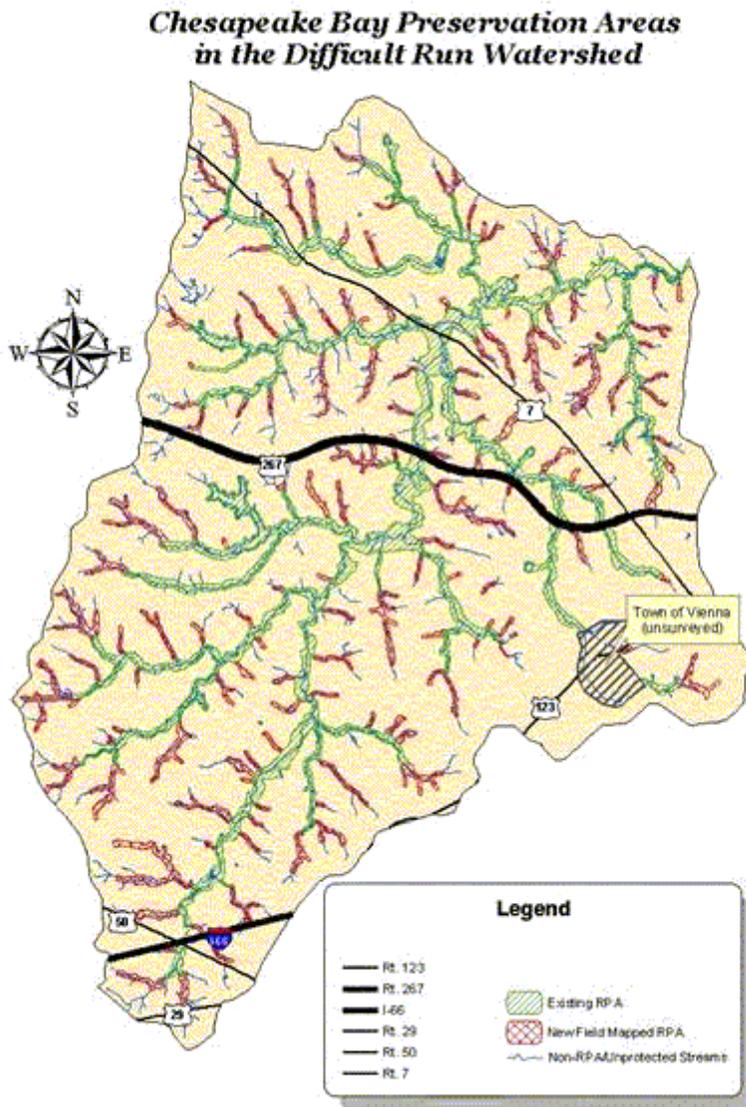


submitted to obtain a permit to develop a property. These maps can be viewed at:
<http://www.fairfaxcounty.gov/maps/nofind/PdfLoader/default.htm>

Figure 3. Visual representation of how much RPA was added after completion of the Perennial Stream Project in one watershed, Difficult Run.



In addition to identifying and mapping all perennial streams in the County, the perennial streams identification and mapping project has also helped to develop an updated stream data layer of the County's drainageways, and aided in the characterization and inventory of headwater streams by providing data on physical and ecological conditions.

Countywide Watershed Protection and Restoration Strategy

The current project (***Appendix C***) was conceived as a follow-up to the baseline SPS study, with the overall goal of developing countywide guidance for the application of selected protection and restoration strategies at the subwatershed scale. The SPS baseline study established three broad management categories for future watershed protection and restoration efforts, based primarily on overall stream rankings of biological quality and projected development. The three management categories include Watershed Protection, Watershed Restoration Level I, and Watershed Restoration Level II. The appendix contains maps of the locations of the three management categories within the County's watersheds.

The specific objectives of the Countywide Watershed Protection and Restoration Strategy project are to:

- Delineate county subwatersheds, and classify them as protected, critical, and redevelopment based on current and projected ultimate subwatershed imperviousness.
- Identify areas where the use of selected low-impact development (LID) techniques for promoting groundwater recharge is feasible.
- Map existing publicly maintained flood control only stormwater management facilities in each subwatershed and compute existing and future unit-area Total Phosphorus source loadings in the subwatersheds.
- Rank and prioritize protected, critical, and redevelopment subwatersheds for implementing LID techniques.
- Rank and prioritize subwatersheds with existing flood control only stormwater management facilities for retrofitting to provide water quality benefits.

