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Executive Summary

The Lower Occoquan Watershed Management Plan illustrates an approach for improving the water resources, natural habitat and overall health of the watershed. The plan was initiated by Fairfax County with participation from local residents and is part of the comprehensive, countywide watershed planning effort. The previous watershed plans were developed in the mid-1970s and intended to span a 25-year period. Since then the practice of stormwater/watershed management has rapidly evolved to include newer technologies and innovative techniques. Also within this time period, there have been many regulatory changes governing water quality at the local, state and federal levels. This plan is intended as a management tool to be used over the next 25 years and fulfills Fairfax County's commitment to the multijurisdictional effort of improving water quality in the Chesapeake Bay.

The *Lower Occoquan Watershed Management Plan* was developed to meet the following countywide watershed planning goals established by the County through intensive stakeholder and resident input:

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

Background

The Lower Occoquan watershed is a collection of several small watersheds within Fairfax County that drain into the Bull Run/Occoquan River System. The largest streams in the area are Wolf Run, Sandy Run and Giles Run. There are numerous smaller tributaries that drain directly into the river. Fountainhead Regional Park, Mason Neck State Park and the Mason Neck National Wildlife Refuge are all located in the Lower Occoquan watershed. The watershed also includes the Laurel Hill redevelopment area (formerly the District of Columbia Department of Corrections facility).

All but the southern portion of the watershed is located within the Water Supply Protection Overlay District (WSPOD), established to protect the Occoquan Reservoir. Additionally, most of the northern portion is located within a Residential-Conservation (R-C) District, which limits development to large-lot residential areas, in order to protect streams and water quality. Therefore, the dominant land uses in the watershed are estate residential and open space. Minimal new development is expected, although redevelopment of existing areas will occur in the watershed. The *Lower Occoquan Watershed Management Plan* is a tool to be used to maintain the water quality in the watershed and target areas for improvement.

Watershed Management Areas

Lower Occoquan watershed is divided into 10 smaller watershed management areas (WMAs). A WMA is a small area, approximately 4 square miles, which drains to a specific stream or tributary. Each WMA is then divided into smaller subwatersheds, typically 100 to 300 acres. The purpose of these areas is to identify specific projects or opportunities to enhance the overall stream conditions, as well as to serve as the basic units for watershed modeling and other evaluations. Lower Occoquan's 10 watershed management areas listed in geographical order from northwest to southeast are Old Mill Branch, Wolf Run, Ryans Dam, Sandy Run, Occoquan, Giles Run North, Mill Branch, Giles Run South, Kane Creek, and High Point.

Watershed Planning Process

In general, the watershed management planning process consists of the following steps:

1. Review and synthesize previous studies and compile data.
2. Involve public to gain input, provide education and build community support.
3. Evaluate current watershed conditions and project stormwater runoff from present and ultimate development conditions.
4. Develop candidate non-structural and structural watershed improvement projects.
5. Develop preliminary cost estimates, cost-benefit analysis and prioritization of capital projects.
6. Gain adoption of the final watershed management plan by the Board of Supervisors.

Several indicators were identified to detect changes in the watershed. The main categories of indicators are watershed impact indicators, watershed source indicators and programmatic indicators. These indicators were first used to assess the existing conditions and the future conditions without plan implementation in the watershed. Next they were used to identify management needs and problem areas during subwatershed ranking. Finally, the indicators were used to prioritize projects, along with cost and feasibility.

The subwatersheds were ranked by the following procedure:

1. Using the watershed impact overall composite scores to identify subwatersheds that were potential problem areas under existing and future conditions.
2. Applying individual source indicator scores to identify potential sources of impacts in downstream problem areas.
3. Using the programmatic indicator data inventory to identify subwatersheds where management is most needed.
4. Consulting available field data throughout the previous steps to confirm the results.

Summary of Existing Watershed Conditions

As a result of minimal development, large parks and open space, the overall stream habitat condition of the watershed is considered good to excellent. The Lower Occoquan watershed contains some of the highest stream quality in Fairfax County. The 2001 *Fairfax County Stream Protection Strategy Baseline Study (SPS)* gave ratings of “excellent” to “fair” for various streams in the watershed. The follow-up to this study, the 2005 *Fairfax County Stream Physical Assessment* (2005 SPA) also showed that the streams in the Lower Occoquan were generally above average for Fairfax County.

As one of many measures used to protect stream water quality, the County adopted the Chesapeake Bay Preservation Ordinance, which limits development on land that lies within a Resource Protection Area (RPA). RPAs are buffers adjacent to or near the shorelines of streams, rivers and other waterways that protect sensitive areas from the excessive influx of pollutants. The sensitive areas include tidal and non-tidal wetlands, tidal shorelines, floodplains and perennial streams (waters flowing year-round). More than 50 percent of the streams within the Lower Occoquan watershed lie within an RPA.

To meet the standards of the Clean Water Act, the County and Virginia Department of Environmental Quality regularly monitor water quality at various locations throughout the watershed. Lower Occoquan had relatively few locations considered “impaired,” but these include portions of Wolf Run, Mill Branch, Belmont Bay, Occoquan River and Occoquan Bay. A complete summary of watershed conditions may be found in Appendix A

Project Selection

Several types of both structural and non-structural projects were selected for this watershed restoration plan. The structural projects include stream restorations, pipe daylighting, stormwater pond retrofits, outfall improvements, swale restorations and bioretention areas. The non-structural projects include rain barrels, cisterns, street sweeping, reforestations and buffer restorations.

Projects were proposed throughout the watershed that would help meet the County’s goals and objectives. Projects to improve watershed functions were proposed in subwatersheds with the worst indicator scores. Additional projects were proposed throughout the watershed that would increase stewardship and maintain important watershed functions. Projects were selected by comparing the lowest scoring impact indicators to the types of proposed projects to ensure projects would provide the most benefit within each subwatershed. The proposed projects were then presented at the watershed advisory group (WAG) meetings for community input. This input was taken into consideration while finalizing project selection and during the score adjustment procedure.

Following preliminary project selection, field investigations were performed for the candidate project sites. The purpose of the field investigations was to document site conditions, check for feasibility and take photos. The information was then compiled in a database. The information was used for the prioritization and to support ranking modifications.

Cost estimates were generated for all project types except street sweeping, rain barrels and cisterns, because their costs can be widely variable. Smaller projects were grouped together into “suites,” based on cost and location, to allow their costs and benefits to be compared more evenly to other projects.

Project Prioritization

The *Lower Occoquan Watershed Management Plan* implementation is divided into two priority phases. The first phase has a 0 – 10-year timeframe and includes the top-ranked 21 structural projects. The second phase has an 11 – 25-year timeframe and includes all other viable structural projects, a total of 62 projects. The structural projects were prioritized based on five factors: impact indicators, source indicators, priority subwatersheds, sequencing and implementability. These factors were used to create prioritization scores for each project so that they could then be ranked. Once the projects were quantitatively ranked, they were qualitatively reviewed. The qualitative review involved going through every project and considering factors that aren’t quantitatively considered, such as comments provided by the WAG group, field observations and the ability for the project to meet the County’s goals. A best professional judgment adjustment was added to the initial score to determine the final score.

Due to the higher quality conditions of this watershed group, there were considerably fewer projects in the “priority”, or 10-year, group than compared to other watershed plans in the

County. Another reason that the Lower Occoquan Watershed Plan had fewer projects was that part of the watershed, the Laurel Hill property, is being redeveloped. The stormwater management plan developed for this property is separate from the Lower Occoquan WMP.

A simplified cost-benefit analysis was performed on the structural projects in the 0 – 10-year implementation plan based on a project's overall cost compared to its prioritization score (i.e., benefits). A best professional judgment adjustment based on the cost-benefit analysis was used to amend the rankings where necessary, which determined the final overall ranking of structural projects.

The 19 non-structural projects were ranked separately since they will be implemented concurrently with the capital improvement of the structural projects. The non-structural projects were ranked using a different more qualitative method than the structural project ranking scheme. A detailed description of the project selection and prioritization process can be found in Appendix B.

Project Fact Sheets

Project fact sheet were created for all structural projects that fall into the 10-year plan. These fact sheets include: basic information about location, existing conditions and proposed improvements. The project fact sheets also discuss the benefits and have itemized, planning-level cost estimates. They are illustrated with location maps. Projects that were grouped together, or put into a "suite," were combined on one fact sheet.

Public Involvement

A WAG was formed to help provide feedback from residents of the watershed. The group was assembled from a variety of organizations, including members of homeowners associations, George Mason University, and other public and private organizations. This group acted as proxy for their respective organizations and helped to disseminate information from the process. The group met with County staff and their consultants five times throughout the different stages of the process to provide feedback, which was an essential part of the planning and prioritization process.

Table ES-1-1 provides a list of all projects proposed within Lower Occoquan watershed. This includes the 0 – 10- (10-year) and 11 – 25-year (25-year) structural project groups as well as the non-structural projects.

Plan Costs and Benefits

The total cost of the 0-10-year plan (includes 21 structural projects only) is $12 million. The benefits to the county are wide-ranging. The yearly total suspended sediment load will be reduced by 260 tons if the 0-10-year plan is implemented. Nitrogen will be reduced by an additional 420 pounds and phosphorus will be reduced by 170 pounds annually. This represents a 4% reduction in sediment loads, and 1% reductions in nitrogen and phosphorus. If the additional 62 structural projects in the 11-25 year plan are implemented (at a cost of $50 million), the annual suspended sediment load will be reduced by an additional 790 tons. Nitrogen will be reduced by an additional 1250 pounds yearly and phosphorus by an additional 460 pounds yearly. If the entire 0-25 year plan (83 structural projects) is implemented, at a cost of $62 million, the suspended sediment load will be reduced by 1050 tons annually, and nitrogen and phosphorus will be reduced by 1670 and 630 pounds annually, respectively. This represents a 15.1% reduction in sediment, a 2.0% reduction in nitrogen, and a 4.2% reduction in phosphorus. Additionally, the 19 non-structural projects will have water quality benefits as well, although the costs and benefits of these projects are less easily quantified. These benefits will help attain the goals set by the County to improve water quality in the Lower Occoquan watershed.

The following provisions address the funding and implementation of projects and programs in Fairfax County watershed plans. These provisions as recommended by the Board were developed for the Popes Head Creek Watershed Management Plan in February 2006 and have been applied to the Lower Occoquan Watershed Management Plan:

i. Projects and programs (both structural and non-structural) will first undergo appropriate review by County staff and the Board (please see iii below) prior to implementation. Board adoption of the Watershed Management Plan will not set into motion automatic implementation of projects, programs or initiatives that have not first been subject to sufficient scrutiny to ensure that the projects that are funded give the County the greatest environmental benefit for the cost.

ii. Road projects not related to protection of streambeds or banks or water quality will not be funded out of the stormwater and watershed budget.

iii. The Watershed Management Plan provides a conceptual master-list of structural capital projects and a list of potential non-structural projects for the watershed. Staff will, on a fiscal year basis, prepare and submit to the Board a detailed work plan to include a description of proposed projects and an explanation of their ranking, based on specific criteria. Criteria used to assemble this list will include, but are not limited to, cost-effectiveness as compared to alternative projects, a clear public benefit, a need to protect public or private lands from erosion or flooding, a need to meet a specific watershed or water quality goal, and ability to be implemented within the same fiscal year that funding is provided. Staff also intends to track the progress of implementation and report back to the Board periodically.

iv. Each project on the annual list of structural projects will be evaluated using basic value-engineering cost effectiveness principles before implementation and the consideration of alternative structural and non-structural means for accomplishing the purposes of the project will be considered before implementation. This process will ensure the County's commitment to being a fiscally responsible public entity.

v. Obstruction removal projects on private lands will be evaluated on a case-by-case basis for referral to the Zoning Administrator and/or County Attorney for action as public nuisances; and otherwise to determine appropriate cost-sharing by any parties responsible for the obstructions.

Stream restoration projects on private lands will be evaluated to determine means for cost-sharing by land owners directly responsible for degradation due to their land uses

Table ES-1-1: Project List - Executive Summary

Priority Structural Projects (10-Year Implementation Plan)[1]				
Project #	**Project Type**	**WMA**	**Location**	**Cost**
KC9209	Stream Restoration	Kane Creek	Behind 10809 Harley Rd.	$ 840,000
MB9104	Stormwater Pond Retrofit	Mill Branch-Giles Run South	10418 Old Colchester Rd. (Mason Neck West Park)	$ 240,000
MB9105	Stormwater Pond Retrofit	Mill Branch-Giles Run South	Across from 10555 Furnace Rd.	$ 280,000
MB9107	Stormwater Pond Retrofit	Mill Branch-Giles Run South	10119 Giles Run Rd.	$ 130,000
MB9109	Stormwater Pond Retrofit	Mill Branch-Giles Run South	8115 Mims St.	$ 290,000
MB9111	Stormwater Pond Retrofit	Mill Branch-Giles Run South	9816 Richmond Hwy.	$ 180,000
MB9114	Stormwater Pond Retrofit	Mill Branch-Giles Run South	9850 Furnace Rd. (I-95 Landfill)	$ 160,000
MB9122	Stormwater Pond Retrofit	Mill Branch-Giles Run North	Behind 8605 Cross Chase Court	$ 190,000
MB9202	Stream Restoration	Mill Branch-Giles Run South	10207 Old Colchester Rd.	$ 720,000
MB9506	BMP/LID	Mill Branch-Giles Run South	9850 Furnace Rd, Lorton (I-95 Landfill)	$ 110,000
MB9510	BMP/LID	Mill Branch-Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)	$ 220,000
SA9201	Stream Restoration	Sandy Run	Next to 8721 Birch Cliff Dr.	$ 780,000
SA9209	Stream Restoration	Sandy Run	Near 10746 Beechnut Ct.	$ 600,000
SA9211	Stream Restoration	Sandy Run	Behind 6901 Streamwood Pl.	$ 360,000
SA9213	Stream Restoration	Sandy Run	6650 Rutledge Dr.	$ 560,000
SA9701	Outfall Improvement	Sandy Run	Near 11223 Silverleaf Dr.	$ 150,000
WR9201	Stream Restoration	Wolf Run	Behind 12101 Henderson Rd.	$ 1,120,000
WR9208	Stream Restoration	Wolf Run	Near 12025 Seven Hills La.	$ 1,050,000
WR9209	Stream Restoration	Wolf Run	12060 Rose Hall Dr.	$ 1,420,000

[1] Only 10-yr structural projects will have associated project fact sheets at the end of section 5.

Priority Structural Projects (10-Year Implementation Plan)[1]				
Project #	**Project Type**	**WMA**	**Location**	**Cost**
WR9211	Stream Restoration	Wolf Run	Behind 11724 Amkin Dr.	$ 1,160,000
WR9212	Stream Restoration	Wolf Run	7610 Maple Branch Rd.	$ 1,420,000
Total Cost				**$ 11,980,000**

Long-Term Structural Projects (25-Year Implementation Plan)[1]			
Project #	**Project Type**	**WMA**	**Location**
KC9203	Stream Restoration	Kane Creek	6407 High Point Rd. (Mason Neck State Park)
KC9204	Stream Restoration	Kane Creek	6408 High Point Rd. (Mason Neck State Park)
KC9205	Stream Restoration	Kane Creek	6409 High Point Rd. (Mason Neck State Park)
KC9208	Stream Restoration	Kane Creek	Behind 10800 Harley Rd.
KC9210	Stream Restoration	Kane Creek	Across from 10417 Gunston Rd.
MB9106	Stormwater Pond Retrofit	Mill Branch- Giles Run South	10301 Richmond Hwy
MB9108	Stormwater Pond Retrofit	Mill Branch- Giles Run South	10109 Giles Run Rd.
MB9117	Stormwater Pond Retrofit	Mill Branch- Mill Branch	Behind 8940 Highgrove Ct.
MB9119	Stormwater Pond Retrofit	Mill Branch- Giles Run North	Near 9300 Cardinal Forest La.
MB9120	Stormwater Pond Retrofit	Mill Branch- Giles Run North	9001 Southpointe La. (Behind Cul-de-sac)
MB9121	Stormwater Pond Retrofit	Mill Branch- Giles Run North	8850 Cross Chase Circle (William Halley Elementary School)
MB9123	Stormwater Pond Retrofit	Mill Branch- Giles Run North	Behind 8628 Meadow Edge Terr.
MB9124	Stormwater Pond Retrofit	Mill Branch- Giles Run North	Behind 9210 Cross Oaks Ct.
MB9125	Stormwater Pond Retrofit	Mill Branch- Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)
MB9205	Stream Restoration	Mill Branch- Mill Branch	9751 Ox Rd (Occoquan Regional Park, Site 1)
MB9206	Stream Restoration	Mill Branch- Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 3)
MB9207	Stream Restoration	Mill Branch- Mill Branch	Across street from 8932 Lorton Rd.

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Long-Term Structural Projects (25-Year Implementation Plan)[1]			
Project #	**Project Type**	**WMA**	**Location**
MB9208	Stream Restoration	Mill Branch-Giles Run North	8301 Lorton Rd.
MB9209	Stream Restoration	Mill Branch-Giles Run North	8300 Newby Bridge Dr.
MB9210	Stream Restoration	Mill Branch-Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)
MB9212	Stream Restoration	Mill Branch-Giles Run North	8921 Cross Chase Cir.
MB9213	Stream Restoration	Mill Branch-Giles Run North	8601 Cross View
MB9502	BMP/LID	Mill Branch- Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 5)
MB9504	BMP/LID	Mill Branch-Giles Run South	10100 Gunston Rd. (Gunston Elementary School)
MB9509	BMP/LID	Mill Branch-Giles Run North	8285 Glen Eagles La. (Christ Church United Methodist Inc.)
MB9511	BMP/LID	Mill Branch-Giles Run North	8275 Glen Eagles La. (Crosspointe Swim and Racquet Club)
OC9101	Stormwater Pond Retrofit	Occoquan	Behind 9340 Davis Dr.
OC9102	Stormwater Pond Retrofit	Occoquan	Behind 9270 Davis Dr.
OC9203	Stream Restoration Suite	Occoquan	Behind 9307 Denali Way
OC9204	Stream Restoration	Occoquan	10450 Van Thompson Rd.
OC9207	Stream Restoration Suite	Occoquan	Behind 9035 Palmer Dr.
OC9208	Stream Restoration	Occoquan	Behind 9520 Elk Horn Rd.
OM9201	Stream Restoration	Old Mill Branch	Near 12505 Old Yates Ford Rd. (Fountainhead Regional Park)
OM9202	Stream Restoration	Old Mill Branch	Behind 8100 Flossie La.
OM9203	Stream Restoration	Old Mill Branch	Behind 12606 Clifton Hunt La.
OM9205	Stream Restoration	Old Mill Branch	Behind 12990 Wyckland Dr.
OM9206	Stream Restoration	Old Mill Branch	Behind 12995 Wyckland Dr.
OM9207	Stream Restoration	Old Mill Branch	Behind 7859 My Way Dr.
RD9201	Stream Restoration	Ryans Dam	Near 8517 Wolf Run Shoals Rd.

[1] Only 10-yr structural projects will have associated project fact sheets at the end of section 5.

Long-Term Structural Projects (25-Year Implementation Plan)[1]			
Project #	**Project Type**	**WMA**	**Location**
RD9202	Stream Restoration	Ryans Dam	Behind 11470 Robert Stephens Dr.
SA9101	Stormwater Pond Retrofit	Sandy Run	Next to 9699 Thorn Bush Dr.
SA9102	Stormwater Pond Retrofit	Sandy Run	8120 Ox Rd.
SA9103	Stormwater Pond Retrofit	Sandy Run	Behind 7401 Wayfarer Rd.
SA9105	Stormwater Pond Retrofit	Sandy Run	Behind 7200 Ox Rd.
SA9205	Stream Restoration Suite	Sandy Run	Behind 10901 Henderson Rd.
SA9206	Stream Restoration	Sandy Run	Across street from 11100 Devereux Station La.
SA9207	Stream Restoration Suite	Sandy Run	Near 11212 Hunting Horse Dr.
SA9208	Stream Restoration	Sandy Run	10608 Daysailer Dr.
SA9212	Stream Restoration	Sandy Run	6572 Ox Rd.
SA9214	Stream Restoration	Sandy Run	6635 Rutledge Dr.
SA9702	Outfall Improvement	Sandy Run	Behind 11204 Silver Leaf Dr.
WR9206	Stream Restoration	Wolf Run	Near 7900 Wolf Run Hills
WR9210	Stream Restoration	Wolf Run	7501 Amkin Ct.
WR9213	Stream Restoration	Wolf Run	Behind 7433 Clifton Rd.
WR9214	Stream Restoration	Wolf Run	7121 Swift Run Trails Dr.
WR9217	Stream Restoration	Wolf Run	12013 Corral Dr.
WR9218	Stream Restoration	Wolf Run	11047 Lilting La.
WR9219	Stream Restoration	Wolf Run	11418 Lilting La.
WR9220	Stream Restoration	Wolf Run	11806 Yates Ford Rd.
WR9221	Stream Restoration	Wolf Run	11721 Yates Ford Rd.
WR9222	Stream Restoration	Wolf Run	11543 Lilting La.
WR9223	Stream Restoration	Wolf Run	11543 Lilting La.

[1] Only 10-yr structural projects will have associated project fact sheets at the end of section 5.

Non-Structural Projects[1]			
Project #	**Project Type**	**WMA**	**Location**
HP9801	Buffer Restoration	High Point	Near 10709 Gunston Rd. (Gunston Hall Plantation)
MB9505	BMP/LID	Mill Branch- Giles Run South	10100 Gunston Rd. (Gunston Elementary School)
MB9507	BMP/LID	Mill Branch- Giles Run North	8850 Cross Chase Circle (William Halley Elementary School)
MB9512	BMP/LID	Mill Branch- Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)
MB9801	Buffer Restoration	Mill Branch- Giles Run South	Behind 10463 Greene Dr.
MB9802	Buffer Restoration	Mill Branch- Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 2)
MB9803	Street Sweeping Program	Mill Branch- Giles Run South	8386 Old Vicarage St.
MB9804	Buffer Restoration	Mill Branch- Mill Branch	Next to 8936 Lorton Rd.
MB9805	Street Sweeping Program	Mill Branch- Giles Run North	Near 8327 Bluebird Way
MB9806	Buffer Restoration Suite	Mill Branch- Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)
MB9807	Buffer Restoration Suite	Mill Branch- Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 2)
MB9808	Street Sweeping Program	Mill Branch- Giles Run North	Near 8709 Lorfax Dr.
MB9809	Street Sweeping Program	Mill Branch- Giles Run North	Near 9413 Eagle Glen Ter.
MB9810	Street Sweeping Program	Mill Branch- Giles Run North	Behind 9105 Oak Chase Ct.
MB9811	Buffer Restoration	Mill Branch- Giles Run North	Next to 9527 Crosspointe Dr.
MB9812	Street Sweeping Program	Mill Branch- Giles Run North	Near 8409 Crosslake Dr.
SA9801	Buffer Restoration	Sandy Run	Next to 10711 Sandy Run Trail
SA9802	Buffer Restoration	Sandy Run	10600 Hunting Shire La.
SA9803	Other	Sandy Run	Behind 6909 Heathstone Ct.

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

1.0 Introduction

1.1 Introduction to Watersheds

Figure 1-1: Diagram of a watershed

A watershed is an area of land that drains all of its water to a specific lake or river. As rainwater and melting snow run downhill, they carry sediment and other materials into our streams, lakes, wetlands and groundwater.

The boundary of a watershed is defined by the watershed divide, which is the ridge of highest elevation surrounding a given stream or network of streams. A drop of rainwater falling outside of this boundary will enter a different watershed and will flow to a different body of water.

Streams and rivers may flow through many different types of land use in their paths to the ocean. In the above illustration from the U.S. Environmental Protection Agency, water flows from agricultural lands to residential areas to industrial zones as it moves downstream. Each land use presents unique impacts and challenges on water quality.

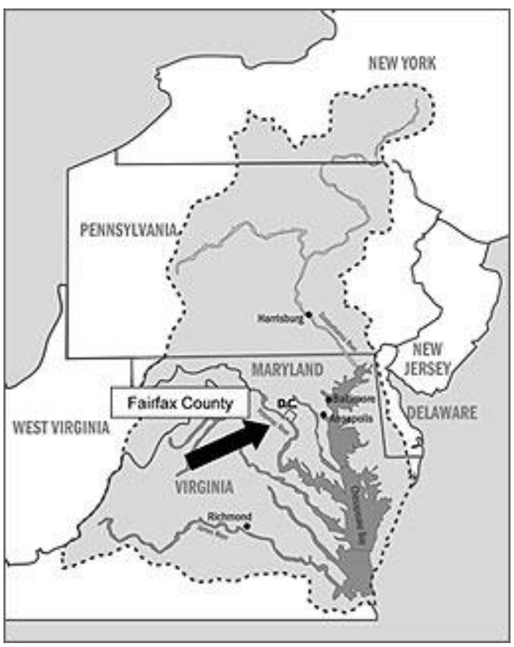

Figure 1-2: The Chesapeake Bay watershed

The size of a watershed can be subjective; it depends on the scale that is being considered.

The image to the left depicts the extent of the Chesapeake Bay watershed, "the big picture" that is linked to our local concerns. This watershed covers 64, 000 square miles and crosses into six states: New York, Pennsylvania, Delaware, West Virginia, Maryland, Virginia and the District of Columbia.

One of the watersheds that comprise the Chesapeake Bay watershed is the Potomac River watershed. Fairfax County, as shown on the map, occupies approximately 400 square miles of the Potomac River watershed. This area contains 30 smaller watersheds. Think of watersheds as being "nested" within each successively larger one.

Each watershed in Fairfax County was subdivided to facilitate data management and to promote local awareness of the streams. Watersheds were divided into Watershed Management Areas (WMAs) approximately four square miles in size. WMAs are usually named for the local major tributary. These areas are further divided into subwatersheds, ranging in size from 100 to 300 acres. Subwatersheds represent the smallest modeling unit for watershed planning.

Beginning in the early 1940's, Fairfax County shifted from an agricultural community to an urbanized one whose population exceeds that of several states. While the County continued to develop, the condition of streams and aquatic life declined. In 1999, a Stream Protection Strategy (SPS) was initiated to monitor stream health and establish a baseline of countywide stream conditions. The results of the baseline monitoring effort indicated that only 25 percent of the County's streams were in good to excellent biological health. Stream condition is determined using an Index of Biological Integrity (IBI) that evaluates ecological health based on the community structure of bottom-dwelling aquatic invertebrates.

The baseline study found that roughly 75 percent of streams within the County had areas negatively impacted by impervious conditions within their watersheds. Due to increasing urbanization prior to implementation of modern stormwater controls, impervious land area rapidly increased, contributing to the degradation of the streams.

1.2 Introduction to Watershed Planning

The County's comprehensive stormwater management program is currently undergoing a transformation that addresses watershed health using a holistic approach. The mission for the stormwater program is dictated by the need to preserve and restore the natural environment and aquatic resources, which is consistent with the Fairfax County Board of Supervisors' Environmental Agenda adopted in June 2004. The County must also comply with all applicable local, state and federal laws and mandates. These include County ordinances and policies, Virginia's Chesapeake Bay Initiatives and the federal Clean Water Act. Under the Virginia Pollutant Discharge Elimination System (VPDES) the County has an individual Municipal Separate Storm Sewer System (MS4) Permit. This permit requires the creation of watershed management plans to facilitate compliance with the Clean Water Act. In addition, the County is doing its part to fulfill Virginia's commitment to the Chesapeake Bay 2000 Agreement to restore the ecological health of the Chesapeake Bay Watershed.

Fairfax County's first set of watershed plans were completed in the 1970s. Land use has changed significantly since that time. Additionally, there have been many advances in technology and development in the field of stormwater management which have resulted in updates to stormwater policies and regulations. New plans were needed to reflect these changes and to plan for a future in which Fairfax County balances the needs of the environment with a high standard of living.

The current watershed plans provide more targeted strategies for addressing stream health given current and future land uses and evolving regulations. These plans are one of several tools that enable the County to address program requirements and to improve and maintain watershed health. Each watershed plan includes a prioritized 25-year list of proposed capital improvement projects in addition to non-structural programs and projects. These projects and programs may lead to new and/or revised ordinances, public facilities manual requirements and policies. The plans promote the use of new and innovative practices in stormwater management such as Low Impact Development (LID) techniques and stream restoration using natural channel design. To maximize the effectiveness of these plans, community engagement and involvement from diverse interests were emphasized during the development process.

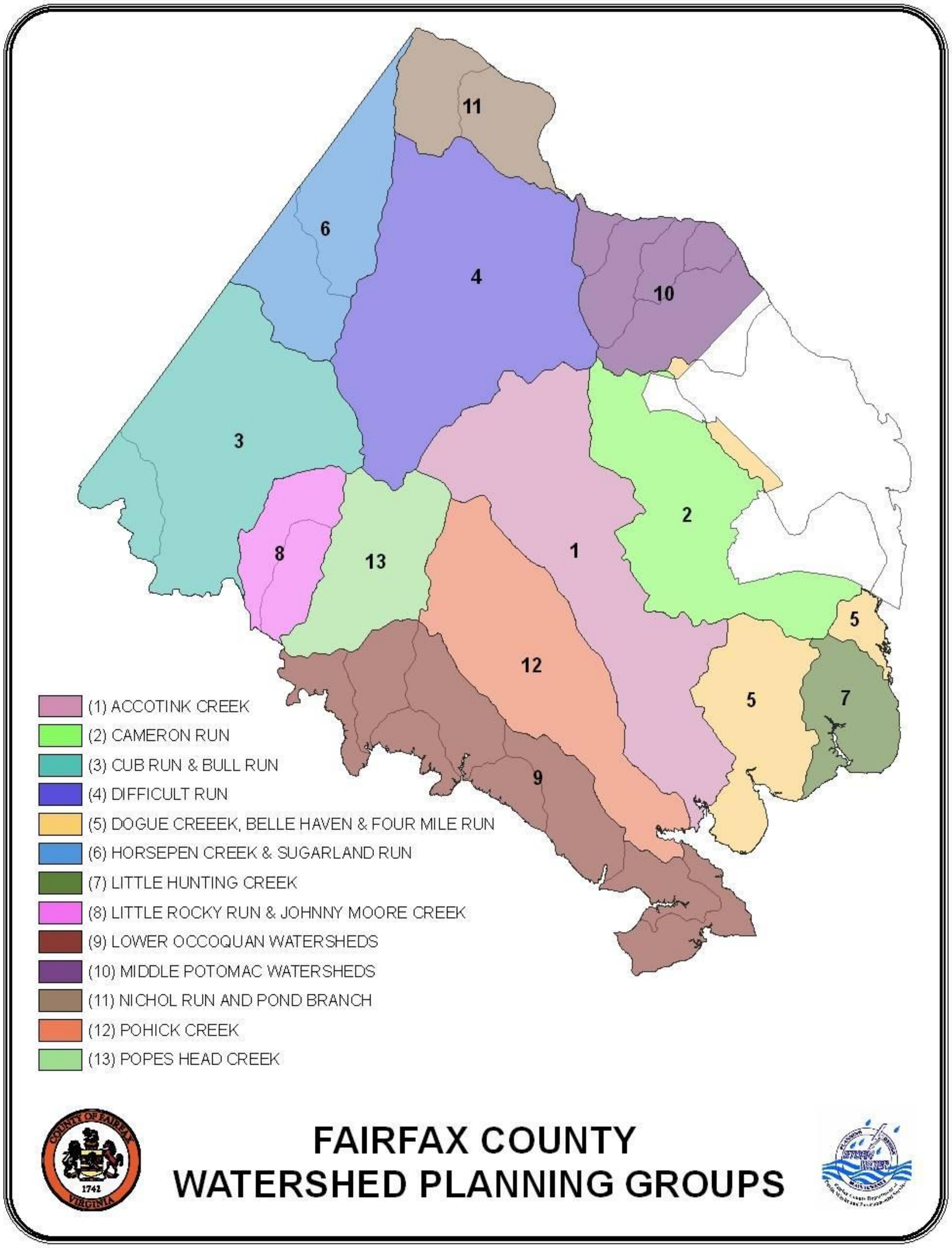

Figure 1-3: Watershed planning groups in Fairfax County

Watershed management plans were developed by grouping the County's 30 watersheds into 13 planning units (**Figure 1-3**). Watershed planning began in 2003. By 2007, roughly 50 percent of the County land area had completed watershed plans. This plan is part of the second group of watershed plans, which was initiated in 2007 for the remaining land area.

In general, the watershed management planning process consists of the following steps:

1. Review and synthesis of previous studies and data compilation
2. Public involvement to gain input, provide education and build community support
3. Evaluation of current watershed conditions and projection of stormwater runoff from present and ultimate development conditions
4. Development of non-structural and structural watershed improvement projects
5. Development of preliminary cost estimates, cost/benefit analysis and prioritization of capital projects
6. Adoption of the final watershed management plan by the Board of Supervisors

The watershed management planning process has been supported by the Board of Supervisors since its inception in 2003. In fiscal year 2006, the Board of Supervisors dedicated $0.01 per $100 of assessed value from the County's real estate tax revenue towards the overall stormwater management program. This supported the ongoing development and implementation of watershed plans and eventually evolved into the adoption of a stormwater service district starting in fiscal year 2010. The Board recently approved increasing the dedicated amount to a penny and a half for fiscal year 2011.

The following provisions address the funding and implementation of projects and programs in Fairfax County watershed plans. These provisions as recommended by the Board were developed for the Popes Head Creek Watershed Management Plan in February 2006 and have been applied to the Lower Occoquan Watershed Management Plan:

vi. Projects and programs (both structural and non-structural) will first undergo appropriate review by County staff and the Board (please see iii below) prior to implementation. Board adoption of the Watershed Management Plan will not set into motion automatic implementation of projects, programs or initiatives that have not first been subject to sufficient scrutiny to ensure that the projects that are funded give the County the greatest environmental benefit for the cost.

vii. Road projects not related to protection of streambeds or banks or water quality will not be funded out of the stormwater and watershed budget.

viii. The Watershed Management Plan provides a conceptual master-list of structural capital projects and a list of potential non-structural projects for the watershed. Staff will, on a fiscal year basis, prepare and submit to the Board a detailed work plan to include a description of proposed projects and an explanation of their ranking, based on specific criteria. Criteria used to assemble this list will include, but are not limited to, cost-effectiveness as compared to alternative projects, a clear public benefit, a need to protect public or private lands from erosion or flooding, a need to meet a specific watershed or water quality goal, and ability to be implemented within the same fiscal year that funding is provided. Staff also intends to track the progress of implementation and report back to the Board periodically.

ix. Each project on the annual list of structural projects will be evaluated using basic value-engineering cost effectiveness principles before implementation and the consideration of alternative structural and non-structural means for accomplishing the purposes of the project will be considered before implementation. This process will ensure the County's commitment to being a fiscally responsible public entity.

x. Obstruction removal projects on private lands will be evaluated on a case-by-case basis for referral to the Zoning Administrator and/or County Attorney for action as public nuisances; and otherwise to determine appropriate cost-sharing by any parties responsible for the obstructions.

i. Stream restoration projects on private lands will be evaluated to determine means for cost-sharing by land owners directly responsible for degradation due to their land uses.

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2.0 Watershed Planning Process

2.1 Watershed Goals and Objectives

The County's first six comprehensive watershed management plans outlined intentions for protecting, maintaining or improving streams and the measures that could be taken to meet them. Although the plans conveyed similar aims overall, there were some differences in the way goals and objectives were developed. As a result of these differences, the initial six plans were analyzed to identify common themes in order to create standardized goals and objectives for the remaining watershed management plans. Standardization improved efficiency in the planning process and achieved greater consistency among the plans.

As part of the standardization process, the County selected three overarching goals, or intended outcomes of the watershed management plans:

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

Ten objectives were developed related to the three goals. Each objective may achieve one or more goals, and each goal may be achieved by one or more objectives. These ten objectives were grouped into five categories based on certain aspects of watershed management the objectives could influence:

1. **Hydrology** - healthy movement and distribution of water through the environment in a way that is protective of streams and human dwellings
2. **Habitat** - suitable environment for sustaining plants and animals
3. **Stream water quality** - general chemical and physical properties of surface waters
4. **Drinking water quality** - quality of water used for human consumption
5. **Stewardship** - the roles the County, other jurisdictions and members of the general public can play in caring for the environment

Under the new approach, County staff and the public had the flexibility to add objectives that were unique and important to a particular watershed, but all plans included the standard goals and objectives as a baseline (Table 2-1).

Table 2-1: Countywide Objectives

Objective	Linked to Goal(s)
CATEGORY 1. HYDROLOGY	
1A. Minimize impacts of stormwater runoff on stream hydrology to promote stable stream morphology, protect habitat, and support biota.	1
1B. Minimize flooding to protect property and human health and safety.	2
CATEGORY 2. HABITAT	
2A. Provide for healthy habitat through protecting, restoring, and maintaining riparian buffers, wetlands, and instream habitat.	1
2B. Improve and maintain diversity of native plants and animals in the County.	1
CATEGORY 3. STREAM WATER QUALITY	

Objective	Linked to Goal(s)
3A. Minimize impacts to stream water quality from pollutants in stormwater runoff.	1, 2
CATEGORY 4. DRINKING WATER QUALITY	
4A. Minimize impacts to drinking water sources from pathogens, nutrients, and toxics in stormwater runoff.	2
4B. Minimize impacts to drinking water storage capacity from sediment in stormwater runoff.	2
CATEGORY 5 STEWARDSHIP	
5A. Encourage the public to participate in watershed stewardship.	3
5B. Coordinate with regional jurisdictions on watershed management and restoration efforts such as Chesapeake Bay initiatives.	3
5C. Improve watershed aesthetics in Fairfax County.	1, 3

Standardizing the goals and objectives will make it easier to integrate plan recommendations into a countywide data management system for prioritizing projects, tracking implementation and evaluating the long-term influence of the plans on the health of County streams.

2.2 Indicators

Since accomplishment of objectives cannot be directly measured, indicators that are able to detect changes in the watershed were developed. Indicators are used to assess the condition of the environment, as early-warning signals of changes in the environment, and to diagnose causes of ecological problems. *Observed* indicators are based upon data and observations collected in the field/area of interest, and are useful in assessing existing watershed conditions. *Predictive* indicators respond in a predictable manner to ecosystem stressors, and can be used in models of hydrologic and ecosystem processes (such as soil erosion, pollutant loading, etc.) to compare existing and future conditions.

Each indicator was measured by one or more metrics. A metric is an analytical benchmark that responds in a predictable way to increasing human, climatic or other environmental stress. Metrics may be actual numeric values (such as pH or Dissolved Oxygen values) or parameters that have been scored to a numeric scale (such as 1 – 10).

The indicators used by Fairfax County may be grouped into the following categories:

- **Watershed Impact Indicators** – Measure the extent that reversal or prevention of a particular watershed impact, sought by the goals and objectives, has been achieved ("What's there now, and how is it doing?").
- **Source Indicators** – Quantify the presence of a potential stressor or pollutant source ("Is there a problem, and what's causing it?").
- **Programmatic Indicators** –After the plans are adopted, these will assess outcomes of resource protection and restoration activities ("What's the County doing about the problem, and how is it doing?").

2.2.1 Watershed Impact Indicators

One or more watershed impact indicators for each objective were identified, including predictive and observed indicators. These indicators and the objectives to which they are linked are shown in Table 2-2.

Table 2-2: Watershed Impact Indicators

Objective	Indicators
1A Stormwater Runoff	Observed: Benthic Communities, Fish Communities, Aquatic Habitat Predictive: Channel Morphology, Instream Sediment, Hydrology
1B Flooding Hazards	Observed: Flood Complaints Predictive: Number of Road Hazards, Magnitude of Road Hazards, Residential Building Hazards, Non-residential Building Hazards
2A Habitat Health	Observed: Aquatic Habitat Predictive: RPA Riparian Habitat, Headwater Riparian Habitat, Protected Wetland Habitat
2B Habitat Diversity	Observed: Benthic Communities, Fish Communities Predictive: None
3A Stream Water Quality	Observed: *E. coli*, Benthic Communities, Fish Communities Predictive: Upland Sediment, Instream Sediment, Nitrogen, Phosphorus
4A Drinking Water Quality	Observed: *E. coli* Predictive: Nitrogen, Phosphorus, Upland Sediment
4B Storage Capacity	Observed: None Predictive: Upland Sediment, Instream Sediment
5A Public Participation	Programmatic Indicators to be tracked by the County
5B Regional Coordination	Programmatic Indicators to be tracked by the County
5C Aesthetics	Programmatic Indicators to be tracked by the County

For predictive indicators, three scenarios were considered. Metrics and scores were calculated for:

- Existing Conditions
- Future without project implementation
- Future with project implementation

The future condition metrics and scores reflect the simulated conditions at ultimate build-out based on the County's Comprehensive Plan.

The watershed impact indicator scores were used at multiple stages of watershed planning. First, they were used to assess current and future conditions without project implementation in the watershed. Indicator scores were then used to identify management needs and problem areas during subwatershed ranking (see Section 2.3). Once candidate projects were identified, the indicators were used to prioritize projects alongside cost and feasibility.

2.2.2 Source Indicators

Source indicators were used to evaluate the sources and stressors that impact watershed processes. Examples include:

- Numeric Source Indicators
  - Amount of Channelized/Piped Streams
  - Amount of Directly Connected Impervious Area (DCIA) (predictive)
  - Amount of Impervious Surface (predictive)
  - Number of Stormwater Outfalls
  - Number of Sanitary Sewer Crossings
  - Streambank Buffer Deficiency
  - Total amount of Nitrogen (predictive)
  - Total amount of Phosphorus (predictive)
  - Total Suspended Solids (predictive)
- Field Reconnaissance Observations
  - Hot Spot Investigations
  - Neighborhood Source Assessments
  - All other field reconnaissance observations

The contributions of these indicators to existing and future watershed impacts were evaluated. Metrics and scores were developed for all source indicators under existing conditions. In addition, three scenarios were considered for the predictive indicators, as noted in the list above. Metrics and scores were calculated for these scenarios:

- Existing Conditions
- Future without project implementation
- Future with project implementation

The future condition metrics and scores reflect the simulated conditions at ultimate build-out based on the County's Comprehensive Plan. Like the watershed impact indicators, source indicator scores were used to rank subwatersheds according to their problems and needs and to assist with candidate project identification.

2.2.3 Programmatic Indicators

Once the plan is adopted, programmatic indicators will be used by the County to help evaluate watershed management needs. These indicators illustrate the extent and location of existing and past management efforts. The following types of management in the watershed were inventoried during plan development:

- Detention Facilities
- Stream Restoration
- Riparian Buffer Restoration
- BMP Facilities
- Low Impact Development
- Inspection and Maintenance of Stormwater Management Facilities
- Inspection and Repair of Stormwater Infrastructure and Outfalls
- Dumpsite Removal
- Regional Ponds
- Volunteer Monitoring

- Subarea Treatment (used in watershed modeling studies)

Information for these indicators will be considered to identify and evaluate watershed management needs for individual watersheds and for the County as a whole.

2.2.4 Composite Scores

After metric values are translated into scores, objective, composite and overall composite scores are calculated for use in subwatershed ranking. Weighting factors are used when calculating composite scores to give more importance to certain indicators and objectives. First, watershed impact indicators are grouped by objective. Each metric score is multiplied by a predetermined weighting factor specific to that indicator, and the products are summed within objectives to generate an objective composite score for each objective. Each objective composite score is then multiplied by a predetermined weighting factor specific to that objective, and the products are summed to generate an overall composite score. A similar process is used for source indicators, but without an objective composite score (since source indicators are not directly linked to objectives).

2.3 Subwatershed Ranking

The composite scores calculated under the methods previously described were used to identify problem areas in the watershed and rank subwatersheds for management priority. Subwatersheds were further categorized based on which management opportunities were most likely to restore functions to the problem areas identified. The resulting data were then utilized to identify key issues and select projects that would achieve the watershed planning goals and objectives.

The subwatershed ranking procedure involved reviewing watershed impact objective, composite, overall composite and source indicator scores. Since some of the indicators are predictive, i.e. based on modeling, it was possible to pose “what if?” questions and test future scenarios with and without management actions. Existing management facilities and programs which were inventoried for programmatic indicators and data collected during field reconnaissance were also considered. The ranking process consisted of the following steps:

1. Used the watershed impact overall composite scores and identified subwatersheds that were potential problem areas under existing and future conditions.
2. Used the watershed impact objective composite scores and identified subwatersheds that were potential problem areas under existing and future conditions for each objective.
3. Reviewed source indicator composite scores and identified additional problem areas.
4. Used individual source indicator scores to identify potential sources of impacts in downstream problem areas.
5. In combination with the above data, used the programmatic indicator data inventory to identify subwatersheds where management was most needed.
6. Consulted available field reconnaissance data throughout the above steps to confirm that results reflected conditions in the field.

All this information was combined to rank subwatersheds in order from the most problematic (higher priority for management actions) to the least problematic (lower priority for management actions). Subwatershed ranking can provide guidance as to where management is most needed and can be applied successfully, but the final determination is ultimately based on best professional judgment.

2.4 Stormwater Modeling

Storm events are classified by the amount of rainfall, in inches, that occurs over the duration of a storm. The amount of rainfall depends on how frequently the storm will statistically occur and how long the storm lasts. Based on many years of rainfall data collected, storms of varying strength have been established based on the duration and probability of that event occurring within any given year. In general, smaller storms occur more frequently than larger storms of equal duration. Hence, a 2-year, 24hr storm (having a 50 percent chance of happening in a given year) has less rainfall than a 10-year, 24hr storm (having a 10 percent chance of happening in a given year). Stormwater runoff (which is related to the strength of the storm) is surplus rainfall that does not soak into the ground. This surplus rainfall flows (or ‘runs off’) from roof tops, parking lots and other impervious surfaces and is ultimately received by storm drainage systems, culverts and streams.

Modeling is a way to mathematically predict and spatially represent what will occur with a given rainfall event. There are two primary types of models that are used to achieve this goal; hydrologic and hydraulic:

- *Hydrologic models* take into account several factors; the particular rainfall event of interest, the physical nature of the land area where the rainfall occurs and how quickly the resulting stormwater runoff drains this given land area. Hydrologic models can describe both the quantity of stormwater runoff and resulting pollution, such as nutrients (nitrogen and phosphorus) and sediment that are transported by the runoff.

- *Hydraulic models* represent the effect the stormwater runoff from a particular rainfall event has on both man-made and natural systems. These models can both predict the ability man-made culverts/channels have in conveying stormwater runoff and the spatial extent of potential flooding.

Table 2-3 shows three storm events and the rationale for being modeling:

Table 2-3: Modeling Rationale

Storm Event	Modeling Rationale
2-year, 24hr	Represents the amount of runoff that defines the shape of the receiving streams.
10-year, 24hr	Used to determine which road culverts will have adequate capacity to convey this storm without overtopping the road.
100-year, 24hr	Used to define the limits of flood inundation zones

2.4.1 Hydrologic Model (SWMM)

The Environmental Protection Agency (EPA) Storm Water Management Model (SWMM) was first developed in the early 1970s. Over the past 30 years, the model has been updated and refined and is now used throughout the country as a design and planning tool for stormwater runoff. Specifically, SWMM is a dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas.

The runoff component of SWMM operates on a collection of subwatershed areas where rain falls and runoff is generated. The routing (or hydraulic) portion of SWMM transports this runoff through a conveyance system of pipes, channels and storage/treatment devices. SWMM tracks the quantity and quality of runoff generated within each subwatershed, and the flow rate and depth of water in the conveyance system during a simulation period.

2.4.2 Pollution Model (STEPL)

While the SWMM model can calculate pollutant loads, the Spreadsheet Tool for Estimating Pollutant Load (STEPL) was used to determine pollutant loads for the watershed planning effort. Also developed by EPA, STEPL employs simple algorithms to calculate surface runoff. This includes nutrient loads, such as nitrogen and phosphorus, and sediment loads from various land uses. STEPL also calculates load reductions that would result from the implementation of various Best Management Practices (BMPs). The nutrient loading is calculated based on the runoff volume and the pollutant concentrations in the runoff as influenced by factors such as land use distribution and management practices. Sediment loads are calculated based on the Universal Soil Loss Equation (USLE) and the sediment delivery ratio. The sediment and pollutant load reductions that result from the implementation of BMPs are computed using known BMP efficiencies.

2.4.3 Hydraulic Model (HEC-RAS)

The Hydrologic Engineering Centers River Analysis System (HEC-RAS) hydraulic model was initially developed by the U.S. Army Corps of Engineers (USACE) in the early 1990s as a tool to manage the rivers and harbors in their jurisdiction. HEC-RAS has found wide acceptance as the standard for simulating the hydraulics of water flow through natural and/or manmade channels and rivers. HEC-RAS is commonly used for modeling water flowing through a system of open channels with the objective of computing water surface elevations.

The geographic input data for the HEC-RAS model was extracted using HEC-GeoRAS. HEC-GeoRAS is a tool that processes the geospatial data within the County's Geographic Information System, specifically as it pertains to physical features such as stream geometry and flow path so that these features can be represented in the model.

Using available County or Virginia Department of Transportation (VDOT) engineering data, bridge and culvert crossings were coded into the model to simulate the effect these facilities have on the water surface elevations or profile. Where data were not available, field reconnaissance was performed to obtain the crossing elevation data. This crossing data was determined relative to a point where the elevation could be estimated accurately from the County's topographic data. Manning's 'n' values, which represent surface roughness, were assigned to the channel and overbank portions of the studied streams based on field visits and aerial photographs.

