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. Water quality can be significantly impacted by land disturbances and surface runoff. Over the past decade, Fairfax County has demonstrated a strong commitment to restore and protect its water resources through a variety of management efforts and public outreach initiatives. Unless water resources are managed properly, increasing demands put on watersheds, such as rapid development, can create many problems.

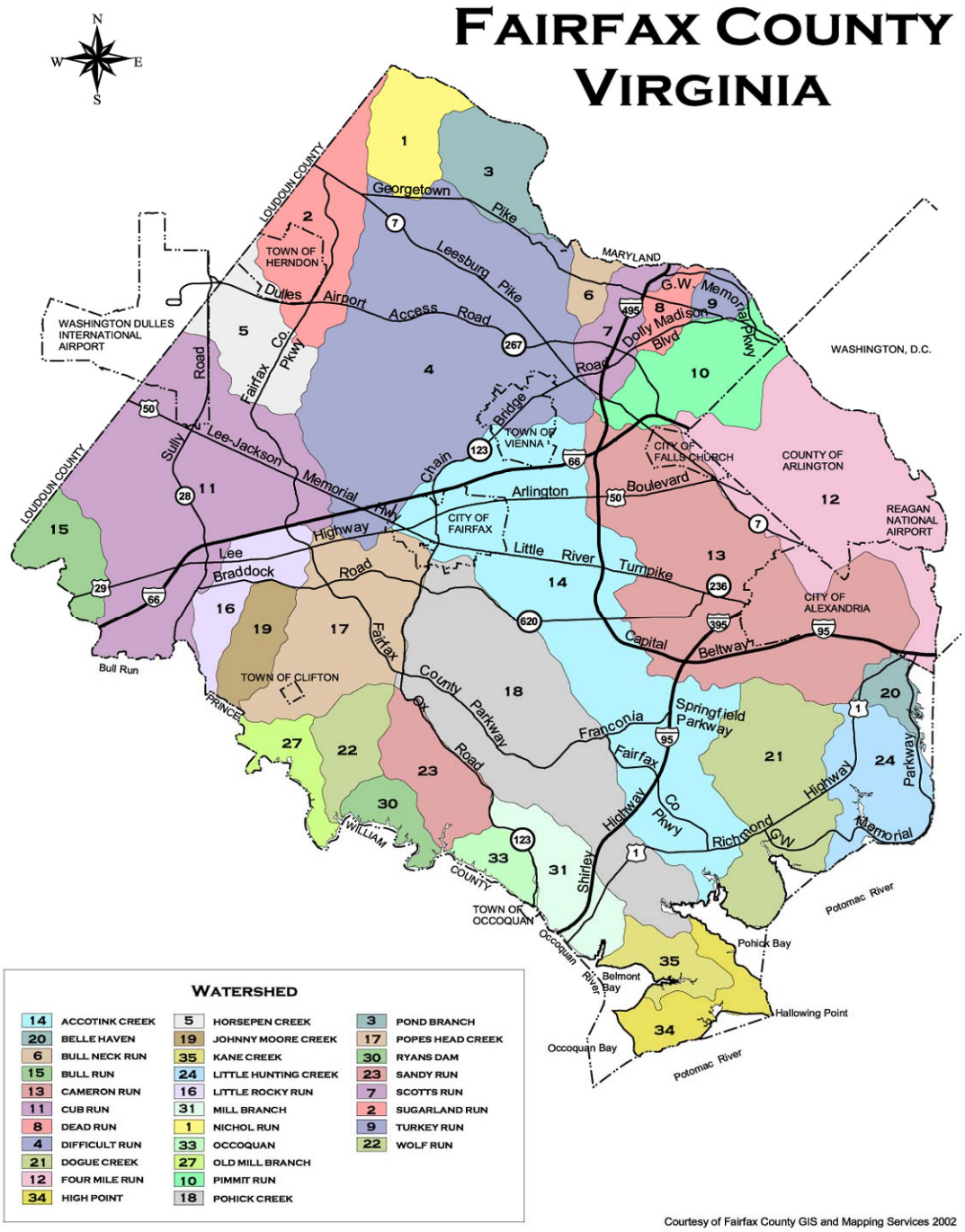
1. Watersheds

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

2. Streams

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

Figure IV-1: Fairfax County Watershed Map



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

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

3. Riparian Buffers

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

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

B. IMPACTS ON WATER RESOURCES

1. Point and Nonpoint Source Pollution

Water pollution originates from either nonpoint or point sources. Nonpoint sources include surface runoff, atmospheric deposition and groundwater flow. Because of their diffuse and intermittent nature, nonpoint source pollution is difficult to control. Nonpoint source pollutant loads are greatest following rainfall and high flow events. A significant part of the nonpoint source load consists of nutrients, including nitrogen and phosphorus (organic matter, fertilizer), which stimulates algal growth. Other nonpoint source pollutants are

sediment (from erosion, construction sites, eroded stream banks, road sand), toxics (oil, paint, pesticides, chemicals and metals), pathogens and bacteria (animal waste, failing septic systems and leaking sewer systems) and trash.

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

2. The Effect of Imperviousness

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

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

C. SURFACE WATER MONITORING AND ANALYSES

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

1. Countywide Watershed and Stream Assessments

a. Stream Protection Strategy Baseline Study

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

b. 2009 Annual Report on Fairfax County's Streams

i. Overview

This report provides data from sampling efforts conducted in 2009 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.

A probability-based site selection sampling methodology was used to identify randomly-selected stream bioassessment locations throughout Fairfax County. These sites were stratified and proportionally distributed throughout the county based on Strahler stream order applied to all perennially flowing streams in Fairfax County. This methodology eliminates any site selection bias and is commonly used as a cost-effective way of obtaining a statistically defensible determination of stream conditions at a countywide scale. A total of 67 sites were sampled in 2009: 40 sites randomly selected within Fairfax County as part of the annual probabilistic monitoring program; 14 trend-monitoring sites in the County; 11 piedmont reference locations in Prince William National Forest Park; and two coastal plain reference sites in the Kane Creek watershed of Fairfax County. **Results from the 40 randomly selected sites suggest that approximately 88 percent of the county's waterways are in "Fair" to "Very Poor" condition based on a decrease in biological diversity**. The monitoring program is part of the framework to establish a baseline to evaluate future changes in watershed conditions. Results may be viewed at http://www.fairfaxcounty.gov/dpwes/stormwater/stormwater_status.htm.

ii. Dry and Wet Weather Monitoring

In 2009, the county selected 99 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 45 of the outfalls and was tested for a range of pollutants (ammonia, conductivity, surfactants, fluoride, pH, potassium, phenol, copper, and chlorine) using field test kits. Of the outfalls tested, 12 required follow-up investigations because they exceeded the allowable limit for at least one pollutant. Upon retesting these sites, 10 continued to exceed the screening criteria, and further testing was conducted in an attempt to track down the source.

Two of the sites were determined to be water line leaks and the county is working with the Fairfax Water to correct these issues.

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

Wet weather screening and industrial high risk monitoring were completed in 2009. Field screening for the seven sites yielded water chemistry data on pollutant concentrations in stormwater runoff that were generally typical of published data on industrial runoff characteristics.

c. Physical Stream Assessment

Completed in 2004, the Stream Physical Assessment Study provides field reconnaissance data for the county's watershed management plans including information on habitat conditions, impacts on streams, general stream characteristics and geomorphic classification of stream type. The Countywide Stream Assessment can be obtained by contacting the Fairfax County Stormwater Planning Division at 703-324-5500.

d. Perennial Stream Mapping

In 2003, the Board of Supervisors adopted a revised Chesapeake Bay Preservation Ordinance in order to comply with amendments to the state's Chesapeake Bay Preservation Area Designation and Management Regulations. The ordinance incorporated changes to the designation criteria for Resource Protection Areas to include water bodies with perennial flow, resulting in a significant expansion to the county's RPAs. Fairfax County's

Chesapeake Bay Preservation Ordinance is available on-line at: http://www.fairfaxcounty.gov/dpwes/environmental/cbay/.

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

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

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

e. USGS Water Science Center Sampling

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

The monitoring network designed to fulfill the objectives of the study consists of four automated continuous water-resources monitoring stations and 10 less-intensely monitored sites. The automated stations were constructed in 2007 and achieved full operational capability in 2008. Instruments at these stations collect stream flow and water quality (water temperature, pH, specific conductance, and turbidity) data every 15 minutes; data are then transmitted via satellite and posted to a USGS Web page hourly. These automated stations also capture storm event samples to be analyzed for sediment and nutrient concentrations. Additionally, samples are collected monthly at all fourteen sites under various hydrologic conditions and analyzed for the same suite of constituents. Nutrient analyses are conducted by the Fairfax County Environmental Services Laboratory and the suspended sediment analyses are conducted by the USGS Eastern Region Sediment Laboratory.

