CHAPTER III

WATER RESOURCES

III. WATER RESOURCES

A. OVERVIEW

The water resources of Fairfax County include its streams, groundwater, ponds and lakes. These serve as sources of drinking water, recreation, and habitat for a myriad of organisms. One-third of the land in the Fairfax County Park system, approximately 7,000 acres, is stream valley parkland. These stream valleys are significant corridors for the county trails system and wildlife.

1. Streams

Fairfax County is criss-crossed by a variety of natural streams, often called runs or creeks. These streams are considered flowing water habitats. Rainfall soaks into the earth and drains to low points within the surrounding land, then emerges from the ground as seeps, springs, and trickling headwaters. These tiny threads of running water join with others in the same drainage area to create a stream system. A stream is a system of fresh water moving over the earth's surface. 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 850 miles of perennial streams within Fairfax County.

2. Watersheds

A watershed is an area from which the water above and below ground drains into a particular stream, river system, or larger body of water. Everyone in Fairfax County lives in a watershed with a name and drainage boundaries. The larger stream watersheds usually have sub-basins. There are 30 separate drainage basins or watersheds within the county (Figure III-1). For example, the largest watershed in Fairfax County, Difficult Run (58 square miles) has ten streams which drain into the main stream, Difficult Run. It, in turn drains into the Potomac River. The Potomac River watershed is a subbasin of the even larger watershed, the Chesapeake Bay watershed, which is 64,000 square miles and extends from New York through 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.

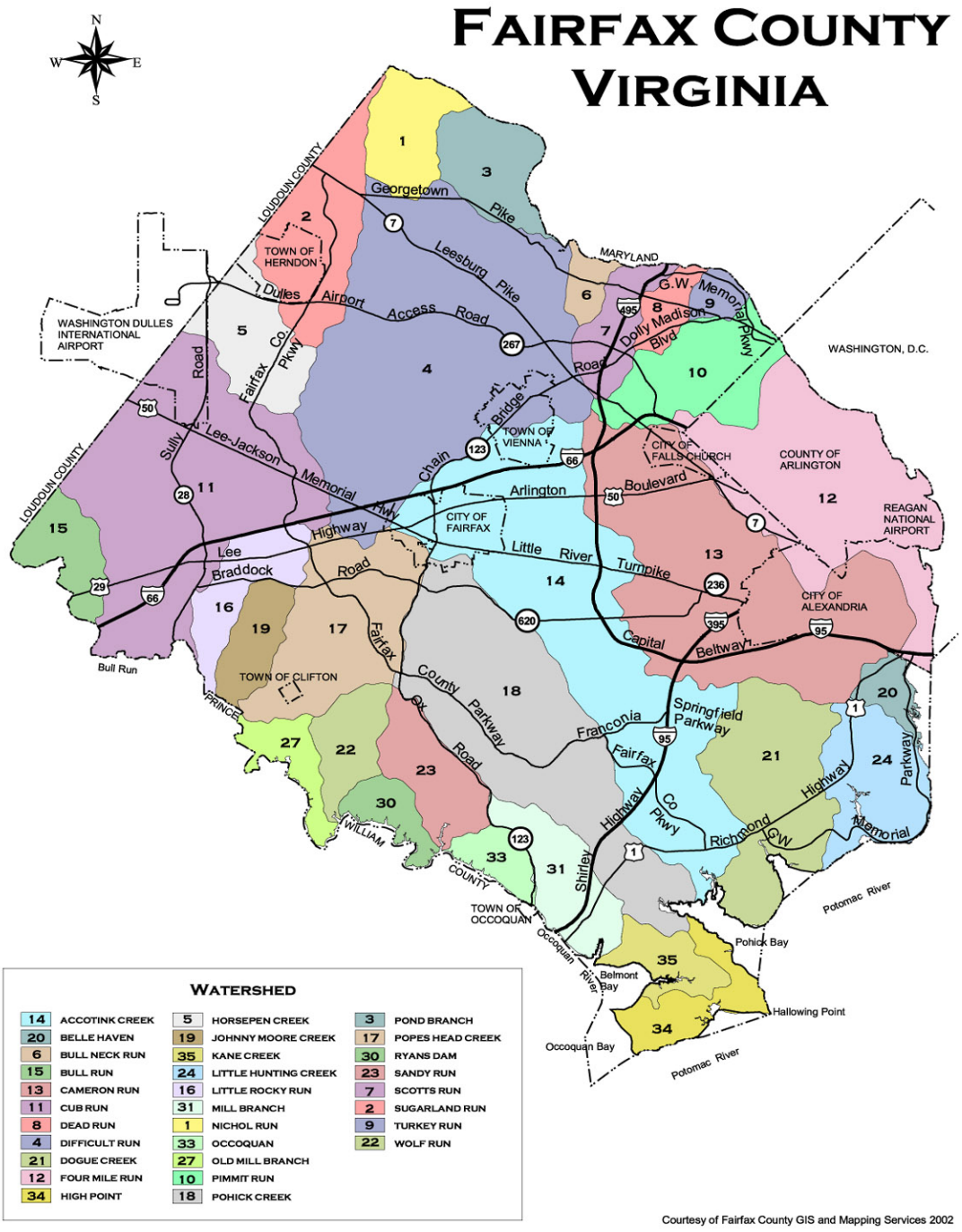

Figure III-1: Fairfax County Watershed Map

3. Stream Ecosystems and Communities

Within a stream are shallow areas called riffles where the velocity is rapid and the bottom consists of boulders, stones, gravel, and/or sand. 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 water speed slows and small particles of mineral and organic matter fall to the bottom and oxygen levels are reduced. Each of these stream regions has a diverse community of plants and animals which spend all or part of their life cycles in the water.

4. Communities

The aquatic food chain begins with leaves and other decaying plant and animal material called detritus. These are carried into the stream from the surrounding forests and fields by wind and water runoff. Food sources also include aquatic vegetation such as algae. Bottom–dwelling (benthic) Macro (large) invertebrate (back-boneless) animals eat this organic matter. These include snails, clams, aquatic worms, and crustaceans such as crayfish. Also ecologically important are the aquatic insect larvae such as stoneflies, mayflies, caddisflies, and true flies. In turn, these macroinvertebrates are eaten by fish, birds, and other streamside wildlife, such as frogs, salamanders, and small mammals.

5. Oxygen

Oxygen is vital to organisms that live in a stream just as it is to terrestrial animals. Submerged animals use oxygen dissolved in the water. Most aquatic insect larvae, such as mayflies and stoneflies, absorb oxygen through their body walls but many are aided by the use of structural gills. Fish absorb oxygen by drawing water in through the mouth where it passes over internal gills. High levels of dissolved oxygen are essential to the life functions of a healthy stream community**.**

6. Trees, Wetlands, and Buffers

A buffer of trees lining the banks of streams is another essential part of a healthy stream system. The temperature in a stream greatly affects how much oxygen it can hold. Since warmer water holds less oxygen, trees are vital along the bank or edge of stream or river. Shade from the tree canopy maintains cool water temperatures so the water will hold more oxygen.

Tree cover also provides food and floating detritus for shelter when leaves and branches fall into a stream. Streamside forests offer food, nesting sites, and protection to a great diversity of streamside wildlife, including birds, turtles, beaver, and snakes. Tree roots stabilize fragile stream banks and give cover to fish, crayfish, and aquatic insects. Forested buffers absorb high percentages of excess nutrient runoff.

Wetland areas adjacent to streams can be forested or open wetlands. These wetlands serve as transitions to stream channels and help to attenuate the effect of stormwater and remove pollutants.

7. Nutrients

Nitrogen and phosphorus are nutrients essential to the growth and development of all plants. An overabundance of either, however, can damage stream ecosystems dramatically. Forested buffers can retain and utilize as much as 89% of the nitrogen and 80% of the phosphorus runoff associated with land use practices. In excess, these nutrients become major pollutants causing the rapid growth of algae in streams, rivers, lakes, and estuaries. When the algae dies and begins to decay, the bacteria breaking down the algae use up the dissolved oxygen necessary for other aquatic life.

8. Groundwater and the Water Cycle

Most of the water on earth, almost 98%, is in liquid form, in the oceans, lakes, ponds, rivers, and streams. Of the remaining 2%, some water is frozen in the polar ice and glaciers, some in the soil and some in the atmosphere in the form of vapor, and some in the bodies of living organisms.

Water is evaporated from the oceans, and in much smaller amounts, from moist soil surfaces, from the leaves of plants, and from the bodies of other organisms. This water, now water vapor, is carried up in the atmosphere by air currents. Eventually these water molecules fall to the Earth's surface as rain or snow. Much of the water that falls onto the land runs off into streams, then rivers, and eventually reaches the ocean.

Some of the water that falls on the land percolates down through the soil until it reaches a zone of saturation. In the zone of saturation, all pores and cracks in the rocks and soils are filled with water (groundwater). The upper surface of the zone of saturation is called the water table. This groundwater provides the base flow in streams and is the reason that streams and rivers have flow when it is not raining. It is this groundwater that is the source of water in wells and provides water for plants through their roots. Eventually all groundwater reaches the oceans, thereby completing the water cycle.

B. POLLUTANTS AND OTHER IMPACTS ON STREAMS

1. Point and Nonpoint Source Pollution

Water-polluting substances originate from either nonpoint or point sources. Nonpoint sources (NPS) include surface runoff, atmospheric deposition, and groundwater flow. Because of their diffuse and intermittent nature, NPS are difficult to control. NPS pollutant loads are greatest following rainfall events. A significant part of the NPS load

consists of nutrients, including nitrogen and phosphorus (organic matter, fertilizer), that are substances that stimulate algal growth. Other NPS pollutants are sediment (from eroding lands, construction sites, and stream banks during high-flow, high-velocity conditions), toxics (oil, paint, chemicals, and metals), pathogens-fecal coliform bacteria (animal waste, failing septic systems, and leaking sewer systems), and trash.

Point sources are specific locations that discharge pollutants. They are relatively constant and provide a steady flow of pollutants. In the Potomac Basin, most point sources are either wastewater treatment plants (WWTPs) or industrial discharges. Point sources contribute relatively small portions of the nutrient loads during high flows and the majority during low flows.

2. The Effect of Imperviousness on Streams

As development occurs, impervious surface increases as driveways and buildings are placed on land that once had trees and other vegetative cover that absorbed water and its contents. With the increase in impervious surface and loss of vegetative cover, there is a concurrent increase in the amount and speed of stormwater running off the land carrying sediment to nearby streams. Sediment is a major nonpoint source pollutant reaching streams and rivers that drain to the Chesapeake Bay. Silt and sand scour stream channels, which erodes the banks and causes loss of tree cover. This, in turn, allows water temperature increases. This silt and sediment also cover the bottom, covering where macroinvertebrates live, cutting off their oxygen supply. This change in bottom substrate usually results in a change in the diversity of organisms--a loss in the numbers and kinds of animals and plants in streams. There is usually a concurrent increase in the numbers of floods that occur where water spills over the banks of streams and onto adjacent lowlands. Over time, this increased flooding and sediment deposition leads to channel widening, loss of pools and riffles, and increased pollutant levels. In urban and suburban watersheds, rain flows off impervious surfaces like parking lots and highways, carrying oil and other automobile wastes into streams. During summer storms, these heated surfaces contribute to raising the temperature of water runoff into streams.

C. STREAM AND WATERSHED ANALYSES

Ongoing testing is conducted by the, the Fairfax County Department of Public Works and Environmental Services (DPWES), Fairfax County Health Department, the Virginia Department of Environmental Quality (VDEQ), and other organizations and agencies. The Audubon Naturalist Society, the Northern Virginia Soil and Water Conservation District, and the Health Department Adopt-A-Stream program also provide volunteer help and data. At present, the Health Department and the Department of Public Works and Environmental Services are both doing comprehensive monitoring of Fairfax County streams. The summary of all these data should provide the first comprehensive understanding of the condition and health of Fairfax County's streams.