The hydrologic flow input data and the locations where the flows change were extracted from SWMM. The 2-yr, 10-yr and 100-yr storm flow outputs were determined at several locations in order to provide a detailed flow profile for input into the HEC-RAS hydraulic model.

As stated previously, the 2-year storm discharge is regarded as the channel-forming or dominant discharge that transports the majority of a stream's sediment load and therefore actively forms and maintains the channel. A comparison of stream dynamics and channel geometry for the 2-year discharge provides insight regarding the relative stability of the system and helps to identify areas in need of restoration.

The 10-year storm discharge is being included to analyze the level of service of bridge and culvert stream crossings. Occurring less frequently than the 2-year storm, the flood stage associated with this storm can result in more significant safety hazards to residents. All stream crossings (bridges and culverts) will be analyzed against this storm to see if they are performing at safe levels.

The 100-year storm discharge is used by the Federal Emergency Management Agency (FEMA) to delineate floodplain inundation zones in order to establish a Flood Insurance Rate Map (FIRM) for a given area. The 100-yr HEC-RAS models have been built in compliance with FEMA standards and are being included to map the limits of these floodplain inundation zones. This mapping provides a means to assess which properties are at risk to flooding by the 100-yr storm event.

2.5 Public Involvement Plan

A consistent approach for public involvement was important to enable comparisons among planning processes and final watershed management plans. Conversely, as each watershed has unique characteristics, the strategies employed must also address the diverse needs, interests and conditions of the watershed and its community. The principal goals for public involvement were:

- Increase community awareness and understanding of stormwater management
- Provide meaningful participation options for a diversity of stakeholders
- Incorporate community ideas into the scope of the watershed plans
- Strive for community support for the final plans

Recognizing the need for public acceptance of the final plans, County staff created a public involvement process with multiple feedback loops to facilitate informed participation by the public and key stakeholder groups at all development stages. The first step of the public involvement process was to host an Introductory and Issues Scoping forum that was open to all residents. The primary purpose of this forum was to solicit informed input on the development of the watershed management plan. Other objectives were to explain the planning process to the community and develop an initial list of watershed issues and concerns.

After the forum, stakeholder groups were invited to be part of a Watershed Advisory Group (WAG) for each plan. These were comprised of local stakeholders who represented various interests (HOA representatives, environmental groups, etc) and advised County staff about community outreach opportunities and key issues affecting their watershed and potential projects. They also were invited to comment on draft and final versions of the watershed management plan. Each WAG met with County staff five to six times throughout the plan development in order to provide guidance and comments at critical junctures of the process.

The WAG also provided support at the second public forum, the Draft Plan Review Workshop. The workshop provided the extended community with an opportunity to review the first draft of the watershed plan and provide input. Comments were collected at the end of a 30-day period and addressed as appropriate. The final plan was then adopted by the Board of Supervisors.

More information on the public involvement process including WAG meeting minutes, public forum meeting minutes and public comments and responses can be found in Appendix C.

3.0 Summary of Watershed Conditions

This section summarizes the *Lower Occoquan Draft Watershed Workbook* (January 2009). The full Lower Occoquan Draft Watershed Workbook can be found in Appendix A.

3.1 Introduction

Consisting of more than 45 square miles, the Lower Occoquan watershed is one of the larger watershed planning units in the County. Located along the southwestern border of Fairfax County, Lower Occoquan is comprised of eight small watersheds: Old Mill Branch, Wolf Run, Sandy Run, Ryans Dam, Occoquan, Mill Branch, Kane Creek and High Point. Refer to **Map 3.1-1** for the locations of each watershed within Lower Occoquan.

For Fairfax County planning and management purposes, most watersheds are subdivided into watershed management areas (WMAs), which are typically a few square miles of land area. For most of the small watersheds in Lower Occoquan, the entire watersheds themselves are defined as WMAs with the exception of the larger Mill Branch watershed, which has been divided into 3 individual WMAs. Table 3-1 below identifies the 10 WMAs identified within Lower Occoquan. Refer to **Map 3.1-2** for the locations of each WMA within Lower Occoquan. For Fairfax County planning and management purposes, WMAs are further subdivided into smaller subwatersheds. Refer to **Map 3.1-3** for the locations of each of the subwatersheds within Lower Occoquan.

Table 3-1: Lower Occoquan Watershed Management Areas (WMAs)

WMA		Sq. Miles	Acres
1	Giles Run North (Mill Branch)	3.13	2,002
2	Giles Run South (Mill Branch)	3.63	2,328
3	Mill Branch (Mill Branch)	1.98	1,268
4	Sandy Run	8.12	5,198
5	Wolf Run	5.88	3,762
6	High Point	5.55	3,555
7	Kane Creek	4.81	3,076
8	Old Mill Branch	4.26	2,724
9	Ryans Dam	3.53	2,262
10	Occoquan	3.32	2,126
	Total	**44.21**	**28,301**

The Lower Occoquan watershed contains more than 220 miles of stream within the 10 WMAs, and included in the 10 WMAs are 15 separate named tributaries.

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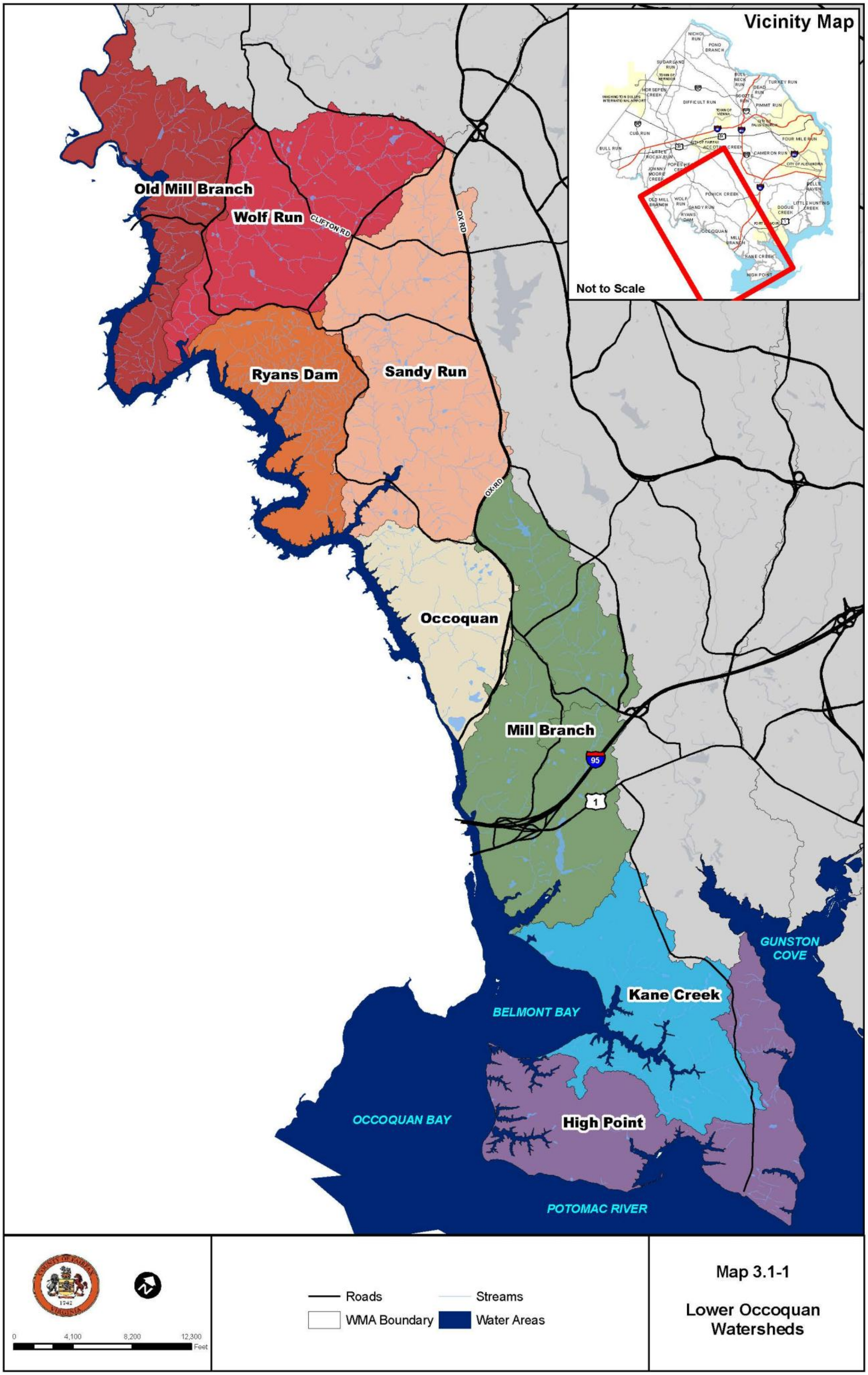
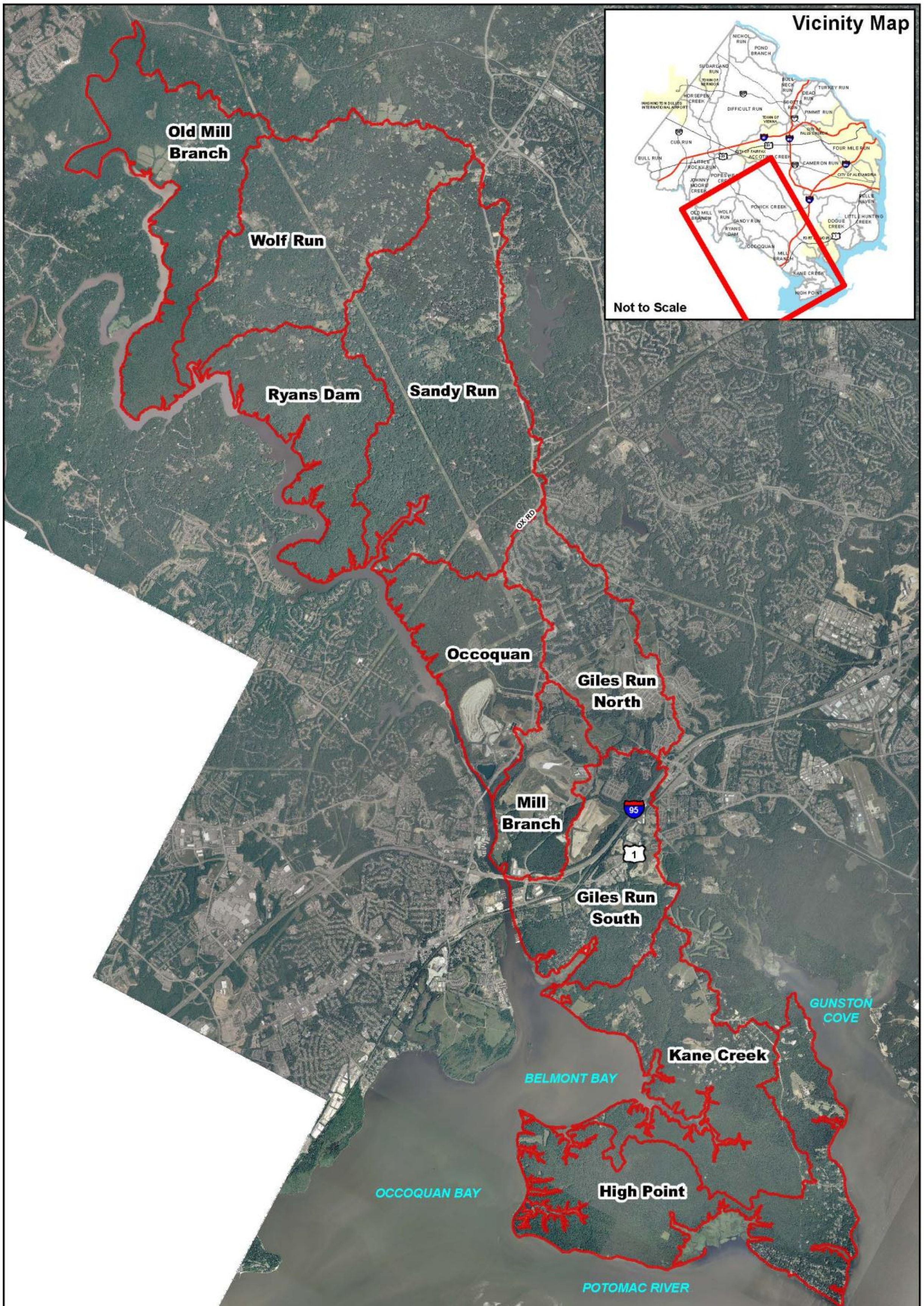


Map 3.1-1

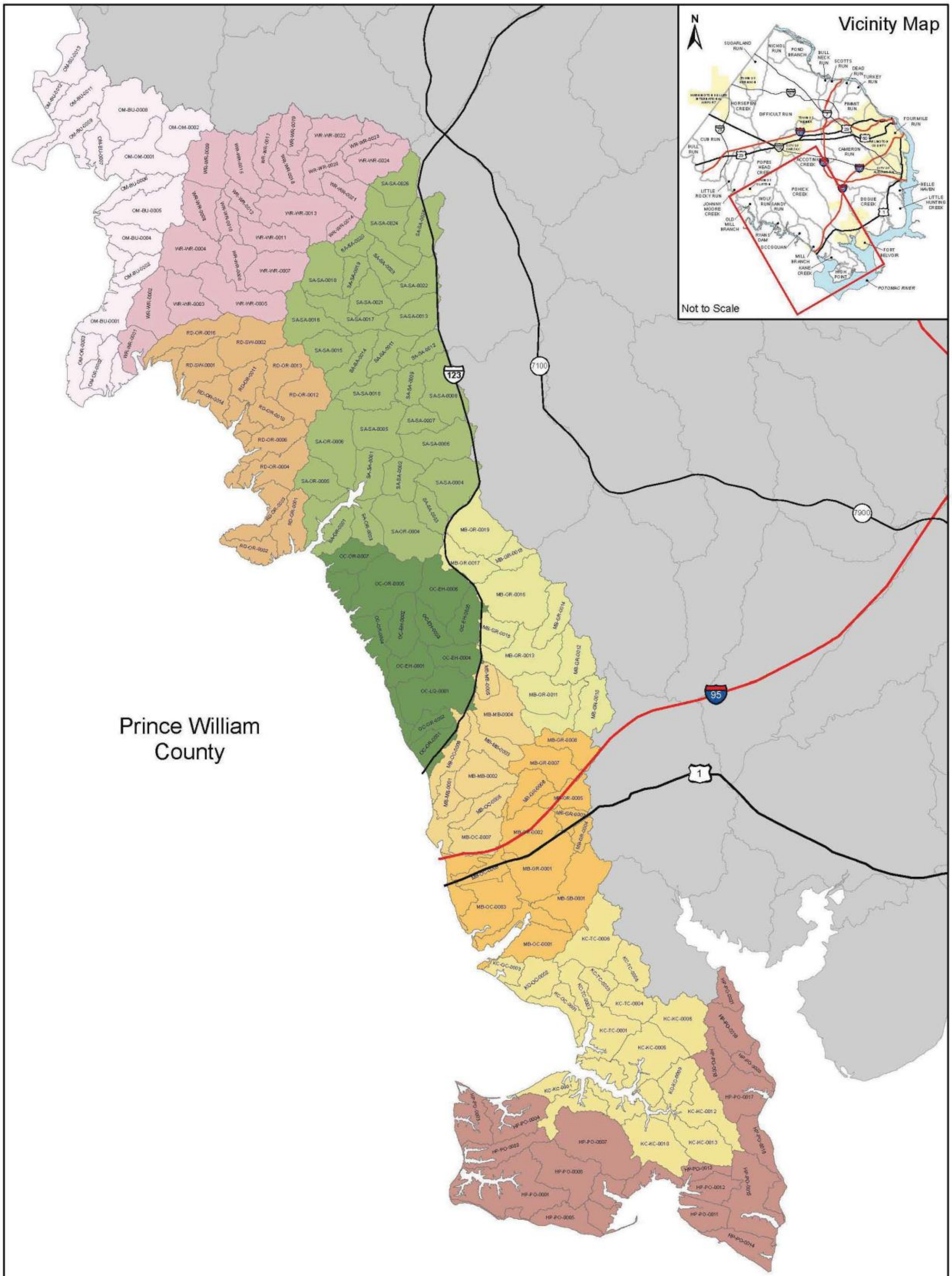
Lower Occoquan Watersheds



0 4,000 8,000 12,000 Feet

Map 3.1-2

Lower Occoquan Watershed Management Areas



0 0.5 1 2 Miles

Legend

County Highway	High Point	Mill Branch- Mill Branch	Sandy Run
State Highway	Kane Creek	Occoquan	Wolf Run
Interstate	Mill Branch- Giles Run North	Old Mill Branch	Watershed Boundaries
US Highway	Mill Branch- Giles Run South	Ryans Dam	

Map 3.1-3

Lower Occoquan Subwatersheds

3.2 Current Conditions

Historically, Lower Occoquan has experienced relatively minimal development, which has resulted in a low overall impervious area. A major reason for the minimal development is due to the fact that majority of the northern portion of Lower Occoquan lies in the Residential-Conservation (R-C) district, which was established to protect streams, ecological areas and minimize impervious surfaces to protect water quality. The R-C district restricts development size within the watershed to a minimum of 5 acres per residential dwelling unit. Consequently, the Lower Occoquan is one of the least developed watersheds in the county. Refer to **Map 3.2-1** for the existing land uses and **Map 3.2-2** for the future land uses.

The Lower Occoquan watershed has many unique facets; it is home to local, regional, state and federal parks including Laurel Hill redevelopment area (formerly the District of Columbia Department of Correction Facility, located in Lorton), Fountainhead Regional Park, Mason Neck State Park and the Mason Neck National Wildlife Refuge. In addition, it contains the Occoquan Reservoir that serves as one of the two major drinking water sources for Fairfax County. More than half of the watersheds fall within the Water Supply Protection Overlay District (WSPOD). The WSPOD was established in 1982 to protect water quality in the Occoquan Reservoir. With the exception of Mill Branch, Kane Creek and High Point, the remaining watersheds lie at least partially within the WSPOD.

With the exception of Mill Branch watershed, which contains the Laurel Hill redevelopment, Lower Occoquan watershed is to have very minimal new development. As a result of minimal development, large parks and open space, the overall stream habitat condition of the watershed is considered good to excellent. The Lower Occoquan watershed contains some of the highest stream quality in Fairfax County.

Lower Occoquan also contains a wide variety of additional stormwater infrastructure and best management practices (BMPs) that track with the watershed's development history. Some older developments contain stormwater management (SWM) facilities, consisting primarily of dry detention basins designed to curb peak storm flows (quantity management). For areas developed more recently, SWM facility types are more varied and are more likely to include a water quality component. Facilities found in these areas include wet detention facilities, underground chambers, infiltration devices and wetlands. However, as a direct result of minimal development, more than 95 percent of Lower Occoquan has no stormwater treatment. Go to http://www.fairfaxcounty.gov/dpwes/stormwater/ for more information on stormwater facilities in Fairfax County.

As one of many measures used to protect stream water quality, the County adopted the Chesapeake Bay Preservation Ordinance, which limits development on land that lies within a Resource Protection Area (RPA). RPAs are buffers adjacent to or near the shorelines of streams, rivers and other waterways that protect sensitive areas from the excessive influx of pollutants. The sensitive areas include tidal and non-tidal wetlands, tidal shorelines, certain floodplains and perennial streams (waters flowing year-round). **Map 3.2-3** shows, more than 50 percent (128 of the 228 miles) of the streams within the Lower Occoquan watershed lie within a RPA (County GIS, 2008). Go to http://www.fairfaxcounty.gov/dpwes/environmental/cbay/ for more information on RPAs and the Chesapeake Bay Preservation Ordinance.

The *Lower Occoquan Draft Watershed Workbook,* in Appendix A, includes a description of the findings in each WMA, including field reconnaissance findings, existing and future land use, stream conditions and stormwater infrastructure. Each WMA was examined at the subwatershed level.

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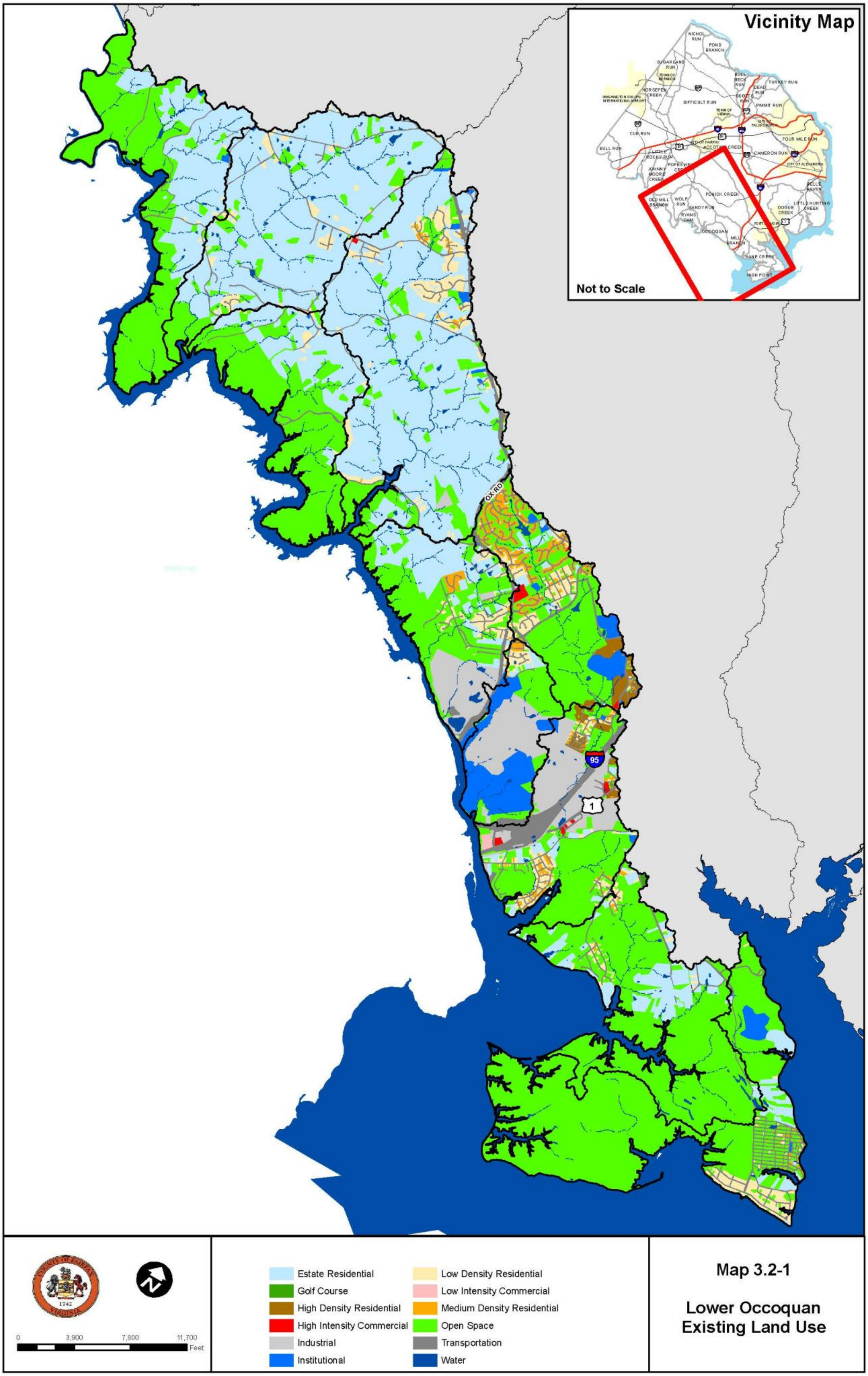
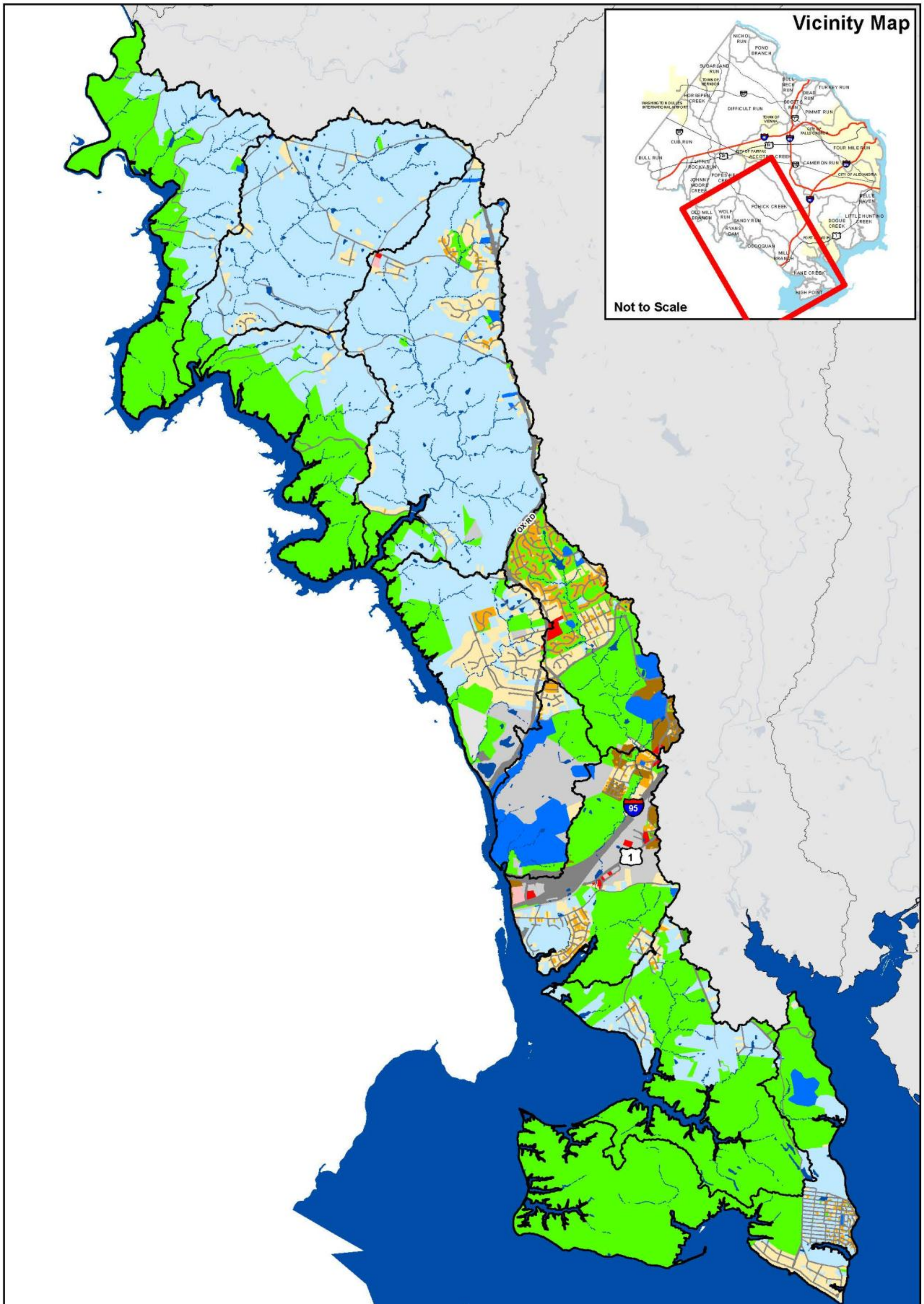


Map 3.2-1

Lower Occoquan Existing Land Use

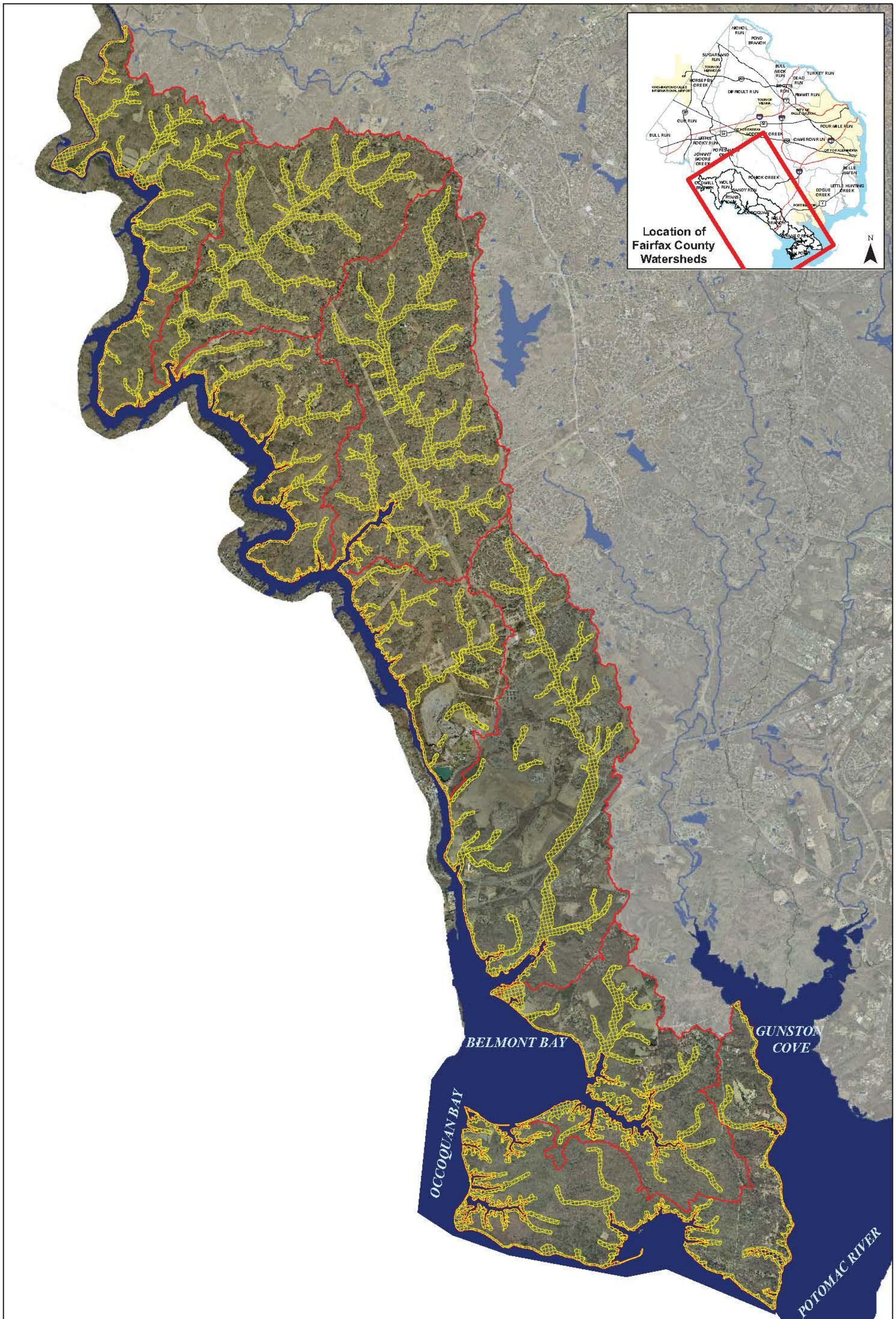


0 3,900 7,800 11,700 Feet

Estate Residential	Low Density Residential
Golf Course	Low Intensity Commercial
High Density Residential	Medium Density Residential
High Intensity Commercial	Open Space
Industrial	Transportation
Institutional	Water

Map 3.2-2

Lower Occoquan Future Land Use



3,500 7,000 10,500 Feet

Resource Protection Areas

RPA Limits

Watersheds

Water

Map 3.2-3
Lower Occoquan
Resource Protection Areas

Hydrology and Water Quantity and Quality Modeling
Modeling is a mathematical way to predict and represent spatially what will occur with a given rainfall event. The following modeling software was used in the watershed management plan:

1. The Environmental Protection Agency (EPA) Storm Water Management Model (SWMM) is a dynamic rainfall-runoff simulation model. It is used to track the quantity and quality of runoff generated within each subwatershed, and the flow rate, flow depth and quality of water in each pipe and channel during a simulation period comprised of multiple time steps.
2. The Spreadsheet Tool for Estimating Pollutant Load (STEPL) was used to determine pollutant loads for Lower Occoquan watershed. Also developed by the EPA, the STEPL worksheet calculates nutrient and sediment loads from various land uses and also calculates the load reductions that would result from the implementation of various BMPs.
3. The U.S. Army Corps of Engineers' (USACE's) Hydrologic Engineering Centers River Analysis System (HEC-RAS) hydraulic model simulates the hydraulics of water flow through natural and/or manmade channels and rivers with the objective of computing water surface profiles.

3.2.1 SWMM Results

Table 3-2 shows the peak flows from the WMAs. The 2-year storm event is defined as the storm that has a 50 percent chance of occurring in any one year. The 10-year storm event has a 10 percent chance of occurring in any one year.

Table 3-2: SWMM Results

WMA Outlet Point	Stormwater Runoff Peak Flow Values	
	2-Year Storm (cubic ft/sec)	10-Year Storm (cubic ft/sec)
High Point	577	1,466
Kane Creek	601	1,697
Mill Branch - Giles Run North	483	1,154
Mill Branch - Giles Run South	593	1,471
Mill Branch	400	981
Occoquan	540	1,570
Old Mill Branch	594	1,763
Ryans Dam	429	1,356
Sandy Run	740	2,260
Wolf Run	552	1,646
Lower Occoquan Totals	**5,508**	**15,364**

3.2.2 STEPL Results

A major cause for many streams' poor water quality is increased levels of two particular nutrients—nitrogen and phosphorous—as well as high levels of suspended sediments. Increased nutrient levels can cause eutrophication and high levels of suspended sediments can kill underwater plants. While nitrogen and phosphorus occur naturally in soil, animal waste, plant material and even the atmosphere, the increase of nitrogen and phosphorus from manmade sources can be detrimental to the overall health of receiving waters. Increased phosphorus and nitrogen pollutants in urbanized areas primarily come from chemical lawn fertilizers, vehicle emissions and discharges from municipal wastewater treatment plants. High levels of suspended sediments are due to land and streambank erosion.

The data provided in Table 3-3 represents the results by WMA from the existing conditions STEPL model (land-based loads) as well as pollutant loads from stream erosion. The STEPL pollutant loads are heavily dependent on land-use distribution within the WMAs. The stream erosion loads were calculated separately and were estimated from available stream survey and soils information.

Table 3-3: Pollutant Loads – STEPL and Streambank Erosion

		Pollutant Loading STEPL Results			Streambank Erosion Pollutant Loading		
WMA	**Area**	**TSS (tons/ ac/yr)**	**TN (lb/ ac/yr)**	**TP (lb/ ac/yr)**	**TSS (tons/ ac/yr)**	**TN (lb/ ac/yr)**	**TP (lb/ ac/yr)**
High Point	2,346	0.091	1.764	0.323	0.049	0.072	0.028
Kane Creek	1,948	0.086	1.740	0.311	0.123	0.171	0.066
Mill Branch - Giles Run North	3,015	0.119	4.237	0.677	0.185	0.278	0.108
Mill Branch - Giles Run South	2,540	0.188	6.678	0.958	0.168	0.248	0.096
Mill Branch	1,889	0.164	6.282	0.869	0.145	0.220	0.085
Occoquan	1,532	0.110	3.356	0.491	0.135	0.197	0.076
Old Mill Branch	2,525	0.070	1.345	0.239	0.092	0.139	0.054
Ryans Dam	2,308	0.080	1.308	0.245	0.140	0.192	0.074
Sandy Run	3,105	0.054	2.488	0.380	0.142	0.223	0.086
Wolf Run	2,041	0.045	2.135	0.326	0.364	0.575	0.223

3.2.3 HEC-RAS Results

Hydraulic models were created for the major channels in the watershed. These major channels extend from the basin outlet to the most upstream sub-basins in the watershed. Cross sections were aligned based on representative channel sections, and upstream and downstream of bridges. Structures along these streams were identified based on the County's GIS road shapefiles and the most recent aerial photos provided by the County, and surveyed using GIS equipment. Flow data was entered from the SWMM model.

Three flood events were modeled in HEC-RAS: the 100-year, 10-year and 2-year events. These are the events that have a 1 percent, 10 percent or 50 percent chance, respectively, of occurring in any given year. The 100- and 10-year floodplains were mapped to determine the extent of the flooding. The impact of the flooding on the watershed was determined by examining roads that are overtopped or buildings that are located within the floodplain.

3.3 Ranking of Subwatershed Areas

The County has developed goals and objectives to be applied to all watersheds during the workbook development process. The countywide goals and objectives allow recommendations to be linked to the countywide watershed assessment. The goals are:

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

The list of objectives allows for a countywide evaluation that addresses stakeholder concerns while providing an efficient and effective means of assessment.

Table 3-4: Fairfax County Watershed Planning Final Objectives

Objective	Linked to Goal(s)
CATEGORY 1. HYDROLOGY	
1A. Minimize impacts of stormwater runoff on stream hydrology to promote stable stream morphology, protect habitat and support biota.	1
1B. Minimize flooding to protect property and human health and safety.	2
CATEGORY 2. HABITAT	
2A. Provide for healthy habitat through protecting, restoring and maintaining riparian buffers, wetlands and instream habitat.	1
2B. Improve and maintain diversity of native plants and animals in the county.	1
CATEGORY 3. STREAM WATER QUALITY	
3A. Minimize impacts to stream water quality from pollutants in stormwater runoff.	1, 2
CATEGORY 4. DRINKING WATER QUALITY	
4A. Minimize impacts to drinking water sources from pathogens, nutrients and toxics in stormwater runoff.	2
4B. Minimize impacts to drinking water storage capacity from sediment in stormwater runoff.	2
CATEGORY 5 STEWARDSHIP	
5A. Encourage the public to participate in watershed stewardship.	3
5B. Coordinate with regional jurisdictions on watershed management and restoration efforts such as Chesapeake Bay initiatives.	3
5C. Improve watershed aesthetics in Fairfax County.	1, 3

The purpose of the subwatershed ranking approach is to provide a systematic means of compiling available water quality and natural resources information. Ranking subwatersheds based on watershed characterization and modeling results provides a tool for planners and managers to aid in the project selection, types of projects and prioritization processes. The ranking was updated based on issues and problem areas identified during the introductory and issues scoping forum and advisory group meetings. The resultant data is then used to identify key issues and proceed with projects that will achieve the County's watershed management goals and objectives.

Three basic indicator categories were used to rank subwatershed conditions, as identified in Table 3-5.

Table 3-5: Subwatershed Ranking Indicators

Indicator Type	Description
Watershed Impact	Diagnostic measures of environmental conditions (e.g., water quality, habitat health biotic integrity) that are linked to the County's goals and objectives
Programmatic	Reports the existence, location or benefits of stormwater management facilities or programs
Source	Quantifies the presence of stressors and/or pollutant sources

These scores were weighted and combined into composite scores that are used in the subwatershed ranking and project prioritization process.

3.4 Lower Occoquan Results

The Lower Occoquan Watershed Impact Composite Score is shown in **Map 3.5-1**. This map displays an overall composite score that itself is a weighted average of composite scores of the individual impact indicators for each subwatershed. The scale on the map ranks the subwatersheds from high (green) to low (red) quality.

In the Lower Occoquan watershed, various portions differ considerably in quality as measured by the overall watershed impact indicator composite score. The watershed's western and northern portions, (including Old Mill Branch, Wolf Run, Ryans Dam and Sandy Run WMAs), all of which discharge directly into the Occoquan River and Reservoir, show generally good watershed quality. These subwatersheds include a wide area that was downzoned by Fairfax County in 1982 to protect the water quality of the Occoquan Reservoir. Several of the subwatersheds in the I-95 corridor of the southern grouping of subwatersheds, including Giles Run North and Giles Run South, show poorer overall watershed quality. The eastern portion of the watershed (including the majority of the Kane Creek and High Point WMAs) also shows generally good watershed quality, as much of this land is either Federally protected or a state park. The more developed central portion of the watershed (Mill Branch, Giles Run North and Giles Run South WMAs) shows a generally average watershed quality, but also a great deal of variation between individual subwatersheds. The older, more heavily developed headwaters of the Mill Branch watershed (Mill Branch, Giles Run North and Giles Run South WMAs) show the poorest watershed quality in general. The Mill Branch WMA is experiencing significant redevelopment as a result of the Laurel Hill project. Pockets of better water quality still exist where undeveloped lands remain intact.

The source composite score rankings are shown in **Map 3.5-2**. Unlike the watershed impact score, the source composite score was computed as a simple average of approximately a dozen individual source indicator scores. The scale establishes the bounds on the gradation from generally good quality (green) to comparatively poor quality (red) on the map. Since the source composite score was computed with a distinct set of indicators from the overall watershed impact score, the subwatersheds with good quality or poor quality may be significantly different than for the overall watershed impact map.

Fairfax County's 1982 downzoning of much of the County's Occoquan River watershed has preserved higher source quality in the watershed. The subwatersheds to the west of the Laurel Hill redevelopment project and Interstate 95 (Old Mill Branch, Wolf Run, Ryans Dam, Sandy Run, and Occoquan) each have generally high source quality. The more densely developed subwatersheds that include Laurel Hill and the I-95 corridor (Mill Branch, Giles Run North and Giles Run South), however, have generally poor source quality, as noted by the orange and red regions on the map. The eastern reaches of the Lower Occoquan subwatersheds, including Kane Creek and High Point, are characterized by above-average to good source quality, with zones of average quality around the Mason Neck marina area just downstream of the I-95 Bridge.

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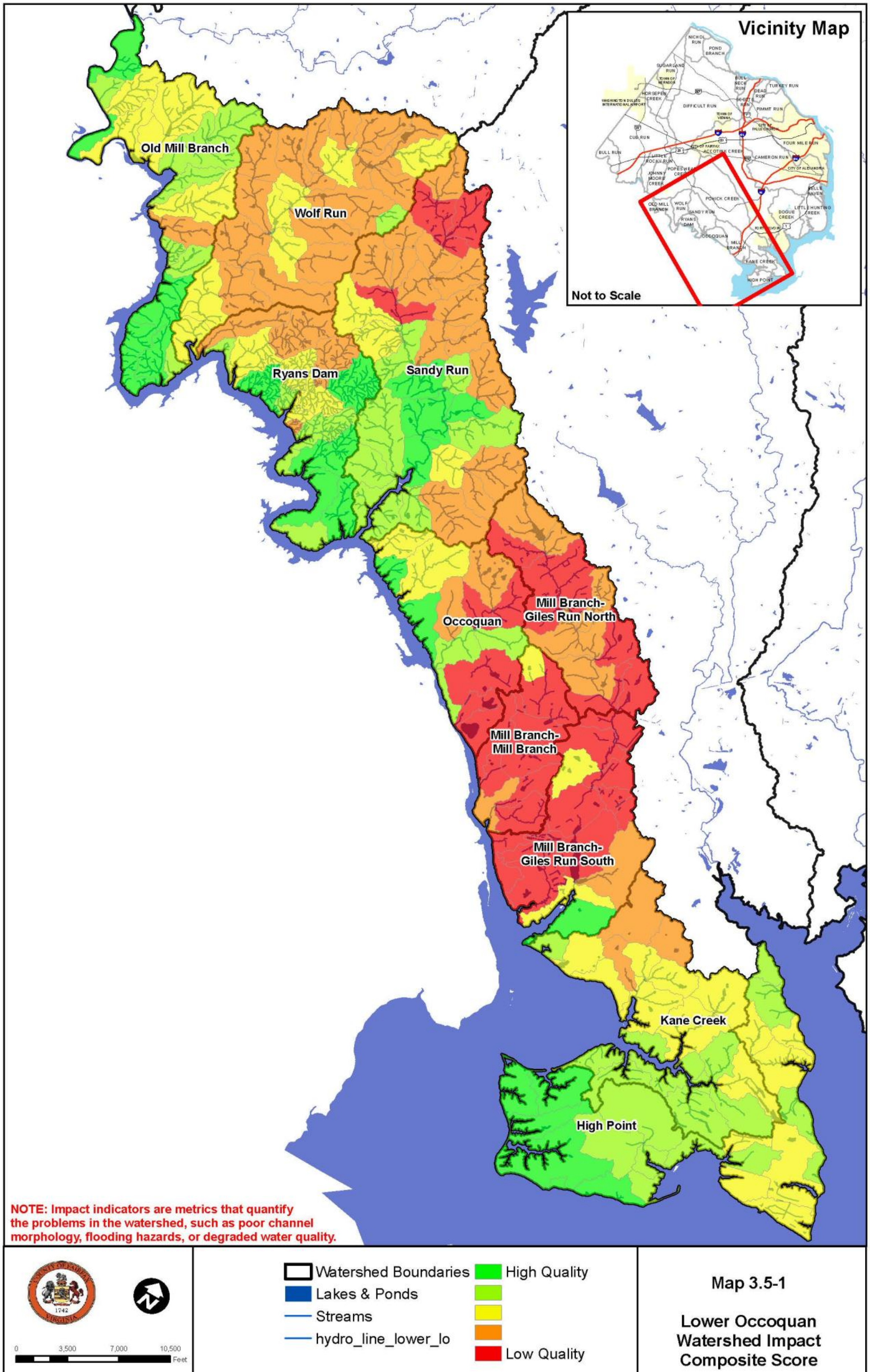
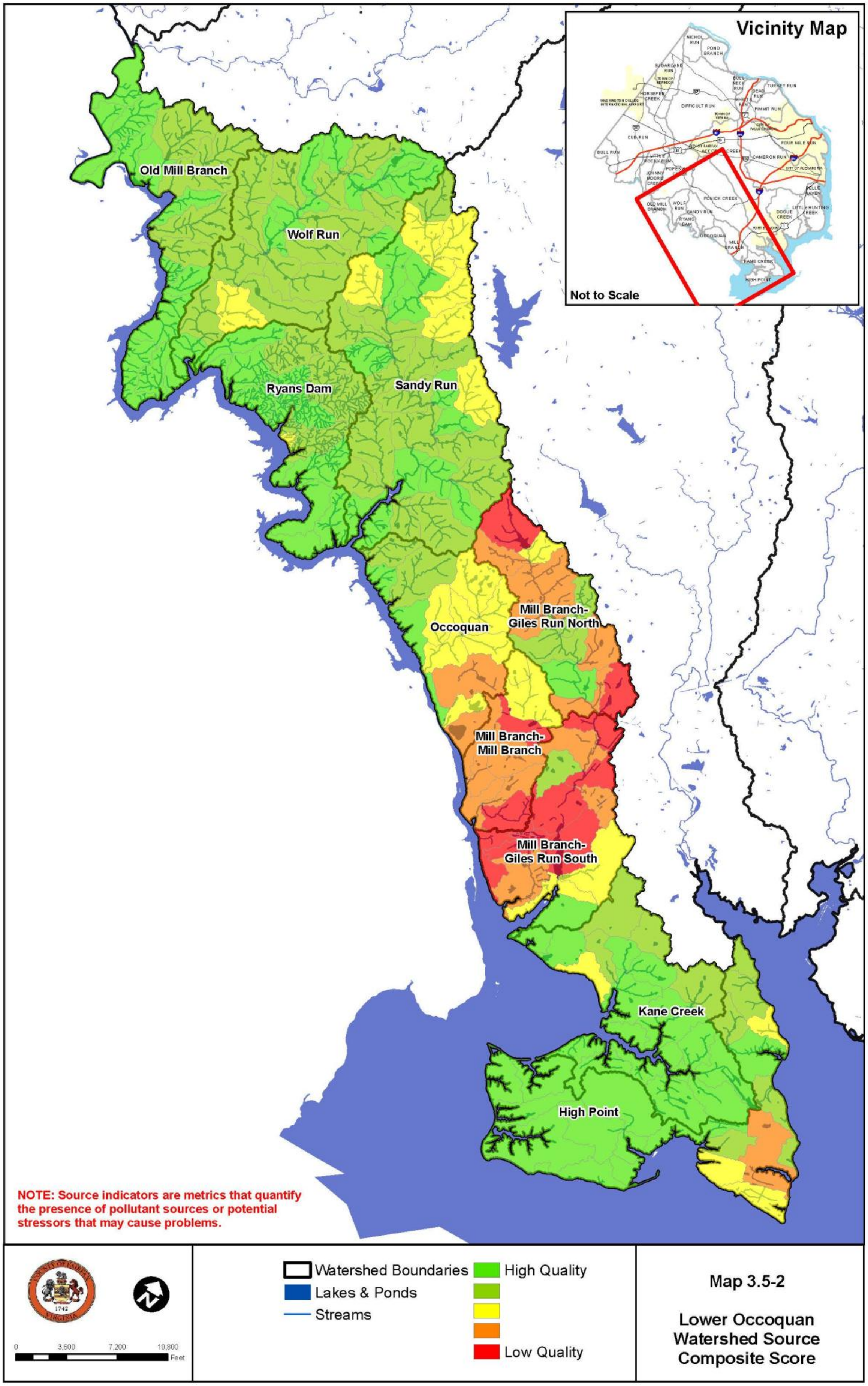


Map 3.5-1

Lower Occoquan Watershed Impact Composite Score


Vicinity Map
Not to Scale
Old Mill Branch
Wolf Run
Ryans Dam
Sandy Run
Occoquan
Mill Branch-
Giles Run North
Mill Branch-
Mill Branch
Mill Branch-
Giles Run South
Kane Creek
High Point
NOTE: Source indicators are metrics that quantify the presence of pollutant sources or potential stressors that may cause problems.
Watershed Boundaries
Lakes & Ponds
Streams
High Quality
Low Quality
0
3,600
7,200
10,800
Feet
Map 3.5-2
Lower Occoquan Watershed Source Composite Score

4.0 Summary of Watershed Restoration Strategies

Watershed impact indicators, source indicators and field reconnaissance were used to determine areas of impairment or degraded conditions in the Lower Occoquan watershed. Maps were created of these areas using the subwatershed ranking procedure. These maps were then used to create restoration strategies to address and mitigate areas of impairment or degraded conditions. Within Lower Occoquan, all 10 of the watershed management areas (WMAs) experienced some level of impairment, ranging from severe stream bank erosion to minor raised nutrient loading. Restoration strategies considered for Lower Occoquan varied in range from stream restoration and habitat quality improvement to addressing flooding issues and improving water quality.