Watershed Management Plans

The Stormwater Planning Division of DPWES is leading the effort to develop watershed management plans for all 30 adopted watersheds within the county. Watershed plan development for entire watersheds, sub-watersheds, and/or groupings of watersheds will be implemented throughout an anticipated 6 year period. The watershed plans are expected to provide an assessment of management needs, encourage public involvement and prioritize solutions within each watershed. The overall goal for the development of watershed management plans is to provide a consistent basis for the evaluation and implementation of solutions for protecting and restoring the health of receiving water, the ecological systems and other natural resources of the County.

Major milestones in the development of the County's watershed management plans in 2003 include:

- The Draft Little Hunting Creek Watershed Plan was unveiled to the community at a major public workshop in December 2003. An Issues Scoping Forum and Community Watershed Forum were also conducted in April and July respectively leading to the development of the draft plan.
- The Popes Head Creek Watershed citizen advisory group was formed in September 2003 to assist the County with the development of this watershed plan.
- The Cameron Run Watershed citizen advisory group was initiated in November 2003 to assist the County with the development of this watershed plan.

The development of comprehensive watershed management plans is expected to include but is not limited to the following tasks preliminarily identified:

1. Review and synthesis of previous studies, and data compilation

Previous studies - This task will entail a detailed review of previous studies performed for the watersheds. The results and recommendations from previous studies will be summarized and re-evaluated upon completion of this project. Previous studies include:

- Basin drainage plans (completed in 1979, based on projections through 2000)
- Regional Stormwater Management Plan (completed in 1988)
- Stream Protection Strategy (SPS) baseline study and follow-up Watershed Protection and Restoration Strategies study
- Northern Virginia Regional Commission's Occoquan Program and Watershed Model
- Fairfax County Water Authority's Source Water Assessments for the Occoquan and Potomac intakes
- Existing small watershed management plans
- Other *ad hoc* studies (e.g. Infill & Residential Development Study)

Data compilation - As part of this task, all available data to support the development of management plans for the watershed(s) under study will be compiled, including:

- Physical Stream assessment data to be acquired through a concurrent consultant contract
- Baseline and on-going SPS study biological assessment data
- County GIS data layers
- County water quality monitoring data
- Other state and federal water quantity and quality monitoring data

2. Evaluation of current conditions, and a projection of ultimate development conditions

Conditions - This task will consist of technical analyses to identify flooding, channel erosion, and water quality problems in the watershed(s) under current and predicted ultimate development conditions. This will typically involve the development of appropriate hydrologic/hydraulic and water quality models to allow formalization of cause-effect relationships. The analyses should include:

- Selection of sub-watershed scale
- Soils, land-use and impervious cover characterization
- Non-point and point source pollution assessment
- Prediction of future land-use based on zoning and comprehensive plan
- Development of appropriate water quantity and quality models
- Identification of current and potential future problem areas
- Consideration of TMDL-listed streams and Virginia's tributary strategy for the Potomac

3. Development of non-structural and structural watershed management alternatives

Watershed management alternatives - Under this task, alternative strategies for mitigating potential problems identified previously under Task 2 will be evaluated. This will involve representation of alternative strategies within the models developed previously and assessment of predicted impacts. Structural and non-structural strategies may include:

- Density restrictions
- Land Acquisition
- Buffer zones
- Source controls
- Public outreach
- Low-impact development type controls
- Conventional structural controls

4. Capital Project implementation options including preliminary cost estimates, cost/benefit analysis, and prioritization

Cost estimates, cost/benefit analysis - Under this task, an economic analysis of structural controls proposed under Task 3 will be performed. Each project will be characterized by the effectiveness in providing flood control, stream erosion control and water quality benefits. Costs associated with construction, land acquisition, and maintenance/operation will be determined. A ranking and prioritization scheme will be developed to provide preliminary project recommendations taking into consideration cost-effectiveness, implementation likelihood, and sustainability. Typical project types to be considered include but are not limited to:

- Stream restoration
- Stream day-lighting
- Stream bank stabilization
- Innovative BMP implementation
- BMP Retrofits
- House Flood-proofing
- Flood Control
- Regional stormwater controls
- Log-jam removal

5. Public Involvement Program

Public involvement program – Fairfax County is committed to engaging its citizens in planning because the County recognizes that better dialogue will lead to better decisions for protecting the environment. In the past, public dialog was limited to public presentations rather than engagement resulting in project oppositions, delays and unhappy customers. The County is more progressive and proactive by engaging the public at all levels of the watershed planning program. This will be an integral part of the development of watershed management plan(s). Input received from the public will be used to guide decisions at all stages of the watershed plan development. The public involvement program will include:

