CHAPTER III

WATER RESOURCES

III. 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 several years, 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 III-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, Virginia and 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, 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.

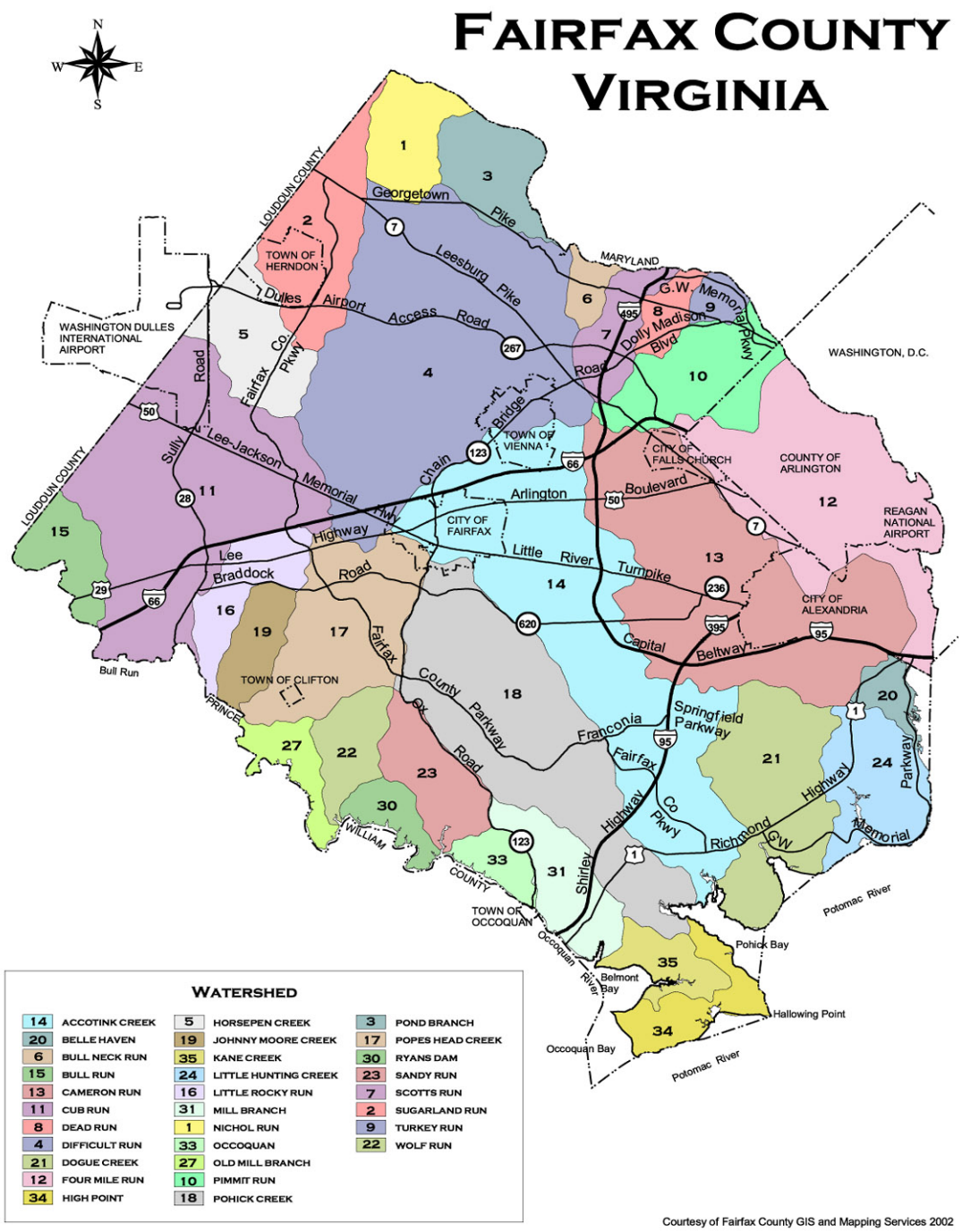

Figure III-1: Fairfax County Watershed Map

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, NPS pollution is difficult to control. NPS pollutant loads are greatest following rainfall and high flow events. A significant part of the NPS load consists of nutrients, including nitrogen and phosphorus (organic matter, fertilizer), which stimulates algal growth. Other NPS 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 NPS, 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 Audubon Naturalist Society and Northern Virginia Soil and Water Conservation District also provide volunteer water quality monitoring data. 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. 2005 Annual Report on Fairfax County's Streams

This annual report provides results from a probability-based sampling program conducted in 2004. The report provides data from monitoring efforts and analyses of bacteria (*E. coli* and fecal coliform), benthic macroinvertebrates and fish. All bacteria monitoring sites where at least four samples were taken exceeded the state's water quality standard for fecal coliform bacteria (400 fc/100 ml) at least once. Samples were also taken to measure chemical parameters including pH, water temperature, nitrate nitrogen, phosphorus and dissolved oxygen. Sampling results indicated that three-quarters of the county's streams are in fair to poor condition. Future sampling sites will continue to be randomly selected throughout the county. Project specific monitoring will also occur as more stream restoration and low impact development projects are implemented throughout the county. The 2005 Annual Report on Fairfax County's Streams can be viewed on-line at: www.fairfaxcounty.gov/dpwes/stormwater/streams/streamreports.htm.