Each year, the automated stations collected as many as 35,000 data points for each of the continuously measured parameters (water level, water temperature, pH, specific conductance and turbidity at 15-minute intervals for 365 days). The monthly and storm event sample collection activities result in the collection of hundreds of samples from the 14 sites. These data, as well as additional study details, are available online via map interface at http://va.water.usgs.gov/cgi-bin/fairfax.cgi.

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

2. Volunteer Water Quality Monitoring Programs

The Northern Virginia Soil and Water Conservation District manages volunteer stream monitoring programs in Fairfax County.

NVSWCD volunteers conduct biological and chemical monitoring and a habitat assessment, using the Save Our Streams protocol four times a year. The District added bacterial and temperature monitoring programs in 2005. Monitors collected data at 30 active monitoring sites in 2010. In addition, 45 public stream monitoring workshops and field trips were held throughout the county and 365 county citizens attended. At each workshop or field trip, biological monitoring was performed and information was presented on stream ecology, stormwater runoff, urban hydrology and watersheds. More information can be found at www.fairfaxcounty.gov/nvswcd/monitoring.htm. Information about the NVSWCD volunteer monitoring program can be found at http://www.fairfaxcounty.gov/nvswcd/monitoring.htm.

The Audubon Naturalist Society program uses a modified version of the EPA's Rapid Bioassessment II protocol, which includes assessment of in-stream and streamside habitat parameters and a survey of benthic macroinvertebrate populations. There were five monitoring stations in Fairfax County. In 2008, ANS monitoring stations were incorporated into the NVSWCD volunteer monitoring program.

Volunteers and Reston Association staff monitor Reston's streams four times a year using the Virginia Save Our Streams protocol. Twenty-four volunteers collect data at eleven monitoring sites in Reston. The Reston Association works

closely with the Northern Virginia Soil and Water Conservation District program. It conducted two stream monitoring workshops since June 2009.

Data are forwarded to Fairfax County, the Virginia Department of Environmental Quality, and other interested organizations or individuals. This program helps supplement the county's monitoring programs, including the Annual Report on Fairfax County's Streams.

3. Fairfax County Park Authority Stream Monitoring

The Park Authority continues to support volunteer stream monitoring programs through partnerships with NVSWCD and ANS. Stream monitoring is conducted by staff and volunteers at Ellanor C. Lawrence, Riverbend and Lake Accotink Parks.

4. Virginia Department of Environmental Quality

i. Overview

DEQ performs long-term trend monitoring at 23 stations in 17 water bodies that are either in Fairfax County or border the county.

- 11 stations are long term, trend monitoring stations
- Biological monitoring data was collected at five stations
- Continuous monitoring data, from April through October, were collected at a station in Pohick Bay
- Burke Lake was monitored from April through October.

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

DEQ's probabilistic monitoring program began in the spring of 2000. This program consists of three sampling components: a thorough examination of the benthic macroinvertebrate community utilizing the EPA's Rapid Bioassessment Protocols; sampling a full suite of chemical parameters in water and sediment; and a physical habitat evaluation at each station. The stations are biologically sampled twice a year. Chemical sampling is performed each spring and fall in conjunction with biological monitoring. The physical habitat evaluation is conducted each fall when the biological monitoring is performed. In 2009, DEQ sampled one probabilistic station in the spring and fall for a total of two sampling events in Fairfax County. Since 2004, as part of the probabilistic program, DEQ has participated in a grant study with the National Academy of Sciences to collect data on periphyton/algae in freshwater systems. Samples for that study are collected at every probabilistic monitoring station each fall.

5. Potomac River Monitoring

a. Metropolitan Washington Council of Governments Chain Bridge Monitoring Program

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

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

b. Potomac River Water Quality Monitoring

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

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

DEQ's Northern Regional Office initiated a long-term water quality monitoring project in the Occoquan River tidal embayment in the spring of 2005. To better characterize the water quality in the Occoquan River tidal embayment, water quality measurements were made using fixed continuous monitors and grab samples. The water quality monitoring for this study was conducted from April to October 2005. The primary objective of this study was to collect monitoring data throughout the warm season to better characterize the water quality and provide detailed monitoring data to

support the development of a Total Maximum Daily Load (TMDL) for pH. A secondary objective of this study was to provide continuous monitoring data to enable a more accurate assessment of the Chesapeake Bay water quality criteria for dissolved oxygen, water clarity and chlorophyll.

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

6. Update on Potomac River Water Quality

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

- Native SAV cover increased tenfold from 288 to 3,081 acres.
- The overall area covered by SAV in the Potomac (both native and exotic) more than doubled since 1990, increasing from 4,207 to 8,441 acres.
- The diversity of SAV has increased. In 1990 the exotic hydrilla was 10 times more abundant than any other species. In 2007 the abundance of the seven most frequently occurring species are more evenly matched.
- In 1990, more than 80% of the total SAV was hydrilla; in 2007 hydrilla declined to 20%.
- Results suggest declining fitness of exotic species relative to native species during restoration.

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

The United States Geological Survey monitors water-quality on the Potomac River at Chain Bridge as part of the Chesapeake Bay River Input Monitoring Program. The results of this work can be obtained on the website http://md.water.usgs.gov/gis/trends/.

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 following summary has been revised only slightly from an overview that was provided to EQAC by the Occoquan Watershed Monitoring Laboratory on September 22, 2010:

The Occoquan Watershed Monitoring Laboratory (OWML) 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 gaging stations located on the major tributary streams of the watershed. These stations record stream flow and automatically collect water samples during storm events. During base flow (non-storm flow) conditions, samples are collected weekly during the spring, summer and fall seasons, and biweekly in the winter. In late 2006, additional equipment was installed at the stream monitoring station on Bull Run at Virginia Route 28 to continuously monitor dissolved oxygen, temperature, pH, conductance, turbidity and nitrate in the stream. Seven stations in the Occoquan Reservoir are sampled on the same weekly/biweekly schedule. The OWML also operates thirteen rain gage stations in the watershed.

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 the recommendation of EQAC. Initially, the program monitored water samples, but quarterly sediment and semi-annual fish samples were added at stations within the Occoquan Reservoir. The Lake Manassas program also funds the monitoring of SOCs in the Lake Manassas watershed.

As in past years, the most-frequently detected SOC is atrazine, typically detected in the spring and early summer months when it is commonly applied. In 2009, although some concentrations in the range of 1.0-2.7 µg/L (microgram per liter) were detected, these were all lower than the drinking water MCL (maximum contaminant level) of 3 µg/L. Other SOCs were also detected in 2009, although generally at concentrations one or more orders of magnitude lower than the MCL or other level of concern. The detected compounds included carbaryl, dual (metolachlor), mocap, some phthalates, anthracene, heptachlor, chlorpyrifos, naphthalene, fluoranthene and fluorene.

In the case of heptachlor (an insecticide), one November 2009 sample from Bull Run above the Occoquan Reservoir had a value of 0.43 ug/L, which was slightly higher than the drinking water MCL of 0.4 µg/L. It should be noted here that the MCL values are used as a reference point for SOC measurements, but they have no regulatory significance in the raw water source or its tributary streams before treatment. The MCL concentration values are typically set for lifetime exposures in finished drinking water, and occasional measurements exceeding those values in the watershed are not unexpected. However, such measurements are useful to detect trends (should they develop) as indicators of fundamental changes in historical conditions. It is encouraging that no such trends have as yet been detected for monitored constituents.

Overall, it may be observed that the general condition of the waters of the Occoquan Watershed with respect to SOCs is good, in that most compounds are either not detected at all or are detected at concentrations below the MCL.

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

OWML works on many other projects within the region that have a water focus. The Potomac regional monitoring program, where OWML operates an automated station at Chain Bridge, is performed for the Metropolitan Washington Council of Governments (COG), and has been in continuous operation since 1982. A brief summary of this program, as provided by COG, is presented in another section of this report.

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

In cooperation with faculty from the Virginia Tech Biological Systems Engineering Department, OWML recently started up a project to evaluate the effectiveness of floating treatment wetlands as an enhancement to urban wet pond best management practices (BMPs). The project was funded by the National Fish and Wildlife Foundation, and the results should be useful to local governments wishing to enhance the nutrient removal performance of existing or contemplated stormwater management practices.

For several years, OWML has had a website (www.owml.vt.edu) through which stakeholders can access near-real-time field data at various stream sites. An effort has been under way to update the website, particularly with respect to the data management and display capabilities. The revamped website is expected to launch within the next few months, and it is hoped that other data (including laboratory measurements) will also be available for display and download.