1. Countywide Stream Assessments

a. Countywide Stream Protection Strategy Baseline Study

i. History

In September, 1997, the Fairfax County Board of Supervisors requested that staff from the Department of Public Works and Environmental Services (DPWES) evaluate the Montgomery County Maryland, Countywide Stream Protection Strategy to determine its applicability in addressing water quality issues and provided an initial allocation of $250,000. Upon completion of the evaluation in 1998, the Board approved an additional $250,000. Work was initiated in September of 1998, was completed by December, 2000, and was published in January, 2001. This study gives a holistic ecological assessment of all county streams.

ii. Study Parameters

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All major nontidal streams and tributaries within the 30 watersheds of the county have been assessed. The field component of this assessment involved the collection of data from a total of 138 sites/reaches, 13 of which were established as Quality Assurance/Quality Control (QA/QC) sites. Of the 125 principal monitoring sites, 114 were reflective of conditions within Fairfax County and 11 were sampling locations in nearby Prince William Forest Park and used to aid in the development of "reference conditions" to which all sites were compared. Data collected on the health of streams included the following four components, and a numeric ranking for overall quality was assigned (See Figures III-2 through III-5):

1) Fish taxa present (numbers and diversity of fish);
2) Index of biotic integrity (the numbers and kinds of benthic macroinvertebrates present);
3) General evaluation of localized watershed and stream features including stream channel and adjacent steam valley habitat and stream morphology; and
4) Calculations of the overall percent impervious cover within each watershed based on upon available Fairfax County geographic information system (GIS) data.

The county will continue long term monitoring of streams with a five-year rotating schedule of sampling so that each site will be resampled at least every five years. Additional data on smaller tributary streams will continue to be provided by volunteer water quality monitors from the Northern Virginia Soil and Water Conservation District and Audubon Naturalist Society. (See below for description of these Volunteer Monitoring Programs.)

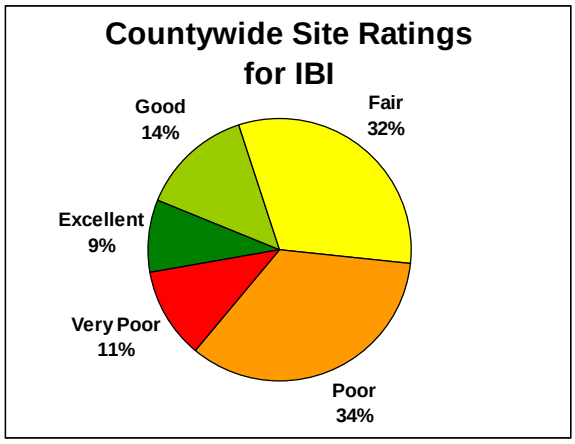

Figure III-2. Percentage of SPS monitoring sites scoring in each of the five IBI quality categories.

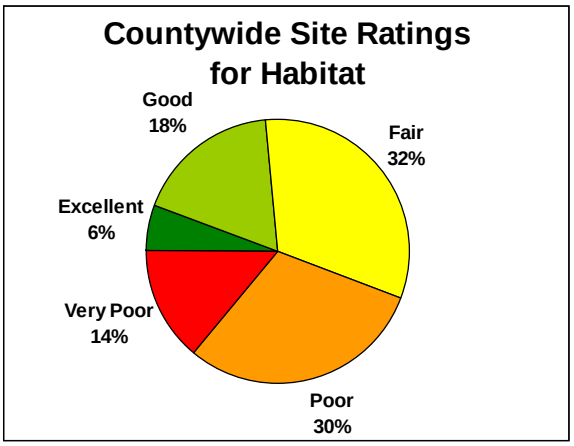

Figure III-3. Percentage of SPS monitoring sites scoring in each of the five Habitat quality categories.

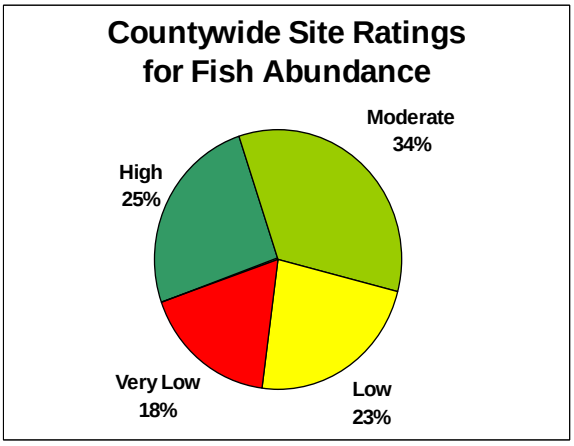

Figure III-4. Percentage of SPS monitoring sites scoring in each of the four Fish Abundance categories.

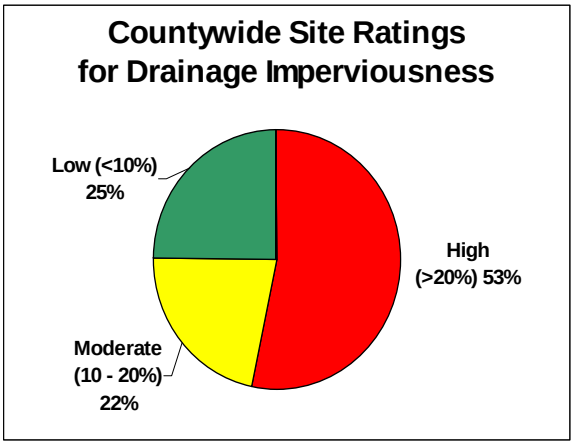

Figure III-5. Distribution of Imperviousness at SPS monitoring sites.

Source of Figures III-2 through III-5: Fairfax County Department of Public Works and Environmental Services, *Fairfax County Stream Protection Strategy, Baseline Study*, January, 2001.

iii. Ranking and Results

The ultimate numeric score for each sampling location reflects the site's degree of departure from reference or "highest-quality" conditions. These composite values were then assigned to one of the following qualitative categories: Excellent, Good, Fair, Poor, and Very Poor.

Using an indicator of biological integrity (IBI) as a basis, the county stream sites were ranked: Excellent - 8.6%; Good – 14.7%; Fair – 31%; Poor 32.8%; and Very Poor –12.9%. Those watersheds that were in good and excellent health had the least amount of impervious surface and the watersheds that were most heavily degraded had the greatest impervious surface (Figure III-6).

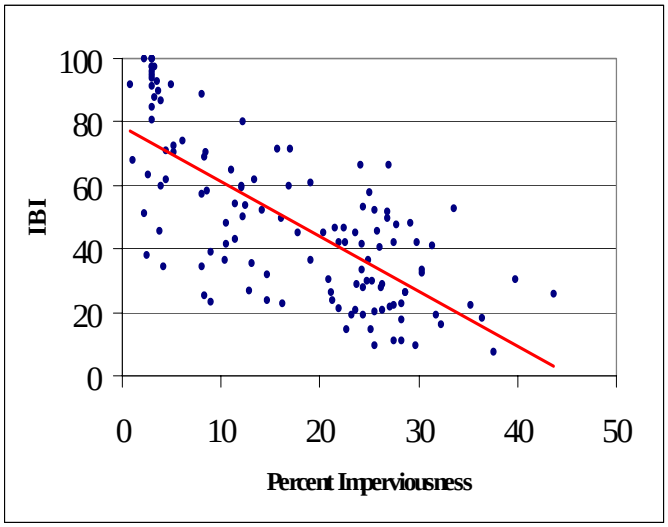

Figure III-6. Trend line indicating that biological integrity, as measured by an Index of Biotic Intetrity (IBI) for benthic macroinvertebrates, generally decreases with increasing percent imperviousness. Source: Fairfax County Department of Public Works and Environmental Services, *Fairfax County Stream Protection Strategy, Baseline Study*, January, 2001.

iv. Recommended Management Strategies

Based on overall stream rankings and projected development within each watershed, three management categories were established to provide recommendations for future efforts:

1) Watershed Protection – Watersheds in this category will be areas with low development density and which currently possess streams with biological communities that are relatively healthy and have a composite ranking of Good or Excellent. The primary goal of this category is to preserve biological integrity by taking active measures to identify and protect, as much as possible, the conditions responsible for the current high quality rating of these streams.

2) Watershed Restoration Level I -- Watersheds in this category have a composite rating of Fair or, rarely, Poor and a projected imperviousness of less than 20%. The primary goal of this category is re-establish healthy biological communities by taking active measures to identify and remedy causes of stream degradation, both broad scale and site-specific.

3) Watershed Restoration Level II -- Watersheds here have a composite rating of Poor, Very Poor, or, rarely, Fair and a projected imperviousness of greater than 20%. This category will likely be categorized by high development density and significantly degraded stream segments. The

primary goal is to prevent further degradation and to take active measures to comply with Chesapeake Bay initiatives.

The report is online at:
http://www.fairfaxcounty.gov/dpwes/environmental/sps_main.htm.

v. 2003 Update on Countywide Stream Assessment

The Stream Protection Strategy (SPS) program completed sampling at 29 randomly selected sites for benthic macroinvertebrates in the spring. In addition, 14 of those sites have been sampled for fish during the summer. The 11 reference sites within Prince William Forest Park have been, and will continue to be, monitored on an annual basis**.**

The report for 2003 should be available on line as data analysis is completed at:
http://www.fairfaxcounty.gov/gov/DPWES/environmental/SPS_Main.htm.

vi. Countywide Stream Physical Assessment

The fieldwork to assess 800 miles of streams was completed in the spring of 2003. The study was completed in February, 2004. The stream assessment will provide the majority of the field reconnaissance information for the watershed plans.

b. Volunteer Water Quality Monitoring Programs

i. Northern Virginia Soil and Water Conservation District (NVSWCD)

The Northern Virginia Soil and Water Conservation District (NVSWCD) manages a water quality monitoring program in Fairfax County, which is conducted by qualified volunteers. The program includes training and certification of monitors, data management and analysis, and quality control. Four times a year, volunteers conduct a biological assessment, using the Save Our Streams protocol. They determine the general quality of the water by evaluating the type and diversity of aquatic macroinvertebrates. They also record their observations of the surrounding watershed, including land uses, the amount of streamside and stream bank vegetation, tree canopy, and signs of erosion and other pollution. The monitors conduct water chemistry tests for temperature, turbidity, and nitrates to assess the water quality. In 2003, 64 sites reported winter data, 95 reported in the spring, 127 in the summer, and 43 in the fall.

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ii. Audubon Naturalist Society (ANS)

ANS also manages a volunteer water quality monitoring program in the region that currently includes 22 monitors in Fairfax County, with an average of four

monitors for each of the seven sites in Fairfax County. Two sites are in E. C. Lawrence Park and are monitored by Park staff. 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 three required monitoring sessions (May, July, and September) and an optional winter monitoring session between December and February. ANS staff performs data entry and quality control activities. ANS also furnishes all monitoring equipment and training. Monitor training includes macroinvertebrate identification (order and family level), protocol practicum, habitat assessment, and benthic macroinvertebrate adaptations. Monitors are recruited in semi-annual introductory workshops. The water quality monitoring program is part of a larger watershed awareness program that includes slide show and video presentations, watershed walks, and other presentations.

iii. Fairfax County Park Authority

Site staff at Ellanor C. Lawrence Park have conducted stream studies (primarily of benthic macroinvertebrates) at Walney Creek, Big Rocky Run, and Courthouse Spring Branch four times in the per year. No data were collected in 2003 at Huntley Meadows Park due to a vacant staff position.

2. Fairfax County Water Quality Report

In the past the Division of Environmental Health in the county Health Department has collected water quality data on Fairfax streams. In 2003, the program was transferred to DPWES to be integrated into other watershed monitoring and planning efforts under way in that agency. Fewer than 300 samples were collected in 2003, as opposed to 1,434 stream samples from the previous year. Heavy rains during the early months of the year and the training and transfer of the sampling equipment to DPWES staff in July resulted in the low number of samples. Using data collected in 2003 would be biased to winter sampling months when fecal coliform counts are at their lowest and would not present a true picture of trends. The Health Department is in the process of creating a summary database for the years from 1985 to 2003, the last year of full sampling by that agency. This database will be posted on line when it is complete.

The overall water quality of the streams in Fairfax County is considered fair for fecal coliform bacteria and good for chemical and physical parameters by the Health Department**.**

The report is online at http://www.fairfaxcounty.gov/service/hd/strannualrpt.htm.