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

On July 7, 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.

On November 17, 2003, based on the Perennial Streams Identification and Mapping program conducted by DPWES staff, 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.

2. Volunteer Water Quality Monitoring Programs

The Northern Virginia Soil and Water Conservation District and the Audubon Naturalist Society coordinate and manage 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. In 2005, there were 50 active monitoring sites. The District added bacterial and temperature monitoring programs in 2005.

The ANS 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 are four permanent monitoring stations in Fairfax County, with a fifth to start in 2006.

Both programs include training and certification of volunteer monitors, equipment, data management and analysis and quality control. Data are forwarded to Fairfax County, Virginia Department of Environmental Quality, Virginia Save Our Streams and other interested organizations. This program helps supplement the county's monitoring programs.

3. Fairfax County Park Authority Stream Monitoring

Ellanor C. Lawrence Park staff conducts stream studies (primarily benthic macroinvertebrates monitoring) at Walney Creek, Big Rocky Run and Courthouse Spring Branch four times per year.

Water quality monitoring was conducted at six sites in Huntley Meadows Park in 2005 using the Rapid Bioassessment II protocol. Eighteen samples were collected. Seven sites on Dogue Creek and four sites on Barnyard Run were reported as "good." Of the

additional sites on Barnyard Run, seven sites were reported "fair," one site was reported "poor" and one site was not monitored due to very low water levels.

4. Virginia Department of Environmental Quality

DEQ performs long-term trend monitoring at 14 streams that are either in Fairfax County or border the county. Additionally, DEQ has eight monitoring stations in the county. Monitoring began in July 2004 and will continue for two years. DEQ staff conduct biological monitoring at four stations in the county. Failure to meet designated water quality standards may result in a stream being placed on the 303(d) list for impaired state waters.

5. 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 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 sewage treatment plants entering the reservoir is carefully treated.

a. Occoquan Watershed Monitoring Laboratory

The Occoquan Watershed Monitoring Program is administered by the OWML and has been in operation since 1972. It is funded by Fairfax Water and the six jurisdictions within the watershed: Fairfax, Prince William, Loudoun and Fauquier counties; and the cities of Manassas and Manassas Park. The program consists of nine stream monitoring stations (automated flow monitoring at all and storm sampling at most) and four Occoquan Reservoir stations. Base flow sampling in the streams and all sampling in the reservoir is done manually. In addition to surface and bottom water samples, profiles of DO, temperature and pH are also obtained at the reservoir stations. Sampling is done weekly during the growing seasons and biweekly or monthly (if ice is present) in winter. Past water quality data indicate little change in water quality in the watershed. The Lake Manassas program is used for monitoring water and sediment at seven stream stations and eight lake stations. The eutrophication status of the Occoquan Reservoir and Lake Manassas is moderately eutrophic.

The OWML monitors quarterly for synthetic organic compounds in the watershed in a program established under the recommendation of EQAC in 1982 for water samples. In 1988, the OWML began monitoring for SOCs in sediment and fish samples within the reservoir. The Lake Manassas program also funds SOC monitoring. The most frequently detected SOC is atrazine, usually detected in springtime and early summer when it is being land applied. Concentrations "are usually lower" than the maximum contaminant level of three micrograms/liter for

drinking water. The pesticide dual (metolachor) and phthalates are regularly found in concentrations one or more order of magnitude below the MCL.

6. Kingstowne Monitoring

In 1998, DPWES, the Northern Virginia Soil and Water Conservation District, the U.S. Natural Resources Conservation Service and two residents' groups (the Friends of Huntley Meadows and the Citizens Alliance to Save Huntley) formed a partnership to restore a stream in the Kingstowne area of the county. The Kingstowne stream is a tributary of Dogue Creek and is upstream of Huntley Meadows Park. Monitoring and testing have substantiated that erosion has been brought under control and water quality downstream is improved. During July 2004-2005 monitoring period, storm event and base flow samples were collected and analyzed to determine pollutant loads in Dogue Creek. Based on the monitoring data, sediment removal efficiencies were achieved for all storm events. The phosphorus removal rate did not meet permit requirements of 50 percent removal so DPWES is working with the Army Corps of Engineers to resolve the problem.