The process for candidate site selection was based on the broad restoration strategies. Color-coded watershed maps and spreadsheets were created using the scoring thresholds developed for the watershed metrics. This gave a visual representation of potential problem trends or issues throughout the overall watershed. The scoring worksheets from the Subwatershed Ranking Spreadsheets were reviewed, and some basic statistical calculations were performed to identify some of the more prevalent issues affecting each watershed as a whole. After identifying some basic trends, individual WMAs were selected for analysis.

The individual metrics comprising the watershed's composite score were reviewed for each subwatershed and any potential project areas were identified. Each subwatershed has a composite score for its source indicators and impact indicators. Subwatersheds with both severe source and impact indicators were deemed most critical for restoration. The final step involved looking at GIS, aerials, field site visit forms, site photos, community input, and other pertinent information. Projects and sites were selected that helped the overall condition of the watershed and which best aligned with County goals and objectives. During site selection and prioritization, stormwater system improvement, system repair, prevention and site-specific conditions were all considered. Multiple remedy options were available. For areas of extreme degradation or severe conditions, improvements were proposed. For areas with moderate conditions, only repairs were proposed. Lastly, for areas in good condition, but facing potential future degradation, prevention projects were selected, most of which were targeted to open areas on public land.

See **Map 4.1**, which includes BOS magisterial districts, for locations of all proposed projects in the Lower Occoquan Creek watershed. See Table 4-1 for a list of all projects. More information on the individual projects can be found in Section 5. A detailed description of the project selection methodology can be found in Appendix B.

Each proposed project was labeled using a standard 6-digit convention, XX9YZZL, where:

XX 2-digit watershed code
Y Project Type Code as follows:

- 0 – Regional pond projects/alternatives
- 1 – New SWM pond/SWM pond retrofit
- 2 – Stream restoration projects
- 3 – Area-wide drainage improvement
- 4 – Culvert retrofit
- 5 – New BMP/LID and BMP/LID retrofit
- 6 – Flood protection/mitigation
- 7 – Outfall improvement
- 8 & 9 – All other project types

ZZ Remaining digits in ascending order throughout the watershed starting with 00 at the lowest point in the watershed
L A, B, C, etc. (if needed), used if a given project consists of several large components.

4.1 Restoration Strategies

4.1.1 Structural Projects

The structural projects will be part of the County's capital improvement plans and were prioritized as being in either the 0-10 year plan or the 11-25 year plan. The structural projects are funded separately from the non-structural projects. Cost estimates for the structural projects were created per the County's guidance. The structural project types proposed were approved by the County and discussed in the WAG.

Structural Project Types include:

- Stormwater pond retrofits / New Stormwater Ponds
- Stream restorations
- BMP/LID Projects
- Dumpsite and obstruction removals

These projects, when possible, were proposed on County owned land to allow for easy implementation. These projects will help improve the County's existing stormwater infrastructure and help ensure full utilization of the County's existing resources.

4.1.2 Types of Structural Projects

Stormwater Pond Retrofits/New Stormwater Ponds

A new stormwater pond project involves the creation of an extended detention dry pond that will improve water quality and quantity treatment for the surrounding area. Wet pond retrofits will modify the existing pond to increase pollutant removal and to provide adequate channel protection above the permanent pool. The retrofit will create a better-functioning environment for gravitational settling, biological uptake, and microbial activity with a permanent pool of standing water, providing for high and reliable pollutant removal performance. The pool prevents re-suspension of sediments and other pollutants and allows for numerous pollutant removal mechanisms to operate. Dry pond retrofits will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure, which enables particulate pollutants to settle out, providing fair to good removal for particulate pollutants.

Figure 4-1: Dry stormwater pond

Figure 4-2: Wet stormwater pond with forebay

Best Management Practice (BMP)/Low Impact Development (LID) Projects

A BMP/Low Impact Development (LID) project is designed to minimize the impact of changes in land use on surface and groundwater systems, with the primary goal of mimicking predevelopment site hydrology. BMP/LID projects can be either structural or non-structural in form. Structural BMP/LID projects include: bioswales, pervious pavement, and bioretention filters. Bioswales will capture sheet flow from impervious areas and reduce runoff volume and increase groundwater recharge. Pervious pavement will treat and/or reduce parking lot runoff using a (semi-)porous material that allows runoff to infiltrate and then trap pollutants in the soil. The pavement will also allow for surface storage, reducing runoff volumes. Bioretention will capture sheet flow from impervious areas and create an ideal environment for filtration, biological uptake and microbial activity, providing moderate to high pollutant removal. It will also reduce the outflow to the storm sewer system.

Figure 4-3: Parking lot pervious pavement

Figure 4-4: Parking lot bioretention filter

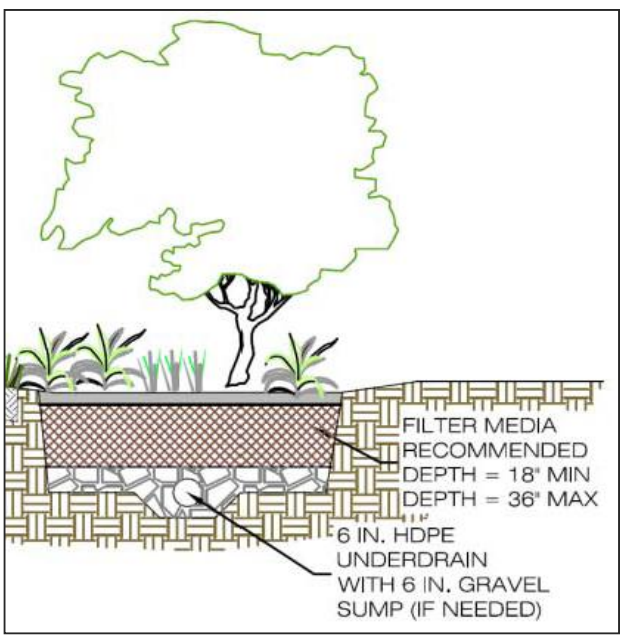


Figure 4-5: Bioretention section

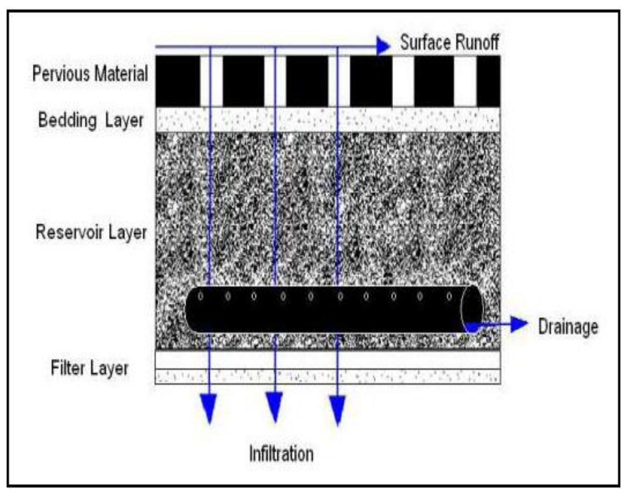


Figure 4-6: Pervious pavement section

Stream Restoration

Stream restoration is the re-establishment of the general structure, function and self-sustaining behavior of a stream. Restoration can include numerous methods such as installation of structures and planting of vegetation to stabilize and protect stream banks, reshaping or re-aligning stream banks, and repairing stream bed erosion in order to restore the natural morphology of the stream. A stream restoration project can consist of reopening to daylight, sections of a stream that had previously been piped. This is also known as daylighting. Other stream restorations include improving conditions around a stream's inflow pipes by providing outfall protection with energy dissipation devices. This will also help to minimize erosion.

Figure 4-7: Cross vane added to stream

Figure 4-8: Stabilized stream banks

Outfall Improvements

Outfall improvement projects consist of several different measures designed to reduce erosive velocities and sediment loads at the stormwater outfalls. Outfall improvement projects can include reconstruction of the outfall to provide an energy dissipation device and erosion protection, reconstruction of roadside swales or concrete channels with vegetated plantings, and construction of a new storage and treatment area below an outfall.

Figure 4-9: An eroded outfall

Figure 4-10: An improved outfall

4.1.3 Non-Structural Projects

Non-structural projects are a group of projects that do not require traditional construction measures to be implemented and may be programmatic in nature. These projects may include:

- Buffer restorations
- Dumpsite and obstruction removals
- Street-sweeping programs
- Rain-barrel/Cisterns programs (BMP/LID projects)
- Community outreach and public education
- Land conservation coordination projects
- Inspection and enforcement projects

Figure 4-11: Community members restoring and replanting stream buffer area

These projects, in concert with the structural projects, represent a holistic approach to watershed management. Since much of the land area in Fairfax County is privately owned, there is a strong need to work with local communities to promote environmental awareness and recommend projects that can be implemented by residents and other groups.

The fundamental difference between structural and non-structural projects is the ability to predict the result of the project implementation through models. For example, the nitrogen removal of a wet pond may be calculated; however, there is no way to predict the reduction in nitrogen from an outreach campaign on proper fertilizer use. Additionally, these projects and programs should not be confined to any single watershed but could be implemented throughout the County as opportunities occur. Because of these differences, non-structural projects were evaluated and will be implemented using a different process than the structural projects.

There are many advantages of non-structural projects. Some of the key advantages to these projects type are:

- Less cost
- Less disruption
- More public and community awareness

In general, non-structural projects represent opportunities to proactively pursue stormwater issues that more traditional structural practices cannot address. The use of non-structural practices fulfills Fairfax County's MS4 permit requirements and environmental initiatives. The full potential of these projects will be realized through partnerships with County agencies, residents and other interested parties.

4.1.4 Types of Non-Structural Projects

Buffer Restorations / Reforestations

Buffer restoration projects consist of practices such as the re-planting of upland buffer areas and providing riparian reforestation (re-establishing additional streamside buffers), which helps filter pollutants while reducing runoff by intercepting the water and increasing surface storage and infiltration.

Figure 4-11: Tires and debris removed near or from stream

Dumpsite/Obstruction Removals

Dumpsite/obstruction removals are the removal of obstructions in or near stream channels, which help restore stream channels to their natural conditions and improve the function of the streams. Examples of proposed projects include: the cleanup of trash in or near the stream channel to help reduce the amount of pollutants from entering adjacent streams and storm systems; or the removal of a blockage within the stream channel, relieving flooding and/or erosion.

Street-Sweeping Programs

Street sweeping helps reduce the amount of potential pollutants entering nearby streams and storm systems. In addition, these programs add the aesthetic benefits of having clean streets and the safety benefits of removing debris that can block storm systems and stormwater facilities. Areas where these projects were proposed are primarily comprised of dense residential development, many of which have streets that are piped directly into the nearby streams with little to no stormwater controls.

Figure 4-12: Street-sweeping truck

Rain-barrel/Cisterns programs

Rain-barrel/Cisterns programs are mainly proposed at school sites. These projects are considered BMP/LID projects because of the low impact they would have on the existing conditions. For these projects, rain-barrels would be placed at schools that have roofs with external downspouts, and cisterns would be designed for schools without external downspouts.

4.2 Project Prioritization Process

The structural project prioritization was completed using a spreadsheet based on the prioritization scheme that is summarized in Appendix B. The spreadsheet uses five factors to provide a basis to compare each project's ability to improve the watershed and rank the most beneficial projects. The five factors were weighted as follows: impact indicators (30 percent), source indicators (30 percent), priority subwatersheds (10 percent), sequencing (20 percent) and implementability (10 percent).

The final composite scores for projects were based on the five factors and their corresponding weights. This score was used to obtain an initial ranking. The higher the overall composite scores the lower the preliminary rank (higher priority). Once the initial rankings were completed using the prioritization scheme's quantitative method, the projects were qualitatively reviewed. This review involved going through every project starting at the highest ranked projects and reviewing the project descriptions, GIS information, field observations, WAG comments, and the ability for a project to achieve the County's objectives. From this review, best professional judgment (BPJ) was used to adjust the scores to verify the projects were ranked correctly. At this time, the number of structural projects to be implemented was reduced, due to Lower Occoquan Watershed's preserved state and the limited number of viable projects. Additionally, candidate projects that cost less than $80,000 and could not be grouped with another project were eliminated from the WMP.

Once the initial priority ranking determined the highest priority projects that would be implemented in the 10-year plan, a simplified cost-benefit analysis (CBA) was completed. The cost-benefit analysis divided a project's composite score (i.e., benefit) by its cost, to allow a cross comparison of 10-year plan projects. This cost analysis created a project ranking that was different from the initial ranking. Projects with CBA rankings substantially different from the initial ranking had their rankings adjusted. Projects with lower costs than other projects with similar benefit had their scores improved so that they would be implemented first.

Non-structural projects were ranked using either a quantitative analysis or a qualitative analysis, depending on the project type. Rain barrels and buffer restorations were scored per the method described above. Project ranks for street sweeping and reforestation projects were determined by comparing the existing conditions suspended solids, phosphorus, and nitrogen ranking indicator scores and were assigned a score of 1 through 5 based on their potential for improvement. The average of these scores was used to obtain an initial ranking. Finally, a BPJ score modification was used to account for any project-specific issues. Due to the high implementability and immediate results of the non-structural projects, these projects were evaluated separately from the 0 – 25-year plan. Additional information on the project prioritization process can be found in Technical Memo 3.4/3.5 in Appendix B.

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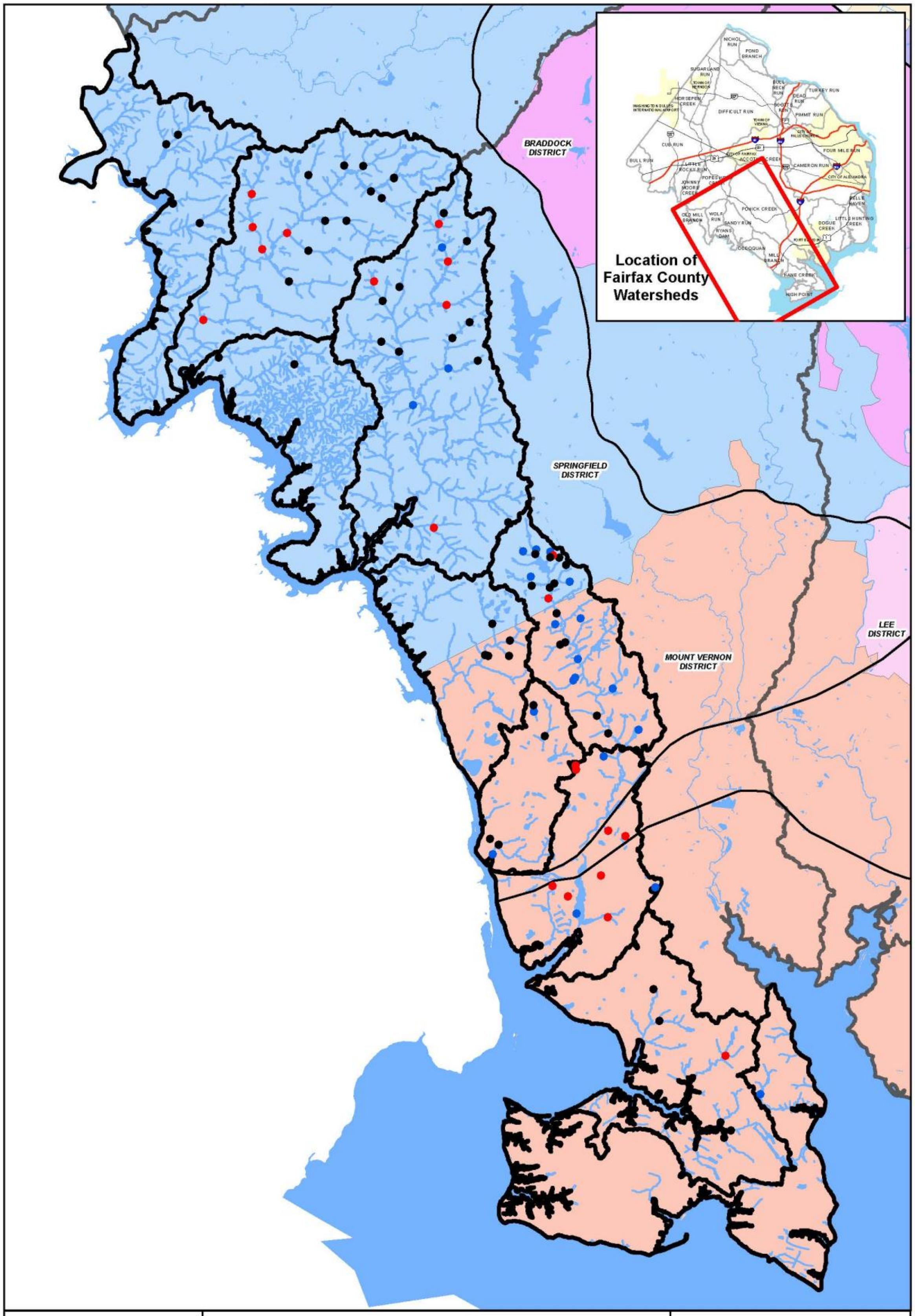

0 3,600 7,200 10,800 Feet

- 0-10 Year Projects
- 11-25 Year Projects
- Non-Structural Projects
- Water Areas
- Major Roads
- Lower Occoquan WMA's

Map 4.1

Proposed Projects and Board of Supervisors Magisterial Districts

Table 4-1: Project List - Master

Priority Structural Projects (Ten Year Implementation Plan)[1]						
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**	**Cost**
KC9209	Stream Restoration	Kane Creek	Behind 10809 Harley Rd.	Water quality control	Public/State/ Private - Department of Conservation and Economic Department, Residential	$ 840,000
MB9104	Stormwater Pond Retrofit	Mill Branch-Giles Run South	10418 Old Colchester Rd. (Mason Neck West Park)	Water quality and quantity control	Public/ Local - FCPA	$ 240,000
MB9105	Stormwater Pond Retrofit	Mill Branch-Giles Run South	Across from 10555 Furnace Rd.	Water quality and quantity control	Public/State - VDOT	$ 280,000
MB9107	Stormwater Pond Retrofit	Mill Branch-Giles Run South	10119 Giles Run Rd.	Water quality and quantity control	Private - Residential	$ 130,000
MB9109	Stormwater Pond Retrofit	Mill Branch-Giles Run South	8115 Mims St.	Water quality and quantity control	Private - Industrial	$ 290,000
MB9111	Stormwater Pond Retrofit	Mill Branch-Giles Run South	9816 Richmond Hwy.	Water quality and quantity control	Private - Commercial	$ 180,000
MB9114	Stormwater Pond Retrofit	Mill Branch-Giles Run South	9850 Furnace Rd. (I-95 Landfill)	Water quality and quantity control	Public/ Local - FCPS	$ 160,000
MB9122	Stormwater Pond Retrofit	Mill Branch-Giles Run North	Behind 8605 Cross Chase Court	Water quality and quantity control	Private - Commercial	$ 190,000
MB9202	Stream Restoration	Mill Branch-Giles Run South	10207 Old Colchester Rd.	Water quality control	Public/ Federal - USA	$ 720,000
MB9506	BMP/LID	Mill Branch-Giles Run South	9850 Furnace Rd, Lorton (I-95 Landfill)	Water quality and quantity control	Public/ Local - FCPS	$ 110,000

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Priority Structural Projects (Ten Year Implementation Plan)[1]						
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**	**Cost**
MB9510	BMP/LID	Mill Branch-Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)	Water quality and quantity control	Public/Local - FCPS	$ 220,000
SA9201	Stream Restoration	Sandy Run	Next to 8721 Birch Cliff Dr.	Water quality control	Private - Residential	$ 780,000
SA9209	Stream Restoration	Sandy Run	Near 10746 Beechnut Ct.	Water quality control	Private - Residential, HOA	$ 600,000
SA9211	Stream Restoration	Sandy Run	Behind 6901 Streamwood Pl.	Water quality control	Public/Local - FCPA	$ 360,000
SA9213	Stream Restoration	Sandy Run	6650 Rutledge Dr.	Water quality control	Private - Residential	$ 560,000
SA9701	Outfall Improvement	Sandy Run	Near 11223 Silverleaf Dr.	Water quality and quantity control	Private - Residential	$ 150,000
WR9201	Stream Restoration	Wolf Run	Behind 12101 Henderson Rd.	Water quality control	Private - Residential	$ 1,120,000
WR9208	Stream Restoration	Wolf Run	Near 12025 Seven Hills La.	Water quality control	Private - Residential	$ 1,050,000
WR9209	Stream Restoration	Wolf Run	12060 Rose Hall Dr.	Water quality control	Private - Residential	$ 1,420,000
WR9211	Stream Restoration	Wolf Run	Behind 11724 Amkin Dr.	Water quality control	Private - Residential	$ 1,160,000
WR9212	Stream Restoration	Wolf Run	7610 Maple Branch Rd.	Water quality control	Private - Residential	$ 1,420,000
					Total Cost	**$11,980,000**

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Long-Term Structural Projects (25 Year Implementation Plan)[1]					
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**
KC9203	Stream Restoration	Kane Creek	6407 High Point Rd. (Mason Neck State Park)	Water quality control	Public/Federal - USA
KC9204	Stream Restoration	Kane Creek	6408 High Point Rd. (Mason Neck State Park)	Water quality control	Public/State/Federal - Commonwealth of VA, USA
KC9205	Stream Restoration	Kane Creek	6409 High Point Rd. (Mason Neck State Park)	Water quality control	Public/State/Federal - Commonwealth of VA, Department of Conservation and Economic Development, USA
KC9208	Stream Restoration	Kane Creek	Behind 10800 Harley Rd.	Water quality control	Public/Federal/Private - USA, Residential
KC9210	Stream Restoration	Kane Creek	Across from 10417 Gunston Rd.	Water quality control	Public/State/Federal/Private - VDOT, USA, Residential
MB9106	Stormwater Pond Retrofit	Mill Branch-Giles Run South	10301 Richmond Hwy	Water quality and quantity control	Public/Local/Private - FCPA, Industrial
MB9108	Stormwater Pond Retrofit	Mill Branch-Giles Run South	10109 Giles Run Rd.	Water quality and quantity control	Private - Industrial
MB9117	Stormwater Pond Retrofit	Mill Branch-Mill Branch	Behind 8940 Highgrove Ct.	Water quality and quantity control	Private - Residential, HOA
MB9119	Stormwater Pond Retrofit	Mill Branch-Giles Run North	Near 9300 Cardinal Forest La.	Water quality and quantity control	Private - Commercial
MB9120	Stormwater Pond Retrofit	Mill Branch-Giles Run North	9001 Southpointe La. (Behind Cul-de-sac)	Water quality and quantity control	Private - Commercial
MB9121	Stormwater Pond Retrofit	Mill Branch-Giles Run North	8850 Cross Chase Circle (William Halley Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9123	Stormwater Pond Retrofit	Mill Branch-Giles Run North	Behind 8628 Meadow Edge Terr.	Water quality and quantity control	Private - Commercial
MB9124	Stormwater Pond Retrofit	Mill Branch-Giles Run North	Behind 9210 Cross Oaks Ct.	Water quality and quantity control	Private - Commercial
MB9125	Stormwater Pond Retrofit	Mill Branch-Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)	Water quality and quantity control	Public/Local-FCPS

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Long-Term Structural Projects (25 Year Implementation Plan)[1]					
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**
MB9205	Stream Restoration	Mill Branch-Mill Branch	9751 Ox Rd (Occoquan Regional Park, Site 1)	Water quality control	Public/Local - FCPS
MB9206	Stream Restoration	Mill Branch-Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 3)	Water quality control	Public/Local - FCPS
MB9207	Stream Restoration	Mill Branch-Mill Branch	Across street from 8932 Lorton Rd.	Water quality control	Public/Local - FCPA
MB9208	Stream Restoration	Mill Branch-Giles Run North	8301 Lorton Rd.	Water quality control	Public/Local/State/Private - FCPA, VDOT, Residential
MB9209	Stream Restoration	Mill Branch-Giles Run North	8300 Newby Bridge Dr.	Water quality control	Public/Local - FCPA
MB9210	Stream Restoration	Mill Branch-Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)	Water quality control	Public/Local - FCPA
MB9212	Stream Restoration	Mill Branch-Giles Run North	8921 Cross Chase Cir.	Water quality control	Private - Commercial
MB9213	Stream Restoration	Mill Branch-Giles Run North	8601 Cross View	Water quality and quantity control	Private - Commercial
MB9502	BMP/LID	Mill Branch-Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 5)	Water quality and quantity control	Public/Local - FCPS
MB9504	BMP/LID	Mill Branch-Giles Run South	10100 Gunston Rd. (Gunston Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9509	BMP/LID	Mill Branch-Giles Run North	8285 Glen Eagles La. (Christ Church United Methodist Inc.)	Water quality and quantity control	Private - Church
MB9511	BMP/LID	Mill Branch-Giles Run North	8275 Glen Eagles La. (Crosspointe Swim and Racquet Club)	Water quality and quantity control	Private - Residential
OC9101	Stormwater Pond Retrofit	Occoquan	Behind 9340 Davis Dr.	Water quality and quantity control	Private - HOA

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Long-Term Structural Projects (25 Year Implementation Plan)[1]					
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**
OC9102	Stormwater Pond Retrofit	Occoquan	Behind 9270 Davis Dr.	Water quality and quantity control	Private - Residential
OC9203	Stream Restoration Suite	Occoquan	Behind 9307 Denali Way	Water quality control	Private - Residential, HOA
OC9204	Stream Restoration	Occoquan	10450 Van Thompson Rd.	Water quality control	Public/Local/Private - FCPA, Residential
OC9207	Stream Restoration Suite	Occoquan	Behind 9035 Palmer Dr.	Water quality control	Private - Residential
OC9208	Stream Restoration	Occoquan	Behind 9520 Elk Horn Rd.	Water quality control	Private - Residential
OM9201	Stream Restoration	Old Mill Branch	Near 12505 Old Yates Ford Rd. (Fountainhead Regional Park)	Water quality control	Public/Local/Private - FCPA, Residential
OM9202	Stream Restoration	Old Mill Branch	Behind 8100 Flossie La.	Water quality control	Private - Residential
OM9203	Stream Restoration	Old Mill Branch	Behind 12606 Clifton Hunt La.	Water quality control	Private - Residential
OM9205	Stream Restoration	Old Mill Branch	Behind 12990 Wyckland Dr.	Water quality control	Private - Residential
OM9206	Stream Restoration	Old Mill Branch	Behind 12995 Wyckland Dr.	Water quality control	Private - Residential
OM9207	Stream Restoration	Old Mill Branch	Behind 7859 My Way Dr.	Water quality control	Private - Residential
RD9201	Stream Restoration	Ryans Dam	Near 8517 Wolf Run Shoals Rd.	Water quality control	Pubic/Local/Private - NVRPA, Residential
RD9202	Stream Restoration	Ryans Dam	Behind 11470 Robert Stephens Dr.	Water quality control	Private - Residential, HOA
SA9101	Stormwater Pond Retrofit	Sandy Run	Next to 9699 Thorn Bush Dr.	Water quality and quantity control	Public/State - VDOT
SA9102	Stormwater Pond Retrofit	Sandy Run	8120 Ox Rd.	Water quality and quantity control	Public/State - Commonwealth of VA
SA9103	Stormwater Pond Retrofit	Sandy Run	Behind 7401 Wayfarer Rd.	Water quality and quantity control	Private - HOA
SA9105	Stormwater Pond Retrofit	Sandy Run	Behind 7200 Ox Rd.	Water quality and quantity control	Private - Church

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Long-Term Structural Projects (25 Year Implementation Plan)[1]					
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**
SA9205	Stream Restoration Suite	Sandy Run	Behind 10901 Henderson Rd.	Water quality control	Private - Residential
SA9206	Stream Restoration	Sandy Run	Across street from 11100 Devereux Station La.	Water quality control	Private - Residential
SA9207	Stream Restoration Suite	Sandy Run	Near 11212 Hunting Horse Dr.	Water quality control	Private - Residential
SA9208	Stream Restoration	Sandy Run	10608 Daysailer Dr.	Water quality control	Private - Residential, HOA
SA9212	Stream Restoration	Sandy Run	6572 Ox Rd.	Water quality control	Private - Residential
SA9214	Stream Restoration	Sandy Run	6635 Rutledge Dr.	Water quality control	Private - Residential
SA9702	Outfall Improvement	Sandy Run	Behind 11204 Silver Leaf Dr.	Water quality and quantity control	Private - Residential
WR9206	Stream Restoration	Wolf Run	Near 7900 Wolf Run Hills	Water quality control	Private - Residential
WR9210	Stream Restoration	Wolf Run	7501 Amkin Ct.	Water quality control	Private - Residential
WR9213	Stream Restoration	Wolf Run	Behind 7433 Clifton Rd.	Water quality control	Private - Residential
WR9214	Stream Restoration	Wolf Run	7121 Swift Run Trails Dr.	Water quality control	Private - Residential
WR9217	Stream Restoration	Wolf Run	12013 Corral Dr.	Water quality control	Private - Residential
WR9218	Stream Restoration	Wolf Run	11047 Lilting La.	Water quality control	Private - Residential
WR9219	Stream Restoration	Wolf Run	11418 Lilting La.	Water quality control	Private - Residential
WR9220	Stream Restoration	Wolf Run	11806 Yates Ford Rd.	Water quality control	Private - Residential
WR9221	Stream Restoration	Wolf Run	11721 Yates Ford Rd.	Water quality control	Public/State/Private - VDOT, Residential
WR9222	Stream Restoration	Wolf Run	11543 Lilting La.	Water quality control	Private - Residential
WR9223	Stream Restoration	Wolf Run	11543 Lilting La.	Water quality control	Private - Residential

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Non-Structural Projects[1]					
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**
HP9801	Buffer Restoration	High Point	Near 10709 Gunston Rd. (Gunston Hall Plantation)	Water quality control	Public/State - Commonwealth of VA
MB9505	BMP/LID	Mill Branch-Giles Run South	10100 Gunston Rd. (Gunston Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9507	BMP/LID	Mill Branch-Giles Run North	8850 Cross Chase Circle (William Halley Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9512	BMP/LID	Mill Branch-Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9801	Buffer Restoration	Mill Branch-Giles Run South	Behind 10463 Greene Dr.	Water quality control	Public/Local/Federal - FCPA, USA
MB9802	Buffer Restoration	Mill Branch-Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 2)	Water quality control	Public/Local/Private - FCPS, Industrial
MB9803	Street Sweeping Program	Mill Branch-Giles Run South	8386 Old Vicarage St.	Water quality control	Public/State - VDOT
MB9804	Buffer Restoration	Mill Branch-Mill Branch	Next to 8936 Lorton Rd.	Water quality control	Private - Residential
MB9805	Street Sweeping Program	Mill Branch-Giles Run North	Near 8327 Bluebird Way	Water quality control	Public/State - VDOT
MB9806	Buffer Restoration Suite	Mill Branch-Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)	Water quality control	Public/Local - FCPA
MB9807	Buffer Restoration Suite	Mill Branch-Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 2)	Water quality control	Public/Local - FCPA
MB9808	Street Sweeping Program	Mill Branch-Giles Run North	Near 8709 Lorfax Dr.	Water quality control	Public/State - VDOT
MB9809	Street Sweeping Program	Mill Branch-Giles Run North	Near 9413 Eagle Glen Ter.	Water quality control	Public/State - VDOT
MB9810	Street Sweeping Program	Mill Branch-Giles Run North	Behind 9105 Oak Chase Ct.	Water quality control	Public/State - VDOT
MB9811	Buffer Restoration	Mill Branch-Giles Run North	Next to 9527 Crosspointe Dr.	Water quality control	Private - Residential
MB9812	Street Sweeping Program	Mill Branch-Giles Run North	Near 8409 Crosslake Dr.	Water quality control	Public/State - VDOT

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Non-Structural Projects[1]					
Project #	**Project Type**	**WMA**	**Location**	**Watershed Benefit**	**Land Owner**
SA9801	Buffer Restoration	Sandy Run	Next to 10711 Sandy Run Trail	Water quality control	Private - Residential
SA9802	Buffer Restoration	Sandy Run	10600 Hunting Shire La.	Water quality control	Private - Residential
SA9803	Other	Sandy Run	Behind 6909 Heathstone Ct.	Water quality and quantity control	Public/Local - FCPA

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

5.0 Watershed Management Area Restoration Strategies

The Lower Occoquan includes eight of the 30 watersheds located within Fairfax County. These eight watersheds drain into the Occoquan River. For planning and management purposes, the County has defined drainage units called watershed management areas (WMAs), which are typically a few square miles of land area. For most of the small watersheds in Lower Occoquan, the entire watersheds are defined as WMAs. The larger Mill branch watershed has been divided into 3 individual WMAs. Figure 5-1 identifies the 10 WMAs within Lower Occoquan, their drainage area size and the number of proposed structural and non-structural projects. Summaries of Lower Occoquan's 10 WMAs are listed in the following WMA sections including field reconnaissance findings, existing and future land use, stream conditions, and stormwater infrastructure. Each WMA was examined at the subwatershed level in order to capture as much data as possible. The subwatershed conditions were reviewed and problems areas were highlighted. Projects were proposed in problematic subwatersheds. The Lower Occoquan Draft Watershed Workbook, which includes the full watershed characterization, can be found in Appendix A.

The restoration strategies proposed for the Lower Occoquan consist of 21 structural projects that should be implemented within the next ten years (0-10 year plan); 62 structural projects that should be implemented over the next 25 years (11-25 year plan) and 19 non-structural projects. This section contains project maps of the WMAs, descriptions of the WMAs, and individual project descriptions. Additionally, more detailed fact sheets for the 0-10 year plan projects are provided at the end of this section. The restoration projects proposed in this watershed management plan are distributed to the subwatersheds with poor conditions, not necessarily throughout the entire WMA.

Figure 5-1: Lower Occoquan Watershed Management Areas

WMA:		Acres	10-Year Plan	25-Year Plan	Non-Structural
1	High Point	3,555.0	0	0	1
2	Kane Creek	3,076.0	1	5	0
3	Mill Branch - Giles Run North	2,002.0	2	13	10
4	Mill Branch - Giles Run South	2,328.0	8	3	3
5	Mill Branch - Mill Branch	1,268.0	0	5	2
6	Occoquan	2,126.0	0	6	0
7	Old Mill Branch	2,724.0	0	6	0
8	Ryans Dam	2,262.0	0	2	0
9	Sandy Run	5,198.1	5	11	3
10	Wolf Run	3,761.7	5	11	0
Totals		**28,300.8**	**21**	**62**	**19**

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5.1 High Point Watershed Management Area

The High Point WMA has a total area of approximately 6.28 square miles. It is located on a peninsula in the southeastern corner of Fairfax County. More than two-thirds of High Point's boundary is surrounded by the Potomac River. It is bound to the north end by Pohick Bay Drive (Route 721) and on the west by Gunston Road (Route 242) down to the point at the confluence of Gunston Cove and the Potomac River. The High Point WMA also extends to points south and west along High Point Road, adjacent to the Kane Creek WMA to the north and the Potomac River to the south. The High Point WMA is a portion of the 800-acre Mason Neck peninsula.

The majority of the High Point watershed is covered by wetlands and is protected as part of the Elizabeth Hartwell Mason Neck National Wildlife Refuge and State Park. The streams are almost flowing wetlands. Development in this WMA has been limited to the areas east of Gunston Road and south of the Gunston Hall Plantation site in the lower end of the Mason Neck peninsula. Two primary residential subdivisions have been developed in this WMA, Hallowing Point River Estates and Gunston Manor. Residential subdivision streets lack curb and gutter and no sidewalks were observed. Stormwater infrastructure consists primarily of open channel drainage to Gunston Cove, the Potomac River and to Belmont Bay.

In the High Point WMA, the most prevalent stream conditions include disturbed stream buffers, stream channel erosion and/or widening, and crossing impacts from roads and utilities. Channel incision conditions and crossing impacts are noted in a tributary stream along Gunston Road draining into Gunston Cove. Channel incision was also noted on a tributary running through portions of the Mason Neck State Park and the Mason Neck National Wildlife Refuge. Very few pipe discharges are noted in the WMA, and road crossing impacts in the High Point WMA are generally minor. Stream buffer deficiencies are noted sporadically around the WMA, with the most significant, contiguous deficiencies noted in the residential area around Hallowing Point River Estates.

The only project proposed for this WMA, which has been preserved by the Mason Neck Park, is a buffer restoration project. No structural projects are proposed in the High Point WMA due to its preserved natural state in comparison to other watersheds. A map of this WMA and a proposed project list is provided.

5.1.1 0 – 10 Year Structural Projects

No projects proposed

5.1.2 11 – 25 Year Structural Projects

No projects proposed

5.1.3 Non-Structural Projects

<u>HP9801 Buffer Restoration</u>

This project proposes the repair of a stream buffer along Gunston Road near Gunston Hall Plantation. Repairing the buffer will re-establish the RPA. Primary indicators are streambank buffer deficiencies. Increased vegetation from buffer repair will provide additional buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration. It will also reduce runoff rates to stream and minimize erosion.

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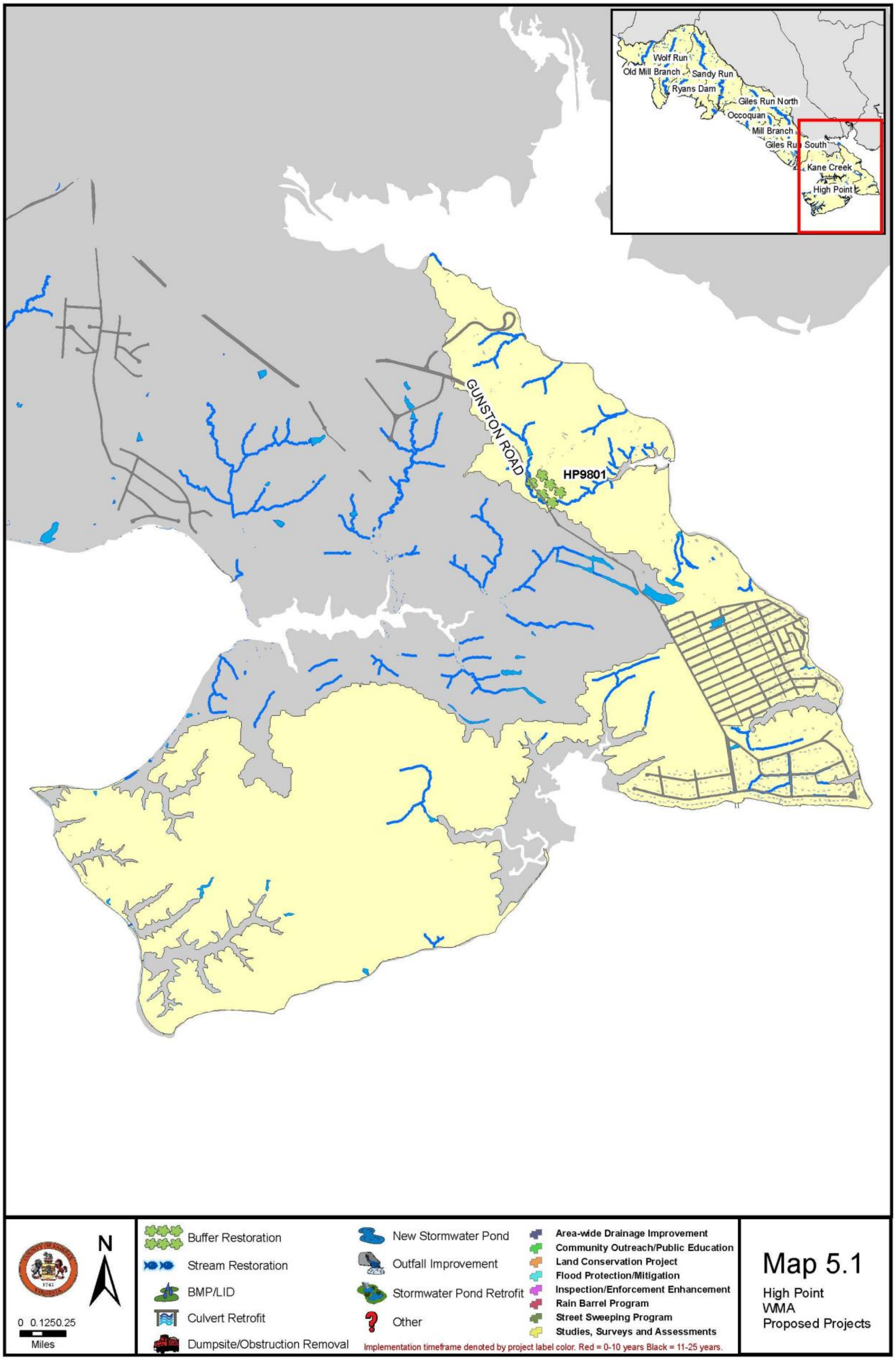
Wolf Run
Old Mill Branch
Sandy Run
Ryans Dam
Giles Run North
Occoquan
Mill Branch
Giles Run South
Kane Creek
High Point
GUNSTON ROAD
HP9801
N
0 0.1250.25
Miles
Buffer Restoration
Stream Restoration
BMP/LID
Culvert Retrofit
Dumpsite/Obstruction Removal
New Stormwater Pond
Outfall Improvement
Stormwater Pond Retrofit
Other
Area-wide Drainage Improvement
Community Outreach/Public Education
Land Conservation Project
Flood Protection/Mitigation
Inspection/Enforcement Enhancement
Rain Barrel Program
Street Sweeping Program
Studies, Surveys and Assessments
Implementation timeframe denoted by project label color. Red = 0-10 years Black = 11-25 years.
Map 5.1
High Point
WMA
Proposed Projects

Table 5-1: Project List - WMA (High Point)

Structural Projects[1]						
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
No Structural projects were ranked as a priority for this watershed due to its low density						

Non-Structural Projects[1]					
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**
HP9801	Buffer Restoration	HP-PO-0018	Near 10709 Gunston Rd. (Gunston Hall Plantation)	Water quality control	Public/State - Commonwealth of VA

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5.2 Kane Creek Watershed Management Area

Kane Creek is located on a peninsula in the southeastern corner of Fairfax County, covers 4.84 square miles, and includes 21 subwatersheds. The Kane Creek WMA consists of several small independent streams which discharge into the Belmont Bay along the Potomac River. The Kane Creek WMA is roughly bounded on the north end by Gunston Road (Route 242) and to the west by Belmont Boulevard (Route 601) and by Belmont Bay, to which Kane Creek's tributaries drain. The Kane Creek WMA is roughly bounded to the south by High Point Road and extends east into portions of the Mason Neck National Wildlife Refuge. Kane Creek is tidally influenced well into Mason Neck State Park. Kane Creek one of the highest quality Coastal Plain basins within Fairfax County and has been used as a source for reference conditions for other watersheds.

In the Kane Creek WMA, the most prevalent stream condition features noted include stream channel erosion, widening, and incision, and crossing impacts from roads and utilities. Channel incision conditions and crossing impacts are noted in most of the upstream tributaries in the Kane Creek WMA, including Thompson Creek in the Meadowood property. Stream buffer disturbance has been noted in a few of the upstream tributaries, but is less prevalent than in other lower Occoquan WMAs. Where stream buffer deficiencies are noted, they appear more sporadically around the WMA, with no significant, contiguous deficiencies noted.

The only projects proposed for this WMA are stream restorations. All of this WMA's streams are classified as stage II or III. Streams with these classifications are the best candidates for stream restorations. Below is a descriptions of a stream restoration proposed in the 0-10 year plan. No non-structural projects are proposed, such as buffer restorations, since this WMA is such a high quality coastal basin. A map of this WMA and a list of all the projects proposed in this WMA are provided. Project Fact Sheets for this WMA are located in Section 5.11.

5.2.1 0 – 10 Year Structural Projects

<u>KC9209 Stream Restoration</u>

Stream south of Springfield Drive in Lorton shows indicators of poor channel morphology. Stream is downstream of two ponds. A project is proposed to repair bank and bed erosion to restore channel morphology. Stream ultimately discharges into Belmont Bay. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

5.2.2 11 – 25 Year Structural Projects

<u>KC9203 Stream Restoration</u>

Three streams located west of High Point Road in Lorton feed into Belmont Bay and show indications of poor channel morphology. This project proposes repairing the bank and bed erosion for the southeastern stream branch to restore channel morphology. This restoration will reduce sediment loads to the stream and help control unwanted meander.

<u>KC9204 Stream Restoration</u>

Three streams located west of High Point Road in Lorton feed into Belmont Bay and show indications of poor channel morphology. This project proposes repairing the bank and bed erosion for the eastern stream branch to restore channel morphology. This restoration will reduce sediment loads to the stream and help control unwanted meander.

<u>KC9205 Stream Restoration</u>

Three streams located west of High Point Road in Lorton feed into Belmont Bay and show indications of poor channel morphology. This project proposes repairing the bank and bed erosion for the northern stream branch to restore channel morphology. This restoration will reduce sediment loads to the stream and help control unwanted meander.

<u>KC9208 Stream Restoration</u>

The Stream north of Harley Road in Lorton shows indicators of poor channel morphology. A project is proposed to repair bank and bed erosion to restore channel morphology. Restoration will minimize sediment loads to stream while maintaining capacity and controlling unwanted meander. This stream outfalls into Belmont Bay.

<u>KC9210 Stream Restoration</u>

The Stream southwest of Gunston Road flowing south east has indicators of poor channel morphology. This project proposes repairing bank and bed erosion, thereby restoring channel morphology. This will reduce sediment loads while maintaining capacity and controlling unwanted meander.

5.2.3 Non-Structural Projects

No non-structural projects are proposed for this watershed.