- An advisory group representing a diversified community interests and stakeholders throughout the watershed is formed to frame the problems to be addressed, propose solutions and strategies for their implementation, investigate approaches and feasibility to achieve proposed solutions, engage all interested constituencies throughout the process, and achieve community buy-in and solidify support for the final plan(s).
- Four public involvement meetings opened to all interested parties are scheduled at key milestones during the planning process. The four meetings include; issues scoping forum, community watershed forum, draft plan review workshop, and final plan review workshop.
- The County encourages and offers assistance for the formation of community watershed groups (i.e., "Friends of..." groups) for each watershed to maximize community involvement in all phases of the watershed program and promote long-term stewardship.
- The County is pursuing an overall Public Education Campaign (concurrent with watershed planning effort). An interactive watershed web page has been developed to provide citizens with help finding their watershed, learn the status of plan development

and gain information on how to get involved at

<http://www.fairfaxcounty.gov/Watersheds>

6. Documentation of watershed management plan

Documentation - The results of all previous tasks will be consolidated into a document detailing the recommended watershed management plan. The document will also define a process to monitor, measure the success of, and modify the watershed management plan as necessary in the short-term and long-term. The preferred method of final delivery will be a GIS-based analytical tool that encapsulates the data and methodology used in developing the watershed management plan.

Chesapeake Bay Preservation Ordinance

The Chesapeake Bay Preservation Ordinance (CBPO), Chapter 118 of The Code of the County of Fairfax, Virginia, was adopted by the Board of Supervisors on March 22, 1993, and became effective July 1, 1993. This ordinance protects certain areas along the corridor of streams designated as RPAs, from most development and requires that the remaining areas outside RPAs be designated as Resource Management Areas (RMAs). The amendments also included changes to the performance criteria for development and redevelopment in RPAs and RMAs; changes in the information to be provided with plans of development in applications for construction permits; and changes to the procedures and criteria for the granting of exceptions to the requirements of the Chesapeake Bay Preservation Ordinance. This Ordinance is enforced through the development review and inspection process, which assures that the development plans address the requirements of the ordinance and are constructed as approved. Civil and criminal penalties are available to address violations.

The Board of Supervisors held a public meeting on May 19, 2003, about possible perennial stream amendments to the CBPO and adopted the amendments during their regularly scheduled Board meeting on November 17, 2003. These amendments became effective on November 18, 2003. The amendments to the Public Facilities Manual of Fairfax County were adopted on July 7, 2003, and also became effective on November 18, 2003, to include those areas that the Board designated as RPAs and RMAs. RPA and RMA components are identified in § 118-1-7 of the Code. Performance criteria have been established which require that there shall be water quality control measures designed to prevent a net increase in non-point source pollution from new development.

DPWES enforces compliance with the Chesapeake Bay Preservation Ordinance through the development review and inspection process. In addition, DPWES has the responsibility for assuring that development plans address the requirements of the ordinance as well as are constructed as approved. During 2003, DPWES received 434 site, subdivision and public improvement plans for review and approval, of these, 210 were first submission plans (a plan may be submitted multiple times before approval is granted).

The NVSWCD develops soil and water quality conservation plans for all land in agricultural use. In most cases in Fairfax County, these are horse-keeping operations. The plans are written to comply with the Chesapeake Bay Preservation Act guidelines to include best management practices to reduce: sediment pollution from erosion; excess nutrients from animal waste and fertilizers; and misuse of pesticides and herbicides. The plans also prescribe riparian buffers for Resource Protection Areas (RPAs). As required by county ordinance, soil and water quality conservation plans are developed for all Agricultural and Forestal Districts in the County. Plans are updated and technical assistance is provided by NVSWCD as

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needed. The 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.

In 2003, 14 soil and water quality conservation plans were developed for 1000 acres and included 23,348 linear feet of RPAs. 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.

Regional Pollution Prevention Outreach Strategy - NVRC continues to work with several local governments (including Fairfax County) and the Potomac Watershed Roundtable's Public Education and Outreach Committee on the development of a regional pollution-prevention outreach strategy. Excess nutrients are a key threat to the health of the Chesapeake Bay and the Potomac River. In response, NVRC has targeted three nutrient pollution-causing behaviors: over-use of fertilizers, dog waste left on the ground, and car washing where soap suds drain to the storm sewer. NVRC is requesting information on any jurisdictional plans to address these and other targeted behaviors. This information will better enable NVRC to look at ways a regional strategy can supplement, support, or enhance local efforts in terms of timing, reach, and message.