8. Kingstowne Monitoring and Stream Restoration

In 1999, the Department of Public Works and Environmental Services, the Northern Virginia Soil and Water Conservation District, the USDA Natural Resources Conservation Service, the Friends of Huntley Meadows and the Citizens Alliance to Save Huntley formed a partnership to restore a stream in the Kingstowne area, with the help of a grant from the Virginia Department of Conservation and Recreation. The Kingstowne stream is a tributary of Dogue Creek, receives runoff from a 70 acre watershed and is upstream of Huntley Meadows Park. Monitoring and testing have substantiated that the stream segment is stable, erosion has been brought under control and water quality and habitat in the stream are improved.

During the July 2008-June 2009 monitoring period, 15 storm events and base flow samples collected at the Kingstowne station and collected at the Dogue Creek station were analyzed to determine pollutant loads in Dogue Creek. The Kingstowne station data suggest that erosion and sediment controls, including stormwater best management practices, are minimizing sediment loads to Dogue Creek. The permit phosphorus load reduction target of 50 percent was attained for South Van Dorn during this monitoring period. The mean annual total phosphorus concentration measured at South Van Dorn during storm events was 0.116 mg/L. Phosphorus data were only available for the South Van Dorn Station.

9. Gunston Cove Aquatic Monitoring Program

Gunston Cove is the site of the outfall of Fairfax County's Noman M. Cole, Jr. Pollution Control Plant. 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 2009 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 (although chlorophyll values increased somewhat in 2008).

Accompanying this decline have been more normal levels of pH and dissolved oxygen, increased water clarity and a virtual cessation of cyanobacteria blooms such as *Microcystis*. The increased water clarity has brought the rebound of SAV, 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 Cole wastewater treatment plant which were initiated in the late 1970s. This lag period of 10-15 years between phosphorus control and phytoplankton decline has been observed in many freshwater systems, resulting at least partially from sediment loading to the water column, which can continue for a number of years. Gunston Cove is now an internationally recognized case study for ecosystem recovery due to the actions that were taken and the subsequent monitoring to validate the response.

In short, due to the strong management efforts of the county and the robust monitoring program, Gunston Cove has proven an extremely valuable case

study in eutrophication recovery for the Chesapeake Bay region and even internationally.

For a copy of the "Ecological Study of the Gunston Cove 2009" Final Report, contact R. Christian Jones, Professor and Project Director at George Mason University.

10. Total Maximum Daily Loads

Under the Clean Water Act, states are required to monitor water quality and assess compliance with water quality standards every two years. 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 (TMDL) must be developed. A Total Maximum Daily Load is a watershed-specific plan for bringing an impaired water body into compliance with the Clean Water Act goals. A 1999 Consent Decree required the state to develop TMDL plans for all impaired streams listed on the 1998 303(d) Impaired Waters List by 2010.

A total of 41 water bodies with a total of 92 impairments in Fairfax County are included in 2008 Virginia's 305(b)/303(d) Water Quality Assessment Integrated Report (the listing of impaired waters.) The most common causes of impairment for riverine segments are bacteria (Escherichia coli or fecal coliform), impacts to benthic macroinvertebrates and polychlorinated biphenyls (PCBs) in fish tissue. For the estuarine water bodies, the most common causes of impairment are PCBs in fish tissue and bacteria. The causes of impairment in the Occoquan Reservoir are dissolved oxygen and PCBs in fish tissue. Water Quality Assessments are performed by the Virginia Department of Environmental Quality (DEQ) and are available at: http://www.deq.virginia.gov/wqa/homepage.html

County staff tracks development of new TMDLs and addresses impairments on stream segments located within the county. Watershed management plans advocate best management practices to address uncontrolled stormwater runoff and associated pollutant loadings to streams.

A representative sampling of some Fairfax TMDLs: Bacteria TMDLs have been established for six stream segments in the county, including one section each of Bull Run, Difficult Run, Four Mile Run and Popes Head Creek and two sections of Accotink Creek. Sediment TMDLs have been established for three stream segments in the county, including Bull Run, Difficult Run and Popes Head Creek.

Bacteria and benthic TMDL plans are being developed for Hunting Creek and Accotink Creek, respectively. Both TMDLs fall under the 1999 Consent Decree. DEQ had obtained an extension from EPA on the Hunting Creek TMDL until October 2010 in order to address concerns raised by the City of

Alexandria regarding potential impacts of the TMDL to their combined sewer system. EPA has taken over development of the Accotink Creek benthic TMDL. While sediment has been identified as the pollutant of concern that is causing the benthic impairment, EPA has proposed an approach that would use flow as a surrogate for sediment. EPA's stated goal was to have established the flow TMDL in September 2010. Information on TMDL development in Virginia is available on DEQ's website: http://www.deq.virginia.gov/tmdl/homepage.html

a. Accotink Creek TMDL

Accotink Creek was first listed as impaired on the 1996 303(d) Priority List of Impaired Waters for not meeting the aquatic life use due to poor health in the benthic biological community. This impaired segment of Accotink Creek stretches from the confluence of Calamo Branch with Accotink Creek and extends downstream to the start of the tidal waters of Accotink Bay (7.35 miles). This segment was listed in Attachment A, Category 1 (Waters Listed on Part 1 of Virginia's 1998 303(d) Report) of the 1999 Consent Decree.

Benthic macroinvertebrate data from 1990 – 1994 indicate that Accotink Creek at Station 1AACO006.10 (located at Alban Road--Route 790) is moderately impaired. This trend remains relatively unchanged through 2008. The benthic community in Accotink Creek continues to reflect an urbanized environment, with Hilsenhoff Biotic Index scores remaining in the 6-7 range, and organism density continuing to be low. This station exhibits a benthic impairment for the entire period of record of biological monitoring (1990 to present). The benthic impairment reflects not only the lack of pollutant intolerant species, but also the lack of benthic macroinvertebrates in general. Biological monitoring data from 1994 to the present indicate a benthic impairment on Accotink Creek, with Stream Condition Index scores ranging from the mid-20s to the low 40s.

The United States Environmental Protection Agency is the lead agency for completing the Accotink Creek benthic TMDL. To date, three Technical Advisory Committee Meetings (December 2008, August 2009, January 2010) and one Public Meeting (September 2009) have been held for this project. This TMDL will be completed by May 1, 2011.

b. Four Mile Run TMDL

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

participation of Fairfax County in the Four Mile Run TMDL study and implementation plan.

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

In 2002, the bacteria TMDL study for Four Mile Run developed by the Northern Virginia Regional Commission and the VA DEQ was approved by the EPA. NVRC, under a grant from VA DEQ, worked with four jurisdictions (Fairfax and Arlington counties and the cities of Falls Church and Alexandria) to develop an implementation plan for the TMDL study. Completed in 2003, the plan focuses on reducing bacteria contamination from human and pet sources in the watershed and includes several initiatives from community outreach efforts to large capital projects. The plan can be viewed on-line at: http://www.novaregion.org/index.asp?nid=394.

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

c. Hunting Creek, Cameron Run, Holmes Run – Bacteria TMDLs

Portions of Hunting Creek, Cameron Run and Holmes Run 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. The Hunting Creek, Cameron Run and Holmes Run watersheds are located within Arlington County, the City of Alexandria, the City of Falls Church and Fairfax County. The impaired portion of Hunting Creek extends from Route 241 (Telegraph Road) bridge crossing downstream to the confluence with the Potomac River. The impaired reach of Cameron Run extends from the confluence with Backlick Run, downstream to the end of the free-flowing waters (Route 241, Telegraph Road bridge crossing). The impaired portion of Holmes Run extends from

the mouth of Lake Barcroft, downstream to the confluence with Backlick Run.

To date, three Technical Advisory Committee Meetings (March 2009, June 2009 and June 2010) and two Public Meetings (March 2009 and June 2009) have been held for this project. These TMDLs were to have been completed by October 1, 2010.

d. Potomac PCBs TMDL

The county is participating in a cooperative effort among Maryland, the District of Columbia and Virginia to develop a TMDL for PCBs for the Tidal Potomac River. A PCB TMDL has been established for the Tidal Potomac River that assigned waste load allocations to 14 county waterways.

e. Chesapeake Bay TMDL

A preliminary notice of TMDL development for the Chesapeake Bay was published by EPA in the Federal Register on September 17, 2009. In order to provide reasonable assurance that the Chesapeake Bay TMDL can be achieved, EPA is requiring states and the District of Columbia to develop Watershed Implementation Plans that document how each jurisdiction will partner with federal and local governments to achieve and maintain water quality standards. EPA's stated goal is to establish the Chesapeake Bay TMDL by December 31, 2010. Information on the Chesapeake Bay TMDL is available on EPA's website at:
http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/index.html

f. Public Participation in the TMDL Process

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

g. TMDLs completed in 2009

There were no TMDLs completed in Fairfax County in 2009.