PLEASE NOTE…The data below are from 2002, the last year of full sampling by the Health Department. It is assumed that, since the trends in the county for water quality have been relatively consistent over the last few years, this is a reasonable estimate of the water quality of the streams and waterbodies in the county last year.

a. Fecal Coliform Bacteria

These bacterial organisms, most notably Escherichia coli, or E. coli, are found in the intestinal tracts of warm-blooded animals, including humans, and therefore can be indicative of fecal contamination and the possible presence of a pathogenic organism. In surface waters, Virginia Water Quality Standards have been changed as of January, 2003 to reflect a dual standard for fecal coliform bacteria: 1) An instantaneous maximum allowable standard of 400 fecal coliform bacteria (F.C.)/100 ml of water and 2) a geometric mean standard of 126 F.C./100 ml of water or single sample maximum of 235 F.C./100 ml based on a site specific log standard deviation in freshwater systems.

--In the watersheds tested, Fairfax County streams met the previous standards of < 200 F.C./100 ml (considered good) 17% of the time. Several streams had readings exceeding 1,000 F.C./100 ml.

Because of excessive and persistently high coliform bacteria counts in Accotink Creek and Four Mile Run, TMDL (Total Maximum Daily Load) processes are underway in each watershed. For more information, see the section of this chapter entitled "Special Stream Reports and Programs" beginning on page 71.

b. Dissolved Oxygen

The presence of dissolved oxygen (D.O.) is essential for aquatic life, and the type of aquatic community is dependent to large extent on the concentration of dissolved oxygen present. Dissolved oxygen standards are established to ensure the growth and propagation of aquatic ecosystems. The minimum Virginia state standard for dissolved oxygen is 4.0 mg/l.

--Ninety-nine percent (94%) of the samples collected for determination of D.O. were above the 4.0 mg/l range. The majority of the samples below the acceptable range were recorded in June and July.

The Mill Branch sampling station showed readings below 4.0 only 50% of the time (two out of four samples collected in 2000). This sampling site is located downstream from a debris landfill and could indicate that organic contaminants are entering the stream. This site has been dropped from the sampling schedule after four samples were collected in 2000 and it was determined that the amount of available water to sample was insufficient for proper evaluation. This sampling site is monitored by Virginia's Department of Environmental Quality-Waste Management Division.

c. Nitrate Nitrogen

Nitrate Nitrogen is usually the most prevalent form of nitrogen in water because it is the end product of aerobic decomposition of organic nitrogen. Nitrate from natural sources is attributed to the oxidation of nitrogen in the air by bacteria and to the decomposition of organic material in the soil. Fertilizers may add nitrate directly to water resources. Deposition of nitrogen compounds from air pollution also occurs. Nitrate concentrations can range from a few tenths to several hundred milligrams per liter. In non-polluted water, they seldom exceed 10 mg/l. Nitrate is a major component of human and animal wastes, and abnormally high concentrations suggest pollution from these sources.

--The samples for nitrate nitrogen ranged from a low of 0.07 mg/l to a high of 13.5 mg/l. The overall nitrate nitrogen geometric mean was 0.5 mg/l, well below the maximum limit of 10 mg/l. Four samples were above the maximum contaminant level of 10 mg/l. Station 25-04 (Old Mill Branch watershed) accounted for three of the four samples over 10mg/l.

d. Phosphorus (Total)

Phosphorus is found in natural water in the form of various types of phosphates. Organic phosphates are formed in the natural biological process--by organisms existing in the water, contributed to sewage in body wastes and food residues, and/or formed in the biological treatment process for sewage. Condensed phosphates and orthophosphates are found in treated wastewater, laundry detergent, commercial cleansing compounds, and fertilizers. Phosphorus is essential to the growth of organisms and is usually the nutrient that limits growth of organisms in a body of water. Therefore, the discharge of raw or treated sewage, agricultural drainage, or certain industrial wastes may stimulate nuisance quantities of photosynthetic aquatic organisms and bacteria.

-- There is no established limit for phosphorus in stream water. This year's geometric mean of 0.10 mg/l does not indicate a significant increase over the prior year's average.

e. Temperature

The existence and composition of an aquatic community also depends greatly on the temperature characteristics of a body of water. The maximum standard for free flowing streams is 89.9^{o} F (32^{o} C).

--The temperature range for all stream water samples collected in 2002 was 28^{o} F for the low in February and 80^{o} F for the high in June. The average temperature was 54^{o} F.

f. Heavy Metals and Toxins

The presence of heavy metals in stream water indicates the possible discharge of household and industrial waste into streams. Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, and Silver are monitored for based on their occurrence in industrial and household waste, their potential health hazards, and as part of the Virginia Department of Environmental Quality water requirements.

-- All results are within required limits.

g. pH

Stream pH is an important factor in aquatic systems. The pH range of 6.0 – 9.0 generally provides adequate protection of aquatic life and for recreational use of streams.

--The pH ranged from a low reading of 5.0 to a high of 8.7 for all samples. Four samples were above the 8.5 limit and sixteen samples were below the 6.0 limit. Follow up testing indicated normal pH.

h. Summary

The average geometric mean for fecal coliform bacteria at several of the stream sample sites approaches or exceeds 1,000 f.c./100 ml. (This is definitely not in the good range). The chemical and physical parameters have remained constant over the past five years. Therefore, the Health Department considers the overall water quality of Fairfax County watersheds fair for fecal coliform bacteria and good for chemical and physical parameters.

The Health Department ends its Water Quality Summary Statement with the following caveat:

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

3. Health Department Volunteer Monitoring Program (Adopt-A-Stream)

This program, which was administered by the Environmental Services Section of the Health Department, was initiated in 1989 in response to the recommendation of the county's Environmental Quality Advisory Council. Its objective is to make people aware of stream pollution issues and to establish a network for reporting pollution incidents. This program became the responsibility of the DPWES in July, 2003.

4. Virginia Department of Environmental Quality (DEQ)

The DEQ performs long-term trend monitoring at 14 streams in Fairfax County, or streams that border the county. Additionally, DEQ will be focusing resources at eight monitoring stations in the county, which will be sampled for two years beginning in July, 2004. DEQ will be doing biological monitoring in 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.

a. Occoquan River and Basin Management

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 (formerly the Fairfax County Water Authority), which operates a facility and withdraws water from the Reservoir. Because of its use as drinking water, water quality in the Reservoir is highly monitored and water from sewage treatment plants entering the Reservoir is highly treated.

i. Upper Occoquan Sewage Authority (UOSA)

The following information has been excerpted directly from information 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 carbonation, multimedia filtration, granular activated carbon adsorption, post carbon filtration, breakpoint chlorination, and dechlorination. The plant's capacity was 32 million gallons a day (mgd) and is being expanded to a capacity of 54 mgd (Contract 54). Most of these UOSA new facilities are substantially complete and operational.

UOSA operates under a Virginia Pollutant Discharge Elimination System (VPDES) Permit. The permit limits and 2003 plant performance are listed in Table III-1**.**

2003 was a very wet year, resulting in high flows to the UOSA plant. According to the National Oceanographic and Atmospheric Administration, North Carolina, Virginia, and Maryland had their wettest January-November on record. Precipitation in Virginia had already exceeded the record annual total for the state by the end of November, 2003.

Table III-1. UOSA Permit Requirements and 2003 Performance		
Parameter	**Limit**	**Performance**
Flow	32 mgd	31.3 mgd
Chemical oxygen demand	10.0 mg/l	4.6 mg/l
Turbidity	0.5 NTU	0.1 NTU
Total Suspended Solids	1.0 mg/l	0.65 mg/l
Total Phosphorus	0.1 mg/l	0.05 mg/l
Surfactants	0.1 mg/l	0.026 mg/l
Total Kjeldahl Nitrogen	1.0 mg/l	0.57 mg/l
Disinfection Minimum Chlorine Residual	0.6 mg/l	0.7 mg/l
Dechlorination Chlorine Residual (mg/l)	Non detect	Non detect

Source: Upper Occoquan Sewage Authority

In 2003, the maximum 30-day average flow of 35.25 mgd was above the design flow of 32 mgd. The influent highest rolling 30-day flow was observed in March at 39.82 mgd. The excess flows were diverted to the Equalization Retention Ponds and subsequently treated during days of lower flows**.** During 2003, UOSA was able to use some of its expanded treatment facilities, which was key to managing the high flows encountered during the year.

UOSA produces and treats two types of residuals: biosolids from conventional treatment and lime solids from chemical treatment. Biosolids are anaerobically digested, which produces stable compounds that are conditioned with lime and ferric chloride, and dewatered and hauled off-site to be land applied or landfilled. The lime solids are thickened and dewatered and landfilled in a permitted industrial landfill.

ii. Occoquan Watershed Monitoring Laboratory (OWML)

The Occoquan Watershed Monitoring Program (OWMP) 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 (9) stream monitoring stations (automated flow monitoring at all and storm sampling at most) and four (4) 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. The water quality data that have been provided in past years indicates little change in water quality in the watershed. The Lake Manassas program is used for monitoring water and sediment at seven (7) stream stations and eight (8) lake stations. The eutrophication status of the Occoquan Reservoir and Lake Manassas were within the same range as before, moderately eutrophied but holding steady.

The OWML monitors quarterly for organic synthetic organic compounds (SOCs) in the watershed in a program established under the recommendation of EQAC in 1982 for water samples. In 1988, the OWML began monitoring sediment and fish samples within the reservoir for SOCs. The Lake Manassas program also funds monitoring of SOCs at its stations. 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 (MCL) 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.

No sampling results were available for 2003.

b. Noman M. Cole Jr. Pollution Control Plant (NMCPCP)

The NMCPCP, located in Lorton, is a 54 million gallon per day (mgd) advanced wastewater treatment facility that incorporates preliminary, primary, secondary, and tertiary treatment processes to remove pollutants from wastewater generated by residences and businesses in Fairfax County. The original plant, which began operation in 1970 at a treatment capacity of 18 million gallons a day (mgd), has undergone two 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 (DEQ). Table III-2 presents the facility's performance and current effluent monthly limitations.

Table III-2
NMCPCP Permit Requirements and 2003 Performance Averages

Parameter	Limit	Performance
Flow	54 mgd	44.93 mgd
$CBOD_5$	5 mg/l	< 2 mg/l
Suspended Solids	6 mg/l	1.7 mg/l
Total Phosphorus	0.18 mg/l	<0.05 mg/l
Chlorine Residual	Non Detect	Non Detect
Dissolved Oxygen	6.0 mg/l (minimum)	8.3 mg/l
pH	6.0-9.0 (range)	7.1
Fecal Coliform Bacteria	200/100ml	< 1./100ml
Total Nitrogen	No Limit	< 7.8 mg/l

Source: Department of Public Works and Environmental Services

Construction to expand the plant treatment capacity to 67 mgd began in 1997, with completion planned by the end of 2004. This includes 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 2003, 63,962 wet tons of sludge were generated and incinerated.

In August, 2004, the Virginia Secretary of Natural Resources announced proposed changes to nutrient discharge limits for sewage treatment facilities in Virginia's portion of the Chesapeake Bay watershed. These proposed changes will have substantial implications to NMCPCP and will be discussed in greater detail in next year's Annual Report.

