since 1984, data from Gunston Cove and the nearby Potomac River provide valuable information regarding long-term trends; this information will aid in the continued management of the watershed and point source inputs.

Data from 2014 report (December 2014) generally reinforced the major trends which were reported in previous years. First, phytoplankton algae populations in Gunston Cove have shown a clear pattern of decline since 1989.

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 at the Noman M. Cole, Jr. Pollution Control Plant, which were initiated in the late 1970s. A 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.

Another trend of significance to managers is changes in the relative abundance of fish species. While it is still the dominant species in trawls, white perch has gradually been

displaced in seines by banded killifish. Blue catfish have entered the area recently, and brown bullhead has decreased greatly in the cove. To determine some of the most significant changes in the fish community through time, the report authors performed a community analysis using the seine collections. The most dominant species of the fish collected was white perch (59.9 percent, numerically). Other abundant species (annual total greater than one percent) included: spottail shiner (19 percent), Alosa sp. (8.25 percent), bluegill (2.61 percent), blue catfish (2.27 percent), redear sunfish (1.55 percent), Bay anchovy (1.48 percent) and pumpkinseed (1.06 percent). Overall, the fish assemblage in Gunston Cove is dynamic and supports a diversity of commercial and recreational fishing activities.

The DPWES Wastewater Management program continued its funding of and collaboration with the George Mason University Department of Environmental Science and Policy to monitor the water quality of Gunston Cove, which receives the NMCPCP discharge. Sampling and analysis results are shared with GMU researchers, who gather and evaluate data on the cove biota. Together, Wastewater Management program and GMU collect hundreds of field measurements and samples yearly. These data form the basis of the ecological assessment of Gunston Cove."

In short, due to these 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 and detailed read of the "Ecological Study of the Gunston Cove 2013" Final Report, see www.academia.edu/12414213/The_Ongoing_Aquatic_Monitoring_Program_for_the_Gunston Cove Area of the Tidal Freshwater Potomac River 2013 Final Report or contact R. Christian Jones, Professor and Project Director at George Mason University.

9. Fairfax County Park Authority Huntley Meadows Monitoring Water Quality Monitoring Project in Huntley Meadows Park

Huntley Meadows Park staff conducted water quality monitoring at four sample sites in 2014. During years prior to 2011 seven sites were sampled, three on Dogue creek and four on Barnyard Run. However, in 2011 the Watershed Planning and Assessment Branch (WP&AB) of the Department of Public Works and Environmental Services took over the analysis of Dogue Creek. The analysis conducted by the WP&AB of DPWES is a much more detailed assessment than done by site staff at Huntley Meadows Park. The Dogue Creek data are included in the DPWES stream monitoring annual report. Huntley Meadows Park staff continues to sample four sites along East Barnyard Run, including the central wetland, although the locations have changed slightly due to the Wetland Restoration Project completed in 2014. The Rapid Bio-assessment II monitoring protocol was used at all four sites sampled by Huntley Meadows Park staff.

Results

Water Quality scores are based on the numbers and tolerance levels of the macroinvertebrate families collected during sampling; zero to eight are unacceptable; nine to 13 are partially acceptable; and 14 to 24 are acceptable. Barnyard Run watershed includes the Central Wetland, and samples were collected at four different locations: the Central Wetland Inflow (CWI), the Central Wetland Reservoir (CWR), the Lower Wetland Reservoir (LWR) and the berm (Berm). All four sites were sampled in the spring and three were sampled in summer 2014; one was dry and a sample was not possible. Scores for all sites in spring and summer are in the following tables. All sites sampled in the spring had a partially acceptable score; the summer sampled varied with two "partially acceptable" scores for the central wetland (CW) and the berm (Berm) and one "unacceptable" score for the wetland inflow site (CWI). The wetland outflow (CWO) site was dry and therefore no sample was collected.

Tables IV-2 and IV-3 below, showing water quality scores for each of the four locations sampled in the spring and summer of 2014.

Table IV-2.
Water Quality Scores, Huntley Meadows Park, Spring 2014

	CW	CWI	CWO	Berm
%EPT[1]	3	0	0	3
Gomphidae	0	0	0	0
Non-Insects	0	6	3	3
Tolerance	6	6	6	6
Total	9	12	9	12

Table IV-3.
Water Quality Scores, Huntley Meadows Park, Summer 2014

	CW	CWI	CWO	Berm
%EPT	3	0	N/A	0
Gomphidae	0	0	N/A	0
Non-Insects	3	0	N/A	3
Tolerance	6	6	N/A	6
Total	12	6	N/A	9

[1] *Ephemoptera* (mayflies), *Plectoptera* (stoneflies) and *Trichoptera* (caddisflies)

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 TMDL is a watershed-specific plan for bringing an impaired water body into compliance with water quality goals. Since fulfilling the requirements of a consent decree, Virginia has developed a pacing guideline of approximately 150 TMDLs per biennium, which is expected to allow for TMDL development for currently listed waters by 2022.

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 Run, Johnny Moore Creek and Little Rocky Run).
- Popes Head Creek.
- Difficult Run.
- Hunting Creek (includes Cameron Run and Holmes Run).
- Sugarland Run.
- Mine Run.
- Pimmit Run.

Sediment (Benthic Impairment):

- Bull Run (includes Cub, Johnny Moore and Little Rocky Runs).
- Popes Head Creek.
- Difficult Run.

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

Water Quality Assessments are performed by the Virginia Department of Environmental Quality and are available at:

www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments.aspx.

i. Accotink Creek TMDL

Accotink Creek was first listed as impaired on the 1998 303(d) List of Impaired Waters for not meeting the recreational use due to exceedances of the bacteria water quality standard. This impaired segment of Accotink Creek begins at the confluence with Crook Branch, upstream from Route 846 (Woodburn Road), downstream to the start of Lake Accotink (4.77 miles). Additional segments of Accotink Creek were listed as impaired for bacteria in 2002 (1.20 miles from the confluence with Daniels Run, in the City of Fairfax downstream to the confluence with Bear Branch) and 2004 (7.34 miles from the confluence with Calamo Branch downstream to the tidal waters of Accotink Bay), and a segment of Long Branch was listed in 2008 (4.76 miles from the headwaters of Long Branch downstream to the confluence with Accotink Creek, at rivermile 4.41.) TMDLs were developed for the upper Accotink Creek watershed in 2002 and for the lower watershed in 2008.

Fairfax County partnered with the United States Geological Survey following development of the upper Accotink Creek bacteria TMDL to identify the distribution and specific sources of the human wastewater signal within the Accotink Creek watershed. Samples were collected during low flow periods and the results indicated that many sources are transitory, making them extremely challenging to detect, locate and eliminate.

The U.S. Environmental Protection Agency (EPA) established a TMDL to address the benthic impairments in Accotink Creek 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 called for a 48.4 percent overall reduction in in-stream flows in Accotink Creek. Utilizing a flow approach to the TMDL would not stabilize or reverse the evolution that has already occurred in Accotink Creek. This evolution has taken place in response to increased urbanization and development in the watershed, and flow reduction alone will not reverse its impacts or address the impairment that originally triggered development of the TMDL. Stream restoration is also required in order to stabilize the eroded banks, reconnect the stream to its floodplain, reduce in-stream erosion and restore habitat.

In July 2012, the county and the commonwealth challenged the flow TMDL in U.S. District Court. In January 2013, the court issued its decision that EPA is authorized to regulate pollutants using TMDLs, and that sediment is a pollutant, but flow is not. The flow TMDL was remanded to EPA for reconsideration. It is important to note that the court's decision applies only to the use of non-

pollutants (such as flow) as surrogates for pollutants (such as sediment) in TMDLs. It is not a blanket prohibition on the regulation of stormwater. A schedule for development of the TMDL has been set for estimated completion in 2016.

County staff was invited by VDEQ to serve on the technical advisory committee (TAC) that will assist in the development of this TMDL, and the first TAC meeting was held on August 26, 2014. VDEQ presented the project plan for development of the TMDL which included a summary of the engagement and outreach process, and a project timeline. The first public meeting on the development of a replacement TMDL was held on September 10, 2014 and also covered the outreach process and project timeline.

ii. Potomac River--Tidal Potomac River- Polychlorinated Biphenyls

A PCB TMDL was established for the Tidal Potomac River in 2007 and includes Accotink Creek, Belmont Bay, Dogue Creek, Four Mile Run, Gunston Cove, Hunting Creek, Little Hunting Creek, Occoquan River and Pohick Creek. Loads of PCBs to the Potomac River estuary system were grouped into seven categories: the non-tidal Potomac River at Chain Bridge; lower basin tributaries; direct drainage; wastewater treatment plants; combined sewer overflows; atmospheric deposition to the water surface; and contaminated sites. An average reduction of 96 percent is required.

iii. Potomac River – *Escherichia coli* TMDL

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 5.72 miles from the confluence with Folly Lick Branch downstream to the confluence with the Potomac River. The impaired reach of Mine Run extends 0.93 miles from the confluence with an unnamed tributary to the confluence with the Potomac River. The impaired portion of Pimmit Run extends 7.37 miles from the headwaters of Pimmit Run downstream to the confluence with the Potomac River.

In order to meet the *E. coli* geometric mean water quality criterion of 126 cfu/100 ml, reductions are required from point source dischargers, pet waste, residential waste and wildlife sources. This TMDL was approved by EPA on September 26, 2013.

Information on TMDL development in Virginia is available on VDEQ's website: www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment.aspx

The TMDL project was completed and approved by EPA on September 26, 2013 and is available on the VDEQ website (www.deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx).

b. 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 required states and the District of Columbia to develop Watershed Implementation Plans (WIPs) 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: www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/index.html.

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

i. Northern Virginia Regional Commission (NVRC) Chesapeake Bay TMDL Coordination

At the request of local governments and the Virginia Department of Conservation and Recreation, NVRC hosted meetings between the department and local governments to discuss the Phase II Watershed Implementation Plan, the Virginia Assessment and Scenario Tool (which allows users to develop scenarios rapidly with varying best management practices) and the integration of the new stormwater management regulations and the MS4 permit regulations. An NVRC staff member continues to serve as the Chairman of the Urban Stormwater Work Group (USWG) for the EPA Chesapeake Bay Program.

The USWG has been charged with developing a set of recommendations for the Chesapeake Bay Program's Water Quality Goal Implementation Team regarding issues dealing with urban stormwater and the impact to the health of the Chesapeake Bay. The process of making these recommendations is to create panels populated with experts in the field from all different disciplines and

geographic locations within the Bay watershed. The panel members then review the current literature about their subject areas, discuss the issues, consider any implications of the recommendations to localities, and eventually come up with a set of recommendations.

In 2014, a number of 'expert panels' were convened to define and develop nutrient and sediment load reductions for localities:

- Recommendations of the Expert Panel to Define Removal Rates for the Elimination of Discovered Nutrient Discharges from Grey Infrastructure www.chesapeakebay.net/publications/title/elimination_of_discovered_nutrient_discharges_from_grey_infrastructure.

- Recommendations of the Expert Panel to Define Removal Rates for Urban Filter Strips and Stream Buffer Upgrade Practices www.chesapeakebay.net/publications/title/recommendations_of_the_expert_panel_on_urban_filter_strips_and_stream_buffe.

- Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects (short version) with updated adjustor curves January 2015 www.chesapeakebay.net/publications/title/stormwater_retrofits_expert_panel_report_without_appendices.

- Recommendations of the Expert Panel to Define Removal Rates for New State Stormwater Performance Standards (short version) with updated adjustor curves January 2015 www.chesapeakebay.net/publications/title/stormwater_performance_standards_bmp_panel_report_without_appendices.

- Recommendations of the Expert Panel to Define Removal Rates for Urban Nutrient Management (short version) www.chesapeakebay.net/publications/title/recommendations_of_the_expert_panel_to_define_removal_rates_for_urban_nutri.

- Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (short version) http://www.chesapeakebay.net/publications/title/recommendations_of_the_expert_panel_to_define_removal_rates_for_indivi.

- Recommendations of the Expert Panel to Define Removal Rates for Erosion and Sediment Control Practices www.chesapeakebay.net/publications/title/recommendations_of_the_esc_expert_panel.