7. 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. Twenty years of data from Gunston Cove and the nearby Potomac River provide valuable long-term trends that will aid in the continued management of the watershed and point source inputs.

8. Total Maximum Daily Loads

A Total Maximum Daily Load is a highly structured, watershed-specific plan for bringing an impaired waterbody into compliance with the Clean Water Act goals. The 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 19 waterbodies in Fairfax County are included in Virginia's listing of impaired waters. Ten of the waterbodies are multi-jurisdictional. Of the listed waterbodies, 12 are riverine systems totaling 58.45 miles, six are estuarine with a total area of 23.23 square miles and one is a drinking water reservoir (Occoquan) with an area of 1,700 acres. The cause of the impairment for the majority of riverine systems is either fecal coliform bacteria or declining populations of benthic macroinvertebrates. For the estuarine waterbodies, the cause of impairment is bacteria and/or PCBs in fish tissue. According to the schedule, seven waterbodies require TMDL studies to be completed by 2010, nine by 2014 and three by 2016.

Bacteria and benthic TMDL plans are being developed for seven tributaries to the Occoquan River, including Popes Head Creek and Bull Run, and will be submitted to the EPA in 2006. TMDLs for the lower section of Accotink Creek and for Difficult Run are to be developed by 2008.

a. Accotink Creek TMDL

Due to high levels of fecal coliform bacteria, a 4.5 mile segment of Accotink Creek in Fairfax County, beginning at the confluence of Crook Branch and Accotink Creek to the start of Lake Accotink, was placed on the 1998 Virginia 303(d) TMDL list. A United States Geological Survey study was initiated in August 2001 to identify and isolate specific sources of human fecal coliform bacteria found in Accotink Creek. The study focuses on storm drains that flow during dry periods and sampling of locations with elevated fecal coliform bacteria levels. The results of these studies will be used to identify "hot-spots" for remedial work and inclusion in the TMDL implementation plan. The USGS paper on sampling Accotink Creek can be viewed on-line at: http://water.usgs.gov/pubs/wri/wri034160/wrir03-4160.htm.

An extensive Dry Weather Screening program has been undertaken in the Accotink Creek Watershed as part of the ongoing efforts to detect illicit connections and improper discharges.

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, 6 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: www.novaregion.org/bacteriaimplementation.htm.

9. 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. The majority 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, these waterbodies 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 2005 Reston Lakes Annual Monitoring Report. This report and other information about Reston's lakes can be obtained by contacting RA's watershed manager at 703-435-6560 or visiting the Web site: www.reston.org.

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. In 1999, Lake Barcroft

dredged approximately 15,000 cubic yards of sediment from the lake. In order to avoid the costs associated with hauling it to a landfill, the WID rented a huge topsoil screening machine and excavator to load it, converting the waste material into topsoil by filtering out all the sticks, stones and trash. The topsoil was then made available to local residents. The WID is planning another large-scale dredging project in 2006; however, there are concerns with the lack of nearby disposal areas to reduce dredge disposal costs. For more information about Lake Barcroft, contact the Operations Director at 703-820-1300 or see the Web site: 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. 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. The planned dredge amount was 161,000 cubic yards over a 12 month time period. DPWES issued a Notice to Proceed in September 2005. In July 2005, a contract was awarded to Mobile Dredging and Pumping Company. Mobilization began in October 2005 and the pipe line installation in January 2006. Dredging began in June 2006. The project also includes wetland creation and enhancing existing wetlands. DPWES is anticipating the project to be substantially complete in the spring of 2007.

10. 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.

Neither Fairfax County nor the Virginia Department of Environmental Quality monitor the quality of groundwater.

a. Leaking Underground Storage Tanks

In 2005, there were 132 reported incidents investigated by the Virginia Department of Environmental Quality, of which 36 remain open for ongoing scrutiny. As of June, 2005, there were a total number of 2,101 cases, of which 157 remain open.

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.

Two watershed management plans (Little Hunting Creek and Popes Head Creek) have been completed and are being implemented. The plans includes several projects, including stream restoration, riparian buffer restoration, installation of low impact development practices, retrofitting and improving existing stormwater management facilities and infrastructure and recommendations on modifying the County Code and Public Facilities Manual.

Four additional management plans, Cameron Run, Difficult Run, Cub Run/Bull Run and Pimmit Run/Middle Potomac, are in the process of being completed. Additional watershed management plans that had been anticipated to be started in 2006 include Accotink Creek, Dogue Creek, Little Rocky Run/Johnny Moore Creek, Pohick Creek and Sugarland Run/ Horsepen Creek. The completion of all watershed plans is expected by 2009.