5. Special Stream Reports and Programs

a. TMDLs (Total Maximum Daily Loads)

A total of 17 waterbodies with drainage areas in Fairfax County are included in Virginia's listing of impaired waters for 2002. Of the listed waterbodies, 11 are riverine systems totaling 51.85 miles, five are estuarine with a total area of 23.18 square miles and one is a drinking water reservoir (Occoquan) with an area of 1,700 acres. Nine of the 17 waterbodies are multijurisdictional. The cause of the impairment for the majority of riverine systems is either fecal coliform or benthic standards. For the estuarine waterbodies, the cause of impairment for the majority is PCBs in fish tissue. Twelve of the 17 water bodies were listed for the first time in 2002. According to the schedule, six waterbodies require TMDL studies to be completed by 2010, with the rest by 2014. Four new TMDLs are being proposed by the Virginia Department of Environmental Quality. Popes Head Creek and Bull Run TMDLs are to be developed by 2006 and the lower section of Accotink and Difficult Run by 2008.

i. Accotink Creek TMDL

Due to excessive fecal coliform bacteria counts, 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 (Total Maximum Daily Load) list. A TMDL is a highly structured, watershed-specific plan for bringing an impaired waterbody into compliance with the Clean Water Act goals. A two-year study began in December, 1998, headed by the U.S. Geological Survey, in partnership with the Virginia Department of Conservation and Recreation (DCR), the Virginia Department of Environmental Quality (DEQ), and Fairfax County. The initial study was complete in fall of 2001. The sample collection and analysis, which began in April, 1999, to determine the "type" of fecal coliform bacteria found in

streams is now complete. Results of this analysis are discussed in Chapter 7 of this report, with Figure VII-2-1 (see page 210) presenting a breakdown of sources of fecal coliform bacteria. The most significant identified sources were geese, humans, and dogs, with ducks, cats, seagulls, raccoons, rodents, cattle, and deer also identified as sources. A draft TMDL has been published by the Virginia Department of Environmental Quality. The draft TMDL includes a goal to reduce the human sources of fecal coliform bacteria by 99%. A study by USGS initiated in the August of 2001 will identify and isolate the specific sources of human fecal coliform bacteria. The study will be conducted over a three-year period. During 2002, an extensive Dry Weather Screening program was undertaken in the Accotink Creek Watershed as part of the ongoing efforts to detect illicit connections and improper discharges. In 2003, due to large amounts of rain, scheduling sampling campaigns became extremely difficult. Only one in April was completed. To date, five sampling campaigns of the eight planned have been completed. Throughout the final campaigns, there will be continued focus on storm drains that flow during dry periods and sampling of locations with elevated fecal coliform bacteria levels. The USGS paper on sampling Accotink Creek can be viewed on-line at: http://water.usgs.gov/pubs/wri/wri034160/wrir03-4160.htm.

ii. Four Mile Run TMDL and the Four Mile Run Program

Although only the very upper reaches of Four Mile Run occur in Fairfax County, it is important to note the existence of a TMDL for Four Mile Run and the participation of Fairfax County in the Four Mile Run Program.

The Four Mile Run Program is the oldest continually active program of the Northern Virginia Regional Commission (NVRC). The four jurisdictions (Arlington County, Fairfax County, the City of Falls Church and City of Alexandria) through which Four Mile Run flows are involved in the program. The program was founded in 1977 to ensure that future development would not result in increased flooding in the watershed. Today, all development and redevelopment is analyzed through the Four Mile Run Computer Model to determine whether on-site detention of stormwater is necessary to prevent downstream flooding. In 1998, the Four Mile Run Agreement was amended to address urban water quality issues in addition to flooding.

The Four Mile Run Fecal Coliform Study to determine the sources of fecal coliform bacteria in the watershed using DNA was completed in 2000. The study found that waterfowl contribute over one-third (31%) of that bacteria that could be matched. Eighteen percent of the bacteria originated from humans, 13% from dogs, 6% from deer, 19% from raccoons and 13% 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 regrow, through cloning, within the storm drains and stream sediments,

which in turn perpetuates bacteria levels. Efforts are underway to study this hypothesis.

NVRC was given a grant from the Virginia Department of Environmental Quality (DEQ) for the development of a TMDL (Total Maximum Daily Load) for bacteria in Four Mile Run, which was approved by the EPA on May 31, 2002. The draft implementation plan was presented for public comment on December 10, 2003; its focus is on the reductions of fecal coliform bacteria from human and canine sources by 98 percent. The plan was finalized on December 20, 2003 and can be viewed on-line at: www.novaregion.org/bacteriaimplementation.htm

iii. Bull Run TMDL

NVRC has been approached by the Virginia Department of Environmental Quality concerning the development of TMDLs for impaired streams in the Occoquan watershed. The first two will be for streams outside Fairfax County, Licking Run and Cedar Run. However a TMDL for degradation of the streams benthic community is scheduled to be completed for Bull Run in Fairfax by 2008.

b. Kingstowne Stream Restoration Project

In 1998, Fairfax County, the Northern Virginia Soil and Water Conservation District, the U.S. Natural Resources Conservation Service, and two citizens 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. Started in October and finished by December, 1999, the Kingstowne Stream Restoration Project is now functional. The project used principles of geomorphology and soil bioengineering to create gentle meanders that slow the velocity of flow and natural vegetation to stabilize the stream banks. Testing has substantiated that erosion has been brought under control and water quality downstream is improved. During 2003, 19 storm event samples and 12 base flow samples were collected and analyzed to determine pollutant loads in Dogue Creek. Based on the monitoring data, the sediment removal efficiencies were achieved for all storm events. The NVSWCD continues to monitor the project, which continues to improve bank and floodplain stability**.**

c. 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 should provide the basis for well-grounded management

strategies to improve water quality and biotic resources in the tidal Potomac. It was recommended in this final report that long term monitoring should continue.

Water quality has generally improved since the 1980s. Algae are at lower levels than in the mid 1980s, probably due to lower phosphorus levels in the water, and zooplankton (microscopic "animals' found in surface waters) levels have increased. Benthic (bottom dwelling) organism levels are greater in the river channel than in the cove.

In the cove in 2002, white perch has remained dominant at steady levels over the period, suggesting a supportive environment. Bay anchovy and blueback herring comprised a significant percentage of the total trawl catch. Brown bullhead has declined since 1984. Banded killifish dominated the seine collection and may reflect an increase in habitat as submerged aquatic vegetation has increased in the cove.

The report suggests goals to reduce man-made stresses that we can, and reduce or manage those we cannot, eliminate. Specific management practices to control point and non-point sources, protect and enhance stream buffers and tidal wetlands, and avoid further exotic species introductions are recommended. Continued of monitoring program to assess effective management is also recommended.

d. Wetlands Mitigation Monitoring

The Virginia Department of Transportation is currently monitoring two wetlands mitigation projects, one with between Dranesville Road and Sugarland Run in Dranesville District and one near Roberts Parkway Overpass and Virginia Railway Express-Burke station in Braddock District. Both sites were created to mitigate impacts from the construction of the Fairfax County Parkway and both require five-year success monitoring. The Braddock site was just planted in 2003 and the Dranesville site has been monitored for one year.

e. Illicit and Potential Hazardous Material Discharges

In calendar year 2003, the Hazardous Materials and Investigative Services Section of the Fairfax County Fire and Rescue Department responded to 32 reports involving improper disposals of various hazardous materials and solid waste, 16 pipeline incidences, 39 various types of product release and 191 petroleum product releases. Hurricane Isabel accounted for ten incidences where petroleum products or vessels were impacted by floodwaters.

f. Investigations of Contamination caused by Leaking Underground Storage Tanks

There were 53 reported incidences investigated by the Virginia Department of Environmental Quality, of which 23 remain open for on-going scrutiny.

D. PONDS AND LAKES

All ponds and lakes in Fairfax County are man-made by excavation and/or the damming of streams. These open water impoundments have their own aquatic communities and have many of the same organisms as streams. Most provide recreational opportunities for humans. Due to increased runoff in more urbanized areas, they are often subject to heavy sediment and nutrient loads. Heavy sedimentation means that most of the lakes have to be dredged on a regular basis in order to maintain pond or lake depth. Heavy nutrient loads result in large algal and plant blooms over the warmer months of the year.

1. Reston Lakes

Reston has several large lakes (Lake Newport, Lake Anne, Lake Thoreau, and Lake Audubon) which are managed by the Reston Association and have been monitored for algae growth and sedimentation since 1981.

a. Management Initiatives

The invasive weed hydrilla has become a severe problem and triploid sterile grass carp were released in two lakes in 2002 in order to control growth of the weed. Accelerated sedimentation, algae blooms, and nuisance exotics continue to be the primary problems in Reston Lakes.

A shoreline and stream bank stabilization project using biologs, erosion cloth, and plantings on a 1,000 foot section of Snakeden Branch. The upper 200 feet was done in partnership with several organizations, and the lower 600 feet was completed with a private firm. Reston Association staff also worked on several shoreline and stream bank stabilization projects with several clusters and individual homeowners. RA staff also installed several areas of native submerged aquatic vegetation to re-establish fish habitat and improve water quality.

Waterfowl management initiatives are on-going in an effort to curb the large Canada Goose population on Reston's lakes. In the spring of 2003, 39 goose nests were located and 155 eggs were addled.

Also in 2003, the Reston Association received a multi-million dollar grant for a stream restoration project in Reston. The project will help to fund the implementation of the Reston Watershed Management Plan over a ten-year period. The project, conducted by Wetland Studies and Solutions, will establish a stream mitigation bank in Reston. The project will be coordinated by Reston Association staff and will be overseen by a team of natural resource regulatory agencies.

Reston Association completed a brochure about rain barrels to educate residents and is working on educating the public about having on-site stormwater control.

b. Monitoring and Results

The lakes are monitored for dissolved oxygen, temperature, pH, total phosphorus, clarity, chlorophyll (the green pigment found in algae), and the presence of plankton (small unicellular organisms found in the upper surfaces of waters). The 2003 monitoring was conducted six times (April through September) during the year by Aquatic Environment Consultants. In 2003, fecal coliform and *E. coli* testing were conducted in Lake Audubon because two swimming events take place each year in this lake. In 2003, two Reston Association ponds, Bright and Butler, were added to the monitoring regime. Spring and summer of 2003 had cool temperatures and excessive rain, with May through September averaging 3.3 inches above the 30 year average. Excess runoff may have been the cause of some unique conditions found in the lakes in 2003. Most of these lakes have large surface algae populations and therefore lower water clarity during summer and early fall. This classifies them as eutrophic, a term which comes from the Greek for "well nourished," and is most probably an indicator of high nutrient, most specifically phosphorus, levels in the lakes**.**

i. Lake Anne

Dissolved Oxygen levels were improved over previous years. The aeration system remained functional save for a few days throughout the summer and is credited with the DO improvement. The temperature profile was cooler than any season since the installation of the aeration system. The surface water warmed slightly through July and August, with the average temperature being 20.9^{o} C. The pH levels were below those of previous seasons. Blooms of green and blue-green algae did occur throughout the season, with the largest blue-green algal bloom recorded in September of 2003.

ii. Lake Audubon

Lake Audubon had a ruptured sewer main sometime during June or July that leaked into the waters feeding the lake. The temperature/dissolved oxygen profile for Lake Audubon showed stratification throughout the monitoring season (different "layers" of water had different DO and temperature readings). Water temperatures were below long-term averages. The pH levels were also below long-term averages. The algal blooms on the lake did not come close to the extreme conditions of last year. Normal populations of zooplankton (small microscopic animals that float on the surface of the water) were significantly reduced after the sewage leak. These organisms are important because they "feed" on algae.

iii. Lake Thoreau

Temperatures were below average in 2003. Dissolved oxygen levels in certain "layers" of the lake decreased during summer months as early as May, 2003 but

the overall oxygen levels remained good. The numbers of algae present were the lowest of any of the lakes in Reston and were just above average for the season. Zooplanton numbers were relatively low for the season.

iv. Lake Newport

Water temperatures were below long-term averages. Thermal stratification was present throughout the season. This lake had the highest oxygen depletion of any of the lakes, with the dissolved oxygen overall saturation being the lowest recorded. Lake Newport's algal density is the highest of any of the Reston lakes, this year in July setting a new record. Blue-green and green algae were the most abundant types. There was an extremely large blue-green algae bloom in August. Seasonal density of alga was nearly four times the 12 year average and seasonal biomass was over three time the average, all due to the July *Anabaena* (a blue-green) algal bloom.

2. 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.

3. Lake Barcroft

The Lake Barcroft Watershed Improvement District (WID) is a local taxing district authorized by Virginia Law for conservation purposes. In 1999, Lake Barcroft had about 15,000 cubic yards of dredge spoil from the lake to dispose of. In order to avoid the costs associated with hauling it to a landfill, they rented a huge topsoil screening machine and excavator to load it, converting the waste material into topsoil by filtering out all the sticks, stones, beverage cans and other debris. The topsoil was then made available to local residents for a modest delivery fee. Some innovative BMPs (Best Management Practices), such as flow regulators, check dams, a diversion debris trap, a stormwater injection pit, and street sweeping program have been implemented by the WID. These BMPs are being studied for both their capacity to reduce pollution and improving water quality in the lake and its tributaries, possibly leading to Countywide implementation. The WID also has a program to purchase and distribute high quality lawn fertilizer (that has been formulated without phosphorus) in 50-pound bags and sell it to homeowners. They also did a fish flesh study by sending edible portions of fish removed for analysis of toxins and heavy metals. Fish studied were Largemouth Bass, Bluegill and Black Crappie. None of the counts were over EPA warning levels.