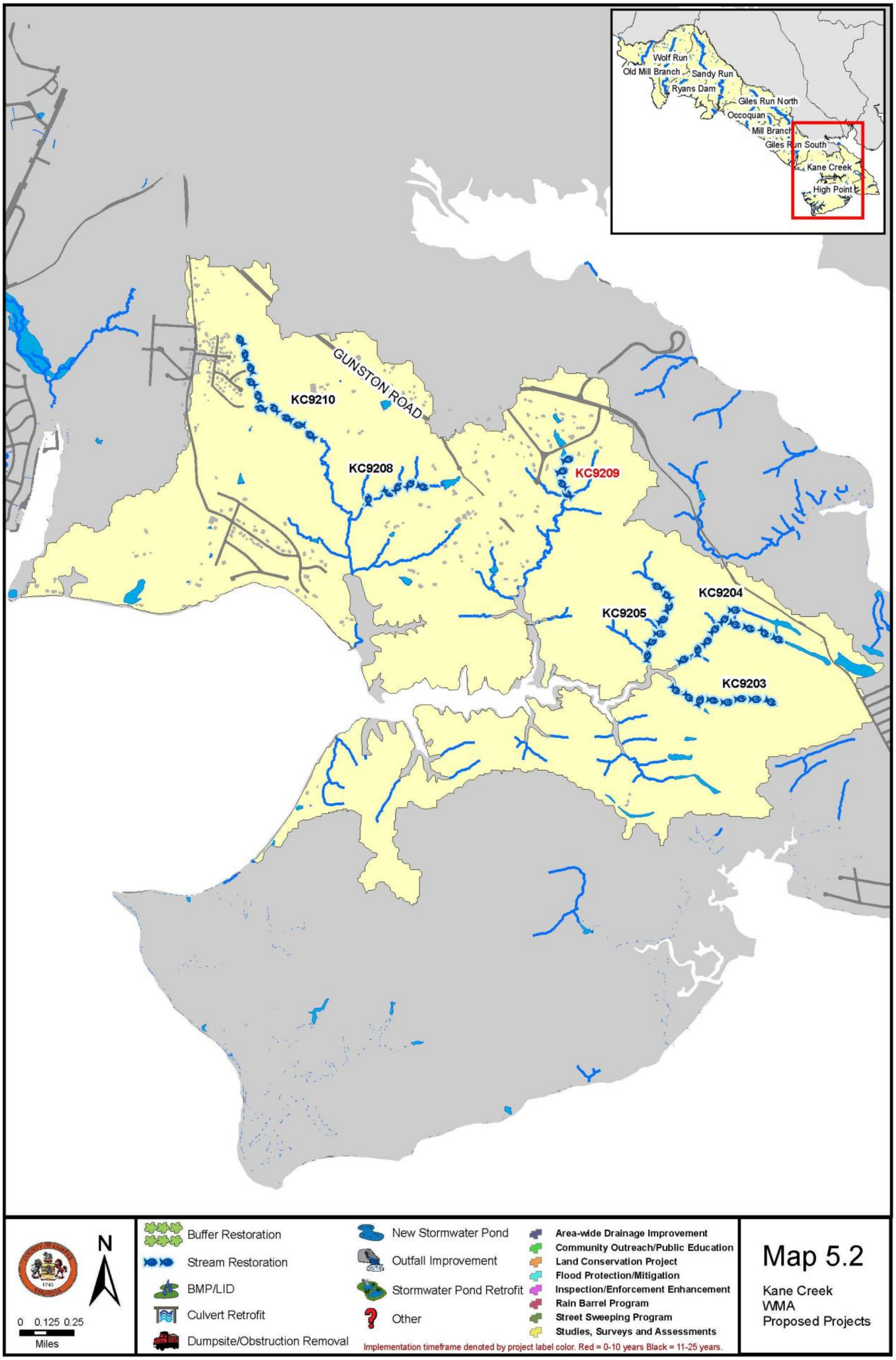
Wolf Run
Old Mill Branch
Sandy Run
Ryans Dam
Giles Run North
Occoquan
Mill Branch
Giles Run South
Kane Creek
High Point
GUNSTON ROAD
KC9210
KC9208
KC9209
KC9205
KC9204
KC9203
N
0 0.125 0.25
Miles
Buffer Restoration
Stream Restoration
BMP/LID
Culvert Retrofit
Dumpsite/Obstruction Removal
New Stormwater Pond
Outfall Improvement
Stormwater Pond Retrofit
Other
Area-wide Drainage Improvement
Community Outreach/Public Education
Land Conservation Project
Flood Protection/Mitigation
Inspection/Enforcement Enhancement
Rain Barrel Program
Street Sweeping Program
Studies, Surveys and Assessments
Implementation timeframe denoted by project label color. Red = 0-10 years Black = 11-25 years.
Map 5.2
Kane Creek
WMA
Proposed Projects

Table 5-2: Project List – WMA (Kane Creek)

Structural Projects[1]						
Project #	**Project Type**	**Sub-water-shed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
KC9209	Stream Restoration	KC-KC-0006	Behind 10809 Harley Rd.	Water quality control	Public/State/Private - Department of Conservation and Economic Department, Residential	0 – 10
KC9203	Stream Restoration	KC-KC-0013	6407 High Point Rd. (Mason Neck State Park)	Water quality control	Public/Federal - USA	11 – 25
KC9204	Stream Restoration	KC-KC-0012	6408 High Point Rd. (Mason Neck State Park)	Water quality control	Public/State/Federal - Commonwealth of VA, USA	11 – 25
KC9205	Stream Restoration	KC-KC-0009	6409 High Point Rd. (Mason Neck State Park)	Water quality control	Public/State/Federal - Commonwealth of VA, Department of Conservation and Economic Development, USA	11 – 25
KC9208	Stream Restoration	KC-TC-0004	Behind 10800 Harley Rd.	Water quality control	Public/Federal/Private - USA, Residential	11 – 25
KC9210	Stream Restoration	KC-TC-0006	Across from 10417 Gunston Rd.	Water quality control	Public/State/Federal/Private - VDOT, USA, Residential	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**
No non-structural projects are proposed for this Watershed.					

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

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5.3 Mill Branch – Giles Run North Watershed Management Area

The Giles Run North WMA is located in the eastern reaches of the collection of the Lower Occoquan watersheds and is a portion of the Mill Branch watershed. Giles Run North consists of 11 subwatersheds. The Giles Run North WMA is roughly bounded by Silverbrook Road to the north and northeast. The western border is roughly formed by Ox Road (Route 123) and the southern border of the WMA essentially follows Furnace Road east to Lorton Road. Giles Run North WMA lies entirely within the Coastal Plain physiographic province, characterized by relatively gentle topography.

This WMA is comprised primarily of single-family, detached residential properties in a number of established subdivisions, including Giles Runs, Crosspointe, Lorfax Heights, Silverbrook Estates, Spring Hill and Gunston Corner. There is also a significant amount of single-family attached homes (i.e. townhouses) development, especially in the Gunston Corner area, at the southeastern end of the WMA. Non-residential land uses include: low intensity commercial developments, schools, the Laurel Hill Golf Course, and the Christ United Methodist Church. The Giles Run North (MB) is fairly developed in certain areas; therefore, the WMA has relatively high levels of imperviousness when compared to the Lower Occoquan watershed as a whole.

The high residential development in this WMA has resulted in a stormwater infrastructure consisting primarily of curb and gutter collection through piped stormwater networks discharging to either best management practices (BMPs) or directly to Giles Run and its tributaries. In areas that developed earlier, stormwater management facilities, where present, consist primarily of dry detention basins designed to curb peak storm flows (quantity management). For areas that developed more recently, stormwater management facilities are more likely to include a water quality component.

The Giles Run North WMA contains approximately 14 dry detention and extended dry detention facilities designed to manage stormwater quantity and quality. In addition, the WMA contains three wet detention facilities, also designed for water quality and quantity management, as well as one underground chamber, which provides quantity management. As part of the Laurel Hill redevelopment project, a number of additional stormwater management facilities appear planned for construction.

The most prevalent stream impacts include disturbed stream buffers and stream channel widening. Channel widening, coincident with poor overall stream habitat, is the primary impact for the main stem of Giles Run through the WMA. Channel incision is noted for tributaries running through the Laurel Hill Park area to the south and east. Pipes discharge in streams have demonstrated an impact as well, as these pipes discharge stormwater runoff directly into the streams in areas that were developed prior to current stormwater management requirements for post-construction controls. These discharges contribute to the noted, upstream widening and erosive conditions. In addition, several 1- to 2-foot head cuts were noted on downstream tributaries in the WMA.

The watershed restoration structural projects for this WMA includes: retrofitting stormwater ponds, restoring streams, and BMP/ LID projects at school sites. Non-structural projects include street sweeping programs and buffer restorations. These projects are well suited for existing residential development. Below are descriptions of the 0-10 year plan projects and non-structural projects. Also a map of this WMA and a list of all the projects proposed in this WMA are provided. Project Fact Sheets for this WMA are located in Section 5.11.

5.3.1 0 – 10 Year Structural Projects

MB9122 Stormwater Pond Retrofit

This project proposes the retrofit of an existing public pond east of Cross Chase Circle to create a wetland system with sediment forebays and bench planting. The existing dry pond receives runoff from two pipes, a channel and sheet flow from the back of the residential houses. The wetland retrofit will include adding two sediment forebays for the stormwater inflows, expanding the pond to provide more time to treat stormwater in the pond, and the creation of high and low marsh areas in the pond to increase the biological uptake in the pond.

MB9510 BMP/ LID

This project proposes the construction of a bioretention area at Silverbrook Elementary School on Crosspointe Drive. The bioretention landscaping feature will receive runoff from the parking lot and building. A filter layer made of 18-48 inches of sand is placed below a mulch layer. During a storm, the runoff ponds 6-9 inches in the bioretention area, is filtered by the bioretention media soil, and outfalls either to the existing storm system or infiltrates into the native soil. The primary indicators are upland sediment, total suspended solids and pollutants including nitrogen and phosphorous.

5.3.2 11 – 25 Year Structural Projects

MB9119 Stormwater Pond Retrofit

This project proposes the retrofitting of the existing pond near Cardinal Forest Lane at Mid Atlantic Petroleum and creating an extended detention pond with a sediment forebay. The primary indicators are pollutants, including nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better temporary ponding using a control structure, which promotes particulate pollutant settlement.

MB9120 Stormwater Pond Retrofit

This project proposes the retrofit of an existing wet pond behind Southpointe Lane to create a wetland system, sediment forebay and bench planting. The primary indicators are pollutants, including nitrogen, and phosphorus. The retrofit will modify the existing pond to increase pollutant removal and to provide adequate channel protection above the permanent pool. The retrofit will create a better-functioning environment for gravitational settling, biological uptake and microbial activity with a permanent pool. The pool prevents re-suspension of sediments and other pollutants.

MB9121 Stormwater Pond Retrofit

This project proposes the retrofit of an existing dry pond at William Halley Elementary School to create an extended detention dry pond with a sediment forebay. The primary indicators are pollutants including nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to provide adequate downstream channel protection and provide better function of temporary ponding using a control structure, which promotes particulate pollutant settlement.

MB9123 Stormwater Pond Retrofit

This project proposes the retrofit of an existing public pond northwest of Meadow Edge Terrace to create a wetland system, sediment forebay and bench planting. The primary indicators are pollutants, including nitrogen and phosphorus. The wetland retrofit will provide increase in shade, detritus, woody plant material and cooler water temperatures which will improve habitat. Pollutant removal will be achieved through settling and biological uptake within the wetland, while reducing volume and peak runoff rates.

MB9124 Stormwater Pond Retrofit

This project proposes the retrofit of an existing public pond northeast of Cross Oaks Court in Fairfax Station to create a wetland system, sediment forebay and bench planting. The primary indicators are pollutants, including nitrogen and phosphorus. The retrofit will modify the existing pond to increase pollutant removal and to provide adequate channel protection. The retrofit will create a better-functioning environment for gravitational settling, biological uptake and microbial activity with a permanent pool of standing water. The permanent pool prevents re-suspension of sediments and other pollutants. A large berm currently divides the pond.

MB9125 Stormwater Pond Retrofit

This project proposes the retrofit of an existing pond in front of Silverbrook Elementary School to an extended detention dry pond with a sediment forebay. The primary indicators are pollutants, including nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure, which enables particulate pollutants to settle out. The small dry pond is just upstream of large wet pond. Improving the quality of the upstream pond will have positive effects on the large downstream pond.

MB9208 Stream Restoration

This project proposes the restoration of the stream east of Windermere Hill Drive that flows from north to south. The project proposes to restore poor channel morphology by improving bed and bank erosion. The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander. Project should be coordinated with the downstream property owners to consider extending the area of restoration and/or spot improvements further downstream. Representatives of the landfill located near I-95 have expressed support for extending the restoration downstream.

MB9209 Stream Restoration

This project proposes the restoration of the stream north of Cumbia Valley Drive that runs parallel to Lorton Road. The project proposes to restore channel morphology by improving bed and bank erosion. The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander. This project is located on the Giles Run Main Stem just downstream from Lorton Road. Laurel Hill Park is located along this segment of Lorton Road opposite of the proposed project. The current road improvement project for the Lorton Road widening will result in major alignment shifts in this area and may result in a portion, or all, of this stream project being located on Laurel Hill Park. In consideration of this road alignment change, DPWES should coordinate closely with the Park Authority in the design of this project.

MB9210 Stream Restoration

This project proposes the restoration of the stream at Laurel Hill Golf Club in Lorton. The stream flows west to east. The project proposes to restore poor channel morphology by improving bed and bank erosion. The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander.

MB9212 Stream Restoration

This project proposes the restoration of the stream east of Cross Chase Circle in Lorton by restoring channel morphology and reducing bed and bank erosion. The stream stabilization will reduce downstream sediment loads, maintain capacity of the stream channel, and control unwanted meander. The stream flows southwest to northeast and outfalls into a pond.

MB9213 Stream Restoration

This project proposes daylighting an outfall pipe further upstream, providing outfall protection, installing an energy dissipation device and constructing an open channel. The pipe is located north of Cross View in Fairfax Station. The primary indicators are poor channel morphology downstream. Daylighting redirects a closed system back to an aboveground channel, returning water to its natural state, reducing runoff rates, encouraging infiltration and minimizing downstream erosion.

MB9509 BMP/ LID

This project proposes the construction of a bioretention area at Christ United Methodist Church on Glen Eagles Court in Fairfax Station. The bioretention landscaping feature will receive runoff from the parking lot and building. The primary indicators are upland sediment, total suspended solids and pollutants including nitrogen and phosphorus. The bioretention area will create an ideal environment for filtration, biological uptake and microbial activity. It will also reduce the outflow to the storm system.

MB9511 BMP/ LID

This project proposes pervious pavement for the parking lot at Crosspointe Swim and Racquet Club on Glen Eagles Lane. The project will replace the existing pavement with pervious pavement or pavers. Additional underground detention may be provided as site conditions permit. The primary indicators are total impervious area and total urban land cover. Pervious pavement will reduce runoff rates using porous materials that allow runoff to infiltrate so pollutants may be trapped in the soil.

5.3.3 Non-Structural Projects

MB9507 BMP/ LID

This project proposes the collection of downspouts in rain barrels or roof drains in underground cisterns for reuse in irrigation at William Halley Elementary School. A rain barrel/cistern program will capture, store and reuse rooftop runoff. The rain barrels can be used by students as a hands-on educational program.

MB9512 BMP/ LID

This project proposes the collection of downspouts in rain barrels or roof drains in underground cisterns for reuse in irrigation at Silverbrook Elementary School. A rain barrel/cistern program will capture, store and reuse rooftop runoff. The rain barrels can be used by students as a hands-on educational program.

MB9805 Street Sweeping Program

This project proposes a street sweeping program to help reduce the amount of potential pollutants from entering the nearby streams and storm systems. The area is near Cardinal Forest Lane and consists of 35 acres. The area is a multifamily housing development. The primary indicators are upland sediment and total suspended solid load. A street sweeping program will improve water quality in residential areas by capturing and preventing potential pollutants from entering the nearby streams and storm systems.

MB9806 Buffer Restoration

This suite of projects proposes to repair deficient stream buffers at Laurel Hill Golf Club in Lorton in order to re-establish the RPA. Increased vegetation from the buffer repair will provide additional stream buffer for filtration of pollutants and will reduce runoff by intercepting the water, thereby increasing surface storage and infiltration.

MB9807 Buffer Restoration

This Buffer Restoration suite of projects proposes repairing a deficient stream buffers at Laurel Hill Golf Club in Lorton. Increased vegetation from the buffer repairs will provide additional stream buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration.

MB9808 Street Sweeping Program

This project proposes a street sweeping program to help reduce the amount of potential pollutants from entering the nearby streams and storm systems. The area is off of Lorfax Drive and consists of 125 acres. The area is mostly single-family residential development. The primary indicators are upland sediment and total suspended solid load. A street sweeping program will improve water quality in residential areas by capturing and preventing potential pollutants from entering the nearby streams and storm systems.

MB9809 Street Sweeping Program

This project proposes a street sweeping program to help reduce the amount of potential pollutants from entering the nearby streams and storm systems. The area is along Chase Glenn Circle and consists of 230 acres. The area is mostly single-family residential and very small area of commercial development. The primary indicators are upland sediment and total suspended solid load. A street sweeping program will improve water quality in residential areas by capturing and preventing potential pollutants from entering the nearby streams and storm systems.

MB9810 Street Sweeping Program

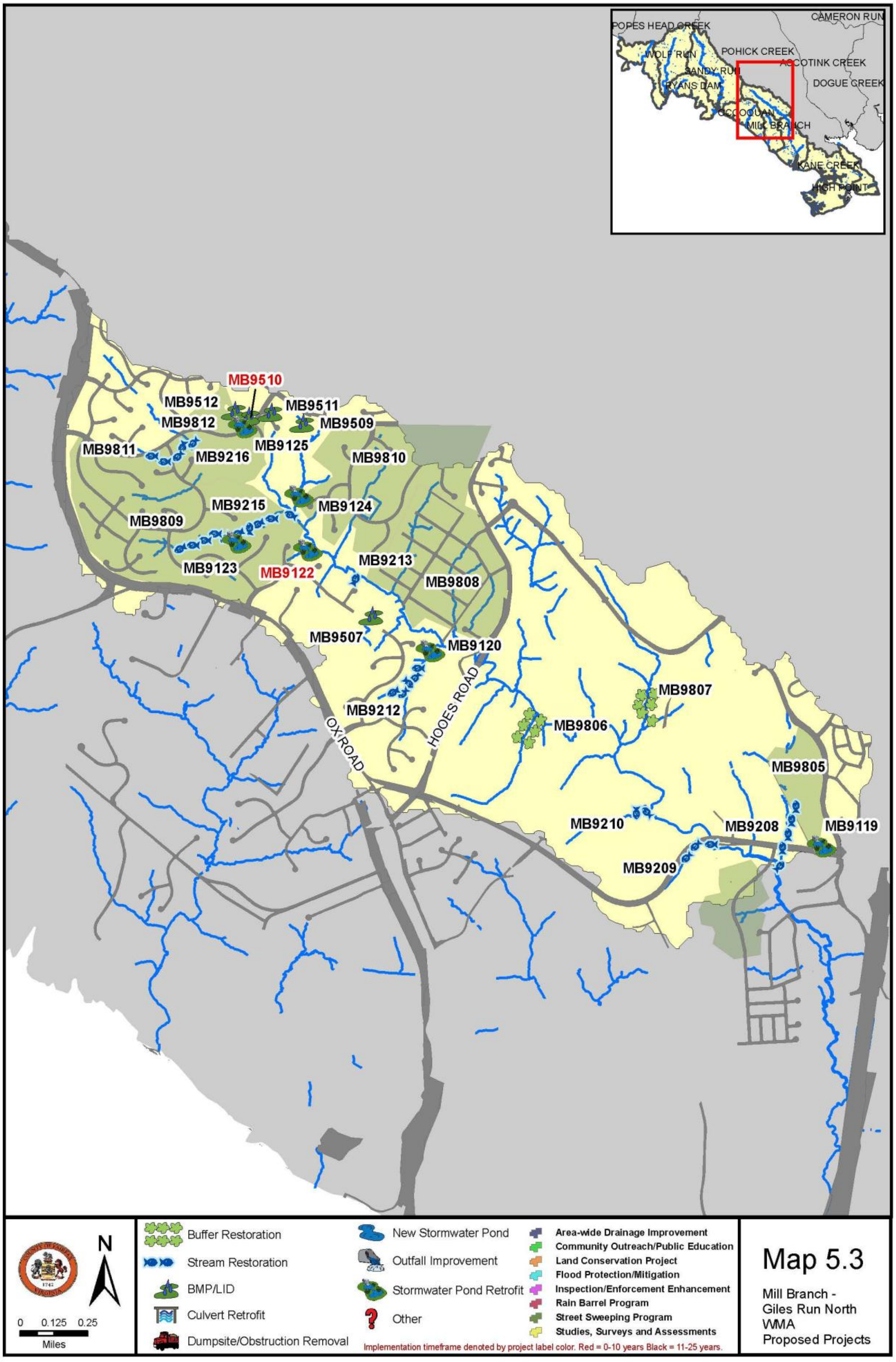
This project proposes a street sweeping program to help reduce the amount of potential pollutants from entering the nearby streams and storm systems. The area is along Cross Chase Circle and consists of 135 acres. The area is single-family residential and commercial development. The primary indicators are upland sediment and total suspended solid load. A street sweeping program will improve water quality in residential areas by capturing and preventing potential pollutants from entering the nearby streams and storm systems.

MB9811 Buffer Restoration

This project proposes to repair a deficient stream buffer south of Crosspointe Drive in order to re-establish the RPA. Increased vegetation from the buffer repair will provide additional stream buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration.

MB9812 Street Sweeping Program

This project proposes a street sweeping program to help reduce the amount of potential pollutants from entering the nearby streams and storm systems. The area is along Crosspointe Drive near Silverbrook Elementary School and consists of 45 acres; however, there is not very much roadway within drainage area. The area is single-family residential, a school and a very large wet pond. The primary indicators are upland sediment and total suspended solid load. A street sweeping program will improve water quality in residential areas by capturing and preventing potential pollutants from entering the nearby streams and storm systems.


POPES HEAD CREEK
CAMERON RUN
WOLF RUN
POHICK CREEK
SANDY RUN
ACCOTINK CREEK
RYANS DAM
DOGUE CREEK
OCCOQUAN
MILL BRANCH
KANE CREEK
HIGH POINT
MB9510
MB9512
MB9511
MB9812
MB9509
MB9811
MB9125
MB9216
MB9810
MB9215
MB9124
MB9809
MB9123
MB9122
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MB9808
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MB9807
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MB9806
OX ROAD
HOOES ROAD
MB9805
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MB9208
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0 0.125 0.25
Miles
Buffer Restoration
Stream Restoration
BMP/LID
Culvert Retrofit
Dumpsite/Obstruction Removal
New Stormwater Pond
Outfall Improvement
Stormwater Pond Retrofit
Other
Area-wide Drainage Improvement
Community Outreach/Public Education
Land Conservation Project
Flood Protection/Mitigation
Inspection/Enforcement Enhancement
Rain Barrel Program
Street Sweeping Program
Studies, Surveys and Assessments
Implementation timeframe denoted by project label color. Red = 0-10 years Black = 11-25 years.
Map 5.3
Mill Branch - Giles Run North WMA Proposed Projects

Table 5-3: Project List – WMA (Mill Branch – Giles Run North)

Structural Projects[1]						
Project #	**Project Type**	**Sub-water-shed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
MB9122	Stormwater Pond Retrofit	MB-GR-0016	Behind 8605 Cross Chase Court	Water quality and quantity control	Private - Commercial	0 – 10
MB9510	BMP/LID	MB-GR-0019	9350 Crosspointe Dr. (Silverbrook Elementary School)	Water quality and quantity control	Public/Local - FCPS	0 – 10
MB9119	Stormwater Pond Retrofit	MB-GR-0010	Near 9300 Cardinal Forest La.	Water quality and quantity control	Private - Commercial	11 – 25
MB9120	Stormwater Pond Retrofit	MB-GR-0015	9001 Southpointe La. (Behind Cul-de-sac)	Water quality and quantity control	Private - Commercial	11 – 25
MB9121	Stormwater Pond Retrofit	MB-GR-0016	8850 Cross Chase Circle (William Halley Elementary School)	Water quality and quantity control	Public/Local - FCPS	11 – 25
MB9123	Stormwater Pond Retrofit	MB-GR-0017	Behind 8628 Meadow Edge Terr.	Water quality and quantity control	Private - Commercial	11 – 25
MB9124	Stormwater Pond Retrofit	MB-GR-0018	Behind 9210 Cross Oaks Ct.	Water quality and quantity control	Private - Commercial	11 – 25
MB9125	Stormwater Pond Retrofit	MB-GR-0019	9350 Crosspointe Dr. (Silverbrook Elementary School)	Water quality and quantity control	Public/Local-FCPS	11 – 25
MB9208	Stream Restoration	MB-GR-0010	8301 Lorton Rd.	Water quality control	Public/Local/ State/Private - FCPA, VDOT, Residential	11 – 25
MB9209	Stream Restoration	MB-GR-0009	8300 Newby Bridge Dr.	Water quality control	Public/Local - FCPA	11 – 25
MB9210	Stream Restoration	MB-GR-0011	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)	Water quality control	Public/Local - FCPA	11 – 25
MB9212	Stream Restoration	MB-GR-0015	8921 Cross Chase Cir.	Water quality control	Private - Commercial	11 – 25
MB9213	Stream Restoration	MB-GR-0016	8601 Cross View	Water quality and quantity control	Private - Commercial	11 – 25

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Structural Projects[1]						
Project #	**Project Type**	**Sub-water-shed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
MB9509	BMP/LID	MB-GR-0018	8285 Glen Eagles La. (Christ Church United Methodist Inc.)	Water quality and quantity control	Private - Church	11 – 25
MB9511	BMP/LID	MB-GR-0018	8275 Glen Eagles La. (Crosspointe Swim and Racquet Club)	Water quality and quantity control	Private - Residential	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Sub-watershed**	**Location**	**Watershed Benefit**	**Land Owner**
MB9507	BMP/LID	MB-GR-0016	8850 Cross Chase Circle (William Halley Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9512	BMP/LID	MB-GR-0019	9350 Crosspointe Dr. (Silverbrook Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9805	Street Sweeping Program	MB-GR-0010	Near 8327 Bluebird Way	Water quality control	Public/State - VDOT
MB9806	Buffer Restoration Suite	MB-GR-0013	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)	Water quality control	Public/Local - FCPA
MB9807	Buffer Restoration Suite	MB-GR-0012	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 2)	Water quality control	Public/Local - FCPA
MB9808	Street Sweeping Program	MB-GR-0016	Near 8709 Lorfax Dr.	Water quality control	Public/State - VDOT
MB9809	Street Sweeping Program	MB-GR-0017	Near 9413 Eagle Glen Ter.	Water quality control	Public/State - VDOT
MB9810	Street Sweeping Program	MB-GR-0018	Behind 9105 Oak Chase Ct.	Water quality control	Public/State - VDOT
MB9811	Buffer Restoration	MB-GR-0019	Next to 9527 Crosspointe Dr.	Water quality control	Private - Residential
MB9812	Street Sweeping Program	MB-GR-0019	Near 8409 Crosslake Dr.	Water quality control	Public/State - VDOT

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

5.4 Mill Branch – Giles Run South Watershed Management Area

The Giles Run South WMA is a portion of the Mill Branch watershed and is located in the eastern reaches of the Lower Occoquan watersheds. Giles Run South has an area of 3.64 square miles and contains 14 subwatersheds. The Giles Run South WMA is roughly bounded by Lorton Road (Route 642) to the extreme north. The western border is roughly formed by a portion of Interstate 95 in the southern end and Furnace Road (Route 611) on the central and northern end. The eastern boundary of the WMA is formed by Gunston Road (Route 242) and Belmont Boulevard (Route 601) to the southern end of the WMA. The WMA discharges to the Occoquan River to the south, and is bisected by both Interstate 95 and the Richmond Highway (U.S. Route 1). Old Colchester Road also bisects the WMA south and east of U.S. Route 1. Giles Run South lies entirely within the Coastal Plain physiographic province, characterized by relatively gentle topography.

Land uses range from single family residential to industrial park land. Residential developments include portions of the Laurel Hill redevelopment project in the extreme north, the more established Colchester neighborhood to the south near the Occoquan River, and other, newer single family developments to the south and east including the western end of Gunston Heights to the east and Harbor View, which abuts Massey Creek. The majority of the observed single-family detached dwellings were constructed on lots estimated to be less than a quarter to one acre in size.

Impervious cover estimates in the WMA vary significantly based on the land use. In residential developments, approximately 10 to 15 percent impervious cover exists, whereas non-residential, such as industrial lands, may be as high as 70 percent in some cases. Giles Run South contains limited, low intensity commercial development, primarily associated with industries/activities supporting residential development. The largest commercial complex observed was the Lorton Station Marketplace, off Gunston Road. The Giles Run South WMA also includes the Mason Neck West Area Park.

The Giles Run South WMA contains a variety stormwater infrastructure and BMPs, which track with the watershed's development history. In areas that developed earlier, stormwater management facilities, where present, consist primarily of dry detention basins designed to curb peak storm flows (quantity management). For areas that developed more recently, stormwater management facilities are more likely to include a water quality component, and the variety of facility types increases. Facilities found in these areas include underground chambers, parking lot detention, rooftop detention, and manufactured BMP systems. The majority of stormwater in Giles Run South WMA is uncontrolled and drains untreated to receiving waters which is consistent with the small percentage of impervious area within the WMA and the overall age of development.

Stream impacts noted include disturbed stream buffers and stream channel widening. Buffer disturbances appear coincident with roadways, including residential streets as well as major road arteries in the WMA. Channel widening, coincident with poor overall stream habitat, is the primary feature for the main stem of Giles Run through the WMA. Finally, some obstructions and dump site impacts were noted throughout the WMA.

The watershed restoration projects for this WMA include: retrofitting stormwater ponds, restoring streams and BMP/ LID projects. Below are descriptions of the 0-10 year structural projects and non-structural projects. Also a map of this WMA and a list of all the projects proposed in this WMA are provided. Project Fact Sheets for this WMA are located in Section 5.11.

5.4.1 0 – 10 Year Structural Projects

MB9104 Stormwater Pond Retrofit

Dry pond retrofit proposed at Mason Neck West Park located off of Old Colchester Road in Lorton. The project proposes to create an extended detention dry pond with sediment forebays. The retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure, which promotes particulate pollutant settlement.

MB9105 Stormwater Pond Retrofit

This project proposes the retrofit of an existing pond between Richmond Highway and west of the Old Colchester Road ramp to create a wetland system with sediment forebay and bench planting. The primary problem indicators are pollutants, including nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to increase the time stormwater travels through the facility. The retrofit will add areas of high marsh and low marsh to the pond with tree peninsulas and will create a better functioning environment for gravitational settling, biological uptake and microbial activity.

MB9107 Stormwater Pond Retrofit

Dry pond located in industrial area off of Richmond Highway. Project proposes retrofitting existing dry pond to create an extended detention dry pond with sediment forebays. The retrofit will modify the existing discharge structure to increase the time stormwater is detained in the pond. The pond will be expanded to handle this larger treatment volume. This retrofit will provide better downstream channel protection and promote particulate pollutant settlement. Pollutant indicators include nitrogen, phosphorous and total suspended solids.

MB9109 Stormwater Pond Retrofit

This project proposes retrofitting the existing pond west of Mims Street to create an extended detention pond with a sediment forebay. The pond currently receives stormwater runoff from a private concrete company. The primary problem indicators are pollutants, including nitrogen, phosphorus and total suspended solids. The pond's existing discharge structure will be modified to increase the time stormwater is treated in the facility. This will provide better downstream channel protection and will promote particulate settlement.

MB9111 Stormwater Pond Retrofit

This project proposes retrofitting an existing wet pond east of Mims Street to create a constructed wetland system, with sediment forebay and engineered landscaping plan. The retrofit will extend the flow path of stormwater runoff in the wetland by enlarging the facility's size and creating high and low marsh areas. The primary pollutant indicators are nitrogen, phosphorous and total suspended solids. The retrofit will increase pollutant removal and provide better channel protection above the permanent pool of standing water. The pool prevents re-suspension of sediments and other pollutants.

MB9114 Stormwater Pond Retrofit

This project proposes to retrofit an existing dry pond at the Fairfax County Landfill off of Furnace Road in Lorton. A sediment forebay will be added to provide pretreatment to the pond's two inflows. The pond's existing discharge structure will be modified to increase the time water is detained in the pond. To handle the larger detention volume the pond will be enlarged. Lastly, an aquatic bench will be added to increase biological uptake of pollutants.

MB9202 Stream Restoration

This project proposes the restoration of a stream southeast of Old Colchester Road that flows from east to west. The project proposes to restore channel morphology by improving bed and bank erosion. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent. Stream receives runoff from residential housing to the east and surrounding wooded areas.

MB9506 BMP/ LID

This project proposes the construction of a bioretention area at Fairfax County Landfill. The bioretention landscaping feature will receive runoff from parking lots. Filter layer made of 18-48 inches of sand is placed below a mulch layer. During a storm, the runoff ponds 6-9 inches drains through the bioretention filter media, and outfalls or infiltrates into the native soil. The primary indicators are upland sediment, total suspended solids and pollutants including nitrogen and phosphorous.

5.4.2 11 – 25 Year Structural Projects

MB9106 Stormwater Pond Retrofit

This project proposes retrofitting an existing dry pond south of Hassett Street to create an extended detention dry pond with a sediment forebay. The primary indicators are pollutants, including nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure, which promotes particulate pollutant settlement.

MB9108 Stormwater Pond Retrofit

This project proposes retrofitting an existing pond located off of Giles Run Road near a parking lot of an industrial area to create an extended detention pond with a sediment forebay. The primary indicators are pollutants such as nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure. This will promote the settlement of particulate pollutants.

MB9201 Stream Restoration

This project proposes the restoration of a large portion of the stream west of Anita Drive. The project proposes to restore channel morphology by reducing bed and bank erosion. The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander.

MB9504 BMP/ LID

This project proposes the construction of a bioretention area at Gunston Elementary School. The bioretention landscaping feature will receive runoff from impervious areas, including the parking lot and the school building. The primary indicators are upland sediment, total suspended solids and pollutants including nitrogen and phosphorus. The bioretention area will create an ideal environment for filtration, biological uptake and microbial activity. It will also reduce runoff to the storm system.

5.4.3 Non-Structural Projects

MB9505 BMP/ LID

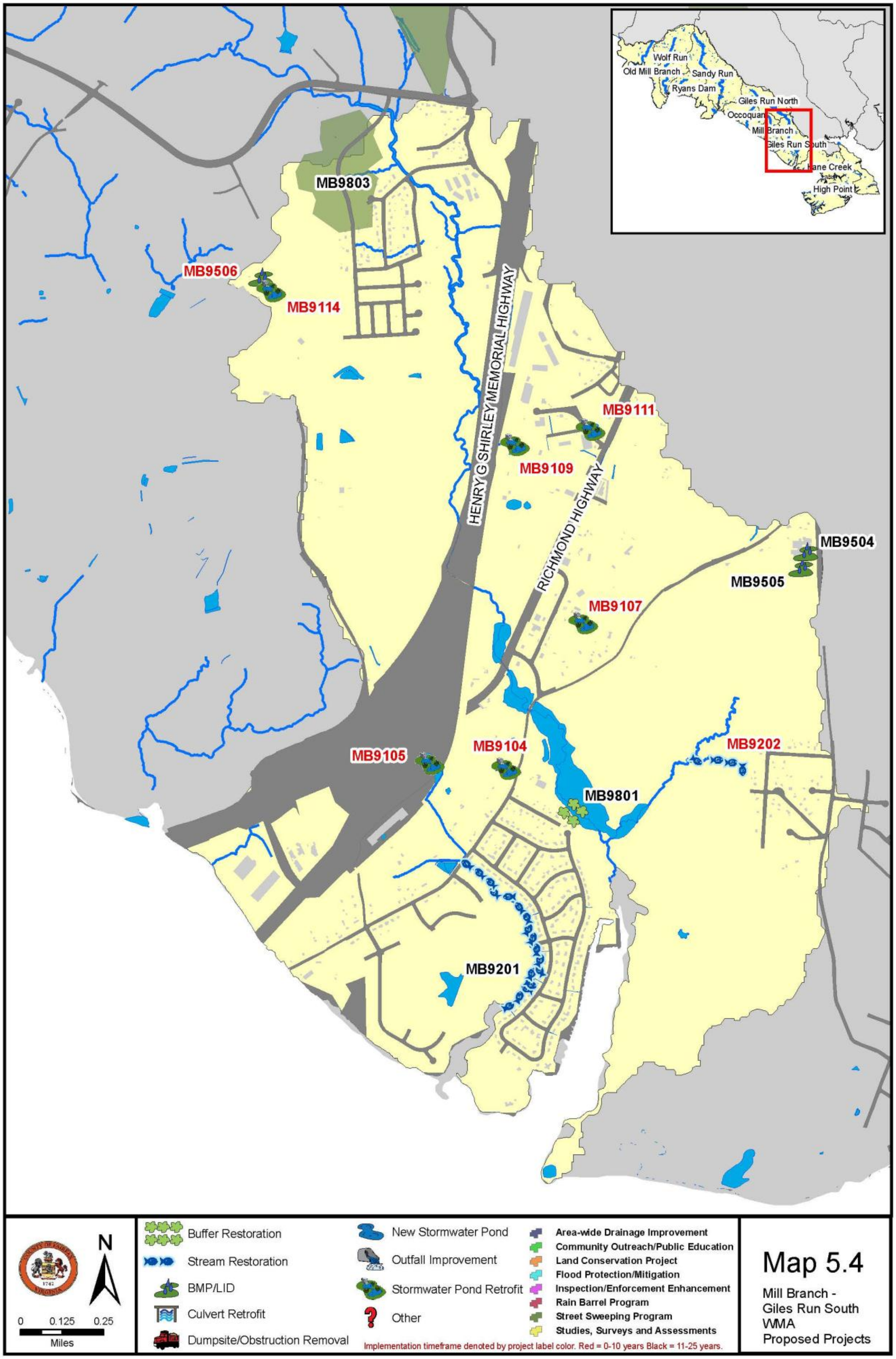
This project proposes the collection of downspouts in rain barrels or roof drains in underground cisterns for reuse in irrigation at Gunston Elementary School. A rain barrel/cistern program will capture, store and reuse rooftop runoff. The rain barrels can be used by students as a hands-on educational program.

MB9801 Buffer Restoration

This project proposes to repair a deficient stream buffer northeast of Greene Drive in order to re-establish the RPA and provide reforestation to a partially bare area. Increased vegetation from the buffer repair will provide additional stream buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration.

MB9803 Street Sweeping Program

This project proposes a street sweeping program to help reduce the amount of potential pollutants from entering the nearby streams and storm systems. The area is near Wind mere Hill Drive and consists of 40 acres. The area is a townhouse development. The primary indicators are upland sediment and total suspended solid load. A street sweeping program will improve water quality in residential areas by capturing and preventing potential pollutants from entering the nearby streams and storm systems.


Wolf Run
Old Mill Branch
Sandy Run
Ryans Dam
Giles Run North
Occoquan
Mill Branch
Giles Run South
Kane Creek
High Point
MB9803
MB9506
MB9114
HENRY G SHIRLEY MEMORIAL HIGHWAY
MB9111
MB9109
RICHMOND HIGHWAY
MB9504
MB9505
MB9107
MB9105
MB9104
MB9202
MB9801
MB9201
Buffer Restoration
Stream Restoration
BMP/LID
Culvert Retrofit
Dumpsite/Obstruction Removal
New Stormwater Pond
Outfall Improvement
Stormwater Pond Retrofit
Other
Area-wide Drainage Improvement
Community Outreach/Public Education
Land Conservation Project
Flood Protection/Mitigation
Inspection/Enforcement Enhancement
Rain Barrel Program
Street Sweeping Program
Studies, Surveys and Assessments
Implementation timeframe denoted by project label color. Red = 0-10 years Black = 11-25 years.
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0 0.125 0.25
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Map 5.4
Mill Branch - Giles Run South WMA Proposed Projects

Table 5-4: Project List – WMA (Mill Branch – Giles Run South)

Structural Projects[1]						
Project #	**Project Type**	**Sub-watershed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
MB9104	Stormwater Pond Retrofit	MB-GR-0001	10418 Old Colchester Rd. (Mason Neck West Park)	Water quality and quantity control	Public/Local - FCPA	0 – 10
MB9105	Stormwater Pond Retrofit	MB-OC-0005	Across from 10555 Furnace Rd.	Water quality and quantity control	Public/State - VDOT	0 – 10
MB9107	Stormwater Pond Retrofit	MB-GR-0001	10119 Giles Run Rd.	Water quality and quantity control	Private - Residential	0 – 10
MB9109	Stormwater Pond Retrofit	MB-GR-0003	8115 Mims St.	Water quality and quantity control	Private - Industrial	0 – 10
MB9111	Stormwater Pond Retrofit	MB-GR-0003	9816 Richmond Hwy.	Water quality and quantity control	Private - Commercial	0 – 10
MB9114	Stormwater Pond Retrofit	MB-GR-0007	9850 Furnace Rd. (I-95 Landfill)	Water quality and quantity control	Public/Local - FCPS	0 – 10
MB9202	Stream Restoration	MB-SB-0001	10207 Old Colchester Rd.	Water quality control	Public/Federal - USA	0 – 10
MB9506	BMP/LID	MB-GR-0007	9850 Furnace Rd, Lorton (I-95 Landfill)	Water quality and quantity control	Public/Local - FCPS	0 – 10
MB9106	Stormwater Pond Retrofit	MB-GR-0001	10301 Richmond Hwy	Water quality and quantity control	Public/Local/Private - FCPA, Industrial	11 – 25
MB9108	Stormwater Pond Retrofit	MB-GR-0001	10109 Giles Run Rd.	Water quality and quantity control	Private - Industrial	11 – 25
MB9504	BMP/LID	MB-SB-0001	10100 Gunston Rd. (Gunston Elementary School)	Water quality and quantity control	Public/Local - FCPS	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Sub-watershed**	**Location**	**Watershed Benefit**	**Land Owner**
MB9505	BMP/LID	MB-SB-0001	10100 Gunston Rd. (Gunston Elementary School)	Water quality and quantity control	Public/Local - FCPS
MB9801	Buffer Restoration	MB-GR-0001	Behind 10463 Greene Dr.	Water quality control	Public/Local/Federal - FCPA, USA
MB9803	Street Sweeping Program	MB-GR-0008	8386 Old Vicarage St.	Water quality control	Public/State - VDOT

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

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5.5 Mill Branch – Mill Branch Watershed Management Area

The Mill Branch WMA is a portion of the larger Mill Branch watershed and is located in the eastern reaches of the Lower Occoquan watersheds. Mill Branch WMA consists of nine subwatersheds. The Mill Branch WMA is roughly bounded by Furnace Road (Route 611) to the north and east. The western border is roughly formed by a portion of Ox Road (Route 123). The southern border is formed by Interstate 95 to the southeast and the Occoquan River to the southwest.

The Mill Branch WMA contains a wide variety of land uses including: single family residential, an inactive landfill, a sewage treatment plant, portions of the Laurel Hill redevelopment project, and the Occoquan Regional Park. In the landfill area, many of stream segments are piped. In areas of residential development, approximately 20 to 25 percent impervious cover exists based on an average lot size of a quarter- to half-acre lot sizes. The majority of stormwater in Mill Branch WMA is uncontrolled and drains untreated to receiving waters, however, as the Laurel Hill redevelopment process continues, stormwater treatment will increase.

Stream impacts include disturbed stream buffers and stream channel incision. Buffer disturbances appear coincident with channel widening and incision on the tributaries in this WMA, but appear limited to the downstream channels. An extreme head cut impact was noted at the downstream end of an existing pond in the southern end of the WMA. Minor to moderate crossing and pipe impacts have been observed throughout the WMA. With so much planned redevelopment activity in this WMA, stream conditions are subject to significant change based on grading activities and other physical amendments to the topography in the area.

This watershed management plan proposes structural watershed restoration projects in the next 11-25 years, but no structural projects are proposed in the next 0 – 10 years. The Laurel Hill redevelopment process will provide some watershed restoration benefits. Non-structural projects proposed include two buffer restoration projects. Below are descriptions of the non-structural projects. Also, a map of this WMA and a list of all the projects proposed in this WMA are provided.

5.5.1 0 – 10 Year Structural Projects

No structural projects are proposed in the next ten years.

5.5.2 11 – 25 Year Structural Projects

MB9117 Stormwater Pond Retrofit

This project proposes retrofitting an existing public dry pond, situated behind houses on the south end of High Grove Court in Lorton, to create an extended detention dry pond with a sediment forebay. The primary indicators are pollutants including nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to provide downstream channel protection and allow for better function of temporary ponding using a control structure, which promotes particulate pollutant settlement.

MB9205 Stream Restoration

This project proposes restoring the stream, west of a parking lot at Occoquan Park, improving channel morphology and reducing bed and bank erosion. The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander. Since the stream directly outfalls into Occoquan River, improving this stream will directly benefit the overall condition of the larger body of water.

MB9206 Stream Restoration

This project proposes restoring the stream, west of a parking lot at Occoquan Park, improving channel morphology and reducing bed and bank erosion. The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander. Since the stream directly outfalls into Occoquan River, improving this stream will directly benefit the overall condition of the larger body of water.

MB9207 Stream Restoration

This project proposes the restoration of a stream east of Ox Road at Lower Occoquan Park and will restore channel morphology by improving bed and bank erosion. The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander. The stream directly outfalls into Occoquan River. Improving the outfall into the river will benefit the overall condition of the larger body of water. (Coordination with the Fairfax County Park Authority should be done to prevent any potential conflicts.)

MB9502 BMP/ LID

This project proposes pervious pavement at parking lot at Occoquan Park. The project will replace the existing pavement with pervious pavement or pavers. Additional underground detention may be provided as site conditions permit. The primary indicators are total impervious area and total urban land cover. Pervious pavement will reduce runoff rates using porous materials that allow runoff to infiltrate so pollutants may be trapped in the soil.

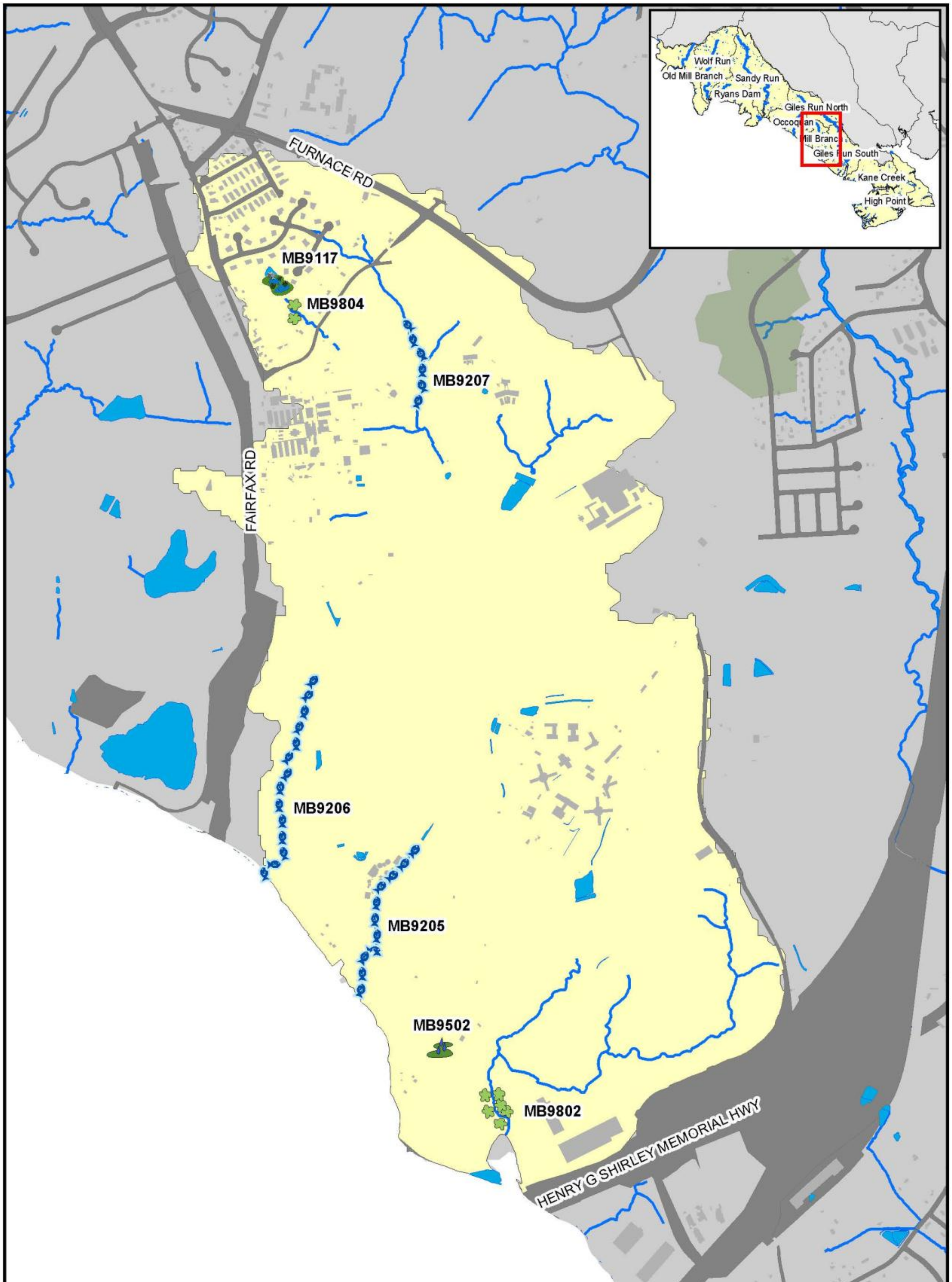
5.5.3 Non-Structural Projects

MB9802 Buffer Restoration

This project proposes to repair a deficient stream buffer at Occoquan Regional Park in order to re-establish the RPA. Increased vegetation from the buffer repair will provide additional stream buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration.

MB9804 Buffer Restoration

This project proposes to repair a deficient stream buffer northwest of Lorton Road. Increased vegetation from the buffer repair will provide additional stream buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration. Stream buffer area is located in the yards of private houses.



Map 5.5

Mill Branch -
Mill Branch
WMA
Proposed Projects

Table 5-5: Project List – WMA (Mill Branch – Mill Branch)

Structural Projects[1]						
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
MB9117	Stormwater Pond Retrofit	MB-MB-0005	Behind 8940 Highgrove Ct.	Water quality and quantity control	Private - Residential, HOA	11 – 25
MB9205	Stream Restoration	MB-MB-0001	9751 Ox Rd (Occoquan Regional Park, Site 1)	Water quality control	Public/Local - FCPS	11 – 25
MB9206	Stream Restoration	MB-OC-0009	9751 Ox Rd. (Occoquan Regional Park, Site 3)	Water quality control	Public/Local - FCPS	11 – 25
MB9207	Stream Restoration	MB-MB-0004	Across street from 8932 Lorton Rd.	Water quality control	Public/Local - FCPA	11 – 25
MB9502	BMP/LID	MB-OC-0006	9751 Ox Rd. (Occoquan Regional Park, Site 5)	Water quality and quantity control	Public/Local - FCPS	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**
MB9802	Buffer Restoration	MB-OC-0006	9751 Ox Rd. (Occoquan Regional Park, Site 2)	Water quality control	Public/Local/Private - FCPS, Industrial
MB9804	Buffer Restoration	MB-MB-0005	Next to 8936 Lorton Rd.	Water quality control	Private - Residential

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

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5.6 Occoquan Watershed Management Area

The Occoquan watershed is adjacent to the Occoquan River, covers 3.36 square miles, and is the smallest WMA. The Occoquan WMA is roughly bounded on the northern and eastern ends by Ox Road (Route 123), to the north by Hampton Road (Route 647), and to the extreme west by Van Thompson Road. The Occoquan WMA contains 14 subwatersheds and contains approximately six miles of stream that discharge directly into the Occoquan River.