A complete review of all the past and current USWG BMP Expert Panels can be found under the publication tab at: www.chesapeakebay.net/groups/group/urban_stormwater_workgroup.

c. 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 a published notice 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 or to specific TMDL projects should be directed to the TMDL Coordinator at the Northern Regional Office of VDEQ: http://deq.state.va.us/Programs/Water/WaterQualityInformationTMDLs/TMDL/Contacts.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 2014 Reston Lakes

Annual Monitoring Report. This report and other information about Reston's lakes can be obtained by contacting RA's watershed manager at 703-435-6560 or visiting the website: www.bit.ly/LakeReport

In 2014, RA staff continued the massive removal of purple loosestrife from the shoreline at all four lakes. RA's management strategy included contracting with a licensed aquatic herbicide company, Aquatic Environmental Consultants, Inc., to do treatments at Lake Newport to control white water lilies, Lake Thoreau to control for Fireflag and Lake Anne to control algae when needed.

In 2014, Bright Pond and Butler Pond were hydraulically dredged. In 2015, Lake Anne canal was dredged.

In 2014 RA helped install two shoreline stabilization projects by placing biologs at Lake Anne and Lake Audubon.

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 regularly monitored for biological or chemical parameters.

Beginning in 2011, water quality in Huntsman Lake was characterized to evaluate potential management activities that could be employed in addition to the dredging planned in summer 2014. In 2012, in-lake water quality monitoring continued at Huntsman Lake through the warmer months. Preliminary analysis shows that the lake is highly nutrient enriched and is exhibiting summertime hypoxia at levels deeper than 6-10 feet. Since the initiation of the original characterization study, a solar powered water circulator has been installed in the lake and has had pronounced effects on the low-oxygen conditions occurring in the deeper areas of the lake. Dissolved oxygen is present at much higher concentrations at the deeper levels of the lake, thus allowing occupation of these areas by greater numbers of aquatic plants and animals. Despite the improvement of dissolved oxygen distribution in the lake, there are still excessive levels of nutrients in the lake, feeding summertime algae blooms, hindering water quality and limiting sunlight penetration depths.

In spring 2014, Huntsman Lake was drained to allow for necessary dam upgrades and to dredge up to 34,500 cubic yards of accumulated sediments in the lake bottom. A lake restoration plan will be implemented as part of this work. Post construction monitoring will commence on Huntsman Lake in 2015. In 2012, monitoring of recently-dredged Lake Barton commenced. In late 2013, the solar powered water circulator was moved from Huntsman Lake to Lake Barton (in anticipation of dredging activities). The water quality data collected at Lake Barton will be evaluated in concert with the data from nearby Huntsman Lake.

In 2014, a more comprehensive lake monitoring scheme was developed on the Pohick lakes and two more lakes were added to the monitoring: Lake Royal and Woodglen Lake. These two lakes are the next two scheduled for improvements and dredging. Analysis of these data will focus on the benefits of selected management/restoration actions and the potential for these impoundments to be utilized fully as water quality improvement facilities contributing to improved stream health within the Pohick Creek watershed.

c. Lake Barcroft

The Lake Barcroft Watershed Improvement District (WID) 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 had 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 oversaw 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 included 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 could 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 had 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 were removed by the time of project completion in September 2008.

12. Groundwater Monitoring

The United States Geological Survey maintains a series of wells throughout the nation to monitor groundwater levels and drought. Several wells (Site Number: 385311077215001 - 52V 25, Site Number: 385305077162101 - 52V 24, Site Number: 384956077250301 - 51U 144, Site Number: 384854077251801 - 51U 145, Site Number: 384354077135801 - 53T 59, Site Number: 385930077215901 - 52V 23 and Site Number: 385638077220101 - 52V 2D) are depicted on the Fairfax County, Virginia location map, which is provided at the following link: http://groundwaterwatch.usgs.gov/countymap.asp?sa=VA&cc=059. By clicking on the icon associated with the well, you can get information on how long the well has been functioning and what data are being collected.

a. Expansion of the Eastern Virginia Groundwater Management Area

On June 17, 2013, the State Water Control Board adopted final regulations developed by the Department of Environmental Quality adding portions of Fairfax County east of Interstate 95 to the Eastern Virginia Groundwater Management Area. On January 1, 2014, the Eastern Virginia GWMA was expanded (9VAC25-600-10 et seq.) and the Groundwater Withdrawal Regulations (9VAC25-610-10 et seq.) became effective in the expanded area.

As a result, all persons in the expanded area withdrawing or having withdrawn groundwater on or before January 1, 2014 in excess of 300,000 gallons per month (from well, well system or a pond recharged by groundwater with mechanical assistance) must apply for an Existing Users Groundwater Withdrawal Permit to continue their withdrawals. Persons wanting to establish a new withdrawal or expand an existing withdrawal must apply for that new/expanded use in accordance with 9VAC25-610-92 of the regulations.

b. Virginia Department of Environmental Quality Leaking Underground Storage Tank Information

With respect to leaking underground storage tanks for regulated tanks (i.e., gas stations), in 2014, there were 16 open cases and 1,108 closed cases, with seven new cases opened and 14 cases closed. In terms of unregulated tanks (i.e. residential

heating oil), there were 46 open cases and 2,036 closed cases, with 82 new cases opened and 75 cases closed.

D. WATERSHED MANAGEMENT

Watershed management is the process of implementing plans, programs and projects to protect and/or restore watershed functions. Streams form at the low points of watersheds. Plans usually take into account both ground and surface water flow, recognizing and planning for the interaction of water, plants, animals and human land use found within the physical boundaries of a watershed.

1. Watershed Management Plans

In 2003, the Stormwater Planning Division of the Fairfax County Department of Public Works and Environmental Services commenced a planning initiative to develop a series of watershed management plans. The plans were developed between 2003 and 2011 with the assistance of the community through a public involvement process that included community interest meetings and stakeholder groups. A total of 13 plans, which cover all 30 county watersheds (www.fairfaxcounty.gov/dpwes/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:

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

Many non-structural projects and policy recommendations from the watershed plans have been implemented while implementation of others is ongoing. The number of projects selected each year for implementation will be determined as part of the annual budget process. Projects under design and construction can be found on the Stormwater Improvement Projects Web page at: www.fairfaxcounty.gov/dpwes/stormwater/projects/project_list.htm

Fairfax County's Department of Information Technology (DIT) used 2009 topographic data to create the most highly detailed elevation model of the county. With that Geographic Information System (GIS) modeling, DIT was able to build a complex set of watershed delineation tools that significantly reduces DPWES Stormwater's time and cost in carrying out its work.

DIT was expecting, in fall 2015, delivery of LIDAR imagery from USGS to provide countywide coverage. Having such coverage will enable more detailed modeling of

the surface, which will assist DPWES Stormwater in its analysis and forensics analysis of runoff problems.

2. 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. Maps may be viewed at www.fairfaxcounty.gov/dpwes/watersheds/perennial.htm.
Fairfax County's Chesapeake Bay Preservation Ordinance is available on-line at: 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.

The countywide RPA map is changed occasionally to update site-specific perenniality classification changes. Additions to the RPA map are approved by the Board of Supervisors. Removal of RPAs is approved administratively through the plan review process.

3. Restoration Efforts

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

In 2014, the county and its partners continued to implement stormwater management-related capital projects. Projects completed in 2014 included six stormwater management facility retrofits, seven low impact development projects and nine stream restoration projects. Examples are identified below.

i. Stream Restorations

In 2014, the county completed nine stream restoration or stabilization projects:

- Banks Property Stream Restoration.
- Big Rocky Run Phase II Stream Restoration.
- Great Passage Channel Stabilization.
- Hickory Hill Outfall Stabilization.
- Indian Run Stream Restoration.
- Pohick Creek Stream Restoration.
- Scotts Run at Arbor Row.
- South Lakes Stream Restoration.
- Wakefield Run Stream Restoration.

ii. Detention Basin Retrofits

Stormwater management facility retrofits are intended to improve water quality and/or quantity control beyond their original designs. Water quality retrofits enhance nutrient uptake and increase the infiltration, uptake and transpiration of stormwater while water quantity retrofits help to reduce downstream flooding and erosion. In 2014, six retrofit projects throughout the county were completed for enhanced detention/retention and improved water quality. Specially designed native seed mixes enhanced basin function and vegetation longevity.

iii. Low Impact Development Projects

Seven locations were retrofitted in calendar year 2014 through partnership projects with the Department of Public Works and Environmental Services, Fairfax County Public Schools, Fairfax County Park Authority and the Fairfax Fire and Rescue Department. Various techniques for water quality were employed, including the installation of rain gardens, pervious pavement, underground storage, rainwater harvesting, soil amendment, native vegetation and water quality swales.

iv. Education and Outreach

Tours of stormwater retrofits were conducted in 2014 to educate county staff, other agencies, civic and environmental groups, homeowner associations and residents on innovative stormwater techniques. Members and staff of the following participated in educational tours of the Big Rocky Run, Pohick Creek and Government Center projects:

- Environmental Quality Advisory Council.
- Fairfax County Board of Supervisors.
- Fairfax County DPWES Directors Office.

- Fairfax County Office of the County Attorney.
- Fairfax County Department of Planning and Zoning.
- Fairfax County Department Purchasing and Supply Management.
- Fairfax County Waste Water Management.
- Fairfax County Engineers in Training Program.

b. Riparian Buffer Restoration

Fairfax County continued its countywide riparian buffer restoration project in collaboration with various partners to mitigate stormwater runoff into local streams and to support the Board of Supervisors' adopted Environmental Agenda. Numerous agencies and organizations provide support for riparian buffer restoration efforts, and these efforts are detailed, within the broader context of ecological restoration efforts, within the Ecological Resources chapter of this report.

c. NVSWCD Stream Restoration

Virginia's Phase II Watershed Implementation Plan recognizes a need for urban/residential BMPs in its "Local Implementation Strategies for Urban/Suburban Source Sector," including a cost share program strategy. Funded through the Environmental Improvement Program and working with representatives from Fairfax County DPWES' Stormwater Planning Division and Maintenance and Stormwater Management Division (MSMD) and the Fairfax County Park Authority, NVSWCD implemented, through its Conservation Assistance Program (CAP), the first four urban cost-share projects in Fairfax County in spring 2015 (Table IV-4). These projects were implemented by homeowners associations.

Table IV-4.
NVSWCD Urban Cost-Share Projects in Fairfax County, Spring 2015

Community	Supervisor District	Watershed	Practice	Acreage Treated	CAP Program Cost	Community Cost (anticipated)
Loftridge HOA	Lee	Cameron Run	- Bioretention (Rain Garden)	9,700 ft^2	$2,500.00	$2,500.00
Chesterfield Mews CA	Providence	Accotink Creek	- BayScaping - Dry Well/Infiltration Trench	20,327 ft^2	$4,000.00	$4120.00
Lake Braddock CA	Braddock	Pohick Creek	- Bioretention (Rain Garden) - BayScaping	19,100 ft^2	$2,000.00	$2,000.00
Winding Ridge HOA	Sully	Cub Run	- BayScaping	20,880 ft^2	$1,500.00	$3,000.00
Total				70,007 ft^2	$10,000.00	$11,620.00

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 February 12, 2008. 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 underway for the remaining six miles of stream restoration. For more information on the stream restoration project in Reston visit: http://reston.wetlandstudies.com or www.reston.org.

e. Collaboration between Fairfax County Public Schools and the County's Stormwater Planning Division on Stormwater Management Projects

In November 2012, staff from FCPS and SWPD provided a briefing to EQAC regarding the identification of opportunities to enhance stormwater management efforts (beyond code requirements) on school properties through FCPS and DPWES collaboration. These include: evaluation of opportunities to provide additional stormwater management onsite during the design and construction of projects in the FCPS Capital Improvement Program (CIP); opportunities for SWPD to construct stormwater management facilities on school properties which are not part of the CIP; and education and outreach opportunities in the FCPS science curriculum.

FCPS and SWPD coordinate throughout the planning and design of FCPS CIP projects to identify opportunities to enhance the code required stormwater management provided by FCPS. For those projects for which additional stormwater management measures are found to be feasible, SWPD provides technical support and funding, through the Stormwater Service District revenue, to FCPS for the design and construction of this additional stormwater management measures to be permitted and built as part of the FCPS CIP. A list of FCPS CIP projects for which SWPD and FCPS were able to provide additional stormwater management is included below. These additional stormwater management measures help us improve water quality in our streams and meet our Total Maximum Daily Load requirements. It is anticipated that these efforts will continue with future FCPS CIP projects.

Table IV-5 shows the schools and the status of facilities being implemented.

Table IV-5. FCPS and SWPD Stormwater Collaborations as of July 2015		
Location	**Plan Status**	**Facility Descriptions**
Langley High School	Under construction	Underground storage / filtration (Bay Filter)
Marshall High School	Construction substantially complete	Cistern - irrigation system
Mt Vernon High School	Construction complete	Added storage under turf field
Ravensworth Elementary School	Under construction	Bioretention, amended soils
Sunrise Valley Elementary School	Under construction	Permeable pavers, vegetative swale, underground detention / infiltration trench
Terraset Elementary School	Under construction	Pervious pavement, Filterras, permeable pavers, Underground Detention
Keene Mill Elementary School	Under construction	Vegetative swales, permeable pavers, amended soils, sheet flow
North Springfield Elementary School	Under construction	Bioretention, amended soils
Hayfield High School	Under construction	Additional storage under turf field

Source: Department of Public Works and Environmental Services

4. Low Impact Development (LID) 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.

In 2014, the Department of Public Works and Environmental Services, the Fairfax County Park Authority, Fairfax County Public Schools, various nonprofit organizations, individual volunteers and other partners contributed to the design and implementation of seven projects within the county that incorporated one or more LID practices. Partnership projects that result in multiple LID practices being implemented on sites across the county are increasing in number and becoming a major focus of the stormwater program. Numerous projects with LID components are currently under way and are scheduled to be constructed in the coming months. A summary of completed projects, including those with integrated LID practices, is prepared each year and available from DPWES, Stormwater Management.

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 new Virginia stormwater regulations, including a suite of LID practices, have been integrated into the local code and PFM requirements. The revisions have incorporated VDEQ's requirements from the Best Management Practices Clearinghouse and include 17 different practices:

- Simple rooftop disconnection.
- Rooftop disconnection to alternative practice.
- Sheet flow to vegetated filter or conserved open space.
- Soil compost amendment.
- Reforestation.
- Vegetated roof.
- Rainwater harvesting.
- Permeable pavement.
- Infiltration practices.
- Bioretention.
- Vegetated swale.
- Wet swale.
- Filtering practice.
- Constructed wetland.
- Wet pond.
- Extended detention.
- Manufactured (proprietary) BMP.

The amended Public Facilities Manual became effect July 1, 2014.

b. DPWES LID Monitoring Efforts

DPWES staff has conducted monitoring and evaluation of the quantity and quality of runoff from selected innovative stormwater management systems installed at Fairfax County-operated stormwater management facilities. The stormwater systems that were 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 attempt to replicate the natural processes that occur when stormwater is retained by forests, meadows and wetlands.

Between 2007 and 2012, monitoring occurred at four innovative stormwater facilities implemented by DPWES: the Providence District Supervisor's Office/Fire Station 30 in Merrifield, Cub Run RECenter, the Herrity Building in the Government Center complex and the Cinnamon Oaks pond retrofit. 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. Lastly, wetland cells and benches, a sand seepage storm outfall and organic soil amendment with native landscaping were installed at the Cinnamon Oaks pond.

The Virginia Tech Occoquan Watershed Monitoring Laboratory was contracted to conduct full analysis of the monitoring record for these four facilities. The data are being evaluated to determine performance and make design-related recommendations.

c. Virginia Department of Transportation LID Monitoring

VDOT's research division, the Virginia Center for Transportation Innovation and Research, conducts research on current and future environmental topics related to maintenance, construction and operations of transportation systems. Current research projects include:

- ***Assessment of the low impact development strategies for the Lorton Road widening project, Fairfax County, Virginia:*** The primary objectives of this study are to: (1) determine the effectiveness of multiple LID systems for mitigating potential adverse impacts of highway stormwater runoff; and (2) determine the maintenance requirements, procedures and costs associated with LIDs used in the highway setting. Phase I of the project is under way and involves the characterization (both quantity and quality) of runoff coming from Lorton Road prior to LID construction. This will serve as a baseline to determine the pollutant removal efficiency of LID technologies once they are installed and monitored. This information will also help determine the performance of vegetated roadsides and the effects on performance of various vegetation management and maintenance routines. Currently, efforts are concentrated on three automatic samplers and flow monitors located at a single location to aid in this characterization. This pre-construction monitoring will continue until the initiation of construction in the area and is expected to be completed in fall 2015. Subsequent sampling will take place at new sites as construction progress allows.

- ***Permeable pavement pilot project using porous asphalt:*** The purpose of the study is to address the remaining VDOT-specific questions pertaining to installation costs, constructability, maintenance requirements and long-term hydraulic performance of permeable pavements. The scope of the study will be limited to the installation, monitoring and evaluation of a single type of permeable pavement – porous asphalt – by way of a pilot project at the newly constructed I-66/Route 234 Bypass Park and Ride Facility in Prince William County. The study began with the installation of the permeable pavement in March 2013. Following the completion of construction, initial permeability readings were taken at the six primary sampling locations and the 18 auxiliary points. In addition to the initial sampling, follow-up sampling was done in July

2013. In November 2013, permeability was measured again and then two of the four sections of the pavement were maintained using two different vacuum systems: a standard vacuum truck and a regenerative air vacuum system. Five days after the maintenance, permeability readings were taken again. Readings were taken again in May 2014, and selected sections will be cleaned, immediately followed by additional permeability tests. The project is scheduled to be complete in fall 2016.

d. LID Public Education and Outreach

There are numerous ways to reach county residents and many methods are employed by the staff of the Stormwater Planning Division of DPWES to inform and educate:

- News releases ("tell and sell" the story to the media).
- Social media (i.e. Facebook and You Tube).
- Pod casts and the "County Conversation" (audio).
- Television public service announcements (video).
- Channel 16 television programs.
- Fact sheets, brochures, newsletters and booklets.
- Slideshare (online PowerPoint presentations).
- Flickr (photo stream).
- Web pages.
- Events (SpringFest, Celebrate Fairfax, Fall for Fairfax homeowner association and project meetings).
- Reports (Stormwater Status Report).
- Personal contact by telephone, email, letter and visit.
- Volunteer opportunities (stream and litter cleanups).
- School programs (Sewer Science, Water Quality Day).
- Stormy the Raindrop (activity books, puppet shows at events).
- Tours of completed projects (e.g., Government Center stream restoration, Big Rocky Run Phase II stream restoration, Pohick Creek stream restoration).

Popular public education topics have included: The stormwater ordinance; stream restorations; litter in the environment; proper disposal of pet waste; motor oil and other household hazardous waste; natural gardening techniques; completed projects; detention basins and micropools; native plants; permeable pavers; rain barrels and rain gardens; how to properly discharge swimming pool water; summer and winter tree care tips; and the Huntington levee, among other topics.

Fairfax County addresses nonpoint source pollution through public education in partnership with surrounding jurisdictions. As a member of the Northern Virginia Clean Water Partners, Fairfax County continued to support the regional stormwater education campaign commenced in 2012. By pooling outreach funds with other jurisdictions to reach a wider audience, the campaign used radio and television

advertising in an effort to reduce pollution-causing behaviors among Northern Virginia residents.

The 2014 campaign ran four commercials featuring messages on the importance of picking up pet waste, used motor oil, over fertilization of lawns and general household stormwater pollution reduction measures. The ads aired on twelve cable TV channels, including three Spanish-speaking channels, a total of 3,502 times. These TV ads reached three million Northern Virginia residents and resulted in more than 400 visits to the www.onlyrain.org website.

The Clean Water Partners conducted a mini campaign featuring banner ads on the Comcast website that promote alternatives to chemical fertilizer use, how to dispose used motor oil correctly and the importance of picking up pet waste.

The Northern Virginia Clean Water Partners website may be seen here: www.onlyrain.org/.

e. Green Golf Course at Pohick Bay

The Pohick Bay Regional Park Authority 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. Pohick Bay Regional Golf Course follows a Nutrient Management Plan approved by the Virginia Department of Conservation & Recreation to ensure sustainability for the wetlands, the Potomac River and the Chesapeake Bay. The course completed a new pump station in 2014 that will reduce groundwater withdrawals for irrigation.

In 2014, Pohick Bay Regional Park continued improvements on its trail system to protect the Pohick Bay tributaries and watershed, by restoring poorly designed trails and stream crossings and relocating unsustainable trail segments to maintainable areas. The work is being funded by a grant from the Bureau of Land Management, in partnership with improvement of its trail system at Meadowood Recreation Area across Gunston Road from Pohick Bay Regional Park. During an Earth Day cleanup, volunteers at Upton Hill Regional Park mulched the park's natural surface trails to prevent erosion.

5. 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 the City of 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 County, resulting in "State of Emergency" declarations. In Fairfax County, the New Alexandria and Belle View communities experienced severe flooding from the tidal surge; more than 200 structures were damaged. Both neighborhoods are located in the Special Flood Hazard Area (SFHA) 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 flood wall/levee combination, with a pumping station for interior drainage, may be feasible. The USACE study evaluated structural options (levees and flood walls) and flood proofing alternatives (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. The USACE last updated cost estimates and cost benefit ratios for several flood wall/levee alignments in April 2014, with the most expensive alternative being approximately $34 million.

b. Huntington Flood Remediation Project

In June 2006, the Huntington community experienced flooding from Cameron Run--more than 160 homes were affected. The flood waters exceeded the Federal Emergency Management Agency 100-year floodplain elevation by approximately three feet. The community also experienced 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 conceptual flood mitigation plans in April 2009, which included a levee along Cameron Run. The estimated cost for the levee project is $30 million. On November 6, 2012, Fairfax County voters approved a stormwater bond referendum that included funds to design and construct the levee and pump station proposed by the USACE in its 2009 study. The scope of work will include design and construction administration services for the levee and pump station. Construction of the levee will also require utility relocations, acquisition of land rights on adjacent properties and significant public outreach. ARCADIS U.S., Inc. was selected as the design consultant and began work in June 2013. The project is expected to take five to seven years to complete.

6. 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.

NVSWCD continues to provide environmental and stewardship offerings for adults and families as well as youth. Throughout FY 2015, NVSWCD staff presented or participated in roughly 100 events, reaching out to approximately 5,000 individuals on watershed, soil, stormwater and conservation-related topics. In addition, NVSWCD staff coordinated the following efforts:

i. Storm Drain Marking

Volunteers educate their communities about nonpoint source pollution prevention and glue pre-printed labels on the concrete covers of storm drains. The labels identify the stream or Potomac River watershed in addition to providing a "No Dumping" message. Many residents in Fairfax County are unaware that storm drains lead to local streams and the storm drain education and marking program is key to getting that message out to the public. In FY 2015, 484 volunteers logged 2,883 hours over 33 projects to label 2,303 storm drains and educate 12,249 households. Since the start of this program, one-quarter of the more than 80,000 storm drains in the county have labels.

ii. Watershed Calendar

Every month, NVSWCD distributes a calendar of engagement opportunities across Fairfax County to over 1,300 recipients. Events are sponsored by NVSWCD and other partnering agencies and include stream monitoring activities, green breakfast announcements, seminars, watershed cleanups, film festivals, invasive management and others.

iii. Conservation Currents

NVSWCD's quarterly newsletter, Conservation Currents, is distributed to 2,500 individuals and organizations. Topics covered during FY 2015 included:

- Jean Packard's Legacy.
- Clover in Your Pasture?
- Wakefield Run Stream Restoration Project.
- Rain Barrel Art.
- 2014 Land Conservation Awards.
- Stewardship is a Focus for New NVSWCD Director – Jerry Peters.
- Trash Cleanups.

b. Virginia Department of Forestry

In 2014, the Virginia Department of Forestry partnered with volunteers from organizations such as Fairfax ReLeaf, Eagle Scouts, homeowner associations and school groups and completed 23 community tree plantings in the county. Volunteers donated 615.25 hours and planted 1,417 trees in these events. Two of the tree plantings were along streams and added 863 feet of riparian buffer.

In an attempt to expand outreach and education and planting efforts, the Department of Forestry initiated a Tree Stewards program in 2011. 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. A fourth class of Tree Stewards was trained in 2014. Thirty Tree Stewards reported 715.5 hours of volunteer service, including invasive plant removal, tree planting and education and outreach activities.

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.

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.

c. DPWES Urban Forest Management Division--Tree Canopy

i. Urban Tree Canopy Analysis

The 2012 Urban Tree Canopy (UTC) Analysis conducted by the University of Vermont Spatial Analysis Laboratory indicated that 53 percent of the county's land mass is covered by tree canopy. In addition to canopy coverage, the analysis delineated the percent coverage for impervious surfaces, water, grass/shrub, bare soil, roads and buildings. The analysis was used to develop canopy coverage for all 30 major watersheds found within Fairfax County. The high resolution satellite imagery and UTC analysis for the county is being updated in 2016.