2. Restoration Efforts

a. Riparian Buffer Restoration

Fairfax County is conducting a countywide riparian buffer restoration project in collaboration with volunteers and various other partners to help lessen the impacts of stormwater runoff on local streams. An evaluation of the inventory of buffer deficiencies from the recently completed countywide stream physical assessment was conducted to develop a planting priority list and schedule. Approximately 2,000 trees and shrubs were planted at six sites throughout the county in fall 2005. It is anticipated that 40 additional sites will have been restored by the summer of 2006 through volunteer and contracted planting efforts.

b. Accotink Creek Watershed

In 2005, the Fairfax County Park Authority and Virginia Department of Forestry worked together to construct a crib wall to reduce bank erosion along a 30-foot section of stream below the Lake Accotink Dam.

c. Pohick Creek Watershed

In spring 2005, VDOT completed a stream restoration project using bioengineering techniques on a tributary of Pohick Creek near Lorton Road. The project was part of VDOT's U.S. Route 1 widening project. Field evaluations indicate the project was successful.

d. Difficult Run Watershed

The Fairfax County Park Authority hired a consulting firm to design a stream restoration project to stabilize several hundred feet along two sections of Difficult Run upstream of Georgetown Pike. The project involved a combination of structural and bioengineering techniques. Construction for the project was completed in November 2005.

e. Huntley Meadows Park - Barnyard Run

In spring 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 seeding.

f. Reston

In 2005, Reston Association continued to work with Northern Virginia Stream Restoration, L.C., to help coordinate and establish the Reston stream mitigation bank. 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.

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 LID projects.

b. Virginia Department of Forestry

The Virginia Department of Forestry helps protect water quality and forest resources in Fairfax County. In 2005, VDOF partnered with volunteers from various organizations, such as the Difficult Run Community Conservancy, Potomac Conservancy, Trout Unlimited, Eagle Scouts and the Chesapeake Bay Foundation to plant approximately 3,500 seedlings along 3,020 linear feet of streams throughout Fairfax County.

VDOF continues to work with NVSWCD and DPWES on various stream restoration and LID projects. In 2005, VDOF conducted 25 presentations on benefits of urban forests and three workshops on rain gardens and forest buffers. VDOF also reviews and comments on rezoning applications and development plans.

VDOF, FCPA and DPWES 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.

E. STORMWATER MANAGEMENT, ENFORCEMENT AND INSPECTIONS

1. NPDES Municipal Separate Storm Sewer System Permit

The National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit, a five year permit that is commonly referred to as the "MS4" permit, was reissued by the Virginia Department of Environmental Quality in January 2002. Total Maximum Daily Loads are included in the permit. The Stormwater Planning Division and the Maintenance and Stormwater Management Division manage a comprehensive stormwater management program, which includes 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. MS4 reports can be viewed on-line at: www.fairfaxcounty.gov/dpwes/stormwater/ms4permit.htm.

2. Regional Stormwater Management 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.

3. Stormwater Management Facilities and Infrastructure

Fairfax County maintains more than 1,000 stormwater management facilities, 1,400 miles of pipe and 45,000 drainage structures designed to protect the county's streams. The county completed over 30 improvement and retrofit projects in 2005. The 2005 Fairfax County Stormwater Status Report provides updated information on the number and types of public and private stormwater management facilities in the county as well as detailed information about the type of projects being undertaken to improve and protect water quality.

4. 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 2005, significant progress was made towards the fulfillment of the stormwater and erosion and sedimentation control recommendations. DPWES, the Northern Virginia Building Industry Association and the Engineers and Surveyors Institute worked

together to explore ways to improve the effectiveness of the county's E&S Control Program. Classes and workshops were conducted that covered topics including the county's E&S requirements, constructability issues, quality control of plans and inter-jurisdictional E&S regulations.

In 2005, 258 E&S plans were submitted and approved for projects that would disturb one acre or more of land. Land Development Services staff conducted 27,469 Erosion and Sediment control inspections, totaling over 3,100 inspections a month. Approximately 45 percent of these projects consisted of bonded site plans and subdivision plans. The remaining 55 percent consisted of individual residential grading plans and minor site plans.

In June 2006, the Virginia Soil and Water Conservation Board gave the county's Erosion and Sediment Control Program a rating of "fully consistent" in the four areas: Administration; Plan Review; Inspection; and Enforcement.

