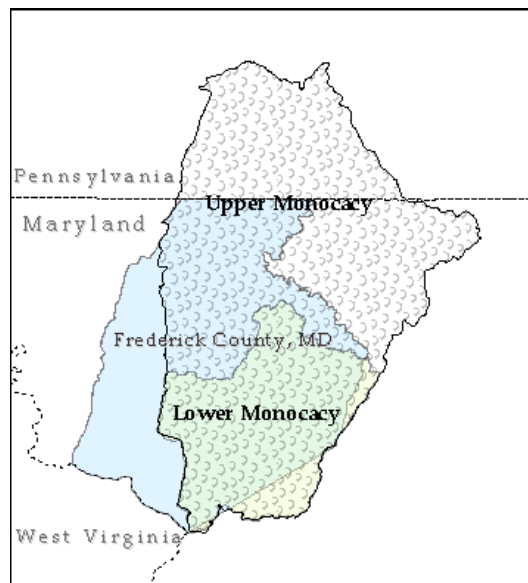


# Lower Monocacy River Watershed Restoration Action Strategy

**Frederick County, Maryland**

## **FINAL REPORT**

May, 2004



Prepared by  
Frederick County, Division of Public Works  
118 North Market Street, Frederick, MD 20701

In Consultation with  
Lower Monocacy WRAS Steering Committee





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Dear Reader:

Here are the elements that comprise the Lower Monocacy Watershed Restoration Action Strategy including a 100 page pdf file with the text for the report, the title page and some of the tables and appendices. Maps referenced in the text are found in the map folder. Some of the appendices are with the text and others are in the appendices folder. The two news articles are in the hard bound copy and are not available in electronic form.

You may seek additional information by contacting Kay Schultz at 301 694-1741 or [kschultz@fredco-md.net](mailto:kschultz@fredco-md.net), Jessica Hunicke at 301 694-1350 or [jhunicke@fredco-md.net](mailto:jhunicke@fredco-md.net), or Shannon Moore at 301 694-1413 or [smoore@fredco-md.net](mailto:smoore@fredco-md.net).

Thanks for your interest in the health of the Lower Monocacy Watershed.

Sincerely,

Kay Schultz  
WRAS Program Coordinator



This report was developed by the Lower Monocacy WRAS Steering Committee coordinated by Frederick County's Division of Public Works and more fully described in the pages which follow.



This Report was developed under the provisions of the Lower Monocacy WRAS between the State of Maryland, Department of Natural Resources, Watershed Services, Coastal Zone Management Division and the Frederick County Board of County Commissioners on behalf of the Division of Public Works, Inter-Agency Contract No. 14-03-855-EPA-055.



This project was funded in part by the U.S. EPA Section 319 Nonpoint Source Program. Although this project is funded in part by the Environmental Protection Agency, it does not necessarily reflect the opinion or position of the EPA.

## **Abstract**

The Lower Monocacy River Watershed is part of the Potomac River Watershed and encompasses 194,700 acres in three counties in Maryland: Frederick, Montgomery, and Carroll. 87% of the drainage area is within Frederick County, 3% in Carroll County, and 10% in Montgomery County. The 264 square miles of the watershed within Frederick County are the main focus of this Watershed Restoration Action Strategy. The Watershed is ranked in the state's Clean Water Action Plan as a "Priority Category 1 and Select Category 3 Watershed".

In the conduct of this WRAS, Frederick County's Division of Public Works and the Planning Department worked closely with Maryland's Department of Natural Resources staff on this two part process. During the first step, the DNR staff sampled and analyzed base flow nutrient concentrations and loading rates, gathered and analyzed existing information to develop a Watershed Characterization, field assessed selected stream corridors in the Upper Linganore and Bennett Creek Watersheds, and surveyed fish and aquatic invertebrate communities. During the second phase, the County organized a Lower Monocacy WRAS Steering Committee comprised of 40 representatives from 25 organizations. The Steering Committee reviewed DNR data, organized seven working groups to formulate goals and objectives, and reached out to owners of stream frontage in the Bennett and Upper Linganore Creek Watersheds through public meetings. The purpose of these meetings was to share WRAS findings and learn about landowner concerns.

As a result of this collaborative process, WRAS goals were adopted in seven areas. Detailed outreach/education and natural resource priorities accompanied by related nutrient reductions were developed. Examination of stream corridor conditions on eight stream reaches in Bennett and Upper Linganore Creek Watersheds resulted in the identification of 51 priority sites for recommended actions. Also identified were twenty-two issues requiring further study categorized in three areas: capacity building; innovative techniques, and program changes.