This information on existing tree canopy in the county is being used to also calculate the environmental benefits, such as carbon sequestration, stormwater management, air and water quality benefits and energy conservation, of the urban forest based on science and Web-based tools (*i-Tree*) developed by the U.S. Department of Agriculture (USDA) Forest Service. These efforts are in support of Tree Action Plan Core Recommendations #5, to Improve Water Quality and Stormwater Management through Tree Conservation and #6, to Use Ecosystem Management to Improve and Sustain the Health and Diversity of the Urban Forest.

ii. Tree Canopy and Watersheds

In 2013 and 2014, the Urban Forest Management Division, in cooperation with the county GIS office, continued modeling on county watersheds to simulate the effects of changes in tree and impervious cover on stream flow and water quality. The selected modeling software is i-Tree Hydro, a part of the i-Tree suite of tools developed by the USDA Forest Service which analyzes urban and community forest benefits. The tree canopy analysis, along with field-collected inventory data, hourly stream flow and weather data, is used to quantify the value of trees on the watershed level. Theoretical gains or losses in tree canopy and/or impervious surfaces can be modeled to demonstrate the effects on water quality and stream flow.

The Urban Tree Canopy Analysis and i-Tree Hydro will provide useful input toward achieving many goals set forth by the Tree Action Plan. The benefits of these analyses include:

- Developing benchmark tree canopy levels for the major watersheds in Fairfax County from Urban Tree Canopy Analysis data.
- Using i-Tree Hydro software to model effects of gains and/or losses of tree canopy and impervious surface on water quality and stormwater flow.
- Cooperating with Stormwater Planning to incorporate tree canopy analysis with MS4 Permit and Chesapeake Bay TMDL regulatory requirements.
- Adjusting watershed canopy goals to reflect available planting space, demographics, comprehensive plan potential for land use change, etc. if needed.
- Embedding reforestation and related best management practices in MS4 Permit and Watershed Improvement Plans as credited measures.

The Urban Forest Management Division provides consultations to various county agencies. Representing only two percent of requests of the total requests for help, there were 20 stormwater-related requests coming primarily from the Stormwater Planning Division, the Utilities Design and Construction Division, contractors and stakeholders as part of planning and implementation teams. Contributions included project scoping, plan review, pre-construction meetings and consultation during construction of various projects, including stream restoration, stream stabilization and stormwater management facilities. In addition, UFMD staff participated in

outreach efforts to property owners impacted by proposed stormwater projects to help explain the scope of work and anticipated impacts to trees, as well as proposed planting.

d. Reston Association

The Reston Association, the homeowners association for the large, planned community of Reston (population of greater than 60,000), has an active watershed and lakes management program.

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.

i. Programs for All Ages:

- On March 21, 2015, RA hosted the fifth annual **Reston Kid's Trout Fishing Day**, during which 322 kids ages 2-12 enjoyed catching rainbow trout from the restored Snakeden Branch stream between Soapstone Drive and Lake Audubon.
- At RA's **Spring Festival** on May 2, 2015, residents rented boats at Lake Audubon, learned about stream monitoring and tried their hands at fishing at the lake.
- RA hosted a **Stream Monitoring Workshop** on March 4, 2015 with four people getting certified as stream monitors in addition to two other field days with 14 volunteers gaining experience.
- RA, working with volunteers and an Eagle Scout, marked over 200 storm drains in 2015.

ii. Community Low Impact Development:

Reston Association provides watershed education opportunities for the public at its Walker Nature Center. The nature center conducts programs for all ages that promote watershed appreciation and conservation, including stream and lake explorations, rain barrel workshops and fishing programs. A summary of RA's activities in 2014 follows:

- Distributed printed watershed education materials at the center and at community events, including "Helping Our Watersheds: Living in the Potomac and Chesapeake Bay Watershed," "Understanding, Preserving and Enjoying Reston's Lakes and Streams" and "Rain Barrels."
- Assessed the Snakeden Branch stream restoration with the South Lakes High School IB students.
- Included watershed education, stream and lake exploration and fishing and boating activities at eight of its summer camp programs for children ages

three to 16. These programs served over 1,200 campers between June 30 and August 29.

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

iii. Reston Stormwater 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 stormwater trail in Reston that serves as a guide to help community associations, residents and youths 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 stormwater trail includes best management practices/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 low-maintenance native species that grow well in the Northern Virginia area and a rain barrel that will be used to collect and conserve rainwater to be used to water the gardens in between rainstorms. The stormwater 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 stormwater 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.

e. DPWES Wastewater Management Public Education and Outreach Efforts

These efforts include:

- School programs; Sewer Science in Fairfax County high schools.
- Water quality field day for students.
- Wastewater treatment plant pours.
- Raising awareness at county events (Fall for Fairfax, town halls, Earth Day, Touch a Truck, Take Back Medication Day).
- Television public service announcements.
- Water quality education videos.
- Participation in Fairfax County Channel 16 programs/broadcasts.
- Distribution of informational fact sheets, tri-folds and brochure.
- Web pages.
- Social media (Facebook and YouTube) communiques.
- News releases.
- Flickr.

Fairfax County's Wastewater Management program also addresses point source pollution also in partnerships with surrounding jurisdictions. As a member of the Council of Area Governments, COG Water Team jurisdictions (including Fairfax County) pool together funds to support regional efforts such as Take Back Medication Day or Fats, Oil and Grease (FOG) campaigns.

7. Organized Watershed Cleanups

Staffs from the Stormwater Planning Division, Solid Waste Management Program, Wastewater Management, Fairfax County Park Authority and the Northern Virginia Soil and Water Conservation District continued to support large and small-scale volunteer cleanups coordinated by the Alice Ferguson Foundation, Clean Virginia Waterways and Clean Fairfax.

a. Clean Fairfax

Clean Fairfax reports that, last year, the organization worked with over 2,200 volunteers at 82 assisted cleanups, picking up over 320 cubic yards of trash, on and around Fairfax County's roads, parks and side streets. Additional activities of Clean Fairfax are highlighted in the Solid Waste chapter of this report.

b. Reston Association

Reston Association reports the following cleanups:

- The **2015 Potomac River Watershed Cleanup** was a success, with 80 volunteers getting out into Reston's natural areas and streams to collect a total

of 112 bags of trash. They were able to recycle 42 of those bags and remove three tires, over 550 plastic bags and 1,350 cigarette butts.

- On June 6, 2015, 34 volunteers collected 300 pounds of trash from Lakes Anne, Audubon and Thoreau. Reston's **Lake Cleanup** was held in conjunction with the Chesapeake Bay Foundation's Clean the Bay Day.

- At Reston Association's **Fall Stream Watershed Cleanup** on October 18, 2014, 58 volunteers cleaned approximately two miles of stream and collected 55 bags of trash, 23 of which were able to be recycled. The cleanup effort at the four sites (Hunters Woods, Cedar Ridge, Great Owl Circle and Nature House) removed about 700 pounds of trash. Volunteers collected over 900 beverage bottles and cans, making them the most common items collected.

c. Alice Ferguson Foundation Potomac Watershed Cleanup

The 27th Annual Potomac River Watershed Cleanup was successful again with 16,521 volunteers removing 285 tons of trash from 411 sites throughout the watershed. In Fairfax County, 1,643 volunteers removed 37.5 tons of trash from 77 sites. Additional activities of the Alice Ferguson Foundation are highlighted in the Solid Waste chapter of this report.

d. Clean Virginia Waterways

According to Clean Virginia Waterways, a total of 778 volunteers participated in the International Coastal Cleanup in Fairfax County during September and October 2014. 10,055 pounds of trash and marine debris were removed. Plastic bags, beverage bottles, food wrappers and containers and litter from recreational activities and fast food consumption (i.e. cups, plates, forks etc.) were the most commonly collected trash items in the county.

e. Fairfax County Park Authority

Fairfax County Park Authority organized and/or assisted with a number of stream cleanups in 2014.

f. NOVA Parks (Northern Virginia Regional Park Authority)

Occoquan, Fountainhead and Bull Run Marina Regional Parks hosted cleanup events on the Occoquan River with Friends of the Occoquan (FOTO), removing dozens of bags of trash from the reservoir. Pohick Bay Regional Park hosted the Alice Ferguson Foundation Rivershore Cleanup. At Sandy Run Regional Park, rowing crew teams took part in water cleanup days, removing trash from the Occoquan Reservoir in the vicinity of the park.

g. Department of Public Works and Environmental Services

In 2014, the Stormwater Planning Division continued to develop a logical model to organize and analyze data collected using the Trash Assessment for Improved Environments (TAFIE) stream condition assessment protocols and data forms developed in 2012. When completed, this will enable TAFIE data collected by the county as well as by volunteer groups to be integrated and compared with stream cleanup data collected using similar methodologies (particularly the Alice Ferguson Foundation's Visible Trash Survey and the International Coastal Cleanup), as well as allow cleanup data to be merged with other permit-related information (for example, stream cleanup results and stream biomonitoring data).

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

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

E. STORMWATER MANAGEMENT, ENFORCEMENT AND INSPECTIONS

1. Virginia Pollutant Discharge Elimination System (VPDES) Municipal Separate Storm Sewer System (MS4) Permit

Fairfax County's VPDES 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 stormwater outfalls four times per year (seasonally). Outfalls are monitored during dry weather to determine the presence of illicit discharges.

VDEQ administers these programs through the Virginia Stormwater Management Program Regulations, which are authorized by the Virginia Stormwater Management Act.

The county's MS4 permit was renewed on April 1, 2015. Fairfax County's MS4 permit and MS4 annual reports can be viewed on-line at: www.fairfaxcounty.gov/dpwes/stormwater/ms4permit.htm.

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 (IHRR) 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.

The county received a formal report on the results of the inspection from EPA in June 2012 and an Administrative Order (AO) in November 2012. The AO directed the county to take steps to address aspects of the Industrial and High Risk Runoff and Construction Site Runoff inspection programs. The county responded to the AO on November 30, 2012 and identified the steps being taken to attain compliance with the AO.

The county has taken the following steps related to the Industrial and High Risk Runoff inspection program:

- Drafting of a standard operating procedure to identify and control pollutants in stormwater discharges from industrial and high-risk facilities.

- Development of a database of industrial and high-risk facilities that have the potential to discharge to the MS4; this database is being used to identify facilities that will be used to prioritize inspections associated with the IHRR program.

- Updating of its list of facilities holding Virginia Pollutant Discharge Elimination System permits.

- Development of new educational materials to assist other county agencies with recognizing and reporting IHRR during their inspections.

- Hiring of two Code Specialists for the purpose of conducting IHRR inspections.

The following steps related to the Construction Site Runoff inspection programs will include:

- Updates to the site inspection database (Site Inspections 2000 or SI2K) and the Inspector's Handbook to require documentation in SI2K of:
  - Location information and comments regarding compliance or noncompliance for erosion and sediment control inspections.
  - Any verbal communications regarding erosion and sediment control inspections.
  - The content of the comments for erosion and sediment control inspections.
  - Revisions to the inspector's copy of the plan regarding any minor changes in the erosion and sediment control features made during construction. (Major revisions currently require formal submission of a plan revision and are reviewed by county engineering staff and appropriate outside agencies for compliance with state and local regulations.)

- These updates to SI2K and the Inspector's Handbook will be followed by annual training with the inspectors to ensure that revisions result in a change in practice in the field.

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, 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

In 2014, Fairfax County inspected 475 of the 1,749 county-owned stormwater management facilities and 749 of the 3,825 privately maintained stormwater facilities.

The Maintenance and Stormwater Management Division of DPWES 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 exceeds 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. MSMD also inspects privately-maintained facilities at least once during the term of the permit (every five years). As part of the private facility inspections, MSMD oversees private maintenance agreements.

In 2014, MSMD continued its maintenance program for county stormwater management facilities. Maintenance can include repairs to stormwater management facility structures and removal of sediment. During 2014, the county cleaned and/or mowed 1,355 dam embankments, including 56 regional ponds that 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 3,432 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; graffiti removal; sign repairs/installation; and responses to complaints.

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

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 168 facilities, including: bioretention gardens; green roofs; permeable pavers; vegetated swales; tree box filters; and infiltration trenches.

In 2014, MSMD continued a partnership with the Fairfax County Sheriff's department using the Community Labor Force (CLF) crews to help maintain Fairfax County's public LID facilities and remove trash in all the publicly maintained stormwater ponds. In 2014, the CLF work crews were tasked with maintaining roughly 36 publically-maintained LID facilities and removed trash in over 1,300 ponds.