In 2005, DPWES developed amendments to the adequate drainage provisions of the PFM to address adequate outfall. The county board of supervisors adopted the amendments in 2006. The amendments clarify the extent of downstream analysis that must be provided and provide alternatives for proving no adverse impact and a proportional improvement of outfalls.

5. Illicit Discharges

In 2005, the Hazardous Materials and Investigative Services Section of the Fairfax County Fire and Rescue Department responded to 586 calls, including 440 reported releases of petroleum products. Sixty-nine cases directly impacted storm drains or surface waters.

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 a day.

UOSA operates under a Virginia Pollutant Discharge Elimination System Permit, which is issued by the VA Department of Environmental Quality. The permit limits and 2005 plant performance are listed in Table III-1.

Table III-1. UOSA Permit Requirements and 2005 Performance

Parameter	Limit	Performance
Flow	54 mgd	28.9 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	0.007 mg/l
Total Kjeldahl Nitrogen	1.0 mg/l	0.2 mg/l
Dissolved Oxygen	>5.0 mg/l	8.1
Disinfection Minimum Chlorine Residual	>0.6 mg/l	0.9 mg/l
Dechlorination Chlorine Residual (mg/l)	Non detect	Non detect

Source: Upper Occoquan Sewage Authority

UOSA produces and treats two types of residuals: biosolids from conventional treatment and lime solids from chemical treatment. UOSA produces exceptional quality biosolids utilizing a dryer-pelletizer process. Exceptional Quality biosolids have commercial potential in the horticultural and agricultural markets. Thickened lime residuals are gravity thickened and dewatered on recessed chamber filter presses. All lime solids are disposed of on site in a permitted industrial landfill.

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 III-2 presents the facility's performance and current effluent monthly limitations.

Table III-2
NMCPCP Permit Requirements and 2005 Performance Averages

Parameter	Limit	Performance
Flow	67 mgd	42.1 mgd
$CBOD_5$	5 mg/l	< 2 mg/l
Suspended Solids	6 mg/l	1.1 mg/l
Total Phosphorus	0.18 mg/l	0.06 mg/l
Chlorine Residual	0.008 mg/l	< 0.008 mg/l
Dissolved Oxygen	6.0 mg/l (minimum)	9.1 mg/l
pH	6.0-9.0 (range)	7.1
E. coli Bacteria	126/100mls*	< 1/100mls*
Ammonia Nitrogen	1.0 – 2.2 mg/l (seasonal)	< 0.15 mg/l
Total Nitrogen	No Limit	< 3.9 mg/l

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

The last major construction was completed in July, 2005. This project included process upgrades to remove ammonia to less than one mg/l and total nitrogen to less than eight mg/l in order to meet Virginia Water Quality Standards and the Chesapeake Bay Program goals for total nitrogen. Also included in the project are: flow equalization tanks, a new/upgraded laboratory for water quality testing, upgraded odor control systems, new instrumentation and control systems and a new septage receiving facility.

In 2005, 57,223 wet tons of sludge were generated and incinerated.

In 2005, the Virginia State Water Control Board formally adopted 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.

2. Septic System Permitting and Repairs

Approximately 30,000 homes and business are served by septic tank systems in Fairfax County. The county's Health Department has reported that, in fiscal year 2005, 193 new septic systems were constructed and 602 Septic Tank Repair Permits were issued (repairs ranged from total replacement of the system to minor repairs such as broken piping). Areas of marginal or highly variable soil remain a concern for future failing septic systems.

3. Sanitary Sewer Maintenance and Repair

The Wastewater Collection Division within the Department of Public Works and Environmental Services manages the county's infiltration abatement program. Closed circuit television inspection is used to inspect trunk sewer mains to identify defective lines in need of repair. In 2005, 229 miles of old sewer lines and 30 miles of new sewer lines were inspected. Approximately 115,557 feet of sanitary sewer lines were rehabilitated. Over the past eight years, 219 miles of sewer lines have been repaired and 36 dig-up and 101 trenchless point repairs were completed.

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 provides drinking water to most Fairfax County residents. Fairfax Water also provides drinking water to the Prince William County Service Authority, Loudoun County Sanitation Authority, Virginia America Water Company (City of Alexandria and Dale City), Town of Herndon, Fort Belvoir and Dulles Airport. However 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 54.117 billion gallons of drinking water in 2005.

Table III-3
Fairfax Water -Water Supply Sources, 2005

Sources	Gallons (in billions)
Occoquan Reservoir (Lorton/Occoquan)	20.41
Potomac (Corbalis)	33.47
Wells	0.003
Purchased	0.082
Untreated	0.152
TOTAL	54.117

Source: Fairfax Water

Federal regulations require water suppliers to provide annual reports on the quality of the drinking water to their customers through the Consumer Confidence Report Rule. The 2005 Water Quality Report is available for review on the FW Web site at www.fairfaxwater.org.