## Executive Summary

With funds from an EPA Section 319 grant and Frederick County General Funds, Frederick County Government partnered with Maryland's Department of Natural Resources to create a *Watershed Restoration Action Strategy (WRAS)* for the Lower Monocacy from January 2003 through May 2004. The WRAS was initiated because of negative human-induced impacts to water quality and habitat due to:

- sediment and nutrient losses from agricultural lands;
- atmospheric deposition from fossil fuel burning engines;
- practices by residential, commercial and municipal developments;
- high proportions of denuded soils that erode easily; and
- the exploding population growth in the area and resultant rapid land use conversion.

Frederick County organized a coalition of over 40 stakeholders including watershed/environmental groups, land trusts, colleges, city and county governments, Soil Conservation Districts, state and federal agencies, Non-Governmental Organizations (NGOs), business and professional organizations, religious groups, foundations, farmers, interested citizens, and others.

DNR gathered, analyzed, and summarized existing data in its *Lower Monocacy River Watershed Characterization*. DNR also conducted original field studies for a Stream Corridor Assessment and Synoptic Nutrient Survey. Data from the studies and field assessments revealing problems facing the watershed were presented to the Steering Committee in a two-day workshop as well as several subsequent sessions. Seven working subgroups emerged from the process: managing growth and the development process; citizen outreach; agricultural practices; business, municipal and institutional practices; natural resources and wildlife management; recreation and tourism; and monitoring and evaluation. The working subgroups collectively developed a vision statement as well as individual plans to include specific pilot projects and long-term goals.

The Watershed Restoration Action Strategy (WRAS) for the Lower Monocacy includes measurable environmental goals, stakeholder involvement, and monitoring to address the water quality impairments within the Monocacy River Watershed. The WRAS includes initiatives such as restoring unbuffered streams, expanding cover crop programs, and introducing best management practices (BMPs) in urban areas for nutrient reduction benefits.

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## Introduction

### The Challenge

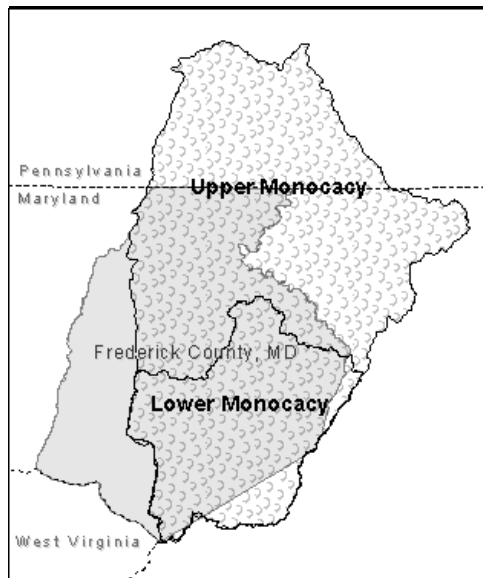
The Monocacy River Watershed, located primarily in Frederick County’s fertile agricultural region, is rich in history, cultural heritage, and natural resources. The area is also confronted by complex water resource problems that negatively impact the quality of life for area residents and the health of the Chesapeake Bay. Some of the most challenging resource problems are:

- Sediment and nutrient losses from agricultural lands;
- Atmospheric deposition from fossil fuel burning engines;
- Practices by residential, commercial and municipal development;
- High proportions of denuded soils that erode easily; and
- The exploding population growth in the area and resultant rapid land use conversion.

For the past few decades, various groups have undertaken initiatives to address water quality issues, and although progress has been made, a comprehensive effort has never taken place and only partial success has been achieved.

The 1998 Maryland statewide assessment of watersheds determined that the Monocacy River Watershed needs both restoration and protection to meet water quality and habitat needs. As Map 1 below illustrates, the Lower Monocacy River Watershed is located primarily in Frederick County but includes small parts of Montgomery and Carroll Counties as well. The Upper Monocacy River Watershed includes portions of Adams County, PA. and Carroll County, MD.

**Map 1: Monocacy Watershed**



**Project History and Background**

Frederick County received its Lower Monocacy WRAS grant from DNR in January 2003 at which time a Steering Committee with broad representation was organized and began meeting. Over the course of the year, the open Steering Committee membership grew to more than 40 representatives of many different stakeholder groups. These groups include, for example, the Frederick Forestry Board, the Audubon Society of Central Maryland, Carrollton Manor Land Trust, Lake Linganore Conservation Society, Hood College, and the City of Frederick. The Steering Committee members, their affiliations, and group assignments are shown in Table 1.