In 2014, MSMD continued implementation of its infrastructure inspection and rehabilitation program. Staff inspected over 11,000 pipe segments and over 10,000 storm structures with video and photo documentation. Under the rehabilitation program, more than 834,200 linear feet (158 miles) of pipe were videoed, documenting the existing structural and service conditions of the interior of the storm system. These efforts represent 389 miles, or one-third of the storm drainage network, being screened through walking and/or video documentation for obvious deficiencies. In addition, more than 3.1 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. Erosion and Sediment (E&S) Control

DPWES continues to make improvements to the county's erosion and sediment control program, resulting in a greater emphasis on, 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.

In 2014, a total of 594 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 Environmental Quality.

In 2014, 25,844 E&S inspections were performed through the county's Alternative Inspection Program on all sites under construction. Those E&S inspections represented 57.2 percent of the 45,167 total site inspections that were performed by Site Development and Inspection Division (SDID) personnel. The site inspections total also included 19,323 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 2014, SDID wrote 741 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 99 violations in 2014 and 90 of those were later cleared. The remaining nine violations are extended until the required corrections are made or court action is initiated. SDID held 21 escrows for either landscaping or stabilization issues.

The Land Disturbance and Post Occupancy Branch of DPWES-Land Development Services investigates complaints alleging violations of the Fairfax County's Erosion and Sediment Control Ordinance (Chapter 104). The branch also investigates complaints alleging violations of the county's Chesapeake Bay Preservation Ordinance (Chapter 118 of the County Code). In 2014, the branch received 245 total complaints. In most instances there was either no violation or there was timely compliance if a violation was cited. The branch issued 19 Resource Protection Area violation notices and 38 land disturbance violation notices. The branch undertook one criminal proceeding to ensure compliance.

5. Illicit Discharges

a. Fire and Rescue Department

The Fire and Rescue Department's Fire and Hazardous Materials Investigative Services (FHMIS) 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. FHMIS 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 offenses related to storage, use and transportation of hazardous materials and hazardous waste, as well as environmental crimes. 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 2014, the section received 581 complaints involving hazardous materials. The actual spill, leak or release of hazardous materials into the environment occurred in

289 of these cases. Of these 289 releases, 125 involved petroleum based products. There were 22 hydraulic oil spills/releases (mostly from trash trucks), 22 gasoline releases, 10 fuel oil or home heating oil releases and 40 diesel fuel releases. The remainder consisted of a variety of materials including, paint, antifreeze, cleaners, various gases, various chemicals and mercury. There were 22 incidents where the release of hazardous materials impacted storm drains or surface waters. The section tracked eight sites for both short and long term remediation activities.

b. Virginia Department of Environmental Quality

The Northern Regional Office of the Virginia Department of Environmental Quality reported that, in 2014, there were 158 stream pollution incidents in Fairfax County. These include petroleum surface spills, discharges from point sources (discrete conveyances/pipes) and sewage discharges. Water bodies were involved in 72 of the incidents.

6. Virginia Department of Transportation Wetlands, Streams and Water Quality Mitigation Actions and Policies

a. Virginia House Bill 2

On April 6, 2014, Governor Terry McAuliffe signed *House Bill 2* (HB2). HB2 became effective as of July 1, 2014 and requires the Commonwealth Transportation Board to develop and implement a quantifiable, transparent prioritization and funding process for all modes of transportation by July 2016. The prioritization process will evaluate projects for six evaluation measures, one of which is environmental quality to reduce pollutant emissions and energy consumption, and minimize the impact on natural and cultural resources.

b. Wetlands and Streams

Potential impacts to stream and wetland resources from VDOT projects and activities are avoided and minimized to the greatest extent feasible. Avoidance of such impacts involves a balance with avoiding and minimizing technical, logistical, socio-economic as well as other environmental resource factors to find the most practical and least environmentally-damaging solution.

For unavoidable impacts to aquatic resources federal/state water quality laws and regulations may require compensatory mitigation in order to obtain water quality permit authorizations form the permit regulators. To comply compensatory mitigation requirements, VDOT designed and constructed several on-/off-site mitigation areas as a part of a highway construction project. Within Fairfax County, several mitigation sites were created on state right-of-way totaling approximately eight acres of wetlands (seven acres non-tidal and one acre tidal) and approximately 2,635 linear feet of restored streams associated with unavoidable impacts from VDOT highway improvement projects. These compensatory mitigation sites have

satisfied the success establishment criteria set by the regulatory permitting agencies and now exist in perpetuity as protected conservation easements. One of that last remaining on-site mitigation sites under active post-construction permit monitoring is associated I-95/Telegraph Road interchange improvement project (opened to traffic lasts year). The compensatory mitigation requirements for the unavoidable impacts included wetland enhancement/creation of 1.71 acres of tidal wetlands and 0.63 acre of non-tidal wetlands near the confluence of Taylor Run and Cameron Run plus 0.36 acre of stream restoration to relocated tributary to Cameron Run; these areas are in the third year of a five year monitoring period.

Beginning in 2008, EPA, USACE and VDEQ jointly supported an order of preference for compensatory mitigation: first through purchase of stream and wetland credits from approved commercial mitigation banks; second by payment of in-lieu funds; and third by permittee responsible mitigation (i.e., preservation, enhancement and creation) for compensation of unavoidable impacts to aquatic resources. As a result, VDOT now purchases wetland and stream credits from approved mitigation banks to fulfill compensatory requirements. While compensatory mitigation is ultimately subject to approval of the regulatory permitting agencies, VDOT is open suggestions from EQAC for exploring mitigation opportunities within the Fairfax County geographical area.

VDOT has been treating nearly 900 acres of impervious road surface area through a system of 190 stormwater basins throughout the county under the requirements of the 1990 stormwater regulatory requirements. Under the new stormwater regulations effective last year, runoff from all existing and proposed impervious pavement on VDOT highway improvement projects will need to treated before it is discharged into adequate outfalls. These new requirements will increase the acreage of impervious road surface as well as expand the number of best management practice (BMP) measures for treatment of stormwater runoff from highways.

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 (maintained by Fairfax County) 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 through which the water infiltrates into ground and ultimately reaches groundwater. The only small treatment plant remaining in the county serves the Harborview subdivision of Mason Neck.

Fairfax County generates about 100 million gallons a day in wastewater. Approximately 40 percent of this is delivered to the Noman M. Cole, Jr. Pollution Control Plant (owned and operated by Fairfax County) for treatment. The treatment facility operated by the Upper Occoquan Service Authority (UOSA, an independent regional authority) treats 13 percent of the county's wastewater. The Blue Plains facility (the largest tertiary sewage

treatment facility in the world, it is owned and operated by the District of Columbia) treats 30 percent, 15 percent is delivered to AlexRenew (Alexandria) and the remaining small percentages go to facilities in Arlington County and Prince William County.

The improved water quality of Gunston Cove (Noman M. Cole Pollution Control Plant), the Occoquan Reservoir (the UOSA Plant) and the Potomac River (Blue Plains) are testament to the high standards of treatment in the last decades.

1. Treatment Facilities

a. Upper Occoquan Service Authority

The following information has been provided by UOSA:

UOSA is an independent authority that 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 water 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 2015 plant performance are listed in Table IV-6.

Table IV-6.
UOSA Permit Requirements and 2014 Performance

Parameter	Limit	Performance
Flow	54 mgd	34.1 mgd
Fecal Coliform	<2/100 mg/l	<1./100 mg/l
Chemical oxygen demand	10.0 mg/l	0.54mg/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	0.03 mg/l
Total Kjeldahl Nitrogen	1.0 mg/l	0.34 mg/l
Dissolved Oxygen	>5.0 mg/l	>7.0 mg/l
Dechlorination Chlorine Residual (mg/l)	Non detect	Non detect

Source: Upper Occoquan Service Authority

In 2014, the influent highest rolling 30-day flow was observed during the 30-day rolling period ending on May 14, 2014 at 40.53 mgd. The UOSA Plant continues to produce high quality reclaimed water that is used to replenish the Occoquan Reservoir.

UOSA produces and treats two types of residuals: biosolids from conventional treatment and lime solids from chemical treatment.

In 2014, the UOSA Water Reclamation Plant prepared a total of 4,632 dry weight metric tons of biosolids by two different processes. One of the processes yielded Class B biosolids and the other produced Class A pellets.

Of the total biosolids produced in 2014, a rotary dryer system (RDS) produced 3,647 dry metric tons of Class A Exceptional Quality pellets. The RDS heats centrifuge cake to a temperature in excess of 93 degrees Celsius and produces pellets that are approximately one to three millimeter in size.

For the Class A pellets, the level of pathogen requirements were achieved as stated in paragraph 9 VAC 25-31-710.A.7 – Alternative 5 (Process to Further Reduce Pathogens Option 2 – Heat Drying). The process produced pellets with a fecal coliform density that were <0.19 MPN (Most Probable Number) per dry gram of biosolids, meeting the requirements of 9 VAC 25-31-710.A.7.a.

The UOSA Class A pellets samples total solids content ranged from 92.9 to 95.8 percent, therefore, the Vector Reduction Attraction requirements of paragraph 9 VAC 25-31-720.B.8 were met.

Of the total biosolids produced in 2014, 791 dry metric tons were produced by centrifugation followed by lime stabilization. Anaerobic digested and thickened waste activated sludge were blended together, conditioned with polymer and processed through centrifuges. The centrifuged sludge was transported to a screw mixer where granular lime was added, resulting in biosolids with percent total solids ranging between 25.7 to 30.9 percent.

For the lime stabilized biosolids, the level of pathogen requirements were achieved as stated in paragraph 503.32(b)(3) Class B – Alternative 2 *(Appendix B.A - Process to Significantly Reduce Pathogens Option 5-lime stabilization)* by achieving a pH of 12 units after two hours of contact.

The UOSA lime stabilized biosolids had a pH of 12 after two hours of contact and 11.5 or higher for an additional 22 hours. Therefore, the Vector Reduction Attraction requirements of paragraph 503.33(b)(6) were met.

Thickened lime residuals are gravity thickened and dewatered on 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 plant is owned and operated by the Fairfax County DPWES Wastewater Division 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-7 presents the facility's performance and current effluent monthly limitations.

Table IV-7.
NMCPCP Permit Requirements and 2014 Performance Averages

Parameter	Limit	Performance
Flow	67 mgd	39.23 mgd
$CBOD_5$	5 mg/l	< 2 mg/l
Suspended Solids	6 mg/l	0.6 mg/l
Total Phosphorus	0.18 mg/l	0.06 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)	6.9
E. coli Bacteria	126/100 N/MCL*	1 N/MCL*
Ammonia Nitrogen	1.0 – 2.2 mg/l (seasonal)	< 0.12 mg/l
Total Nitrogen (Annual)	7 mg/l	2.25 mg/L

*Geometric mean
Source: Fairfax County Department of Public Works and Environmental Services

In 2014, 56,927 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, which was completed in 2013, is to provide treated effluent, as allowed by state regulations, that can be used by various users in lieu of potable water. 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 (E/RRF), 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.

2. Sanitary Sewer Maintenance, Repairs and Rehabilitation

The Wastewater Collection Division (WCD) within the Department of Public Works and Environmental Services manages the county's operation and maintenance program for the 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.

WCD takes a proactive approach toward maintenance of the county's wastewater collection and conveyance system to assure that facilities remain at a high service level:

- Sewer Rehabilitation - Utilization of trenchless technologies for sewer rehabilitation is a major initiative for both gravity and pressure lines. In 2014, 99,774 linear feet of gravity sewers and 2,237 linear feet of 20-inch force mains were rehabilitated using cured-in-place pipe repair. Over the past 10 years, 206.2 miles of sewer lines have been rehabilitated. From 1974 to present, 492.34 miles of sewer lines have been rehabilitated.

- Inflow/Infiltration (I & I) and Flow Monitoring Program -The WCD in-house I & I and flow monitoring programs enable the Wastewater Management program to be proactive in diagnosing wet weather induced problem areas. The I & I program targets the system's older sewer service areas, which are then addressed by the comprehensive sewer capital project and rehabilitation program. The flow monitoring program provides valuable data to determine problem areas and for billing of inter-jurisdictional flows.

- Sewer Maintenance-The Sewer Maintenance group integrates and optimizes the sewer maintenance activities of WCD. Staff reviews and evaluates procedures, programs, work completed to date and equipment needs. They also plan 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

2014, 384.2 miles of sewer were cleaned and 104.0 miles were visually inspected. The work orders are planned and managed using a Web-based asset management

- The Television Inspection Group continues its documentation process for new construction as well as existing sanitary lines. Closed circuit television (CCTV) inspection is used to inspect sanitary sewer lines to identify defective lines in need of repair, rehabilitation and/or regular maintenance. In 2014, 163.5 miles of old sewer lines and 7.5 miles of new sewer lines were inspected using CCTV. All inspections are recorded in the Enterprise Asset Management system and are used in work order planning and management. There is a new WCD initiative, to replace current process of manual visual inspection of the gravity sewer system with scanning technology (in combination with a digital camera pole) to create robust, efficient, reliable and searchable video inspections. This initiative will enhance the reliability of the inspection program.