1. Wells

a. Fairfax Water and Public Wells

In 2005, Fairfax Water operated two wells in Fairfax County, both located in the Riverside Manor Community until June 8, 2005, when these wells were permanently removed from service.

b. Private Wells

There are approximately 12,000 single family residences and businesses that are served by individual well water supplies in Fairfax County. In 2005, 135 New Well Permits were issued for single family residences.

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. New Occoquan Water Treatment Plant (Griffith WTP)

In May 2006, the new Fairfax Water Griffith Water Treatment Plant, a 160 million gallons per day facility, became operational. The plant replaces the Lorton and Occoquan treatment plants. In addition to flocculation and sedimentation, the Griffith Water Treatment Plant includes advanced treatment processes of ozone disinfection and biologically active, deep bed, granular activated carbon filtration.

b. Potomac Water Treatment Plant (Corbalis)

The Corbalis plant, located near Herndon, is currently treating up to 150 mgd taken from an offshore intake on the bottom of the Potomac River. A third 75 mgd phase, which will bring the plant capacity up to 225 mgd, is currently under construction and scheduled to be in service in 2008. 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.

c. Water Quality Monitoring at Corbalis and Griffith Plants

Trihalomethanes are by-products of chlorination water treatment and are thought to be carcinogenic. The 2005 averages were below the Maximum Contaminant Levels for trihalomethanes. In addition to the disinfection byproduct, haloacetic acid levels were below the required MCL. The presence of chlorine in drinking water supplies remained below the required Maximum Residual Level. Fairfax Water tests water for the following 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 2005 continued to be below their MCLs. The concentration levels for unregulated metals were within the expected range. Test results are available on-line at: http://www.fairfaxwater.org.

4. Tap Water Monitoring

In 2005 Fairfax Water monitored 3,299 taps for coliform bacteria. The monthly monitoring results were within EPA required limits. FW also monitored surface source water and finished drinking water for 42 volatile organic compounds and 39 synthetic organic compounds. No VOCs were detected in source waters except for trace amounts of MTBE, an unregulated gasoline additive. In finished waters, TTHMs and trace amounts of MTBE were detected. Specific information on these programs 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 a 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 the adjustment, the flow would be 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 flows, 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. The next step will be a workshop with regional and national aquatic biologists to develop targeted species and guilds for re-evaluating ranges of tolerance during low-flow events in the study area.

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.

In June, 2005, the State Water Control Board adopted the Water Supply Planning Regulation (9 VAC 25-780). This regulation 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. DEQ is revising the Virginia Water Protection Permit regulation to incorporate various elements of the water planning process as they relate to permitting of withdrawals.

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 2005. No releases from upstream reservoirs to augment water supplies were needed. 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 on-line at: www.potomacriver.org/water_supply/status.htm.

The 2005 study is available on-line at:
www.potomacriver.org/water_supply/coop-pubs.htm.

b. Metropolitan Washington Area Council of Governments Water Supply and Drought Awareness Plan

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.

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 is working with members and other stakeholders to organize workshops over the next two years that will address subjects such as endocrine disruptors in the Chesapeake Bay watershed and contaminants of emerging concern in the Potomac and Anacostia Rivers.

H. REGULATIONS AND LAWS

1. 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. On March 21, 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 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.

2. 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. The target date for the transfer of the permitting program to jurisdictions had been set for July 1, 2006; however, this is subject to approval by the U.S. EPA.

3. Virginia Stormwater Management Program (Chapter 60)

Changes to the Virginia Stormwater Management Program (Chapter 60) became effective, July 2006. The legislation requires that "*stormwater management programs maintain post-development runoff rate of flow and characteristics that replicate, as nearly as practicable, the existing predevelopment runoff characteristics and site hydrology, or improve upon the contributing share of the existing predevelopment runoff characteristics and site hydrology if stream channel erosion or localized flooding is an existing predevelopment condition. Any land-disturbing activity that provides for stormwater management shall satisfy the conditions of this subsection if the practices are designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm; and (iii) reduce the allowable peak flow rate resulting from the 1.5, 2, and 10-year, 24-hour storms to a level that is less than or equal to the peak flow rate from the site assuming it was in a good forested condition, achieved through multiplication of the forested peak flow rate by a reduction factor that is equal to the runoff volume from the site when it was in a good forested condition divided by the runoff volume from the site in its proposed condition, and shall be exempt from any flow rate capacity and velocity requirements for natural or manmade channels.*"

The legislation is available on-line at: www.dcr.state.va.us/lawregs.htm.