The Occoquan WMA lies partially within the area down-zoned by Fairfax County in 1982 to protect the Occoquan Reservoir, which supplies water to well over one million people. As a result, development in the western reaches of the Occoquan WMA is primarily estate residential, which includes several established, estate subdivisions such as Hampton Hunt Estates, Hampton Woods West and Hampton Woods East. The majority of the observed single-family residential parcels are over one acre in size and are primarily newer residential development, constructed in the early 2000s (less than 10 years old). Residential subdivision streets lack curb and gutter and no sidewalks were observed. These larger lot developments also demonstrated significant grass and tree cover, with impervious cover estimates at 10 percent or lower.

Institutional uses in the Occoquan WMA appear to be limited to parkland, as part of the Sandy Run Regional Park, the Vulcan Quarry facility, and the Fairfax Water supply facility. The Occoquan dam is located on the Occoquan River upstream of Route 123. No schools, shopping centers, or other institutional or commercial developments are in this WMA. As such, grass and some tree cover are prevalent throughout the Occoquan WMA.

Approximately five dry, extended detention basins are located in the WMA, with one of those basins owned by the Virginia Department of Transportation (VDOT). Other stormwater infrastructure consists primarily of open channel drainage to main stem tributaries and eventually to the Occoquan River. Limited stormwater pipe infrastructure is present in the WMA.

The most prevalent stream impacts noted were channel widening coincident with poor overall stream habitat, and crossing impacts from roads and utilities. Disturbed stream buffers were noted in the headwaters of the tributaries. Some moderate head cutting (1 to 2 feet) and stream obstructions also occurred.

No watershed restorations strategies are proposed for this WMA within the next 10 years. Only structural projects are proposed for this watershed in the next 25 years. These projects include retrofitting stormwater ponds and stream restorations. A map of this WMA and a list of all the projects proposed are provided.

5.6.1 0 – 10 Year Structural Projects

No projects proposed

5.6.2 11 – 25 Year Structural Projects

OC9101 Stormwater Pond Retrofit

This project proposes retrofitting an existing pond, on the north of Davis Drive in Lorton, to create a wetland system, sediment forebay and addition of bench planting. The pond collects runoff from adjacent residential neighborhoods. The primary indicators are pollutants, including nitrogen, phosphorus and total suspended solids. The retrofit will create a better-functioning environment for gravitational settling, biological uptake and microbial activity. The permanent pool prevents re-suspension of sediments and other pollutants.

<u>OC9102 Stormwater Pond Retrofit</u>

A small dry pond located northwest of Davis Drive in Lorton collects runoff from adjacent residential neighborhoods and outfalls into a stream. This project proposes retrofitting this pond to create an extended detention pond with a sediment forebay. The primary indicators are pollutants such as nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure. This will promote the settlement of particulate pollutants.

<u>OC9203 Stream Restoration Suite</u>

Subproject A proposes repairing bank and bed erosion to restore channel morphology for the stream north of Elkhorne Run Court has indications of poor channel morphology. Stream stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Subproject B proposes removing an obstruction in stream west of Dogue Hollow Road. Stream conveys runoff from wooded area, houses and open space. This will remove trees and debris blocking the stream channel and restore natural conditions. The primary indicator is flood complaints and has been field verified.

<u>OC9204 Stream Restoration</u>

This project proposes restoring the stream west and south of Hampton Woods Drive in Lorton. This Stream flows to the south west and discharges directly into the Occoquan Reservoir. The primary indicator is poor channel morphology. Stream stabilization will reduce sediment loads to the stream while maintaining capacity on controlling unwanted meander.

<u>OC9207 Stream Restoration Suite</u>

Subproject A proposes repairing bank and bed erosion of a stream south of Palmer Drive. The stream conveys runoff from wooded area and several houses downstream of a pond. Stream stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Subproject B proposes the removal of tires and 55-gallon drums blocking the stream channel to restore natural conditions in the stream north of Elk Horn Road. The primary indicator is flood complaints and has been field verified. Removal of obstructions will help restore the natural conditions of the stream and alleviate flooding problems.

<u>OC9208 Stream Restoration</u>

This project proposes restoring the stream south of Lakehill Drive, which flows southeast in a heavily wooded area, downstream of multiple ponds, and collects runoff from woods and several houses. The primary indicator is poor channel morphology. Stream stabilization will reduce bed and bank erosion and sediment loads to stream, and will maintain conveyance capacity and control unwanted meander.

5.6.3 Non-Structural Projects

The non-structural projects have been grouped with structural projects for this WMA.

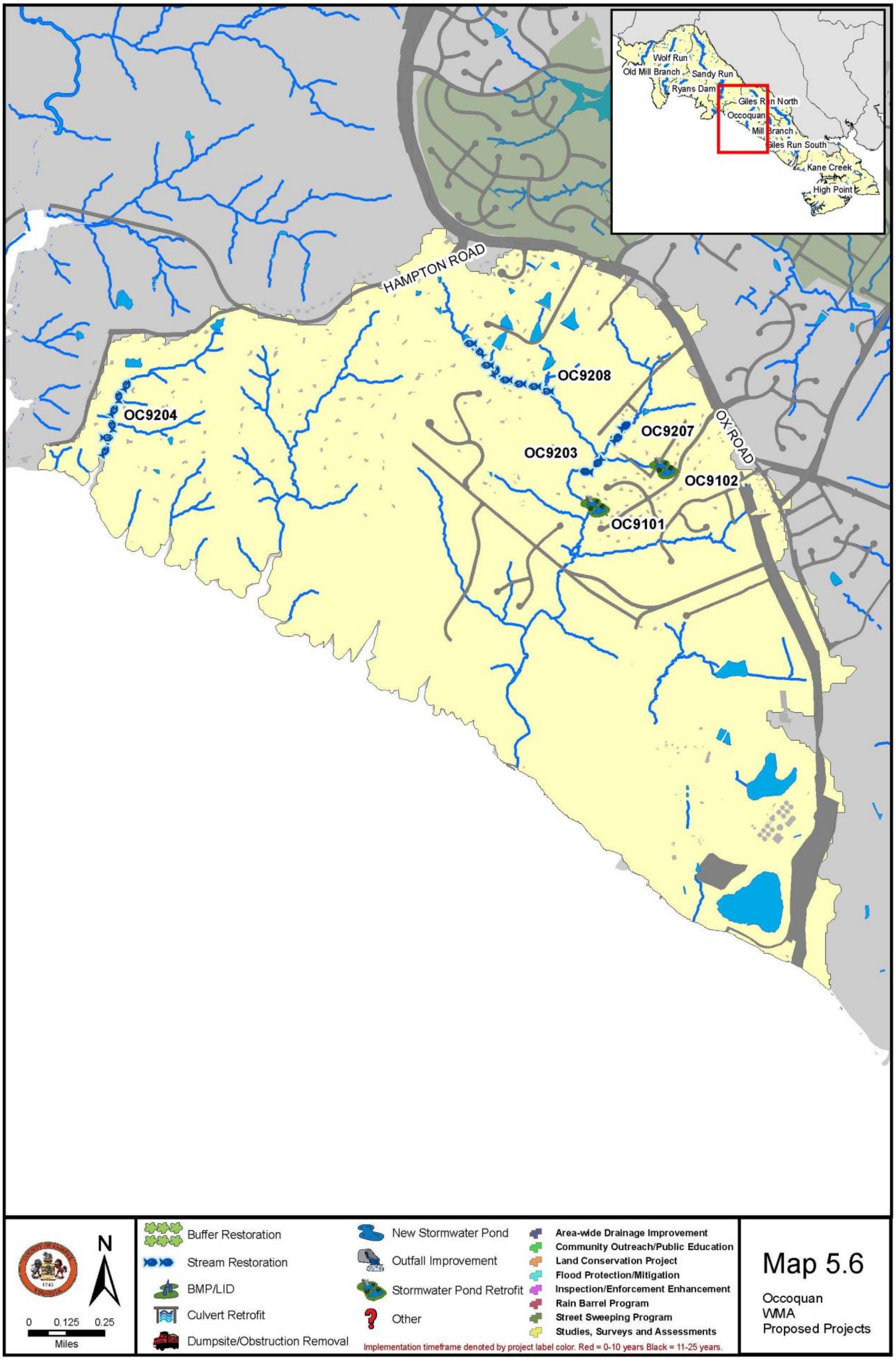
Wolf Run
Old Mill Branch
Sandy Run
Ryans Dam
Giles Run North
Occoquan
Mill Branch
Giles Run South
Kane Creek
High Point
HAMPTON ROAD
OX ROAD
OC9208
OC9204
OC9207
OC9203
OC9102
OC9101
N
0 0.125 0.25
Miles
Buffer Restoration
Stream Restoration
BMP/LID
Culvert Retrofit
Dumpsite/Obstruction Removal
New Stormwater Pond
Outfall Improvement
Stormwater Pond Retrofit
Other
Area-wide Drainage Improvement
Community Outreach/Public Education
Land Conservation Project
Flood Protection/Mitigation
Inspection/Enforcement Enhancement
Rain Barrel Program
Street Sweeping Program
Studies, Surveys and Assessments
Implementation timeframe denoted by project label color. Red = 0-10 years Black = 11-25 years.
Map 5.6
Occoquan
WMA
Proposed Projects

Table 5-6: Project List – WMA (Occoquan)

Structural Projects[1]						
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
OC9101	Stormwater Pond Retrofit	OC-EH-0003	Behind 9340 Davis Dr.	Water quality and quantity control	Private - HOA	11 – 25
OC9102	Stormwater Pond Retrofit	OC-EH-0005	Behind 9270 Davis Dr.	Water quality and quantity control	Private - Residential	11 – 25
OC9203	Stream Restoration Suite	OC-EH-0003	Behind 9307 Denali Way	Water quality control	Private - Residential, HOA	11 – 25
OC9204	Stream Restoration	OC-OR-0007	10450 Van Thompson Rd.	Water quality control	Public/Local/Private - FCPA, Residential	11 – 25
OC9207	Stream Restoration Suite	OC-EH-0005	Behind 9035 Palmer Dr.	Water quality control	Private - Residential	11 – 25
OC9208	Stream Restoration	OC-EH-0006	Behind 9520 Elk Horn Rd.	Water quality control	Private - Residential	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**
The non-structural projects have been grouped with structural projects for this WMA.					

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

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5.7 Old Mill Branch Watershed Management Area

Located along the central southwestern border of the county, the Old Mill Branch WMA covers 4.37 square miles and is adjacent to Bull Run and the Occoquan River. It is roughly bounded on the north end by Yates Ford Road (Route 615), on the east by Henderson Road (Route 643) to roughly the edge of Fountainhead Regional Park, to the west by Hemlock Overlook Regional Park and to the south by the Occoquan River. Old Yates Ford Road (Route 612) bisects the WMA from east to west.

The Old Mill Branch WMA is roughly half parkland/open space and half estate residential development. The Old Mill Branch WMA includes a portion of Fountainhead Regional Park at the downstream end of the WMA as well as portions of Hemlock Regional Overlook Park to the north and west and the entire Bull Run Marina Regional Park.

Due to the nature of development in the Old Mill Branch WMA, very little formal stormwater infrastructure exists today. Older development in the WMA likely pre-dates local requirements for stormwater management. For areas of the Old Mill Branch WMA that have been developed more recently, the stormwater management facilities present include both a water quality and water quantity management component. One wet detention facility is located in the Old Mill Branch WMA. Other stormwater infrastructure consists primarily of open channel drainage to main stem tributaries and eventually to Bull Run and to the Occoquan River. Limited stormwater pipe infrastructure is present in the WMA.

The most prevalent stream impacts noted include channel widening coincident with limited, poor overall stream habitat; disturbed stream buffers in the headwaters reaches of the tributaries, and crossing impacts from roads and utilities. Channels noted as widening almost universally appear to be located in the residentially developed areas of the WMA. The stream conditions in the public lands in the Old Mill Branch WMA are noted as generally healthy.

No watershed restorations strategies are proposed within the next 10 years for this WMA. Only structural projects are proposed in the next 25 years for this watershed. These projects are entirely stream restorations. A map of this WMA and a list of all the projects proposed are provided.

5.7.1 0 – 10 Year Structural Projects

No projects proposed

5.7.2 11 – 25 Year Structural Projects

<u>OM9201 Stream Restoration</u>

This project proposes repairing the stream south of Old Yates Ford Road at Fountainhead Regional Park. This stream conveys runoff from wooded area and several houses. Stream stabilization will reduce bank and bed erosion, restore channel morphology, reduce sediment loads to the stream, maintain conveyance capacity and control unwanted meander.

<u>OM9202 Stream Restoration</u>

The stream south of Clifton Hunt Court has indicators of poor channel morphology. The stream conveys runoff from houses and wooded area. This project proposes reducing bank and bed erosion to restore channel morphology. Stream stabilization will reduce sediment load to the stream while maintaining capacity and controlling unwanted meander.

OM9203 Stream Restoration

This project proposes restoring the stream east of Kincheloe Road, which outfalls directly into the Occoquan Reservoir, conveying runoff from houses and wooded area. Stabilizing this stream will reduce bank and bed erosion, restore channel morphology, reduce sediment loads to the stream, maintain conveyance capacity and control unwanted meander.

OM9205 Stream Restoration

This project proposes restoring the stream west of Kincheloe Road that conveys runoff from wooded area and several houses and is immediately upstream of a pond. Stabilizing this stream will reduce bank and bed erosion, restore channel morphology, reduce sediment loads to the stream, maintain conveyance capacity, and control unwanted meander.

OM9206 Stream Restoration

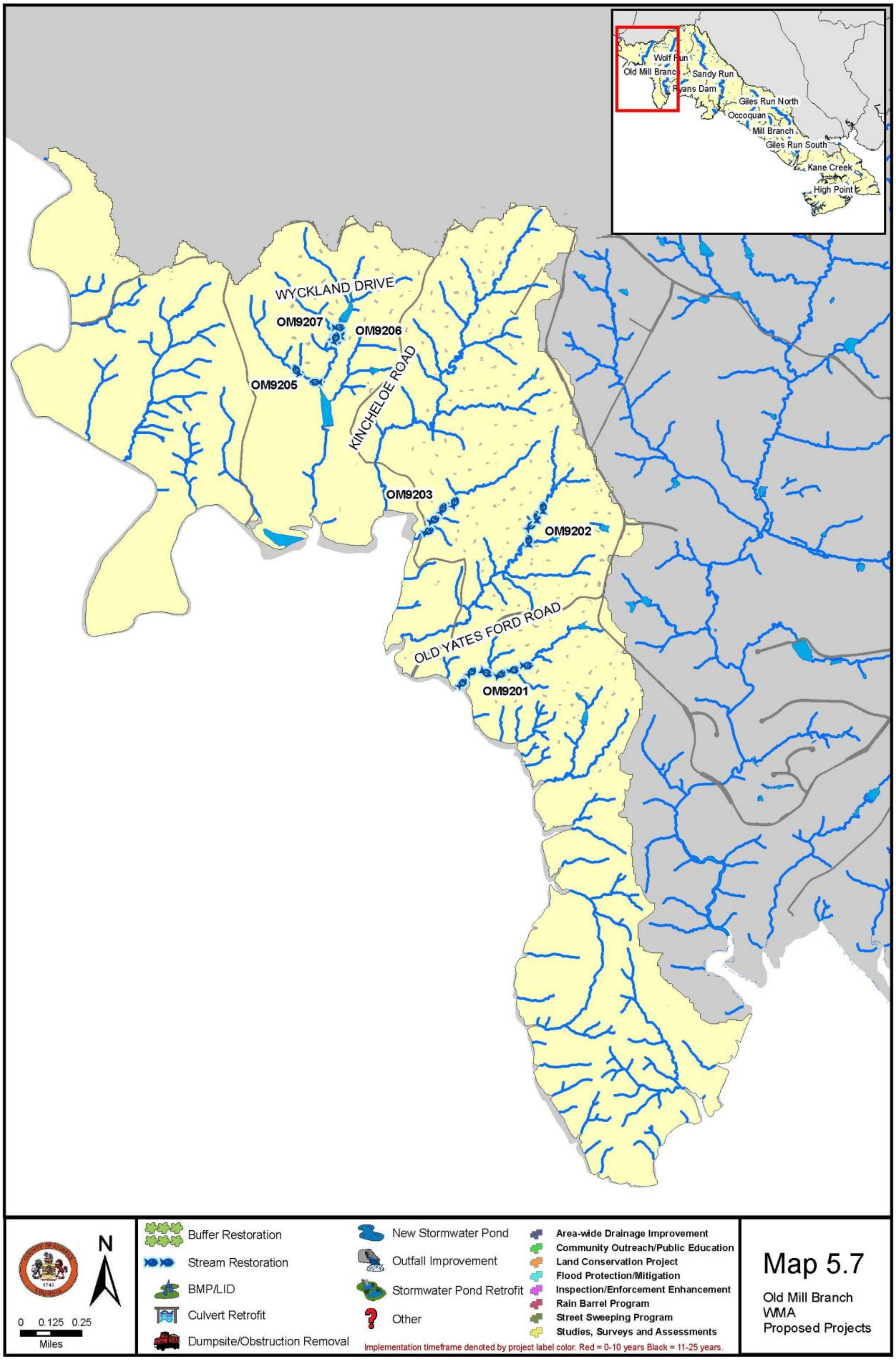
This project proposes restoring the stream south of Wyckland Drive where two streams converge. These streams convey runoff from houses and wooded area. Stabilizing this stream will reduce bank and bed erosion, restore channel morphology, reduce sediment loads to the stream, maintain conveyance capacity, and control unwanted meander. This project should be coordinated with project OM9207 to share mobilization costs.

OM9207 Stream Restoration

This project proposes restoring the stream south of Wyckland Drive and downstream of pond WP0267, which conveys runoff from houses and wooded area. Stabilizing this stream will reduce bank and bed erosion, restore channel morphology, reduce sediment loads to the stream, maintain conveyance capacity, and control unwanted meander. This project should be coordinated with project OM9206 to share mobilization costs.

5.7.3 Non-Structural Projects

No projects proposed



Map 5.7

Old Mill Branch WMA Proposed Projects

Table 5-7: Project List – WMA (Old Mill Branch)

Structural Projects[1]						
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
OM9201	Stream Restoration	OM-BU-0004	Near 12505 Old Yates Ford Rd. (Fountainhead Regional Park)	Water quality control	Public/Local/Private - FCPA, Residential	11 – 25
OM9202	Stream Restoration	OM-BU-0005	Behind 8100 Flossie La.	Water quality control	Private - Residential	11 – 25
OM9203	Stream Restoration	OM-BU-0006	Behind 12606 Clifton Hunt La.	Water quality control	Private - Residential	11 – 25
OM9205	Stream Restoration	OM-BU-0008	Behind 12990 Wyckland Dr.	Water quality control	Private - Residential	11 – 25
OM9206	Stream Restoration	OM-BU-0008	Behind 12995 Wyckland Dr.	Water quality control	Private - Residential	11 – 25
OM9207	Stream Restoration	OM-BU-0008	Behind 7859 My Way Dr.	Water quality control	Private - Residential	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**
No non-structural projects are proposed for this WMA.					

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

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5.8 Ryans Dam Watershed Management Area

Also located along the central southwestern border of the county, Ryans Dam WMA has a total area of approximately 3.63 square miles and is adjacent to the Occoquan River and Reservoir. The Ryans Dam WMA is bounded on the north by Henderson Road (Route 643) and roughly to the west by Henderson Road as well. The WMA is bounded on the east by Hampton Road (Route 647) and to the south by the Occoquan Reservoir. The WMA contains a number of tributary streams and stream valleys, including Stilwell Run.

The majority of the Ryans Dam WMA is parkland/open space, including a significant portion of Fountainhead Regional Park, with the remaining portion estate residential development. The majority of the observed single-family residential parcels are over one acre in size and were primarily developed in the 1970s (30-plus years old) and 1980s (20-plus years old). Residential subdivision streets lack curb and gutter and no sidewalks were observed. These larger lot developments also demonstrated significant grass and some tree cover, with impervious cover estimates at 10 percent or lower based on the size of the lots and the amount of development present.

The most prevalent stream impacts noted include channel widening, disturbed stream buffers in the headwaters reaches of the Ryans Dam WMA and its tributaries, and crossing impacts from roads and utilities. Channels noted as widening are almost universally located in the residentially developed areas of the WMA, including almost the entire length of Stilwell Run. The stream conditions in the public lands in the Ryans Dam WMA are noted as generally healthy.

No watershed restorations strategies are proposed within the next 10 years for this WMA. Only structural projects are proposed in the next 25 years for this watershed. These projects are entirely stream restorations. A map of this WMA and a list of all the projects proposed are provided.

5.8.1 0 – 10 Year Structural Projects

No projects proposed

5.8.2 11 – 25 Year Structural Projects

<u>RD9201 Stream Restoration</u>

The stream west of Stillwell Acres Lane upstream of Occoquan Reservoir in Fountainhead Park has indicators of poor channel morphology and conveys runoff primarily from wooded and open space areas. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

<u>RD9202 Stream Restoration</u>

The stream west of Crestridge Road conveys runoff from houses and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

5.8.3 Non-Structural Projects

No projects proposed.

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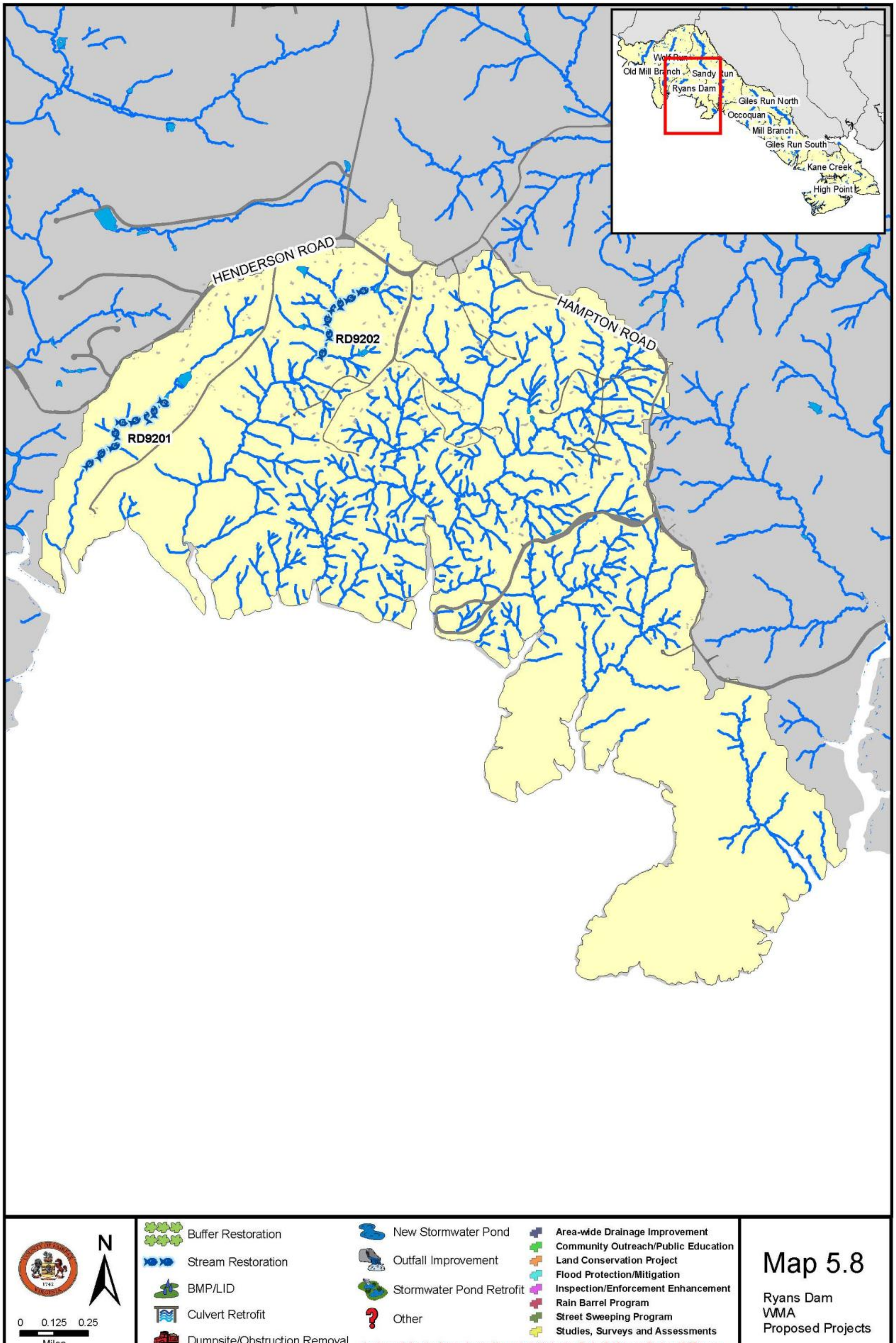

Map 5.8

Ryans Dam WMA Proposed Projects

Table 5-8: Project List – WMA (Ryans Dam)

Structural Projects[1]						
Project #	**Project Type**	**Sub-watershed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
RD9201	Stream Restoration	RD-OR-0016	Near 8517 Wolf Run Shoals Rd.	Water quality control	Pubic/Local/ Private - NVRPA, Residential	11 – 25
RD9202	Stream Restoration	RD-SW-0002	Behind 11470 Robert Stephens Dr.	Water quality control	Private - Residential, HOA	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**
No non-structural projects are proposed for this watershed.					

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5.9 Sandy Run Watershed Management Area

Sandy Run WMA covers 8.77 square miles (5,229 acres) and is located along the central southwestern border of Fairfax County. Sandy Run is bounded on the northeast and east by Ox Road (Route 123), to the west and south by Hampton Road (Route 647). Henderson Road (Route 643) and Clifton Road (Route 645) both bisect the Sandy Run watershed's northern half.

Sandy Run consists of approximately 20 miles of stream and includes two main tributary systems. A small portion of southern Sandy Run is covered by Fountainhead Regional Park. The majority of the observed single-family residential parcels are over one acre in size, consistent with the zoning status, and were primarily developed in the 1980s and 1990s. The WMA includes some additional institutional uses, including several houses of worship along Ox Road (Route 123).

The stormwater infrastructure consists primarily of open channel drainage to either dry detention basins or directly into Sandy Run and its associated stream valleys and tributaries. Sandy Run contains approximately 22 dry detention facilities designed to manage stormwater quantity, several of which are owned/maintained by the VDOT.

The most prevalent stream impacts noted include disturbed stream buffers, stream channel erosion and/or widening, and crossing impacts from roads and utilities. Channel widening and incision conditions are noted in the head waters of the Sandy Run main stem, but the downstream main stem of Sandy Run, moving toward the park, generally appears more stable. Pipes discharging into the streams have demonstrated impacts as well, contributing to the upstream widening and erosive conditions.

The watershed restoration projects for this WMA include a host of projects such as: retrofitting stormwater ponds, restoring streams and outfall improvements. Non-structural projects include buffer restoration projects and a reforestation project. Below are descriptions of the 0-10 year structural projects and non-structural projects. Also, a map of this WMA and a list of all the projects proposed in this WMA are provided. Project Fact Sheets for this WMA are located in Section 5.11.

5.9.1 0 – 10 Year Structural Projects

<u>SA9201 Stream Restoration</u>

Stream near Birch Cliff Drive conveying runoff from houses, wooded area, and substation area upstream of outfall to Occoquan Reservoir has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment.

<u>SA9209 Stream Restoration</u>

Stream section upstream of Beechnut Court in Fairfax Station conveys runoff from wooded area, housing, and Ox Road has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

<u>SA9211 Stream Restoration</u>

Stream section east of Streamwood Place in Fairfax Station where two streams converge, conveys runoff from adjacent houses, streets and wooded area has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

SA9213 Stream Restoration

Stream section east of Wolf Run Shoals Road in Fairfax Station conveying runoff primarily from wooded area, several houses, and a building with parking lot, has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment.

SA9701 Outfall Improvement

This project proposes removing the outfall section of an existing concrete swale along Silverleaf Drive to reduce erosive velocities to the stream and reduce pollutants. Currently, stormwater runs off of Silverleaf Drive into the concrete swale and directly into the adjacent stream with no stormwater treatment. The receiving stream has poor channel morphology. Replacing the existing concrete swale with a natural swale with check dams and step pools to reduce velocity and encourage infiltration would help downstream erosion.

5.9.2 11 – 25 Year Structural Projects

SA9101 Stormwater Pond Retrofit

This project proposes the retrofit of an existing VDOT dry pond (VDOT29025) south of Thorn Bush Drive to create an extended detention dry pond with a sediment forebay. This pond receives runoff from the road and has pollutant indicators, including nitrogen and phosphorus. This retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure, which enables particulate pollutants to settle out.

SA9102 Stormwater Pond Retrofit

This project proposes the retrofit of an existing VDOT dry pond (VDOT29031) to create an extended detention dry pond with a sediment forebay. The primary indicators are pollutants included nitrogen and phosphorus. The pond treats a portion of Ox Road next to the stream in which it discharges. Dry pond retrofits will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure which enables particulate pollutants to settle out providing better removal for particulate pollutants.

SA9103 Stormwater Pond Retrofit

This project proposes the retrofit of an existing public dry pond (0209DP) east of Wayfarer Drive to create an extended detention dry pond with a sediment forebay. The pond receives runoff from an adjacent subdivision, wooded area and road. The pond outfalls into a stream that crosses Henderson Road. The primary indicators are pollutants including nitrogen and phosphorus. Dry pond retrofits will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure, which promote particulate pollutant settlement.

SA9105 Stormwater Pond Retrofit

This project proposes the retrofit of an existing dry pond (DP0535) near Virginia Korean Baptist Church to create a wetland system, sediment forebay and bench planting. The pond is located to the west of the church. The primary indicators are pollutants, including nitrogen and phosphorus. Wet pond retrofits will modify the existing pond to increase pollutant removal and to provide adequate channel protection above the permanent pool. The retrofit will create a better functioning environment for gravitational settling, biological uptake and microbial activity.

SA9205 Stream Restoration Suite

Subproject A proposes repairing bank and bed erosion to restore channel morphology for a stream between Henderson Roads and a pond. This project occurs where two streams converge and convey runoff from houses, open space and wooded area. The streams have indicators of poor channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Subproject B proposes the removal of concrete slabs blocking the channel behind stables northeast of Henderson Road to restore natural conditions. The stream is in a wooded area and collects runoff from a stable, houses, and wooded area. The primary indicators are flood complaints and have been field verified. Removal of obstructions will help restore the natural conditions of the stream and alleviate flooding problems.

SA9206 Stream Restoration

The stream section upstream of Henderson Road conveys runoff from houses, open space, a power line easement and wooded area. The stream has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

SA9207 Stream Restoration Suite

Subproject A proposes repairing bank and bed erosion to restore channel morphology of a stream section south of Silverleaf Drive, which conveys runoff from wooded areas and housing lots. The stream has indicators of poor channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Subproject B proposes the repair of a stream buffer upstream of Hunting Horse Drive. Repairing the buffer will re-establish the RPA and provide reforestation to a partially bare area. Primary indicators are streambank buffer deficiencies. Increased vegetation from buffer repair will provide additional buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration. It will also reduce runoff rates to stream and minimize erosion.

SA9208 Stream Restoration

The stream section upstream of Daysailer Drive conveys runoff from wooded area, housing and buildings with parking and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

SA9212 Stream Restoration

This project proposes restoring the stream section east of Streamwood Place in Fairfax Station where two streams converge. The streams conveys runoff from adjacent houses, streets and wooded area and has indicators of poor channel morphology. Stabilization will reduce bank and bed erosion, restore channel morphology, reduce sediment loads to the stream, maintain capacity and control unwanted meander.

SA9214 Stream Restoration

The stream section east of Wolf Shoals Road in Fairfax Station conveys runoff from a church site, major road, wooded area and houses and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

SA9702 Outfall Improvement

This project proposes the reconstruction of a swale southwest of Sandy Manor Drive that conveys runoff from street, adjacent houses and wooded area directly into stream. The primary indicator is poor channel morphology. Retrofitting the swale will reduce flow velocities and increase filtration capacities. This will provide some water treatment and protect the downstream channel against erosion.

5.9.3 Non-Structural Projects

SA9801 Buffer Restoration

This project proposes the repair of a stream buffer south of Sandy Run Trail. Repairing the buffer will re-establish the RPA and provide reforestation to a partially bare area. Primary indicators are streambank buffer deficiencies. Increased vegetation from buffer repair will provide additional buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration. It will also reduce runoff rates to stream and minimize erosion.

SA9802 Buffer Restoration

This project proposes the repair of a stream buffer east of Hunting Shire Lane. Repairing the buffer will re-establish the RPA and provide reforestation to a partially bare area. Primary indicators are streambank buffer deficiencies. Increased vegetation from buffer repair will provide additional buffer for filtration of pollutants and will reduce runoff by intercepting the water, increasing surface storage and infiltration. It will also reduce runoff rates to stream and minimize erosion.

SA9803 Other

This project proposes reforestation to a sparsely wooded area southwest of Old Stone Fence Road to provide natural runoff volume reduction and pollutant removal. The primary indicator is poor channel morphology. Increased vegetation from reforestation will provide additional stream buffer for filtration of pollutants and will reduce runoff by intercepting water, increasing surface storage and infiltration.

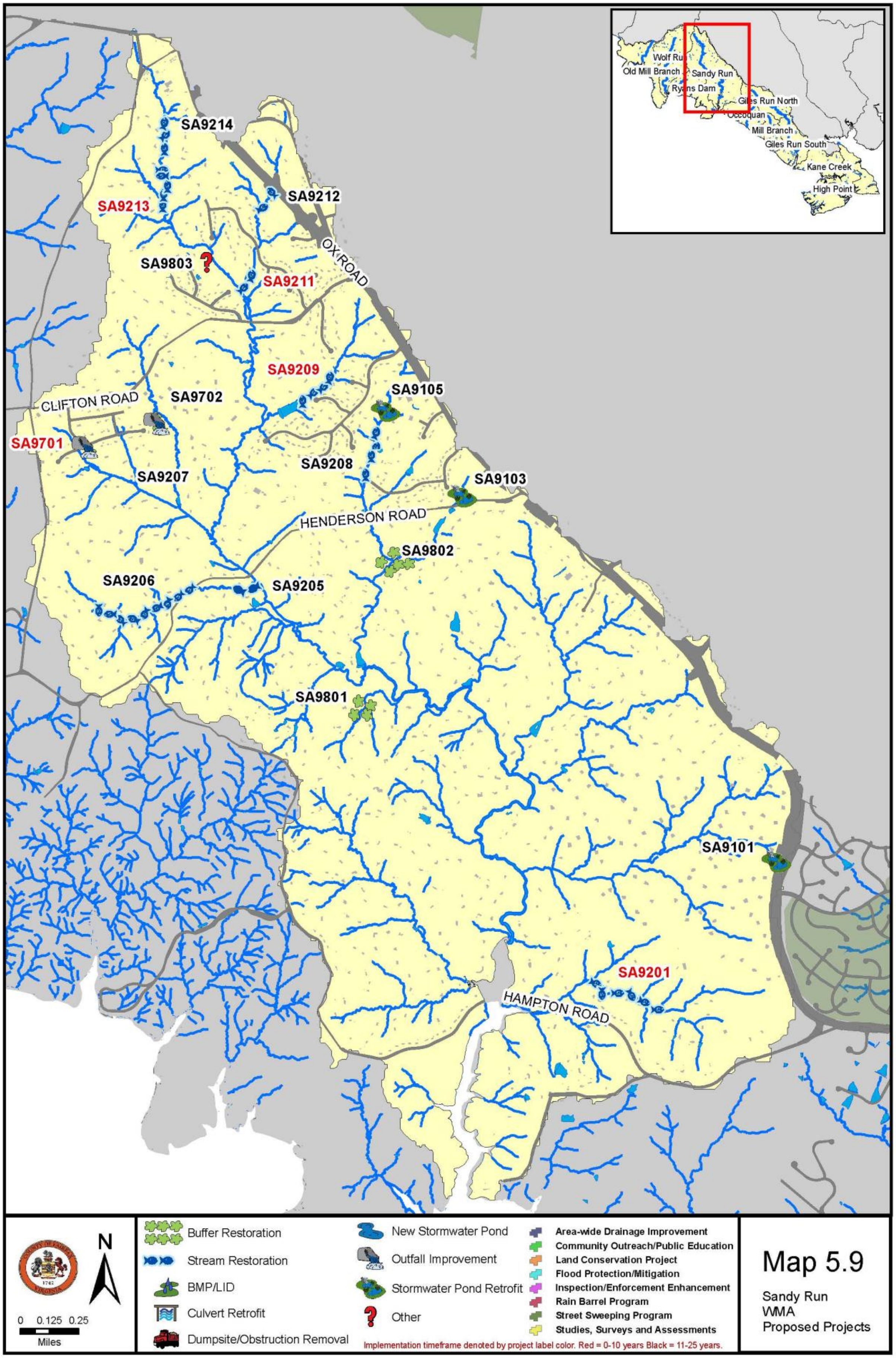

SA9214
SA9213
SA9212
SA9803
SA9211
OX ROAD
SA9209
SA9105
CLIFTON ROAD
SA9702
SA9701
SA9208
SA9207
SA9103
HENDERSON ROAD
SA9802
SA9206
SA9205
SA9801
SA9101
SA9201
HAMPTON ROAD
Wolf Run
Old Mill Branch
Sandy Run
Ryans Dam
Giles Run North
Occoquan
Mill Branch
Giles Run South
Kane Creek
High Point
N
0 0.125 0.25
Miles
Buffer Restoration
Stream Restoration
BMP/LID
Culvert Retrofit
Dumpsite/Obstruction Removal
New Stormwater Pond
Outfall Improvement
Stormwater Pond Retrofit
Other
Area-wide Drainage Improvement
Community Outreach/Public Education
Land Conservation Project
Flood Protection/Mitigation
Inspection/Enforcement Enhancement
Rain Barrel Program
Street Sweeping Program
Studies, Surveys and Assessments
Implementation timeframe denoted by project label color. Red = 0-10 years Black = 11-25 years.
Map 5.9
Sandy Run
WMA
Proposed Projects

Table 5-9: Project List – WMA (Sandy Run)

Structural Projects[1]						
Project #	**Project Type**	**Sub-water-shed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
SA9201	Stream Restoration	SA-OR-0004	Next to 8721 Birch Cliff Dr.	Water quality control	Private - Residential	0 – 10
SA9209	Stream Restoration	SA-SA-0022	Near 10746 Beechnut Ct.	Water quality control	Private - Residential, HOA	0 – 10
SA9211	Stream Restoration	SA-SA-0025	Behind 6901 Streamwood Pl.	Water quality control	Public/Local - FCPA	0 – 10
SA9213	Stream Restoration	SA-SA-0026	6650 Rutledge Dr.	Water quality control	Private - Residential	0 – 10
SA9701	Outfall Improvemen t	SA-SA-0018	Near 11223 Silverleaf Dr.	Water quality and quantity control	Private - Residential	0 – 10
SA9101	Stormwater Pond Retrofit	SA-SA-0004	Next to 9699 Thorn Bush Dr.	Water quality and quantity control	Public/State - VDOT	11 – 25
SA9102	Stormwater Pond Retrofit	SA-SA-0004	8120 Ox Rd.	Water quality and quantity control	Public/State - Commonwea lth of VA	11 – 25
SA9103	Stormwater Pond Retrofit	SA-SA-0012	Behind 7401 Wayfarer Rd.	Water quality and quantity control	Private - HOA	11 – 25
SA9105	Stormwater Pond Retrofit	SA-SA-0013	Behind 7200 Ox Rd.	Water quality and quantity control	Private - Church	11 – 25
SA9205	Stream Restoration Suite	SA-SA-0016	Behind 10901 Henderson Rd.	Water quality control	Private - Residential	11 – 25
SA9206	Stream Restoration	SA-SA-0016	Across street from 11100 Devereux Station La.	Water quality control	Private - Residential	11 – 25
SA9207	Stream Restoration Suite	SA-SA-0018	Near 11212 Hunting Horse Dr.	Water quality control	Private - Residential	11 – 25
SA9208	Stream Restoration	SA-SA-0013	10608 Daysailer Dr.	Water quality control	Private - Residential, HOA	11 – 25
SA9212	Stream Restoration	SA-SA-0025	6572 Ox Rd.	Water quality control	Private - Residential	11 – 25
SA9214	Stream Restoration	SA-SA-0026	6635 Rutledge Dr.	Water quality control	Private - Residential	11 – 25
SA9702	Outfall Improvemen t	SA-SA-0019	Behind 11204 Silver Leaf Dr.	Water quality and quantity control	Private - Residential	11 – 25

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

Non-Structural Projects[1]					
Project #	**Project Type**	**Sub-watershed**	**Location**	**Watershed Benefit**	**Land Owner**
SA9801	Buffer Restoration	SA-SA-0010	Next to 10711 Sandy Run Trail	Water quality control	Private - Residential
SA9802	Buffer Restoration	SA-SA-0012	10600 Hunting Shire La.	Water quality control	Private - Residential
SA9803	Other	SA-SA-0024	Behind 6909 Heathstone Ct.	Water quality and quantity control	Public/Local - FCPA

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

5.10 Wolf Run Watershed Management Area

The Wolf Run WMA has a total area of approximately 5.90 square miles and is located along the southwestern border of Fairfax County. The Wolf Run WMA is roughly bounded on the north end by Chapel Road (Route 641) east of the Town of Clifton, on the east by Wolf Run Shoals Road (Route 610) and roughly on the south and west by Henderson Road (Route 643), which bisects the extreme southern portion of the WMA. The Wolf Run WMA is bisected in the northern region by Clifton Road (Route 645) and Yates Ford Road (Route 612).

Development in the watershed is primarily estate residential, which includes several established, estate subdivisions such as Wolf Run Estates, Wolf Run, Wolf Run Hills, Lakewood Estates, Wolfs Landing, Plantation Hills, and Rose Hall. The majority of the observed single-family residential parcels are over one acre in size and were primarily developed in the 1980s (20-plus years old) and 1990s (10-plus years old). Residential subdivision streets lack curb and gutter and no sidewalks were observed. Non-residential uses in the Wolf Run WMA appear to be limited to parkland (portion of Fountainhead Regional Park) and a few small, private cemeteries. No schools, shopping centers, or other institutional or commercial developments were observed. As such, grass and tree cover is prevalent throughout the Wolf Run WMA.

Due to the nature of development in the Wolf Run WMA, very little formal stormwater infrastructure exists today. The stormwater management facilities present include two wet detention facilities. Other stormwater infrastructure consists primarily of open channel drainage to main stem tributaries and eventually to the Occoquan River. There are few large diameter stormwater pipes present in this WMA.

The most prevalent stream impacts noted include channel widening coincident with poor overall stream habitat, disturbed stream buffers in the headwaters reaches of Wolf Run and its tributaries, and crossing impacts from roads and utilities. Channels noted as widening are almost universally impacted by multiple crossing impacts, including widening noted on Swift Run, Maple Branch, and the unnamed tributary following Lakewood Lane in the southern end of the Wolf Run WMA. Crossing impacts are noted as primarily minor, with the exception of a pair in the southern end of Wolf Run. In addition, several moderate to severe obstructions are noted in two different Wolf Run tributaries. Head cuts, including one severe instance – over 2 feet, were noted in the upper reaches of Wolf Run and two dump sites were identified as well.

The watershed restoration projects proposed for this WMA are entirely stream restorations. No non-structural projects are proposed. Also, a map of this WMA and a list of all the projects proposed in this WMA are provided. Project Fact Sheets for this WMA are located in Section 5.11.

5.10.1 0 – 10 Year Structural Projects

WR9201 Stream Restoration

Stream section east of Wolf Valley Drive in Fairfax Station conveying runoff from wooded area and houses has indicators of poor channel morphology. Stream crosses under Henderson Road. Stream located upstream of outfall to Occoquan Reservoir and downstream of Henderson Road. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

WR9208 Stream Restoration

Stream section east of Turtle Valley Drive conveying runoff from open space and houses has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

WR9209 Stream Restoration

Stream section near Rose Hall Drive conveying runoff from upstream houses and wooded area has indicators of poor channel morphology. Stream is in a very steep wooded area and portions are close to homes and roadways. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

WR9211 Stream Restoration

Stream section west of Amkin Drive conveying runoff from upstream houses and wooded area has indicators of poor channel morphology. Stream receives runoff from adjacent residential areas and wooded areas and conveys stormwater from stream to the east. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

WR9212 Stream Restoration

Stream section near Maple Branch Road conveying runoff from upstream houses and wooded area has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

5.10.2 11 – 25 Year Structural Projects

WR9206 Stream Restoration

The stream section near Winterway Road in Fairfax Station convey runoff from wooded area and houses and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9210 Stream Restoration

The stream section north of Amkin Court conveys runoff from upstream houses and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9213 Stream Restoration

The stream section west of Swift Run Trails Drive conveys runoff from upstream houses and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9214 Stream Restoration

The stream section upstream of Swift Run Trails Drive conveys runoff from upstream houses and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9217 Stream Restoration

The stream section south of Corral Drive conveys runoff from upstream houses, open space and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9218 Stream Restoration

The stream section near Lilting Lane in Fairfax Station conveys runoff from upstream houses, roadways and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9219 Stream Restoration

The stream section near Lilting Lane in Fairfax Station conveys runoff from upstream houses, roadways and wooded area where two streams converge and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion on the eastern branch to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9220 Stream Restoration

The stream section east of Wolf Den Road in Fairfax Station conveys runoff from upstream houses, open spaces and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9221 Stream Restoration

The stream section west of Lilting Lane in Fairfax Station conveys runoff from upstream houses, roadways and wooded area where two streams converge and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion on the western stream to restore channel morphology. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander.

WR9222 Stream Restoration

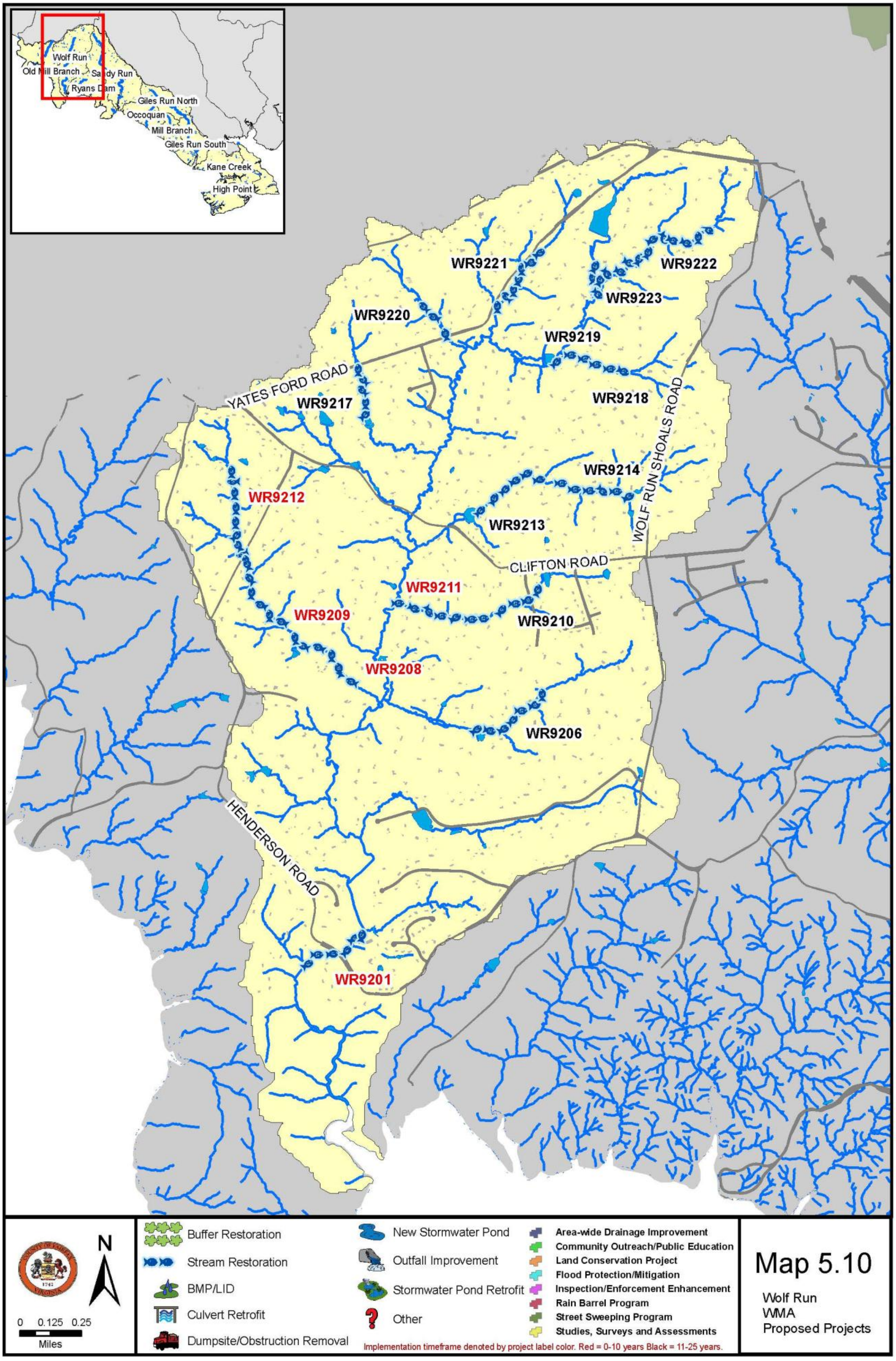
South of Ryanlynn Drive there are two streams which convey runoff from upstream houses and a wooded area. The streams have indicators of poor channel morphology. This project proposes restoring the channel morphology of the eastern branch by reducing the bank and bed erosion. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. This project should be coordinated with project WR9223 (the western branch) to share mobilization costs.