The County also received DNR staff services to develop three reports. The first report was a summary of existing data on water quality, landscape and living resources called the Watershed Characterization and can be found on DNR’s web site at <http://www.dnr.state.md.us/watersheds/surf/proj/wras.html>. In addition, DNR staff collected water samples at selected sites and analyzed water quality to submit a Synoptic Survey, the second report, showing nutrient yields and concentrations at 77 locations in the watershed. They also walked 75 miles of stream corridor in the Upper Linganore and Bennett Creek Watersheds. Town, Woodville, and Talbot branches within Upper Linganore Creek and Bear, Fahrney, Pleasant, and Urbana branches within Bennett Creek were assessed. The data was compiled into a Stream Corridor Assessment (SCA), the third report, and reviewed by the committee in Fall 2003.

WRAS outreach work during Spring and Summer 2003 included a “Greener Lifestyle” workshop series offered county-wide by Steering Committee member, Community Commons. Included were workshops on native plants, rain gardens, rain barrels, composting, natural household cleaners, and natural lawn care practices. Another similar series is being offered during 2004.

Once underway with the planning and data gathering process in the Lower Monocacy region, Frederick County successfully applied for funding for an Upper Monocacy WRAS and was awarded a grant which begins July 2004. The Lower Monocacy Strategy presented here is not static but dynamic in nature and will continue to mature and evolve over time as new information and ideas are added and projects and programs are implemented.

The work of the Steering Committee resulted in their adoption of the following:

**Vision Statement**

We envision a broadening and deepening stewardship ethic among an informed citizenry, which will help protect the County’s agricultural heritage and rural character, maintain and improve the quality of life, protect and treasure our natural resources, and manage future growth more wisely. We envision healthy streams and rivers with forested buffers supplying clean drinking water and supporting healthy communities of aquatic and terrestrial life, as well as diverse and popular recreational uses. We envision a healthy and vibrant agricultural community built on links with citizens who support local agricultural and renewable forest products. We envision increasingly concentrated residential development using conservation design principles with access to collective transportation modes and a web of well-maintained trails. We envision watershed conservation folks from all sectors and communities collaborating to implement effective conservation and restoration practices and foster a creative stewardship consciousness.

In the pages which follow the goals and objectives of the plan are described, the methods discussed include stakeholder and public participation, watershed priorities, and issues requiring further study. Detailed Appendices include letters of invitation to public meetings, local media coverage of WRAS

activities, the WRAS brochure, Flyers outlining the Bennett and Linganore Creek Watersheds, and six leaflets summarizing “Greener Lifestyle” practices.

## The Monocacy River and its Watershed

The Monocacy River Watershed, HUC8 number 0207009, is located in both Maryland (Frederick County, with portions in Carroll and Montgomery Counties) and Pennsylvania (Adams County). It is part of the Potomac River Watershed. Designated uses for water bodies in the Monocacy River Watershed include selected natural or recreational trout streams with the remainder designated for recreation and aquatic life. Water quality impairments that affect designated uses include nutrients, sediment, fecal coliform bacteria and biological impairment (poor or very poor ranking for fish or benthic macroinvertebrates). A Total Maximum Daily Load (TMDL) was approved for Lake Linganore that caps both phosphorus and sediment loads. A fish consumption advisory is in effect due to methyl-mercury. Long-term water quality monitoring of the river's main stem for nitrogen, phosphorus, and sediment shows generally fair conditions upstream and generally poor conditions downstream. The Watershed is also ranked in the state's Clean Water Action Plan as a "Priority Category 1 and Select Category 3 Watershed".

Impaired water quality in the Monocacy River Watershed is a complex result of agriculture, business, municipal practices, air deposition, and citizen behaviors. More than half of the watershed (59%) is in agricultural use, specifically large dairy and beef operations, horses, horticulture, wineries, orchards and crop farms. Forestry is the next most common land use, at 31% of the watershed. Despite the relatively high proportion of forest, 2/3 of the stream corridors have no or inadequate forest buffers (twice as large a proportion as the average for the State of Maryland). Compounding the problem, the Monocacy River Watershed is dominated by highly erodible soil and is the largest contributor of sediment to the Potomac River. Finally, "urban" land use (municipalities and suburban areas with residential, commercial or industrial development) comprises 11% of the watershed and is expanding rapidly. Critical problems in seven municipalities and other urbanized areas include impervious surface (18.6% in Carroll Creek watershed and 13.4% in Ballenger Creek watershed); antiquated or nonexistent stormwater management in older subdivisions and resultant downstream stream corridor degradation; inadequately maintained septic systems in older communities and in the floodplain (e.g. Monocacy Direct watershed); overuse of fertilizers, herbicides, and pesticides for turf; new home construction, and associated impacts from rapidly growing communities of newcomers. The effluent from wastewater treatment plants throughout the watershed also have a negative impact on water quality.

## Goals and Objectives

The Lower Monocacy Watershed Restoration Action Strategy seeks to maintain and improve water quality and habitat in the Lower Monocacy River Watershed through goals in seven areas:

### **Agriculture**

- To conserve and preserve viable working farms and forests providing land-based livelihoods and stewarding natural resources, with priority to protecting and improving water quality and soil conservation.

### **Natural resources**

- To conserve, preserve, and protect and, where appropriate, connect natural habitats including forests and wetlands
- To provide for no net loss of either forests or wetlands
- To increase stream-side vegetated corridors
- To increase meadows and fallow field habitat for ground nesting birds
- To protect and restore cold water fisheries in Rocky Fountain Run and Ballenger Creek

### **Growth and Development Pressure**

- To offer leadership and participation in a comprehensive, long-range visioning and planning effort countywide that addresses the critical issues facing our local watersheds and communities
- To engage local citizens, elected officials, municipal, county and business leaders, and the development community in an education and outreach campaign focusing on managing growth and development pressures in our local watersheds and communities
- To reduce or mitigate potential detrimental impacts of land development on our watersheds and communities through economic incentives and regulation

### **Commercial/municipal and industrial practices**

- To foster an ethic and practices of water resource protection by Frederick County, its municipalities, nonprofits, homeowner associations, developers, businesses and industries

### **Citizen Outreach**

- To improve water quality and habitat by educating citizens about the ecology of the area and “greener” lifestyle practices

### **Tourism and recreation**

- To promote greater enjoyment of the landscape and rivers by improving land and water trail quality, accessibility, and connectivity and promoting use by residents and visitors

### **Monitoring**

- To establish a monitoring program that integrates data from a variety of sources, targets additional sampling sites, interprets and reports findings periodically to the public, program operators and policy makers.

## Stakeholder Involvement and Public Participation

### Stakeholder Involvement

Frederick County’s Division of Public Works organized a Steering Committee of Stakeholders to guide the WRAS watershed planning initiative. The Committee was assembled in January 2003, and grew organically in the sixteen months that followed. The Table below lists members of the Steering Committee and their affiliations and team assignments.

Table 1: Stakeholders

Participant	Affiliation	Agriculture	Natural Resources	Growth/Dev	Citizen Outreach	Municipal, Industrial Practices	Recreation & Tourism	Monitoring
Anita Schipper Caplan	Frederick Forestry Board		X					
Becky Wilson	DNR Forester							
Betsy Donnelly	Community Commons				X			
Betty Boyland	Ft. Detrick					X		
Bill Becraft	Audubon Society							
Bill Strang	Friends of Lake						X	
Bob Schaeffer	Audubon Society		X					
Bryan Seipp	Potomac Conservancy				X	X		
Carole Larsen	Frederick Co. Planning Dept.						X	
Chad Wentz	Soil Conservation District	X						
Charlotte Dusold	Lake Linganore Conservation Soc.			X	X			
Christine Rodick	Hood College	X	X					
Danielle Lucid	DNR							
Darrell McCartney	Forestry Board	X	X					
Donald Rohrback	DNR wildlife		X					
Drew Ferrier	Hood College							
Dusty Rood	Rodgers (Engineering Firm)			X				
Hailu Sharew	DNR Forestry		X					
Hilari Varnadore	Community Commons			X			X	
James Arnold	Forestry Board							X
Jennifer Dotson	ICPRB		X		X			

LOWER MONOCACY WATERSHED RESTORATION ACTION STRATEGY

Participant	Affiliation	Agriculture	Natural Resources	Growth/Dev	Citizen Outreach	Municipal, Industrial Practices	Recreation & Tourism	Monitoring
Jessica Hunicke	DPW/WRAS & DNR SCA				X			
Joe Metzger	Maryland Native Plant Soc., Catoctin Chapter							X
John Mullican	DNR Fisheries		X					
Kai Hagan	Community volunteer			X				
Kathy Marmet	Bennett Watershed citizen	X		X				
Kay Schultz	DPW – WRAS Coordinator	X	X					
Kelly Neff	MDE, wetlands		X					
Ken Shanks	DNR							
Ken Sloate	DNR		X					
Ken Yetman	DNR							
Matt Berres	Potomac Conservancy							
Michael Kay	DNR Forestry		X			X		
Mike Marshner	Frederick Co. Div of Solid Waste & Utilities							X
Morris Perot	Versar							X
Niles Primrose	DNR							X
Paul Ericksson	Western Maryland RC&D		X		X			
Phil Pannill	Western Maryland RC&D							
Richard Lind	City of Frederick					X		
Rolan Clark	Carrollton Manor Land Trust	X		X				
Shannon Moore	DPW/NPDES			X		X		X
Steve Czwartacki	DNR							
Tim Goodfellow	Frederick Co. Planning Dept	X		X				