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 2009 Reston Lakes Annual Monitoring Report. This report and other information about Reston's lakes can be obtained by contacting the association's watershed manager at 703-435-6560 or visiting the website: www.reston.org.

In 2007, Lake Anne was randomly chosen to be surveyed as part of EPA's National Lake Survey. In June 2008, USGS sampled the bottom sediments at Lake Anne as part of a national study of water quality trends. The scientists learn about trends by studying bottom sediment cores from lakes, in a similar way to using tree rings to look at historical climate. The scientists took sediment cores from Lake Anne in 1996 and analyzed them for metals and organic compounds and will update the trends they saw a decade ago by comparing them to the 2008 samples. Some of the most common compounds used to date the sediment cores include DDT and lead. In addition, the amounts of Polycyclic Aromatic Hydrocarbons, which most commonly are found in coal tar asphalt sealers, are analyzed. For more information on the national study of water quality trends visit: http://tx.usgs.gov/coring/index.html.

Purple loosestrife, a noxious weed in Virginia, was well established at Lake Newport and was discovered on the other three lakes in 2008. In 2010, the Reston Association's staff continued the massive removal of purple loosestrife from the shoreline at all four lakes.

In 2010, Lake Newport was also treated to control the spread of water lilies.

RA treats Lake Anne seasonally in the summer to prevent blue green algae blooms. Lake Anne is the oldest lake and has been treated since 2005.

Lake Audubon was dredged in the summer of 2010, removing about 10,000 cubic yards of material.

b. Pohick Watershed Lakes

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

c. Lake Barcroft

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

d. Lake Accotink

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

In September 2005, the Park Authority Board approved a contract award to Mobile Dredging and Pumping to hydraulically dredge 161,000 cubic yards of silt from Lake Accotink and pump the material to a property owned by Virginia Concrete for dewatering and disposal. The Department of Public

Works and Environmental Services is overseeing the construction contract because of its past experience on other similar type projects.

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

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

12. Groundwater Monitoring

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

a. Leaking Underground Storage Tanks

In 2009, there were 133 new release cases investigated by the Virginia Department of Environmental Quality. Of the new cases, 117 were closed. As of December 2009, there were a total number of 2,619 cases from years past, of which only 118 remain open.

13. Stream Restoration and Ecosystem Function

The Hydroecology of Flowing Waters group in the National Research Program of the United States Geological Survey is currently conducting a study on two streams in Fairfax County to evaluate the effects of stream restoration on stream ecosystem functioning at low levels of the food chain. By changing the morphology of the stream, restoration activities change the distribution of

habitats for primary producers and consumers and the amount of time it takes water to move through those habitats. Restoration activities also change the quantity of light reaching the stream, altering the amount of primary production by algae. Both factors influence the balance between the production and respiration of organic matter, which in turn strongly influences food web structure and water chemistry. The USGS study focuses on obtaining a fundamental understanding of the linkage between flow, the transport of sediment and organic matter, the physical structure of the stream and the resulting production and respiration of organic matter in a restored section of Accotink Creek, compared to an unrestored section of Upper Difficult Run. Initial efforts are under way to understand how spatial differences in the physical characteristics of these streams control spatial differences in primary production and respiration. Future efforts will involve laboratory and numerical modeling studies to determine how storm flows influence these processes.

D. WATERSHED MANAGEMENT

1. Watershed Master Plans

In 2003, the Stormwater Planning Division of the Fairfax County Department of Public Works and Environmental Services commenced a watershed planning program to develop management plans for all 30 county watersheds. Data from the Physical Stream Assessment, Stream Protection Strategy Baseline Study and other monitoring information are being used in the development of the watershed plans. The plans encourage public involvement; provide an assessment of stormwater conditions; recommend protection strategies and improvement projects including stream restoration, riparian buffer restoration, installation of low impact development practices and retrofitting and improving existing stormwater management facilities and infrastructure; and recommend modifications to the County Code and Public Facilities Manual.

Six watershed management plans (Little Hunting Creek, Popes Head Creek, Cub Run/Bull Run, Difficult Run, Cameron Run and Middle Potomac) have been completed and approved by the Board of Supervisors. Combined these six plans cover 11 watersheds and 50 percent of the land area in the county. Plans for the remaining watersheds in the county (Accotink Creek, Dogue Creek, Little Rocky Run/Johnny Moore Creek, Pohick Creek, Sugarland Run/Horsepen Creek, Lower Occoquan Watersheds and Nichol Run/Pond Branch) are anticipated to be completed by the end of 2010.

2. Restoration Efforts

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

i. Stormwater Capital Projects.

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

ii. Stream and outfall improvements

The Poplar Springs stream restoration project was a 692 linear foot stream restoration project in Burke, Virginia, on an unnamed tributary to Pohick Creek, within property owned by the Fairfax County Park Authority that is known as Hatches Lake. The goal of the project was to use natural channel design techniques to install a self-sustainable, regenerative stream design that reduces erosion processes, improves water quality and restores the ecological structure and function of the stream corridor. The project was also implemented to protect private property adjacent to the project area. This project restored the stream by establishing a stable stream morphology through the use of natural channel design principles and soil bio-engineering. The riparian area was restored through establishing a multi-layered riparian forest of native trees, shrubs, herbaceous plants and grasses. Construction lasted five months and was substantially completed in April 2009.

iii. Detention Basin retrofits

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

iv. Water Quality Retrofits

Three locations were retrofitted for water quality with rain gardens and/or tree boxes. These locations include schools and parks.

b. Riparian Buffer Restoration

The Fairfax County Park Authority, Fairfax ReLeaf and the Virginia Department of Forestry hosted independent stream buffer restorations in the county in 2009. The Park Authority completed its fifth year of riparian buffer enhancement. To date, there have been 35 projects on parkland throughout the county. These projects have focused on the conversion of mowed grass to areas of native trees and shrubs typical of riparian areas. Park Authority staff completed additional planting projects in the RPA unrelated to the county's buffer planting program. Two such projects in 2009 were the planting of 50 trees in Pohick Stream Valley Park and the planting of over 240 trees and shrubs in Accotink Stream Valley Park to promote reforestation after the completion of a federally funded commuter and stream valley trail. Other projects were focused on reforestation of uplands to include the planting of over 70 trees at Pinecrest Golf Course and 75 trees at Mount Vernon District Park.

c. Huntley Meadows Park

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

In 2007, the county began working on the plan for Huntley Meadows Wetland Restoration project. The goal of the project is to restore the wetland to its previous, more water-filled condition with the aid of an earthen berm, water control structure and several wetland pools. The project is ongoing. Information about the project can be found on-line at: http://www.fairfaxcounty.gov/parks/huntley/restorationproject.htm.

d. Reston

In 2006, Reston Association worked with Northern Virginia Stream Restoration, L.C., to establish the Reston stream mitigation bank. The restoration bank was approved in March 2006. Aerial photography of watersheds and surveying/tagging of thousands of trees in the stream valleys

was conducted as part of establishing the groundwork for future restoration projects. The project will implement 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, the U.S. Environmental Protection Agency, the U.S. Fish & Wildlife Service and the Virginia Department of Environmental Quality, will oversee the progress of the bank.

In 2007, Reston Association continued 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.

The groundbreaking for Phase I, which covers 14 miles of stream, occurred on February 12, 2008. As of August 2010, approximately seven miles of stream in the Snakeden Branch watershed have been restored, fully funded by the Northern Virginia Stream Restoration, L.C. Construction, planting and cleanup should be finished on The Glade by the end of 2010. Survey and data collection is complete in the Colvin Run Watershed. Design plans for the first two priority stream reaches in Colvin Run have been developed. For more information on the stream restoration project in Reston, visit http://reston.wetlandstudies.com or https://www.reston.org/ParksRecreationEvents/StreamRestoration/BackgroundInformation/Default.aspx?qenc=HzT9ACzZbNs%3d&fqenc=IuyzM7YCiw14%2b790IAj6bg%3d%3d. .

e. Little Pimmit Run

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

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

3. 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 (LID) projects.

b. Virginia Department of Forestry

The Virginia Department of Forestry helps protect water quality and forest resources in Fairfax County. In 2009, VDOF partnered with a number of organizations and volunteers including the Potomac Conservancy, the Fairfax County Park Authority, Earth Sangha, Fairfax, Eagle Scouts and the Chesapeake Bay Foundation to plant approximately 5,000 seedlings throughout Fairfax County.