4. Lake Accotink

Lake Accotink is owned and managed by the Fairfax County Park Authority. County government has authorized the expenditure of $6,000,000 to dredge and remove 200,000 cubic yards of sediment from the lake. The Fairfax County Park Authority

provides a boat and operator to the Fairfax County Health Department, which conducts water quality tests from four surface points from May through August. Results from the sampling were within the required limits as mentioned in the Health Department Stream Report. This sampling will now be part of the DPWES monitoring program.

5. Other Ponds and Lakes

There are other significantly sized private and public lakes within the county. Many are centered within developments and have dwellings built along the banks of the lakes. There are also numerous smaller ponds throughout the county that are found within communities, commercial developments or on farm properties. Some are associated with golf courses and many serve as stormwater management ponds.

E. STORMWATER MANAGEMENT

1. Status of Stormwater Utility (Environmental Stormwater Utility) Concept in Fairfax County

In December of 1998, a draft report by the Stormwater Utility Advisory Group (SUAG) to the Board of Supervisors was circulated for review. The report addressed several issues relating to the implementation of a stormwater service charge program for Fairfax County. Activities were suspended leading up to the fall, 1999 Board of Supervisors elections. DPWES is evaluating the need to conduct a more comprehensive public information campaign to articulate need and gain wider public support. During the summer of 1999, the firm of Camp, Dresser and McKee (CDM) was requested to develop a concept paper/report on framing significant aspects of the county's existing stormwater control program and present ideas and recommendations on the essential elements of future stormwater program. CDM submitted a draft report in December of 1999. A final edition was completed by March, 2000. Work on public outreach is proceeding but any further action awaits full funding and the implementation of the stormwater utility fee program by the county.

2. Status of NPDES Requirements

The National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System Permit (MS4), a five year permit, was reissued by the Virginia Department of Environmental Quality (DEQ) in January, 2002. Total Maximum Daily Loads (TMDLs) are tied into the new permit. The Stormwater Planning Division and the Maintenance and Stormwater Management Division incorporated into the new permit a more comprehensive stormwater management program. This program includes the comprehensive Watershed Management Planning effort and long term biological monitoring, infrastructure mapping, inspections and maintenance, retrofitting developed areas with water quality control facilities, and a more rigorous public outreach and education. The Maintenance and Stormwater Management Division of

DPWES will perform inspection of privately owned stormwater management facilities on a regular basis (every five years). Water quality will be monitored at six storm sewer outfalls four times a year (seasonally), and 100 outfalls per year will be monitored during dry weather to determine the presence of illicit discharges.

During 2003, the county continued to evaluate BMPs (best management practices), undertook ten stormwater management ponds, continued with the monitoring of dry weather outfalls, and inspected over 1,600 stormwater control facilities.

The 2003 Annual MS4 (Municipal Separate Storm Sewer System) Report was submitted by the county and accepted by the Virginia Department of Environmental Quality.

3. Regional Stormwater Management Program

a. Background

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

In January 1989, the Board of Supervisors adopted a plan prepared by the engineering firm of Camp, Dresser and McKee. The plan, intended to be a pilot program, consists of a network of 134 detention facilities that will directly control 35 square miles of drainage area. To date, over 46 regional ponds in the Regional Stormwater Management Plan have been constructed. Currently there are 28 facilities in various stages of implementation. Eighteen potential facilities are in the final design phase either as county managed projects or via developers through rezoning commitments. Five regional pond facilities are currently in the bonding or construction phase.

This Stormwater Management Plan has been reevaluated, and recommendations for change have been made, by the Regional Pond Subcommittee, which is an ad hoc subcommittee of the Fairfax County Environmental Coordinating Committee. The Department of Public Works and Environmental Services is responsible for chairing and the work production of the Subcommittee. This Subcommittee was tasked by the Board of Supervisors on January 28, 2002 to examine the role of regional ponds as well as other alternative types of stormwater controls as watershed management tools. Public meetings (attended by over 100 people) were held in late 2002, and the report was submitted to, and subsequently accepted by, the Board of Supervisors. The Subcommittee identified 61 recommendations to improve Fairfax County's stormwater management program and to clarify the role of regional ponds in that program. The general consensus is that regional ponds do play a part in the

county's stormwater management program, but their size and usage can be reduced by the use of better site designs and low impact development practices. The Subcommittee is currently coordinating the development of an implementation plan for all 61 recommendations, including a timeline and defined agency roles and assignments. This new plan, when implemented, should facilitate the merging of stormwater management goals within the watershed protection and restoration goals and should allow for the use of more innovative low-impact development and stormwater management techniques in Fairfax County.

b. Creation of new Stormwater Planning Division (SWPD)

Created in February, 2000 by the Director of DPWES after approval by the Board of Supervisors, this new division is to review current countywide policies affecting the ecosystem and stormwater management issues. SWPD is to promote policies to improve and protect the quality of life and support the environmental goals of the county.

c. Changes in County Mowing Policy at Stormwater Management Ponds

During the summer of 2000, in support of the interim tree policy adopted by the Board of Supervisors in 1999, the county revised the pond-mowing program. The interim tree policy provides opportunities for planting trees beyond the areas currently allowed under the Public Facilities Manual. The mowing program reduces the area mowed in and around a stormwater management pond by an average of 60% per pond.

d. Stormwater Pond Retrofit to Shallow Marsh Wetlands

The Maintenance and Stormwater Management Division of DPWES has noted the following: In 2002, 12 stormwater ponds that are maintained by the county, serving a total of 344 drainage acres, were retrofitted with shallow marsh wetlands in the pond floors. To date there are 1,487 dry-ponds in the county and less than 467 provide water pollution treatment. That leaves nearly 1,020 existing dry ponds which could potentially be retrofitted for pollution treatment. Of the 467 ponds that currently provide water quality treatment, there are a sizeable number that could be modified with new technologies to enhance their treatment capacities. It is estimated that approximately ten additional ponds will be planted this year.

4. Stormwater Treatment Facilities in Fairfax County

Fairfax County has various types of stormwater treatment facilities. Dry ponds are designed to fill up with water during a storm but return to a "dry" state within a few hours or a few days depending on its functional requirements. Wet ponds contain water year-round. The county maintains 1,093 stormwater management facilities, including 971 on-site dry ponds, 33 regional ponds, 47 underground chambers, 32 percolation trenches, five wet ponds, three bioretention areas, and two manufactured BMPs. In

2003, the county inspected each facility at least once, mowed 802 dam embankments, and performed 251 maintenance work orders at 203 facilities.

There are 2,164 privately maintained facilities in the county: 285 wet ponds; 473 dry ponds; 113 sand filters; 49 manufactured BMPs; 322 percolation trenches; 496 roof top detention areas; 44 parking lot detention areas; 376 underground detention facilities; and six bio-retention areas. These facilities are inspected once every five years. A total of 550 such facilities were inspected in 2003.

5. Infill and Residential Development Study

The combination of development patterns in the county and a growing concern over water quality issues led to the May, 1999 request from the Board of Supervisors for the "Infill and Residential Development Study." The study was completed and released to the public in 2000. The Board of Supervisors accepted the final recommendations at a public hearing on January 22, 2001. The Study staff has reviewed the effectiveness of current policies regarding erosion control and storm drainage with the dual goals of minimizing any impacts of stormwater from a proposed development on downstream property and limiting the impacts of stormwater management facilities on a neighborhood. Recommendations include:

1) An enhanced erosion and sediment control program, including the revoking of land disturbing permits during egregious violations;
2) Allowance of the use of chemical erosion prevention products, and bonded fiber matrix on highly sensitive soils or on steep slopes;
3) Adoption of innovative BMPs;
4) Amendment of the Public Facility Manual to include Super Silt Fence requirements, Storm Drain Inlet Protection Devices, and Faircloth Skimmers;
5) Improved requirements for early review of stormwater management facilities as part of the rezoning process;
6) Improved requirements for evaluating the adequacy of stream channels for increased runoff due to new developments;
7) Development of a BMP monitoring program; and
8) Enhanced education programs for citizens, staff, and industry regarding E&S control.

Actions in 2002 to fulfill the recommendations included the following:

1) Development of an alternative Inspection program has been completed and approved by the Virginia State Soil and Water Conservation Board in December of 2002.
2) Changes in improved siltation and erosion control amendments in the PFM now include Super Silt Fences and the start of the approval process for including Faircloth Floating Skimmers.
3) A Study concerning the impact of extended detention of the one-year storm was started in January, 2002.

Implementation of the recommendations continues. In 2003 significant progress was made towards the fulfillment of the stormwater and erosion and sedimentation (E&S) control initiatives. It is anticipated that the proposed Adequate Outfall Public Facilities Manual amendments will be finalized in 2004.

F. NONPOINT SOURCE POLLUTION PROGRAMS

1. Chesapeake Bay Program and Agreements

The Chesapeake Bay Program (CBP) 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. These commitments are not legally binding. 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. Three Chesapeake Bay Agreements have been signed, focusing on reducing pollutants in the Bay and its tributaries**.**

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 goals to reduce nonpoint source phosphorus and nitrogen entering the Bay. Pursuant to the requirements of the Chesapeake Bay Preservation Act and Regulations, the Chesapeake Bay Local Assistance Department (CBLAD) and the Chesapeake Bay Local Assistance Board (CBLAB) have reviewed Fairfax County's Comprehensive Plan for consistency with the Act and Regulations.

On March 19, 2001 the Chesapeake Bay Local Assistance Board determined that Fairfax County's Phase II program is consistent, with conditions, with the Chesapeake Bay Preservation Act and Regulations. Released in September, 2004 the county has proposed amendments to address the four consistency recommendations: 1) map of the county's Chesapeake Bay Preservation Area components; 2) a shoreline erosion inventory and implementation strategies for use by the Wetlands Board in approving shoreline erosion structures; 3) inventory and development of plan for public waterfront access; and 4) development of policies that address the recommendations for water quality as discussed in the "Infill and Residential Development Study."

The agricultural portion of the Chesapeake Bay Preservation Ordinance requires landowners with land in agricultural uses to have conservation plans. The Northern Virginia Soil and Water Conservation District (NVSWCD) prepares soil and water quality conservation plans and provides technical assistance in the implementation of approved plans. NVSWCD has written plans for all Agricultural and Forestal Districts

that have Resource Protection Areas within their limits. Currently, NVSWCD is working extensively with horse owners and keepers, since a large percentage of agricultural land use in Fairfax County is related to horse operations. These operations require innovative land management and careful nutrient management to prevent and reduce pollution in runoff to nearby streams.

In 2003, 14 soil and water quality conservation plans were developed for 1,000 acres; 23,348 linear feet of RPAs were included. Cumulatively, 9,859 acres and 260,091 linear feet of RPAs are covered by water quality conservation plans that have been developed since 1994 when the program began. County regulations require conservation plans for establishing and renewing Agricultural and Forestal Districts. As noted in the Ecological Resources chapter of this report, there are 40 Local and four Statewide Agricultural and Forestal Districts in the county. NVSWCD also develops conservation plans for landowners receiving state cost-share money for installing agricultural BMPs, such as manure storage and composting structures or fencing animals out of streams. NVSWCD continues to distribute a brochure it developed for Fairfax County horse-keepers: Agricultural *Best Management Practices for Horse Operations in Suburban Communities*.

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 (see section K of this chapter). Of particular note was the incorporation of changes to the designation criteria for Resource Protection Areas (RPAs) to more directly reference water bodies with perennial flow, resulting in a significant expansion to the county's RPA network. A related effort to map all perennial streams in the county (see section G of this chapter) has been completed, and revised maps of Chesapeake Bay Preservation Areas have been prepared.