WR9223 Stream Restoration

South of Ryanlynn Drive there are two streams which convey runoff from upstream houses and a wooded area. The streams have indicators of poor channel morphology. This project proposes restoring the channel morphology of the western branch by reducing the bank and bed erosion. Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. This project should be coordinated with project WR9222 (the eastern branch) to share mobilization costs.

5.10.3 Non-Structural Projects

No projects proposed.



Wolf Run
Old Mill Branch
Sandy Run
Ryans Dam
Giles Run North
Occoquan
Mill Branch
Giles Run South
Kane Creek
High Point
WR9221
WR9222
WR9223
WR9220
WR9219
YATES FORD ROAD
WR9217
WR9218
WOLF RUN SHOALS ROAD
WR9214
WR9212
WR9213
CLIFTON ROAD
WR9211
WR9209
WR9210
WR9208
WR9206
HENDERSON ROAD
WR9201
N
0 0.125 0.25
Miles
Buffer Restoration
Stream Restoration
BMP/LID
Culvert Retrofit
Dumpsite/Obstruction Removal
New Stormwater Pond
Outfall Improvement
Stormwater Pond Retrofit
Other
Area-wide Drainage Improvement
Community Outreach/Public Education
Land Conservation Project
Flood Protection/Mitigation
Inspection/Enforcement Enhancement
Rain Barrel Program
Street Sweeping Program
Studies, Surveys and Assessments
Implementation timeframe denoted by project label color. Red = 0-10 years Black = 11-25 years.
Map 5.10
Wolf Run
WMA
Proposed Projects

Table 5-10: Project List – WMA (Wolf Run)

Structural Projects[1]						
Project #	**Project Type**	**Sub-watershed**	**Location**	**Watershed Benefit**	**Land Owner**	**Phase**
WR9201	Stream Restoration	WR-WR-0002	Behind 12101 Henderson Rd.	Water quality control	Private - Residential	0 – 10
WR9208	Stream Restoration	WR-WR-0008	Near 12025 Seven Hills La.	Water quality control	Private - Residential	0 – 10
WR9209	Stream Restoration	WR-WR-0008	12060 Rose Hall Dr.	Water quality control	Private - Residential	0 – 10
WR9211	Stream Restoration	WR-WR-0011	Behind 11724 Amkin Dr.	Water quality control	Private - Residential	0 – 10
WR9212	Stream Restoration	WR-WR-0009	7610 Maple Branch Rd.	Water quality control	Private - Residential	0 – 10
WR9206	Stream Restoration	WR-WR-0006	Near 7900 Wolf Run Hills	Water quality control	Private - Residential	11 – 25
WR9210	Stream Restoration	WR-WR-0011	7501 Amkin Ct.	Water quality control	Private - Residential	11 – 25
WR9213	Stream Restoration	WR-WR-0013	Behind 7433 Clifton Rd.	Water quality control	Private - Residential	11 – 25
WR9214	Stream Restoration	WR-WR-0013	7121 Swift Run Trails Dr.	Water quality control	Private - Residential	11 – 25
WR9217	Stream Restoration	WR-WR-0017	12013 Corral Dr.	Water quality control	Private - Residential	11 – 25
WR9218	Stream Restoration	WR-WR-0021	11047 Lilting La.	Water quality control	Private - Residential	11 – 25
WR9219	Stream Restoration	WR-WR-0021	11418 Lilting La.	Water quality control	Private - Residential	11 – 25
WR9220	Stream Restoration	WR-WR-0019	11806 Yates Ford Rd.	Water quality control	Private - Residential	11 – 25
WR9221	Stream Restoration	WR-WR-0022	11721 Yates Ford Rd.	Water quality control	Public/State/ Private - VDOT, Residential	11 – 25
WR9222	Stream Restoration	WR-WR-0024	11543 Lilting La.	Water quality control	Private - Residential	11 – 25
WR9223	Stream Restoration	WR-WR-0023	11543 Lilting La.	Water quality control	Private - Residential	11 – 25

Non-Structural Projects[1]					
Project #	**Project Type**	**Subwatershed**	**Location**	**Watershed Benefit**	**Land Owner**
No non-structural projects are proposed for this WMA.				N/A	N/A

[1] **Only 10-yr structural projects will have associated project fact sheets at the end of section 5.**

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5.11 Lower Occoquan – Project Fact Sheets

Project fact sheets for each 10-yr structural project included in the Lower Occoquan Watershed Management Plan are included in this section. Individual project fact sheets are comprised of the following information:

- Address / Location
- Land owner
- PIN (Tax map and parcel info)
- Control type (Water quality control, water quantity control, or both)
- Drainage area
- Receiving waters
- Description of proposed project
- Aerial view and sketch of proposed project
- Project Benefits
- Project Design Considerations
- Project Costs
- Site photos (existing conditions)

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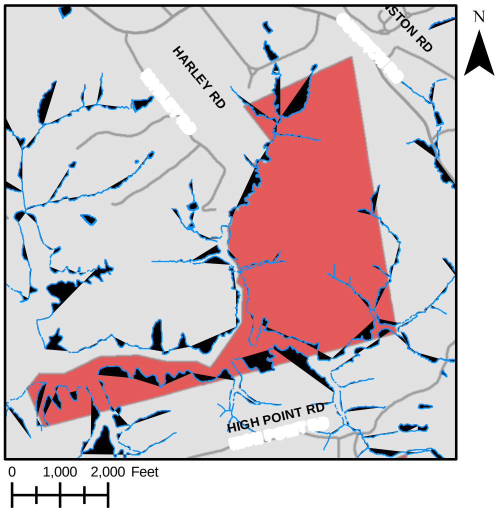
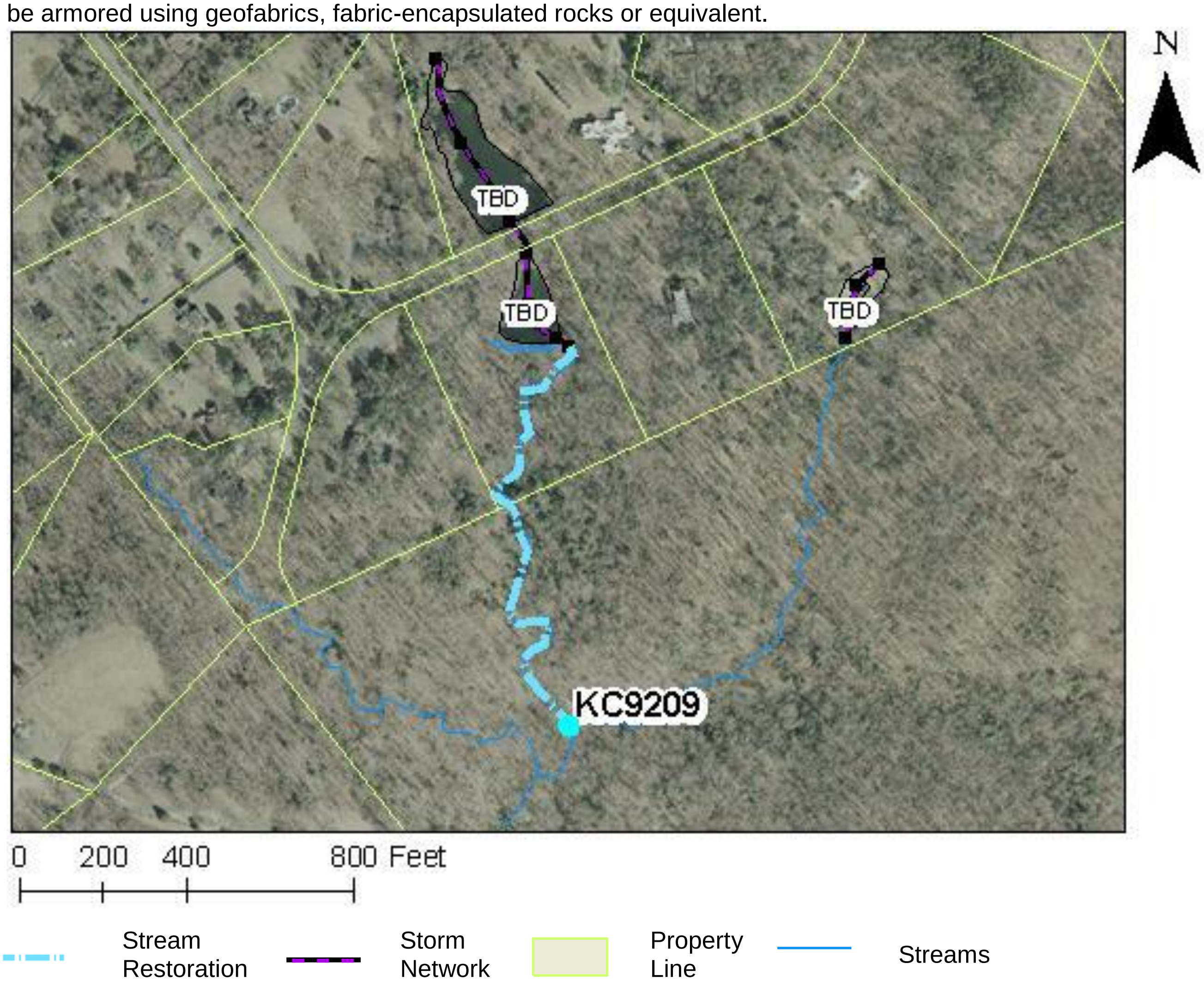
KC9209 Stream Restoration



Address: Behind 10809 Harley Rd., Lorton, Virginia
Location: Stream near Harley Rd.
Land Owner: Public/Private – Virginia Department of Conservation and Economic Development, private owner
PIN: 1182 01 0004, 1144 03020016
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Kane Creek

Description: The stream south of Springfield Drive in Lorton shows indicators of poor channel morphology. The stream is downstream of two ponds, and ultimately discharges into Belmont Bay. A project is proposed to repair bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. To reduce further erosion the banks will be armored using geofabrics, fabric-encapsulated rocks or equivalent.



Project Benefits: Restoration will minimize sediment loads to the stream while maintaining capacity and controlling unwanted meander. The stream is severely eroded in some areas. The restoration and stabilization will reduce current erosion and minimize future erosion. Below are the project's estimated pollutant removal amounts.

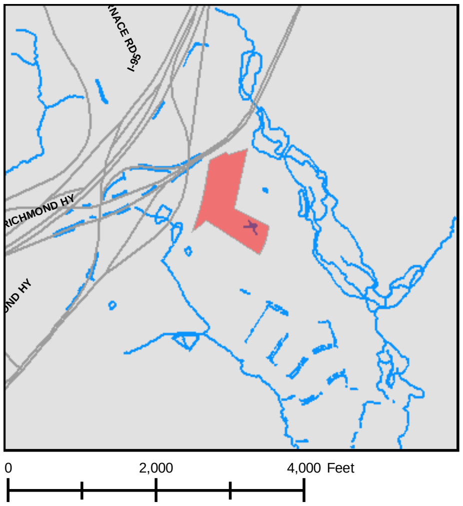
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
9.06	12.32	4.78

Project Design Considerations: Field investigation revealed that the stream is severely eroded, especially directly downstream from the pond, and has created a "waterfall" that drops approximately 5 feet. The stream is narrowing and deepening, and receives discharge from upstream pond and runoff from primarily wooded areas to the east and west. Energy dissipation devices downstream of the pond would be beneficial in reducing erosion to the steam by decreasing velocities.

Cost:

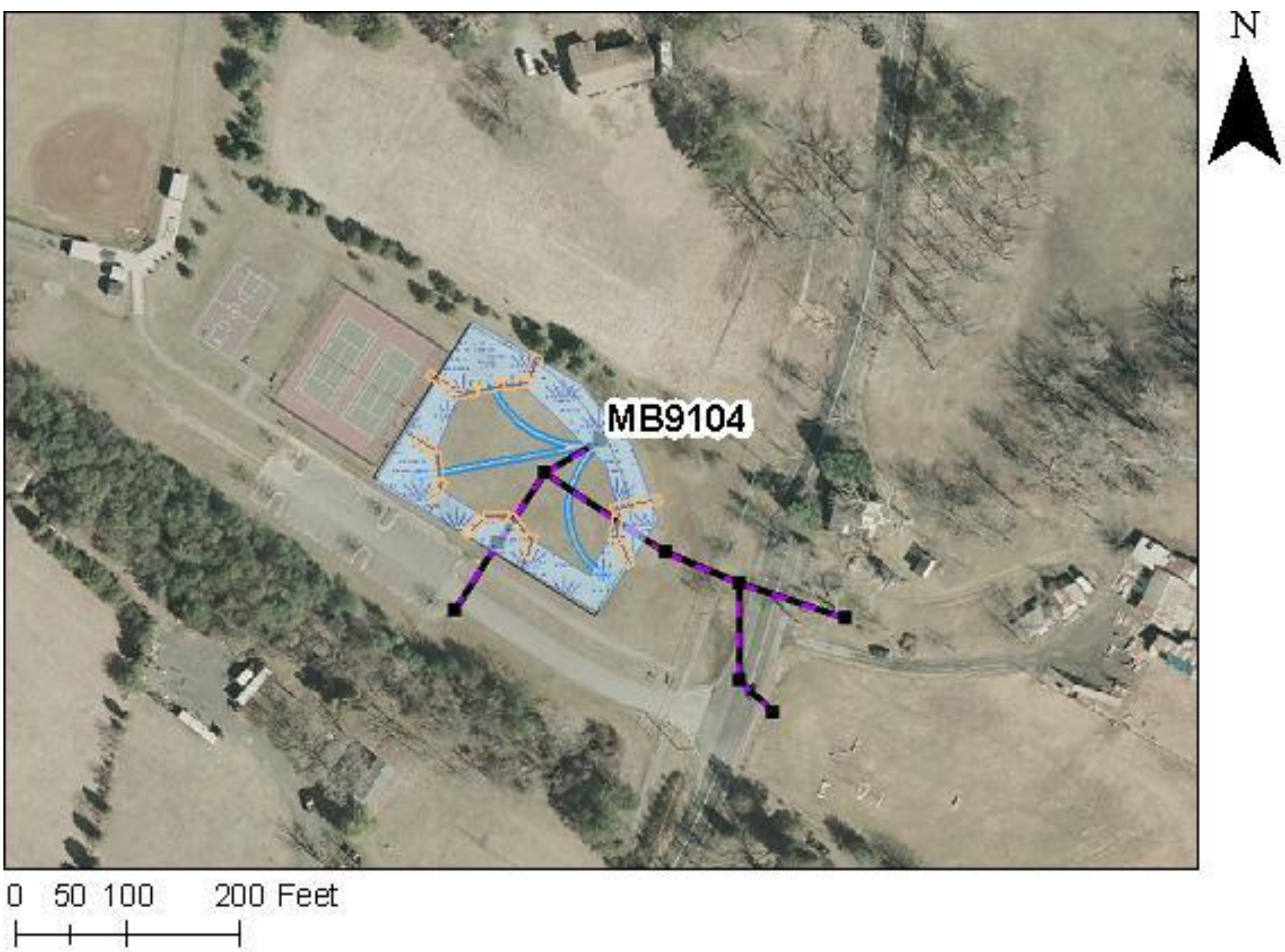
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1207	LF	$200	$241,400
Clear and Grub	1.39	AC	$10,000	$13,900
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$38,030
Ancillary Items	1	LS	5%	$19,015
			Base Construction Cost	$437,345
			Mobilization (5%)	$21,867
			Subtotal 1	$459,212
			Contingency (25%)	$114,803
			Subtotal 2	$574,015
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$258,307
			Total	$832,322
			Estimated Project Cost	$840,000

MB9104 Stormwater Pond Retrofit



Address: 10418 Old Colchester Rd., Lorton, Virginia
Location: Pond at Mason Neck West Park
Land Owner: Public/Local – Fairfax County Park Authority
PIN: 1134 01 0040A
Control Type: Water quality and quantity control
Drainage Area: 6.62 acres
Receiving Waters: Tributary of Giles Run

Description: A dry pond retrofit is proposed at Mason Neck West Park located off of Old Colchester Road in Lorton. The project proposes to create an extended detention dry pond with sediment forebays. The retrofit will modify the existing pond to provide adequate downstream channel protection and allow for better function of temporary ponding using a control structure, which promotes particulate pollutant settlement.



Project Benefits: Extending the time stormwater is treated in the pond promotes particulate pollutant settlement and reduces erosion in the channel downstream. Installing the sediment forebays will reduce debris and coarse sediment in the pond. This will reduce costly maintenance and improve water quality. Removing the existing concrete pilot channels will encourage low flows with high concentrations of pollutants to infiltrate. The plantings in the proposed aquatic bench and safety bench will increase the ponds biological uptake of pollutants, such as nitrogen and phosphorus. Below are the project's estimated pollutant removal amounts.

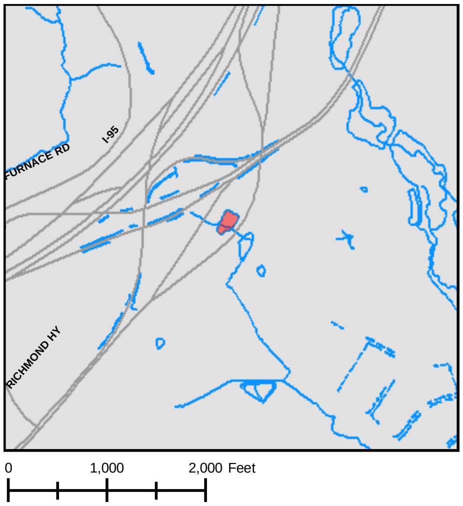
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
0.39	3.96	0.83

Project Design Considerations: The project occurs on a state park with ample open space. County records show that the pond is not located in a storm drain easement. The available head difference in the pond appears minimal. The pond has three concrete pilot channels to direct low flows to the outlet. These should be removed. Due to the ponds minimal head, a micro-pool will need to be created. The pond's safety bench and aquatic bench should be landscaped to prevent access to the pool, due to the pond's location in the park. The pond receives many inflows. Sediment forebays should be constructed for inflows that drain 10 percent or more of the contributing drainage area. The total area of the sediment forebays should equal approximately 10 percent of the pond's surface.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.44	AC	$8,500	$3,740
Grading and Excavation	1500	CY	$35	$52,500
Structural BMP Retrofit and Incidentals	1	LS	$10,000	$10,000
Embankment	55	CY	$50	$2,750
Outflow Pipe	90	LF	$125	$11,250
Rip Rap Stabilization	75	SY	$100	$7,500
Organic Compost Soil Amendment	350	CY	$40	$14,000
Plantings	1	LS	5%	$5,087
Ancillary Items	1	LS	5%	$5,087
Erosion and Sediment Control	1	LS	10%	$10,174
			Base Construction Cost	$122,088
			Mobilization (5%)	$6,104
			Subtotal 1	$128,192
			Contingency (25%)	$32,048
			Subtotal 2	$160,241
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$72,108
			Total	$232,349
			Estimated Project Cost	$240,000

MB9105 Stormwater Pond Retrofit



Address: Near 10595 Furnace Rd., Lorton, Virginia
Location: Pond near Richmond Hwy and ramp
Land Owner: Public **-** Virginia Department of Transportation
PIN: US Route 1 (Richmond Highway)
Control Type: Water quality and quantity control
Drainage Area: 21.57 acres
Receiving Waters: Tributary of Occoquan River

Description: This project proposes the retrofit of an existing pond between Richmond Highway and west of the Old Colchester Road ramp to create a wetland system with sediment forebay and bench planting. The primary problem indicators are pollutants, including nitrogen, phosphorus and total suspended solids. The retrofit will modify the existing pond to increase the time stormwater travels through the facility. The retrofit will add areas of high marsh and low marsh to the pond with tree peninsulas and will create a better functioning environment for gravitational settling, biological uptake and microbial activity.

Project Benefits: Installing the sediment forebay will reduce debris and coarse sediment in the wetland, reducing required maintenance. The extra travel time of water through the wetland will provide better downstream channel erosion protection. The wetland system will promote pollutant settlement and biological uptake of excessive nutrients. Below are the project's estimated pollutant removal amounts.

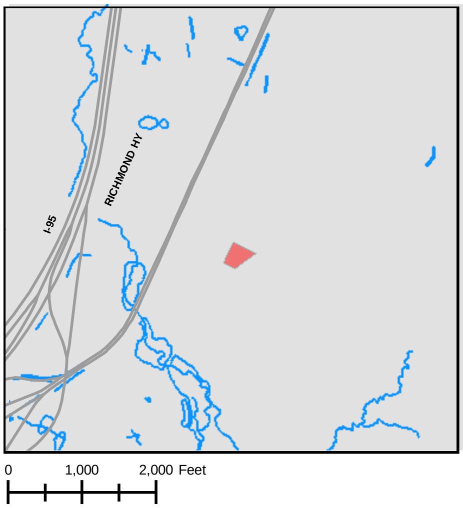
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
9.18	137.76	38.26

Project Design Considerations: Pond water quality treatment functions could be greatly improved with this retrofit. The existing pond footprint will need to be enlarged. The expansion should minimize impacts to the existing vegetation and should incorporate this vegetation into the wetland's tree peninsulas. The existing pond does not have a discharge structure. County records show that the pond is not located in a storm drain easement, but it is located in the road right-of-way.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.36	AC	$8,500	$3,060
Grading and Excavation	1800	CY	$35	$63,000
Structural BMP Retrofit and Incidentals	1	LS	$15,000	$15,000
Embankment	35	CY	$50	$1,750
Outflow Pipe	100	LF	$125	$12,500
Rip Rap Stabilization	125	SY	$100	$12,500
Organic Compost Soil Amendment	290	CY	$40	$11,600
Plantings	1	LS	5%	$5,971
Ancillary Items	1	LS	5%	$5,971
Erosion and Sediment Control	1	LS	10%	$11,941
			Base Construction Cost	$143,292
			Mobilization (5%)	$7,165
			Subtotal 1	$150,457
			Contingency (25%)	$37,614
			Subtotal 2	$188,071
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$84,632
			Total	$272,703
			Estimated Project Cost	$280,000

MB9107 Stormwater Pond Retrofit



Address: 10119 Giles Run Rd., Burke, Virginia
Location: Dry pond near Giles Run Rd.
Land Owner: Private – private owners
PIN: 1132 03 E2
Control Type: Water quality and quantity control
Drainage Area: 0.79 acres
Receiving Waters: Tributary of Giles Run

Description: A dry pond is located in an industrial area off of Richmond Highway. This project proposes retrofitting the existing dry pond to create an extended detention dry pond with sediment forebays. The retrofit will modify the existing discharge structure to increase the time stormwater is detained in the pond. The pond will be expanded to handle this larger treatment volume. This retrofit will provide better downstream channel protection and promote particulate pollutant settlement. Pollutant indicators include nitrogen, phosphorous and total suspended solids.

SW Pond Retrofit | Storm Network | Sediment Forebay | Property Line | Streams

Project Benefits: Installing the sediment forebays will reduce debris and coarse sediment in the pond, which will reduce maintenance requirements. Extending the detention time of the stormwater will improve the pond's downstream channel erosion protection. Below are the project's estimated pollutant removal amounts.

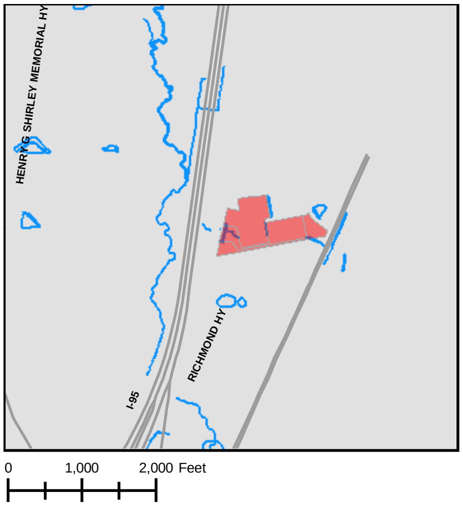
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
0.53	7.21	1.07

Project Design Considerations: This project is located on private property. Per County records, this pond is not located in a storm drain easement. A swale will need to be added to direct runoff to the sediment forebay. The two forebays will be approximately 10 percent of the pond area. The expanded pond will have a safety bench, and an aquatic bench will be planted around the perimeter of the pond. The expansion of the pond should incorporate the existing vegetation as much as possible. The landscaping plan should allow the pond to mature into a native forest in the right places, yet keep turf along the embankment and all access areas.

Cost:

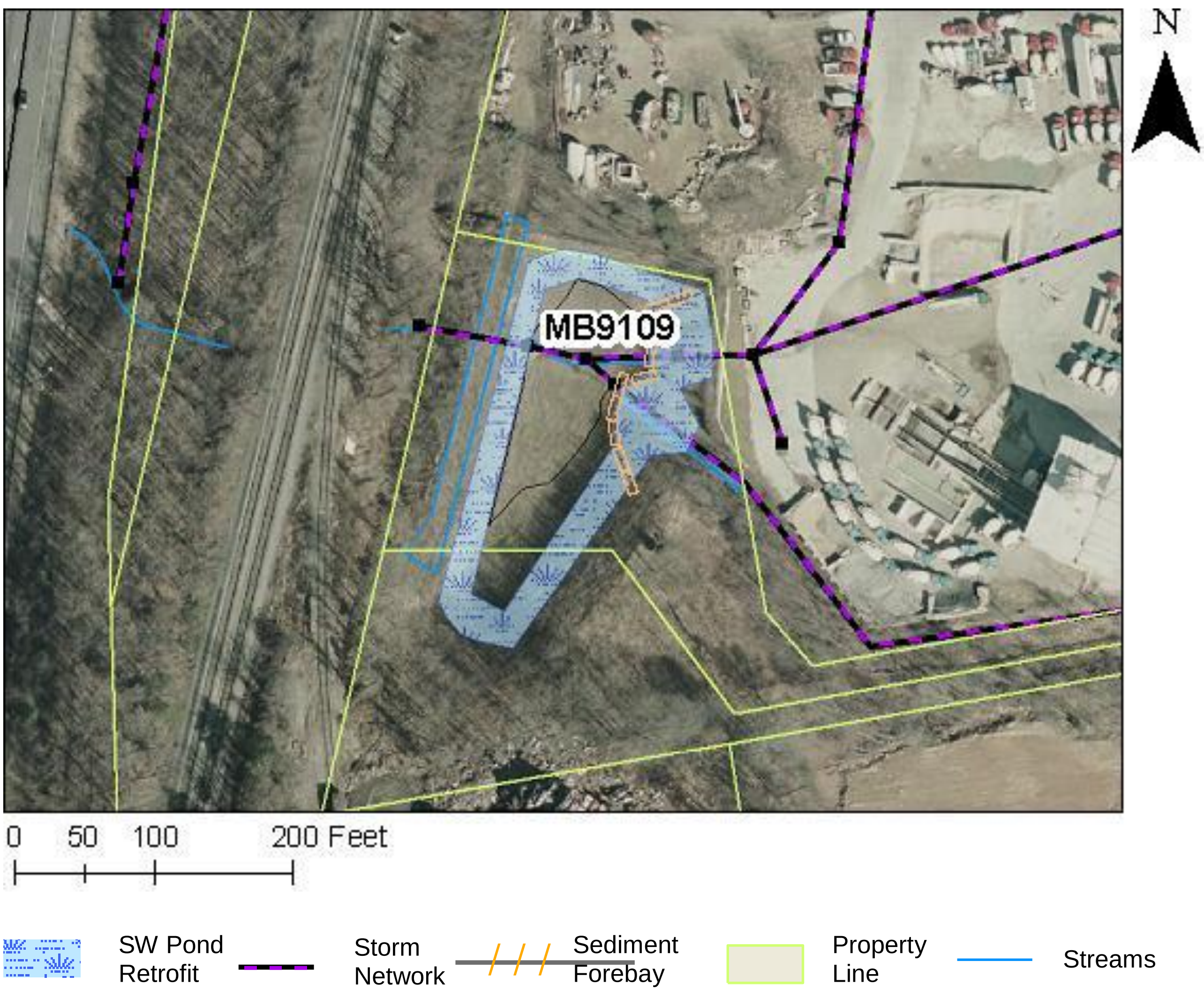
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.1	AC	$8,500	$850
Grading and Excavation	670	CY	$35	$23,450
Structural BMP Retrofit and Incidentals	1	LS	$10,000	$10,000
Embankment	25	CY	$50	$1,250
Outflow Pipe	75	LF	$125	$9,375
Rip Rap Stabilization	50	SY	$100	$5,000
Organic Compost Soil Amendment	80	CY	$40	$3,200
Plantings	1	LS	5%	$2,656
Ancillary Items	1	LS	5%	$2,656
Erosion and Sediment Control	1	LS	10%	$5,313
			Base Construction Cost	$63,750
			Mobilization (5%)	$3,188
			Subtotal 1	$66,938
			Contingency (25%)	$16,734
			Subtotal 2	$83,672
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$37,652
			Total	$121,324
			Estimated Project Cost	$130,000

MB9109 Stormwater Pond Retrofit



Address: 8115 Mims St., Lorton, Virginia
Location: Pond at Cardinal Concrete
Land Owner: Private – Cardinal Concrete Co., Lorton Storage LLC, Liliana Enterprises LLC
PIN: 1132 04 0001, 1132 04 0002B, 1132 04 0002C
Control Type: Water quality and quantity control
Drainage Area: 97.26 acres
Receiving Waters: Tributary of Giles Run

Description: This project proposes retrofitting the existing pond west of Mims Street to create an extended detention pond with a sediment forebay. The pond currently receives stormwater runoff from a private concrete company. The primary pollutant problem indicators include nitrogen, phosphorus and total suspended solids. The pond's existing discharge structure will be modified to increase the time stormwater is treated in the facility. This will provide better downstream channel protection and will promote particulate settlement.



Project Benefits: Installing the sediment forebay will reduce debris and coarse sediment in the pond. This will reduce pond maintenance costs. The proposed aquatic bench planting and safety bench plantings will increase infiltration and increase biological uptake of pollutants. By extending the time stormwater remains in the pond, downstream erosion will be reduced. Below are the project's estimated pollutant removal amounts.

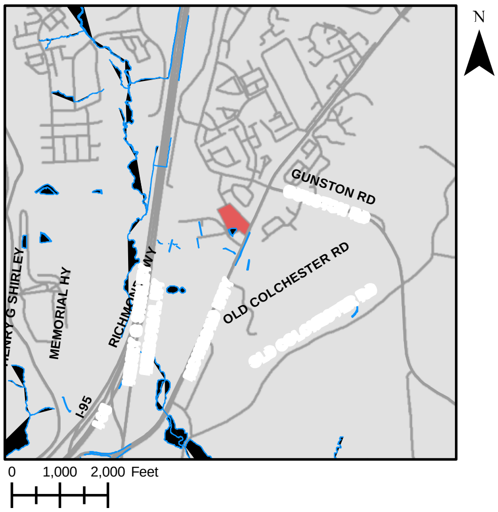
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
7.24	106.98	16.36

Project Design Considerations: County records show that the pond is located in a storm drain easement. The pond outfalls under a railroad track into the drainage system along Henry G. Shirley Memorial Highway. This highly industrialized area would benefit from additional stormwater treatment. The proposed sediment forebay should be sized to be at least 10 percent of the surface area of the pond. The pond will probably need to be expanded to accommodate the larger detention volume (see hatching on map). The aquatic bench and safety bench planting should incorporate the existing vegetation as much as possible.

Cost:

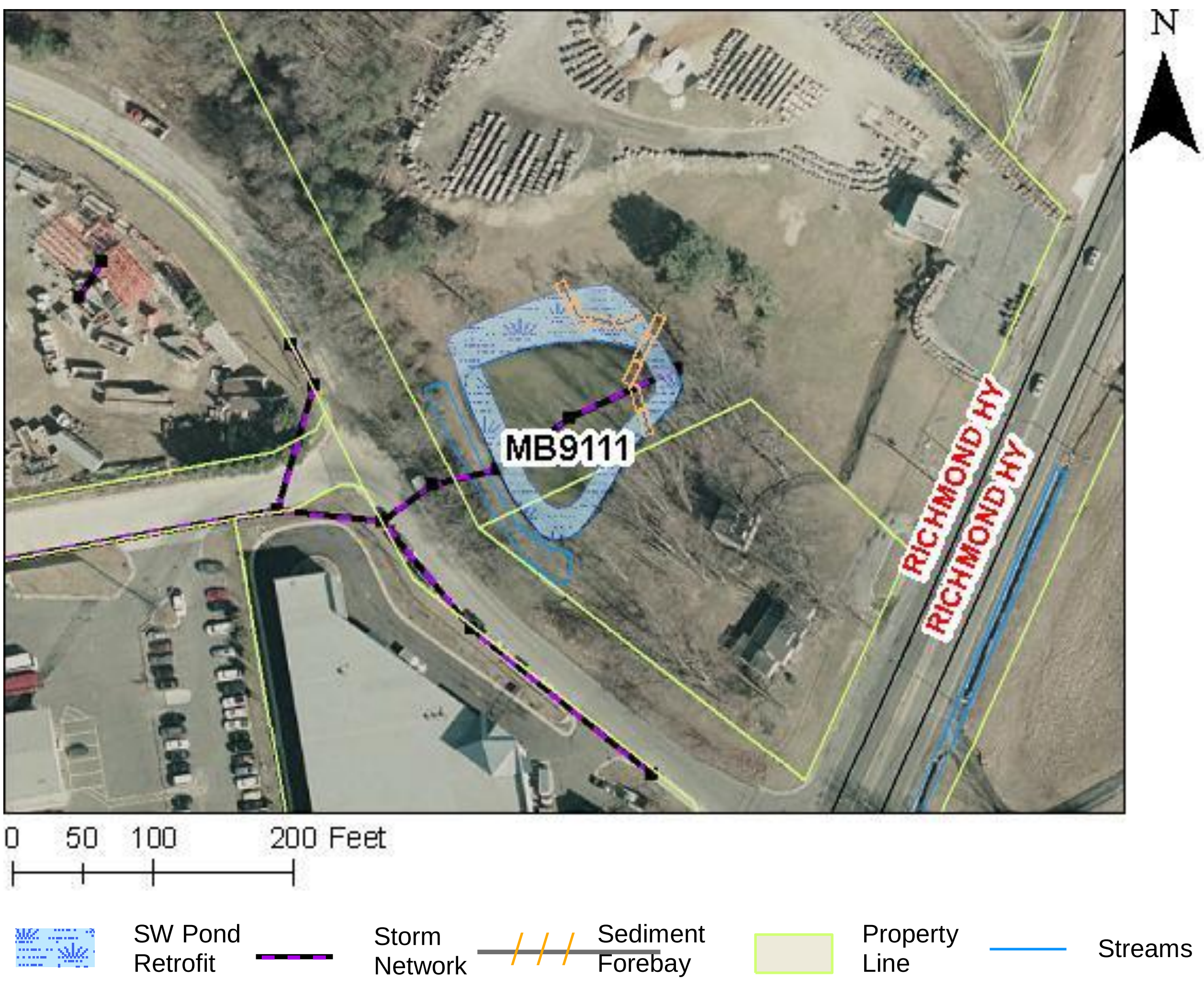
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.38	AC	$8,500	$3,230
Grading and Excavation	1800	CY	$35	$63,000
Structural BMP Retrofit and Incidentals	1	LS	$15,000	$15,000
Embankment	55	CY	$50	$2,750
Outflow Pipe	125	LF	$125	$15,625
Rip Rap Stabilization	75	SY	$100	$7,500
Organic Compost Soil Amendment	430	CY	$40	$17,200
Plantings	1	LS	5%	$6,215
Ancillary Items	1	LS	5%	$6,215
Erosion and Sediment Control	1	LS	10%	$12,431
Base Construction Cost				$149,166
Mobilization (5%)				$7,458
Subtotal 1				$156,624
Contingency (25%)				$39,156
Subtotal 2				$195,780
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$88,101
Total				$283,882
Estimated Project Cost				$290,000

MB9111 Stormwater Pond Retrofit



Address: 9816 Richmond Hwy., Lorton, Virginia
Location: Pond west of Richmond Hwy.
Land Owner: Private – Shepherd Family LP
PIN: 1132 01 0019, 1132 01 0060
Control Type: Water quality and quantity control
Drainage Area: 16.80 acres
Receiving Waters: Tributary of Giles Run

Description: This project proposes retrofitting an existing wet pond east of Mims Street to create a constructed wetland system, with sediment forebay and an engineered landscaping plan. The retrofit will extend the flow path of stormwater runoff in the wetland by enlarging the facility's size and creating high and low marsh areas. The primary pollutant indicators are nitrogen, phosphorous and total suspended solids. The retrofit will increase pollutant removal and provide better channel protection above the permanent pool of standing water. The pool prevents re-suspension of sediments and other pollutants.



Project Benefits: Installing the sediment forebay will reduce debris and coarse sediment in the wetland, resulting in less maintenance. Extending the flow path of water through the wetland will provide better downstream channel protection. Below are the project's estimated pollutant removal amounts.

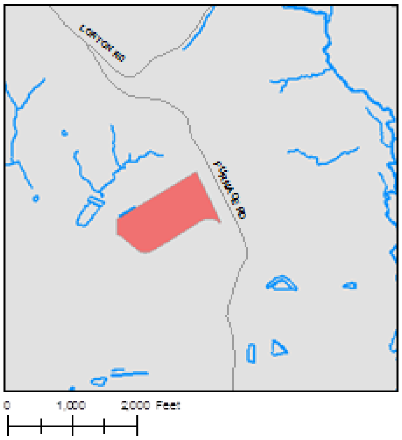
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
26.78	5.55	1.35

Project Design Considerations: The existing wet pond collects runoff from an industrial area. Part of the pond is located on a wooded single-family home site. The remaining part of the pond is on a commercial parcel. Both parcels are owned by the same limited partnership. County records show no storm drain easements for the pond. When the pond is expanded, the area north of the pond should be regraded to a pretreatment swale. This swale would then discharge to sediment forebay. The total volume of the sediment forebays should be at least 15 percent of the treatment volume. To maximize the flow path in the wetland and increase pool vegetation, internal structures such as tree peninsulas and high marsh wedges should be added. The expansion should try to incorporate the existing vegetation as much as possible.

Cost:

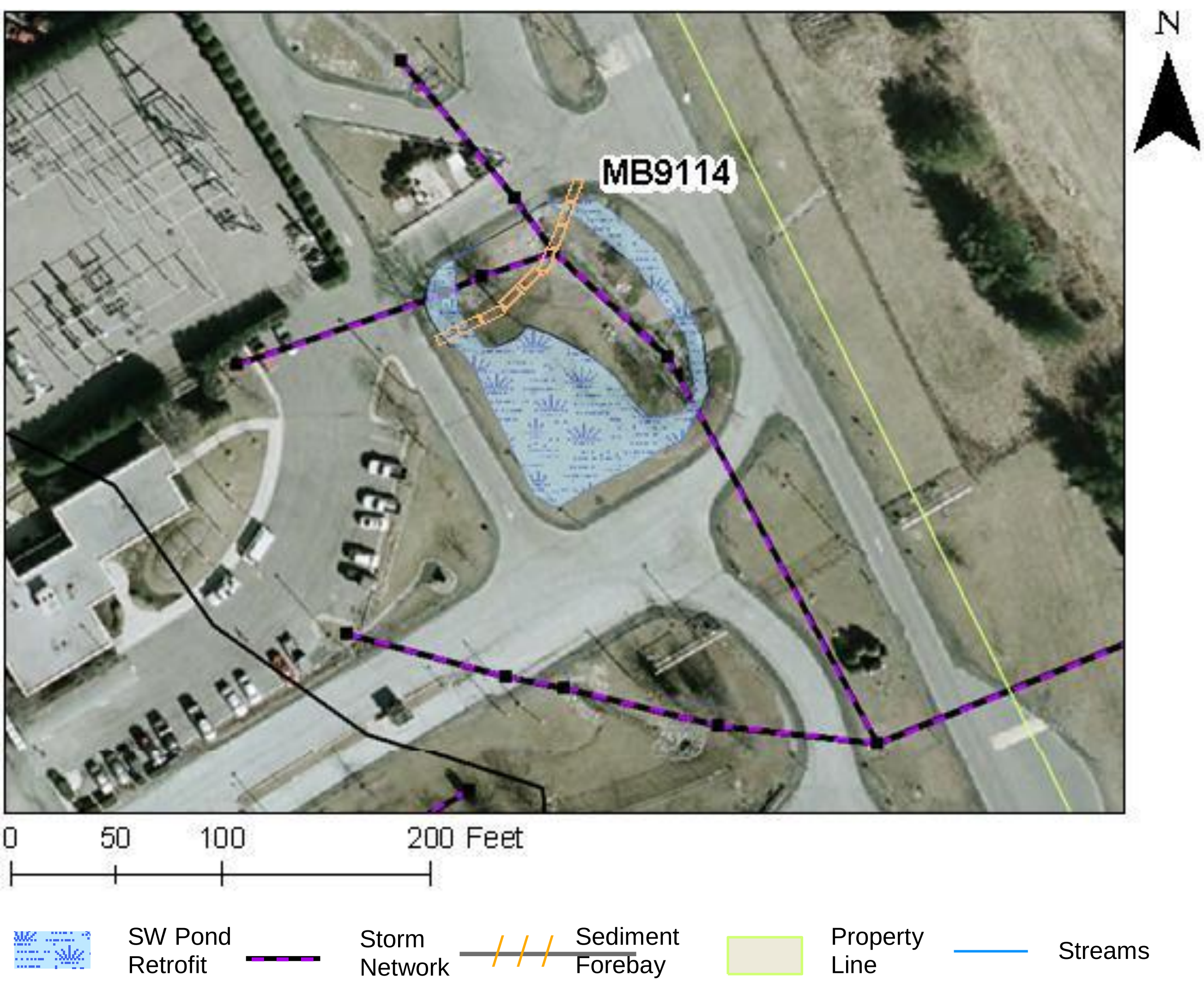
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.22	AC	$8,500	$1,870
Grading and Excavation	1000	CY	$35	$35,000
Structural BMP Retrofit and Incidentals	1	LS	$15,000	$15,000
Embankment	40	CY	$50	$2,000
Outflow Pipe	75	LF	$125	$9,375
Rip Rap Stabilization	75	SY	$100	$7,500
Organic Compost Soil Amendment	180	CY	$40	$7,200
Plantings	1	LS	5%	$3,897
Ancillary Items	1	LS	5%	$3,897
Erosion and Sediment Control	1	LS	10%	$7,795
			Base Construction Cost	$93,534
			Mobilization (5%)	$4,677
			Subtotal 1	$98,211
			Contingency (25%)	$24,553
			Subtotal 2	$122,763
			Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)	$55,244
			Total	$178,007
			Estimated Project Cost	$180,000

MB9114 Stormwater Pond Retrofit



Address: 9850 Furnace Rd, Lorton, Virginia
Location: I-95 Landfill
Land Owner: Public/Local – Fairfax County Board of Supervisors
PIN: 1073 01 0020
Control Type: Water quality and quantity control
Drainage Area: 2.59 acres
Receiving Waters: Tributary of Giles Run

Description: This project proposes to retrofit an existing dry pond at the Fairfax County Landfill off of Furnace Road in Lorton. A sediment forebay will be added to provide pretreatment to the pond's two inflows. The pond's existing discharge structure will be modified to increase the time water is detained in the pond. To handle the larger detention volume the pond will be enlarged. And an aquatic bench will be added to increase biological uptake of pollutants.



Project Benefits: Extending the time that stormwater remains in the pond will promote the settlement of particulate pollutants, reducing the total suspended solids discharging from the pond. The pond's extended detention will also provide better downstream channel protection against erosion. Adding the aquatic bench, designed with an engineered planting plan, will improve the pond's biological uptake of nutrients and reduce phosphorus and nitrogen from the stormwater runoff. Below are the project's estimated pollutant removal amounts.

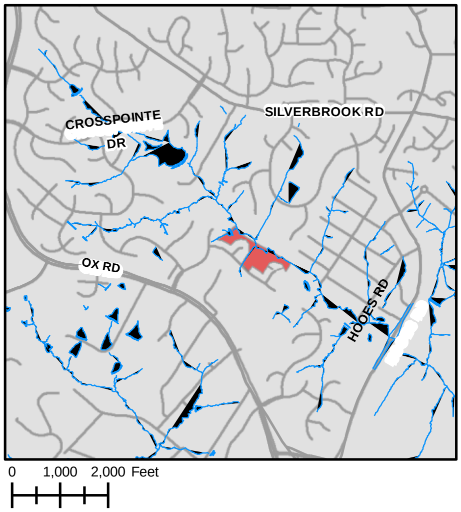
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
0.22	4.48	1.00

Project Design Considerations: Providing proper stormwater treatment at a landfill should be given a high priority. Also, because the site is owned by the County this project will be easier to implement. Currently, this pond is labeled as To-Be-Determined (TBD) in the County's system, which means this pond is not actively maintained. Implementing the project would insure this pond is maintained, better treating the landfill's stormwater runoff. This pond retrofit is just downstream of another proposed project at the landfill, MB9506, a bioretention area.

Cost:

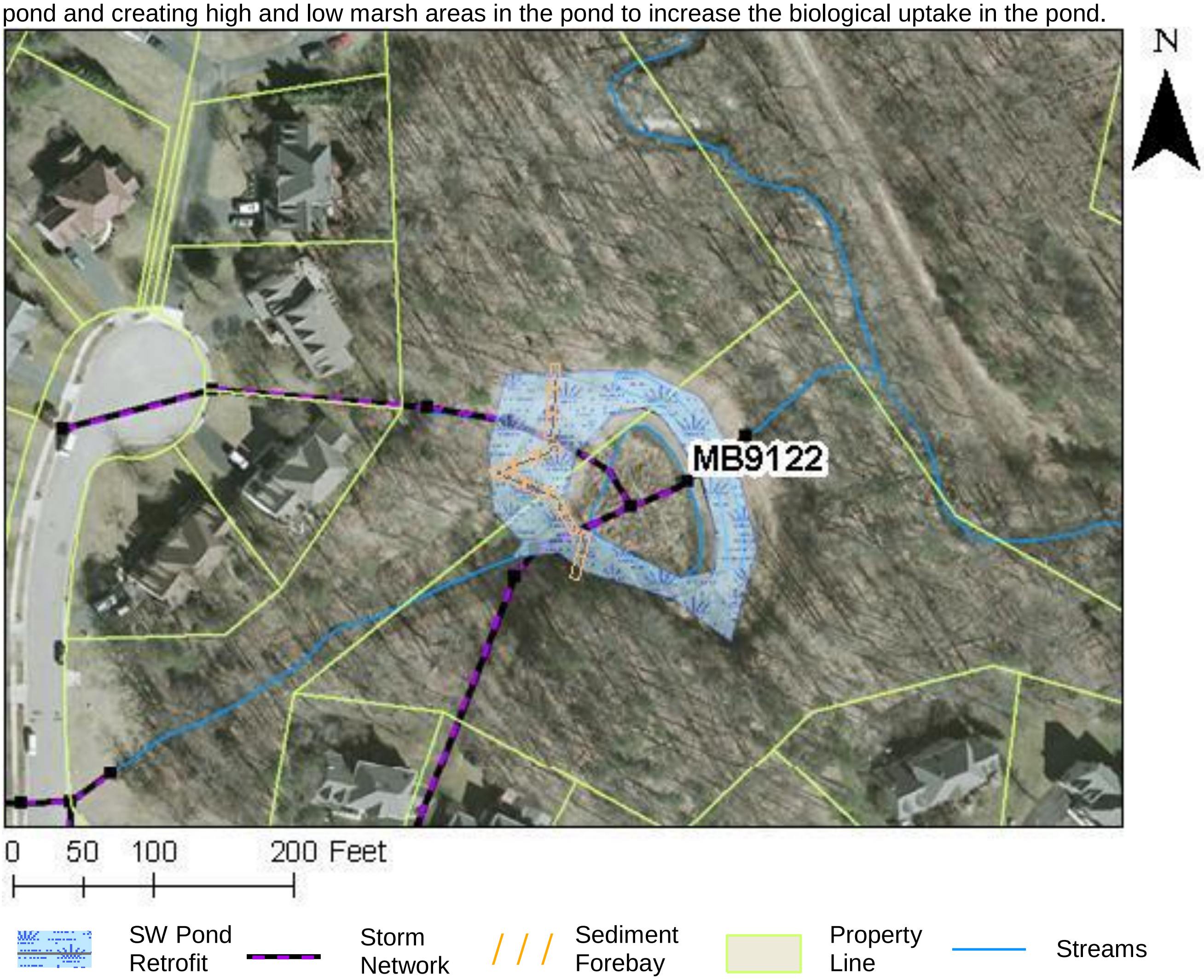
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.15	AC	$8,500	$1,275
Grading and Excavation	900	CY	$35	$31,500
Structural BMP Retrofit and Incidentals	1	LS	$10,000	$10,000
Embankment	30	CY	$50	$1,500
Outflow Pipe	100	LF	$125	$12,500
Rip Rap Stabilization	75	SY	$100	$7,500
Organic Compost Soil Amendment	120	CY	$40	$4,800
Plantings	1	LS	5%	$3,454
Ancillary Items	1	LS	5%	$3,454
Erosion and Sediment Control	1	LS	10%	$6,908
			Base Construction Cost	$82,890
			Mobilization (5%)	$4,145
			Subtotal 1	$87,035
			Contingency (25%)	$21,759
			Subtotal 2	$108,793
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$48,957
			Total	$157,750
			Estimated Project Cost	$160,000

MB9122 Stormwater Pond Retrofit



Address: 8605 Cross Chase Court, Fairfax Station, Virginia
Location: Behind 8605 Cross Chase Ct
Land Owner: Crosspointe Swim and Racquet Inc.
PIN: 1062 1015C, 1062 1016A
Control Type: Water quality and quantity control
Drainage Area: 9.83 acres
Receiving Waters: Tributary of Giles Run

Description: This project proposes the retrofit of an existing public pond east of Cross Chase Circle to create a wetland system with sediment forebays and bench planting. The existing dry pond receives runoff from two pipes and a channel, and sheet flow from the back of the residential houses. The wetland retrofit will include adding two sediment forebays for the stormwater inflows, expanding the pond to provide more time to treat stormwater in the pond and creating high and low marsh areas in the pond to increase the biological uptake in the pond.