VDOF, the Fairfax County Park Authority and the Department of Public Works and Environmental Services are partnering on a stream buffer restoration project that will replenish areas along streams with deficient riparian vegetation. Areas will be determined based on data from the Stream Physical Assessment Study, which identified deficient buffers along over 800 miles of streams.

c. Reston Association

Reston Association presented 3 **Make Your Own Rainbarrel workshops** in 2010. Approximately 80 barrels were made and distributed.

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

In 2010, RA worked with several clusters and individual homeowners and conducted several shoreline stabilization projects using biologs, erosion cloth and native plantings. RA continues to promote natural shoreline stabilization and encourages the use of more environmentally sensitive materials for docks, such as recycled plastic materials, as opposed to conventional pressure-treated timber.

In 2010, Reston continued marking 200 storm drains with the message **"No Dumping, Drains to Difficult Run"** or "Sugarland Run." The storm drain marking project is part of the countywide initiative to educate residents on the impact of nonpoint source pollution.

4. Reston Storm Water Trail

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

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

The Storm Water Trail helps satisfy the goal outlined in Reston's watershed plan of expanding environmental education opportunities in the watersheds of

Reston. On-site controls have been implemented that include low impact development technologies to reduce storm water runoff volume and peak flows and to implement best management practices and retrofits to take advantage of natural storm water infiltration that is provided in natural stream valleys.

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

5. Organized Countywide Stream CleanUps

a. Alice Ferguson Foundation

On April 10, 2010, the annual Alice Ferguson Foundation Potomac River Watershed Cleanup was held; there were 575 cleanup sites in four states and the District of Columbia. Cleanups were conducted at numerous state, county and local parks (see below) and the county wastewater treatment plant. In Fairfax County and the City of Fairfax, 2,115 volunteers removed over 58,600 pounds of trash, which included 340 tires, over 26,200 bottles and over 2,200 cigarette butts. In FY 2009, the Alice Ferguson Foundation also held two site leader trainings in Fairfax County with approximately 25 participants. These trainings were to prepare volunteers and site leaders for the Potomac cleanup as well as inform them on the workings of the Trash Free Potomac Initiative.

b. Clean Virginia's Waterways

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

c. General

During 2009, various "Friends of" citizen groups reported that over 88 bags of general trash, 323 plastic shopping bags, 318 pounds of bulk items and 18 tires were removed from county streams by 86 adult, teen and child volunteers.

As in past years, the Fairfax County Park Authority hosted and organized numerous cleanup events in many stream valley parks and two lake front parks during 2009. Over 61 stream cleanups were conducted on county

parkland as part of the Alice Ferguson Foundation's Potomac Watershed Cleanup (see the above discussion for 2010 cleanup data from Fairfax County and the City of Fairfax—the county parkland cleanups were a subset of the larger watershed cleanup event). These events provided an excellent learning opportunity for a reported 1,023 volunteers who removed 46,612 pounds of trash from county streams and water bodies.

E. STORMWATER MANAGEMENT, ENFORCEMENT AND INSPECTIONS

1. NPDES Municipal Separate Storm Sewer System Permit

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

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

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

The Virginia Department of Conservation and Recreation (DCR) took over administration of the MS4 permit program as part of the Virginia Stormwater Management Program (VSMP) in 2005. The county's current MS4 permit expired in January 2007; however, the county is operating under an administrative continuance of the existing permit while the county and state work on reissuing the permit. In July 2006, the county submitted its MS4 permit reapplication to DCR. County staff has been working with DCR and other municipalities on the development of the new permit requirements. In March 2010, the county responded to DCR's fourth preliminary draft permit.

The latest preliminary draft includes incorporation of Fairfax County Public Schools into the countywide permit, as well as new requirements related to MS4 program plan updates, inventory control, monitoring, public outreach, employee training and development of TMDL action plans. The county is working diligently with the state to obtain a new permit. Fairfax County MS4 annual reports can be viewed on-line at: www.fairfaxcounty.gov/dpwes/stormwater/ms4permit.htm.

2. Regional Stormwater Management Pond Program

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

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

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.

No regional ponds were completed in 2009.

3. Stormwater Management Facilities and Infrastructure

Fairfax County maintains more than 1,400 stormwater management facilities (which are inspected annually), 1,500 miles of pipe and 45,000 inlets and manholes and over 100 miles of manmade channels. The county also inspects one-fifth of the over 3,200 privately maintained stormwater facilities every year.

In 2009, the Maintenance and Stormwater Management Division inspected 926 county-maintained SWM and BMP facilities at least once, which represents approximately 72 percent of the 1,284 existing facilities in the inventory at the start of 2009. This represents a shift to inspecting most pond facilities on a biannual basis, yet complies with the permit requirement to inspect all county-

maintained facilities once during the term of the permit. MSMD inspected 570 of the 3,234 privately-maintained facilities in 2009 with the goal of inspecting all privately-maintained facilities at least once during the permit cycle as required.

In 2009, MSMD continued its maintenance program for county stormwater management facilities. Maintenance can include repairs to stormwater management facility structures and removal of sediment. During 2009, the county cleaned and/or mowed 1,074 dam embankments, including 39 regional ponds which were maintained four times each during the calendar year. Cleaning involves removing trash, sediment and debris from the trash rack, control structure and all inflow channels leading to the control structure. At each stormwater management facility, deposited sediment is removed from the trickle ditch upstream from the control structure and deposited offsite. The cleaning keeps the facility functioning properly by conveying water and performing the BMP function as designed.

In 2009, MSMD completed 264 work orders, including: un-blocking stormwater ponds and pipes to avoid flooding or damaged infrastructure; channel and pond cleaning, mowing, weeding and planting; outfall repair; and stream restoration and bank stabilization.

4. Low Impact Development Techniques

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

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

The county continues to implement a number of demonstration projects including several vegetated roofs. The West Ox Operations Center green roof was substantially completed on October 16, 2008. The approximately 1,000 square-foot green roof is an extensive type of green roof located on the administration-building roof of the bus operation center facility. The construction of the green roof went smoothly from the initial step of flooding the roof to insure no leaks, to the finished product of thriving sedums with very

little maintenance requirements. The administration building provides stair access to the roof with pavers to and around the green roof, for easy viewing access. The total cost of the green roof was $34,194.

With the addition of these important techniques comes the challenge of what will be a significant increase of small stormwater management facilities that will need to be tracked, inspected, and maintained. Enforcing maintenance requirements will also be a challenge given limited staff.

In 2007, with the help of a grant from the Virginia Department of Conservation and Recreation, the Northern Virginia Soil and Water Conservation District conducted a study of 20 existing rain gardens in the county, three to five years old, both publicly and privately maintained. The evaluation focused on their physical characteristics, in relation to how well they were functioning. The analysis included infiltration tests and lab analyses of soil texture, organic matter content and bulk density. The filter media were examined to determine the type and level of pollutants retained and their relationship to the area drained. The actual installation of each rain garden was compared to the approved design. In general, publicly maintained rain gardens fared better than private ones, as did those built according to their approved designs. The study suggests several design recommendations. Perhaps the most important recommendations for overcoming the problems that were observed are for training and education that would ensure rain gardens are properly installed and well-maintained.

5. Erosion and Sediment Control

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

There were five complaints received by DCR from residents on properties in Fairfax County for FY09; all but one were addressed by county and DCR staff and closed. The remaining one is currently being addressed but is not yet closed.

In 2006, DPWES and the Engineers and Surveyors Institute conducted a class and workshop on constructability issues. In addition, in February 2006, a Letter to Industry was issued to announce the addition of two amendments to the PFM. The first clarified the requirements for drainage divides; the second clarified the adequate outfall requirements.

In 2009, a total of 616 erosion and sediment control plans were submitted and approved for projects that would disturb a land area of 2,500 square feet or more. Fairfax County's Alternative Inspection Program, established in cooperation with DCR, resulted in 33,797 Erosion and Sediment control inspections. This number represents 54 percent of the 62,546 total site inspections conducted by the Environmental and Facilities Inspection Division. In 2009, the county issued 108 notices of violations given to developers who failed to take required corrective action. In 2009, the county investigated 178 reports of illegal land disturbing and Resource Protection Area (RPA) violations, resulting in 36 criminal proceedings to achieve compliance.

6. Illicit Discharges

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

In 2009, FHIS received 465 complaints. Approximately 292 of the complaints involved the actual release of various petroleum or chemical substances. Of the 292 releases, 174 involved diesel fuel (30), home heating fuel oil (49), gasoline (33), motor oil (17) or hydraulic oil (45). Other releases investigated involved antifreeze, paint, sewage, mineral oil and mercury. Storm drains were involved in 52 of the releases.