3. Erosion and Sedimentation Control and Enforcement-Fairfax County Department of Public Works and Environmental Services

DPWES is planning the implementation of organizational improvements to the Environmental and Facilities Inspection Division (EFID, formerly the Site Inspection Branch) that will result in a greater emphasis and a higher quality of inspection services associated with erosion and sediment control. They will be developing a new quality assurance program and will be training Field Specialists (a newly established position). Field Specialists will be responsible for resolving all erosion and sediment control violations. DPWES will be developing 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. These proposed resource requirements and organizational improvements are being led by the county's Environmental Coordinator.

a. Inspections

In 2003, the EFID conducted 29,110 Erosion and Sediment (E&S) control inspections, an increase of 36% over 2002. There was an average of approximately 1,400 major plan projects and 1,600 minor plan projects ongoing at any given time in 2003. Currently, 35 site inspectors perform these Erosion and Sediment Control inspections along with other site inspection duties.

In 2003, EFID issued an average of 28.1 Notices of Violation (NOVs) per month for violations of Chapter 104 of the *Fairfax County Code*. This represents a 60% increase over last year's NOV rate. It is hypothesized that the unusually wet weather, including Hurricane Isabelle, likely contributed to the increase in NOVs.

b. Lake Martin

Litigation against two of the upstream developers for off-site damages associated with land development activities has been completed; the developers have been ordered to pay for restoration activities. The county has engaged the services of a consultant to prepare a plan to remove 6,100 cubic yards of sediment from Lake Martin. Additionally, plans to retrofit two upstream existing stormwater management ponds to protect stream channels that drain into Lake Martin have been drafted. Revisions to the project site were completed in May of 2004. However there is a shortfall in available funds for implementation of the project.

c. Virginia Department of Conservation and Recreation (DCR) Division of Soil and Water

i. Program review

The Fairfax County Erosion and Sediment Control Program was given an "inconsistent" rating for each of the four components: Administration, Plan Review, Inspection, and Enforcement. DCR is currently working with the county doing reviews based on a Corrective Action Agreement to bring the program to Consistent Status. The reviews should be completed in the fall of 2004.

ii. Complaints

DCR received two complaints in Fairfax County since July 1, 2003, with both having been abated.

4. Occoquan Basin Nonpoint Pollution Management Program

The Northern Virginia Regional Commission continued in its role as staff to the Occoquan Basin Nonpoint Pollution Management Program. The program was established in 1982 to provide an institutional framework for maintaining acceptable

levels of water quality in the Occoquan Reservoir, one of the two major sources of drinking water for much of Northern Virginia. With the release of the 2000 Census data, staff determined that were approximately 363,000 people residing in the Occoquan watershed as of the year 2000. This represents a four-fold increase in population from when statistics were first collected in 1977. The Occoquan Program has initiated an update to its 1992 Northern Virginia BMP (Best Management Practice) Handbook. The main emphasis will be on the inclusion of previously innovative, but now accepted, techniques such as rain gardens and some non-structural BMP techniques with demonstrated removal efficiencies.

a. Modeling

In October, 2001, the Occoquan Policy Board and Technical Advisory Committee approved a fundamental change in the management structure for the Occoquan Model. A standing Modeling Subcommittee has been created to oversee the model development, which will be handled by Occoquan Watershed Monitoring Laboratory. The result will be a state-of-art model that will be able to take quick advantage of advances in modeling technology.

b. Storm Drain Marker Program

NVRC, along with the four local governments that share the watershed, has launched a program designed to place more than 1,100 colorful durable vinyl markers on storm drains. These markers will alert citizens of the potential harm from dumping. Also, NVRC has developed door hangers, in English and Spanish, informing citizens of the program and providing telephone numbers. This program continued in 2003.

5. Soil and Water Conservation Technical Assistance

In calendar year 2003, NVSWCD:

- Reviewed 56 sites plans and provided comments to DPWES on the erosion and sediment controls, water quality protection, and stormwater management aspects of site development plans in the Pohick Creek Watershed and within three miles of the Potomac River. NVSWCD also reviews DPWES, Fairfax County Park Authority (FCPA), and School Board projects and any other plans, as requested, which appear to have particular difficulties involving soil types and slopes.

- Reviewed and commented to the county's Department of Planning and Zoning (DPZ) on 233 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.

- Provided information about soils to 292 consultants, engineers, developers, realtors, and citizens.

- Provided land management assistance to individual homeowners and homeowner associations via 595 phone calls, e-mail or office visits, and 217 site visits. Solutions were recommended for drainage, erosion, and other natural resource problems.

- Provided technical advice to 67 pond owners.

- Demonstrated the *Enviroscape* watershed model 14 times to a total of 351 people, who learned about watersheds and how man's activities on the land directly affect water quality in nearby lakes and streams.

- Coordinated two stenciling outreach programs that educated 740 homeowners about pollutants that reach streams via storm drains—pollutants such as used motor oil, anti-freeze fluid, paint, pet waste, excess fertilizer, and yard debris. These projects were carried out by youth groups and culminated in stenciling a reminder message, "Dumping Pollutes—drains to our stream" on storm drains through the neighborhoods.

NVSWCD created and distributes the *Citizens Water Quality Handbook*, a practical guide to water quality, that contains chapters on watersheds, water conservation, nonpoint source pollution, stream management, wetlands protection, water quality monitoring, environmentally friendly lawn care, specific suggestions for "making a difference," and a listing of agencies and organizations that provide services, information, and help related to water quality.

The *Citizens Water Quality Handbook* has been revised, updated, and renamed the *Water Quality Stewardship Guide*. It is available on line at http://www.fairfaxcounty.gov/nvswcd/waterqualitybk.htm.

Don't Dump Oil, a Spanish language brochure, explains that dumping used oil into storm drains is not only illegal, but can harm people and the environment.

A guidebook entitled "*Maintaining BMP's- A Guidebook for Private Owners and Operators in Northern Virginia"* was published in February, 2000 by the Northern Virginia Regional Commission. The guidebook specifically targets homeowners/civic associations and small businesses that may have responsibility for BMP maintenance. The guidebook addresses simple maintenance tasks, how to plan for long-term BMP maintenance costs and where to go for additional information.

In 2003, NVSWCD distributed 3,953 brochures.

6. Virginia Department of Forestry Technical Assistance

In 2003, the Virginia Department of Forestry provided technical assistance for the development and installation of a rain garden at Daniel's Run Park Elementary School. They also gave over 20 presentation that included topics such stream restoration workshops and watershed/water quality presentations to students, homeowner associations, garden clubs, and professional groups.

7. Stream Valley Reforestation

In 2003, the Virginia Department of Forestry partnered with volunteers from various organizations such as the Difficult Run Conservancy, the Potomac Conservancy, 4-H Clubs, Chesapeake Bay Foundation, and the NVSWCD to plant approximately 2,000 seedlings along 1,300 linear feet along stream valleys throughout Fairfax County.

8. Stream Bank and other Stabilization Projects

a. Accotink Creek Watershed

The Fairfax County Department of Public Works Stormwater Management Division, the Northern Virginia Soil and Water Conservation District, and the Virginia Department of Forestry sponsored two stream bank stabilization projects in the Accotink Watershed. In 2002, 11 root wads were used for stabilization of 300 linear feet of stream bank. The end result of the project is the reduction of sediment in the Accotink Creek Watershed. This installation continues to perform well and has proven itself during the excessive amounts of rain in 2003.

b. Old Farm Pond at Mason District Park Reconstruction and Turkeycock Run Project

The Fairfax County Park Authority (FCPA) finished reconstruction of the old farm pond at Mason District Park (which replaces the existing dam), has installed new structures, installed an overlook at the pool edge, and created a wetland area with boardwalk access. Prior to the reconstruction, stream reaches of Turkeycock Run below the pond had been adversely affected; the increase in pool surface will create stormwater protection for those stream segments.

The FCPA is also planning a restoration of Turkeycock Run that will begin in 2003 as the Mason District Pond restoration is completed.

c. Hidden Pond Park Stream Retrofit

The Fairfax County Park Authority will add BMP (Best Management Practice) controls to an existing facility to protect the portions of the stream above the pond, allow for restoration of stream health, and reduce sedimentation in the pond. The project went out to bid in June, 2003. The second phase of this project will include

reconstructing a forebay just above Hidden Pond and dredging some areas in the pond to restore habitat. The project had been scheduled for construction beginning in 2004. The Park Authority has plans to selectively dredge the upstream end of the main pond.

d. Huntley Meadows Park - Dogue Creek and Barnyard Run

The Fairfax County Park Authority and the Department of Public Works and Environmental Services are working on a bond project that would use bioengineering and conventional stabilization practices to protect the stream reaches of Barnyard Run and Dogue Creek above Huntley Meadows Park.

e. Difficult Run Watershed

The DPWES Maintenance and Stormwater Management Division partnered with the Northern Virginia Soil and Water Conservation District, the Virginia Department of Forestry, and the Reston Association to construct two stream bank stabilization projects, one in Difficult Run mainstem and one in Snakeden Branch, utilizing bioengineering techniques. The Hunter Valley Riding Club assisted in the mainstem Difficult Run Project. Approximately 1,300 linear feet of stream bank was stabilized using root wads, coconut fiber matting, and native vegetation in the Snakeden Branch and a section of mainstream Difficult Run.

9. Septic System Permitting and Repairs

Improperly built and maintained septic systems can often be a source of pollution to surface and ground waters. 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 2003, 205 new septic systems were constructed, 776 Septic Tank Repair Permits were issued (repairs ranged from total replacement of the system to minor repairs such as broken piping), and there were 721 Septic System Repair Permit approvals. Areas of marginal or highly variable soil remain a concern for future failing septic systems. The Health Department inspects new septic systems that are installed as well as the repair of malfunctioning systems. Further, the Health Department enforces requirements pertaining to failing septic systems when such systems are identified (either through a neighborhood survey or by citizen complaint). However, staff resources do not allow for routine inspections of operating systems.

During 2003, three Sewer Extension and Improvement projects extended sewer to 94 homes. It should be noted that this does not mean that all 94 homes had malfunctioning septic systems; typically, neighborhoods considered for sewer line extensions have a few failing systems along with conditions that evoke concerns about the potential for more widespread failure (e.g., ages of septic systems; lack of replacement area in case of failure).

10. Sanitary Sewer Maintenance and Repair

In 2003, 187 miles of old sewer lines and 34 miles of new sewer lines were inspected. Approximately 139,000 miles of sanitary sewer lines were rehabilitated. Over the past six years, repairs add up to 170 miles of sewer lines. 25 dig-up repairs and 91 trenchless point repairs were completed.

11. Storm Sewer Maintenance and Repair

In 2003, 167.5 miles of storm drainage pipe were verified as to location and inspected for deficiencies and maintenance items.

G. PERENNIAL STREAM MAPPING PROJECT

A project to field identify perennial streams was initiated in September of 2001 in response to Fairfax County Board of Supervisors' direction as a result of an Environmental Quality Advisory Council (EQAC) resolution relating to the mapping and protection of additional stream segments under the county's Chesapeake Bay Preservation Ordinance. Funding was approved on September 10, 2001. During the fall of 2001, staff developed a draft protocol for field identifying the boundaries between intermittent and perennial streams. Fieldwork was completed by November 2003 and serves as the basis for delineating perennial stream segments for Resource Protection Area buffers as required by the Chesapeake Bay Preservation Ordinance. On November 17, 2003, the Board of Supervisors adopted the new maps, thus increasing by 52% the amount of stream miles protected (from 638 to 968 stream miles).

H. WATERHED PLANNING AND MANAGEMENT

1. Countywide Watershed Planning

The Fairfax County Department of Public Works Stormwater Planning Division has commenced a five to seven year watershed planning program to develop new management plans for all 30 county watersheds. The current master drainage plans were developed for the county in the mid 1970s. Consultants have been selected for the stream physical assessment tasks for the development of the watershed management plans. The first group of watershed areas totals 43% of the county and includes the following watersheds:

- Little Hunting Creek;
- Popes Head Creek;
- Cameron Run;
- Cub Run/Bull Run; and
- Difficult Run.

The first Stakeholder and Public Involvement Meeting was for Little Hunting Creek. The final Draft Little Hunting Creek watershed Plan was presented in December, 2003. It is expected to be adopted soon.

The Popes Head Creek Watershed advisory group was formed in September, 2003 and the Cameron Run Watershed citizen advisory group began its work in November of 2003.