Project Benefits: Pollutant removal will be achieved through settling and biological uptake within the wetland. Increasing the time it takes for stormwater to travel through the pond will reduce stormwater runoff volume and peak discharge rates. This project will increase shading and contact with plant life, resulting in cooler water temperatures and improved habitat. Below are the project's estimated pollutant removal amounts.

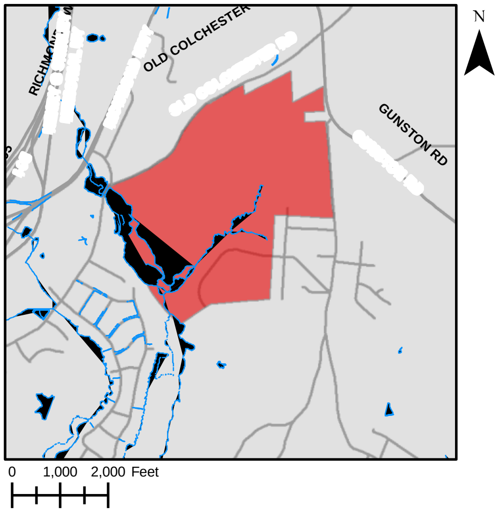
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
0.12	0.78	0.30

Project Design Considerations: County records show that this pond is within a storm drain easement and actively maintained under the pond ID 0775DP. The facility footprint will need to be expanded to accommodate the addition of the new sediment forebays and the additional detention time. When the pond is expanded, care should be taken to try and incorporate the existing vegetation into the proposed planting plan. Care should be taken when designing the wetland system to establish a stable ecology which will deter excessive mosquito reproduction.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.38	AC	$8,500	$3,230
Grading and Excavation	1200	CY	$35	$42,000
Structural BMP Retrofit and Incidentals	1	LS	$10,000	$10,000
Embankment	45	CY	$50	$2,250
Outflow Pipe	45	LF	$125	$5,625
Rip Rap Stabilization	50	SY	$100	$5,000
Organic Compost Soil Amendment	275	CY	$40	$11,000
Plantings	1	LS	5%	$3,955
Ancillary Items	1	LS	5%	$3,955
Erosion and Sediment Control	1	LS	10%	$7,911
			Base Construction Cost	$94,926
			Mobilization (5%)	$4,746
			Subtotal 1	$99,672
			Contingency (25%)	$24,918
			Subtotal 2	$124,590
			Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)	$56,066
			Total	$180,656
			Estimated Project Cost	$190,000

MB9202 Stream Restoration



Address: 10207 Old Colchester Rd, Lorton, Virginia
Location: Stream near Old Colchester Rd. (upstream)
Land Owner: Public – United States of America
PIN: 1134 01 0048
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of South Branch

Description: This project proposes the restoration of a stream southeast of Old Colchester Road that flows from east to west. The project proposes to restore channel morphology by improving bed and bank erosion. Erosion will be stabilized through the use of bank shaping, toe protection, erosion-control fabrics and rapid vegetation establishment. The banks will be armored using geofabrics, fabric encapsulated rocks or the equivalent to reduce further erosion. The stream receives runoff from residential housing to the east and surrounding wooded areas.

0 200 400 800 Feet

Stream Restoration | Storm Network | Property Line | Streams

Project Benefits: The stream stabilization will reduce sediment loads to the stream while maintaining capacity of the stream channel and controlling unwanted meander. There is an area of high erosion near residential properties. Restoration will help minimize potential impacts to residences over time. It will also help stabilize the existing mature vegetation along the banks. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

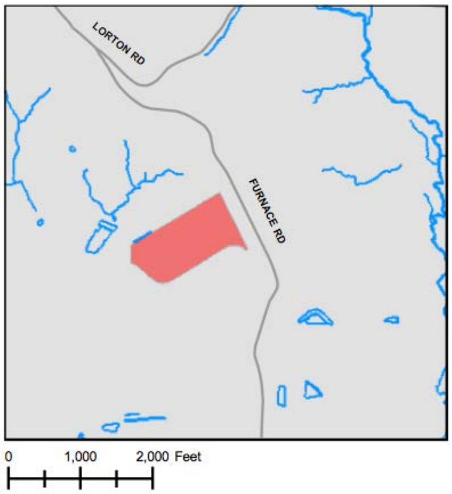
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
10.32	14.03	5.44

Project Design Considerations: Field investigation revealed severe erosion and would indicate a high priority should be set for this project. The area of highest erosion is the farthest upstream point where a "waterfall" has formed due to approximately 10 feet of erosion. Conditions marginally improve further downstream. The stream is created by several small swales discharging from the adjacent residential areas at the same point, which is causing severe erosion.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	945	LF	$200	$189,000
Clear and Grub	1.08	AC	$10,000	$10,800
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$32,480
Ancillary Items	1	LS	5%	$16,240
			Base Construction Cost	$373,520
			Mobilization (5%)	$18,676
			Subtotal 1	$392,196
			Contingency (25%)	$98,049
			Subtotal 2	$490,245
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$220,610
			Total	$710,855
			Estimated Project Cost	$720,000

MB9506 BMP/LID



Address: 9850 Furnace Rd, Lorton, Virginia
Location: I-95 Landfill
Land Owner: Public/Local – Fairfax County Board of Supervisors
PIN: 1073 01 0020
Control Type: Water quality and quantity control
Drainage Area: 3.72 acres
Receiving Waters: Tributary of Giles Run

Description: This project proposes the construction of a bioretention area at Fairfax County Landfill. The bioretention landscaping feature will receive runoff from parking lots. The bioretention landscaping feature will have a filter layer made of 18 – 48 inches of sand placed below a mulch layer. During a storm, the runoff will pond 6 – 9 inches, drain through the bioretention filter media, infiltrate into the native soil or outfall to the storm system. The primary indicators are upland sediment, total suspended solids and pollutants, including nitrogen and phosphorous.

Project Benefits: The bioretention area will create an ideal environment for filtration, biological uptake and microbial activity. The bioretention areas will promote infiltration and decrease runoff volume from site. Below are the project's estimated pollutant removal amounts.

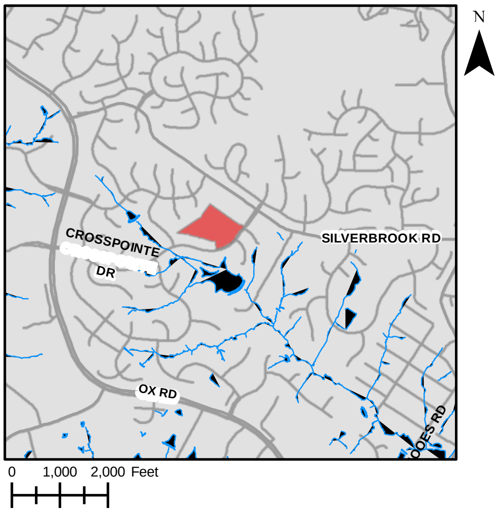
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
0.24	4.85	0.97

Project Design Considerations: The Watershed Advisory Group (WAG) identified this project as critical. Increased priority is due to high pollutants on the landfill site. During field investigations the site was not accessible because it is in a secure area. The site selected is a good location for bioretention due to storm pipe network and topography.

Cost:

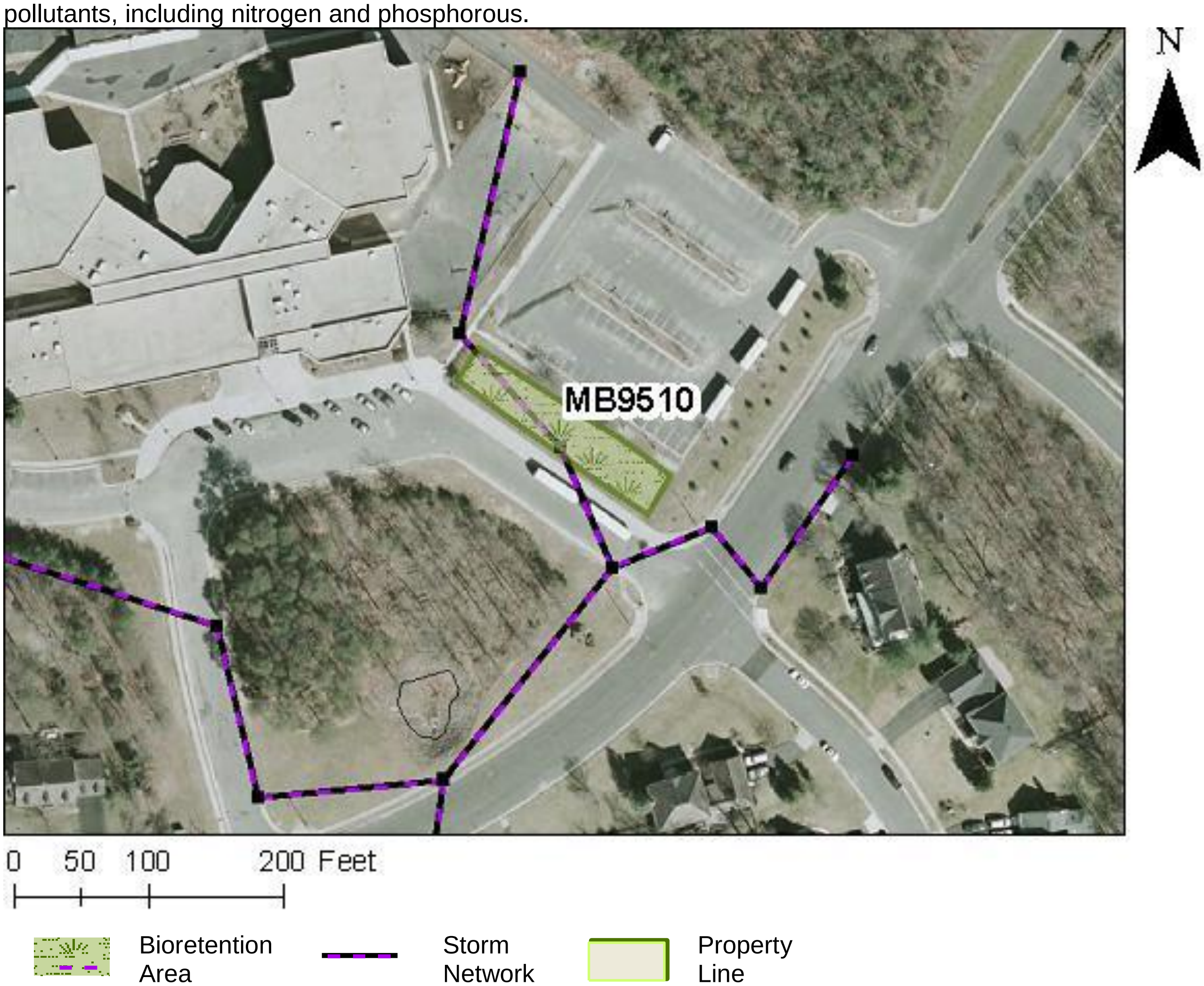
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters and Basins	300	SY	$150	$45,000
Plantings	1	LS	5%	$2,250
Ancillary Items	1	LS	5%	$2,250
Erosion and Sediment Control	1	LS	10%	$4,500
			Base Construction Cost	$54,000
			Mobilization (5%)	$2,700
			Subtotal 1	$56,700
			Contingency (25%)	$14,175
			Subtotal 2	$70,875
			Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)	$31,894
			Total	$102,769
			Estimated Project Cost	$110,000

MB9510 BMP/LID



Address: 9350 Crosspointe Dr., Fairfax Station, Virginia
Location: Silverbrook Elementary School
Land Owner: Public/Local – Fairfax County School Board
PIN: 0974 01 0028
Control Type: Water quality and quantity control
Drainage Area: 3.14 acres
Receiving Waters: Tributary of Giles Run

Description: This project proposes the construction of a bioretention area at Silverbrook Elementary School on Crosspointe Drive. The bioretention landscaping feature will receive runoff from the parking lot and building. A filter layer made of 18 – 48 inches of sand will be placed below a mulch layer. During a storm, the runoff will pond 6 –9 inches in the bioretention area, filter through the bioretention media soil, and either outfall to the existing storm system or infiltrate into the native soil. The primary indicators are upland sediment, total suspended solids and pollutants, including nitrogen and phosphorous.



Project Benefits: Bioretention will capture sheet flow and create an ideal environment for filtration, biological uptake and microbial activity. The bioretention areas will promote infiltration, decrease runoff volume from the site and reduce peak outflow to the storm system. Bioretention areas at schools provide great examples of environmental stewardship and help educate the students about proper stormwater management. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

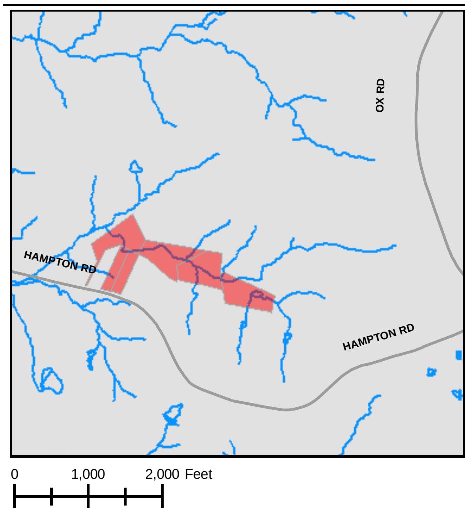
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
0.54	8.52	2.08

Project Design Considerations: Construction of bioretention area at this location should have minimal impacts. The existing topography and the storm pipe network make this a location ideal. Area is upstream of a regional pond.

Cost:

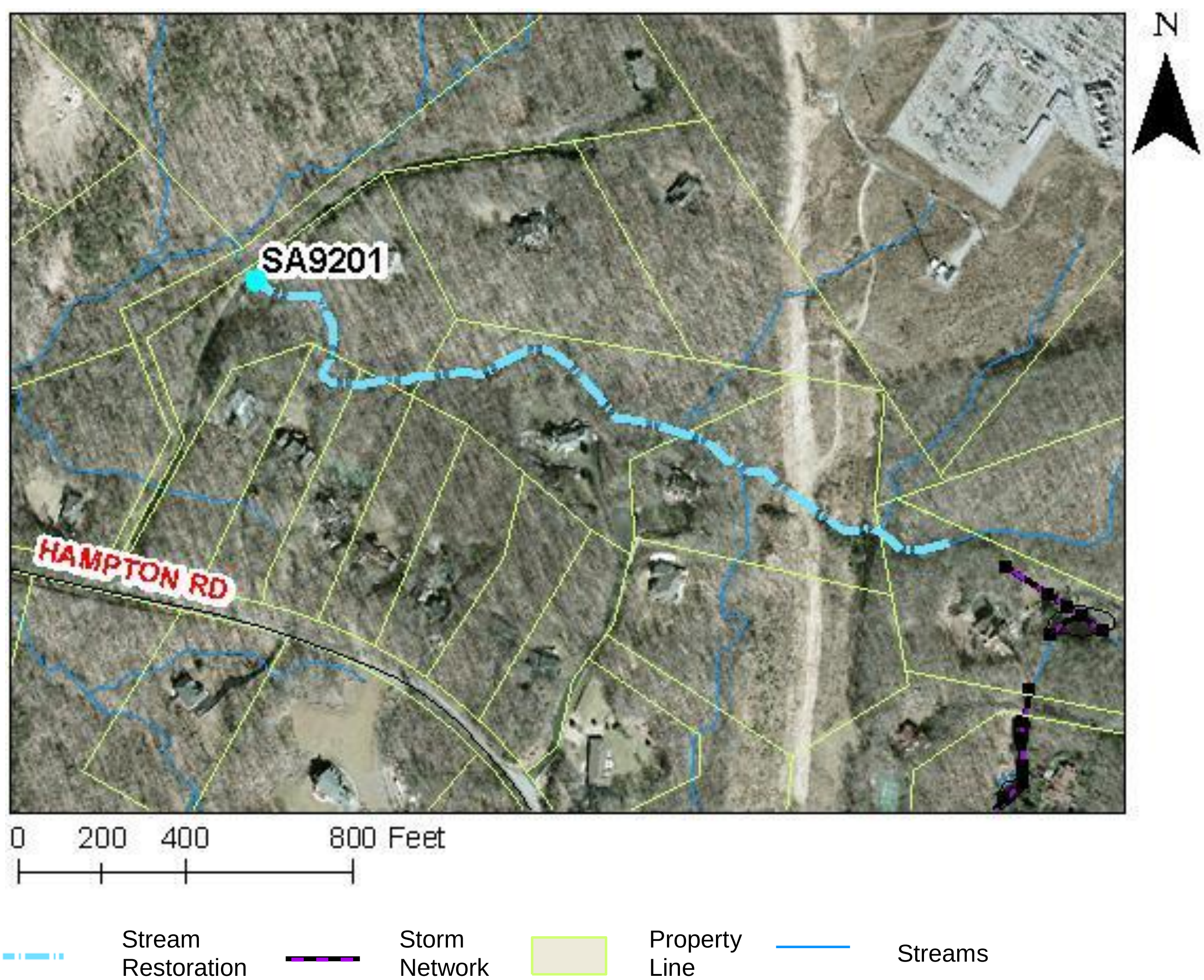
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters and Basins	625	SY	$150	$93,750
Plantings	1	LS	5%	$4,688
Ancillary Items	1	LS	5%	$4,688
Erosion and Sediment Control	1	LS	10%	$9,375
			Base Construction Cost	$112,500
			Mobilization (5%)	$5,625
			Subtotal 1	$118,125
			Contingency (25%)	$29,531
			Subtotal 2	$147,656
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$66,445
			Total	$214,102
			Estimated Project Cost	$220,000

SA9201 Stream Restoration



Address: Next to 8721 Birch Cliff Dr., Fairfax Station, Virginia
Location: Stream section upstream of Birch Cliff Dr.
Land Owner: Private – private owners
PIN: 1052 08 0002, 1052 08 0003, 1052 08 0030, 1052 08 0032, 1052 08 0034, 1061 07 0041
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Occoquan River

Description: The stream near Birch Cliff Drive conveying runoff from houses, wooded area, and substation area upstream of outfall to Occoquan Reservoir has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment.



Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Implementation of these measures, including bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment will repair existing erosion and help prevent future erosion over time. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

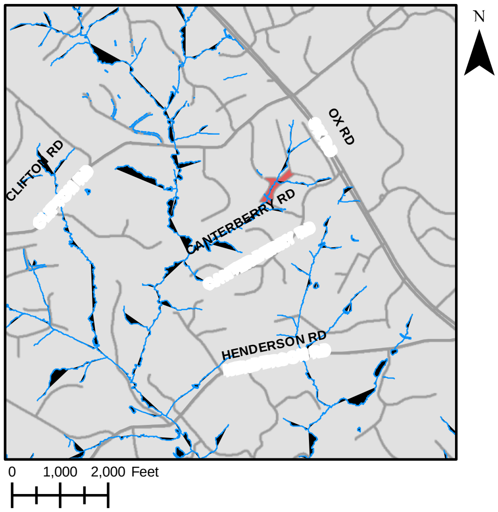
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
9.74	6.62	2.57

Project Design Considerations: The Watershed Advisory Group (WAG) commented that manmade impediments to the flow of the natural stream, including a fence near the culvert, are a hindrance to any effort at this site. Field investigation revealed areas of slight to moderate erosion. Several peninsulas and islands have formed from sediment deposition. A dam has been created before the culvert. The stream has several areas that need spot repairs and cleanup of the man-made features that are obstructing natural flow.

Cost:

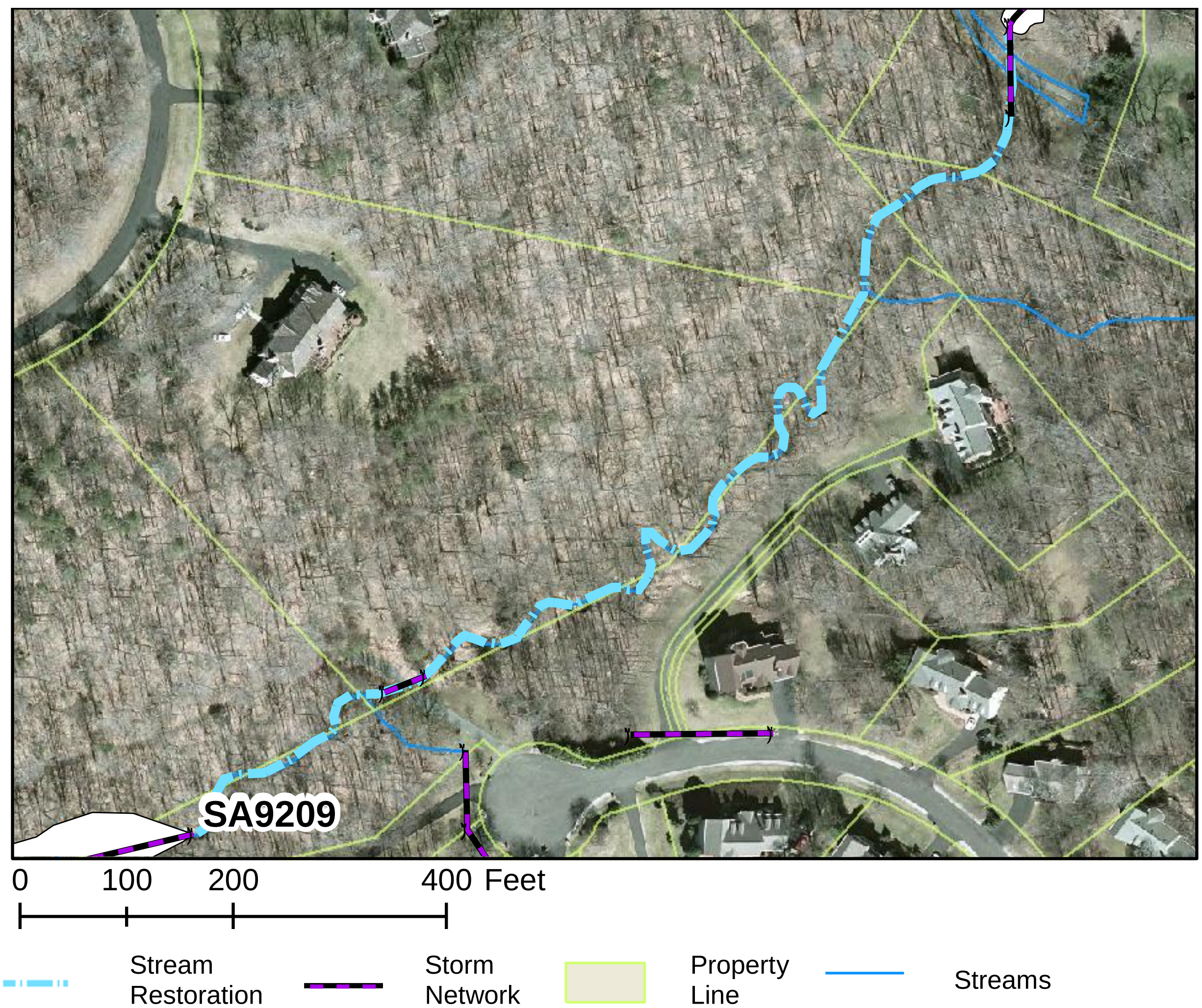
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Spot Improvements Along Channel	2053	LF	$100	$205,300
Clear and Grub	2.36	AC	$10,000	$23,600
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$35,390
Ancillary Items	1	LS	5%	$17,695
			Base Construction Cost	$406,985
			Mobilization (5%)	$20,349
			Subtotal 1	$427,334
			Contingency (25%)	$106,834
			Subtotal 2	$534,168
			Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)	$240,376
			Total	$774,543
			Estimated Project Cost	$780,000

SA9209 Stream Restoration



Address: Near 10746 Beechnut Ct., Fairfax Station, Virginia
Location: Stream upstream of Beechnut Ct.
Land Owner: Private – Wildwood Hills Estates Homeowners Association, private owners, Canterberry Estates Community Association
PIN: 0873 11 C, 0873 12 0002, 0873 12 0003, 0873 12 0004, 0873 09 A1, 0873 09 0013
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Sandy Run

Description: The stream section upstream of Beechnut Court in Fairfax Station conveys runoff from wooded area, housing, and Ox Road has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.



Project Benefits: This project will help stabilize the streambanks and will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Additionally, restoration will repair existing erosion and will help to reduce further erosion. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

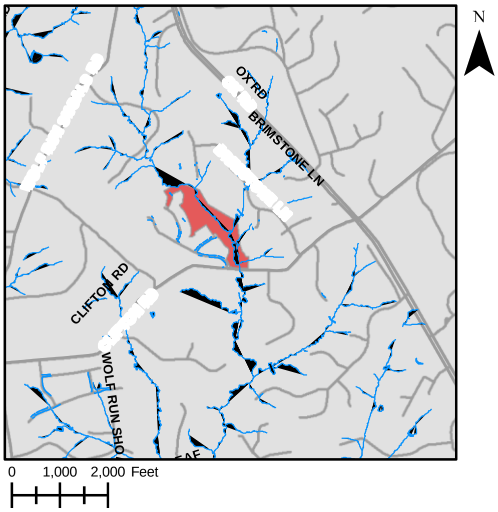
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
6.82	5.46	2.12

Project Design Considerations: The Watershed Advisory Group (WAG) identified this project as critical. The field investigation identified streambank cut approximately 2 feet or more along majority of the length of the stream. The stream is close to several homes. Erosion could eventually have impacts on these properties if erosion is not contained. Measures implemented (as described above) should minimize potential for future erosion. Also a culvert consisting of three pipes, has one pipe entirely blocked. The culvert needs to be restored to maximize benefits of this restoration. The culvert is shown on the aerial map as a pipe in line with the stream. The culvert crosses a dirt road near the cul-de-sac.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Spot Improvements Along Channel	1321	LF	$100	$132,100
Clear and Grub	1.52	AC	$10,000	$15,200
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$27,230
Ancillary Items	1	LS	5%	$13,615
			Base Construction Cost	$313,145
			Mobilization (5%)	$15,657
			Subtotal 1	$328,802
			Contingency (25%)	$82,201
			Subtotal 2	$411,003
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$184,951
			Total	$595,954
			Estimated Project Cost	$600,000

SA9211 Stream Restoration



Address: Behind 6901 Streamwood Pl., Fairfax Station, Virginia
Location: Stream near Stream Wood Pl.
Land Owner: Public/Local – Fairfax County Park Authority
PIN: 0871 05 C, 0871 0502 A
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Sandy Run

Description: The stream section east of Streamwood Place in Fairfax Station where two streams converge, conveys runoff from adjacent houses, streets and wooded area has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored to reduce further erosion using geofabrics, fabric encapsulated rocks or equivalent.

Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. The stream is downstream of an existing pond and west of several homes. Erosion could have impacts on private homeowners' properties over time. Restoration will improve existing erosion and prevent future impacts. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

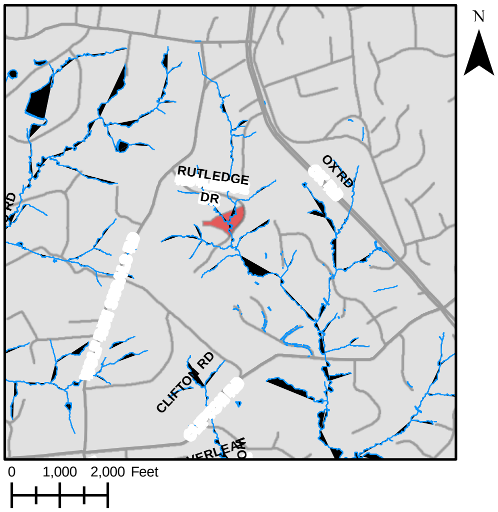
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
2.24	1.53	0.59

Project Design Considerations: This project is proposed on property owned by Fairfax County Park Authority and should be closely coordinated with the Park Authority. A section of stream is close to houses and roadways. Erosion has already had impacts on existing mature vegetation. The Watershed Advisory Group (WAG) has identified this project as critical. Field investigation revealed minor to moderate erosion. There are areas of significant sediment deposition. Spot improvements are recommended. This project should be executed in conjunction with project SA9803

Cost:

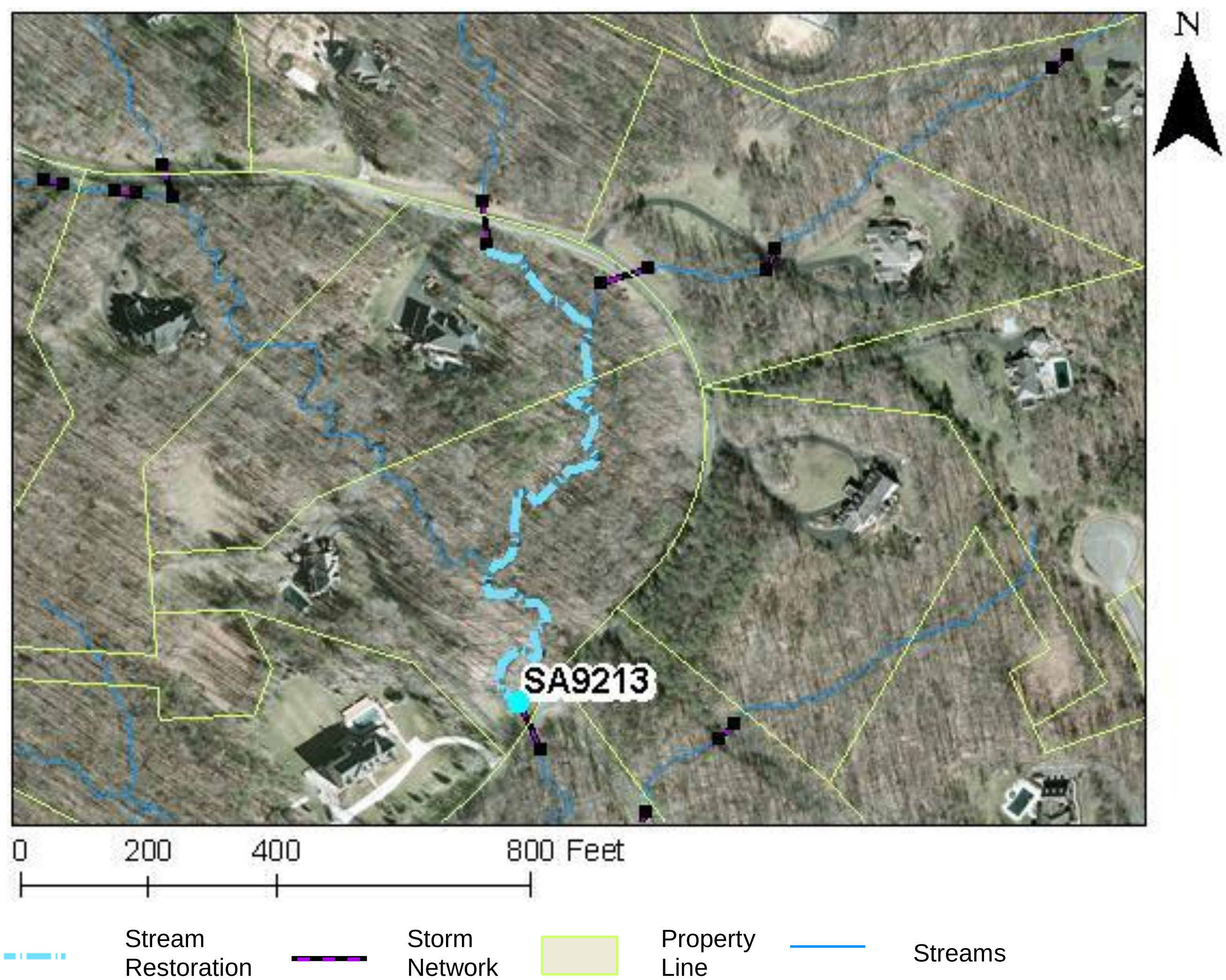
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Spot Improvements Along Channel	446	LF	$100	$44,600
Clear and Grub	0.51	AC	$10,000	$5,100
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	446	LF	$200	$89,200
Erosion and Sediment Control	1	LS	10%	$16,390
Ancillary Items	1	LS	5%	$8,195
			Base Construction Cost	$188,485
			Mobilization (5%)	$9,424
			Subtotal 1	$197,909
			Contingency (25%)	$49,477
			Subtotal 2	$247,387
			Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)	$111,324
			Total	$358,711
			Estimated Project Cost	$360,000

SA9213 Stream Restoration



Address: 6650 Rutledge Dr., Fairfax Station, Virginia
Location: Stream section downstream of Rutledge Rd.
Land Owner: Private – private owners
PIN: 0871 11 0019, 0871 11 0020
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Sandy Run

Description: The stream section east of Wolf Run Shoals Road in Fairfax Station conveying runoff primarily from wooded area, several houses, and a building with parking lot, has indicators of poor channel morphology. This project proposes spot improvements along the stream to restore channel morphology and repair eroded areas. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics, and rapid vegetation establishment.



Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Implementation of measures above, including bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment will repair existing erosion and help prevent future erosion over time. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

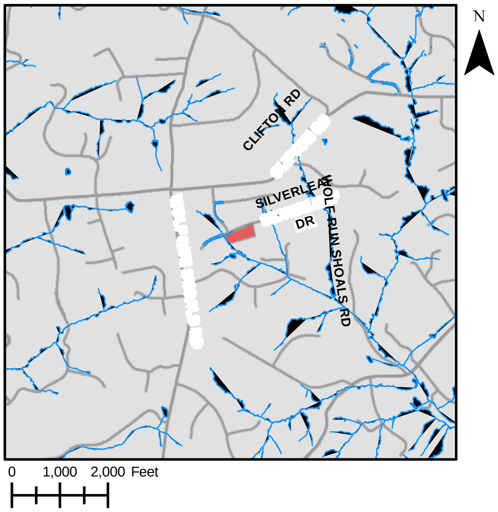
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
6.13	4.90	1.90

Project Design Considerations: The Watershed Advisory Group (WAG) has identified this project as critical. Field investigation identified moderate to severe erosion in spots. There are several areas of sediment deposition. Restoration will allow the stream to flow more naturally with less sediment creating less islands or peninsulas. The stream runs through private home lots. If not repaired, erosion could ultimately affect these homes.

Cost:

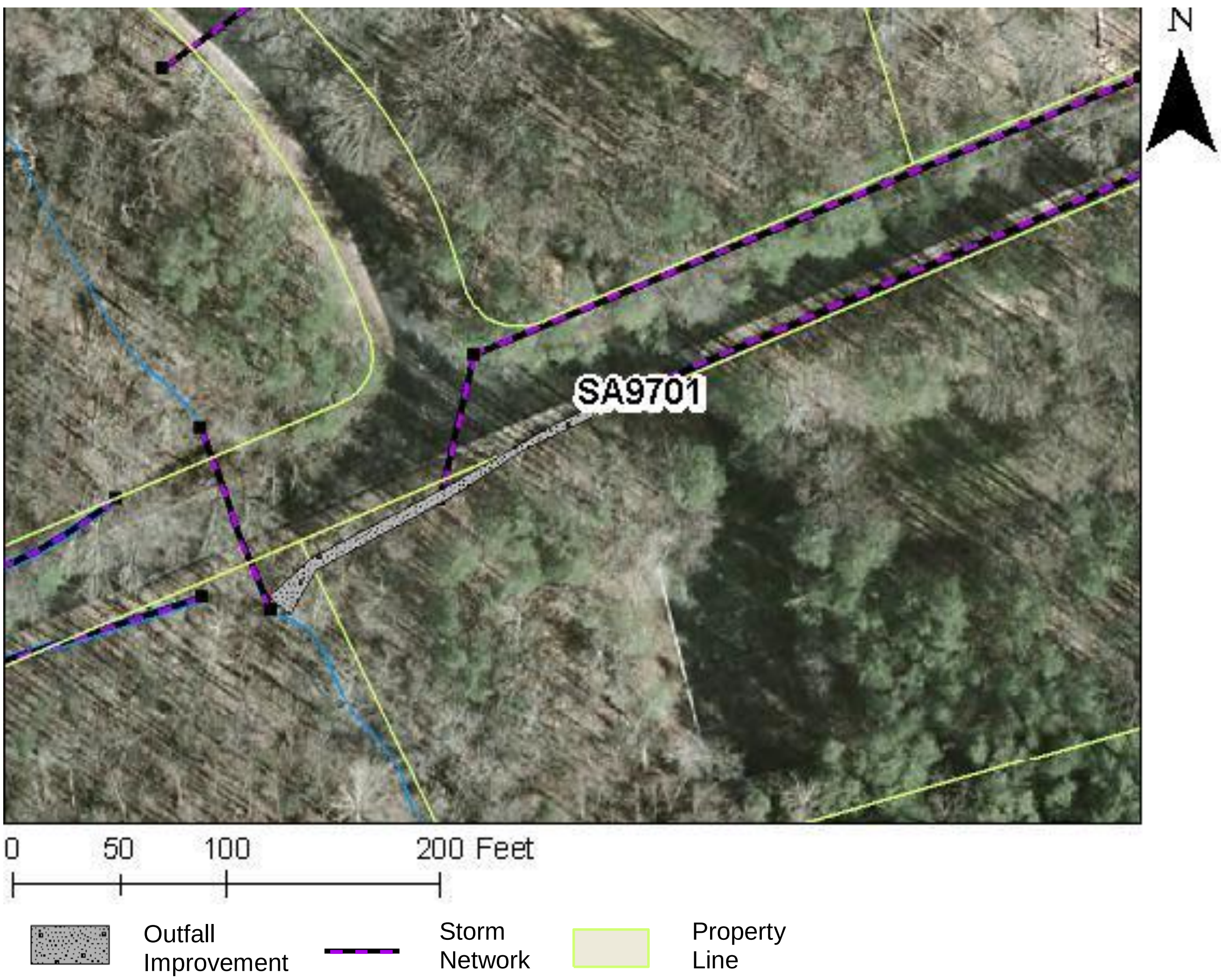
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Spot Improvements Along Channel	1135	LF	$100	$113,500
Clear and Grub	1.3	AC	$10,000	$13,000
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$25,150
Ancillary Items	1	LS	5%	$12,575
			Base Construction Cost	$289,225
			Mobilization (5%)	$14,461
			Subtotal 1	$303,686
			Contingency (25%)	$75,922
			Subtotal 2	$379,608
			Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)	$170,824
			Total	$550,431
			Estimated Project Cost	$560,000

SA9701 Outfall Improvement



Address: Near 7399 Beach Plum Dr., Fairfax Station, Virginia
Location: Paved ditch along Silverleaf Dr.
Land Owner: Private – private owners
PIN: 0864 05 0028
Control Type: Water quality and quantity control
Drainage Area: N/A
Receiving Waters: Tributary of Sandy Run

Description: This project proposes removing the outfall section of an existing concrete swale along Silverleaf Drive to reduce erosive velocities to the stream and reduce pollutants. Currently, stormwater runs off of Silverleaf Drive into the concrete swale and directly into the adjacent stream with no stormwater treatment. The receiving stream has poor channel morphology. Replacing the existing concrete swale with a natural swale with check dams and step pools, to reduce velocity and encourage infiltration, would help downstream erosion.



Project Benefits: Retrofitting the swale will reduce erosive flow velocities, increase stormwater infiltration and provide better downstream channel protection. The step pools created by the check dams will provide stormwater treatment and protect the downstream channel against erosion. Below are the project's estimated pollutant removal amounts.

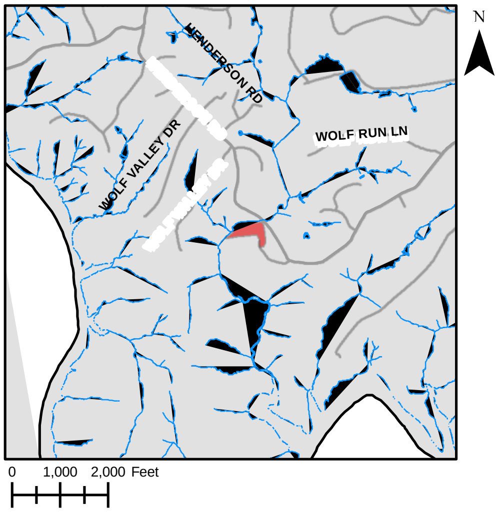
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
0.850	1.36	0.53

Project Design Considerations: When the existing concrete channel is removed, the remaining soils will need to be amended to improve infiltration of the compacted soils. The number of check dams and step pools necessary for the retrofit will be determined by the existing slope of the swale. GIS contour data yields an estimated slope of 7 percent for the existing concrete swale. A settling basin might need to be constructed at the end of the proposed retrofit. This settling basin should receive flow from the culvert under Silverleaf Drive to be more effective at reducing erosive velocities in the stream. County records show that the project is not located in a storm drain easement, and the swale is located outside the road right-of-way and on private property.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	161	LF	$200	$32,200
Clear and Grub	0.02	AC	$10,000	$200
Plantings	0.02	AC	$25,000	$500
Additional Cost, First 500 LF	161	LF	$200	$32,200
Erosion and Sediment Control	1	LS	10%	$6,510
Ancillary Items	1	LS	5%	$3,255
			Base Construction Cost	$74,865
			Mobilization (5%)	$3,743
			Subtotal 1	$78,608
			Contingency (25%)	$19,652
			Subtotal 2	$98,260
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$44,217
			Total	$142,477
			Estimated Project Cost	$150,000

WR9201 Stream Restoration



Address: Behind 12101 Henderson Rd., Fairfax Station, Virginia
Location: Stream near Henderson Rd
Land Owner: Private – private owners
PIN: 0951 01 0025, 0951 12 0013, 0951 12 0016, 0953 01 0002A, 0953 01 0014, 0953 03 0008
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Wolf Run

Description: The stream section east of Wolf Valley Drive in Fairfax Station is conveying runoff from wooded area and houses and has indicators of poor channel morphology. The stream crosses under Henderson Road and eventually outfalls to Occoquan Reservoir. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored using geofabrics, fabric encapsulated rocks or equivalent to reduce further erosion.

Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Because the stream crosses the existing road, erosion could have major structural and flooding impacts on the road. Restoration will help to repair the existing erosion and minimize the potential for further erosion. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

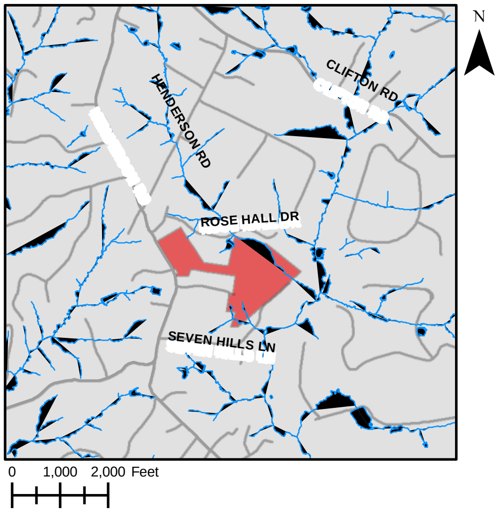
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
37.27	59.63	23.11

Project Design Considerations: Field investigations identified that the stream has areas of highly eroded banks, widening, meander and fallen trees. An upstream bank of bridge support has erosion, exposing the support. The upstream end of the meandering stream has cut an overflow ditch through the woods. The downstream end has sediment deposit obstruction. Erosion has had impacts on mature vegetation by causing trees to lose stability. The stream has several areas of natural debris that could be impeding the natural flow of the stream.

Cost:

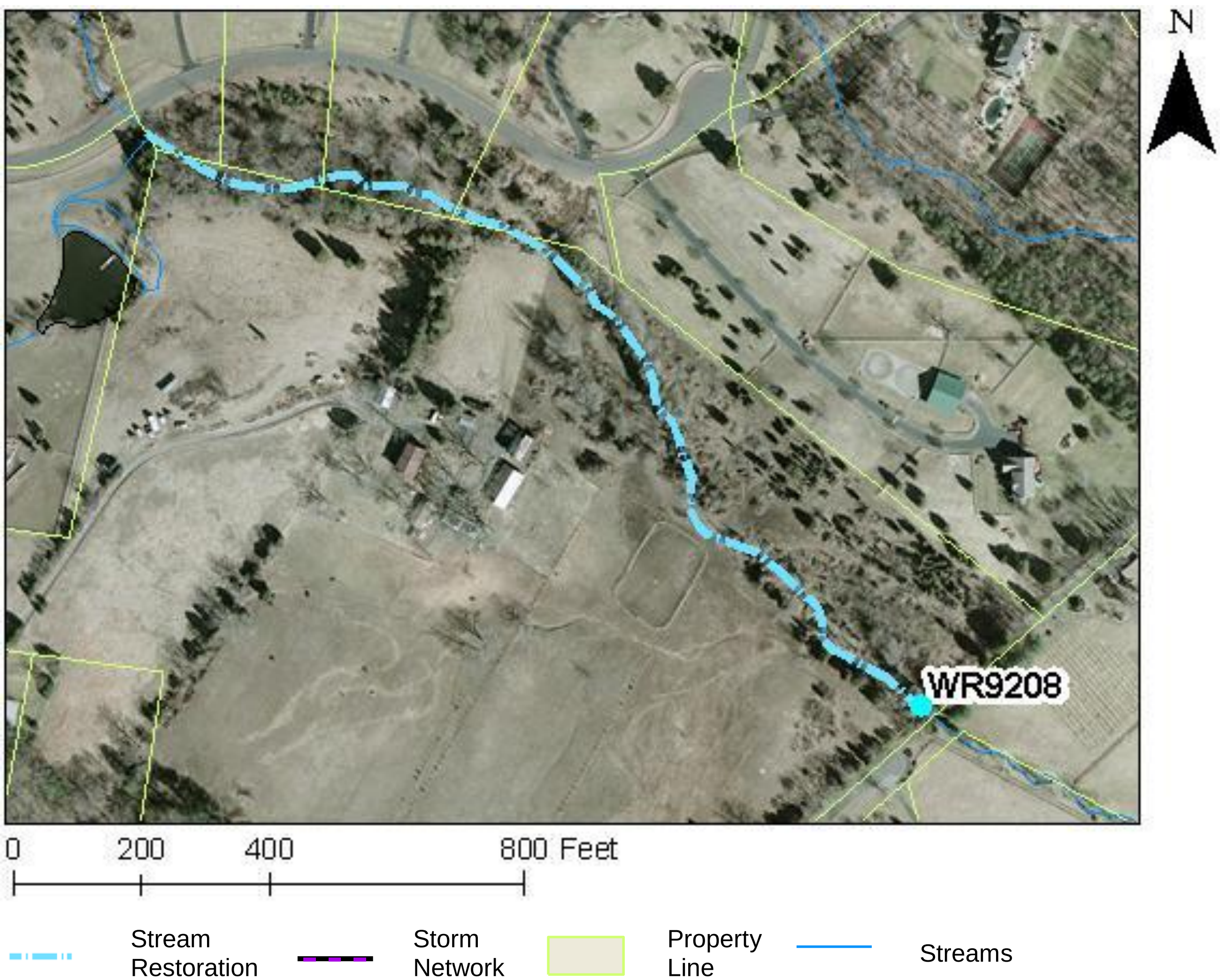
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1823	LF	$200	$364,600
Clear and Grub	2.09	AC	$10,000	$20,900
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$51,050
Ancillary Items	1	LS	5%	$25,525
			Base Construction Cost	$587,075
			Mobilization (5%)	$29,354
			Subtotal 1	$616,429
			Contingency (25%)	$154,107
			Subtotal 2	$770,536
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$346,741
			Total	$1,117,277
			Estimated Project Cost	$1,120,000

WR9208 Stream Restoration



Address: Near 12025 Seven Hills Lane, Clifton, Virginia
Location: Stream section upstream of Seven Hills Lane
Land Owner: Private – private owners
PIN: 0863 01 0017, 0863 13 0008, 0863 13 0009, 0863 13 0010, 0863 13 0011
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Wolf Run

Description: The stream section east of Turtle Valley Drive is conveying runoff from open space and houses and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored using geofabrics, fabric encapsulated rocks or equivalent to reduce further erosion.



Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored using geofabrics, fabric encapsulated rocks or equivalent to reduce further erosion. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

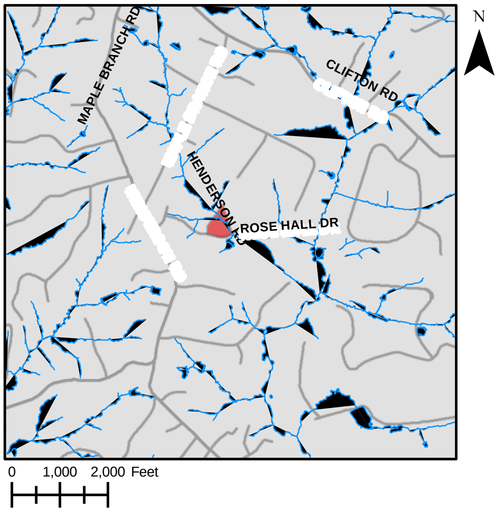
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
37.50	60.00	23.25

Project Design Considerations: The banks are eroded in some places up to 4 feet. Some trees have fallen into the stream, and two bath tubs are near the streambank. The project area is on private property. The project area is close to homes and roadways. Drainage area is not highly impervious. Field investigations showed that the upstream sections had the most erosion.

Cost:

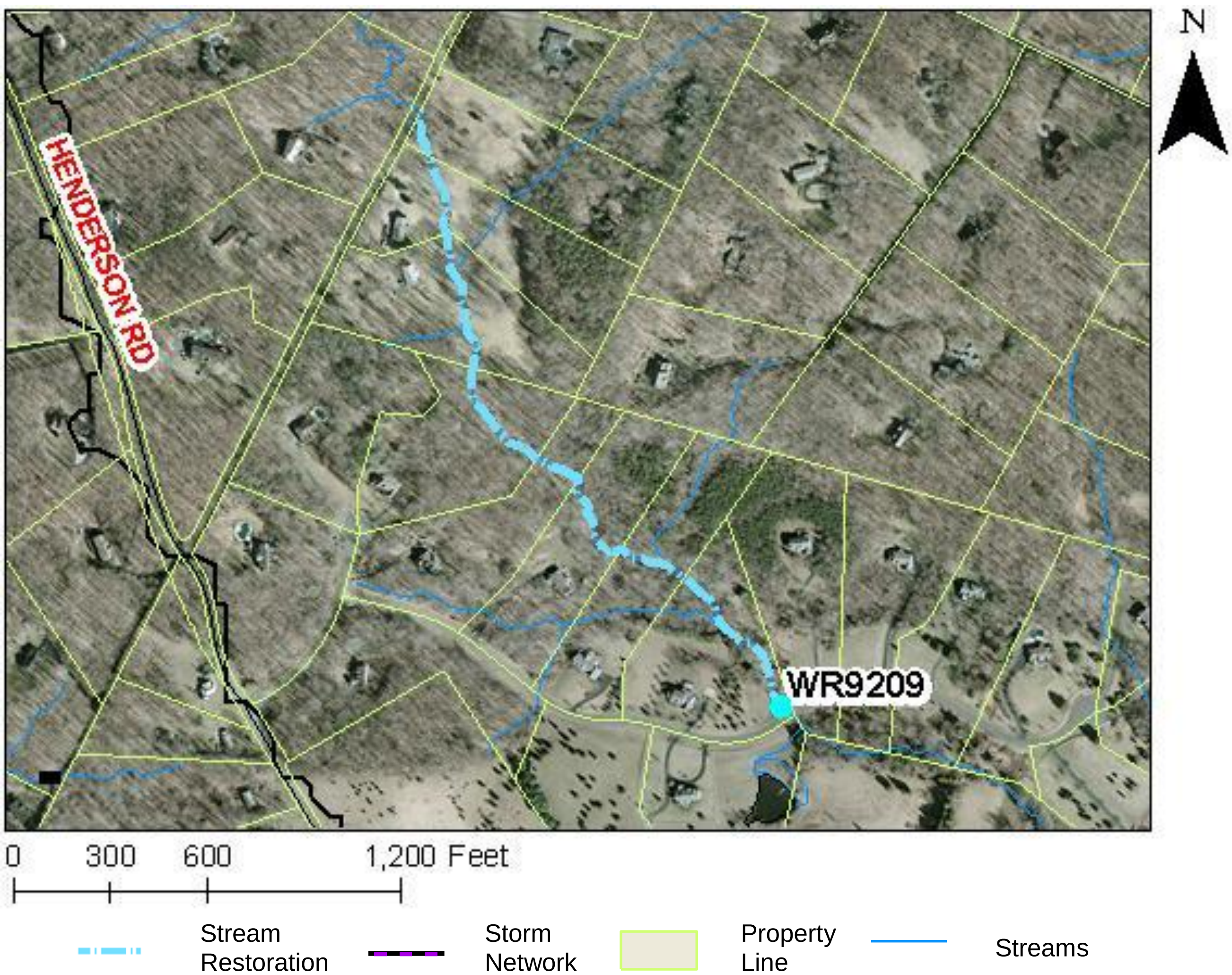
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1676	LF	$200	$335,200
Clear and Grub	1.92	AC	$10,000	$19,200
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$47,940
Ancillary Items	1	LS	5%	$23,970
			Base Construction Cost	$551,310
			Mobilization (5%)	$27,566
			Subtotal 1	$578,876
			Contingency (25%)	$144,719
			Subtotal 2	$723,594
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%).				$325,617
			Total	$1,049,212
			Estimated Project Cost	$1,050,000

WR9209 Stream Restoration



Address: 12060 Rose Hall Dr., Clifton, Virginia
Location: Stream section upstream of Rose Hall Dr.
Land Owner: Private – private owners
PIN: 0863 13 0012, 0863 13 0013, 0863 13 0014, 0863 13 0015, 0863 13 0016, 0863 03 0001, 0863 03 0002, 0863 03 0003
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Wolf Run

Description: Stream section near Rose Hall Drive conveying runoff from upstream houses and wooded area has indicators of poor channel morphology. The stream is in a steep wooded area and portions are close to homes and roadways. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored using geofabrics, fabric encapsulated rocks or equivalent to reduce further erosion.



Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. The farthest upstream section is close to adjacent roadway and erosion is encroaching on the pavement. Restoration will repair erosion and reduce potential for future erosion in this area as well as other heavily eroded sections of stream and bank. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

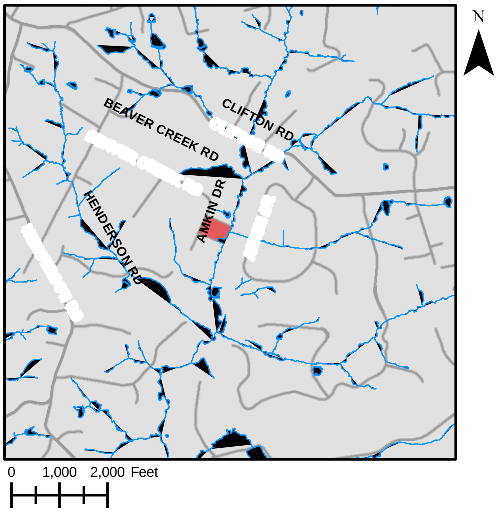
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
55.05	88.07	34.13

Project Design Considerations: Field investigations revealed stream actively meandering with exposed banks (around 2 feet). There are sections of approximately 5 feet of undercut banks showing significant erosion. The stream has room for the banks to be stabilized. Due to the proximity of the existing roadway and several homes, this restoration project should be a high priority.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	2460	LF	$200	$492,000
Clear and Grub	2.82	AC	$10,000	$28,200
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$64,520
Ancillary Items	1	LS	5%	$32,260
			Base Construction Cost	$741,980
			Mobilization (5%)	$37,099
			Subtotal 1	$779,079
			Contingency (25%)	$194,770
			Subtotal 2	$973,849
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$438,232
			Total	$1,412,081
			Estimated Project Cost	$1,420,000

WR9211 Stream Restoration



Address: Behind 11724 Amkin Dr., Clifton, Virginia
Location: Stream section behind houses on Amkin Dr.
Land Owner: Private – private owners
PIN: 0863 05 0005, 0863 05 0026, 0863 05 0027, 0863 05 0028, 0863 05 0029, 0864 08 0030A, 0864 08 0031A
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Wolf Run

Description: The stream section west of Amkin Drive is conveying runoff from upstream houses and wooded area and has indicators of poor channel morphology. The stream receives runoff from adjacent residential and wooded areas and conveys stormwater from the stream to the east. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored using geofabrics, fabric encapsulated rocks or equivalent to reduce further erosion.

Stream Restoration | Storm Network | Property Line | Streams

Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Some areas of the stream are heavily eroded. Stream stabilization will repair currently existing erosion and prevent future erosion. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

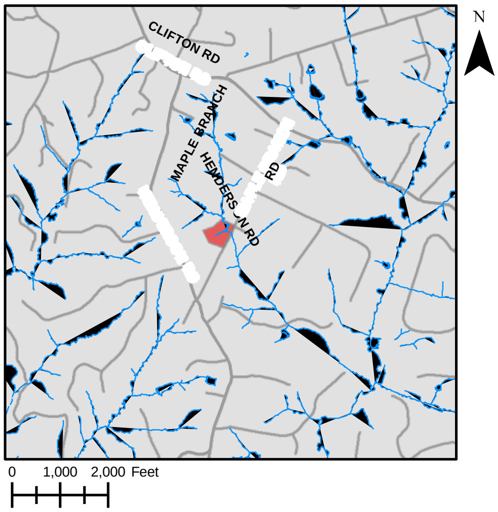
TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
16.39	26.23	10.16

Project Design Considerations: The Watershed Advisory Group (WAG) commented that the project could be important long-term, and numerous owners with property near the stream would welcome any project that stabilizes the stream and does not involve extreme invasion of property. Field investigation revealed streambank eroded 7 feet near the culvert. The stream is down cutting, meandering and undercutting trees. Eroded banks are threatening adjacent homeowner property.

Cost:

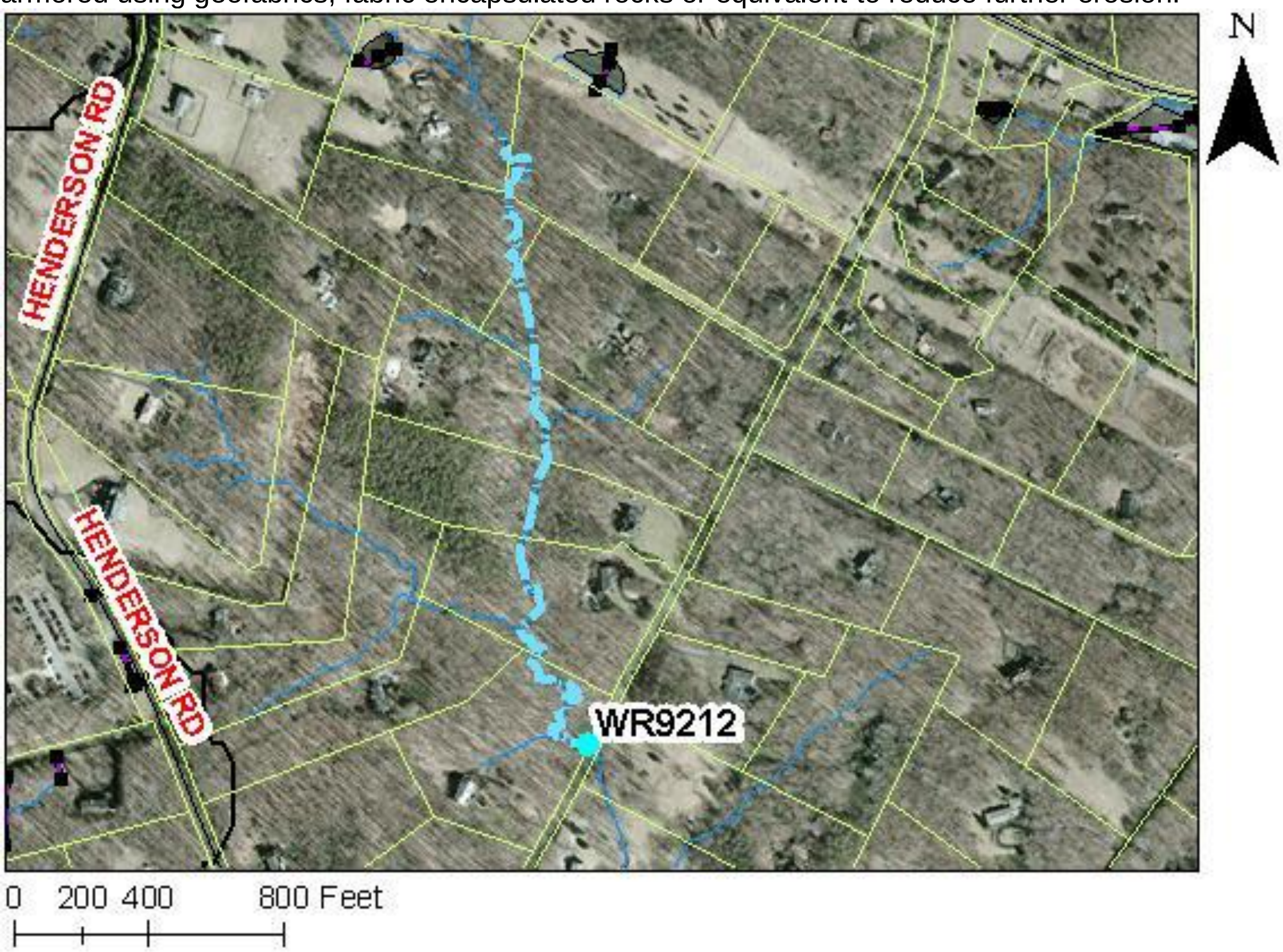
ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	1914	LF	$200	$382,800
Clear and Grub	2.2	AC	$10,000	$22,000
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$52,980
Ancillary Items	1	LS	5%	$26,490
			Base Construction Cost	$609,270
			Mobilization (5%)	$30,464
			Subtotal 1	$639,734
			Contingency (25%)	$159,933
			Subtotal 2	$799,667
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$359,850
			Total	$1,159,517
			Estimated Project Cost	$1,160,000

WR9212 Stream Restoration



Address: 7610 Maple Branch Rd., Clifton, Virginia
Location: Stream section upstream of Maple Branch Rd.
Land Owner: Private – private owners
PIN: 0861 09 0004, 0863 02 0002, 0863 02 0003, 0863 02 0005, 0863 12 0004, 0863 12 0005A, 0863 12 0006A, 0863 12 0007
Control Type: Water quality control
Drainage Area: N/A
Receiving Waters: Tributary of Wolf Run

Description: The stream section near Maple Branch Road is conveying runoff from upstream houses and wooded area and has indicators of poor channel morphology. This project proposes repairing bank and bed erosion to restore channel morphology. Erosion will be stabilized through the use of bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment. The banks will be armored using geofabrics, fabric encapsulated rocks or equivalent to reduce further erosion.



Stream Restoration — Storm Network — Property Line — Streams

Project Benefits: Stabilization will reduce sediment loads to the stream while maintaining capacity and controlling unwanted meander. Implementing the suggested measures, including bank shaping, toe protection, erosion control fabrics and rapid vegetation establishment will repair the existing erosion and help to prevent future erosion. Reducing erosion from this stream will reduce instream sediment and its associated pollutants. Below are the project's estimated pollutant removal amounts.

TSS Removal (Tons/Yr)	TN Removal (Lbs/Yr)	TP Removal l(Lbs/Yr)
54.96	87.93	34.07

Project Design Considerations: The Watershed Advisory Group (WAG) commented that the road that crosses the stream is a major thoroughfare and the project should be high on the priority list due to potential road-closure and blockage consequences. Per field investigation, the stream is in an open area running across two roads. The streambanks have exposed roots and typical vertical slopes of two feet. One exposed slope had a vertical slope of four feet near the culvert crossing and needs improved. The stream exhibits signs of widening, eroding banks and sediment deposition.

Cost:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct New Channel	2456	LF	$200	$491,200
Clear and Grub	2.82	AC	$10,000	$28,200
Plantings	1	LS	$25,000	$25,000
Additional Cost, First 500 LF	500	LF	$200	$100,000
Erosion and Sediment Control	1	LS	10%	$64,440
Ancillary Items	1	LS	5%	$32,220
			Base Construction Cost	$741,060
			Mobilization (5%)	$37,053
			Subtotal 1	$778,113
			Contingency (25%)	$194,528
			Subtotal 2	$972,641
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				$437,689
			Total	$1,410,330
			Estimated Project Cost	$1,420,000

6.0 Benefits of Plan Implementation

For the 10-year plan, projects that might have a measurable impact on the watershed hydrology (rate and timing of flows) or hydraulics (stream water level) were selected for additional modeling. For the Lower Occoquan projects, only stormwater pond retrofit projects were assumed to have a measurable effect on the hydrology. Therefore, only the stormwater pond retrofit projects were modeled in the hydrologic model, SWMM. Once the projects had been modeled in SWMM, the resulting flows were input into the hydraulic model, HEC-RAS.

6.1 Hydrology

A total of 7 pond projects were modeled both individually in SWMM and in a combined model. The model shows a decrease in peak flows as a result of these projects. A detailed discussion of the hydrologic modeling can be found in Appendix B. An overview of the existing, “future without,” and “future with projects” flows can be found in Table 6.1.

6.2 Hydraulics

Flows from the combined model, which included all relevant projects from the 10-year plan, were input into the hydraulic model for the watershed. As the stormwater retrofit projects in the 10-yr plan are all located in Giles Run and the nearby unnamed tributary watersheds, differences in the modeled water surface elevations between the “future without” and “future with projects” conditions are only seen along these streams. The 100-year (a storm that has a 1 percent probability of occurring in a given year) and the 10-year (a storm with a 10 percent annual chance) floodplains were mapped. An analysis was performed to determine the affected structures located inside or within 15 feet of the floodplain boundaries.

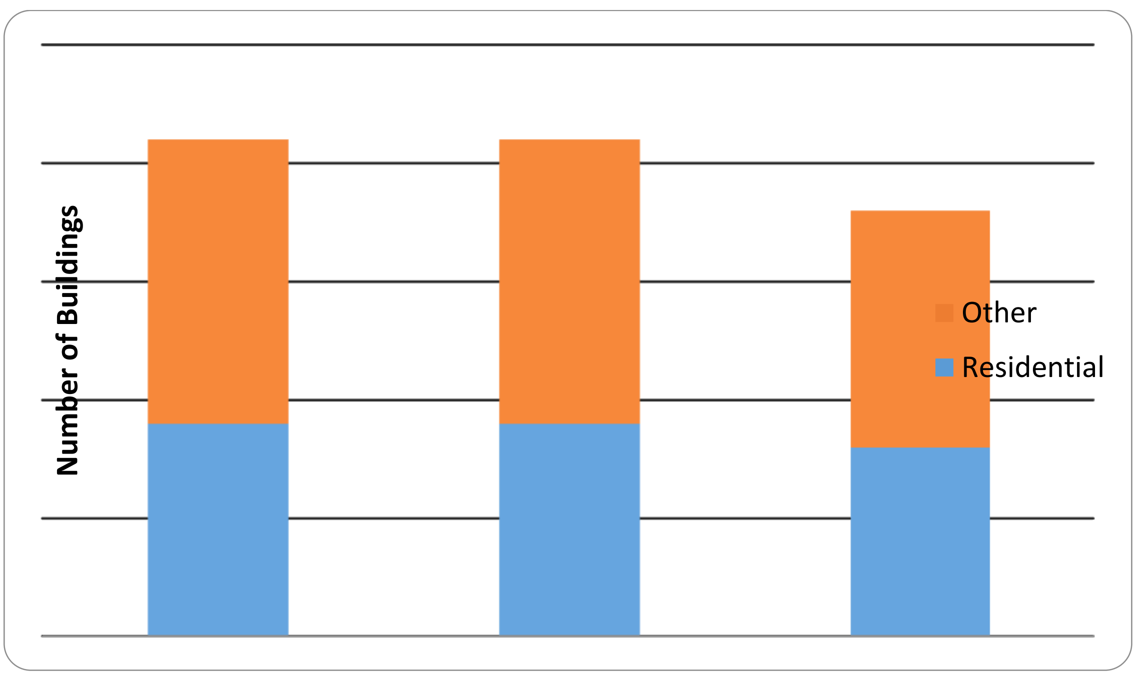


Figure 6-1: Buildings located in the 100-year floodplain

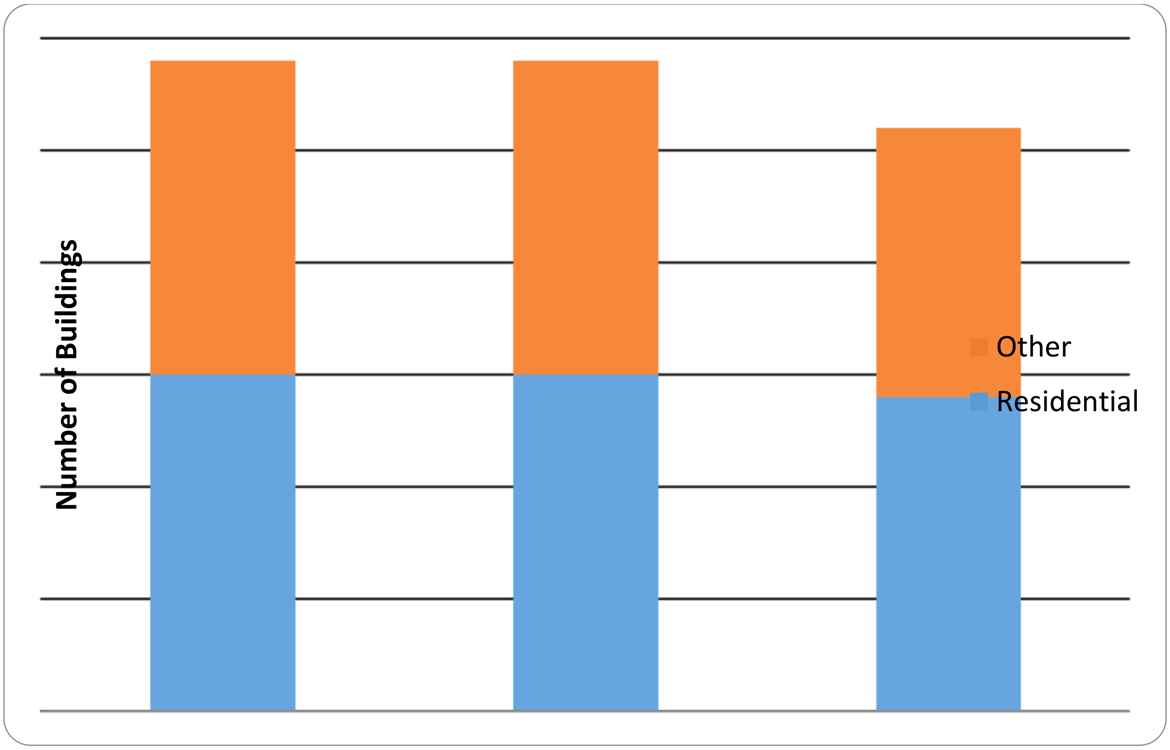


Figure 6-2: Buildings located within 15 feet of the 100-year floodplain

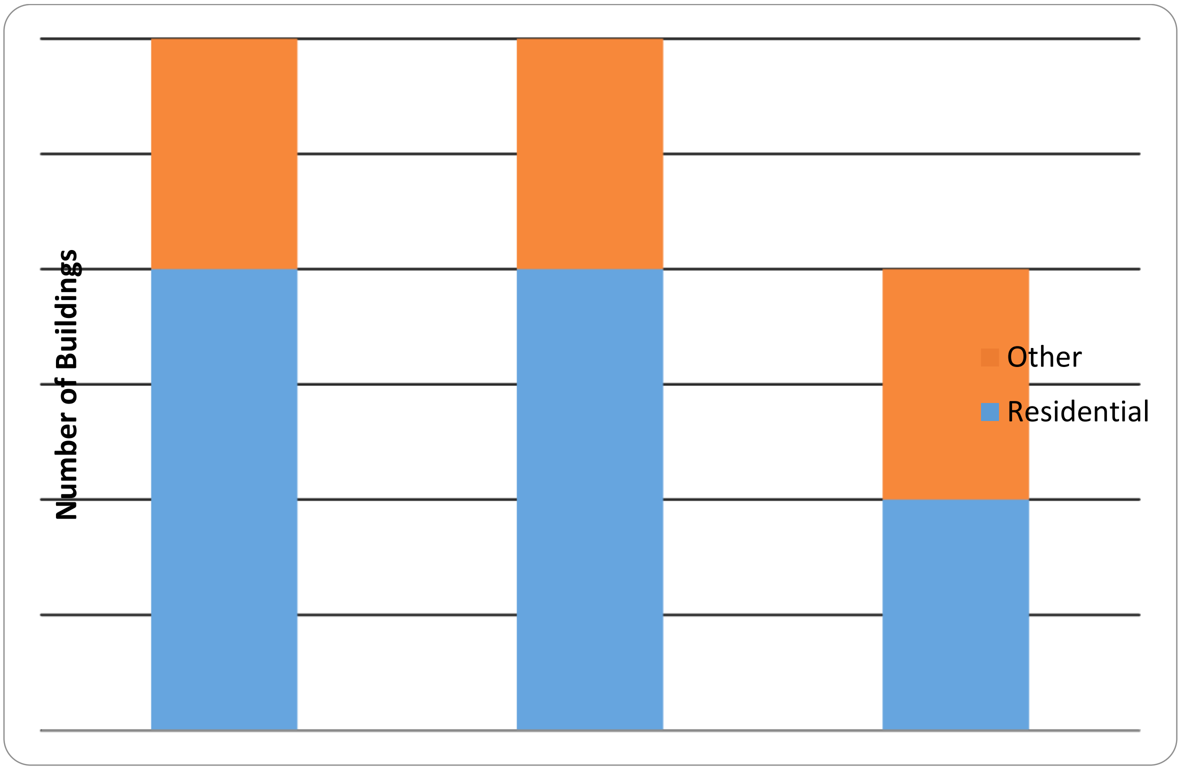


Figure 6-3: Buildings located within the 10-year floodplain

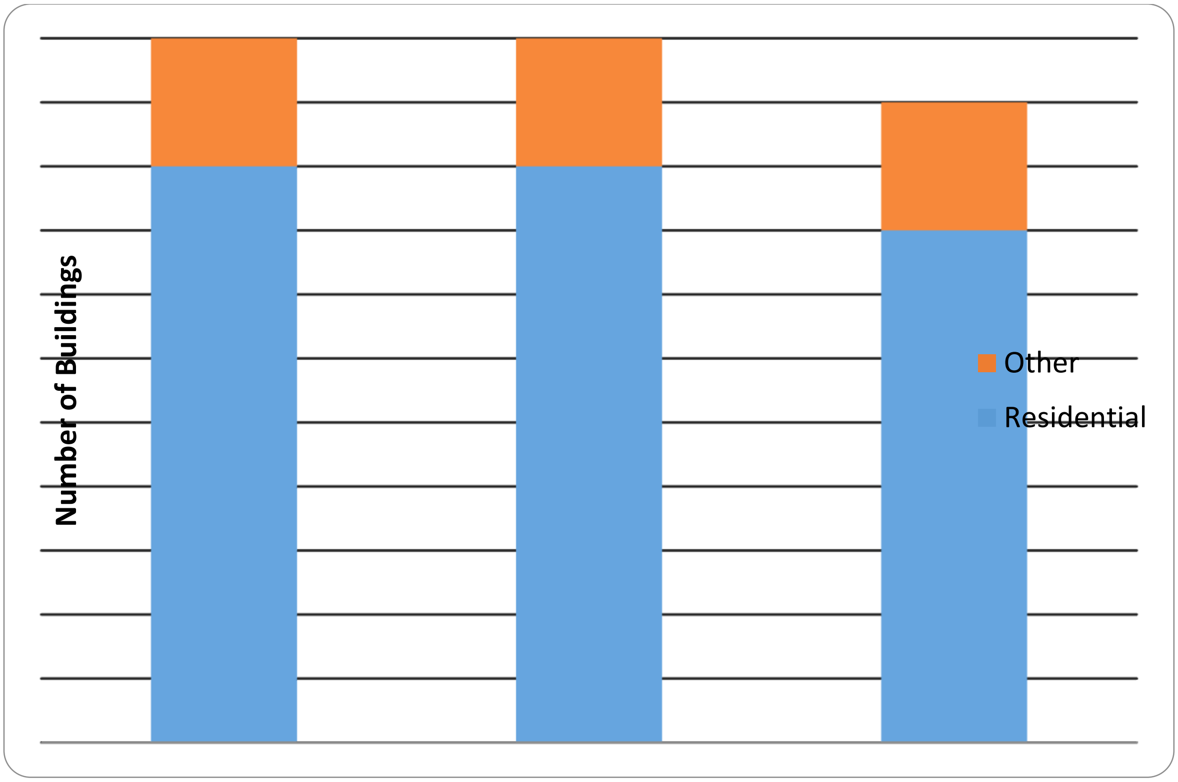


Figure 6-4: Buildings located within 15 feet of the 10-year floodplain

The analysis shows that the number of structures in or near the floodplain decreases between "future" conditions and "future with projects" conditions. A more detailed discussion of the hydraulic analysis can be found in Appendix B.

6.3 Pollutant Loading

Pollutant loads at the subwatershed level were modeled using STEPL, a water quality model. Additionally streambank erosion was calculated for affected reaches per guidance from the County. The streambank erosion pollutant loads were broken down into subwatershed loads and added to the STEPL subwatershed pollutant loads. The model generates estimated pollutant loads based on land use. Various types of stormwater treatment facilities can be modeled by applying reductions to these loads based on the treatment type and area treated. Detailed results from the STEPL model can be found in Appendix B. Table 6.1 includes a summary of the "existing," "future without," and "future with proposed projects" pollutant loadings by WMA.

6.4 Plan Costs and Benefits

The total cost of the 10-year plan (includes structural projects only) is $12 million. The additional cost to implement the structural projects in the 25-year plan is $50 million, which combined gives a total cost of $62 million. The benefits to the county are wide-ranging. The yearly total suspended sediment load will be reduced by 260 tons if the 10-year plan is implemented, 1,050 tons if the entire 25-year plan is implemented. Likewise, the yearly load of nitrogen and phosphorus will be reduced by over 420 pounds and over 170 pounds, respectively, for the 10-year plan, and 1670 pounds and 630 pounds for the entire 25-year plan. These benefits will help attain the goals set by the County to improve water quality and stream conditions in the Lower Occoquan watershed.

Table 6-1: Pollutant Loading & Flow Reduction Table (High Point)

WMA	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac /yr)[3]	TN (lb/ac /yr)[3]	TP (lb/ac /yr)[3]
			2-Year	10-Year	2-Year	10-Year			
High Point	3,555	Existing Condition	1.070	2.755	0.162	0.412	280.42	1.84	0.35
		Future Without Projects	1.085	2.775	0.178	0.442	274.19	1.93	0.36
		Future With Projects (10-Yr)	1.085	2.775	0.178	0.442	274.19	1.93	0.36
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	274.19	1.93	0.36
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	0.00	0.00	0.00
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	0.00	0.00	0.00

Table 6-2: Pollutant Loading & Flow Reduction Table (Kane Creek)

WMA	Area (ac)	Scenario1	Runoff Volume (in)2		Peak Flow (cfs/ac)2		TSS (lb/ac /yr)3	TN (lb/ac /yr)3	TP (lb/ac /yr)3
			2-Year	10-Year	2-Year	10-Year			
Kane Creek	3,075	Existing Condition	1.218	2.937	0.195	0.552	418.15	1.91	0.38
		Future Without Projects	1.227	2.948	0.201	0.564	414.78	2.08	0.40
		Future With Projects (10-Yr)	1.227	2.948	0.201	0.564	408.89	2.08	0.40
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	316.79	2.01	0.37
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	5.89	0.00	0.00
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	97.99	0.07	0.02

1. 25-year projects were not evaluated in the hydrologic model
2. Flow is cumulative
3. Loads are representative of individual land area contributions

Table 6-3: Pollutant Loading & Flow Reduction Table (Mill Branch - Giles Run North)

WMA	Area (ac)	Scenario1	Runoff Volume (in)2		Peak Flow (cfs/ac)2		TSS (lb/ac/yr)3	TN (lb/ac/yr)3	TP (lb/ac/yr)3
			2-Year	10-Year	2-Year	10-Year			
Mill Branch - Giles Run North	2,002	Existing Condition	1.279	2.830	0.241	0.576	607.70	4.52	0.78
		Future Without Projects	1.318	2.874	0.258	0.601	611.40	4.69	0.80
		Future With Projects (10-Yr)	1.271	2.817	0.251	0.575	611.22	4.69	0.80
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	559.45	4.64	0.77
		Reduction (10-year Plan)	0.048	0.057	0.007	0.026	0.18	0.00	0.00
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	51.95	0.05	0.03

Table 6-4: Pollutant Loading & Flow Reduction Table (Mill Branch - Giles Run South)

WMA	Area (ac)	Scenario1	Runoff Volume (in)2		Peak Flow (cfs/ac)2		TSS (lb/ac/yr)3	TN (lb/ac/yr)3	TP (lb/ac/yr)3
			2-Year	10-Year	2-Year	10-Year			
Mill Branch - Giles Run South	2,327	Existing Condition	1.563	3.368	0.255	0.632	711.12	6.93	1.05
		Future Without Projects	1.609	3.427	0.273	0.664	672.80	6.51	1.02
		Future With Projects (10-Yr)	1.517	3.321	0.237	0.603	653.35	6.48	1.01
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	653.34	6.48	1.01
		Reduction (10-year Plan)	0.092	0.105	0.036	0.061	19.45	0.03	0.02
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	19.46	0.03	0.02

1. 25-year projects were not evaluated in the hydrologic model
2. Flow is cumulative
3. Loads are representative of individual land area contributions

Table 6-5: Pollutant Loading & Flow Reduction Table (Mill Branch)

WMA	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac/yr)[3]	TN (lb/ac/yr)[3]	TP (lb/ac/yr)[3]
			2-Year	10-Year	2-Year	10-Year			
Mill Branch	1,268	Existing Condition	1.532	3.329	0.315	0.773	617.11	6.50	0.95
		Future Without Projects	1.543	3.340	0.326	0.787	617.30	6.60	0.96
		Future With Projects (10-Yr)	1.543	3.340	0.326	0.787	617.30	6.60	0.96
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	522.75	6.53	0.94
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	0.00	0.00	0.00
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	94.54	0.07	0.02

Table 6-6: Pollutant Loading & Flow Reduction Table (Occoquan)

WMA	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac/yr)[3]	TN (lb/ac/yr)[3]	TP (lb/ac/yr)[3]
			2-Year	10-Year	2-Year	10-Year			
Occoquan	2,126	Existing Condition	1.008	2.665	0.254	0.738	491.36	3.55	0.57
		Future Without Projects	1.071	2.740	0.304	0.833	444.80	3.35	0.55
		Future With Projects (10-Yr)	1.071	2.740	0.304	0.833	444.80	3.35	0.55
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	413.97	3.32	0.54
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	0.00	0.00	0.00
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	30.83	0.03	0.01

1. 25-year projects were not evaluated in the hydrologic model
2. Flow is cumulative
3. Loads are representative of individual land area contributions

Table 6-7: Pollutant Loading & Flow Reduction Table (Old Mill Branch)

WMA	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac/yr)[3]	TN (lb/ac/yr)[3]	TP (lb/ac/yr)[3]
			2-Year	10-Year	2-Year	10-Year			
Old Mill Branch	2,723	Existing Condition	1.075	2.747	0.218	0.647	325.09	1.48	0.29
		Future Without Projects	1.085	2.759	0.222	0.660	321.48	1.55	0.30
		Future With Projects (10-Yr)	1.085	2.759	0.222	0.660	321.48	1.55	0.30
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	220.95	1.47	0.26
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	0.00	0.00	0.00
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	100.53	0.07	0.04

Table 6-8: Pollutant Loading & Flow Reduction Table (Ryans Dam)

WMA	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac/yr)[3]	TN (lb/ac/yr)[3]	TP (lb/ac/yr)[3]
			2-Year	10-Year	2-Year	10-Year			
Ryans Dam	2,261	Existing Condition	0.975	2.627	0.190	0.600	440.10	1.50	0.32
		Future Without Projects	0.985	2.639	0.194	0.611	434.31	1.58	0.33
		Future With Projects (10-Yr)	0.985	2.639	0.194	0.611	434.31	1.58	0.33
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	434.31	1.58	0.33
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	0.00	0.00	0.00
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	0.00	0.00	0.00

1. 25-year projects were not evaluated in the hydrologic model
2. Flow is cumulative
3. Loads are representative of individual land area contributions

Table 6-9: Pollutant Loading & Flow Reduction Table (Sandy Run)

WMA	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac/yr)[3]	TN (lb/ac/yr)[3]	TP (lb/ac/yr)[3]
			2-Year	10-Year	2-Year	10-Year			
Sandy Run	5,198	Existing Condition	1.038	2.756	0.142	0.435	390.69	2.71	0.47
		Future Without Projects	1.052	2.772	0.145	0.439	385.13	2.78	0.47
		Future With Projects (10-Yr)	1.052	2.772	0.145	0.439	375.21	2.78	0.45
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	342.28	2.75	0.44
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	9.92	0.00	0.02
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	42.86	0.03	0.04

Table 6-10: Pollutant Loading & Flow Reduction Table (Wolf Run)

WMA	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac/yr)[3]	TN (lb/ac/yr)[3]	TP (lb/ac/yr)[3]
			2-Year	10-Year	2-Year	10-Year			
Wolf Run	3,761	Existing Condition	0.968	2.633	0.147	0.438	818.33	2.71	0.55
		Future Without Projects	0.979	2.643	0.149	0.440	812.18	2.78	0.56
		Future With Projects (10-Yr)	0.979	2.643	0.149	0.440	705.23	2.69	0.55
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	553.84	2.58	0.52
		Reduction (10-year Plan)	0.000	0.000	0.000	0.000	106.95	0.09	0.01
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	258.34	0.20	0.03

1. 25-year projects were not evaluated in the hydrologic model
2. Flow is cumulative
3. Loads are representative of individual land area contributions

Table 6-11: Pollutant Loading & Flow Reduction Table (Lower Occoquan Watershed)

Water-shed	Area (ac)	Scenario[1]	Runoff Volume (in)[2]		Peak Flow (cfs/ac)[2]		TSS (lb/ac/yr)[3]	TN (lb/ac/yr)[3]	TP (lb/ac/yr)[3]
			2-Year	10-Year	2-Year	10-Year			
Lower Occoquan	28,300	Existing Condition	1.131	2.822	0.195	0.543	493.71	3.01	0.52
		Future Without Projects	1.151	2.847	0.206	0.563	483.54	3.04	0.53
		Future With Projects (10-Yr)	1.140	2.834	0.202	0.556	465.24	3.02	0.52
		Future With Projects (25-Yr)	N/A	N/A	N/A	N/A	409.17	2.98	0.51
		Reduction (10-year Plan)	0.011	0.013	0.003	0.007	18.29	0.01	0.01
		Reduction (25-year Plan)	N/A	N/A	N/A	N/A	74.36	0.06	0.02

1. 25-year projects were not evaluated in the hydrologic model
2. Flow is cumulative
3. Loads are representative of individual land area contributions

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7.0 Glossary / Acronyms

B

Best Management Practice (BMP): A structural or nonstructural practice that is designed to minimize the impacts of changes in land use on surface and groundwater systems. Structural best management practices typically designed to trap or filter pollutants from stormwater runoff or reduce runoff velocities. Structural best management practices consist of bioretention filters, constructed stormwater wetlands, pervious pavement, etc. Nonstructural best management practices refer to land use or development practices that are determined to be effective in minimizing the impact on receiving stream systems such as street-sweeping, restoring stream buffers and improving outfalls.

Bioretention Basin: A BMP that retains, filters and treats stormwater runoff using a shallow depression of conditioned soil topped with a layer of mulch or high carbon soil layer and vegetation tolerant of short-term flooding. Depending on the design, a basin can provide retention or detention of runoff water and will trap and remove suspended solids and filter or absorb pollutants to soils and plant material.

Bioswale: A vegetated swale that is a form of bioretention. It is used to partially treat water quality, attenuate flooding potential and convey stormwater.

Best Professional Judgment (BPJ): This indicates deviation from various standard methods used County-wide, to account for circumstances where strict application of the methods is not advisable.

Buffer: Area of land bordering a stream. Buffer restoration projects are implemented to replant the stream buffer area, providing protection from direct runoff from developed areas.

C

Channel: A natural or manmade waterway.

Channel Evolution Model (CEM): Describes the five stages of channel adjustment. In urban areas, the channel generally adjusts due to increased runoff from development.

Chesapeake Bay Preservation Areas: An area designated by a local government under Virginia's Chesapeake Bay Preservation Act to protect Chesapeake Bay (VDCR, 2008). In Fairfax County, these areas are Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) under the Chesapeake Bay Preservation Ordinance adopted by the County (Fairfax County, 2005).

Cistern: An underground basin of water or above-ground barrel or tank that stores rainwater. They are used to ensure that water is not contaminated nor suffers from evaporation.

Confluence: The joining point where two or more streams create a combined, larger stream.

D

Daylight: Exposing waterways currently conveyed in buried culverts or pipes.

Density: The number of dwelling units per acre.

Detention: The temporary impoundment or holding of stormwater runoff.

Directly Connected Impervious Area (DCIA): Paved or hard surfaces, such as streets and rooftops, for which runoff is collected through a drain and directly piped into the stormwater management system.

Dry Detention Basin: An extended detention basin is designed to completely empty out between runoff events, typically within 48 hours, and therefore have no permanent pool. A dry detention basin can limit downstream scour and loss of aquatic habitat by reducing the peak flow rate and energy of stormwater discharges.

E

Easement: A designated part of a property that allows someone other than the property owner to use the land for a specific purpose.

Energy Dissipation Device: Structure designed to reduce erosive water velocities at an outfall.

Extended Detention Basin: A stormwater management facility whose outlet is designed to detain the stormwater runoff from a water quality storm for some minimum duration, allowing sediment particles and associated pollutants to settle out to the bottom of the basin.

F

Floodplain: The flat area located adjacent to the main stream channel. When streambanks overflow during or after a storm, the floodplain provides natural storage for the excess water. The 100-year frequency storm, which is the rainfall intensity that has a 1-percent chance of occurring in a year, is used to determine the limits of the floodplain. Floodplains include all areas of the County which are designated as a floodplain by the Federal Insurance Administration, the United States Geological Survey or Fairfax County.

G

Geographic Information System (GIS): A system of organizing and viewing digital spatial data; text and numerical data can be attributed to the digital features, or this information can be linked to a database. This system was used to create many of the maps contained in this report.

Green Roof: A roof that is covered with vegetation, which reduces stormwater run-off and lowers cooling costs.

H

Head Cut: Deepening of the stream channel through erosion, which starts at one location and moves upstream.

Headwater: The uppermost reaches of a stream or watershed.

Hydrologic Engineering Center River Analysis System (HEC-RAS): Using flows determined from a hydrologic model, this model computes the water levels in the stream system.

Hydraulics: The modeling or computing of the water elevation in a stream or manmade feature.

Hydrology: The modeling or computing of the quantity or in some cases quantity and timing, of water flow.

I

Impervious Area or Impervious Cover: A surface composed of any material that significantly impedes or prevents natural infiltration of water into soil. Impervious surfaces include, but are not limited to, roofs, buildings, streets, parking areas, and any concrete, asphalt or compacted gravel surface.

Index of Biological Integrity (IBI): evaluates ecological health based on the community structure of bottom-dwelling aquatic invertebrates.

L

Low-Impact Development (LID): A stormwater approach with a basic principle of managing rainfall at the course using uniformly distributed decentralized controls. Instead of conveying and managing/treating stormwater in large, end of pipe facilities located at the bottom of drainage areas, LID addresses stormwater though small landscape features located at the lot level. The primary goal of LID methods is to mimic the predevelopment site hydrology by using techniques that infiltrate, filter, store, evaporate and detain runoff close to its source.

M

Municipal Separate Storm Sewer System (MS4) permit: A permit which requires the creation of watershed management plans to facilitate compliance with the Clean Water Act

N

National Pollutant Discharge Elimination System (NPDES): A program administered by the Environmental Protection Agency that regulates pollution sources from pipes or man-made ditches (US EPA, 2009).

P

Peak Flows: The highest flow modeled or measured during a storm event at a certain location.

Perennial Streams: A body of water that normally flows year-round in a defined channel or bed, and is capable, in the absence of pollution or other manmade stream disturbances, of supporting bottom-dwelling aquatic animals.

Pervious Cover: Any ground cover material that allows water to infiltrate to the soil below.

Pervious Pavement: Pavement that allows percolation or infiltration of stormwater through the surface into the soil below.

R

Rain Barrel: Low-cost, effective and easily maintainable retention and detention devices that are applicable to residential, commercial and industrial sites to manage rooftop runoff. Rain barrels can be used to store runoff for later use in lawn and garden watering.

Regional Pond: A pond designed to control water quality/quantity for a number of developments in a large area.

Residential-Conservation (R-C) District: Restricts development size within the watershed to a minimum of 5 acres per residential dwelling unit.

Resource Management Area (RMA): A Chesapeake Bay Preservation Area that includes all land that may cause harm to the water quality of the Resource Protection Areas (RPAs); includes all of Fairfax County except those areas designated as RPAs (Fairfax County, 2005).

Resource Protection Area (RPA): A Chesapeake Bay Preservation Area located along sensitive streams draining to the Potomac River (Fairfax County, 2005).

Retention: The permanent storage of stormwater indefinitely.

Retrofit: Converting an existing detention facility into a more functional treatment practice.

Return Period: The average length of time between events having the same volume and duration. If a storm has a 1-percent chance of occurring in any given year, then it has a return period of 100 years.

Riparian Buffer: Land adjacent to a stream where vegetation is strongly influenced by the presence of water. It often contains native grasses, flowers, shrubs and trees that line the stream banks. Riparian buffers are important for good water quality and help to prevent sediment, nitrogen, phosphorous, pesticides and other pollutants from reaching the stream.

Runoff: The portion of precipitation, snow melt or irrigation water that runs off the land into surface waters.

S

Sediment Forebay: An area designed to collect some sediment from stormwater runoff before the runoff enters the main portion of the facility.

Spreadsheet Tool for Estimating Pollutant Load (STEPL): This tool calculates pollutant loads from various land uses, and models the pollutant reduction capabilities of various best management practices (BMPs).

Stream Morphology: The study of the size, pattern and geometry at several points along the stream, including the network of tributaries within the drainage basin.

Stream Physical Assessment (SPA): A report documenting the results from a data collection effort that involved a County-wide assessment of stream conditions. The purpose of the assessment is to collect information on and document: habitat conditions, impacts on the stream from specific infrastructure and problem areas, general stream characteristics and geomorphic classification of stream type.

Stream Protection Baseline Study (SPS): A 2001 study that documented the stream conditions throughout the County using physical, chemical and biological evaluations.

Stream Restoration: The re-establishment of the general structure, function and self-sustaining behavior of a stream.

Stormwater Management Model (SWMM): Developed by the EPA, this is a hydrologic model that computes flows in the stream network of the watershed using inputs such as rainfall, land use and other physical characteristics of the watershed.

T

Ten-Year Storm: The rainfall totals or intensity that have a 10-percent probability of occurring at that location in that year.

Total Nitrogen (TN): This is an indicator of water quality, and is a measure of all types of nitrogen in the water.

Total Phosphorus (TP): An indicator of water quality and a measure of all types of phosphorus in the water.

Tributary: A stream or a river that flows into a main stem or large river.

Total Suspended Sediment (TSS): An indicator of water quality, representing the amount of solid material that is being carried in the water.

Two-Year Storm: The rainfall totals or intensity that have a 50-percent probability of occurring at that location in that year.

U

Underground Chamber: An underground structure that detains stormwater for a period of time and discharges it through a hydraulic outlet structure to a downstream conveyance system.

Universal Soil Loss Equation (USLE): An equation for estimating average erosion from an area of land.

V

Virginia Pollutant Discharge Elimination System (VPDES): The Virginia administration of the National Pollutant Discharge Elimination System (NPDES). Administered by the Virginia Department of Environmental Quality (VDEQ), the U.S. Environmental Protection Agency still has authority over major point source discharges, as defined by the quantity and content of the source (VDEQ, 2010).

W

Watershed Advisory Group (WAG): Representatives of various stakeholder groups in the watershed who provide input at various stages of the Watershed Management Plan (WMP).

Watershed: An area of land for which rainwater collects and drains to a particular outlet point. Watersheds are commonly delineated from the mouth of a stream and include any land draining to the stream or its tributaries.

Watershed Management Area (WMA): A group of subwatersheds, used for breaking the watershed into subareas for management purposes.

Water Supply Protection Overlay District (WSPOD): Regulates development in the watersheds draining to a water supply.

Wet Pond: A detention basin with a permanent pool of water, which helps increase settling and pollutant uptake.

Watershed Management Plan (WMP): A plan for watershed restoration.

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