F. WASTEWATER TREATMENT

Wastewater is primarily treated two ways in Fairfax County. In most cases it is collected from homes and commercial sites and carried through the sanitary sewer pipe system to large treatment facilities that release the treated waters into local waterways. For a small percentage of Fairfax County residents, wastewater is

treated on-site via septic systems where the water infiltrates into ground and ultimately reaches groundwater.

1. Treatment Facilities

a. Upper Occoquan Sewage Authority

The following information has been provided by UOSA:

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

UOSA operates under a Virginia Pollutant Discharge Elimination System Permit, which is issued by the Virginia Department of Environmental Quality. The permit limits and 2009 plant performance are listed in Table IV-1.

Table IV-1. UOSA Permit Requirements and 2009 Performance

Parameter	Limit	Performance
Flow	54 mgd	31 mgd
Fecal Coliform	<2/100 mg/l	<1.1/100 mg/l
Chemical oxygen demand	10.0 mg/l	<5.0 mg/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	0.011 mg/l
Total Kjeldahl Nitrogen	1.0 mg/l	0.3 mg/l
Dissolved Oxygen	>5.0 mg/l	8.1` mg/l
Dechlorination Chlorine Residual (mg/l)	Non detect	Non detect

Source: Upper Occoquan Sewage Authority

The influent highest rolling 30-day flow was observed during the 30-day rolling period ending on December 31, 2009 at 40.9 mgd. The UOSA Plant continues to produce high quality reclaimed water.

UOSA produces and treats two types of residuals: biosolids from conventional treatment and lime solids from chemical treatment. UOSA produces Exceptional Quality (EQ) biosolids utilizing a dryer-pelletizer process. EQ biosolids have commercial potential in the agricultural and

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

b. Noman M. Cole Jr. Pollution Control Plant

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

Table IV-2
NMCPCP Permit Requirements and 2009 Performance Averages

Parameter	Limit	Performance
Flow	67 mgd	40.8 mgd
$CBOD_5$	5 mg/l	< 2 mg/l
Suspended Solids	6 mg/l	2.4 mg/l
Total Phosphorus	0.18 mg/l	< 0.10 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	126/100mls*	< 1/100mls*
Ammonia Nitrogen	1.0 – 2.2 mg/l (seasonal)	< 0.10 mg/l
Total Nitrogen (Annual)	7 mg/l	4.61mg/L

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

In 2009, 59,928 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.

The Virginia Department of Environmental Quality issued a new general permit for nutrient discharge limits for sewage treatment facilities in Virginia's portion of the Chesapeake Bay watershed. These proposed changes will further limit nutrient discharges from the NMCPCP and require substantial modifications by 2010. Design and construction of the new modifications have begun. The NMCPCP has volunteered to comply with the phosphorus requirement five years early.

NOTE: In the past five years, electrical usage has been cut by 18% through changes in pumps, lights and spending strategies. The reduction in annual electricity usage of 8,400 MW cut green house gas emissions by 4,500 metric tons.

Water Reuse Project

The purpose of the project is to provide treated effluent that can be used by various users in lieu of potable water as allowed by state regulations. The Water Reuse project includes the design and construction of approximately 20,000 linear feet of water reuse main, an elevated water tank, a pump station upgrade at the Treatment Plant, a wastewater pump station upgrade at the county's Energy/Resource Recovery Facility (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. The notice to proceed on the reuse project was issued on December 23, 2009. The project duration is 20 months with a completion date of August 2011.

2. Septic System Permitting and Repairs

a. Overview

An estimated 23,000 homes and business are served by on-site sewage disposal systems in Fairfax County. 645 of these systems are alternative sewage disposal systems, which require regulating the operation and maintenance on the part of the home owner. The county's Health Department reported that, in fiscal year 2010, 86 New Sewage Disposal Permits were issued for single family residences. There were 88 new sewage disposal systems installed--52 percent were alternative type systems and 48 percent were conventional systems. Approximately 766 sewage disposal system repair permits were issued; repairs ranged from total replacement of the system to minor repairs such as broken piping or pump replacement. There were 6,390 septic tank pumps outs.

In fiscal year 2010, notices were sent to homeowners to remind them to turn their system's flow diversion valve and pump out the septic tank every three to five years.

b. Septic system failures

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.

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

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

3. Sanitary Sewer Maintenance, Repairs and Rehabilitation

The Wastewater Collection Division within the Department of Public Works and Environmental Services manages the county's operation and maintenance program for the 3,300 mile sanitary sewer system. Closed circuit television inspection is used to inspect trunk sewer mains to identify defective lines in need of repair and/or rehabilitation. In 2009, 226 miles of old sewer lines and 7.7 miles of new sewer lines were inspected using CCTV. Approximately 114,681 feet of sanitary sewer lines were rehabilitated and 32 dig-up and 118 trenchless point repairs were completed (118 tophats). Over the past 12 years, 274 miles of sewer lines have been rehabilitated.

G. DRINKING WATER

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

With the exception of some wells, water must be treated prior to use. Fairfax Water provided 52,869 billion gallons of drinking water in 2009.

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 2010 Water Quality Report is available for review on the Fairfax Water website at http://www.fairfaxwater.org/water/water.htm.

1. Wells

The Fairfax County Health Department has developed and maintains an extensive data base and GIS layer of all water well systems installed in the county. The Health Department permits and inspects all new well construction, existing well repairs and well abandonments. In FY 2009 there were 50 new well approvals, 39 well repairs and 153 Water Well Abandonments issued. There were 81 Geothermal Well Permits (HVAC) issued.

Table IV-3 Fairfax Water -Water Supply Sources, 2009	
Sources	Gallons (in billions)
Occoquan Reservoir (Lorton/Occoquan)	20.474
Potomac (Corbalis)	32.295
Wells	0.000
Purchased	0.02
Untreated	0.08
TOTAL	52.869

Source: Fairfax Water

The Virginia State Health Department Office of Drinking Water regulates 78 public well water supplies in Fairfax County. The operators of these systems are required to conduct quarterly water sampling and analysis.

Fairfax Water no longer operates public wells.

There are approximately 13,249 single family residences and businesses that are served by individual well water supplies in Fairfax County.

2. Source Water Assessments

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

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

3. Treatment Facilities

a. Occoquan Reservoir Facilities

The Frederick P. Griffith, Jr., Water Treatment Plant, sourced by the Occoquan Reservoir, came on line in 2006 and has a current capacity of 120 million gallons per day. The plant is designed for an ultimate capacity of 160 mgd. In addition to flocculation and sedimentation, the Griffith Plant includes advanced treatment processes of ozone disinfection and biologically active, deep bed, granular activated carbon filtration. Chloramines are used for final disinfection.

b. Potomac River Facilities

The James J. Corbalis, Jr., Water Treatment Plant, sourced by the Potomac River, has a current capacity of 225 mgd. The plant is designed for an ultimate capacity of 300 mgd. The plant uses ozone as a primary disinfectant, flocculation-sedimentation, biologically active filters with carbon caps and chloramine final disinfection.

4. Drinking Water Quality Monitoring

Federal regulations require water suppliers to provide annual reports on the quality of the drinking water to their customers through the Consumer Confidence Report Rule. The 2010 Water Quality Report is available for review on the Fairfax Water website at www.fairfaxwater.org, and includes much of the following information.

a. Disinfection by-Products

Trihalomethanes are by-products of chlorination water treatment and are suspected carcinogens at elevated levels. The 2009 distribution system averages continue to be below the federally mandated Maximum Contaminant Levels for total trihalomethanes. In addition to the trihalomethanes, haloacetic acid levels, another by-product of chlorination, continue to be below the required maximum contaminant level. The presence of chlorine in drinking water supplies remained below the required Maximum Residual Disinfectant Level.

b. Metals

Fairfax Water also tests for the following regulated elements: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, manganese, magnesium, mercury, nickel, potassium, selenium, silver, sodium, thallium and zinc. The levels of these metals in 2009 continued to be below their MCLs. The concentration levels for unregulated metals were within the expected range. Test results for these and other constituents are available on-line at: http://www.fairfaxwater.org.

c. *Cryptosporidium*

Cryptosporidium is a microbial pathogen sometimes found in surface water throughout the United States. Although filtration removes *Cryptosporidium*, the most commonly used filtration methods cannot guarantee 100 percent removal. Fairfax Water consistently maintains its filtration process in accordance with regulatory guidelines to maximize removal efficiency. Fairfax Water's monitoring indicates the occasional presence of these

organisms in the source water. Current test methods do not help determine whether the organisms are dead or if they are capable of causing disease.