- Sanitary Sewer Extension and Improvement Program – This 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. There was no activity in this program in 2014

- Pumping Stations - The Pumping Stations Branch is responsible for operation and maintenance of the county's sewage pump stations, low pressure systems and flow meters. The preventive and corrective maintenance performed by the branch is critical for reliable operation within the pumping station system. The Pumping Station Branch is also responsible for the rehabilitation of the county's pump stations, meter stations and force mains. The branch works to monitor, repair and identify future projects associated with keeping these facilities in good working order.

  The pump station Supervisory Control and Data Acquisition system provides remote monitoring, alarm management and limited control capabilities for the pump stations on a local area network.

- Lifecycle Asset Management Initiative - In 2009, WCD began participating in Fairfax County's new program-wide strategic lifecycle asset management initiative for wastewater assets including: planning; funding; operation; management; inspection; maintenance; rehabilitation; renewal; disposal; and performance measurement. WCD Projects and Assets Branch is responsible for: monitoring and recommending adjustments to the WCD's asset management strategies and objectives; minimizing wastewater collection and conveyance asset whole life cost; and maintaining acceptable level of service and managing risk associated with asset failure.

- The county has been listed as an example case study by EPA for its capacity, management, operation and maintenance program to abate sewer overflows and extend the life of the sewer systems. Since its inception in 1995, it has reduced

sewer overflows by 66 percent.
www.epa.gov/npdes/pubs/sso_casestudy_fairfax.pdf

3. Septic System Permitting and Repairs

a. Overview

An estimated 21,534 homes and business are served by onsite sewage disposal systems in Fairfax County. Over 700 of these systems are alternative sewage disposal systems, which require more extensive maintenance than conventional systems. The operation and maintenance of all onsite sewage disposal facilities is regulated by the county's Health Department, which reported that, in 2014, 143 New Sewage Disposal Permits were issued for single family residences. There were 115 new sewage disposal systems installed: 62 (54 percent) were alternative type systems and 53 (46 percent) were conventional systems. There were 737 sewage disposal system repair permits issued; repairs ranged from total replacement of the system to minor repairs such as broken piping or pump replacement. There were 3,275 septic tank pumps outs.

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 28 properties permitted for pump and haul as a result of failing onsite sewage disposal systems with no areas 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 onsite 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 may not be aware of their responsibilities for maintaining these systems. Education from the private sector and government sector is essential.

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

No changes have been made to the Fairfax County Individual Sewage Disposal Facilities Code (Chapter 68.1). Chapter 68.1 will continue to be reviewed for future amendments to address changes that may be necessary to comply with statutory codes related to alternative onsite sewage systems.

The Virginia Regulations for Alternative Onsite Sewage Systems (AOSS) supersede requirements of Chapter 68.1. This regulation establishes permanent design, operation and monitoring requirements for AOSS. The Chesapeake Bay watershed nitrogen limitations, set in the AOSS regulations, went into effect December 7, 2013.

The Virginia Department of Health contracted the University of Virginia Institute for Environmental Negotiation to undertake a stakeholder process to examine privatization of the onsite sewage disposal system and offer consensus-based recommendations on how the agency should proceed. The stakeholder group, Safety and Health in Facilitating a Transition (SHIFT), included both VDH and private sector onsite sewage practitioners, local government representatives, homeowners and other interested parties who can provide different perspectives. SHIFT was charged to produce a report of recommendations to advise VDH on how to maximize private sector participation in the onsite sewage program while providing adequate oversight to protect public health and the environment. The Division of Environmental Health is monitoring this process to determine the potential impacts to the Onsite Sewage and Water program in Fairfax County.

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 homeowners 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.

G. DRINKING WATER

The county's water supply comes from the Potomac River, the Occoquan Reservoir, 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, Town of Vienna, Fort Belvoir and Dulles Airport. As of 2014, both the City of Fairfax and Falls Church systems were incorporated into Fairfax Water's system.

Fairfax Water provided 59,585 million gallons of drinking water in 2014 (see Table IV-8).

With the exception of water from some wells, water must be treated prior to use.

Table IV-8
Fairfax Water -- Water Supply Sources, 2014

Sources	Gallons (in billions)
Occoquan Reservoir (Griffith)	21.638
Potomac (Corbalis)	32.753
Wells	0.000
Purchased	5.114
Untreated	.08
TOTAL	59.585

Source: Fairfax Water

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/water/water.htm.

1. Source Water Assessments

The 1996 amendments to the Safe Drinking Water Act (SDWA) 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. In 2002, Fairfax Water 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/water/swap.htm

Fairfax Water is currently participating in a Water Research Foundation study to develop an information system that catalogs storage facilities, pipelines, roads, rail crossings and other potential sources of contaminants sources in the watershed upstream of drinking water utility intakes in the Potomac and Occoquan watersheds. Concurrently, Fairfax Water is also participating in a project through the Metropolitan Washington Council of Governments to assess vulnerabilities and to rank contaminant

sources based on risk for drinking water treatment facilities. The goal of both projects is to ultimately update the 2002 Source Water Assessments.

2. Treatment Facilities

a. Fairfax Water Occoquan Reservoir Facilities

The Frederick P. Griffith, Jr., Water Treatment Plant, sourced by the Occoquan Reservoir, came on line in 2006. It is currently operating at an average of 59 mgd and has a current capacity of 120 million gallons per day. The plant is designed for a future 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.

On June 3, 2014, the Board of Supervisors adopted an amendment to Fairfax County's Comprehensive Plan to facilitate the reconfiguration and conversion in phases of the quarry located adjacent to the Griffith facility to a future water supply storage facility. In 2015, Fairfax Water and the quarry operator received zoning approvals for this action.

b. Fairfax Water Potomac River Facilities

The James J. Corbalis, Jr., Water Treatment Plant, sourced by the Potomac River, is currently operating at 90 mgd and 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.

e. Washington Aqueduct Facilities

Fairfax Water purchases treated water from the U.S. Army Corps of Engineers, Washington Aqueduct Division, treated at the Dalecarlia and McMillan water treatment plants in Washington, D.C. The original Dalecarlia plant was completed in 1928. The plant capacity was increased in the 1950s by the addition of two additional sedimentation basins, a 30 million gallon clearwell, a 577 million gallon per day finished water pumping station and additional filters. A new chemical building and an additional filter building were completed in 1964. The plant has a capacity of 164 mgd based on filtration rates of two gallons per minute per square foot, and a maximum capacity of 264 mgd. Its treatment scheme consists of screening, chemical additions for flocculation and sedimentation, rapid sand filtration and chemical additions for chlorination, fluoridation and pH control.

The original McMillan plant was constructed in 1905 as a slow sand filter plant. It was replaced in 1985 with a new rapid sand filtration plant at the same site with an average design capacity of 120 mgd based on a filter design rate of 4 gpm/sf, and a maximum capacity of 180 mgd.

3. Wells

Fairfax Water no longer operates public wells.

There are approximately 14,285 single family residences and businesses that are served by individual well water supplies in Fairfax County.

The Fairfax County Health Department has developed and maintains an extensive database and GIS data 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 2014, there were 153 new well permits for single family residences, 30 well repairs permits and 167 Water Well Abandonments issued. There were 40 Geothermal Well 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.

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. Fairfax Water's current Water Quality Report is available for review on its website at www.fairfaxwater.org/water/water.htm. It includes much of the following information in more detail.

a. Disinfection By-Products

Trihalomethanes are by-products of chlorination water treatment and are suspected carcinogens at elevated levels. The 2014 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 and unregulated elements: aluminum; antimony; arsenic; barium; beryllium; cadmium; calcium; total chromium; copper; iron; lead; manganese; magnesium; mercury; nickel; potassium;

selenium; silicon, silver; sodium; thallium; and zinc. The levels of these metals in 2014 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: www.fairfaxwater.org/water/imar.htm

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.

In 2006, EPA created the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) to provide for increased protection against microbial pathogens, such as *Cryptosporidium,* in public water systems that use surface water sources. Fairfax Water completed monitoring for Round 1 of the LT2ESWTR in 2006 and recently began monitoring for Round 2. Both monitoring programs involve the collection of two samples from water treatment plant sources each month for a period of two years.

Under the LT2ESWTR, the average *Cryptosporidium* concentration determines whether additional treatment measures were needed. A *Cryptosporidium* concentration of 0.075 oocysts/liter would have triggered the need for additional water treatment measures. Fairfax Water's raw water *Cryptosporidium* concentrations continue to remain well below this LT2ESWTR 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. While it would be impossible to test for all of them, Fairfax Water considered the feasibility of monitoring and implemented a targeted program focused on constituents most likely to be relevant. First, a suitable list of compounds was carefully researched. Influences in the Potomac and Occoquan River watersheds (industrial, agricultural uses, etc.) to determine which compounds are most likely to be present were also considered. Fairfax Water then evaluated its 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, Fairfax Water began testing an updated list of 25 compounds on a routine basis.

As part of the special monitoring, Fairfax Water tested its source waters, the Potomac River and the Occoquan Reservoir, and its treated water. Samples were sent to an independent laboratory specializing in this type of analysis. As expected, trace amounts of a very few compounds were found in the Potomac River and Occoquan Reservoir sources. Trace amounts of a very few 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, and Fairfax Water concluded its special monitoring in 2014. To view the results from Fairfax Water's monitoring of these compounds and learn more about emerging water quality issues, visit the Fairfax Water Web site at www.fairfaxwater.org/current/monitoring_program.htm 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. 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 EPA at http://water.epa.gov/drink/contaminants/unregulated/perchlorate.cfm 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 its 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 2014, Fairfax Water monitored more than 3,600 taps for coliform bacteria. The monthly monitoring results were within the 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 and caffeine were detected in the source water, and none of the compounds were detected in finished waters during regulatory testing. Total trihalomethanes, a subset of volatile organic compounds, as discussed above, were detected at low levels in the finished water as expected in a chlorinated system.

Since 1992, Fairfax Water has been testing for lead and copper in customer tap samples in accordance with EPA's lead and copper rule and has consistently tested below the action level established in the rule. In 2014, the 90th percentile value for lead was 0.78 parts per billion (ppb), compared to the EPA action level of 15.00 ppb. For copper, the 90th percentile value in 2014 was 0.17 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 2017. Additional information on these programs and more can be found at: www.fairfaxwater.org.

h. New Regulatory Monitoring - EPA Unregulated Contaminant Monitoring Rule 3

The 1996 SDWA amendments require the EPA once every five years to issue a new Unregulated Contaminant Monitoring Rule (UCMR) list of no more than 30 unregulated contaminants to be monitored by public water systems. This is the first step in the EPA's process to determine what new contaminants may need to be regulated.

Through the UCMR, public water systems provide the EPA with scientifically valid data about the presence of these contaminants in drinking water. These data allow the EPA to determine if the population is being exposed, quantify the level of exposure and assess the impact of these unregulated contaminants on the environment and public health. These data provide one of several primary sources of occurrence and exposure information used by EPA to develop regulatory

decisions for emerging contaminants. The first UCMR was published on Sept. 17, 1999, the second on Jan. 4, 2007 and the third on May 2, 2012. Each UCMR provides a basis for future regulatory actions to protect public health.

The UCMR3 requires public water systems like Fairfax Water to monitor for 28 chemical contaminants for at least a 12-month period between January 2013 and December 2015. Two types of monitoring are being conducted:

- Assessment Monitoring uses common analytical method technologies used by drinking water laboratories. For UCMR3, Fairfax Water is monitoring for 21 contaminants using this method.

- Screening Survey Monitoring uses specialized analytical method technologies not as commonly used by drinking water laboratories. Fairfax Water is required to monitor for seven contaminants using this method.

The UCMR program was developed in coordination with the Contaminant Candidate List (CCL). The CCL is a list of contaminants that are not regulated by the National Primary Drinking Water Regulations, are known or anticipated to occur at public water systems and may warrant regulation under the SDWA. Data collected through the UCMR are stored in the National Contaminant Occurrence Database to support analysis and review of contaminant occurrence, to guide the CCL selection process and to help determine whether to regulate a contaminant in the interest of protecting public health.