Coastal Program Pollution Prevention Media Strategy -Working with local jurisdictions, NVRC prepared a media strategy report to address the problem of stormwater pollution. The report addresses the pollution-causing behaviors to be targeted, target audience demographics, messages, media options, and budget alternatives. In addition, the report contains findings regarding the basics of behavior change, conservation communications challenges, market research, effective messages, media considerations, and "earned" or unpaid media coverage. The information contained in the report is intended to be a useful reference for any conservation-related communications effort.

NVRC is coordinating the proposed regional campaign with that of the larger Chesapeake Bay Program. It is expected that local participation in the campaign will address the outreach requirements of a number of existing programs, including MS4 stormwater programs, Total Maximum Daily Load implementation, and Potomac Tributary Strategies. Upon acceptance by government partners, NVRC will coordinate implementation. NVRC will report to the Virginia Department of Environmental Quality on implementation progress and will make an assessment of the effectiveness of a regional approach.

Accotink Creek Total Maximum Daily Load

In 1998, 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 Virginia 303(d) Total Maximum Daily Load (TMDL) priority list for fecal coliform impairment. As a result of this, Fairfax County Health Department entered into a partnership with the United States Geological Survey (USGS), the Virginia Department of Conservation and Recreation (DCR), and Virginia Department of Environmental Quality (DEQ) to pursue a bacteria source tracking study for Accotink Creek as part of a statewide study, **Figure 4**. The initial study results indicated that the sources of bacteria are distributed as follows; 40% waterfowl, 20% human, 13% dogs, 5.4% raccoon, 1.4% deer, and 21% other.



Figure 4. SPS member stream gauging in TMDL Study

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Based on the results of this initial study, DEQ developed and submitted a TMDL to the US-EPA in 2002 that included a goal to reduce the human sources of fecal coliform bacteria by 99%. The TMDL for Accotink Creek was approved by US-EPA in July 2002. As a follow-up step to the TMDL, USGS initiated another study in cooperation with Fairfax County Stormwater Planning Division (SWPD), City of Fairfax, and DCR to help identify the distribution of fecal coliform and locate the precise sources of human fecal coliform inputs to Accotink Creek. This second study began in mid-to-late 2001 and will continue for 3 years. The field-work portion of the study is anticipated to be completed in late 2004. Staff from the SWPD is currently assisting the USGS in the field sampling efforts and laboratory analysis for certain parameters.

So far, five sampling campaigns of the eight planned have been completed. In 2003, due to large amounts of rain throughout the entire year, scheduling sampling campaigns became extremely difficult. Because of this abnormally wet year, only one sampling campaign was completed. A few other sampling campaigns were started, but had to be abandoned due to the occurrence of rain in the middle of the campaign. The total number of samples as well as the breakdown of sample types taken within the watershed can be found in the following table:

Table 1. Breakdown of TMDL Sampling Campaigns

<i>Dates of Campaign</i>	<i>Total # of Samples Taken</i>	<i># of Main Channel Samples</i>	<i># of Storm Drain Samples</i>	<i># of Tributary Samples</i>
December 3-7, 2001	110	15	40	55
April 2-5, 2002	123	16	52	55
July 8-12, 2002	96	16	41	39
October 21-24, 2002	90	15	29	46
April 14-17, 2003	123	19	48	56

These first five sampling events are surveys of the watershed, and they help identify all potential contributing tributaries, storm drains, sewer lines, and septic systems. The range in total number of samples taken is due to the seasonal variability of natural stream flow. This is most obvious in the number of stormdrain samples collected during the October 21-24, 2002 campaign when the region was experiencing a severe drought. Only indicator tracers (such as Fecal Coliform bacteria, turbidity, surfactants, temperature, and dissolved oxygen) were applied during the first two sampling campaigns. Bacteria Source Tracking (BST) and organic tracers are used selectively during campaigns 3-8. In campaign #5, approximately 20 more sites were added to better describe water-quality conditions in certain portions of the study area. In future campaigns, sampling locations may be further refined to help identify more specific areas demonstrating contamination. During these campaigns, some sampling stations will be eliminated while new ones will be added. Throughout the final campaigns, there will also be continued focus on stormdrains that flow during dry periods, as well as sampling locations exhibiting elevated levels of fecal coliform and other contamination tracers.

The data compiled from this study will help provide the County with a better understanding of the transport mechanisms and sources of the human wastewater signal in Accotink Creek. Ultimately, this study will support a cost-effective implementation plan for a TMDL addressing water quality impairments based on violations of the state's fecal coliform and E. coli bacteria water quality standard. The USGS has published a paper specifically on their project in the Accotink Creek watershed of Fairfax County. This report outlines the techniques and methods used in the study and development of the fecal coliform TMDL for Accotink Creek. It can be viewed and downloaded from the web at: