Northeastern Jones Falls Small Watershed Action Plan

Volume 1

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Final

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Northeastern Jones Falls SWAP Steering Committee

BLUE WATER BALTIMORE

BALTIMORE COUNTY MARYLAND

NORTHEASTERN JONES FALLS SWAP REPORT
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CHAPTER 1

INTRODUCTION

1.1 Overview

The purpose of this report is to provide guidance on the restoration of the Northeastern Jones Falls Watershed. This report outlines a series of recommendations for watershed restoration, describes management strategies for each of the 4 subwatersheds and identifies priority projects for implementation. Planning level cost estimates are provided where possible and a preliminary schedule for implementation over a 13-year horizon is outlined. Financial and technical partners for plan implementation are suggested for various recommendations and projects. The watershed plan is intended to assist the Blue Water Baltimore and Baltimore County in moving forward with restoration of the Northeastern Jones Falls.

1.2 Background

A unique partnership was formed between Baltimore County and the Blue Water Baltimore to develop this Small Watershed Action Plan (SWAP). This effort involved working with all partners to conduct upland assessments and stream corridor assessments to identify pollution sources, environmental degradation, and restoration opportunities.

An initial effort towards this SWAP began in early 2005, along with 3 other SWAP areas. Late in 2006, Department of Environmental Protection and Sustainability (DEPS) staff realized that accomplishing several SWAPs at one time was not feasible and the Northeastern Jones Falls SWAP was put off until the summer of 2009.

During this initial effort, the partners participated in the Steering Committee to provide technical guidance and direction on the collection of existing data and the field assessments and the development of the SWAPs. The Steering Committee partners also helped develop the materials for the three Stakeholder meetings that were held to solicit input from citizens on goals, locations of problems, and acceptable restoration practices. Members of the Steering Committee are listed below:

Jim Shaffer -

Stuart Staiman – Patapsco/Back Trib Team

Halle van der Gaag – Jones Falls Watershed Association

Ernie Shea – Lutherville Community Association

Dick Parsons – West Towson

Ellie Kelly – Ruxton Riderwood Lake Roland Community Association

Kimberly Warren - Ruxton Riderwood Lake Roland Community Association

John Sandkuhler – Sheppard Pratt

In addition to the steering committee meetings, several public outreach meetings were held throughout the course of the early development of the SWAP:

February 8, 2005 at the Riderwood Elementary School
Overview of SWAP process and summaries of land use and natural resources in the study area.

May 17, 2005 at the Church of the Good Shepherd
Presentation on SWAPs given to the 52nd Annual Meeting of Ruxton-Riderwood-Lake Roland Area Improvement Association

June 11 & 14, 2005 at the Bykota Center
Training/informational workshop on the upland assessments for the SWAP

This document follows in the footsteps of prior and continuing efforts to address adverse environmental conditions that exist within the Jones Falls Watershed. These efforts include:

- Baltimore County – Lower Jones Falls SWAP (2008)
- Jones Falls Water Quality Management Plan (1996)

1.3 Environmental Requirements

This Small Watershed Action Plan was developed to meet diverse environmental program requirements, including, National Pollutant Discharge Elimination System – MS4 permit assessment and planning requirements, Total Maximum Daily Load (TMDL) reductions for nutrients, sediment, and bacteria, and the Chesapeake Bay Program (CBP) TMDL for nutrient and sediment reductions to meet water quality standards for the Chesapeake Bay. This is in addition to citizen needs for a healthy environment, clean water, and an aesthetically pleasing landscape to enhance community livability.

1.3.1 NPDES – MS4 Permits

The Baltimore County (99-DP-3317, MD0068314) NPDES permit has a number of requirements that will be addressed by this plan.

One requirement is a systematic assessment of water quality within all of our watersheds and the development of restoration plans. This assessment must include:

- Source identification information based on GIS information
- A determination of current water quality conditions
- Identification and ranking of water quality problems
- Results of visual watershed inspections
- Identify all structural and non-structural water quality improvements opportunities, and
- Specify overall watershed restoration goals.

A second requirement requires each jurisdiction to address 10% of the impervious cover during each 5-year term of the permit, with jurisdictions seeking to address 20% of the impervious cover within their respective jurisdictions by 2010 when their current permit is up for renewal. The renewal of the Baltimore NPDES – MS4 Permit, anticipated in 2012 will include a

requirement to address an additional 20% of the impervious cover during the next 5-year term of the permit.

This plan meets the systematic assessment and planning requirements of the NPDES Permits and provides the mechanism for how each jurisdiction will meet the goals for addressing impervious cover.

1.3.2 Total Maximum Daily Loads (TMDLs)

Three TMDLs have been developed by Maryland Department of the Environment (MDE) for addressing water quality impairments within the planning area and a fourth is pending. A TMDL was developed for nutrients (Appendix F) to improve water quality in the Baltimore Harbor sufficiently to meet water quality standards for dissolved oxygen and chlorophyll a. The nutrient TMDL for Jones Falls is based on this receiving tidal water body. The TMDL identified urban stormwater runoff as a contributor to the water quality degradation and based on the model determined that a 15% reduction in nitrogen and phosphorus in urban runoff was required to meet the water quality standards. However, the CBP TMDL for the Chesapeake Bay supersedes this TMDL.

A TMDL for bacteria (Appendix G) was developed by MDE and approved in February 2008 to address the high bacteria concentrations in the streams of Jones Falls. Using a Bacteria Source Tracking (BST) methodology the sources of bacteria are partitioned between human, domestic pet, livestock, and wildlife. The Jones Falls bacteria TMDL requires reductions of bacteria in the range of 92%-98%. To achieve water quality standards, reductions for human and domestic pet sources would have to be 98%, while wildlife sources would have to be reduced 42-76%. The TMDL indicated that due to the large reduction requirements, the reductions would be implemented in an iterative fashion, with additional monitoring to measure progress.

The TMDL for chlordane in fish tissue for Lake Roland (Appendix J) developed by MDE in March 2001 recognized that there are no known current sources of chlordane and that the chlordane in fish tissue is the result of legacy concentrations in the sediment of Jones Falls. Chlordane was withdrawn from the market in 1988 and suspended for agricultural usage, other than to control termites, in 1975. Given the urban nature of the Jones Falls watershed, the most likely source of chlordane was its use in the control of termites around residential dwellings. With the product unavailable on the market for twenty years now, the sources of chlordane have been reduced. Hazardous Waste Collection Days held by both Baltimore County and Baltimore City provide a means for homeowners to dispose of any chlordane products safely. MDE will continue to monitor chlordane in fish tissue with the expectation of decline over time. Chlordane will not be further addressed in this SWAP.

EPA approved a TMDL for sediment for the Jones Falls in September of 2011. This TMDL is based on the impact of elevated sediment loads on stream biology in the Jones Falls. To determine whether aquatic health is impacted by elevated sediment loads, MDE developed a *Biological Stressor Identification* (BSID) methodology to identify the most probable cause(s) of the existing biological impairments in Maryland 8-digit watersheds based on the suite of available physical, chemical, and land use data. The BSID identified one of the most probable causes for observed biological impairments to be sediment. This TMDL requires a sediment reduction of 21.9% of sediment or total suspended solids (TSS).

The BSID analysis mentioned above did not identify any nutrient-related stressors present and/or nutrient-related stressors showing a significant association with degraded biological conditions. The results of the BSID study, combined with the analysis of recent water quality data indicate that the Jones Falls watershed is not being impaired by nutrients. A Water Quality Analysis (WQA) of eutrophication, which received a letter of concurrence from EPA in March 2010, supports the conclusion that a TMDL for nutrients is not necessary to achieve water quality standards in the Jones Falls.

1.3.3 Chesapeake Bay Nutrient and Sediment Impairment

On Dec. 29, 2010, the U.S. Environmental Protection Agency established the Chesapeake Bay Total Maximum Daily Load (TMDL). The Bay TMDL is actually a combination of 92 smaller TMDLs for individual Chesapeake Bay tidal segments. Nutrient allocations have been divided into five sectors: agriculture, urban, septic, point source and forest. For the purposes of this and all other Baltimore County SWAPs, the urban sector allocations will be addressed. By 2025, the reduction targets for Nitrogen, Phosphorus and sediment are 29.0% and 45.1%, respectively. No target has been set for sediment, addressing phosphorus is assumed to address the sediment reduction as well respectively.

1.4 Partner Capabilities

In order to achieve effective watershed restoration, the capabilities of several organizations must be brought together and coordinated. Within the Baltimore region the cooperation and coordination has been advancing in recent years as we all seek common goals in water quality improvement in our streams and tidal waters.

1.4.1 Baltimore County

Baltimore County has a history of implementing restoration projects, including stream restoration, stormwater conversions and retrofits, reforestation, and shoreline enhancement projects. In the Jones Falls watershed over three miles of streams (16,550ft.) have been restored, 177 acres of urban land has been either retrofit with stormwater management or existing stormwater management has been enhanced to provide additional water quality improvements. 8.4 million dollars have been spent to date on restoration activities within the entire Jones Falls watershed. An additional 1 million dollars has been allocated for future restoration in the Jones Falls. Many of the projects have additional funding provided through grant programs.

Baltimore County has an extensive monitoring program that assesses the current ambient water quality, efficiency of various restoration projects in relation to pollutant removal efficiency and biological community improvement, and tracks trends over time. The County also has an Illicit Connection Program that monitors storm drain outfalls, tracks pollution sources, and coordinates remediation.

Baltimore County is under a consent decree to address Sanitary Sewer Overflows. The consent decree has specific requirements for improvements to pumping stations, remediation of sanitary sewer lines, maintenance and inspection. Implementation of the consent decree requirements will help reduce bacteria contamination as well as reduce nitrogen and phosphorus in the streams.

The county operates street sweeping and inlet cleaning programs throughout the county that remove sediment, nitrogen, and phosphorus before they reach the waterways. These programs are tracked and estimates of the pollution removal are calculated.

Through the many municipal restoration efforts of the county and those of the local watershed group, Baltimore County estimates that of the urban nutrient loads, 6% of the nitrogen and 7% of the phosphorus in the county portion of the watershed have been reduced (2010 NPDES Report, Table 10-8).

1.4.2 Blue Water Baltimore Watershed Association

Blue Water Baltimore (BWB) is a grassroots, volunteer-based watershed organization representing the merger in 2010 of three separate watershed groups-Gwynns Falls, Jones Falls and Herring Run. The BWB mobilizes volunteers for environmental stewardship through outreach, public education, and advocacy. Their main focus has been on restoration through hands-on projects that take people to the stream, show them its problems, and take actions to solve those problems. These actions include planting trees to reduce runoff, taking action to reduce stormwater runoff from homes, monitoring streams, and creating a green urban watershed center.

1.4.4 Summary

As can be seen from the above descriptions, the partners are well placed in terms of programs and experience to implement the actions proposed in this SWAP. Additional efficiencies can be realized through continued cooperation and implementation of the Baltimore Watershed Agreement Action Strategies across the broader region.

1.5 US EPA Watershed Planning A-I Criteria

The Clean Water Act (CWA) was amended in 1987 to establish Section 319 Nonpoint Source Management Program, after recognizing the need for federal assistance with focusing state and local nonpoint source efforts. Under this section, states, tribes, and territories can receive grant money for the development and implementation of programs aimed at reducing nonpoint source (NPS) pollution. NPS pollution comes from many different sources and is a result of human activities on the land. It is caused by pollutants from human activities and atmospheric deposition that are deposited on the ground and eventually carried to receiving waters by stormwater runoff. Common NPS pollutants and sources include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas
- Oil, grease, and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks
- Salt from irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes, and failing septic systems

CWA Section 319 grant funds can be requested to support various activities such as technical assistance, financial assistance, education, training, technology transfer, restoration projects, and monitoring to assess the success of specific nonpoint source implementation projects. Watershed-based plans to restore impaired water bodies and address nonpoint source pollution

using incremental Section 319 funds must meet USEPA's A through I criteria for watershed planning:

- **A.** An identification of the causes and sources or groups of sources that will need to be controlled to achieve the load reductions estimated in the watershed plan.
- **B.** Estimates of pollutant load reductions expected through implementation of proposed nonpoint source (NPS) management measures.
- **C.** A description of the NPS management measures that will need to be implemented.
- **D.** An estimate of the amounts of technical and financial assistance to implement the plan.
- **E.** An information/education component that will be used to enhance public understanding and encourage participation.
- **F.** A schedule for implementing the NPS management measures.
- **G.** A description of interim, measurable milestones for the NPS management measures
- **H.** A set of criteria to determine load reductions and track substantial progress towards attaining water quality standards.
- **I.** A monitoring component to evaluate effectiveness of the implementation records over time.

Table 1-1 summarizes the location(s) within this document where each criterion is addressed.

Table 1-1: Where to Locate Information for USEPA's A-I Criteria

Report Section	USEPA Criteria								
	A	B	C	D	E	F	G	H	I
Chapter 1		✓							
Chapter 2		✓							
Chapter 3	✓	✓	✓		✓				
Chapter 4			✓		✓				
Chapter 5							✓	✓	✓
Appendix A			✓	✓	✓	✓	✓		
Appendix B				✓					
Appendix C		✓						✓	
Appendix D	✓								
Appendix E	✓								

1.6 Northeastern Jones Falls Watershed Overview

The Northeastern Jones Falls area was selected for this SWAP based on similarity of land use, and environmental issues. The Northeastern Jones Falls represents 19% of the entire Jones Falls watershed. The Lower Jones Falls SWAP was addressed through a SWAP in 2008 and the Upper Jones Falls, will be addressed through a separate SWAP to be developed in 2013.

The Northeastern Jones Falls was further divided into 4 subwatersheds displayed in Figure 1-1. Table 1-2 provides a summary of key characteristics of the Northeastern Jones Falls watershed.

Table 1-2: Basic Profile of the Northeastern Jones Falls Watershed

Drainage Area	• 6,957 acres (10.9 mi^2) including Lake Roland	
Stream length	• 43.7 miles	
Land Use	• Low-Density residential (20%) • Med-Density Residential (32%) • High-Density Residential (8%) • Commercial (10%)	• Industrial (6.5%) • Institutional (9%) • Open Urban (6.2%) • Forest (9%)
Current Impervious Cover	• 24.7% of watershed	
Soils	• A Soils – 5.4% • B Soils – 61.4%	• C Soils – 23.9% • D Soils – 9.3%

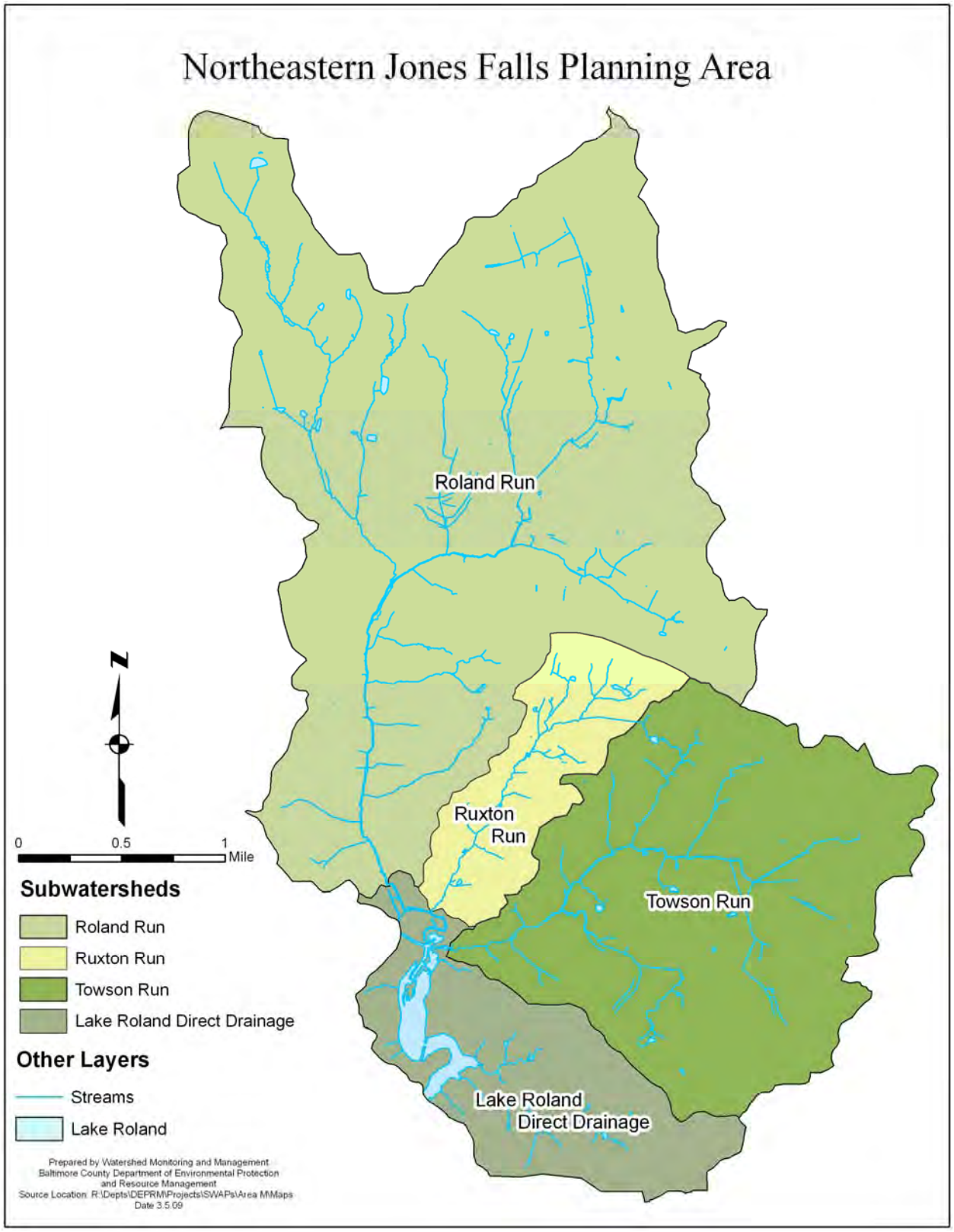

Figure 1-1: Northeastern Jones Falls SWAP planning area and subwatersheds.

1.7 Report Organization

The remainder of the report is organized as follows:

Chapter 2 presents the watershed goals and the objectives associated with these goals.

Chapter 3 provides brief descriptions of the types of watershed restoration practices recommended for Northeastern Jones Falls Watershed in two categories – government strategies and citizen strategies.

Chapter 4 presents a prioritization of the 4 subwatersheds in the Northeastern Jones Falls and summarizes their associated subwatershed-specific restoration strategies.

Chapter 5 presents the evaluation criteria and restoration-monitoring framework.

A series of appendices provide additional detailed information used in the development and support for the Northeastern Jones Falls SWAP. These appendices are outlined below:

- Appendix A – A table of specific restoration actions related to the goals and objectives presented in Chapter 2 are presented along with benefits, timeline, performance measure, estimated cost, and responsible party(s).
- Appendix B – Cost analysis and a listing of potential funding sources.
- Appendix C – A copy of the Chesapeake Bay Program – Best Management Practice pollutant load reduction credits.

In addition, a second volume of appendices of supporting documentation on the condition of the Northeastern Jones Falls watershed is provided. This second volume includes:

- Appendix D – Northeastern Jones Falls Characterization Report (EPS 2011)
- Appendix E – Links to Chesapeake Bay TMDL and Local TMDLs

CHAPTER 2

VISION STATEMENT AND GOALS

2.1 Vision Statement

The Northeastern Jones Falls Steering Committee adopted the following vision statement that served as a guide in the development of the SWAP.

> *We envision a healthy, vibrant Northeastern Jones Falls watershed, which protects high quality streams and is supportive of diverse aquatic life. Our watershed conserves treasured natural resources and maintains and celebrates our residential character and landscape for today and for future generations.*

2.2 Northeastern Jones Falls SWAP Goals

The goals for the Northeastern Jones Falls watershed grew out of the vision statement and input from both the Steering Committee and the wider Stakeholder Group. A total of 7 goals were identified. These goals were developed through discussions with the Northeastern Jones Falls SWAP Steering Committee and from watershed residents at the stakeholder meetings. The actions associated with the goals and objectives are presented in Appendix A. Many of the actions address multiple goals and objectives, therefore the Action Table in Appendix A shows the goals and objectives with which it is associated. The actions, while in many cases are expressed in a quantifiable mode (i.e. linear feet of forest buffer planted), are meant to serve as a guide and not as an absolute in achieving the goals. It has been determined that an Adaptive Management Strategy will be emphasized as implementation goes forward. This strategy will assess the success of implementation over time and will change the implementation actions based on the acceptance of the community and availability of funding.

2.3 Goal 1: Improve and Maintain Clean Water

The Northeastern Jones Falls watershed is identified as being impaired by sediment and bacteria as indicated in the Maryland 303(d) list of impaired waters. In addition, Lake Roland has been identified as impaired by chlordane, and the Chesapeake Bay (receiving waters for Jones Falls watershed) has been listed as impaired by nutrients and sediment. To rectify this impairment a Total Maximum Daily Load (TMDL) analysis has been completed for nitrogen, phosphorous, and sediment for the Chesapeake Bay; for chlordane in Lake Roland; bacteria in the Jones Falls watershed; and sediment that is impairing stream biological communities. The objectives below are designed to meet the TMDL reduction requirements in the Northeastern Jones Falls watershed. The Phase II Watershed Implementation Plans currently under review detail

strategies on both the state and county level to meet the nutrient and sediment reduction requirements for the Chesapeake Bay TMDL. This plan provides finer detail on the implementation options within the planning area.

Objectives:

1. To meet Chesapeake Bay TMDL nutrient reduction requirements:
   a) Reduce annual average Total Nitrogen loadings by 29%
   b) Reduce annual average Total Phosphorous loadings by 45%
2. To meet the Sediment TMDL reduction requirements to restore the stream aquatic communities in Jones Falls – reduce sediment of 21.9%.
3. To meet the Bacteria TMDL reduction requirements to protect human health – work towards reducing bacteria by 92%.

2.4 Goal 2: Reduce Stream Stability Problems That Create Flooding and Erosion

A number of factors in the watershed cause increased stormwater flow to streams, which leads to erosion and flooding. Impervious surfaces (roofs, roads, parking lots) prevent rain from penetrating the ground. Stormwater is conveyed to streams, which typically concentrates the flow. It enters the stream at a rapid rate, which causes erosion of streambanks, and flooding at times. Altered stream channels (by concrete channel, straightening, riprap or walls) contribute to increased flow velocity. Reduction in forest cover leads to an overall reduction in the watershed's ability to retain stormwater and release it slowly, as other land uses (residential, institutional, commercial, agricultural) result in a greater amount of runoff. By restoring the watershed and stream channel to a more natural state, erosion and flooding can be reduced.

Objectives:

1. Review existing hydrologic studies
2. Review existing stream data and assessments
3. Review existing county capital projects and evaluate their success in reducing flooding and erosion problems
4. Evaluate potential Roland Run/Towson Run capital restoration projects

2.5 Goal 3: Enhance Stream Riparian Corridors for Water Quality and Habitat Value

Stream riparian corridors provide critical habitat (food, shelter, nesting sites) and migration/dispersal routes for wildlife. Natural forest cover shades the stream and helps keep the water cool, which is critical for some of the native fish and invertebrates. In developed areas, it is not uncommon for natural areas to be over-run by exotic invasive plant species and for forest cover to be lacking, which compromises the habitat's ability to provide for wildlife. Some of the culprits include: English ivy, Japanese honeysuckle, oriental bittersweet, kudzu, Japanese stiltgrass, periwinkle, multi-flora rose, barberry, Russian/autumn olive, and tree-of-heaven.

Objectives:

1. Design a program in concert with the Soil Conservation District to manage invasive species
2. Evaluate existing stream buffers and follow-up with additional planting using beneficial native species

2.6 Goal 4: Increase Citizen Participation with Restoration Projects

People are empowered when they can physically make a difference and improve their community in a way that benefits everyone. Clean-ups and other restoration projects are great opportunities for education. Students, families, and community groups (civic, corporate, and religious) are readily available labor sources. All restoration projects should be recognized as celebrations of our natural heritage. Provide communities with information and assistance with restoration actions that can be conducted on private lands.

Objectives:

1. Facilitate a partnership between the community associations and Blue Water Baltimore
2. Initiate citizen adoption of county parks for regular clean-up and restoration activity
3. Engage citizens in follow-up maintenance activities related to Baltimore County capital restoration projects
4. Design and install community rain gardens and develop education programming
5. Characterize all communities in the watershed and develop a program of remedial actions that includes at least one community-based project per community
6. Increase cross-age citizen participation in hands-on restoration projects on private and public sites
7. Increase the number and variety of watershed restoration projects
8. Increase funding for community clean-ups and restoration projects

2.7 Goal 5: Encourage Collaboration with the Institutional Landowners and Baltimore County EPS on Restoration Projects

Thirteen institutions were assessed as part of this SWAP and several restoration opportunities were identified, including planting of over 600 trees. Collaborating with these institutions will obviously be essential to the successful installation of the recommended restoration projects.

Objectives:

1. Engage schools in the SWAP area to develop schoolyard habitat programs and ensure that surrounding communities are involved in the planning and maintenance

2.8 Goal 6: Enhance Natural Resources on Public Property

Government should "lead by example" to encourage businesses and neighborhood communities to employ best management practices on their sites. Government properties should be valued as opportunities for construction of BMPs and have a secondary purpose as demonstrations of BMPs that are being promoted throughout the community.

Objectives:

1. Improve the condition of natural resources on a demonstration public site
2. Showcase all completed natural resource enhancement projects that are accessible to the public as models for the community

2.9 Goal 7: Maintain the Residential Character of the Watershed

Citizens must have an awareness of local streams and the natural environment before a sense of stewardship can be expected. When citizens have an experience with a stream, they may make a personal connection and ultimately change their behavior. The Northeastern Jones Falls watershed has 44 miles of open stream channels. It should be safe for children to play in these streams. Local parks are opportunities for neighborhoods to engage in local stream protection activities.

Objectives:

1. Ensure the opportunity for representative(s) from community group(s) in the SWAP area attend meetings held by County Planning Board and Commission for Environmental Quality (CEQ).

CHAPTER 3

RESTORATION STRATEGIES

3.1 Restoration Strategies Overview

The restoration strategies presented here are divided into two mutually supporting categories; government strategies (3.2) and citizen based strategies (3.3). The ultimate goal of these strategies is to find a mix of restoration activities that will, when implemented, result in achieving the goals set out in Chapter 2. In order to meet the Chesapeake Bay TMDL for nutrients a 29% reduction in nitrogen and a 45% reduction in phosphorus from the urban MS4 allocation must be achieved. In order to meet the local TMDL for sediments, a 22% reduction in total sediment must be achieved. The analysis of the pollutant loads is presented in the *Northeastern Jones Falls Characterization Report* in Volume 2 of this report. Section 3.4 of this chapter summarizes the pollutant load calculations and presents the management scenario on how the reduction in nitrogen, phosphorus and sediment will be achieved.

3.2 Government Strategies

Baltimore County government plays a key role in the SWAP implementation process by restoring local streams and improving water quality through capital improvement projects and management activities (development review process, street sweeping and inlet cleaning, illicit connection programs, and sewer line rehabilitation and maintenance).

3.2.1 Stormwater Management for New Development and Redevelopment

The Maryland Stormwater Act of 2007 required Maryland Department of the Environment to develop new stormwater management requirements for new development and redevelopment using Environmental Site Design (ESD) techniques. The use of ESD best management practices (BMPs) will result in the distribution of flow throughout the development site resulting in a reduction of stormwater runoff leaving the site. This will effectively reduce pollutant loads and protect stream channels from erosion. The ESD requirements build on the design manual and regulation change in 2000 where channel protection and water quality were specifically required. However, ESD may not result in a zero pollutant load from new development. There should be water quality improvements that result from the application of ESD to redevelopment projects where water quality was not previously provided. For purposes of restoration in the Northeastern Jones Falls, the water quality improvements that result from redevelopment will not be counted. Instead, redevelopment will be tracked along with new development to determine if the increase in loads from new development is balanced by redevelopment, and

thereby maintain the cap that is implicit in the TMDLs (i.e. there will be no increase in either phosphorus or nitrogen as a result of development).

3.2.2 Existing Stormwater Management Facility Conversions

Stormwater facility conversions involve the re-design of existing stormwater management facilities that are currently providing limited water quality improvement, to ones with more effective stormwater management capabilities. Only dry detention ponds, which are designed for water quantity control, were investigated for conversion potential. The results of the assessment are presented in section 3.7.2.2 of Appendix D, *The Northeastern Jones Falls Characterization Report* in Volume 2 of this SWAP. Until further analysis is conducted to determine the extent of the conversion, it is unknown how much pollutant removal could be obtained. For purposes of this plan, it was assumed that the dry pond could be converted to limited extended detention with a shallow marsh, which permits 20% removal of nitrogen, 45% removal of phosphorus and 60% removal of sediment. In addition to design limitations, there are limitations based on ownership and size. Privately owned facilities will require additional staff time to obtain easements and the owner may not be willing to grant an easement. The size of the drainage area to the facility can also be a limitation, since proportional cost of the design and construction will increase.

3.2.3 Stormwater Management Retrofits

Stormwater retrofits are new structural stormwater management practices that can be used to address existing stormwater management problems and water quality issues where there are currently no stormwater facilities. Typically this BMP is installed to treat sheet flow from impervious surfaces such as parking lots and alleys.

3.2.4 Stream Restoration

Stream corridor restoration practices are used to enhance the appearance, stability, and aquatic function of urban stream corridors. The practices range from routine stream clean-ups, simple stream repairs such as vegetative bank stabilization and localized grade control, to comprehensive repair applications such as full channel redesign and re-alignment. Primary practices for use in the Northeastern Jones Falls watershed include stream restoration and buffer reforestation.

Using the results of the Stream Corridor Assessment, detailed in section 3.3 of the *Northeastern Jones Falls Characterization Report*, areas of primary concern can be targeted for restoration projects. Any restoration project will most likely have an effect on the residents or businesses whose properties border or contain the stream. Outreach to these individuals can be accomplished through community meetings, mailed questionnaires, and canvassing to determine if sufficient authorization will be granted to perform the restoration.

Stream corridors outside of the Stream Stability Assessment area can be targeted based on citizen complaints about the streams and neighborhoods identified by the Neighborhood Source Assessment (Appendix D, chapter 4) that are encroaching on the stream buffer. Areas on public land, where a successful buffer planting effort or establishment of no-mow area may be more likely, should be given a priority when selecting a buffer reforestation project location.

Tables 3-5, 3-6, and 3-7 below identify the nutrient reductions associated with stream restoration opportunities in the Northeastern Jones Falls. There were 18 sites identified for restoration (stream erosion) through the Stream Corridor Assessments in Roland Run and Ruxton Run totaling 11,879 feet of potential restoration opportunity. This shows that 24% of the assessed reaches are recommended for restoration. Extrapolating this percentage to the entire watershed's 230,736 ft of stream, it can be estimated that 55,377 ft of stream possess potential for restoration.

3.2.5 Street Sweeping and Storm Drain Inlet Cleaning

Street sweeping removes trash, sediment and organic matter such as leaves and twigs from the curb and gutter system, preventing their entry into storm drains and nearby streams. This helps reduce sedimentation and pollutants, like oils and metals, in the stream. Excessive organic matter can clog the streams and storm drain system resulting in costly maintenance. In addition, the decay of a disproportionate amount of organic matter in the stream can rob essential oxygen from the stream.

Neighborhoods with street sweeping recommended through the Neighborhood Source Assessments will be referred to Baltimore County Public Works offices to determine if street sweeping is conducted there and if so, at what frequency. Adding a targeted neighborhood to the sweeping route or increasing the frequency of the sweeping there could address the build up of excessive curb and gutter material in that location.

There were approximately 42 miles of street recommended throughout 19 neighborhoods in the Northeastern Jones Falls for street sweeping. Based on numbers from the 2010 Street Sweeping Program from the Dept of Public Works (NPDES Report Tables 3-6, 3-7), in the Jones Falls watershed, there were 1,902 lbs. of material removed per mile of street sweeping. The concentrations used for nutrient removal are 1825.92 mg/kg total nitrogen and 707.95 mg/kg total phosphorus, based on the recently completed study entitled "Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin" (CWP 2008). Finally, the milligrams of pollutant were back calculated for pounds of pollutant removed. Sediment reductions are calculated per MDE guidance taking 70% of the total weight to achieve dry weight and 62.4% of this dry weight as sediment (CWP 2008).

3.2.6 Illicit Connection Detection and Disconnection Program and Hotspot Remediation

An Illicit Discharge Detection and Elimination program has been developed by Baltimore County. The objective of this program is to find and remediate discharges into streams that are harmful to aquatic life and water quality, or that are causing erosion/ sedimentation problems.

Baltimore County will continue with their Illicit Discharge Detection and Elimination program, seeking to improve techniques and methodologies for more effective reductions of these discharges. The pollutant reduction realized from implementation of the illicit connection programs have not been incorporated into the nutrient reduction strategies due to the uncertainty in the contribution of illicit connections to the overall pollutant loading rates. These programs will provide a margin of safety in the overall nutrient reduction strategy.

3.2.7 Sanitary Sewer Consent Decrees

A Consent Decrees have been issued by the Environmental Protection Agency (EPA) and Maryland Department of the Environment (MDE) against Baltimore County. The Consent Decree outlines the agreed upon work (capital, equipment and operations improvements to be completed by 2020) and includes deadlines necessary for compliance with the Clean Water Act and the Maryland water pollution control laws with the goal of eliminating sanitary sewer overflows.

Over an 11-year period (2000-20010), the documented Sanitary Sewer Overflows in the Northeastern Jones Falls totaled 237,093 gallons. This is an average of 21,554 gallons/yr. Using waste and washwater concentrations from Table 7.6 of The Watershed Treatment Model (CWP 2002) (30mg/L concentration for nitrogen, 10mg/L concentration for phosphorus and 225 mg/L sediment), pollutant load reduction estimates were calculated and are shown in Tables 3-5, 3-6 and 3-7 below. The reduction of these sanitary sewer overflows will improve water quality by reducing the nutrients and sediment as well as the bacteria associated with these overflows.

3.3 Citizen Based Strategies

The participation of citizens in improving the health of a watershed is an essential part of the SWAP process. When large numbers of individuals become involved in citizen-based water quality improvement initiatives, changes can be made to the aesthetic and chemical aspects of the water and waterways within the watershed that would not be possible otherwise.

3.3.1 Downspout Disconnection

Rain downspout disconnection decreases flow to nearby streams during storm events, reducing stream bank erosion and pollutants entering the stream during rainstorms. Downspout disconnection can be achieved through downspout redirection, rain barrels and/or rain gardens (see Appendix D, chapter 4).

Using a mix of outreach/awareness techniques and financial incentives, a downspout disconnection program can be implemented in neighborhoods identified by the Neighborhood Source Assessment. Initially, one or two pilot disconnection programs will be conducted in order to determine successful techniques and strategies for future success. The Baltimore Downspout Disconnection Program was established by Blue Water Baltimore in 2009 and in 2010 began a pilot disconnection program in the Mayfield community in the Baltimore City section of the Back River watershed. The Center for Watershed Protection is monitoring runoff from a control location to compare and assess results. This disconnection program will be useful in implementing the disconnection recommendations of this SWAP.

Through GIS, 230 rooftop acres were calculated within neighborhoods that were recommended for downspout disconnection through the Neighborhood Source Assessment. Based on the Neighborhood Source Assessment field sheets, the percentage of the rooftop acres that were estimated to be connected to the storm drain system for each neighborhood was used to determine each individual neighborhood's rooftop acres available for disconnection. These calculations yielded 156 rooftop acres with potential for disconnection in the Northeastern Jones Falls. Chesapeake Bay Program efficiencies for filtration (40% Nitrogen, 60% Phosphorus, 80% Sediment) were used to calculate the potential nutrient reductions associated with disconnection in the Northeastern Jones Falls. These reductions are shown in Tables 3-5, 3-6 and 3-7 below.

3.3.2 Citizen Awareness

Raising awareness among citizens about some of the common activities around their homes and how those activities can negatively affect water quality is a primary citizen based strategy.

3.3.2.1 Lawn Fertilizer Application Awareness

A well-manicured and responsibly maintained lawn can be an asset to a watershed. Too often however, over-fertilization and irresponsible chemical applications result in pollutant charged runoff from lawns to local streams.

Areas identified by the Neighborhood Source Assessment as having high lawn maintenance should be targeted for awareness programs emphasizing responsible fertilizing techniques such as proper application amounts, proper time of year for fertilizing, soil testing for the nutrient requirements of the lawn and keeping fertilizers away from impervious surfaces. This education could be achieved through door-to-door canvassing, informational doorknob hangers or mailings, blurbs in community newsletters, or demonstrations at community meetings. Information on organic alternatives to chemical lawn treatments should also be included in these outreach efforts.

3.3.2.2 Pet Waste Awareness

Pet waste on yards, sidewalks and common areas can be washed away by rain into the stormdrain and therefore into the stream. Once in the stream, this waste contributes bacteria such as *E.coli* and fecal coliforms that can cause health problems for people who come in contact with the contaminated stream. This waste can also contribute nutrients and its decay robs the stream of oxygen needed by fish and aquatic plants for survival.

Awareness programs emphasizing the importance of picking up after pets can include ‘pick up after your pet’ signs in common areas, informational doorknob hangers or mailings, blurbs in community newsletters, or discussions at community meetings.

3.3.3 Reforestation and Street Tree Planting

Trees help improve water quality by processing nitrogen and phosphorus in the groundwater which prevents these nutrients from reaching streams. Trees intercept precipitation, which helps to reduce the energy of raindrops and prevent erosion. In addition, trees strategically planted around the home can form windbreaks to reduce heating costs in the winter and when planted closer to the home, can reduce cooling costs in the summer.

Incentive programs like Tree-Mendous Maryland and NeighborSpace of Baltimore County for planting on public property, and coupon incentive programs and discounted tree sales for private property plantings, could increase the success of planting efforts.

3.3.3.1 Riparian Buffer Reforestation

The riparian buffer is the last line of defense for the stream against nutrients in the groundwater. Buffer tree roots also help stabilize stream banks, reducing erosion and sedimentation in the stream.

The Stream Corridor Assessment indicates areas within the assessed subwaterhseds that are recommended for buffer enhancement projects and the Neighborhood Source Assessment identifies 14 neighborhoods where buffer encroachment is evident. By combining this data,

areas within the watershed can be selected for buffer reforestation. Additional buffer awareness initiatives to encourage landowners to plant trees and/or create a no-mow area adjacent to the stream should be incorporated into the reforestation projects.

Table 2-7 of the Northeastern Jones Falls Characterization Report (Appendix D) shows that 224 acres of buffer were determined to be open pervious or available for reforestation through GIS land data anaysis. Further rough analysis throughout the SWAP area showed that approximately 5% of the buffer area is feasible for establishing a forested buffer. Extrapolating this percent throughout the watershed gives a total of 11.2 acres of buffer possible for planting. The Chesapeake Bay Program states the pollutant removal capability for buffers involves a land use change reduction plus a reduction efficiency of 25% for Nitrogen, 50% for phosphorus and 50% for sediment. Tables 3-5, 3-6 and 3-7 show the potential nutrient and sediment reductions associated with forest buffers in the Northeastern Jones Falls.

3.3.3.2 Upland Reforestation

Converting open areas in the upland portion of the watershed to forested areas by planting trees can decrease nutrients in nearby streams and reduce erosion.

Areas identified by the Pervious Area Assessment should be further investigated for potential for successful tree-planting efforts, focusing these investigations on the publicly owned parcels. A total of 80 acres were assessed, of these, 50.5 acres were on public property requiring minimal site preparation (Appendix D, Table 4-11). These areas should be investigated first as the likelihood of a successful planting effort is greater.

Ten of the 13 institutional areas assessed through the Institutional Site Assessment showed approximately three acres of tree-planting opportunities. Using Appendix 4-3 of Chapter 4 of Appendix E, institutions can be identified where tree-plantings are recommended restoration options.

3.3.3.3 Street Tree Planting

Aside from aesthetic values, street trees shade concrete and can help cool an entire neighborhood while absorbing nutrients through their root systems, improving air quality and providing habitat for wildlife.

Neighborhoods recommended for street trees by the Neighborhood Source Assessment should be the initial focus for street tree plantings. Canvassing residents and/or contacting neighborhood associations can be effective techniques for beginning a street tree-planting program within a neighborhood. A permit must also be obtained through Maryland Department of Natural Resources.

3.4 Pollutant Load Reduction Analysis to Meet the TMDLs

3.4.1 TMDL Pollutant Load Reduction Requirements

In order to assess the pollutant loads in the Northeastern Jones Falls planning area, a spreadsheet analysis was conducted. Using land use loading rates supplied by The Chesapeake Bay Program's Watershed Model (Phase 5.3.2, land/river segment WM0-3650-0001 loadings), the total SWAP area loadings for nitrogen, phosphorus and sediment were calculated. Chapter 3, section 3.6 of the Northeastern Jones Falls Characterization Report (Appendix D) presents the

results for each subwatershed. This methodology was applied to derive the pollutant loads for nitrogen, phosphorus and sediment to comply with the Chesapeake Bay TMDL for these pollutants. The Chesapeake Bay TMDL is based on the Phase 5 Chesapeake Bay Watershed Model linked to the Estuary Model.

The SWAP area land use was derived from the Maryland Department of Planning 2007 land use data layer. This information is presented in Chapter 2 of the Upper Back River Characterization Report (Appendix D).

Table 3-1 presents the per-acre loadings for nitrogen, phosphorus and sediment used in this analysis. The urban loading rates are used for the reduction analysis discussed below.

Table 3-1: Land Use per Acre Nitrogen and Phosphorus Loadings (pounds/acre/year)

Land Use	Nitrogen Load per Acre	Phosphorus Load per Acre	Sediment Load per Acre
Urban Pervious	10.14	0.25	105.21
Urban Impervious	15.92	1.34	771.15
Cropland	21.13	1.27	498.87
Pasture	5.93	0.60	107.58
Forest	2.70	0.04	28.67

The results of this reduction analysis are presented in Table 3-2 showing the average annual urban loads of nitrogen, phosphorus and sediment. The Chesapeake Bay TMDL requires 29.0% and 45.1% and reductions in nitrogen and phosphorus respectively from the County Phase I/II MS4 (urban) loads. At the time of the writing of this SWAP report, the details of the Chesapeake Bay TMDL for sediments were not yet available so the local TMDL reduction for Jones Falls of 21.9% was used.

Table 3-2 presents the pollutant removals needed to achieve these reduction goals.

Table 3-2: Northeastern Jones Falls Nitrogen, Phosphorus and Sediment Urban Loads/Reductions

Source	Nitrogen (lbs)	Phosphorus (lbs)	Sediment (lbs)	29.0 % Nitrogen Reduction	45.1% Phosphorus Reduction	21.9% Sediment Reduction
Urban	72,508.7	6,421.8	1,785,325.8	**21,027.5**	**2,896.2**	**390,986.4**
Ag	208.7	21.1	3,786.8			
Forest/Wetlands	1,821.3	27.0	19,339.4			
Water	101.6	6.0	na			

For purposes of this SWAP, the reductions are applied to the urban load. Nutrient loads associated with all other land uses were not incorporated into these reduction estimates.

3.4.2 Pollutant Load Reduction Calculations

Most pollutant removal calculations are based on Chesapeake Bay Program models that credit nutrient reductions specific to individual scenarios as efficiencies or land use conversions. Stream restorations are credited using specific reduction amounts per stream mile restored and other practices are credited simply as a direct removal. Table 3-3 shows the Chesapeake Bay Program removal efficiencies of some stormwater management practices and Appendix D presents the full suite of best management practices and the associated efficiencies.

Table 3-3: Percent Removal Efficiency of BMPs

BMP	Pollutants		
	TN	TP	TSS*
Detention Facilities	5	10	10
Extended Detention Facilities	20	20	60
Wet Ponds	20	45	60
Infiltration Practices	80	85	95
Filtration Practices	40	60	80

*Total Suspended Solids (sediments)
Detention Facilities = Detention Pond and Hydrodynamic Devices (DP, OGS, and UGS)
Extended Detention Facilities = Extended Detention Ponds (EDSD, EDSW, ED)
Wet Ponds and Wetlands = Wet Pond and Shallow Marsh (WP and SM)
Infiltration Practices = Infiltration Trench and Infiltration Basins (IB, IT and ITWQC), Porous Paving (PP), and Dry Wells (DW)
Filtration Practices = Sand filters and Bioretention Facilities (SF, BIO)

Listed below are explanations about how the reduction numbers displayed in Tables 3-5, 3-6 and 3-7 are derived for specific best management practices.

Stormwater Management Existing - based on the numbers from Tables 3-19 and 3-20 of Appendix D, The Northeastern Jones Falls Characterization Report. The pollutant loadings to each facility were based on the loading rates in Table 3-1. The pounds of removal were then calculated based on the facility type and the appropriate removal efficiency from Table 3-3 above.

Stormwater Management Retrofits - from retrofits recommended at 4 institutions through the Institutional Site Assessment. Numbers for 'already implemented' column are from the three retrofits listed in Table 7-14 of the 2010 Baltimore County NPDES Report.

Stormwater Management Conversions - based on the recommended conversions' numbers from Tables 3-21 and 3-22 of Appendix D, The Northeastern Jones Falls Characterization Report.

Forest Buffers - based on Chesapeake Bay Program removal guidance and are based on a land use conversion plus a reduction efficiency. There are 224 acres considered open pervious in the stream buffer areas of the Northeastern Jones Falls. Rough GIS analysis shows approximately 5% or 11 acres feasible for planting. A reduction efficiency of 25% for nitrogen, 50% for phosphorus and 50% for sediment yields the reduction efficiency estimates. The pollutant load for forested land is subtracted from the current urban pervious load to obtain the land use change reductions. The reduction efficiency and land use change numbers are then summed to achieve the total nutrient reduction estimate.

Reforestation - based on 80 acres of pervious areas assessed plus three acres based on tree planting number potentials from the Institutional Site Investigations (100 trees/acre) (see Appendix D). A land use conversion from urban pervious to forested is used here to determine nutrient reductions. The numbers from the 'already implemented' column are based on EPS and Jones Falls Watershed Association's tree plantings.

Stream Restoration - based on erosion site lengths from the Stream Corridor Assessment (Chapter 3, Appendix E), an average of 24% of the assessed streams were noted as having

erosion problems. Extrapolating this percentage to the entire watershed's stream miles yields 56,047 ft or 10.6 miles of stream restoration opportunity.

The calculation of pollutant load reduction potential due to stream restoration are based on approved Chesapeake Bay Program efficiencies:

- Total Nitrogen – 0.02 pounds per linear foot of stream restoration
- Total Phosphorus – 0.0035 pounds per linear foot of stream restoration
- Total Suspended Solids – 2.55 pounds per linear foot of stream restoration

As further research is developed, these numbers may be modified. Future numbers may resemble the interim stream reduction restoration numbers released by the Chesapeake Bay Program:

- Total Nitrogen – 0.20 pounds per linear foot of stream restoration
- Total Phosphorus – 0.068 pounds per linear foot of stream restoration
- Total Suspended Solids – 310 pounds per linear foot of stream restoration

These calculations are represented at the bottom of each table as 'potential future credits'. These reductions represent the difference of the increase in credits and the credits already given in the upper part of each table.

Existing stream restoration numbers indicated in the 'already implemented' column are derived from EPS capital projects listed in Table 3-3 below.

Table 3-4: Existing Stream Restoration Projects in SWAP Area M

Project	Facility Type	Linear Feet	Year	Removal Rate (lb./year)		
				TN	TP	TSS
Roland Run - Essex farm Rd.	SR	250	98	5.0	0.9	637.5
Roland Run – Seminary Ave.	SR	150	98	3.0	0.5	382.5
Towson Run – VFW Hall	SR	600	00	12.0	2.1	1,530.0
Roland Run – Jeffers Rd.	SR	1,550	02	31.0	5.4	3,952.5
Roland Run - Riderwood Hills	SR	2,400	07	48.0	8.4	6,120.0
TOTALS		**4,950**		**99.0**	**17.3**	**1,2622.5**

Downspout Disconnection – The 46 neighborhoods recommended for downspout disconnection contain 230 impervious building acres (Table 4-1 Appendix E). Based on potential for downspout disconnection, 156 impervious building acres were deemed feasible to disconnect. Chesapeake Bay Program efficiencies for filtration, 40% for nitrogen, 60% for phosphorus and 80% for sediment, were used to determine potential nutrient reduction estimates.

Street Trees – It was determined that a total of 945 street trees could be planted in neighborhoods throughout the Northeastern Jones Falls (Table 4-5 Appendix D). Estimated nutrient reductions were determined using the estimate of 100 trees per acre, and a land use conversion from urban pervious acres to forested acres.

Urban Nutrient Management – 58 neighborhoods were noted to have 30% or more high maintenance lawns. A total of 1,230.2 acres of high maintenance lawn exists within these neighborhoods. This acreage was obtained by calculating the pervious acreage within each of the 58 neighborhoods and applying the respective percentage of high maintenance lawn

documented in the NSA. Using Chesapeake Bay Program loading rates for urban pervious, a reduction efficiency is applied (17% for N and 22% for P) to calculate nutrient reduction possibility.

2011 Fertilizer Use Act – On May 19, 2011, Governor Martin O'Malley signed the Fertilizer Use Act of 2011. According to the Bay Program, this will result in a 1% reduction in nitrogen and a 15% reduction in phosphorus from the total acres of urban pervious land use. This SWAP area has 4,474 acres of urban pervious land.

As further research is developed, these numbers may be modified. Future numbers may more closely resemble the load reduction potential used for urban nutrient management (17% for N and 22% for P). These calculations are represented at the bottom of Tables 3-5 and 3-6 below as 'potential future credits'. These reductions represent the difference of the increase in credits and the credits already given for urban nutrient management in the upper part of each table to avoid double counting.

Street Sweeping/Inlet Cleaning – The 19 neighborhoods recommended for street sweeping contain approximately 42 miles of road. Based on numbers from the 2010 Street Sweeping Program from the Dept of Public Works (NPDES Report section 3, Table 3.6), in the Jones Falls watershed, there were 1,902 lbs. of material removed per mile of street sweeping. Using concentrations of 1825.92 mg N/kg and 707.95 mg P/kg, a conversion factor was determined and potential load reductions calculated.

49 miles x 600 lbs/mile x 0.45 kg/lb x .0000022 lb/mg x nutrient concentration mg/kg = lbs nutrient

Nutrient and sediment removals based on existing street sweeping in the Jones Falls watershed are shown in the 'already implemented' columns in the tables below. Table 3-7 of the 2011 NPDES Report shows nutrient removals attributed to street sweeping for 8-digit watersheds for 2010. The Northeastern Jones Falls SWAP area represents 27% of the Baltimore County portion of the larger 8-digit Jones Falls watershed. This percentage was applied to the nutrient removal estimates indicated for the Jones Falls watershed in the NPDES report table.

This 27% was also applied to the total pounds removed for sediment reductions. Sediment reductions for street sweeping are calculated by taking 70% of this 27% to achieve dry weight of swept material (MDE 2011) and taking 62.4% of this dry weight to achieve total sediment (CWP 2008).

129,910 lbs total weight x 27% = 35,076 lbs x 70% = 24,553 lbs x 62.4% = 15,321 lbs sediment

The 27% was also applied to inlet cleaning nutrient/sediment reductions reported in the NPDES Report, Table 3-4.

Sanitary Sewer Overflows-Over an 11-year period (2000-2010), the documented Sanitary Sewer Overflows in the Northeastern Jones totaled 237,093 gallons. This is an average of 21,554 gallons/yr. The consent decree issued in the summer of 2005, by EPA and MDE to Baltimore County will serve to eliminate these sanitary sewer overflows and their associated nutrient loads. Based on a 30mg/L nitrogen concentration for raw sewage and 10mg/L phosphorus concentration (Table 7.6 of The Watershed Treatment Model, CWP 2002), potential load reductions were calculated based on the elimination of these overflows.

The restoration strategies above, once implemented, will help meet the pollutant reduction goals of the Bay TMDL and local sediment TMDL. This is detailed in Tables 3-5, 3-6 and 3-7 below. Note that the reductions are applied to the urban loads shown in Table 3-2.

Table 3-5: Current and Projected Nitrogen Reductions due to BMPs

BMP	How Credited	TN Efficiency	Units Available	Projected Participation	Potential TN Removed (lbs)	TN Removed (lbs) Already Implemented	TN Remaining
Restoration Options							
Nitrogen to be Removed to meet the Bay TMDL 29% Reduction							21,027.52
Stormwater Management Existing	Efficiency	Varies by Type	900.4 acres			1,482.3	19,545.2
Stormwater Retrofits	Efficiency	Varies by Type	2.3 acres	100%	26.2	156.6	19,362.4
Stormwater Management Conversions	Efficiency	Varies by Type	8 ponds	100%	390.6		18,971.8
Riparian Forest Buffers	Land use conversion +Efficiency	50%	224 acres	5%	111.7		18,860.1
Reforestation (PAAs & ISIs)	Land use conversion	Land use conversion	86 acres	40%	256.0	54.6*	18,549.5
Stream Restoration	Linear Foot	0.02 lbs/ft.	55,377 ft	30%	332.3	99.0	18,118.2
Stream Restoration Under Construction/Design	Linear Foot	0.02 lbs/ft.	8,000 ft	100%	160.0		17,958.2
Downspout Disconnect	Efficiency	60%	156 acres	20%	198.7		17,759.5
Street Trees	Land Use Conversion	Land use conversion	9.5 acres	100%	70.3		17,689.2
Urban Nutrient Management	Efficiency	17%	1,230 acres	5%	103.9		17,585.3
2011 Fertilizer Use Act	Efficiency	1%	4,413 acres	100%	447.4		17,137.9
Street Sweeping	Direct removal		42 miles	100%	46.0	64.0	17,027.9
Inlet Cleaning	Direct removal			100%		5.1	17,022.8
SSO Reduction/Elimination	Direct removal			100%	5.4		17,017.4
Projected Total Pounds Nitrogen Removed						**4,010.1**	
Potential Future Credits							
Stream Restoration	Linear Foot	0.20 lbs/ft.	55,377 ft	30%	2,990.4	891.0	13,136.0
Stream Restoration Under Construction/Design	Linear Foot	0.20 lbs/ft.	8,000 ft	100%	1,440		11,696.0

BMP	How Credited	TN Efficiency	Units Available	Projected Participation	Potential TN Removed (lbs)	TN Removed (lbs) Already Implemented	TN Remaining
Restoration Options							
2011 Fertilizer Use Act	Efficiency	17%	4,474 acres	100%	7,158.8		4,537.2
Projected Potential Future Total Pounds Nitrogen Removed					**16,490.3**		

*includes EPS trees and JFWA trees planted

Table 3-6: Current and Projected Phosphorus Reductions due to BMPs

BMP	How Credited	TP Efficiency	Units Available	Projected Participation	Potential TP Removed (lbs)	TP Removal (lbs) Already Implemented	TP Remaining (lbs)
Restoration Options							
Phosphorus to be Removed to meet the Bay TMDL 45% Reduction							2,896.2
Stormwater Management	Efficiency	Varies by Type	900.4 acres	NA	NA	110.3	2,785.9
Stormwater Retrofits	Efficiency	Varies by Type	2.3 acres	100%	2.0	15.7	2,768.2
Stormwater Management Conversions	Efficiency	Varies by Type	8 ponds	75%	42.8		2,725.4
Riparian Forest Buffers	Land use conversion +Efficiency	50%	224 acres	5%	3.8		2,721.6
Reforestation (PAAs & ISIs)	Land use conversion	Land use conversion	86 acres	40%	7.2	2.9*	2,711.5
Stream Restoration	Linear Foot	.0035 lbs/ft	55,377 ft	30%	58.1	17.3	2,636.1
Stream Restoration Under Construction/Design	Linear Foot	.0035 lbs/ft	8,000 ft	100%	28.0		2,608.1
Downspout Disconnect	Efficiency	40%	169 acres	20%	25.1		2,583.0
Street Trees	Land Use Conversion	Land use conversion	9.5 acres	100%	2.0		2,581.0
Urban Nutrient Management	Efficiency	22%	1,230 acres	5%	3.3		2,577.7
2011 Fertilizer Use Act	Efficiency	15%	4,413 acres	100%	165.5		2,412.2
Street Sweeping	Direct removal		49 miles	100%	17.8	24.8	2,369.6
Inlet Cleaning	Direct removal			100%		2.0	2,367.6
SSO Reduction/Elimination	Direct removal			100%	1.8		2,365.8
Total Pounds Phosphorus Removed						**530.4**	

BMP	How Credited	TP Efficiency	Units Available	Projected Participation	Potential TP Removed (lbs)	TP Removal (lbs) Already Implemented	TP Remaining (lbs)
Restoration Options							
Potential Future Credits							
Stream Restoration	Linear Foot	0.068 lbs/ft	55,377 ft	30%	1,071.5	319.3	975.0
Stream Restoration Under Construction/Design	Linear Foot	0.068 lbs/ft	8,000 ft	100%	516.0		459.0
2011 Fertilizer Use Act	Efficiency	22%	4,413 acres	100%	77.2		381.8
Projected Potential Future Total Pounds Phosphorus Removed					**2,514.4**		

*includes EPS trees and JFWA trees planted

Table 3-7: Current and Projected Sediment Reductions due to BMPs

BMP	How Credited	Sed Efficiency	Units Available	Projected Participation	Potential Sed Removed (lbs)	Sed Removal (lbs) Already Implemented	Sed Remaining (lbs)
Restoration Options							
Sediment to be Removed to meet the local TMDL 21.9% Reduction							390,986.4
Stormwater Management	Efficiency	Varies by Type	900.4 acres	NA	NA	100,395.9	290,590.5
Stormwater Retrofits	Efficiency	Varies by Type	2.3 acres	100%	1,244.1	8,305.1	281,041.3
Stormwater Management Conversions	Efficiency	Varies by Type	8 ponds	75%	32,853.5		248,187.8
Riparian Forest Buffers	Land use conversion +Efficiency	50%	224 acres	5%	1,446.4		246,741.4
Reforestation (PAAs & ISIs)	Land use conversion	Land use conversion	86 acres	40%	2,633.0	163.1	243,945.3
Stream Restoration	Linear Foot	2.55 lbs/ft	55,377 ft	30%	42,363.4	12,622.5	188,959.4
Stream Restoration Under Construction/Design	Linear Foot	2.55 lbs/ft	8,000 ft	100%	20,400		168,559.4
Downspout Disconnect	Efficiency	80%	169 acres	20%	19,247.9		149,311.5
Street Trees	Land Use Conversion	Land use conversion	9.5 acres	100%	723.3		148,588.2
Urban Nutrient Management	Efficiency	22%	1,230 acres	5%	0.0		148,588.2
Street Sweeping	Direct removal		49 miles	100%	34,875.0	15,321.0	98,392.2
Inlet Cleaning	Direct removal			100%		2,794.0	95,598.2

BMP	How Credited	Sed Efficiency	Units Available	Projected Participation	Potential Sed Removed (lbs)	Sed Removal (lbs) Already Implemented	Sed Remaining (lbs)
Restoration Options							
SSO Reduction/Elimination	Direct removal			100%	41.0		95,557.2
Total Pounds Sediment Removed					**295,429.2**		
Potential Future Credits							
Stream Restoration	Linear Foot	310 lbs/ft.	55,377 ft	30%	5,107,697.6	1,521,877.5	-6,534,017.9
Stream Restoration Under Construction/Design	Linear Foot	310 lbs/ft.	8,000 ft	100%	2,459,600.0		-8,993,617.9
Projected Potential Future Total Pounds Sediment Removed					**9,384,604.3**		

As shown by the above tables, the actions recommended by this SWAP will be sufficient to meet sediment reduction requirements required by the Bay nutrient TMDL, but insufficient to achieve nitrogen and phosphorus reductions. To address this deficiency, additional stormwater retrofit opportunities will need to be identified. Table 3-5 shows that an additional 4,537.2 lbs of nitrogen needs to be reduced to meet Bay TMDL requirements. Using loading rates from Table 3-1 and infiltration efficiencies from Table 3-3, the following equation was used to determine the that 356.3 acres of impervious area will need to be retrofitted, in addition to opportunities identified through the SWAP fieldwork, to meet the Bay TMDL for nitrogen, which is the limiting factor:

$$15.92 \text{ lbs N/yr} * X \text{ acres} * 80\% = 4{,}537.2 \text{ lbs N/yr}$$

CHAPTER 4

RESTORATION STRATEGY

4.1 Restoration Strategy Overview

An evaluation of each subwatershed in relation to ranking criteria is presented in this Chapter. Criteria were determined and are explained for the ranking methodology. Each criterion was selected because of its relation to one or several of the SWAP Goals. A score is associated with each criterion and then used to evaluate and rank the individual subwatersheds. This is a tool for targeting restoration actions by location/waterbody. A higher score has a higher priority. Some of the criteria are aimed at restoration needs and other criteria are focused on restoration potential.

The four Northeastern Jones Falls subwatersheds are also summarized individually in this section. A profile of the land characteristics is presented in table format along with a narrative description. These characteristics are only a select few from Appendix D titled Characterization Report. A Management Strategy particular to the subwatershed is discussed. This is divided into two categories: *Engaging Citizens & Watershed Groups* and *Municipal Actions and Responsibilities.* This is consistent with the format in the previous Chapter 3.

4.2 Subwatershed Prioritization

A ranking methodology was developed to prioritize subwatersheds in terms of restoration need and potential. Subwatersheds are represented by an overall prioritization score. The total prioritization score for a subwatershed is shown in Table 4-11 and is comprised of the following ranking criteria:

- Nitrogen Loads (lbs/acre/year)
- Phosphorus Loads (lbs/acre/year)
- Impervious Surfaces
- Neighborhood Restoration Opportunity/Pollution Source Indexes
- Neighborhood Lawn Fertilizer Reduction
- Neighborhood Downspout Disconnection
- Institutional Site Index
- Pervious Area Restoration
- Municipal Street Sweeping

- Stormwater Retrofits and Conversions
- Illicit Discharge Elimination
- Stream Corridor Improvements

4.2.1 Phosphorous and Nitrogen Load

Phosphorous and nitrogen loads were calculated for each subwatershed. The loads were calculated using data supplied by the Maryland Department of the Environment on per acre land use nitrogen and phosphorous loadings and the Chesapeake Bay Program Watershed Model 5.3.2. The method and results are summarized in the Characterization Report. For purposes of this prioritization, a higher phosphorous and nitrogen load was correlated with a higher priority for restoration in the subwatershed.

The following point system was used to assign nutrient load scores to the 4 subwatersheds based on the distribution and range of nutrient loads:

≥ 10.75 = 4 pts
10 – 10.74 = 3 pts
9.25 – 9.99 = 2 pts
8.5 – 9.24 = 1 pt

Table 4-1 below shows the nutrient loading scores for each subshed.

Table 4-1: Nitrogen and Phosphorus Load Scores

Subwatershed	Nitrogen Loading Rate (lbs/acre/yr)	Nitrogen Load Score	Phosphorus Loading Rate (lbs/acre/yr)	Phosphorus Load Score
Roland Run	11.04	4	0.87	4
Ruxton Run	11.22	4	0.71	3
Towson Run	10.78	4	0.93	4
Lake Roland Direct	8.77	1	0.57	1

4.2.2 Impervious Surfaces

The amount of impervious surface within a watershed has been correlated with degradation in water quality. Impervious surfaces prohibit stormwater from infiltrating through the soil and prohibit the natural filtration of pollutants. The Center for Watershed Protection (CWP) has created a model that predicts stream quality with the amount of impervious cover in the subwatershed. The model has four categories for sensitive, impacted, damaged and severely damaged stream systems. For purposes of this prioritization the impervious surfaces for each subwatershed were placed into the four categories outlined in the CWPs impervious cover model (Appendix D, Figure 2-10).

Table 4-2: Percent Impervious Scores

Subwatershed	% Impervious	% Impervious Score
Roland Run	25.7	3
Ruxton Run	16.3	2
Towson Run	29.2	3
Lake Roland Direct	14.1	2

4.2.3 Restoration Opportunity Index/Pollution Severity Index

The assessment for each neighborhood contains a scoring system that categorizes the neighborhood as high, medium or low for both restoration opportunities (ROI) and pollution sources (PSI). These scores were combined in the matrix format below and then used as evaluation criteria for the prioritization of the subwatersheds.

ROI / PSI	High	Med	Low
High	***High/High***	**High/Med**	*High/Low*
Med	**Med/High**	*Med/Med*	Med/Low
Low	*Low/High*	Low/Med	Low/Low-None

Subwatersheds with the most neighborhoods rated as high for both pollution severity and restoration potential received the highest score (4 points). Subwatersheds with a single neighborhood rated as high for both pollution severity and restoration received the second highest score (3 points). Subwatersheds with no neighborhoods rated as high for both PSI and ROI but with multiple neighborhoods rated as high or moderate for pollution severity and/or restoration potential were assigned the third highest score (2 points). Subwatersheds with only moderately rated neighborhoods for both pollution severity and restoration potential were assigned the lowest possible score (1 point). The number of neighborhoods associated with various PSI/ROI ratings and corresponding NSA PSI/ROI scores are summarized in the table below by subwatershed.

Table 4-3: Neighborhood PSI/ROI Scores

	# Neighborhoods for PSI/ROI Ratings						
Subwatershed	**High/High**	**High/Med**	**High/Low**	**Med/High**	**Med/Med**	**Med/Low**	**Score**
Roland Run	1	1	1	7	23	1	3
Ruxton Run	-	-	-	2	7	-	1
Towson Run	-	3	-	3	6	-	2
Lake Roland Direct	-	2	-	2	6	-	2

4.2.4 Neighborhood Lawn Fertilizer Reduction/Education

This category was selected from the Neighborhood Source Assessment to use in this prioritization because it has a quantitative pollution reduction efficiency related to the nutrient goals. Each neighborhood was evaluated as a pollution source for nutrients originating from

lawn fertilizer. If more than 20% of the homes showed that fertilizer reduction was warranted then it became a recommendation for the neighborhood. For this prioritization process, the percent of high maintenance lawns noted on the NSA field sheet was applied to the pervious acres associated with the respective neighborhood. This acreage was then divided by the total pervious acreage within the subwatershed. This normalized the acreage across the 4 subwatersheds. A ranking was then made between the subwatersheds and each received a priority score. Table 4-4 below shows these scores.

Table 4-4: Lawn Fertilizer Reduction Scores

Subwatershed	% Pervious Area Addressed	Score
Roland Run	21	2
Ruxton Run	31	3
Towson Run	21	2
Lake Roland Direct	24	2

4.2.5 Neighborhood Downspout Disconnection

This category was selected from the Neighborhood Source Assessment to use in this prioritization because the acres of impervious treated can be quantified and then related to the nutrient goals. Each neighborhood was evaluated as a pollution source for nutrients originating from rooftop runoff. A neighborhood in which 25% or more of the downspouts are feasible for disconnection/redirection scored for downspout disconnection/redirection as a recommended action. Feasible for disconnection was defined as downspouts either directly connected to the system or discharging to an impervious surface that leads into a storm drain inlet AND with at least 15 feet of usable pervious area to redirect the flow. For this prioritization process the impervious building acres associated with the neighborhoods with downspout disconnection as a recommended action were summed. Analysis of Roland Run data yielded an average of 66% potential for disconnection. This percentage was applied to all subsheds' impervious building acres to determine the impervious rooftop that could be addressed using downspout disconnection. This acreage was divided by the total acreage of impervious buildings within the subwatershed. This normalized the acreage across the 4 subwatersheds. A ranking was then made between the subwatersheds and each received a priority score. Table 4-5 below shows these scores.

Table 4-5: Downspout Disconnect Scores

Subwatershed	% Rooftop Area Addressed	Score
Roland Run	28	2
Ruxton Run	54	3
Towson Run	16	1
Lake Roland Direct	46	3

4.2.6 Institutional Site Investigation

Institutions offer a unique opportunity to complete restoration activities on large areas of land. Usually the institutions are located on campuses that include many natural resources. They also offer the opportunity to engage citizens in restoration activities. This has the added benefit of raising awareness at the same time.

There were no institutions assessed in the Lake Roland Direct subwatershed. The remaining three subsheds had both public and private institutions assessed in each. Scoring was therefore based on total number of institutions assessed in the subshed. Table 4-6 shows the ISI scores for each subshed.

Table 4-6: ISI Prioritization Scores

Subwatershed	# Public ISIs	# Private ISIs	Total # ISIs	ISI Scores
Roland Run	2	3	5	2
Ruxton Run	2	1	3	1
Towson Run	2	3	5	2
Lake Roland Direct	0	0	0	0

4.2.7 Pervious Area Restoration

The Pervious Area Assessment identified sites that were open space, not developed. The site assessment included parcel size, public vs. private ownership, existing forest or wetlands and the extent of invasive species if they were present. The sites that are not providing much habitat or water quality value are then targeted for planting. Almost all of the PAAs identified in this survey were open space needing only minimal site preparation. For purposes of this prioritization, sites that are in public ownership are given a greater score because of the greater likelihood that they can be converted to tree cover. Sites that are in private ownership and are open space frequently are being planned for future development or expansion of an existing facility. The acres of PAAs in public ownership were summed and then weighted by two to give them a higher score. The acres of PAAs in private ownership were then added to this number to give a total weighted acreage. The total weighted acreage was then divided by the total acres of the subwatershed to normalize the acreage across the 4 subwatersheds. The percent of land identified as PAA was very small for all the subwatersheds. The Table 4-7 below shows the actual acreages and score.

Table 4-7: PAA Prioritization Score

	Acres PAA Public	Weighted PAA Public (x2)	Acres PAA Private	Total weighted acres	% acres per subshed acres	Score
Roland Run	54.5	109	7	116	.03	3
Ruxton Run	0	0	0	0	0	0
Towson Run	0	0	15	15	.008	2
Lake Roland DD	1.5	3	2	5	.006	1

4.2.8 Hotspot Site Index

Stormwater "hot spots" are commercial or industrial operations that produce higher levels of storm water pollutants, and/or present a higher potential risk for spills, leaks or illicit discharges into the storm water system. Stormwater hotspots are classified into four types of operations: commercial, industrial, municipal and transport-related. The Hot Spot Investigation is used to evaluate the potential of these types of facilities to contribute contaminated runoff to the storm drain system or directly to receiving waters. Sites were classified into four initial hotspot status categories: Not a hotspot, potential hotspot, confirmed hotspot or severe hotspot. These stormwater facilities may need further investigation or possibly need compliance with Maryland's NPDES general discharge permit. A training program for these operations may be helpful to reduce the likelihood that these operations become a source for water contamination. Only the Roland Run subwatershed was found to have possible hot spots and therefore received a prioritization score for this category.

4.2.9 Municipal Street Sweeping

Baltimore County provides street sweeping services throughout its jurisdiction. Street sweeping immediately removes sediment and trash from the stream system network. As part of the Neighborhood Source Assessment, street sweeping is identified as a recommended action for neighborhoods exhibiting trash and organic matter within the curb and gutter. For purposes of this prioritization, the miles of road in neighborhoods where street sweeping was identified as a recommended action were summed. These miles were then summed for each subshed, the sum for each subshed was ranked and placed into four categories. The subsheds with more miles of road received a higher prioritization score as these subsheds would receive a higher benefit from increased municipal street sweeping. Table 4-8 details the street sweeping prioritization scores.

Table 4-8: Street Sweeping Scores

Subwatershed	Miles of Road Addressed	Street Sweeping Score
Roland Run	16.87	3
Ruxton Run	2.78	1
Towson Run	17.08	2
Lake Roland Direct	5.22	1

4.2.10 Municipal Stormwater Conversions and New Stormwater Retrofits

An evaluation of potential stormwater projects was conducted. The evaluation included both conversions of existing ponds and the feasibility of building new retrofit facilities. Baltimore County has a database on all of its stormwater management facilities, which includes information on the types of facility as well as drainage area and other details. The existing stormwater facilities that were classified as dry detention ponds were field assessed for their suitability for conversion to a facility that provides greater water quality benefits.

As part of the upland assessment, neighborhoods and institutions can be recommended for new storm water retrofits. Each of these assessments concluded with a list of potential stormwater facility projects. The results of the pond conversion assessments are located in Appendix D, Tables 3-17, 3-21 and 3-22. All eight potential pond conversions and 3 of the 4 potential retrofit

projects were located in the Roland Run subwatershed. Ranges for scoring were set up using number of opportunities as follows: 0-3: 1 point, 4-6: 2 points, 7-9: 3 points, >9: 4 points.

4.2.11 Illicit Discharge Data

Baltimore County has separate sanitary sewer and stormdrain systems. However, the potential exists in all municipal stormdrain systems for pipes to leak into one another or to have pipes incorrectly connected. There are also situations where private property owners have connected into the public system without approval. Baltimore County conducts a screening of outfall pipes to identify these illicit connections. A summary of the outfall monitoring data is discussed in the *Northeastern Jones Falls Characterization Report* (Appendix D, 3.2.3). The outfall data values are prioritized into four categories: no data, low, high or critical priority. Table 4-9 shows the results for the scoring.

Table 4-9: Baltimore County Storm Drain Outfall Prioritization Results

Subwatershed	Outfall Priority Rating				Illicit Discharge Data Score
	Critical	High	Low	None	
Roland Run	0	9	18	0	**3**
Ruxton Run	0	0	0	0	**0**
Towson Run	0	1	3	0	**2**
Lake Roland Direct	0	1	1	0	**1**

4.2.12 Stream Buffer Improvement

Forested buffer areas along streams play a crucial role in improving water quality and flood mitigation since they can reduce surface runoff, stabilize stream banks, trap sediment, and provide habitat for various types of terrestrial and aquatic life including fish. Maintaining healthy streams and forest buffers are important for reducing nutrient and sediment loadings to the Baltimore Harbor and to the Chesapeake Bay. When stream buffers are converted from forest to developed areas, many of these benefits are lost and stream health declines. Inadequate stream buffers (less than 50 feet wide) were the most commonly observed environmental problem within the Jones Falls stream corridor assessment area. Riparian buffer zones can be re-established or preserved as a BMP to reduce land use impacts by intercepting and controlling pollutants entering a water body.

In the *Northeastern Jones Falls Characterization Report*, the condition of the 100-foot stream buffer was analyzed on either side of the stream system (Table 2-7). Three conditions were used to classify stream buffer conditions: impervious, open pervious, or forested. For each subwatershed, acreages and percentages of stream buffer area were determined for these three conditions. Open pervious areas (e.g., mowed lawns) represent the greatest potential for stream buffer reforestation. Therefore, the percentages of open pervious buffer area were used to prioritize restoration potential among subwatersheds. Subwatersheds with greater percentages of open pervious buffer areas denote the greatest potential for stream buffer improvement and were scored the highest.

Open pervious buffer area percentages range from approximately 15 to 60%. The following point system was used to assign stream buffer improvement scores to the 4 subwatersheds based on the distribution and range of open pervious buffer area percentages:

≥ 80% = 4 pts
60 – 79% = 3 pts
30 – 59% = 2 pts
10 – 29% = 1 pt
< 10% = 0 pts

Table 4-10 below shows the stream buffer scores for each subshed.

Table 4-10: Stream Buffer Improvement Scores

Subwatershed	% Open Pervious in Stream Buffer Area	Stream Buffer Improvement Score
Roland Run	23	1
Ruxton Run	31	2
Towson Run	15	1
Lake Roland Direct	60	3

4.2.13 Stream Corridor Assessment

Stream corridor assessments were conducted in only 2 of the 4 subwatersheds so this was not used in the scoring process, but will be used to identify restoration projects.

4.2.14 Subwatershed Prioritization Summary

The subwatershed restoration prioritization scoring and ranking results are displayed below in Table 4-11.

Table 4-11: Subwatershed Restoration Prioritization Scoring and Ranking Results

Subwaterhsed	Phosphorous Load	Nitrogen Load	% Impervious	ROI/PSI Index	NSA – Lawn Fertilizer Reduction	NSA – Downspourt Disconnection	HSI Index	PAA Index	Street Sweeping	Stormwater Retrofits & Conversions	Illicit Connection Potential	Stream Corridor Improvements	Total Score	Subwatershed Rank
Roland Run	4	4	3	3	2	2	1	3	3	4	3	1	33	1
Ruxton Run	3	4	2	1	3	3	0	0	1	1	0	2	20	3
Towson Run	4	4	3	2	2	1	0	2	2	0	2	1	23	2
Lake Roland Direct	1	1	2	2	2	3	0	1	1	0	1	3	17	3

The subwatersheds were prioritized into three categories: very high priority, high priority, and medium priority. The results are mapped in Figure 4-1. While restoration activities will have to occur throughout the Northeastern Jones Falls in order to meet the environmental goals, the subwatershed prioritization provides information on where the initial focus should be located.

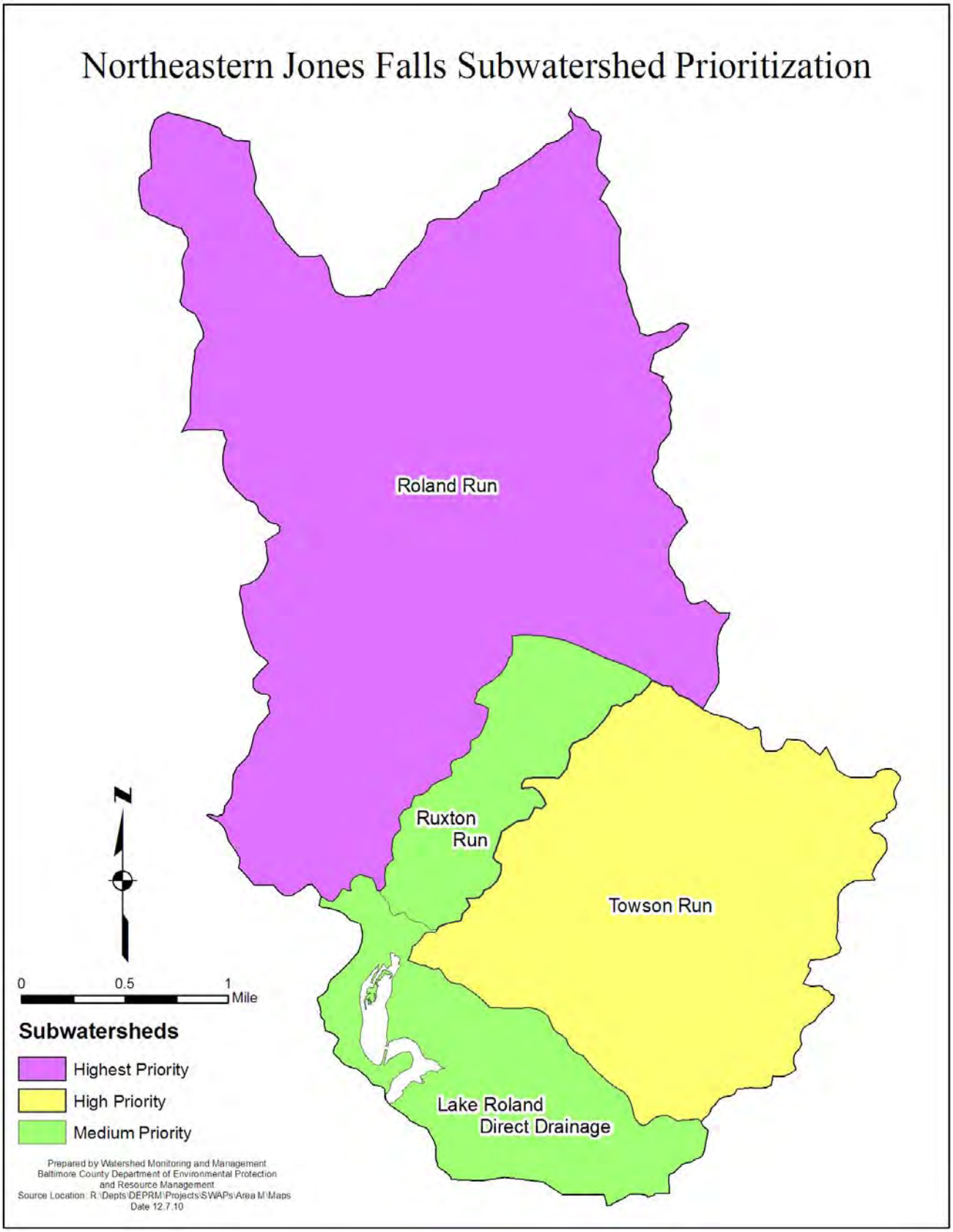

Figure 4-1: Subwatershed Prioritization Based on Scoring

4.3 Subwatershed Overviews

Subwatershed strategies are presented in this section with the subwatersheds arranged in alphabetical order. An initial table for each subwatershed presents basic profile information, including drainage area, stream length, land use, impervious cover, soils, and stormwater management.

At the end of each subwatershed overview, the management strategy for that subwatershed is defined through a series of recommendations for citizen actions and municipal actions. A map showing the location of restoration opportunities follows the recommendations.

Note that subwatershed boundaries were not used to designate neighborhood boundaries so some neighborhoods may cross into more than one subwatershed. Neighborhood Source Aseessments (NSAs) with minimal areas (< 1 acre) within a subwatershed will be discussed in the subwatershed section where the majority of the neighborhood's land lies. If large areas of a neighborhood are located in multiple subwatersheds, it will be discussed in each subwatershed section where it is represented.

4.3.1 Lake Roland Direct Drainage

Subwatershed Description

Lake Roland Direct Drainage is an 817-acre subwatershed that sits directly north of the Baltimore City border and has streams that flow directly to Lake Roland. Streams flow northwest toward Lake Roland, which also receives drainage from the rest of the Northeastern Jones Falls watershed from the North. This subwatershed contains the intersections of Charles St. with Bellona Avenue, Woodbrook Lane and Stevenson Lane. The easternmost section of the subwatershed contains the western edge of Rogers Forge. Twenty-eight percent of the stream buffer is forested. Table 4-12 presents basic information on the subwatershed.

Table 4-12: Basic Profile of Lake Roland Direct Drainage Subwatershed

Drainage Area	• 817 acres (1.3 mi^2)	
Stream length	• 5.5 miles	
Major Land Use Types	• Low-Density residential (38%) • Med-Density Residential (16%) • High-Density Residential (8%)	• Open Urban (8%) • Forested/Wetlands (25%) • Other (5%)
Impervious Cover	• 14% of subwatershed	
Soils	• A Soils – 0% • B Soils – 43%	• C Soils – 46 % • D Soils – 10%
Stormwater management	• 3% of subwatershed is treated by stormwater management	

Neighborhood Assessments

Seven distinct neighborhoods were identified and assessed within the subwatershed as part of the *Unified Subwatershed and Site Reconnaissance*. Pollution prevention opportunities to address stormwater volume and pollutants include downspout disconnection, storm drain stenciling, and fertilizer education.

There are 29.2 impervious building acres in the neighborhoods where simple downspout redirection is recommended in Lake Roland Direct Drainage, simple disconnection meaning redirecting the downspout to a pervious area. Based on an average 88% potential for

disconnection in the subwatershed, 25.7 impervious building acres could potentially be disconnected from the storm drain system. Table 4-5 shows a summary of neighborhood recommendations. Figure 4-2 can be used along with Table 4-13 to locate the neighborhood restoration opportunities geographically.

Table 4-13: Summary of Neighborhood Assessment Recommendations in Lake Roland Direct Drainage

Neighborhood Site ID	Avg Lot Size (acres)	% Opportunity for Downspout Disconnection	Simple Downspout Redirection	Rain Barrels	Rain Gardens	Stormdrain Marking	Bayscape	Increase Lot Canopy	Fertilizer Education	Lot/Alley SW Retrofit	Buffer Enhancement	Street Sweeping	# Street Trees	# Shade Trees	Notes
M_38	3/4	90	X	X	X	X		X	X			X	0	0	
M_44	<1/8	70	X	X					X				50	0	See PAA-M-401
M_46	1/2	100	X	X		X	X	X	X			X	40	0	street trees on stevenson
M_47	1/4	90	X		X	X	X	X	X				0	0	
M_48	<1/8	85		X		X			X				0	100	
M_49	1/2	80	X		X	X		X	X				0	0	
M_55	1/4	100	X		X	X			X			X	0	0	

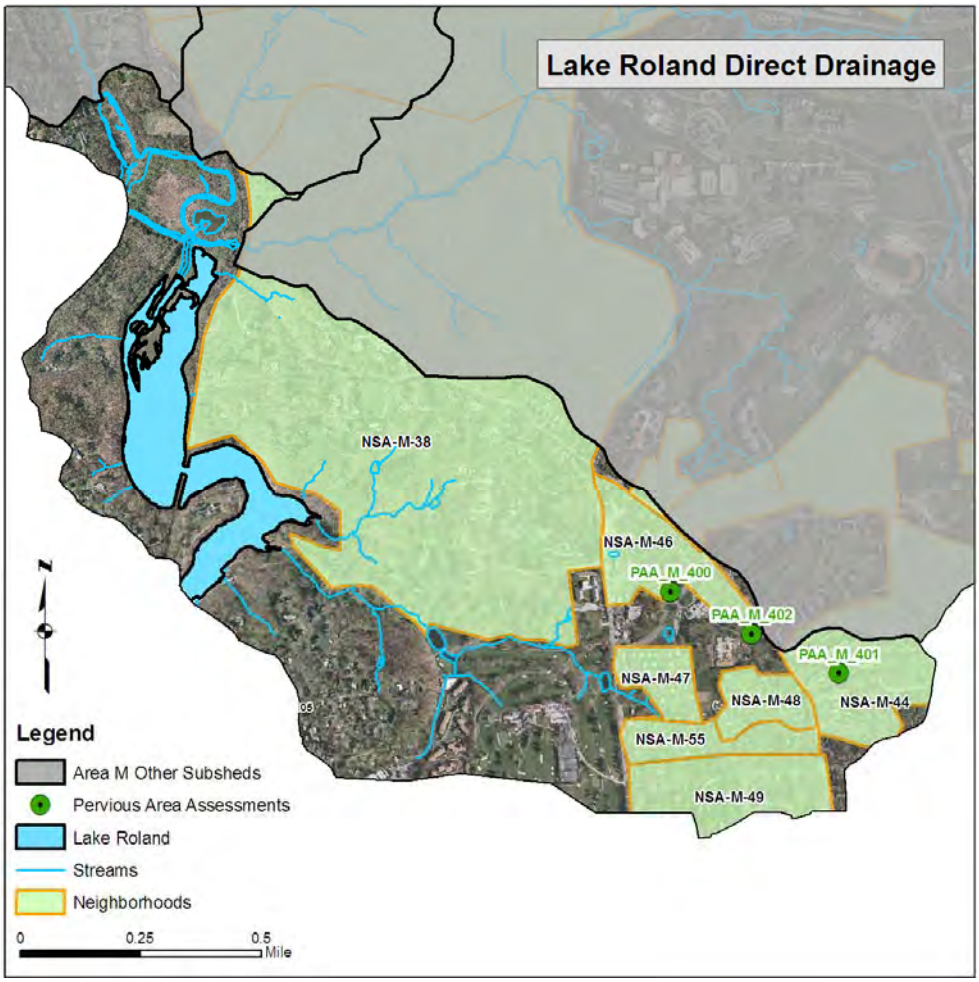

Figure 4-2: Lake Roland Direct Drainage

Hot Spot Assessment

There were no hot spots assessed in the Lake Roland Direct Drainage subwatershed.

Institutional Site Assessment

There were no institutional areas assessed in the Lake Roland Direct Drainage subwatershed.

Stream Assessment

There were no stream assessments performed in the Lake Roland Direct Drainage subwatershed.

Illicit Discharges

Lake Roland Direct Drainage has one high priority outfall and one low priority outfall. See section 3.2.3 of the *Northeastern Jones Falls Characterization Report* (Appendix D) for more details. Baltimore County will continue with their Illicit Discharge Detection and Elimination program to eliminate these discharges.

Stormwater Retrofits and Pond Conversions

There were no retrofit or pond conversion opportunities identified in Lake Roland Direct Drainage.

Pervious Area Restoration

Table 4-14 and Figure 4-2 show the three possible pervious area restoration sites identified during the assessment. Pervious area restoration has the potential to convert areas of turf, sometimes a relatively high nutrient input land use, to forest, which can absorb rather than shed nutrients.

Table 4-14: Summary of Pervious Area Recommendations in Lake Roland Direct Drainage

Site	Location	Description	Size (acres)	Ownership
PAA-M-400	Haddon & Stevenson	Vacant lot	0.5	Private
PAA-M-401	Dunkirk & Bellona	Park	1.5	Public
PAA-M-402	6806 Bellona	Open Pervious	1.5	Private

Subwatershed Management Strategy

Implementation recommendations for the Lake Roland Direct Drainage subwatershed are as follows:

Engaging Citizens & Watershed Groups

1. Conduct downspout disconnection in each of the seven neighborhoods. Most of the lots in NSA-M-48 do not have room for downspout re-direction so rain barrels are recommended. All neighborhoods here have good potential for re-direction.
2. Address buffer encroachment in NSA-L-186 by increasing tree canopy and establishing no-mow areas where possible.
3. Investigate the PAAs further for tree-planting possibilities. Plant street trees in NSA-M-44 and 46 and encourage residential tree planting to expand lot canopies in NSA-M-38, 46, 47 and 49.
4. Engage citizens in a storm drain marking program and educate citizens about fertilizer.

Municipal Actions

1. Implement or increase street sweeping in M-38, 46 and 55.

4.3.2 Roland Run

Subwatershed Description

The Roland Run subwatershed is the largest in the Northeastern Jones Falls SWAP area. The stream system begins at the Maryland State Fairgrounds in the northeast and at the Baltimore Country Club in the northwest and flows in a southerly direction under Seminary Avenue and I-695 toward Lake Roland. Twenty-three % of the stream buffer is forested.

Table 4-15 displays basic information on Roland Run.

Table 4-15: Basic Profile of Roland Run Subwatershed

Drainage Area	• 3,822 acres (6.0 mi^2)	
Stream length	• 22.9 miles	
Major Land Use Types	• Low-Density residential (20%) • Med-Density Residential (41%) • High-Density Residential (6 %)	• Forested (7%) • Commercial/Industrial (14%) • Institutional/Open Urban (8%) • Other (4%)
Impervious Cover	• 25.7% of subwatershed	
Soils	• A Soils – 10% • B Soils – 64 %	• C Soils – 16% • D Soils – 10%
Stormwater Management	• 18% of subwatershed is treated by stomwater management	

Neighborhood Assessment

Thirty-five distinct neighborhoods were identified and assessed within the subwatershed as part of the *Unified Subwatershed and Site Reconnaissance*. Pollution prevention opportunities to address stormwater volume and pollutants include downspout disconnection, bayscaping, storm drain marking, tree planting and public education (i.e. nutrient management).

There are 149.5 impervious building acres in neighborhoods where downspout disconnection is recommended in Roland Run. Based on an average of 66% potential for disconnection, 98.7 impervious building acres could potentially be disconnected from the storm drain system. Table 4-16 shows a summary of neighborhood recommendations.

It is also worth noting that several neighborhoods in this subwatershed showed residents encroaching on county owned stream buffer area. These were reported to Baltimore County EPSs Environmental Impact Review (EIR). An EIR representative responded that since the land is a Department of Public Work's (DPW) drainage and utility easement and not an EPS easement, there is little that can be done internally. Follow up inquiries to DPW regarding these encroachments is recommended. Figure 4-3 can be used along with Table 4-16 to locate the neighborhood restoration opportunities geographically.

Table 4-16: Summary of Neighborhood Assessment Recommendations in Roland Run

Neighborhood Site ID	Avg Lot Size (acres)	% Opportunity for Downspout Disconnection	Simple Downspout Redirection	Rain Barrels	Rain Gardens	Stormdrain Marking	Bayscape	Increase Lot Canopy	Fertilizer Education	Lot/Alley SW Retrofit	Buffer Impact	Street Sweeping	# Street Trees	# Shade Trees	Notes
M-01	1	100	X		X	X			X				0	0	
M-02	1/4	15			X	X	X	X	X				0	10	
M-03	multifam	0		X		X	X		X	X		X	0	0	
M-04	1/4	5		X	X	X	X	X	X				0	0	
M-05	1/4	45	X		X		X	X					100	0	
M-06	<1/4	50		X		X	X						0	0	
M-07	1/4	60	X		X	X	X	X	X				0	0	
M-08	1/2	50	X		X	X	X	X	X				0	0	
M-09	1	85	X		X	X	X	X	X				0	0	
M-10	1/4	65	X	X		X	X	X	X		X		100	100	
M-11	1/4	30	X			X	X	X	X		X		0	100	county owned buffer impacted
M-12	<1/4	25				X	X	X	X		X		100	0	county owned buffer impacted
M-13	1/4	60	X				X	X	X		X	X	100	0	invasive removal
M-14	1/4	60	X		X		X		X		X	X	100	0	county owned buffer impacted
M-15	<1/4	50	X	X		X	X	X			X	X	50	0	
M-16	1/4	50	X	X			X	X					0	0	
M-17	1/4	45	X		X	X	X	X	X				0	0	
M-18	1/4	60	X		X	X	X	X					0	0	
M-19	multifam	95		X		X	X		X	X			0	15	
M-20	1/4	55	X	X		X	X	X	X		X	X	0	0	clogged storm drain
M-21	1/4	25		X		X	X	X				X	40	0	
M-22	<1/4	48	X	X		X	X	X					0	0	
M-23	<1/4	50	X	X		X	X	X			X		60	0	stream restoration here
M-24	1/4	25	X		X	X	X		X			X	0	0	
M-26	1/2	50	X		X	X	X	X	X				0	0	
M-27	>1	50			X	X	X		X		X		0	0	invasives, stream buffer is a mess
M-28	<1/4	95	X		X	X	X						0	0	
M-29	1	75	X		X	X			X		X	X	0	0	clogged storm drains
M-30	>1	60	X		X	X			X		X		0	0	
M-32	<1/4	100	X	X		X			X			X	0	0	
M-34	>1	85	X		X	X	X		X		X	X	0	0	yard waste dumping
M-35	1/4	80	X	X			X	X	X		X		0	0	
M-37	1/4	65		X		X			X			X	10	0	paint dumped in storm drain
M-54	>1	?			X	X	X	X	X				0	0	

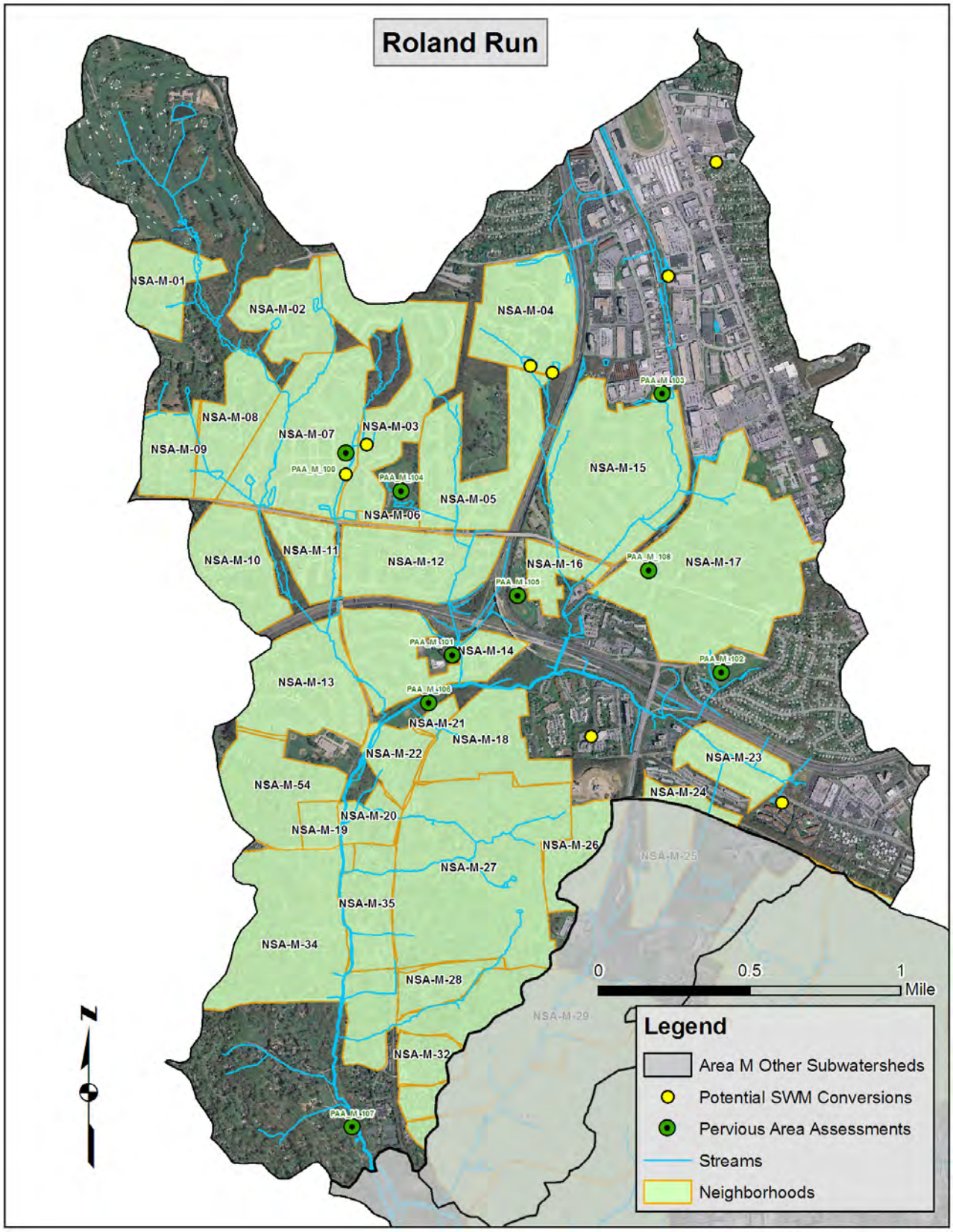

Figure 4-3: Roland Run

Storm drain clogged with sediment in NSA-M-20

Hot Spot Assessment

There were three sites assessed in Roland Run for hot spot status. Table 4-17 below summarizes these hot spot investigation results.

Table 4-17: Summary of Hot Spot Results in Roland Run

Status	Site ID	Description	Potential Sources of Pollution					
			Vehicle Operations	Outdoor Storage Materials	Waste Management	Physical Plant	Turf/Landscaping	Stormwater Management
Confirmed	HSI-M-100	Carry-out		X	X			
Severe	HSI-M-101	Fairgrounds		X	X			
Potential	HSI-M-102	Automotive	X	X	X			

Polluted runoff at fairgrounds, HSI-M-101, after State Fair

Institutional Site Assessment

There were five institutional areas assessed in the Roland Run subwatershed. Results of the assessment are shown in Table 4-18.

Table 4-18: Summary of Recommendations for Institutions in Roland Run

Site ID	Name of Site	Public/ Private	Greening Opportunities						
			Nutrient Management Req?	Tree Planting (#)	Stormwater Retrofit	Downspout Disconnection	Impervious Cover Removal	Trash Management	Notes
ISI_M_100	Riderwood Elementary School	Public	Y	75					clogged storm drain and erosion
ISI_M_101	Lutherville Elementary School	Public	Y	50	X				improve existing rain garden
ISI_M_102	Grace Evangelical Lutheran Church	Private	N	100	X	X			retrofit for parking lot
ISI_M_103	Church of the Good Shepherd	Private	N	7					
ISI_M_104	Kingdom Hall of Jehovah's Witnesses	Private	N	20	X	X			Retrofit curb cut, buffer improvement

Stream Assessment

There were 56 problems identified in the 5.5 miles of stream assessed by field crews in the Roland Run subwatershed. Table 4-19 summarizes the results of the assessment. See section 3.3 of the *Northeastern Jones Falls Characterization Report* (Appendix D) for more details.

Table 4-19: Summary of Assessed Stream Conditions in Roland Run

Channel Alteration Sites	Erosion Sites	Fish Barrier	Inadequate Buffer Sites	Pipe Outfall	Exposed Pipe	In Stream Construction	Trash Dumping	Total
1	11	11	10	19	4	0	0	**56**

Length of Erosion (ft)	Length of Inadequate Buffer (ft)
8,906	11,637

Illicit Discharges

Roland Run has nine high priority outfalls and 18 low priority outfalls. See section 3.2.3 of the *Northeastern Jones Falls Characterization Report* (Appendix D) for more details. Baltimore County will continue with their Illicit Discharge Detection and Elimination program, seeking to eliminate these discharges.

Stormwater Retrofits

There were five retrofit opportunities identified in Roland Run. Table 4-20 shows these retrofits.

Table 4-20: Summary of Retrofit Opportunities in Roland Run

Site	Approx. Impervious Drainage Area (ac)	Description/Classification
NSA_M_03	0.8	parking lot retrofit in multi-family development
NSA_M_19	0.05	parking lot retrofit in multi-family development
ISI_M_101	0.3	curb cuts/lot retrofit to drain to existing(?) rain garden
ISI_M_102	0.7	bioretention strip for lot drainage
ISI_M_104	0.2	bioretention to treat runoff from curb cut

Stormwater Pond Conversions

All eight of the ponds identified for conversion in the SWAP exist in the Roland Run subwatershed. Table 4-21 shows these ponds, their drainage areas and priorities. See section 3.7.1 of the *Northeastern Jones Falls Characterization Report* (Appendix D) for an explanation of the prioritization methodology.

Table 4-21: Summary of SWM Pond Conversion Opportunities in Roland Run

Pond #	Drainage Area (ac)	Priority	Ownership
112	36.2	Medium	Public
113	17.5	High	Public
124	2.2	High	Private
126	3.2	High	Private
630	10.0	High	Private
771	91.2	Medium	Private
966	3.1	High	Private
1797	133.2	Medium	Public

Pervious Area Restoration

Table 4-22 shows nine possible pervious area restorations identified during the assessment. Pervious area restoration has the potential to convert areas of turf, sometimes a relatively high nutrient input land use, to forest, which can contribute significantly less nutrients.

Table 4-22: Summary of Pervious Area Recommendations in Roland Run

Site	Location	Description	Size (acres)	Ownership
PAA_M_100	Marburg Manor and Fairbanks	buffer area and open field	3	Public
PAA_M_101	Jeffers Rd.	open field next to dry stream bed	1.5	Public
PAA_M_102	Bellona and Lincoln	ballfields but areas for planting	13	Public
PAA_M_103	End of Greenspring Dr.	buffer area next to BGE station	2.5	Private
PAA_M_104	Wellington Valley Way	ballfields but areas for planting	13	Public
PAA_M_105	Burton Ave.	athletic fields but areas for planting	10	Public
PAA_M_106	Essex Farm Rd.	stream buffer area	10	Public
PAA_M_107	Circle Rd and Roland Run Rd.	city owned buffer area	4	Public
PAA_M_108	Seminary Ave. and Front Ave.	large open area	4.5	Private

PAA-M-100

Subwatershed Management Strategy

Engaging Citizens & Watershed Groups

1. Conduct downspout disconnection programs in each off the six neighborhoods with 85% or more potential for disconnection.
2. Increase tree canopies on private lots by educating citizens in the 22 neighborhoods recommended for lot canopy improvement on the benefits of trees.
3. Plant street trees in 10 neighborhoods where recommended.
4. Engage citizens in a storm drain marking program and conduct stenciling activities in all neighborhoods where recommended. This activity could be paired with street tree planting.
5. Reduce buffer encroachment by planting trees and establishing no-mow areas in 14 neighborhoods listed in Table 4-16 for 'buffer impact', especially the county owned buffers being mowed.
6. Educate residents on proper fertilizing techniques in 26 neighborhoods indicated in Table 4-16.
7. Further investigate institutions listed in Table 4-19 for tree planting and downspout disconnection possibilities.
8. Pursue tree planting opportunities at the pervious areas listed in Table 4-11, beginning with the largest acreages on public land.

Municipal Actions

1. All three hot spots have been investigated further since the initial assessment and resolutions to noted problems are either complete or pending.
2. Further investigate the possibility of implementing the five retrofits listed in Table 4-20 beginning with the largest drainage areas first.
3. Investigate street sweeping routes and opportunities for increased sweeping frequency in 12 neighborhoods listed in Table 4-16 under 'street sweeping'.
4. Further investigate inadequate buffer and erosion sites indicated in the stream corridor assessment for buffer plating and stream restoration opportunities.
5. Complete feasible pond conversions listed in Table 4-21.

4.3.3 Ruxton Run

Subwatershed Description

Ruxton Run flows in a southwesterly direction beginning south of the Joppa Road and Charles Street intersection. From here, it flows through Blakehurst Retirement Community, through Loyola Blakefield High School and then Baltimore County Department of Education property before it passes through a culvert under Charles Street. From this culvert the stream flows through private residential lots including the neighborhood of Malvern before flowing under Bellona Avenue and onto Baltimore City property and into Lake Roland. Thirty-six% of the Ruxton Run stream buffer is forested. Table 4-23 presents basic information on Ruxton Run.

Table 4-23: Basic Profile of the Ruxton Run Subwatershed

Drainage Area	• 472 acres (0.7 mi^2)	
Stream length	• 3.8 miles	
Land Use	• Low-Density residential (58%) • Med-Density Residential (12%) • High-Density Residential (0%)	• Forested (4%) • Institutional (15%) • Open Urban (11%)
Current Impervious Cover	• 16.3% of subwatershed	
Soils	• A Soils – 0% • B Soils – 75%	• C Soils – 17% • D Soils – 8%
Stormwater Management	• 8% of the watershed is treated by stormwater facilities	

Neighborhood Assessment

Seven distinct neighborhoods were identified and assessed within the subwatershed as part of the *Unified Subwatershed and Site Reconnaissance*. Pollution prevention opportunities to address stormwater volume and pollutants include storm drain marking, downspout disconnection, rain gardens and fertilizer education.

Neighborhood NSA-M-29 has multiple restoration opportunities including invasive removal, in – stream pond removal and buffer planting. Table 4-24 shows a summary of neighborhood recommendations. Figure 4-4 can be used along with Table 4-24 to locate the neighborhood restoration opportunities geographically.

In-stream private pond in NSA-M-29

Table 4-24: Summary of Neighborhood Assessment Recommendations in Ruxton Run

Neighborhood Site ID	Avg Lot Size (acres)	% Opportunity for Downspout Disconnection	Simple Downspout Redirection	Rain Barrels	Rain Gardens	Stormdrain Marking	Bayscape	Increase Lot Canopy	Fertilizer Education	Lot/Alley SW Retrofit	Buffer Enhancement	Street Sweeping	# Street Trees	# Shade Trees	Notes
M_25	¼	50	X		X	X	X	X	X				0	0	
M_26	½	50	X		X	X	X	X	X				0	0	
M_29	1	75	X		X	X			X		X	X	0	0	Invasive removal, sediment in gutters
M_30	>1	60	X		X	X			X		X		0	0	Ivy removal, gutter debris
M_32	<1/4	100	X	X		X			X			X	0	0	
M_36	¼	80	X	X		X	X	X	X		X	X	30	0	Minor buffer encroachment
M_38	1	90	X	X	X	X		X	X			X	0	0	

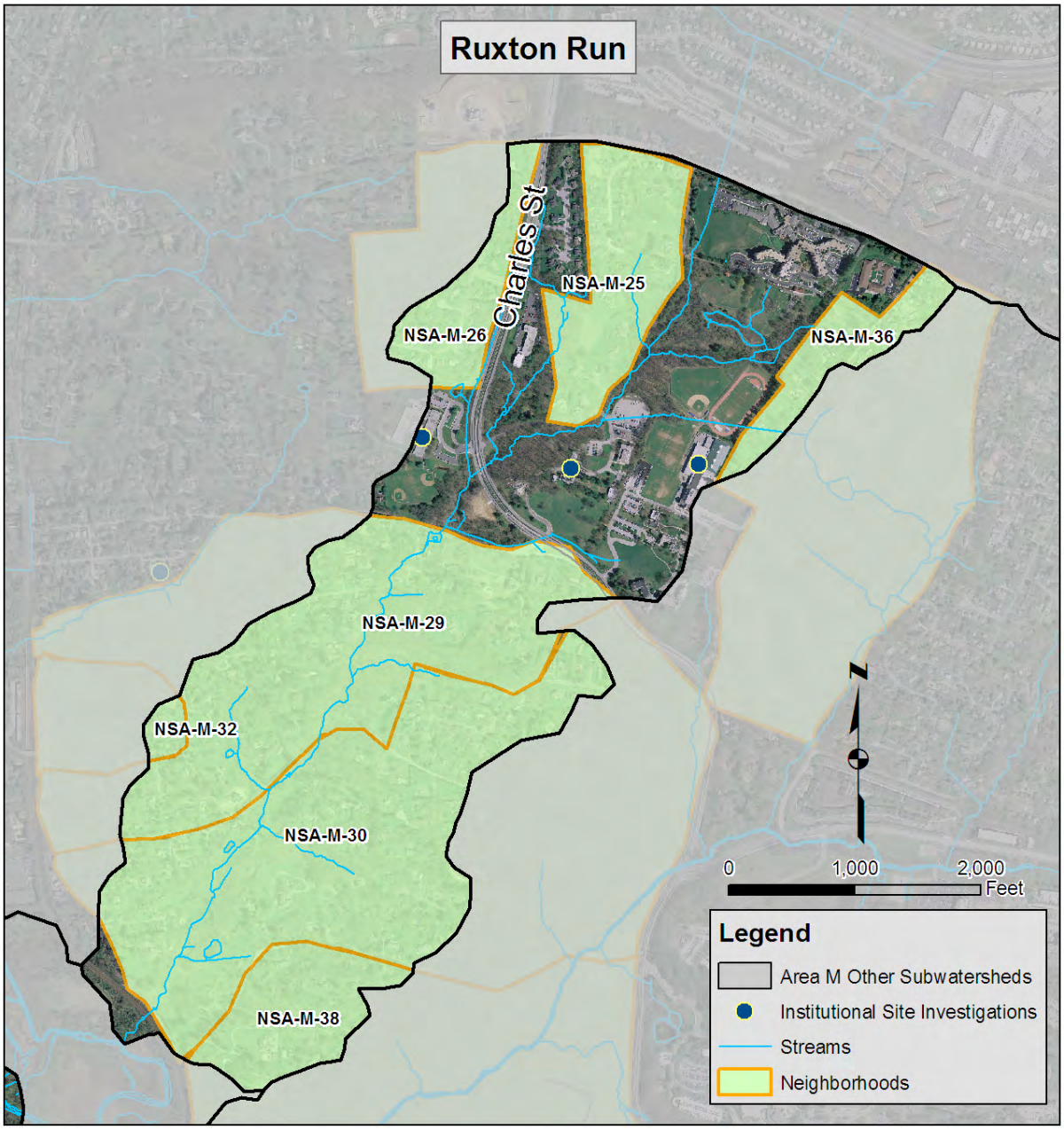

Figure 4-4: Ruxton Run

Hot Spot Assessment

There were no hot spot investigations performed in Ruxton Run.

Institutional Site Assessment

There were three institutional site assessments performed in Ruxton Run. Results of these assessments are shown in Table 4-25.

Table 4-25: Summary of Recommendations for Institutions in Ruxton Run

Site ID	Name of Site	Public/ Private	Greening Opportunities						
			Nutrient Management Req?	Tree Planting (#)	Stormwater Retrofit	Downspout Disconnection	Impervious Cover Removal	Trash Management	Notes
ISI_M_200	Ridge Ruxton School*	Public	Y	*	*	*	*	*	Poor sediment control for construction reported to sediment control
ISI_M_201	Baltimore County Board of Education	Public	Y	100+		X			Invasive removal
ISI_M_202	Loyola Blakefield High School	Private	Y	100+	X	X			Invasive removal, cleat washers drain sediment to SD system

*this site was inaccessible due to heavy construction and should be revisited at a later date

Stream Assessment

There were 38 problems identified in the 3.8 miles of stream assessed by field crews in the Ruxton Run subwatershed. Table 4-26 summarizes the results of the assessment. See section 3.3 of the *Northeastern Jones Falls Characterization Report* (Appendix D) for more details.

Table 4-26: Summary of Assessed Stream Conditions in Ruxton Run

Channel Alteration Sites	Erosion Sites	Fish Barrier	Inadequate Buffer Sites	Pipe Outfall	Exposed Pipe	In Stream Construction	Trash Dumping	Total
2	7	8	4	15	2	0	0	**38**

Length of Erosion (ft)	Length of Inadequate Buffer (ft)
2,973	3,228

Illicit Discharges

At this point Baltimore County has no outfalls sampled in the Ruxton Run subwatershed that are classified as priority 1, 2 or 3. See section 3.2.3 of the *Northeastern Jones Falls Characterization Report* (Appendix D) for more details. Baltimore County will continue with their Illicit Discharge Detection and Elimination program to eliminate these discharges.

Stormwater Pond Conversions

There were no pond conversion or retrofit opportunities identified in Ruxton Run. Note that all pond conversions identified by this SWAP are located in Roland Run.

Stormwater Retrofits

There was one potential retrofit identified at the Loyola Blakefield High School. A stormwater facility could be installed to treat the runoff from the parking lot at the eastern end of the property with an estimated impervious drainage area of 0.5 acres.

Pervious Area Restoration

There were no pervious areas assessed in the Ruxton Run subwatershed.

Subwatershed Management Strategy

Engaging Citizens & Watershed Groups

1. Implement downspout disconnection in all neighborhoods assessed in Ruxton Run as indicated in Table 4-24. Further investigate rain garden potential in neighborhoods listed.
2. Provide lawn care education all neighborhoods assessed in Ruxton Run as all are indicated in Table 4-24 as needing nutrient management. Work with homeowners in these neighborhoods to reduce the amount of chemicals applied to their lawn and other pollution prevention measures.
3. Further investigate buffer improvement possibilities in neighborhoods identified in Table 4-24 and inadequate buffers identified through the Stream Corridor Assessment.
4. Engage citizens in a storm drain marking program and conduct marking activities in all assessed neighborhoods in Ruxton Run as indicated in Table 4-24.
5. Investigate tree planting opportunities at ISIs 201 and 202. There are also potential downspout disconnection and invasive removal opportunities here.

Municipal Actions

1. Make follow up visits to erosion sites identified through the Stream Corridor Assessment to investigate potential for stream restoration.
2. Investigate street sweeping routes and potential for increased sweeping in neighborhoods indicated in Table 2-24.
3. Evaluate the feasibility of the parking lot retrofit at Loyola Blakefield High School.

4.3.4 Towson Run

Subwatershed Description

Drainage from the Towson Run subwatershed flows east-southeast from York Road toward Lake Roland. The subwatershed includes a significant portion of downtown Towson, several institutional sites and residential neighborhoods. The campuses of Towson University, Greater Baltimore Medical Center (GMBC) and Sheppard Pratt hospitals all drain to Towson Run. The mainstem of the stream flows along Towsontown Boulevard and under the intersection of Towsontown and Charles Streets. Table 4-27 presents basic information on Towson Run.

Table 4-27: Basic Profile of Towson Run Subwatershed

Drainage Area	• 1,846 acres (2.9 mi^2)
Stream length	• 11.5 miles
Land Use	• Low-Density residential (13%) • Med-Density Residential (25%) • High-Density Residential (12%) • Commercial (17%) • Forested (8%) • Institutional (23%) • Open Urban (2%) • Other (18%)
Current Impervious Cover	• 29.2% of subwatershed
Soils	• A Soils – 0% • B Soils – 60% • C Soils – 33% • D Soils – 7%
Stormwater Management	• 8% of the watershed is treated by stormwater facilities

Neighborhood Assessment

Eleven distinct neighborhoods were identified and assessed within the subwatershed as part of the *Unified Subwatershed and Site Reconnaissance*. Pollution prevention opportunities to address stormwater volume and pollutants include fertilizer education, downspout disconnection, storm drain marking, tree planting and street sweeping. Table 4-28 shows a summary of neighborhood recommendations. Figure 4-5 can be used along with Table 4-28 to locate the neighborhood restoration opportunities geographically.

Table 4-28: Summary of Neighborhood Assessment Recommendations for Towson Run

Neighborhood Site ID	Avg Lot Size (acres)	% Opportunity for Downspout Disconnection	Simple Downspout Redirection	Rain Barrels	Rain Gardens	Stormdrain Marking	Bayscape	Increase Lot Canopy	Fertilizer Education	Lot/Alley SW Retrofit	Buffer Enhancement	Street Sweeping	# Street Trees	# Shade Trees	Notes
M_29	1	75	X		X	X			X		X	X			Invasives along Boyce
M_30	>1	60	X		X	X			X		X				
M_36	1/4	80	X	X		X	X	X	X		X	X			
M_37	<1/4	65		X		X			X			X	10		Old paint dumping in drain on N. Bend Road
M_38	1	90	X	X	X	X		X	X			X			
M_39	multifam	95		X		X		X	X			X			Establish no mow in buffer
M_40	1/2	80	X			X		X	X			X	25		
M_41	<1/4	80	X	X		X	X	X	X						
M_42	<1/8	95	X	X				X	X	X		X	100		
M_44	<1/8	70	X	X					X				50		PAA here
M_45	<1/4	98	X	X		X	X	X	X	X		X			

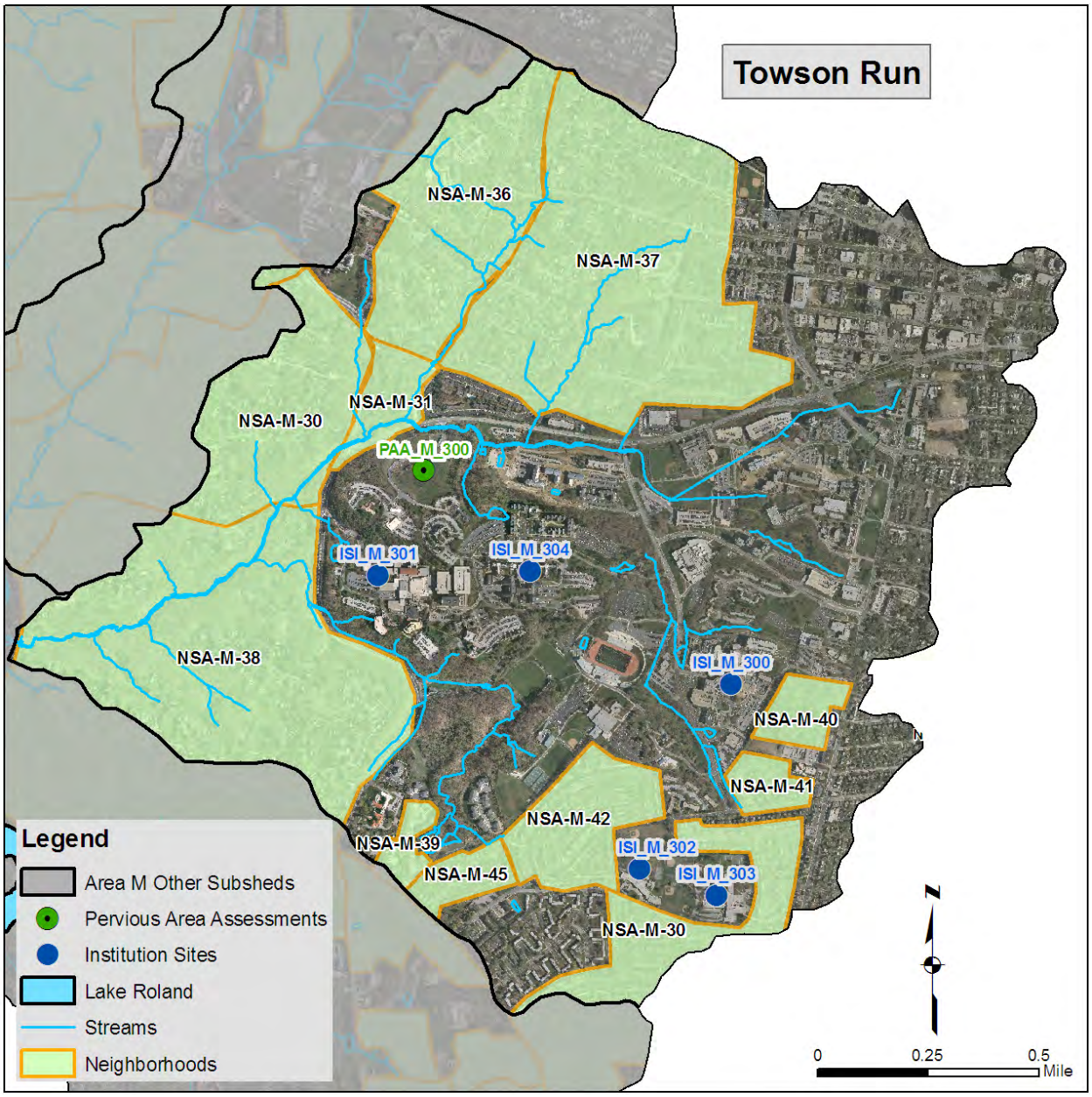

Figure 4-5: Towson Run

Hot Spot Assessment

No sites were assessed in Towson Run for hot spot status.

Institutional Site Assessment

Table 4-29 shows the five institutional areas assessed in the Towson Run subwatershed. Some areas offer opportunities to plant trees and improve stream conditions.

Table 4-29: Summary of Recommendations for Institutions in Towson Run

Site ID	Name of Site	Public/ Private	Greening Opportunities						
			Nutrient Management Req ?	Tree Planting (#)	Stormwater Retrofit	Downspout Disconnection	Impervious Cover Removal	Trash Management	Notes
ISI_M_300	St. Joseph's Hospital	private	N	0					stream naturalization
ISI_M_301	GBMC	private	N	0				X	soil spoil and brush disposal
ISI_M_302	Rogers Forge ES	public	N	50					
ISI_M_303	Dumbarton MS	public	Y	50				X	
ISI_M_304	Sheppard Pratt	private	Y	50		X		X	stream buffer improvement

Stream Assessment

A stream stability assessment was not conducted for the Towson Run subwatershed.

Illicit Discharges

Towson Run has one high priority oufall and three low priority outfalls. See section 3.2.3 of the *Northeastern Jones Falls Characterization Report* (Appendix D) for more details. Baltimore County will continue with their Illicit Discharge Detection and Elimination program to eliminate these discharges.

Stormwater Pond Conversions

There were no pond conversion or retrofit opportunities identified in Ruxton Run. Note that all pond conversions identified by this SWAP are located in Roland Run.

Stormwater Retrofits

There were two potential alley retrofit opportunities identified in the Towson Run subwatershed in NSA-M-42 and NSA-M-45.

Pervious Area Restoration

Table 4-21 shows the one pervious area identified during the assessment. Pervious area restoration has the potential to convert areas of turf, sometimes a relatively high nutrient input land use, to forest, which can absorb rather than shed nutrients.

Table 4-30: Summary of Pervious Area Recommendations

Site	Location	Description	Size (acres)	Ownership
PAA_M_300	Gilcrest Hospice Center entrance	Large parcel owned by TU	15	private

PAA-M-300

Subwatershed Management Strategy

Engaging Citizens & Watershed Groups

1. Further investigate downspout disconnection opportunities shown in Table 4-28.
2. Engage citizens in a storm drain marking program and conduct stenciling activities in the neighborhoods indicated in Table 4-28.
3. Plant street trees in the neighborhoods indicated in Table 4-28. There is an estimated potential for 185 street trees in this subwatershed.
4. Increase tree canopies on private lots by educating citizens on the benefits of trees.
5. Further investigate large pervious area in Table 4-30 for tree plating opportunities.
6. Plant trees and address trash issues at institutions identified in Table 4-29, focusing on public properties first.

Municipal Actions

1. Investigate street sweeping routes and potential for increased sweeping in neighborhoods indicated in Table 2-28.

CHAPTER 5

EVALUATION

5.1 Interim Measurable Milestones

The Northeastern Jones Falls Small Watershed Action Plan (SWAP) Steering Committee plans a 13-year implementation schedule (2025 endpoint), with two year milestones as laid out in the actions detailed in Appendix A. The Northeastern Jones Falls SWAP Implementation Committee (an outgrowth of the Steering Committee) will meet twice yearly to assess progress in meeting the goals and objectives, and to discuss funding options. The performance measures for each action are detailed in Appendix A and will be used to gauge progress.

An adaptive management approach for meeting the goals and objectives detailed in this report is anticipated. As an annual interim measure, the annual progress and success of each action (Appendix A) will be evaluated, along with proposed new actions. Incorporated in this evaluation will be the inclusion of any new best management practice efficiencies and their effect on the overall progress in meeting the SWAP goals. Based on the evaluation, the action strategy may be changed to facilitate meeting the goals and objectives. The ability to implement this plan within the 9-year timeframe is dependent on the availability of staff and sufficient funding.

If additional TMDLs are developed, or other water quality issues arise, the Northeastern Jones Falls SWAP Implementation Committee will initiate a revision of the plan within six months of the TMDL approval, or of when the water quality issue arises, to address the water quality improvements needed to meet the new TMDL or address the issue.

5.2 Criteria for Load Reduction

The pollutant load reductions approved by the EPA Chesapeake Bay Program will be used to measure progress in meeting the Bay TMDL for nitrogen and phosphorus and the local TMDL for sediment. These reduction efficiencies are detailed in Appendix D. The current load reduction scenarios for phosphorus and nitrogen are presented in Chapter 3, along with specific information on how the load reductions were calculated.

5.3 Implementation Tracking

Performance measures have been developed for each action listed in Appendix A and will be used to gauge the progress and success of proposed restoration strategies. The progress

and success of actions in Appendix A will be evaluated every two years. Action strategies may be modified and/or new actions may be proposed based on this annual evaluation. New actions proposed will also be evaluated on a semiannual basis and modified as necessary to meet watershed goals and objectives.

5.4 Monitoring

Baltimore County and Blue Water Baltimore currently conduct monitoring programs within the Northeastern Jones Falls watershed, but additional monitoring is anticipated to assess the effectiveness of restoration projects and progress in meeting the load reductions for the nutrient TMDL.

5.4.1 Existing Monitoring

The existing monitoring programs described in *Northeastern Jones Falls Characterization Report* (Appendix D), will continue. These programs consist of:

- Chemical Trend monitoring at fixed sites
- Biological monitoring at both fixed and randomly chosen sites
- Bacteria Trend monitoring at fixed sites
- Bacteria Source Tracking monitoring to locate sources for correction
- Citizen based Stream Watch Program, coordinated by Blue Water Baltimore
- Illicit connection monitoring

Coordination of these monitoring activities among the SWAP participants,Baltimore County and Blue Water Baltimore, will be enhanced through participation in the Northeastern Jones Falls SWAP Implementation Committee.

5.4.2 Implementation Monitoring

Baltimore County conducts monitoring activities specific to Small Watershed Action Plans throughout the county. This effort will continue to focus on project specific monitoring for effectiveness and targeted monitoring of subwatersheds to measure overall improvement in water quality from multiple restoration actions within a subwatershed. A Quality Assurance Project Plan (QAPP) has been developed for this monitoring component.

Additional monitoring activities targeting specific projects will be identified as restoration progresses. Given the number of restoration actions called for in the SWAPs, it will not be possible to monitor all restoration projects. Additional project monitoring will be targeted at those activities that have limited monitoring data on efficiencies, such as various types of rooftop disconnects.

During the first two years of implementation, Baltimore County will develop and implement a Bacterial Source Tracking monitoring program to address the uncertainty in the location of bacterial sources. This program will be used to target restoration activities that address the reduction in bacteria to meet the bacteria TMDL reduction requirements. Data generated by the Bacteria Source Tracking Program will also be used to determine

bacteria concentration trends over time and assist Maryland Department of the Environment in determining if bacteria water quality standards are being met.

APPENDIX A

SMALL WATERSHED ACTION PLAN STRATEGIES

APPENDIX A

SMALL WATERSHED ACTION PLAN STRATEGIES

This appendix presents the actions related to the goals and objectives presented in Chapter 2, including the expected benefits, the timelines, the performance measures, estimated unit costs, and responsible parties. In many cases, the actions fall under a number of goals and objectives. When this occurs, multiple goals and objectives are indicated as being associated with the action.

The actions are grouped according to the type of activity. The groupings are:

- Restoration Actions
- Outreach and Awareness Activities
- Monitoring Activities
- Funding Activities
- Reporting Activities

The responsible parties are indicated by numeral with the code shown in Table A-1.

Table A-1: Codes for Responsible Parties Listed for Actions in Table A-2

Organization	Numeric Code
Baltimore County Dept. of Environmental Protection and Sustainability	1
Blue Water Baltimore	2
Northeastern Jones Falls SWAP Implementation Committee	3

Implementation progress will be dependant on future funding availability for the various organizations involved. The funding would be for additional staff and implementation of projects identified within Table A-1. The Northeastern Jones Falls SWAP Implementation Committee will aggressively pursue grant opportunities as they become available, subject to staff capacity to manage the grants and availability of matching funds.

	Action	Basis for Performance Measure	Performance Measure	Total Number Units	Period 1 7/11-6/13	Period 2 7/13-6/15	Period 3 7/15-6/17	Period 4 7/17-6/19	Period 5 7/19-6/21	Period 6 7/21-6/23	Period 7 7/23-6/25	Unit Cost	Respons. Party*	Goal 1		Goal 2		Goal 3		Goal 4						Goal 5	Goal 6		Goal 7	
														1	2	1	2	1	2	1	2	3	4	5	6	1	1	2	1	2
RESTORATION ACTIONS																														
NUTRIENT REDUCTION																														
1	Reduce fertilizer use on residential high maintenance lawns in the 58 recommended neighborhoods by implementing a lawn education program.	Conduct 15 lawn care education events targeting 3-4 recommended neighborhoods per event = 58 neighborhoods (1,230 acres of high maintenance lawn identified x 5% participation rate = 61.5 acres)	5% participation X 1,230 acres	15 events	2 events	2 events	2 events	2 events	2 events	2 events	3 events	$500 / event	2	X															
2	Continue municipal road maintenance street sweeping activities. Investigate the 31 neighborhoods recommended for street sweeping to implement activities and/or adjust frequency as needed.	42.0 miles of road within neighborhoods identified for street sweeping	100% participation x 42.0 miles	42.0 miles	42.0 miles	42.0 miles	42.0 miles	42.0 miles	42.0 miles	42.0 miles	42.0 miles	Existing Staff	1	X															
STORMWATER MANAGEMENT																														
3	Convert the 8 dry detention ponds (276 acres drainage area) recommended for conversion to enhanced water quality treatment.	8 potential dry detention ponds recommended for conversion	8 conversions x 100% participation	8 conversions	1 conversion	1 conversion	1 conversion	1 conversion	1 conversion	1 conversion	2 conversions	$3200 / acre	1	X	X														
4	Investigate the feasibility of implementing stormwater retrofits to treat runoff from impervious surfaces (parking lots, alleys) at the 4 institutions (2 acres DA total) identified.	4 potential institution sites identified	4 institutions investigated	4 institutions		2 investigations	2 investigations					Existing Staff	1																
5	Design and implement stormwater retrofits at feasible sites identified in Action 4.	4 institutions x 100% participation rate = 4 stormwater retrofits	100% participation x 4 sites	4 sites				1 site	1 site	1 site	1 site	$3200 / acre	1	X	X														
6	Implement a downspout disconnection program. Use rainbarrels, rain gardens, and/or redirection for downspout disconnection in the 46 recommended neighborhoods.	230 acres of impervious rooftop identified x 20% participation rate = 46 acres	20% participation x 230 acres=46 acres	46 acres/46 neighborhoods	5 acres	7 acres	7 acres	7 acres	7 acres	7 acres	6 acres	$150 / house	1, 2	X	X														
7	Inspect and maintain stormwater conversions and retrofits.	8 conversions + 4 retrofits = 12 projects	1 inspection per site every 3 years	12 projects			1 inspection	1 inspection	2 inspections	3 inspections	3 inspections	Existing Staff	1																
URBAN TREE CANOPY																														
8	Investigate the feasibility of planting riparian stream buffers on open pervious land.	224 acres of open pervious land identified within the 100-foot stream buffer through GIS analysis.	Feasible buffer planting sites identified	224 acres		224 acres investigated						Existing Staff	1, 2																
9	Reforest stream buffer at feasbile sites with a minimum width of 35 feet.	224 acres of open pervious stream buffer identified in the GIS analysis x 5% participation rate =11 acres	5% participation x 224 acres	11 acres	1 acre	1 acre	1 acre	2 acres	2 acres	2 acres	2 acres	$15,000 / acre	1, 2	X				X											
10	Plant trees on PAA sites, focusing efforts on sites identified as mostly open pervious cover type and requiring minimal site preparation.	80 acres of PAA sites x 40% participation rate = 32 acres	40% participation x80 acres=32 acres	32 acres	2 acres	5 acres	5 acres	5 acres	5 acres	5 acres	5 acres	$6,000 / acre	2	X													X		
11	Plant street trees in the 16 recommended neighborhoods.	Maximum potential of 945 trees x (1 acre/100 trees) = 9.5 acres (100% participation)	100% of 945 trees	945 trees	135 tress	135 tress	135 tress	135 tress	135 tress	135 tress	135 tress	$175 / tree	2	X															
12	Encourage institutions to plant trees on available open space at the 10 sites identified.	Maximum potential of 602 trees x (1 acre/100 trees) = 6.0 acres x 40 % participation rate = 2.4 acres (or 240 trees)	40% of 602 trees	240 trees	35 trees	35 trees	35 trees	35 trees	35 trees	35 trees	35 trees	$175 / tree	1,2	X															
13	Baltimore County shall continue to require riparian buffers and forest conservation for all new and re-development.	On-going, keep track of existing riparian buffer and forest preserved	Acres preserved		On-going	On-going	On-going	On-going	On-going	On-going	On-going	Existing Staff	1																
14	Maintain trees planted at reforestation/tree planting sites.	Tree maintenance (watering, mowing, weeding, etc.) is required for the first 5 years to ensure successful growth; projected number of acres to be reforested/planted: 11+32+4.7+1.2 = 48.9 acres	Maintain 48.9acres	48.9 acres		Maintain	Maintain	Maintain	Maintain	Maintain	Maintain	$1,300 / acre	1,2,3																
TRASH MANAGEMENT																														
15	Address trash issues at 3 institutions noted as having trash management problems.	Institutions visited and trash issues solved.		3 Institutions	1 instituion	1 instituion	1 instituion					Existing Staff	2																
16	Develop a county-wide trash reduction strategy within 1 year of issuance of new MS4 permit.	Trash reduction strategy developed		1 strategy		1 strategy						Existing Staff	1																
17	Develop trash TMDL Implementation Plan for Jones Falls within 1 year of EPA approval of the trash TMDL.	TMDL Implementation Plan Developed		1 plan		1 plan						Existing Staff	1																
STREAM CORRIDOR RESTORATION																														
18	Evaluate the restoration potential and feasibility of restoring 55,377 ft of potential degraded stream channels	24% of assessed reaches were recommended for restoration	Feasible restoration sites identified		Assess							Existing Staff	1			X	X												
19	Complete stream restoration projects at feasible sites.	55,377 LF of stream restoration potential x 30% participation rate = 16,613 LF of stream restoration to be completed	30% participation x 55,377 ft	16,613 ft		2,750 ft	2,750 ft	2,750 ft	2,750 ft	2,750 ft	2,750 ft	$350/linear ft	1	X								X				X			
20	Manage invasive plant species in stream riparian areas.	At least 2 demonstration sites chosen and managed for invasives		2 sites managed	choose 2 sites	manage 2 sites	manage 2 sites	manage 2 sites	manage 2 sites	manage 2 sites	manage 2 sites	Existing Staff	1					X			X								
OUTREACH & AWARENESS																														
21	Work with Fairgrounds (HSI-M-101) and MDA (Dwight Dotterer) to prevent polluted runoff after the State Fair each year.	Manure piles no longer exposed to rain events producing polluted runoff.	1 inspection per year		2 inspections	2 inspections	2 inspections	2 inspections	2 inspections	2 inspections	2 inspections	Existing Staff	1																
22	Form partnerships with community groups and discuss the BMP recommendations from the neighborhood assessments and implementation options.	49 neighborhoods assessed - target at least 3 neighborhoods per informational meeting	2 neighborhood meetings per year	26 meetings	2 meetings	4 meetings	4 meetings	4 meetings	4 meetings	4 meetings	4 meetings	$300 / meeting	1, 2, 3						X			X			X				
23	Form partnerships with institutions and discuss the BMP recommendations from the institutional assessments and implementation options. Include implementing/enhancing recycling programs on their properties.	13 institutions assessed	1-2 institution meetings per year	13 meetings	1 meeting	2 meetings	2 meetings	2 meetings	2 meetings	2 meetings	2 meetings	Existing Staff	1, 2, 3										X						
24	Work with community groups to install storm drain markers in the 42 recommended neighborhoods.	Install markers in 42 neighborhoods identified	3 neighborhoods per year	42 sites	6 neighborhoods	6 neighborhoods	6 neighborhoods	6 neighborhoods	6 neighborhoods	6 neighborhoods	6 neighborhoods	$400 / neighborhood	1, 2, 3																
25	Conduct public tours of completed water quality projects/BMPs on public propoerty.	Tours conducted	1 tour every 2 years	7 tours	1 tour	1 tour	1 tour	1 tour	1 tour	1 tour	1 tour	Existing Staff	1														X		
26	Continue community vigilance with zoning and development proposals	Representative(s) from community group(s) in the SWAP area attend meetings held by County Planning Board and Commission for Environmental Quality (CEQ)	Attend 4 meetings per year	56 meetings	8 meetings	8 meetings	8 meetings	8 meetings	8 meetings	8 meetings	8 meetings	Existing Staff	2,3															X	X
27	Encourage and support waterway cleanups in streams and park clean-ups.	Conduct an annual stream and park cleanups	1 cleanup per year	13 cleanups	1 cleanup	2 cleanups	2 cleanups	2 cleanups	2 cleanups	2 cleanups	2 cleanups	Existing Staff	1, 2							X		X							
MONITORING																														
28	Continue to monitor and remove illicit connections through the Illicit Connections Program	Inspect all non-prioritized outfalls within four years and all prioritized outfalls according to their designated inspection schedule	X routine inspections per year	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Existing Staff	1		X														
29	Continue the Stream Watch program, a citizen-based program to increase the ability to monitor/identify sources of water quality and habitat degradation.	Number of stream miles adopted by citizen groups	X miles of stream adopted	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Existing Staff	1, 2							X		X							
30	Continue stormwater facility maintenance and inspection program	Assure continued function of Stormwater Facilities as required as part of the NPDES MS4 permit.	Continue routine inspections	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Existing Staff	1		X														
FUNDING																														
31	Coordinate grant funding requests to secure funding and implement restoration projects to meet TMDL nutrient reductions requirements.	Seek a minimum of 1 grant per year to meet nutrient reduction goals within 10 years	1 grant proposal per year	8 proposals	1 proposal	2 proposals	2 proposals	2 proposals	1 proposal	1 proposal	2 proposals	Existing Staff	1, 2										X						
REPORTING																														
32	Northeastern Jones Falls SWAP Implementation Committee will meet to discuss implementation progress and assess any changes needed to meet the goals.	Conduct meetings on a semi-annual basis	2 meetings per year	26 meetings	2 meetings	4 meetings	4 meetings	4 meetings	4 meetings	4 meetings	4 meetings	Existing Staff	3																
33	Develop a unified restoration tracking system to track progress toward meeting TMDL reduction requirements.	Tracking system currently being developed for similar SWAPs (e.g., Back River, Lower Jones Falls)	Tracking system developed	On-going	On-going	On-going	On-going	On-going	On-going	On-going	On-going	Existing Staff	1, 3																
34	Update the status of citizen-based restoration projects and BMPs on an annual basis	Provide progress update in annual NPDES Report	NPDES annual report	Annual Reports	1 Annual Report	2 Annual Reports	2 Annual Reports	2 Annual Reports	2 Annual Reports	2 Annual Reports	2 Annual Reports	Existing Staff	1																
35	Continue to update status of County capital budget restoration projects and BMPs	Provide progress update in annual NPDES Report	NPDES annual report	Annual Reports	1 Annual Report	2 Annual Reports	2 Annual Reports	2 Annual Reports	2 Annual Reports	2 Annual Reports	2 Annual Reports	Existing Staff	1																

Tabel A-2: Recommended Actions To Meet The Northeastern Jones Falls SWAP Goals and Objectives

APPENDIX B

COST ANALYSIS AND POTENTIAL FUNDING SOURCES

APPENDIX B

COST ANALYSIS AND POTENTIAL FUNDING SOURCES

Cost Analysis and Potential Funding Sources

This appendix presents a cost analysis and potential funding sources for the implementation of proposed restoration BMPs in the Northeastern Jones Falls SWAP. Each is described below.

Cost Analysis

The cost analysis is based on the actions detailed in Appendix A. Table B-1 presents cost estimates based on the projected participation rates needed to achieve the 2020 reduction goals in nutrient loads from urban runoff, also described in Chapter 3. Estimates are provided in 2011 dollars and represent total cost estimates for the anticipated implementation timeframe. Unit costs are based on a combination of local information and previous SWAPs completed for other local watersheds. BMP costs are not annualized over the implementation timeframe and do not include costs of existing staff. Costs are also presented in dollars per pound of nitrogen, phosphorus and sediment removal for those BMPs where pollutant removal calculations were possible (refer to Chapter 3). This provides an additional tool for the assessment and selection of BMPs. The total cost of implementation exclusive of staffing costs is approximately $7,560,346 based on projected participation rates meeting the 2020 pollution reduction goals.

Table B-1: Maximum Estimated Costs for Area M SWAP Implementation

BMP or Action	Cost /Unit	Projected Quantity	Project Total Cost	Project TN Load Reduction (lbs)	Project Cost / Lb of TN Removal	Project TP Load Reduction (lbs)	Project Cost/Lb of TP Removal	Project Sed Load Reduction (lbs)	Project Cost/Lb of Sed Removal
Lawn Care Education Event	$500/ event	15 events	$7,500	103.9	$72	3.3	$2,273	-	-
SWM Conversions	$3,200/ acre	276.3 acres	$884,160	390.6	$2,264	42.8	$20,658	32,853.5	$27
SWM Retrofits	$3,200/ acre	2.3 acres	$32,640	26.2	$1246	2.0	$16,320	1,244.1	$26
Downspout Disconnection	$2,179/ acre	169 acres	$368,251	198.7	$1,853	25.1	$14,671	19,247.9	$19
Urban Stream Buffer Reforestation	$15,000/ acre	11 acres	$165,000	111.7	$1,477	3.8	$43,421	1,446.4	$114
Tree Planting at PAA sites	$6,000/acre	32 acres	$192,000	238.1	$806	6.7	$28,657	2,449.3	$78
Street Tree Planting	$175/tree	945 trees	$165,375	70.3	$2,352	2.0	$82,688	723.3	$229
Tree Planting at ISI sites	$175/ tree	240 trees	$42,000	17.9	$2,346	0.5	$84,000	183.7	$229
Tree Maintenance	$1300/acre/year	48.9 acres	$63,570/year	-	-	-	-	-	-
Exotic/Invasive Species Removal	$250/ acre	2 acres	$500	-	-	-	-	-	-
Stream Corridor Restoration*	$350/ ln foot	16,613 ln foot	$5,814,550	332.3	$17,498	58.1	$100,078	42,363.4	$137

BMP or Action	Cost /Unit	Projected Quantity	Project Total Cost	Project TN Load Reduction (lbs)	Project Cost / Lb of TN Removal	Project TP Load Reduction (lbs)	Project Cost/Lb of TP Removal	Project Sed Load Reduction (lbs)	Project Cost/Lb of Sed Removal
Storm Drain Markers	$400/ event	42 event	$16,800	-	-	-	-	-	-
		Total:	$7,560,346						

*increased credits may apply in the future, see sec 3.4.2

Potential Funding Sources

Funding sources for the implementation of the Area M SWAP include local government funding for Baltimore County and various grants as described below.

Baltimore County uses general funds to support staff, whose responsibility is to monitor and improve water quality through implementation of various programs including capital restoration projects. Baltimore County has a Waterway Improvement Capital Program that is funded by a combination of general funds and bonds. Approximately $4 million per year is allocated for environmental restoration projects throughout the county. The capital budget is projected for six years, with a two-year cycle for changes. Baltimore County provides grants to local watershed organizations through its Watershed Association Citizen Restoration Planning and Implementation Grant Program. These funds provide staffing for restoration project implementation, and education and outreach programs.

In order to implement all of the actions listed in Appendix A and to meet the anticipated funding needs summarized in Table B-1, additional funding from grants will be required. Table B-2 presents potential funding sources to support the implementation of the Area I SWAP including funding source, applicant eligibility, eligible projects, funding amount, cost share requirements, and grant cycle. The anticipated major grant funding sources include the following:

- **The Chesapeake and Atlantic Coastal Bays Trust Fund:** The Trust Fund was established to provide financial assistance to local governments and political subdivisions for the implementation of nonpoint source pollution control projects. These are intended to achieve the state's tributary strategy developed in accordance with the Chesapeake 2000 Agreement and to improve the health of the Atlantic Coastal Bays and their tributaries. The BayStat Program directs the administration of the Trust Fund, with multiple state agencies receiving moneys, including Maryland Department of Environment (MDE), Department of Natural Resources (DNR), Maryland Department of Agriculture (MDA), and Maryland Department of Planning (MDP).

- **319 Non-point Pollution Grants:** Federal money for restoration implementation is available annually through MDE.

- **Bay Restoration Fund (MDE):** The Bay Restoration Fund offers financial assistance to local governments for voluntary stream and creek restoration projects that improve water quality and restore habitat. Funds are targeted to seriously degraded water bodies in Maryland. Types of projects funded include: stream channel reconstruction; stream bank stabilization; vegetative buffers; wetlands creation; treatment of acid mine drainage; and dredging.

- **Stormwater Pollution Control Cost Share Program (MDE):** The Maryland

Stormwater Pollution Control Cost-Share Program provides grant funding for stormwater management retrofit and conversion projects in urban areas developed prior to 1984.
These projects reduce nutrients, sediments and other pollutant loads entering the state's waterways through the use of infiltration basins, infiltration trenches, vegetated swales, extended detention ponds, bioretention basins, wetlands and other innovative structures.

- **Innovative Nutrient and Sediment Reduction Program (National Fish and Wildlife Foundation):** The National Fish and Wildlife Foundation (NFWF), in partnership with U.S. Environmental Protection Agency (USEPA) and the Chesapeake Bay Program, will award grants on a competitive basis to support the demonstration of innovative approaches to expand the collective knowledge about the most cost effective and sustainable approaches to dramatically reduce or eliminate nutrient and sediment pollution to the Chesapeake Bay and its tributaries.

- **Chesapeake Bay Stewardship Fund:** The goal of the Chesapeake Bay Stewardship Fund is to accelerate local implementation of the most innovative, sustainable and cost effective strategies to restore and protect water quality and vital habitats within the Chesapeake Bay watershed. The Stewardship Fund offers four grant programs: the Chesapeake Bay Small Watershed Grant Program; the Chesapeake Bay Targeted Watersheds Grant Program; the Chesapeake Bay Conservation Innovation Grant Program; and the Innovative Nutrient and Sediment Reduction Program. Major funding for the Chesapeake Bay Stewardship Fund comes from the USEPA, the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), the U.S. Department of Agriculture Forest Service (USFS), and the National Oceanic and Atmospheric Administration (NOAA).

- **MD State Highway Administration (SHA) Transportation Enhancement Program (TEP):** This is a reimbursable, federal-aid funding program for transportation-related community projects designed to strengthen the intermodal transportation system. The TEP supports communities in developing projects that improve the quality of life for their citizens and enhance the travel experience for people traveling by all modes. Among the qualifying TEP categories is environmental mitigation to address water pollution due to highway runoff or to reduce vehicle-caused wildlife mortality while maintaining habitat connectivity.

- **Chesapeake Bay Trust:** Provides grants through a variety of grant programs that focus on environmental education, urban greening, fisheries, and remediation of water quality issues. Specifically the Targeted Watershed Grant Program provides funding for on-the ground solutions that address the most pressing nonpoint source pollution challenges facing a small watershed, and that result in measurable improvements in water quality and wildlife habitat. The program also seeks to

support cost effective approaches to Chesapeake Bay restoration actions at the small watershed scale and establish a replicable model of restoration that can be transferred and used throughout the region.

APPENDIX C

CHESAPEAKE BAY PROGRAM POLLUTANT LOAD REDUCTION EFFICIENCIES

Last Updated: February 9, 2011 page 1/8

Non-Point Source Best Management Practices and Efficiencies currently used in Scenario Builder

Values in parentheses are in progress of official approval

Agriculture BMPs		How Credited	TN Reduction Efficiency	TP Reduction Efficiency	SED Reduction Efficiency
Nutrient Management		Landuse Change	N/A	N/A	N/A
Forest Buffers (varies by region; see Appendix 2)		Efficiency, Landuse Change	19-65%	30-45%	40-60%
Wetland Restoration (varies by region; see Appendix 2)		Efficiency	7-25%	12-50%	4-15%
Land Retirement		Landuse Change	N//A	N/A	N/A
Grass Buffers (varies by region; see Appendix 2)		Efficiency, Landuse Change	13-46%	30-45%	40-60%
Non-Urban Stream Restoration		Mass reduction/length	0.02 lb/ft	0.003 lb/ft	2 lb/ft
Tree Planting		Landuse Change	N/A	N/A	N/A
Carbon Sequestration/Alternative Crops		Landuse Change	N/A	N/A	N/A
Conservation Tillage		Landuse Change	N/A	N/A	N/A
Continuous No-Till (varies by region; see Appendix 2)		Efficiency	(10-15%)	(20-40%)	(70%)
Enhanced Nutrient Management		Efficiency	(7%)	(N/A)	(N/A)
Decision Agriculture		Efficiency	(4%)	(N/A)	(N/A)
Conservation Plans	High-till	Efficiency	8%	15%	25%
	Low-till	Efficiency	3%	5%	8%
	All hay	Efficiency	3%	5%	8%
	Pasture	Efficiency	5%	10%	14%
Cover Crops (see Appendix 1)		Efficiency	Varies	Varies	Varies
Commodity Cover Crops (see Appendix 2)		Efficiency	Varies	Varies	Varies
Stream Access Control with Fencing		Landuse Change	N/A	N/A	N/A
Alternative Watering Facility		Efficiency	5%	8%	10%
Prescribed Grazing/PIRG		Efficiency	9%	24%	30%
Horse Pasture Management		Efficiency	N/A	20%	40%
Animal Waste Management Livestock		Efficiency	75%	75%	N/A
Animal Waste Management Poultry		Efficiency	75%	75%	N/A
Barnyard Runoff Control		Efficiency	20%	20%	40%
Loafing Lot Management		Efficiency	20%	20%	40%
Mortality Composters		Efficiency	40%	10%	N/A
Water Control Structures		Efficiency	33%	N/A	N/A
Poultry Phytase		Application Reduction	N/A	N/A	N/A
Swine Phytase		Application Reduction	N/A	N/A	N/A

Dairy Precision Feeding and Forage Management	Application Reduction	N/A	N/A	N/A
Poultry Litter Transport	Application Reduction	N/A	N/A	N/A
Ammonia Emissions Reduction (interim)	Application Reduction	15-60%	N/A	N/A
Poultry Litter Injection (interim)	Efficiency	25%	0%	0%
Liquid Manure Injection (interim)	Efficiency	25%	0%	0%
Phosphorus Sorbing Materials in Ditches (interim)	Efficiency	40%	0%	0%
Resource BMPs	***How Credited***	***TN Reduction Efficiency***	***TP Reduction Efficiency***	***SED Reduction Efficiency***
Forest Harvesting Practices	Efficiency	50%	60%	60%
Dirt & Gravel Road Erosion & Sediment Control – Driving Surface Aggregate + Raising the Roadbed	Mass reduction/length	0	0	2.96lb/ft
Dirt & Gravel Road Erosion & Sediment Control – with outlets	Mass reduction/length	0	0	3.6lb/ft
Dirt & Gravel Road Erosion & Sediment Control – outlets only	Mass reduction/length	0	0	1.76lb/ft
Urban BMPs	***How Credited***	***TN Reduction Efficiency***	***TP Reduction Efficiency***	***SED Reduction Efficiency***
Forest Conservation	Landuse Change	N/A	N/A	N/A
Urban Growth Reduction	Landuse Change	N/A	N/A	N/A
Impervious Urban Surface Reduction	Landuse Change	N/A	N/A	N/A
Forest Buffers	Efficiency, Landuse Change	25%	50%	50%
Tree Planting	Landuse Change	N/A	N/A	N/A
Abandoned Mine Reclamation	Landuse Change	N/A	N/A	N/A
Wet Ponds and Wetlands	Efficiency	20%	45%	60%
Dry Detention Ponds and Hydrodynamic Structures	Efficiency	5%	10%	10%
Dry Extended Detention Ponds	Efficiency	20%	20%	60%
Infiltration Practices w/o Sand, Veg.	Efficiency	80%	85%	95%
Infiltration Practices w/ Sand, Veg.	Efficiency	85%	85%	95%
Filtering Practices	Efficiency	40%	60%	80%
Erosion and Sediment Control	Efficiency	25%	40%	40%
Nutrient Management	Efficiency	17%	22%	N/A
Street Sweeping	Efficiency	3%	3%	9%
Urban Stream Restoration	Load reduction/length	0.02lb/ft	0.003lb/ft	2lb/ft
Septic Connections	Systems Change	N/A	N/A	N/A

Septic Denitrification		Efficiency	50%	N/A	N/A
Septic Pumping		Efficiency	5%	N/A	N/A
Bioretention	C/D soils, underdrain	Efficiency	25%	45%	55%
	A/B soils, underdrain	Efficiency	70%	75%	80%
	A/B soils, no underdrain	Efficiency	80%	85%	90%
Vegetated Open Channels	C/D soils, no underdrain	Efficiency	10%	10%	50%
	A/B soils, no underdrain	Efficiency	45%	45%	70%
Bioswale		Efficiency	70%	75%	80%
Permeable Pavement w/o Sand, Veg.	C/D soils, underdrain	Efficiency	10%	20%	55%
	A/B soils, underdrain	Efficiency	45%	50%	70%
	A/B soils, no underdrain	Efficiency	75%	80%	85%
Permeable Pavement w/ Sand, Veg.	C/D soils, underdrain	Efficiency	20%	20%	55%
	A/B soils, underdrain	Efficiency	50%	50%	70%
	A/B soils, no underdrain	Efficiency	80%	80%	85%