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

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

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

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

d. Emerging Water Quality Issues

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

There are tens of thousands of compounds that are considered potential endocrine disrupting compounds or pharmaceuticals and personal care products. In establishing a protocol for monitoring these compounds,

Fairfax Water carefully considered the most prudent use of its resources when developing the list of compounds to test for in raw and treated water. Fairfax Water looked at influences in the Potomac and Occoquan River Watersheds (industrial, agricultural uses, etc.) to determine which compounds are most likely to be present in the raw water. Fairfax Water then looked at the treatment process to determine which compounds would not be readily removed through treatment. Finally, Fairfax Water looked at which compounds could be measured in water and chose 19 compounds to test for in the source and treated waters. Samples were sent to an independent laboratory proficient in this type of analysis.

To date, none of these compounds have been detected in Fairfax Water's finished drinking water during this study. As expected, very, very small amounts of a few compounds were found in the source waters - the Potomac River and Occoquan Reservoir. Research shows that there is no indication of human health concern at the levels found in the source waters. In addition to research and testing, Fairfax Water continually employs advanced water treatment technologies, ozonation and granular activated carbon to treat all of the water in its system. Ozone breaks down organic matter in the water that is then captured in the granular activated carbon filtration process. Research has shown that the combination of ozone and filtration is highly effective in removing broad categories of the compounds of concern. To view the results from Fairfax Water's monitoring of these compounds and to learn more about emerging water quality issues, visit the Fairfax Water website at www.fairfaxwater.org/current/special_statement_120408.htm or call 703-698-5600**,** TTY 711.

The Fairfax County Health Department participated as part of a countywide technical working group to explore the issue of the disposal of unwanted and expired pharmaceuticals. The group produced an informational brochure and website promoting no flush disposal of pharmaceuticals and achieved agreement from all county agencies to adopt no flush disposal methods. The group is also working with a coalition of groups at the state level consisting of representatives from DEQ, the State Board of Pharmacy and the State Police to enact a statewide pharmaceutical take back/mail back program.

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 a 12-month non-regulatory perchlorate sampling project for the Potomac River funded by the EPA. The EPA initially established a reference dose of 24.5 parts per billion for perchlorate and beginning in

2009 has proposed an interim health advisory of 15 ppb. A reference dose is a scientific estimate of a daily exposure level that is not expected to cause adverse health effects in humans. The reference dose concentration was used in EPA's efforts to address perchlorate in drinking water and to establish the interim health advisory.

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

f. Tap Water Monitoring

In 2009, Fairfax Water monitored 3,301 taps for coliform bacteria. The monthly monitoring results were within EPA required limits. Fairfax Water also monitored surface source water and finished drinking water for 42 volatile organic compounds and 40 synthetic organic compounds. Low levels of atrazine, simazine, metolachlor, and 2,4-D were detected in the source waters, and a very low level of atrazine was detected in finished waters sourced by the Occoquan Reservoir. Total trihalomethanes, a subset of volatile organic compounds, as discussed above, were also detected at low levels in the finished water as expected in a chlorinated system.

Fairfax Water has been testing for lead and copper in customer tap samples in accordance with EPA's lead and copper rule since 1992 and has consistently tested below the action level established in the rule. In 2009, the 90th percentile value for lead was 0.77 parts per billion, compared to the EPA action level of 15 ppb. For copper, the 90th percentile value in 2008 was 0.064 part per million, compared to the EPA action level of 1.3 ppm. Additional information on these programs and more can be found at: www.fairfaxwater.org.

5. Regional Cooperative Water Supply Agreements

In order to protect the Potomac River ecosystem during low flow periods, the three major water utilities in the Metropolitan Washington area developed water allocation agreements for water use during low flow periods. Two upstream dams, Jennings- Randolph on the Potomac River and the Savage River Dam, along with Seneca Lake in Montgomery County, Maryland, are storage facilities for drinking water supplies during low flow periods. While the Potomac River has flows that average above 7,000 million gallons per day, the river has often

reached flows well below that, usually in late summer and early fall. The lowest recorded flow in this region was 388 mgd at Little Falls in September during the drought of 1966. This is an adjusted figure that does include the withdrawal allocation of 290 mgd (e.g., with that adjustment, the flow was actually 98 mgd).

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

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

In September 2003, the Maryland Department of Natural Resource's Power Plant Siting Program issued a report entitled Habitat Assessment of the Potomac River From Little Falls to Seneca Pool (Final Document #PPAD-03-1), which provided substantial background information describing the history of current low-flow requirements, a review of the studies conducted to support those

requirements and a report on habitat assessment conducted during low-flow conditions in 2002. The assessment included development of a habitat map, a field survey of habitat types and measurements of hydraulic and water quality conditions, spanning the period of July through October 2002 when flows were as low as 151 million gallons per day at the gage at Little Falls Dam.

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

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

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. The policy is intended to protect the reservoir's riparian buffer.

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

The watershed assessment will investigate the following:

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

- Condition and flow requirements for the basin's aquatic species and ecosystems.

A symposium hosted by the Nature Conservancy at the National Conservation Training Center in Shepherdstown, West Virginia on September 24-25, 2010 drew together 70 scientists and interested individuals representing a broad spectrum of interest to continue work on the low-flow issue.

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

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

The ICPRB plays several important roles in providing for the region's current and future water supply needs. The Cooperative Water Supply Operations Section facilitates the agreement among the three major water utilities (including Fairfax Water) that requires water suppliers to coordinate resources during times of low flows in the Potomac River. The Water Resources Section also provides technical water resources management assistance to the jurisdictions throughout the basin. Flow in the Potomac River was more than adequate to meet drinking water withdrawal needs by the region's major utilities in 2009. No releases from upstream reservoirs to augment water supplies were needed in that time, and it is unlikely that releases will be needed for the remainder of 2010. In October 2007, ICPRB worked with the region's utilities and the U.S. Army Corps of Engineers to conduct several test releases from upstream reservoirs. These test releases provided useful data on how the river behaves during droughts and will help to make drought management activities more efficient in the future.

The ICPRB annually coordinates a weeklong drought management exercise that simulates water management operations and decision making under drought conditions for the Metropolitan Washington area. Annual simulation allows for renewal of coordination procedures with the water suppliers and other agencies, opportunities for public education and outreach and review and improvement of operational tools and procedures. Information on water supply status, recent streamflow, reservoir storage, water supply outlooks and precipitation maps can be found in the publications section of the ICPRB website, www.potomacriver.org.

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

The first part of the 2010 study has been finalized is available on ICPRB's website: http://www.potomacriver.org/cms/publicationspdf/ICPRB10-01.pdf

Part two of this study, which is scheduled to be completed in December 2010, will address the potential impacts of climate change. Different possible climate change scenarios for the region will be evaluated using climate change models and the results will be incorporated into the water utility planning model to better help forecast future demands and the constraints that need to be overcome to meet the demands.

b. Metropolitan Washington Council of Governments

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

The plan includes four conditions of water supply: 1) Normal, focusing on a year-round program emphasizing "Wise Water Use;" 2) Watch, where the Potomac River basin is in a drought of level D1 as defined by the National Oceanographic and Atmospheric Administration; 3) Warning, when combined storage in Jennings Randolph and Little Seneca reservoirs is at less than 60 percent of capacity, triggering voluntary water use restrictions;

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

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

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

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

c. NVRC Water Supply Plan

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

The Northern Virginia Regional Water Supply Plan will include 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, expected to

be completed in 2011, will include water supply projections for the next 30 years.

6. 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. The policy is intended to protect the reservoir's riparian buffer.

b. Water Supply Stakeholder Outreach Grant Program

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

Since beginning the program in 2000, Fairfax Water has awarded 59 water supply stakeholder outreach grants totaling $238,662.

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

H. REGULATIONS, LAWS AND POLICIES

1. Buffer Protection for Headwater and Intermittent Streams

On February 25, 2008, the Board of Supervisors adopted an amendment to the Policy Plan to strengthen Comprehensive Plan guidance regarding the protection and restoration of streams and associated buffer areas along stream channels upstream of Resource Protection Areas and Environmental Quality

Corridors. This new guidance augments the EQC policy by explicitly encouraging stream and buffer area protection and restoration in these headwaters areas. Details are available at http://www.fairfaxcounty.gov/dpz/comprehensiveplan/adoptedtext/2007p-03.pdf. On July 27, 2010, the EQC policy was further amended to clarify circumstances under which proposals for disturbances to EQCs should be considered favorably. Details are available at http://www.fairfaxcounty.gov/dpz/comprehensiveplan/adoptedtext/2007p-07.pdf.

2. The Virginia Chesapeake Bay Preservation Act and Regulations

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

The Chesapeake Bay Exception Review Committee was formed to hear requests for exceptions to the regulations. The Committee is composed 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 is required. In 2006, the committee heard and denied one exception request.