I. ACCOMPLISHMENTS

Over the past several years, Fairfax County has demonstrated a clear commitment to improve, restore and protect the county's water resources. 2005 was another significant year for watershed protection in Fairfax County.

- The Environment Agenda (Environmental Excellence for Fairfax County: 20-Year Vision) adopted in 2004 continues to have significant impacts on water quality protection and environmental stewardship efforts in the county. In 2005, in response to the board of supervisors' directive for follow up action on the plan, the Environmental Coordinating

Committee prepared the FY 2007 Environmental Improvement Plan. The EIP addresses environmental and policy needs and assists county officials on making decisions regarding environmental funding and project planning. The EIP prepared in 2005 supported environmental initiatives and objectives identified in the Environmental Agenda for consideration in the FY 2007 budget. The ECC anticipates updating the EIP annually prior to the development of the county budget to provide sufficient time for funding decisions. Additionally, the plan will report on progress made and additional needs.

- In 2005, the county required that plans proposing land-disturbing activity must include an analysis of the adequacy of all outfalls from the site during the construction phase in addition to the requirements already in place for the developed site. This analysis will help decrease adverse impacts to outfalls and receiving streams during construction. A committee comprised of professionals from the public and private sector developed recommendations for amendments to the Public Facilities Manual's provision for adequate drainage. Adopted in February 2006, the amendments provide greater protection to receiving streams and areas downstream from areas being developed.

- Efforts commenced in 2005 to incorporate Low Impact Development techniques into the PFM. Six practices (bioretention basins and filters, water quality swales, tree box filters, vegetated roofs, permeable pavers and reforestation) were selected to be developed and identified in the PFM as approved practices in Fairfax County. The proposed amendments to the PFM are anticipated to be brought to the board of supervisors for authorization in 2006. The county also committed to working the Engineering Surveyors Institute, Northern Virginia Regional Commission and other local jurisdictions to develop a design and construction standards manual for LID applications. The manual will be recommended for adoption into the county's PFM.

- The board of supervisors approved the results of the Quality Assurance / Quality Control study and adopted the updated Chesapeake Bay Preservation Area Maps with an additional 5.5 miles of perennial streams. There are a total of 860 miles of perennial streams in Fairfax County and Resources Protection Areas make up 18.4 percent of land area in the county. The study also helped to develop an updated stream data layer for the county's valuable GIS system and assisted in the inventory of headwater streams.

- The county continued the process of developing and completing watershed management plans for each of the county's 30 watersheds; the Little Hunting Creek Watershed Plan was the first watershed plan to be completed and was approved in February 2005. The Popes Head Creek Watershed Management Plan was also completed in 2005. Watershed management planning efforts continued in 2005 for Cub Run/Bull Run, Difficult Run, Pimmit Run and Middle Potomac (Bull Beck Run, Scott's Run, Dead Run and Turkey Run) watersheds. It is anticipated that this countywide watershed planning effort will be completed in 2009. These plans will serve as guidance for all stream restoration and protection efforts in the county. Implementation of these plans is estimated to occur over the next twenty-five years.

- The Stormwater Planning Division of the Department of Public Works and Environmental Services continued the stream monitoring program it assumed from the Health Department in 2004. The division released the 2005 Annual Report on Fairfax County's Streams in November 2005.

J. PROBLEMS

Fairfax County streams and watersheds continue to be impacted by several problems, including uncontrolled stormwater runoff, erosion, high levels of bacteria and sedimentation. Progress has been made with modifications to the Policy Plan section of the county's Comprehensive Plan; watershed and stream protection, however, need to be maximized in land use planning and site design decisions. The cumulative effects of land use decisions on Fairfax County's streams need to be effectively considered. Only a few streams, such as Walney Creek in E. C. Lawrence Park, remain undisturbed and excellent examples of healthy streams in Fairfax County.

Stormwater runoff and erosion continue to have the greatest detrimental impacts on Fairfax County streams. **A key requirement for controlling stormwater discharge is to limit post development runoff to that which does not exceed pre-development runoff rates.** Most Fairfax County streams have increased runoff flows that exceed the capacities of their stream channels. This has created an ongoing erosion cycle that includes eroding stream banks, heavy sediment loads and sediment-smothered stream bottoms. Streams can become damaged by the changes brought about by changes in stream hydrology and increased flow during the pre-development clearing phase. The stream sees an overall increased flow due to the increased runoff caused by the clearing. This is not just the increase in peak flow, but the increase in the total volume of the water entering the stream. These increased flows start the cycle of damage, and once the stream is damaged it may take years or decades for the stream banks to revegetate and restabilize. This has resulted in erosion problems throughout the county that impact trail systems, homeowners' back yards, parks, utilities and infrastructure. Sediment on stream bottoms results in reduced habitat and diversity, which compromises the stream ecology and food chains.