The physical stream assessment of 800 miles of streams throughout the county was completed in the spring of 2003; the stream assessment will provide the majority of the field reconnaissance information for the watershed plans.

2. Reston Watershed Plan

The Reston Association Board of Directors authorized the development of a Watershed Management Plan and establishment of a stakeholders group (the Reston Association Watershed Action Group--ResWAG). Work on the project was initiated in 2001 and was completed and presented in July of 2002. Work was done by the environmental firm GKY and Associates. Focus has been directed to implementation and watershed education outreach programs. The Reston Association has signed a Memorandum of Understanding with the county to coordinate the Reston Watershed Planning efforts with the county Watershed Planning efforts.

3. New Millennium Occoquan Watershed Task Force

In 2002, the Board of Supervisors celebrated the 20th anniversary of the downzoning of nearly 41,000 acres of land in the Watershed for the purpose of protecting the Occoquan Reservoir (one of two sources of drinking water for the majority of Fairfax residents) from nonpoint source pollution. Included in this celebration was the establishment of the New Millennium Occoquan Watershed Task Force, which was established by the Board to provide guidance on appropriate watershed management efforts 20 years after the downzoning. The Task Force presented a series of recommendations addressing watershed management issues on January 27, 2003. The recommendations of the Task Force provide an assessment of issues facing the Fairfax County portion of the Occoquan watershed, examine the gaps in programs being carried out by local, state, and regional agencies, help define the role of volunteer organizations that have interests in the watershed, and provide a vision for the future management of the watershed. On July 7, 2003, county staff presented the Board of Supervisors with an implementation plan responding to each of the 29 recommendations of the report.

I. GROUND WATER ASSESSMENT

The United States Geological Survey (USGS) maintains a series of wells throughout the nation to monitor groundwater levels and drought. Two 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 by the USGS to assess ground water levels. You can find the information on this well by going to http://groundwaterwatch.usgs.gov.

Neither Fairfax County nor the Virginia Department of Environmental Quality monitors for groundwater levels or groundwater water quality data.

J. DRINKING WATER SUPPLY

The county's water supply comes from the Potomac River, the Occoquan Reservoir, Goose Creek, community wells, and private wells. Fairfax Water (FW), formerly known as the Fairfax County Water Authority (FCWA), provides drinking water to most Fairfax County residents. FW 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. Much of the information provided in this section of the Annual Report has been excerpted from guidance provided by Fairfax Water.

With the exception of some wells, prior to use the water must be treated. Fairfax Water provided 48.99 billion gallons of drinking water in 2003.

Table III-3
Fairfax Water -Water Supply Sources , 2003

Sources	Gallons (in billions)
Occoquan Reservoir (Lorton/Occoquan)	19.84
Potomac (Corbalis)	29.01
Wells	0.01
Purchased	0.05
Untreated	0.08
TOTAL	48.99

Source: Fairfax Water

1. Wells

a. Fairfax Water and Public Wells

In 2003, FW operated two wells in Fairfax County, both in the Riverside manor Community. These two wells and their distribution systems were monitored monthly for bacteriological quality and annually for Volatile Organic Compounds

(VOCs). In addition, the wells were tested semiannually for metals, nutrients, solids, odors, color, pH, alkalinity, and turbidity. During 2003, one of the wells "slightly" exceeded the Secondary Maximum Contaminant Level (SMCL) for odor. These are non-enforceable limits relating to the aesthetic quality of drinking water. Lead and copper monitoring in accordance with EPA and Virginia Department of Health (VDH) Waterworks Regulations was performed on both distribution systems in 2001. The system met all EPA Lead and Copper regulatory requirements and was placed on an Ultimate Reduced Monitoring schedule by VDH due to the low levels found. The next scheduled collection is during 2004.

Tests of FW Riverside Manor Well system indicate the presence of radon in the water. Radon is naturally occurring substance and it is not unusual to be present in groundwater resources in Fairfax County. Health effects from radon exposure have found to be far greater from indoor air as opposed to water. For this reason, the Fairfax County Health Department advises residents who may be concerned about radon in their homes to test the indoor air levels. Radon is not currently regulated in public drinking water systems.

b. Private Wells

There are approximately 12,000 single family residences that are served by individual well water supplies in Fairfax County. In 2003, 163 New Well Permits were issued for single family residences. There were 396 wells closed in 2003.

2. Lorton and Corbalis Systems Monitoring Results and Reports

a. Trihalomethanes, Chloramines, and other By-products of Water Treatment

Trihalomethanes are by-products of chlorination water treatment and are thought to be carcinogenic.

b. Trihalomethanes (THM) Monitoring Project

The 2003 distribution system running quarterly averages were below the Maximum Contaminant Levels (MCL) for total trihalomethanes (TTHM) of 80 µg/L. The 2003 running quarterly averages for TTHMs were 13 µg/L and 37µg/L for the Corbalis and Lorton distribution systems, respectively.

c. Disinfectant/Disinfection By-products (D/DB-P) Rule

EPA has promulgated Stage I of the D/DB-P Rule, which lowers the total THM MCL from 100 µg/L to 80 µg/L. This rule took effect in January of 2002 (TTHM - Total Haloacetic Acids, Bromate, and Chlorite and the Disinfectants, Chlorine, Chloramine, and Chlorine Dioxide).

In addition, the disinfection by-product "Haloacetic Acid 5" (HAA5) will be regulated at a level of 60 µg/L. The 2003 HAA5 distribution system running quarterly averages were below the Maximum Contaminant Level (MCL) of 60 µg/L. The 2003 running quarterly averages for HAA5s, as reported to the Virginia Department of Health, were 13 µg/L and 37 µg/ L for the Corbalis and Lorton distribution systems, respectively.

The rule also sets a Maximum Residual Disinfectant Level (MRDL) for chlorine of 4 µg/L in drinking water. The MRDL for chlorine was 3.4 mg/L in 2003.

d. Heavy Metals

FW tests drinking water quarterly for Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Lead, Magnesium, Mercury, Nickel, Potassium, Selenium, Silver, Thallium, and Zinc and on a monthly basis for Iron, Manganese, and Sodium. The levels of these metals monitored in 2003 continue to be below their MCL or SMCL. "The concentration levels for the unregulated metals were within an expected range." The report is available for review on the web at www.fairfaxwater.org.

e. Enhanced Surface Water Treatment Rule (ESWTR)

The ESWTR assumes revisions to the current Surface Water Treatment Rule may be necessary to provide additional protection from pathogenic organisms. The fist step toward developing the ESWTR was the microbiological monitoring required under the Information Collection Rule. The first year of the data has been used to develop requirements for the interim ESWTR. The long-term ESWTR will be based on additional data collection and refinement. The proposed ESWTR will provide for a sanitary survey of the entire system, a maximum contaminant level goal for cryptosporidium of zero, and treatment requirement alternatives. Possible additional requirements may include notifying the state as soon as possible about persistent turbidity levels above the performance standards that might not necessarily be violations.

f. Other Monitoring Programs

Fairfax Water monitored 3,313 distribution taps for total coliform bacteria in 2003. Each month's compliance report was within the regulatory limits for the Virginia Department of Health and the EPA's Total Coliform Rule**.**

During 2003, the FW Laboratory monitored the surface waters and finished drinking water for 42 Volatile Organic Compounds (VOC) and 39 Synthetic Organic Compounds (SOC). No VOCs were detected in source waters except for trace amounts of MtBE (Methyl tertiary butyl ether), a non-regulated parameter. MtBE is a gasoline additive that has received public attention recently. In some parts of the U.S., MtBE has been detectable in high amounts in source waters. The

only VOCs detected in the finished water systems were TTHMs and trace amounts of MtBE. The few SOCs that were detected were detected in both the finished and source waters and were at trace levels significantly below the maximum contaminant levels (MCLs). Specific information on these trace levels can be found in the FW Annual Report on Water Quality for 2003. The report can be accessed on the web at www.fairfaxwater.org.

During 2002, FW monitored 53 customer taps for lead and copper in accordance with the EPA regulations. FCWA met all EPA and VDH requirements for this rule and has been put on Ultimate Reduced Monitoring status due the prolonged low results. The next scheduled monitoring will be in the summer of 2005.

g. Residuals Disposal

Residuals occur as the result of heavy sediment loads entering the freshwater intakes and having to be removed from the water prior to treatment. "Maryland and Virginia farmers consider the high calcium carbonate content of the dewatered residuals to be beneficial soil additives." Residuals generated at Corbalis are presently being applied by contract to agricultural lands in Maryland and Virginia. FW is studying the possible use of polymers in lieu of lime in the dewatering process. If polymer condition dewatering becomes feasible, the solids volume for disposal may decrease.

h. Consumer Confidence Reports

Federal regulations require water suppliers to provide annual reports on the quality of the drinking water to their customers through the Consumer Confidence Report (CCR) Rule. FW customers received their first annual CCR in the summer of 1999. The 2003 Water Quality Report is available for review on the FW Web site at http://www.fairfaxwater.org.

3. Source Water Assessments

The 1996 Amendments to the Safe Drinking Water Act (SDWA) provided for source water assessment and protection programs designed to build a prevention barrier to drinking water contamination. Under SDWA, states are required to develop comprehensive Source Water Assessment Programs that identify the areas that supply public tap water, inventory contaminants, and assess water system susceptibility to contamination. Fairfax Water, through a grant from the Virginia Department of Health, has completed an inventory of potential sources of contamination and a survey of land use activities within the Potomac and Occoquan Watersheds. The Virginia Department of Health is currently reviewing the complete Source Water Assessment. This is available for review on the FCWA website at http://www.fairfaxwater.org.

4. Facilities Management

a. New Treatment Plant in Lorton

FW is building a new state-of–the–art 120 mgd (million gallons per day) water treatment plant, expandable to 160 mgd, to replace the existing Lorton and Occoquan treatment plants in Lorton. In addition to flocculation and sedimentation, the Griffith Water Treatment Plant will include advanced treatment processes of ozone disinfection and biologically active, deep bed, GAC (granular activated carbon) filtration. Construction of the plant began in the spring of 2000 and was approximately 90% completed as of July, 2004. Full use of the plant is currently scheduled by the contractor for end of 2004. The raw water pumping station associated with the new plant is completed and has a capacity of 120 mgd, expandable to 160 mgd.

b. Potomac Water Treatment Plant (Corbalis)

This plant located near Herndon, Virginia is currently treating up to 150 million gallons a day taken from an offshore intake on the bottom of the Potomac River. The third 75 mgd phase, which will bring the plant capacity up to 225 mgd, is currently under design with construction to begin in 2003 and service in 2007. The plant is designed for an ultimate capacity of 300 mgd. This utilizes ozone as a primary disinfectant, flocculation-sedimentation, biologically active filters with carbon caps, and chloramine final disinfection.

5. Regional Cooperative Water Supply Agreements

In order to protect the ecosystem of the Potomac River during low flow periods, the three major water utilities in the Metropolitan Washington area have signed water allocation agreements for water use during these 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. 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 use to create the present low flow requirements in the agreement. Further efforts are underway to determine the scientific research necessary to make a recommendation.

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. The entire report can be viewed at:
http://www.esm.versar.com/pprp/potomac/default.htm.
Click on the word workshop to see the findings for the day and a list of the panel present.

a. Interstate Commission on the Potomac River Basin (ICPRB) Cooperative Water Supply Operations (CO-OP)

The ICPRB plays several important roles in providing for the region's current and future water supply needs. The CO-OP Section facilitates the agreement among the three major water utilities (Fairfax Water is one) that require 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 was more than adequate to meet drinking water withdrawal needs by the regions major utilities in 2003. There were no releases from upstream reservoirs necessary to augment water supplies.

b. Metropolitan Washington Area Council of Governments (COG) 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 CO-OP Section works with COG and the Drought Coordination Committee to assist in providing accurate and timely information to basin residents during low-flow conditions in the Potomac. In process is a campaign targeted to specific audiences to reduce water use based on the Arizona Water Use It Wisely campaign. Based on

a poll conducted in February, 2002 for COG, many respondents did not have a basic knowledge of the water supply system. Those most likely to practice water conservation were women over 45. Those least likely to conserve water were males 18 to 24, non-bill payers, lower income residents, and renters in Washington, D.C.