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

3. Stormwater Legislation HB 1177

This legislation, signed on April 8, 2004 by Governor Warner, encourages jurisdictions to adopt stormwater management ordinances that use the concept of Low Impact Development to the maximum extent practicable. The bill also transferred regulatory authority of the National Pollutant Discharge Elimination System programs associated with municipal separate storm sewer systems and

construction activities from the State Water Control Board to the Soil and Water Conservation Board and transferred oversight of these programs from the Department of Environmental Quality to the Department of Conservation and Recreation. As a result, DCR is responsible for the issuance, denial, revocation, termination and enforcement of NPDES permits for the control of stormwater discharges from municipal separate storm sewer systems and land disturbing activities under the Virginia Stormwater Management Program. The legislation allows the state to transfer the administration of the Erosion and Sedimentation permitting for land disturbing activities to jurisdictions, allows these jurisdictions to charge permitting fees for review and establishes that jurisdictions must transmit 30 percent of these fees to the state.

4. Virginia Stormwater Management Program

In 2010, the Virginia General Assembly passed legislation (SB 395/ HB 1220) that delayed implementation of the regulation that establishes local program criteria and delegation procedures and the water quality and water quantity criteria. The measure provides for the regulation to be adopted within 280 days after the establishment of the U.S. Environmental Protection Agency's Chesapeake Bay-wide total maximum daily load, but no later than December 1, 2011. The measure also directs the Virginia Soil and Water Conservation Board to establish an advisory panel to review the regulation and make recommendations on possible revisions to the regulation.

5. New Dam Safety Regulations

Virginia Impoundment Structures Regulations- A new Virginia Impoundment Structures Regulations (4VAC50-20 et. seq.) was adopted by the state on September 26, 2008. Among other things, the new regulations totally overhauled the dam classification system, streamlined and improved the hydrologic and hydrologic design requirements for dams and instituted provisions aimed at improving the Emergency Action Plans that are designed to facilitate emergency responses to potential dam breaks. Since the adoption of this regulation, the Virginia Soil and Water Conservation Board (VSWCB) has developed draft guidance related to Virginia Impounding Structure Regulations and administration of the Virginia Dam Safety Program that should assist dam owners and industry professionals in gaining a better understanding of the regulation requirements. The draft guidance documents cover roadways below dams, agricultural exemptions, dam-break inundation zone mapping and incremental damage analysis, hazard potential classification, crediting of certificate fees and criteria for special low hazard. The VSWCB invited public comments on the draft guidance documents in March 2010 and is currently working to address these comments before the guidance documents are adopted.

Fairfax County DPWES is responsible for the operation and maintenance of 18 state-regulated dams. DPWES is currently working through the Virginia

Municipal Stormwater Association (VAMSA) to promote improvements to these guidance documents. For further information on the Virginia Impoundment Structures Regulations visit: http://www.dcr.virginia.gov/dam_safety_and_floodplains/index.shtml

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

The Commonwealth of Virginia, State Board of Health is in the process of revising the state Sewage Handling and Disposal Regulations. The Board of Health was also directed by the 2007 General Assembly to adopt Alternative Onsite Sewage System maintenance regulations that were to begin on July 1, 2009. As a result, interim Emergency Regulations for Alternative Onsite Sewage Systems were adopted on April 7, 2010. The final regulations for alternative onsite sewage disposal systems proposed completion date is December 31, 2010. Chapter 68.1 of the Fairfax County Code is being reviewed for possible future amendments to address changes in the state regulations and advances in the field of onsite sewage disposal systems.

I. STEWARDSHIP OPPORTUNITIES

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

1. Disposal of Household Hazardous Wastes

Medicines, paints and other toxics should NOT be flushed down toilets and should NOT be dumped down storm drains. Instead, they should be taken to one of the county's household hazardous materials collection sites. For a list of common household hazardous materials and how to dispose of them, go to http://www.fairfaxcounty.gov/dpwes/trash/disphhw.htm.

2. Septic System Pumpouts

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

3. Yard Management

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

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

Advice regarding drainage and erosion problems in yards can be provided by the technical staff of the Northern Virginia Soil and Water Conservation District. They 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. EQAC also commends the efforts of the Alice Ferguson Foundation and encourages residents, employers and employees in Fairfax County to participate in these initiatives. Visit the foundation’s website at www.Fergusonfoundation.org for further information.

5. Reporting Violations

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

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

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

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

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

A more comprehensive table addressing how to report environmental crimes is provided in the Hazardous Materials chapter of this report.

J. ONGOING CONCERNS

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

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

3. EQAC commends the county for its existing stream protection requirements for perennial streams. EQAC thanks the Board of Supervisors for its recent efforts to protect intermittent and headwater streams by the establishment of protective buffers.

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

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

6. As sedimentation of stormwater management ponds from upstream bank erosion continues, the need to dredge facilities becomes more frequent. Facility owners are having difficulty conducting necessary dredging operations given rising expenses and lack of local, adequate disposal areas. EQAC commends the county for establishing an interagency work group to explore options, such as creating spoil disposal/recycling areas in various parts of the county to assist private facility owners and help protect water quality. EQAC is pleased that staff will investigate the pros and cons of dredging, hauling, and disposal options and will present its findings and recommendations to the Board of Supervisors.

7. Given the anticipated increase in the number of small individual low impact development (LID) 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.

K. COMMENTS

1. EQAC notes with concern that results from the 40 randomly selected sites in the 2009 Stormwater Status Report suggest that now approximately 88 percent of the county's waterways are in "Fair" to "Very Poor" condition based on a decrease in biological diversity. This is significant downward trend from the previous years where about three quarters of the county's streams were considered "Fair" to "Very Poor".

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

   While various maintenance repairs were implemented in FY 2010, the Board of Supervisor's adoption of the FY 2011 stormwater tax district rate of 1.5 cents has allowed the Maintenance and Stormwater Management Division to increase stormwater management infrastructure replacement, create a more comprehensive low impact development maintenance program, and rehabilitate a number of older stormwater management dams and other critical components. Much of the

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

The county's existing stormwater conveyance infrastructure includes about 1,500 miles of pipes and paved channels, in addition to over 850 miles of perennial streams and unknown miles of non-perennial streams. The majority of the stormwater control facilities and pipes were constructed 35 years or more ago. Prior to the board providing a dedicated penny to stormwater in FY 06, there had never been consistent funding to proactively inspect or reinvest in these stormwater systems. When the video inspections of the inside of pipes were first undertaken in FY 2007, over 5% of the system was identified as being in a state of failure and another 10% in need of rehabilitation. With the recently adopted stormwater service rate, it is estimated that the reinvestment cycle for stormwater infrastructure has been reduced from well over 1,000 years to around 400 years.

In addition to the conveyance system, the county owns and maintains roughly 1,300 stormwater management facilities ranging from large flood control lakes to LID techniques such as small infiltration swales, tree box filters or rain gardens. Again, prior to providing a dedicated funding source there was not funding for reinvestment in these LID facilities. Eighteen 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 18 facilities in order to comply with state requirements. In addition to providing required inspection and maintenance of these facilities, the county must provide significant upgrades to the emergency spillways on two more of our PL-566 dam structures to comply with current state dam safety requirements. The construction for one of these spillway upgrades is being funded with FY 11 funds. The remaining spillway upgrade is planned be constructed as part of the FY 12 stormwater budget. In addition, it is estimated that the sediment accumulating in just the five county maintained PL-566 flood control lakes have a combined annual removal cost of between $750,000 and $1,100,000, which is in addition to an estimated $16 to $25 million to remove the silt that has already accumulated. The current program includes a $500,000/yr for dredging projects that will begin to restore capacity in these lakes as well as the other stormwater management facilities.

In addition to supporting infrastructure reinvestment, the capital program funds critical capital projects from the watershed management plans including: flood mitigations; stormwater management pond retrofits; implementation of low impact development techniques; and stream restorations. It is important to note that these projects are necessary to address current community needs, mitigate the environmental impacts of erosion and comply with our current MS-4 permit. The

benefits of these projects include: reducing property damage due to flooding and erosion; reducing excessive sediment loading caused by erosion; improving the condition of streams; and reducing nutrient loads to the Chesapeake Bay.

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

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

L. 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 current budget constraints have removed monies available from the general fund and that the funding for the stormwater program will come from funds generated through the Service District rates.

   EQAC recommends that the Stormwater Service District rate be increased in FY 2012 by a half penny, from a rate of 1.5 cents per $100 assessed real estate value to 2.0 cents per $100. This would, once again, result in the restoration of some more funding for modest watershed improvement programs and a somewhat more realistic infrastructure replacement timeline. We realize that there will likely be a need for additional increases for water quality projects to meet future permit conditions, and for infrastructure reinvestment, as the system is continually growing and aging.

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