Sediment also compromises the quality of, and increases the expense of, treating surface drinking water supplies. Poor land use planning, inadequate enforcement of erosion and sediment control laws and inadequate stormwater management has significantly contributed to erosion problems and impaired water quality. Prevention of such damage would not only be good for the environment but would also be cost effective. Strict monitoring and enforcement of adequate stormwater management and erosion and sediment controls prior to construction can help prevent damage from erosion and sediment.

In addition to problems created in streams, runoff and erosion have resulted in numerous ponds and lakes having enormous sediment deposition. Stormwater management ponds are designed to protect downstream water quality. Ponds also provide additional amenities including recreation (boating, fishing), aesthetics and wildlife habitat. Depending on the

size of the surrounding drainage area, the land uses in that area and the volume of runoff, a pond can fill up with sediment, trash and organic debris in a relatively short period of time. Although dredging is a necessary management component to remove accumulated materials and help protect water quality downstream, private pond owners are experiencing increasing difficulty conducting dredging operations given the significant expense and lack of local, adequate disposal areas.

At times, high levels of fecal coliform bacteria, particularly *E. coli* bacteria, occur in various streams throughout the county. A public outreach and information campaign to increase awareness about potential health hazards from coming in contact with impaired surface waters needs to be developed.

Much credit needs to be given to Fairfax County for its comprehensive watershed management efforts, including stream restoration and protection, adequate monitoring of water resources and adding new tools such as LID and other innovative practices to its stormwater management program. All of these efforts indicate a significant change in county policy and practice towards the protection and restoration of county streams. However, as long as the rate of stream degradation surpasses stream protection and restoration efforts in Fairfax County, the trend will continue to be a downward one.

K. COMMENTS AND ONGOING CONCERNS

1. EQAC commends the board of supervisors for its actions the past two years authorizing one penny of the real estate tax to be dedicated to the stormwater management program. The amount increased from $17.9 million for FY 2006 to $21 million for fiscal year 2007. This additional funding is a significant contribution to implementing the recommendations outlined in the county's comprehensive watershed management plans, including retrofitting and rehabilitating existing and aging stormwater management facilities and infrastructure. EQAC continues to encourage the creation of a sustainable and stable funding source for watershed improvement initiatives.

2. EQAC commends the county for developing and adopting amendments to the PFM'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.

3. 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.

4. EQAC commends the county for its existing stream protection requirements for perennial streams as a result of the perennial stream mapping program. EQAC further encourages the board of supervisors to support future protective measures for intermittent and headwater streams such as the establishment of protective buffers.

5. 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. EQAC further recommends a monitoring program to evaluate the effectiveness of stormwater detention facilities. While EQAC understands that a comprehensive countywide program to monitor effectiveness would be cost-prohibitive, data are still needed, as it is still unclear as to which structures and requirements are effective and working well. At a minimum, monitoring a representative sampling of different types of stormwater facilities throughout the county is recommended.

6. 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 for adopting Residential Development Criteria that include supporting the provision of adequate outfall drainage and innovative water quality measures.

L. RECOMMENDATIONS

The single most important thing Fairfax County should do is to continue to adequately fund and implement its ongoing water resource monitoring, management, restoration and educational stewardship programs. In addition to this overarching recommendation, EQAC is pleased to make the following recommendations:

1. EQAC continues to recommend either posting health warnings at county streams with high bacterial levels OR the creation of an improved public outreach information campaign that is effective in reaching more residents, including different social and economic groups across the county. This campaign should include, among other things, signs/postings at regional libraries, county parks and nature and recreation centers as well as seasonal articles in Fairfax County Weekly Agenda and other countywide distributed newsletters such as NVSWCD's "Conservation Currents." The campaign should not be limited to these examples. Any initiative should contain the following language from the 1999 Health Department report: "*The use of streams for contact recreational purposes, such as swimming, wading, etc. which could cause the*

ingestion of stream water or possible contamination of an open wound by stream water, should be avoided."

2. As sedimentation of stormwater management ponds from upstream development activity continues to increase, 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 recommends that the county conduct a study to analyze and 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.

3. Given that approximately 12,000 single-family residences and businesses are served by individual well water supplies in Fairfax County, and that approximately 30,000 homes and businesses have septic systems that ultimately infiltrate into groundwater, EQAC recommends the inclusion of a groundwater monitoring and management program in the county. Groundwater comprises the base flow for streams and reservoirs and therefore it is important to understand the quality of this input into the county's surface waters and drinking water supplies.

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