EPA reviewed contaminants that had been targeted through existing prioritization processes, including previous UCMR contaminants and the CCL. Additional contaminants were identified based on current research on occurrence and health-effect risk factors. Pesticides that were not registered for use in the United States, contaminants that did not have an analytical reference standard and contaminants for which analytical methods were not ready for use were removed from the list. EPA further prioritized the remaining contaminants based on more extensive health-effects evaluations by the Office of Science and Technology in EPA's Office of Water. These procedures for evaluating health effects support the ranking of contaminants for future CCLs.

The UCMR benefits the environment and public health by providing the EPA and other interested parties with scientifically valid data about the presence of these contaminants in drinking water. This allows the EPA and public water systems to assess whether the population is being exposed and to quantify the level of exposure. This information is one of several primary sources of occurrence and exposure information used by the EPA to develop regulatory decisions for emerging contaminants.

Fairfax Water conducted UCMR3 collection during the EPA-required monitoring period of the third quarter of 2013 through the second quarter of 2014. Very few of

the 28 tested contaminants were detected in Fairfax Water samples, and those that were detected were detected at low levels. For a complete list of the UCMR3 contaminants and those that were detected, please visit www.fairfaxwater.org/current/ucmr3.htm

For more information, visit the EPA website at http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ucmr3/index.cfm or call 202-564-3750, TTY 711.

5. Regional Cooperative Water Supply Agreements

In order to provide adequate supplies of drinking water and to protect the Potomac River ecosystem during low flow periods, the three major water utilities in the Metropolitan Washington Area (Fairfax Water, Washington Aqueduct and Washington Suburban Sanitary Commission) became signatories to agreements that lay out the rules for allocation of water during low flows. Upstream dams, the Jennings-Randolph Dam on the Potomac River and the Savage River Dam, along with Seneca Lake in Montgomery County, Maryland have been constructed. Releases from these reservoirs can be used to augment natural river flows during times of drought.

While the Potomac River has flows that average above 7,000 million gallons per day, flows well below that have also been observed, 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). The average water withdrawals from the Potomac River as of 2014 are over 400 mgd.

In 1978, the three major metropolitan water utilities (including Fairfax Water), along with the Federal Government, signed the Low Flow Allocation Agreement (LFAA), which created a protocol for allocation of water from the Potomac during periods of low flow.

In 1982, the Metropolitan Washington Area (MWA) water suppliers and the Interstate Commission on the Potomac River Basin (ICPRB) signed the Water Supply Coordination Agreement (WSCA). The purpose of the agreement is to maintain adequate flow in the river so that water supply and flow-by needs are met and to reduce the risk of requiring allocations as defined in the LFAA. The WSCA promotes a sharing of benefits, risks and resource costs. All parties agree to optimally utilize the off-Potomac Occoquan and Patuxent Reservoirs to meet water supply demands. The Cooperative Water Supply Operations Section of the ICPRB was established by the WSCA to perform necessary modeling, forecasting and coordination of drought activity.

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.

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 interests to continue work on the low-flow issue. The final large river flow needs report is now available at: www.potomacriver.org/wp-content/uploads/2015/02/ICPRB10-3.pdf

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

ICPRB plays several important roles in providing for the region's current and future water supply needs. The ICPRB's section for Cooperative Water Supply (CO-OP) Operations facilitates the coordination of resources among the three major water utilities (including Fairfax Water) 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.

Since the creation of the region's cooperative water supply system in 1982, low flow conditions necessitating the release of water from upstream reservoirs to augment Potomac River flow have occurred in only three years: 1999; 2002; and 2010. Since 2010, flow in the Potomac River has been more than adequate to meet drinking water withdrawal needs by the region's major utilities and no additional releases from upstream reservoirs to augment water supplies have been needed. Given the rainfall this year throughout the Potomac watershed, it is unlikely that releases will be needed for the remainder of 2015.

Information on water supply status, recent Potomac River flow, reservoir storage, water supply outlooks and precipitation maps can be found in the "Drinking Water and Resources" section of the ICPRB website under "Cooperative Water Supply Operations on the Potomac," www.potomacriver.org/focus-areas/water-resources-and-drinking-water/cooperative-water-supply-operations-on-the-potomac/.

ICPRB annually coordinates a weeklong drought management exercise that simulates water management operations and decision making under drought conditions for the Metropolitan Washington Area (MWA) water utilities. 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 stream flow, reservoir storage, water supply outlooks and precipitation maps can be found at: www.potomacriver.org/focus-areas/water-resources-and-drinking-water/cooperative-water-supply-operations-on-the-potomac/drought-monitoring-and-operations/water-supply-outlook-status/.

Every five years since 1990, the CO-OP section of ICPRB has conducted a 20 year forecast study of demand and resource availability on behalf of the three major MWA water utilities (including Fairfax Water). The most recent study (2015) is in

progress and will provide forecasts of water demand and availability through the year 2040 by analyzing demands trends, population growth and available water resources. It will also provide recommendations for future planning when finalized. This study will be published at: www.potomacriver.org/publications/

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.

The 2010 demand study consisted of two parts. The first part evaluated demand forecast, analysis of current resources and evaluation of alternative resources. The second part factored in the effects and impacts of climate change to this equation. The first part of the 2010 study is available at: www.potomacriver.org/wp-content/uploads/2015/02/ICPRB10-01.pdf
The second part of the 2010 study pertaining to climate change is available at: www.potomacriver.org/wp-content/uploads/2014/12/ICPRB13-071.pdf

b. Potomac River Drinking Source Water Protection Partnership (DSWPP)

The Potomac River DSWPP (Partnership) is a voluntary association of water utilities and government agencies focused on protecting drinking water sources in the Potomac River basin. Fairfax Water, a founding member since its formation in 2004, has been actively involved in the leadership of the Partnership. The Partnership aims to identify priorities for source water protection, to establish coordinated dialogue between water suppliers and government partners, to promote information sharing and to encourage coordinated approaches to water supply protection measures in the basin. It has been effective in providing the utilities and the government partners with a stronger voice and more effective position on numerous watershed protection efforts and has been instrumental in advocating for stronger source water protection efforts. The Partnership works through various workgroups involved in issues that are important and relevant to source water protection. Emerging Contaminants, Early Warning/Emergency Response, Urban Issues, Agricultural Issues and Water Quality data are some of the existing workgroups in the partnership. The Partnership was also recognized in the National Water Program by the Environment Protection Agency (EPA) in 2008 as a best practice. More information on the Partnership can be found at www.potomacdwspp.org

c. Metropolitan Washington Council of Governments Drought Response

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 CO-OP section of ICPRB handles the administration of the coordinated drought response for water withdrawals from the

Potomac River and during low flows. Additionally, the CO-OP Section also works with COG and the Drought Coordination Committee to assist in providing accurate and timely information to residents during low-flow conditions. COG also provides information on current water supply and drought conditions at: www.mwcog.org/environment/water/watersupply.asp

In coordination with the water utilities in the Washington area, including Fairfax Water, a Water Emergency Response Plan (Plan) was developed through the Metropolitan Washington Council of Governments. The Plan, which was completed in 2005 and updated in 2009, 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.

The plan includes four conditions of water supply: 1) Normal, focusing on a year-round program emphasizing "Wise Water Use;" 2) Watch, when 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 held a regional Drought Coordination and Response Plan workshop on April 4, 2013. Participants included COG staff, the Interstate Commission on the Potomac River Basin, the Maryland Department of the Environment, VDEQ, the National Oceanographic and Atmospheric Administration, the U.S. Geological Survey, the Middle Atlantic River Forecast Center, local governments and regional utilities. The main purpose of the workshop was to review the “Drought Watch” trigger and consider modifications to it. Additional information is available on the COG website: www.mwcog.org/environment/water/water_workshops.asp

A revised regional Drought Coordination and Response Plan and also a revised Water Supply Emergency Plan are in process.

COG put forward a report on the effects of climate change in the National Capital Region in November 2008. The report identified potential impacts of climate change on the water resources of the region and contains recommendations to help reduce and control emissions that contribute towards climate change. It also identified goals for climate change adaptations and mitigation.

In 2009, the Climate, Energy and Environment Committee (CEEPC) was established to help meet the goals outlined in the climate change report. The CEEPC Action Plan identifies short term mitigation and adaptation related targets

and strategies to facilitate achieving the long-term goals. It is also responsible for developing a regional climate change strategy to meet the regional greenhouse gas reduction goals. In May 2013, CEEPC adopted the second edition of the regional strategy. The regional strategy is available at:
www.mwcog.org/uploads/committee-documents/lV1aXl5e20130717132447.pdf

CEEPC has also developed a resource guide to help the local jurisdictions with the plan implementation. The resource guide is available at:
www.mwcog.org/uploads/committee-documents/lF1aXl5d20130717132518.pdf

COG issues monthly reports during the drought monitoring season (typically from May to October) unless conditions deteriorate and additional reporting is needed. The report is a snapshot of current water supply and drought monitoring conditions in the Potomac River Basin along with an outlook for the next several months, including: (1) The current U.S. Drought Monitor issued by NOAA; (2) Precipitation data for the Potomac River Basin; (3) Groundwater Levels; (4) Seasonal Drought Outlooks—prediction tools issued by NOAA; and (5) Streamflow data for Little Falls and Point of Rocks. The latest copy and other drought response information can be found on COG's water supply website www.mwcog.org/environment/water/watersupply.asp.

d. Northern Virginia Regional Commission 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. The Northern Virginia Water Supply Plan (Plan), a regional plan as allowed under the Regulation, has 22 local jurisdictions as participants, including Fairfax County. Preparation of the Plan was administered by the Northern Virginia Regional Commission (NVRC).The 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. After a public meeting, the Fairfax County Board of Supervisors adopted the plan in February 2012. VDEQ has issued a final determination of compliance for the regional water supply plan.
The Northern Virginia Regional Water Supply Plan is available at:
www.novaregion.org/index.aspx?NID=1214

6. Occoquan Watershed Initiatives

a. The Occoquan Policy

The Occoquan Reservoir is one of the two sources of drinking water for Fairfax Water. Fairfax Water relies on the reservoir to provide about 40 percent of its water

supply. Therefore, maintaining the water quality in the reservoir is of utmost importance. Several initiatives are in place to protect the water quality in the reservoir.

During the latter part of the 1960s, the Occoquan Reservoir exhibited signs of advanced eutrophication, such as frequent and intense algal blooms (including cyanobacteria), periodic fish kills and taste and odor problems. All these issues threatened the health of the reservoir as a water supply source. In an attempt to find a solution to these problems and to ensure long term health and usability of the reservoir, the Virginia State Water Control Board (SWCB) commissioned the firm Metcalf & Eddy to study the reservoir water quality issues and to suggest a plan of action. Based on the report, in an effort to improve the water quality in the reservoir, the SWCB adopted the Occoquan Policy in 1971. The main goal of the program was to regulate point source pollution in the reservoir by regulating jurisdictional domestic sewage and by setting forth requirements for high performance regional treatment plants. Realizing that the establishment of advanced waste water treatment plants in a rapidly urbanizing watershed might not be sufficient to fully protect the reservoir, the Occoquan Watershed Monitoring Program was established in 1972. It serves as an independent program for monitoring the water quality in the reservoir. The program is overseen by the Occoquan Watershed Monitoring Subcommittee and the monitoring and evaluations are done by the Occoquan Watershed Monitoring Lab. As outlined in the policy, an advanced waste water treatment facility operated by the Upper Occoquan Service Authority came into operation in 1978. It replaced 11 major point sources of pollution in the watershed. This system was also one of the early pioneers of indirect potable reuse.

b. Occoquan Basin Nonpoint Source Pollution Management Program

The point source pollution in the Occoquan watershed was addressed by the Occoquan Policy. Planning studies conducted by NVRC between 1976 and 1978 indicated that nonpoint source pollution loadings from the watershed were a significant contributor to the water quality problems observed in the reservoir. In an attempt to combat the sources of nonpoint source pollution in the basin, the Occoquan Basin Nonpoint Source Pollution Management Program was established in accordance with Section 208 of the Metropolitan Washington Region's Area Wide Water Quality Management Plan, which was developed pursuant to the 1972 Federal Water Pollution Control Act Amendments. NVRC coordinated this multijurisdictional effort to supplement the water quality benefits of the advanced wastewater treatment plant in the basin.

c. Fairfax County New Millennium Occoquan Watershed Task Force Report

To further combat the effects of nonpoint source pollution in the watershed, in 1980 the Fairfax County Board of Supervisors authorized the Occoquan Basin Study and appointed the Citizens Task Force on the Occoquan Basin to carry out the study.