K. NEW LAWS OR REGULATIONS

1. Amendments to the Chesapeake Bay Regulations

On December 10, 2002, the Chesapeake Bay Local Assistance Board (CBLAB) adopted its final amendments to the Chesapeake Bay Preservation Area Designation and Management Regulations. These amendments include a revised method to assign Resource Protection Areas (RPAs) to perennial streams. Fairfax County had until December, 2003 to submit its revised Chesapeake Bay Preservation Ordinance to CBLAB. As noted earlier in this chapter, the Board of Supervisors adopted a revised Ordinance on July 7, 2003 and accepted the revised perennial stream maps as a basis for implementation in November of 2003. CBLAB has determined that the county's revised Ordinance is consistent with the Chesapeake Bay Preservation Act and Chesapeake Bay Preservation Area Designation and Management Regulations.

2. Amendments to the Erosion and Sediment Control Ordinance

The Erosion and Sediment Control Ordinance was amended on August 4, 2003 to include the following:

- A requirement, as a condition of permit issuance, for the identification of the individual who will be in charge of and responsible for carrying out the land-disturbing activity prior to issuance of a land-disturbing permit (the requirement was previously a condition of plan approval);

- A revision to the definition of "land-disturbing activities" as the term relates to shoreline erosion control projects; the revision established that any land-disturbing activity outside of tidal waters associated with such projects is not exempt from being considered as a land-disturbing activity;

- An amendment to the definition of "land-disturbing activities" to include the placement of pavement or other impervious surfaces over existing pervious areas; and

- The incorporation of the following references:

    - The requirement for utilities and railroad companies to file general erosion control specifications annually within the commonwealth;

- The exemption of State agency projects from local ordinances; and

- The requirement for the county's approved inspection program to be in compliance with the Virginia Erosion and Sediment Control Law.

L. AWARDS

Fairfax County received recognition by the Chesapeake Bay Program as a Gold Award recipient for the second time since 1997 under the Chesapeake Bay Partner Community program. "The Chesapeake Bay Partner Community Award recognizes, encourages and supports local government in the Chesapeake Bay watershed whose actions demonstrate their commitments to protecting and restoring the Chesapeake Bay, its rivers and its streams."

M. OVERVIEW

2003 was a watershed year for stream protection and restoration efforts in Fairfax County:

-The new Chesapeake Bay Preservation Ordinance, passed in 2003, increased protection to all perennial streams by changing the performance criteria for development within the Resource Protection Areas. The new language added requirements in the information to be provided with applications for construction permits and changes to the procedures and criteria for the granting of exceptions to the Ordinance. Civil and criminal penalties are available to address violations. The DPWES perennial stream mapping project finished its work in October, 2003 and the Board of Supervisors adopted the new maps as the basis for administration of the Chesapeake Bay Preservation Ordinance on November 17, 2003, thus increasing by 52% the amount of stream and shoreline miles protected from 638 to 968 miles (including 118 miles of shoreline).

-Completion of the Watershed Management Plans for each of the county's 30 watersheds is under way; the final Draft Little Hunting Creek Watershed Plan was presented in December, 2003. The Popes Head Creek Watershed Advisory group was formed in September, 2003 and the Cameron Run Watershed citizen advisory groups were initiated in November, 2003. This countywide Watershed Restoration and Protection Strategy is the result of the recommendations of the 2001 Stream Protection Strategy Report started in 1998 and presented in 2001.

-The New Millennium Occoquan Watershed Task Force report, co-chaired by the Northern Virginia Regional Commission, was presented to the Board of Supervisors on January 23, 2003. The Task Force was established as part of the 2002 Board of Supervisors' celebrations of the 20th Anniversary of the downzoning of nearly 41,000 acres of land in the Occoquan Watershed for the purpose of protecting the Occoquan Reservoir. On July 23, 2003, county staff presented the BOS with an implementation plan responding to each of the 29 recommendations of the report.

-During 2003, the Environmental Coordinating Committee's Regional Pond Subcommittee continued its work to develop a unified position on regional ponds. The Subcommittee identified 61 recommendations to improve Fairfax County's stormwater management program and to clarify the role of regional ponds within that program. The recommendations address the use of regional ponds, suggest the inclusion of other innovative and non-structural techniques, and suggest changes in the Public Facilities Manual, stormwater policies, codes and ordinances. The Subcommittee is currently in the process of developing an implementation plan for all recommendations, including a time line and assignments.

-Much of the local work of monitoring the streams in Fairfax County is now being coordinated in the Stormwater Planning Division of the Department of Public Works and Environmental Services (DPWES); beginning in 2005, the Stormwater Planning Division will assume responsibility for the annual Stream Water Quality Report that is currently prepared by the Health Department.

This year's work adds to the previous years' works not already mentioned above:

-Infill and Residential Development Study Report, accepted by the Board of Supervisors in January of 2001, which had 29 separate recommendations addressing stormwater, erosion. and sediment control issues.

-The reformation of the Environmental Coordinating Committee under the Deputy County Executive and the work and guidance of the Environmental Coordinator have done much to coordinate environmental planning within the county.

-In September, 2002, the Board of Supervisors adopted an amendment to the Policy Plan volume of the Comprehensive Plan to revise criteria that are used to evaluate residential development proposals. This amendment includes a heightened emphasis on environmental protection, including stormwater management. *Developments should minimize off-site impacts on water quality by commitments to state of the art best management practices for stormwater management and low-impact site design techniques. . . . The volume and velocity of stormwater runoff from new development should be managed in order to avoid impacts on downstream properties. Where drainage is a particular concern, the applicant should demonstrate that off-site drainage impacts will be mitigated and that stormwater management facilities are designed and sized appropriately. Adequate drainage outfall should be verified and the location of drainage outfall (onsite or offsite) should be shown on development plans.*

However, Fairfax County streams and watersheds continue to be impacted by four basic problems:

-Although progress has been made in this area with the addition of language to the Policy Plan volume of the county's Comprehensive Plan, watershed and stream protection 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 considered adequately.

-Secondly, stormwater runoff and erosion continue to be the largest problems within 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.** The notion of "adequate outfall' theoretically exists but does not seem to exist in real time. Most Fairfax County streams have increased runoff flows that exceed the capacity of their stream channels. This has created an ongoing erosion cycle that includes eroding stream banks, heavy sediment loads, and sedimented stream bottoms. This erosion cycle persists for years, if not decades, until the stream channel widens to accommodate the flow. This has resulted in erosion problems throughout the county on trail systems, homeowners' backyards, business' landscapes, and transportation infrastructure such as bridge abutments. In addition, these ongoing erosion patterns have resulted in numerous large and small ponds and lakes throughout the county having enormous sediment deposition, which then requires frequent maintenance and dredging to maintain depth. Sediment on stream bottoms results in reduced habitat and diversity, and compromises food webs within watersheds. Sediment also compromises the quality of, and increases the expense of, treating the drinking water within the Occoquan Reservoir. Poor land use planning, inadequate enforcement of soil and erosion laws, and inadequate stormwater management in past years has significantly contributed to these erosion problems. Only a few streams, such as Walney Creek in E. C. Lawrence Park, remain undisturbed and excellent examples of healthy streams in Fairfax County.

-Thirdly, at times, high levels of fecal coliform bacteria occur in specific streams throughout the county.

-Lastly, although much of the responsibility for stream protection and restoration efforts have been coordinated within DPWES, conflicting results have occurred as stormwater management strategies and policies suggested within one area of DPWES have conflicted with waivers granted by others, often resulting in degraded stream habitat.

Much credit needs to be given to Fairfax County for pursuing its efforts in stream restoration and protection. 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 streams, the trend will continue to be a downward one.

N. RECOMMENDATIONS

1. EQAC cannot over-emphasize and support the importance of creating a Stormwater Environmental Utility Fee Program for funding of the county's watershed protection and restoration needs. The Stormwater Environmental Utility Fee program is essential to carrying out the recommendations of the Comprehensive Watershed Plans being created throughout the county.

2. EQAC recommends that increased emphasis be placed on monitoring and enforcement of predevelopment stormwater management controls and the re-examination of "adequate outfall" requirements.

   Recent research has shown that over 60% of the sediments in damaged streams are the direct result of stream bank erosion. 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. Also, expensive stream bank stabilization projects may be required. Prevention of such damage would not only be good for the environment but would also be cost effective. Prevention of this damage can be assisted by strict monitoring and enforcement of the stormwater management control system prior to construction and not allowing predevelopment runoff flows to increase during the development phase.

3. EQAC strongly recommends that Fairfax County (the Board of Supervisors, the Planning Commission, the Board of Zoning Appeals, the Fairfax County Park Authority and various county agencies) continue to develop methodology that incorporates into their land use considerations a protocol that would assist them on the individual and cumulative effect of such decisions on the county's waterways. EQAC urges them to use this information to protect the county's waters, including its lakes, streams, and drinking water supply reservoir. EQAC commends the Board for adopting Residential Development Criteria that include criteria supporting the provision of adequate drainage outfalls and innovative water quality measures; EQAC views this action as a step in the direction of satisfying this recommendation.

   Land use planning and transportation planning are the single most effective tools for the protection of streams and rivers. Structure siting, Best Management Practices, and Low Impact Development techniques could be more effectively used within the county to protect local streams.

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

   Fairfax County's stream and other water resources are a legacy to preserve and protect for today's citizens and future generations. The well conceived and well–done countywide stream assessment report was released in January, 2001. This underlying scientific examination of existing stream conditions is being used to create a well-coordinated and well-planned effort to establish priorities to protect, restore, and monitor changes to these resources using watershed and sub-watershed based strategies. EQAC strongly endorses the ongoing work of the county Board and staff in the watershed planning efforts.

EQAC continues to support:

a) Coordination of ongoing assessments of existing watersheds, to include point and non-point sources, including amounts of impervious surface and vegetative cover;

b) Maintenance and inspection of county BMPs at the highest level;

c) Provision of funding at a level that is adequate to create and implement a fully functional stream protection program;

d) The coordination of all relevant water quality and stream data and data analysis from all sources within the DPWES Stream Protection Strategy and watershed management program; and

e) The granting of a minimum number of waivers and the authority given so that all waivers must be reviewed and either accepted or denied by the stormwater management program responsible for watershed planning (i.e., the Stormwater Planning Division of DPWES).

5. This watershed protection and restoration program should also include the following:

a) Equal importance should be devoted to environmental protection, restoration, and monitoring as compared to infrastructure improvement and maintenance.

b) A Watershed Board should be established to oversee such a program and to ensure that the above conditions are met. While EQAC realizes that there is some concern about how such a board would function, EQAC feels that such a board would best be able to consider input from all stakeholders interested in watershed restoration and protection at the countywide policy level.

c) This also should include structures and practices and a timely approval process that encourages bioretention and recharge to aquatic systems, and other innovative practices to be used in the county.

6. EQAC continues to recommend posting of county streams with a health warning for fecal coliform bacteria until such time that the county conducts a study as to the source of microbiological threats. EQAC recommends that the county initiate such a study within 12 months and subsequently implement a plan to address the sources of actual threats to public health.

County streams have continued to show high coliform bacteria counts. A Total Maximum Daily Load (TMDL) for coliform bacteria has been developed for Accotink Creek and Four Mile Run due to excessive coliform bacteria counts. The sources of the pollution have been identified and steps need to be taken to remediate the problem. Human coliform bacteria have been found to be present in significant amounts. Until such a time as remediation is made, EQAC recommends the posting of signs in county streams with high coliform bacteria counts and/or a broad public information campaign that contains the following 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"*.

7. 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 degradations. EQAC further recommends a pilot program of monitoring or study on the effectiveness of stormwater detention facilities.

   While the overall reports, the Health Department Report and the Stream Protection Strategy Baseline Study (DPWES), indicate that Fairfax County streams have degrees of degradation, the specific causes are unclear. In some cases such as Kingstowne, there is adequate monitoring, and remediation, when required, has occurred. In other cases, such as Lake Martin, citizens were placed in the unfortunate position of having to monitor and document the degradation due to failed or inadequate stormwater facilities and inadequate soil and erosion enforcement.

   EQAC is, however, unclear as to which structures and requirements are effective and working well in what conditions in Fairfax County. The continued granting of stormwater waivers appears to contribute to degradation of streams despite claims to the contrary. Data should be collected.

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