The report from the study was published in 1982. It recommended downzoning the land use in about two-thirds of the Fairfax County portion of the Occoquan Watershed to allow no more than one residence per five acres of land and to implement stringent stormwater management best management practices (BMPs) in the remaining urbanized areas to protect the Occoquan Reservoir from the impacts of stormwater runoff. As recommended by the report, in the same year, Fairfax County downzoned about 41,000 acres of the Occoquan watershed. Concurrent with the 1982 rezoning, the county established the Water Supply Protection Overlay District in its zoning ordinance, consisting entirely of its portion of the Occoquan watershed. Stormwater BMPs are required for all new developments exceeding a density of one dwelling per five acres; a 50 percent phosphorus reduction requirement was established.

On the twentieth anniversary of the downzoning, the Fairfax County Board of Supervisors established a New Millennium Occoquan Watershed Task Force to provide an assessment of issues facing the Fairfax County portion of the Occoquan Watershed. The report was published in 2003 and put forward management options for consideration both at the county and regional levels to further protect the Occoquan Reservoir. The Fairfax County New Millennium Occoquan Watershed Task Force report is available at:
www.fairfaxcounty.gov/dpwes/watersheds/part_1_otf.pdf

7. Lifting the Moratorium on Uranium Mining

Since 1982, there has been in place in Virginia a statewide ban on uranium mining. However there have been recent legislative and/or gubernatorial efforts under way 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 then-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 was 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. EQAC has had the opportunity to review these reports.

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 would potentially result in contaminated 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. The concern exists, though, 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. See EQAC's resolution on retaining the ban at www.fairfaxcounty.gov/dpz/eqac/resolutions/2012_january--uranium_mining.pdf.

8. Water Supply 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. 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: 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 shoreline stabilization projects. The project must address issues within areas served by Fairfax Water or its watershed lying in Fairfax, Loudoun, Prince William, or Fauquier Counties or the Cities of Fairfax, Falls Church Manassas and Manassas Park. 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 91 water supply stakeholder outreach grants totaling $428,696.00. More information about the grant program is available at: www.fairfaxwater.org/outreach/grants.htm.

H. REGULATIONS, LAWS AND POLICIES

1. 2015 Virginia General Assembly Legislation

Legislation enacted, or approved by the Governor, in the Commonwealth of Virginia during 2015 is available at the following link:
http://lis.virginia.gov/cgi-bin/legp604.exe?151+lst+APP.
There was no legislation enacted or approved in 2015 specifically addressing water resources issues.

2. 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.

3. 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 Chesapeake Bay Preservation Ordinance. 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 2014, the Exception Review Committee was not presented any exception requests.
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.

4. Virginia Stormwater Management Program—Stormwater Management Regulations (9VAC25-870-880)

As required by of the Code of Virginia, beginning July 1, 2014, local governments became the Virginia Stormwater Management Program (VSMP) authorities. Prior to this date, this responsibility belonged to the Virginia Department of Environmental Quality. The commonwealth will maintain oversight of local programs to ensure that all applicable state regulations are applied and enforced.

The Stormwater Management Ordinance of Fairfax County applies to all unincorporated areas of the county and the town of Clifton. Any cities or towns that have their own MS4 permit will also have their own ordinance and stormwater management program. The VPDES (formerly known as the VSMP) General Permit for Discharges of Stormwater from Construction Activities will continue to be the vehicle by which land disturbing activities are monitored for compliance with the provisions of the Virginia Stormwater Management Act and associated regulations. As of July 1, 2014, the county administers the state permit program on behalf of the Department of Environmental Quality. Also, the Virginia Soil and Water Conservation Board approved new stormwater management regulations. Compliance with these new rules is required by the 2014 VPDES permit and the localities' stormwater management ordinances as of on July 1, 2014. The Board of Supervisors approved a new Chapter 124, Stormwater Management Ordinance, as well as related County Code and Public Facilities Amendments on January 28, 2014. The main regulatory changes are summarized in Table IV-9.

The *Virginia Stormwater Management Handbook* is being updated to reflect the new regulations and design criteria. The handbook will be available online by chapter. Until the final version is published, practitioners can access approved Best Management Practice specifications at the Virginia Stormwater BMP Clearinghouse: http://vwrrc.vt.edu/swc/PostConstructionBMPs.html. Under the old stormwater regulations, specific BMP utilization a jurisdiction was primarily at the discretion of the locality. Under the new regulations, the BMP must be listed on the clearinghouse. In 2014, manufactured treatment devices were first approved for statewide use and included in the clearinghouse. Also, the VPDES permit requires fully enforceable maintenance agreements for stormwater controls (structural and non-structural best

management practices). The agreements will be deeded to run with the land and will allow for inspections and maintenance to occur that will ensure the long-term function of stormwater controls.

Table IV-9
New Stormwater Management Regulations:
Changes to Stormwater Technical Criteria

Criteria	Old Regulations	New Regulations
Land Use	Impervious cover only	Impervious cover + Forest/Open Space + Managed Turf
Event	0.5 inches of runoff from the impervious cover only	1.0 inches of rainfall from the whole site
New Design Criteria	Average land cover condition/technology based	0.41 pounds per acre per year Total Phosphorus
Redevelopment Criteria with land disturbance of less than one acre	10 percent reduction in Total Phosphorus	Land disturbance of less than one acre: 10 percent reduction in Total Phosphorus or up to 0.41 pounds per acre per year
Redevelopment Criteria with land disturbance of one acre or more		Land disturbance of one acre or more: 20 percent reduction in Total Phosphorus or up to 0.41 pounds per acre per year
Compliance	Occoquan Method	Runoff Reduction Method
Water Quantity	Criteria for natural and man-made conveyance systems	Criteria for natural, man-made and restored conveyance systems

The stormwater management regulations contain the following noteworthy provisions regarding both grandfathering and time limits. Projects may proceed through construction under the old technical criteria for stormwater management, if one of several circumstances applies. These are:

- Projects for which there is plan approval status dated July 1, 2012 or before, but for which no state permit is obtained before July 1, 2014.
    - Documentation may take the form of a locality approved plan, plat, zoning approval or other approved document determined permissible under the locality's ordinance.
    - Any modification to said locality-approved document may call into question the eligibility of the project to be grandfathered.
    - Portions of a project not under construction June 30, 2019, must comply with any new criteria adopted by the state.

- Projects with government bonds or public debt financing before July 1, 2012.

- Projects that obtained 2009 state permit coverage before July 1, 2014 have two five-year permit cycles (until June 30, 2024) to commence construction.

5. Dam Safety Regulations

In December 2010, the Virginia Department of Conservation and Recreation amended its Impounding Structure Regulations to conform with legislative changes made by the General Assembly. This amendment 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.

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: www.dcr.virginia.gov/dam_safety_and_floodplains/index.shtml

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

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. Medicine may be mixed with coffee grounds or kitty litter to be made unusable and then disposed of in regular trash.

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, through which 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 day.

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

2. Septic System Pump Outs

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" (www.fairfaxcounty.gov/nvswcd/youyourland/) and the "Water Quality Stewardship Guide" (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 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. For further information, visit the foundation's website at www.Fergusonfoundation.org.

Environmental stewardship opportunities for volunteers are available at Meadowlark Botanical Gardens, Potomac Overlook Regional Park, Upton Hill Regional Park, Pohick Bay Regional Park and various other regional parks on occasion. NOVA Parks implemented a program that allows youths to access its fee-based park facilities through volunteer service. It has a wide variety of community partnerships in place that encourage groups to take advantage of the regional parks for environmental and historic

education and service projects. More information can be found at www.nvrpa.org/park/main_site/content/volunteer. For current information about NOVA Parks, visit its website, www.NVRPA.org/.

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 the Site Development and Inspection Division of DPWES at 703-324-1720, 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 following the Scorecard section of this report.

6. Pet Wastes

Northern Virginia Clean Water Partners continued its support efforts tailored to stormwater specific messages in 2013. Clean Water Partners used television, print, internet advertising and the Only Rain Down the Storm Drain website (www.onlyrain.org) to distribute messages linked to specific stormwater problems, such as proper pet waste disposal, over-fertilization of lawns and gardens and proper disposal of motor oil.

From April 2013 through August 2013, four commercials featuring messages on the importance of picking up pet waste and general household stormwater pollution reduction measures aired on twelve cable TV channels, including three Spanish-speaking channels, 1,530 times. These TV ads reached four million Northern Virginia residents and resulted in more than 400 visits to the www.onlyrain.org website.

J. NOTABLE AND ONGOING ISSUES

1. EQAC continues to support the full funding and implementation of the comprehensive countywide watershed management program. EQAC strongly endorses 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.

2. 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.

3 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 is pleased to note the long term monitoring of several sites, we also understand that a comprehensive countywide program to monitor effectiveness could be cost-prohibitive.

4. 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.

5. There has been in place in Virginia a ban on uranium mining statewide since 1982. However, in recent years, there have been legislative or/and gubernatorial efforts 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. The concern exists, though, 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 the moratorium on uranium mining in Virginia should remain and no effort should be made to draft regulations pertaining to uranium mining without first addressing concerns identified by the National Academy of Sciences in its report.

K. COMMENTS

1. Wastewater Treatment

EQAC commends the Board of Supervisors and the county for both its own facilities and the other facilities that are contracted with to treat wastewater to high standards. The present levels of funding from fees for service as collected allow the county to adequately maintain and replace the significant amount of infrastructure managed by the Waste Collection Division and the Noman M. Cole, Jr. Pollution Control Plant.

2. Stormwater Management

EQAC commends the Board of Supervisors for its actions of the past few years, initially authorizing one penny of the real estate tax to be dedicated to the stormwater management program in FY 2006 and establishing a Stormwater Service District in FY 2010 that is currently funded at two and one half pennies of the real estate tax. Stormwater funding has increased from the original amount of $17.9 million for FY 2006 to $40.2 million for FY 2014. 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.

The Board of Supervisors' adoption of the FY 2016 Stormwater Service District tax rate of 2.50 cents (and adoption of the five-year plan with a quarter cent increase each year to ramp up to meet the Chesapeake Bay TMDL mandates) has allowed the county's stormwater program to increase stormwater infrastructure replacement, create a more comprehensive low impact development maintenance program and rehabilitate a number of older stormwater management dams as well as other critical components. Much of the stormwater infrastructure in Fairfax County is reaching the end of its life cycle, 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. It is also critical for the stormwater program to implement cost effective solutions such as trenchless pipe rehabilitation technologies, naturalized stormwater management facilities and partnerships with other county agencies such as Fairfax County Public Schools and the Fairfax County Park Authority to help protect and improve local streams.

The county's existing stormwater conveyance infrastructure includes over 1,600 miles of pipes, man-made ditches, channels and swales. This infrastructure conveys stormwater to over 850 miles of perennial streams and about 400 miles of non-perennial streams in the county. The majority of the stormwater control facilities and pipes were constructed 35 or more years ago. Prior to the board providing a dedicated penny to stormwater in FY 2006, 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 five percent of the system was identified as being in a state of failure and another 10 percent in need of rehabilitation. With the recently adopted Stormwater Service District tax

rate, it is estimated that the reinvestment cycle for stormwater infrastructure has been reduced from well over 1,000 years to less than 200 years. With the implementation of the next five-year funding plan, this should reduce this reinvestment cycle eventually to a 100 year plan.

In addition to the conveyance system, the county owns and maintains roughly 1,500 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. Significant upgrades to the emergency spillways have been required in some cases.

In addition to supporting infrastructure reinvestment, the capital program funds critical capital projects from the watershed management plans including: flood mitigation projects; stormwater management pond retrofits; implementation of low impact development techniques; and stream restoration projects. 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 Municipal Separate Storm Sewer System 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 and sediment loads to local streams, the Potomac River and the Chesapeake Bay.

The county must meet the federally mandated requirements of its MS4 permit. Fairfax County and Fairfax County Public Schools are combining their MS4 responsibilities into a single permit that will be administered by the county. Fairfax County's new MS4 permit was issued on April 15, 2015.

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 per year. EQAC supports meeting these challenging requirements through a phased approach (as demonstrated in the five-year adopted plan) 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. RECOMMENDATION

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 2017 by at least one-quarter penny, from a rate of 2.50 cents per $100 assessed real estate value to 2.75 cents per $100. EQAC understands that this increase would not fully meet stormwater management needs and therefore suggests that additional increases be continued each fiscal year until adequate funding to support the program is achieved. 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 be a need for additional increases in funding for water quality projects to meet future permit conditions, and for infrastructure reinvestment, as the system is continually growing and aging.

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