Initial tasks that the Steering Committee helped perform included identifying the stream reaches that would be walked for the Stream Corridor Assessment. As a part of that process, all of the landowners whose property adjoined streams received letters inquiring about their willingness to cooperate. With that information, the team selected stream reaches in priority watersheds: Upper Linganore Creek and Bennett Creek.

Another early task by the team was implementing an outreach program through Steering Committee member, Community Commons. Commons offered a series of six “Greener Lifestyle” workshops to interested citizens in the watershed as well as its Annual Monocacy River paddle during May 2003, which featured a lunchtime presentation on WRAS watershed learnings.

The County hired a part time Program Coordinator during mid-May to help shepherd the WRAS planning initiative. DNR report development continued through the summer with the Characterization available in September, the Synoptic Survey in October, and the SCA report in November/December 2003.

In order to make maximum use of the available technical information as well as tap the considerable knowledge of a broad group of watershed residents, the County convened a two day WRAS planning workshop in October 2003, at which more than 40 representatives of 25 organizations helped analyze and digest information, identify challenges and opportunities in various watersheds, and subdivide the remaining work into seven working teams including agricultural practices, citizen outreach, natural resources, growth and managing the development process, recreation and tourism, municipal, commercial and industrial practices, and monitoring. The National Park Service’s River and Trails Conservation Assistance staff facilitated the workshop, which was assessed as productive and energizing by participants.

Nine members of the Steering Committee participated in two extended sessions on December 16<sup>th</sup> and January 7<sup>th</sup> reviewing all of the data from the Stream Corridor Assessment to understand more fully the nature of problems that were identified. Meeting notes were developed summarizing results of the analysis and shared with the full Steering Committee. WRAS and DNR staff also participated in a meeting with staff of the Soil Conservation District to discuss results of the SCA, with particular focus on Town Branch, the SCA stream reach in the Upper Linganore Creek Watershed with the highest priority.

Subgroups met periodically from November 2003 to April 2004, to address the long-term goals, numeric objectives and demonstration projects in each of their subject areas. Their work was synthesized and shared with the overall Steering Committee at a full day workshop on April 22, 2004 during which goals, natural resource objectives and potential program change recommendations were considered by the group.

Members of the Steering Committee continued to provide input throughout the planning process. Many also have cooperated in demonstration projects during the planning period such as the Backyard Buffer in a Bag program. Through the Steering Committee’s collaboration, the program was implemented this spring resulting in the planting of 7,000 feet of trees to buffer streams on residential lots. Partners offered a variety of services to make the program work including printing the brochure, providing labor for bundling the trees, arranging for press coverage for the program, publicizing the available trees during public meetings, private mailings, etc.

During the planning process, stakeholder outreach and consultation continued to expand particularly within the area of agricultural landowners. The WRAS coordinator and members of the agricultural practices team’s consultations with the agricultural community included participation in the Tributary Team and Soil Conservation District agricultural tours during 2003, private individual driving tour of the Bennett and Linganore Creek Watersheds, telephone conversations with agricultural landowners in the

Linganore Creek Watershed, meetings with the Frederick District Board of the Soil Conservation District (SCD), meetings and consultation with staff of the SCD, and a presentation to the Izaak Walton League.

### **Public Participation**

The WRAS Planning Initiative sought to include the public in the decision making process by hosting two community meetings. The residents of the Linganore Creek Watershed were invited to attend a meeting on March 23<sup>rd</sup> and the residents of the Bennett Creek Watershed were invited to attend a meeting on March 9<sup>th</sup>. During these meetings, residents had the opportunity to learn about the data that was collected during the SCA process, propose potential restoration sites, and express both general and specific environmental concerns regarding the watershed. The Linganore Creek meeting had double the turnout as the Bennett Creek meeting with farmers comprising almost half of the attendees. Note: copies of the invitation letters and news articles can be found in Appendix A.

The table on the following page outlines major areas of citizen environmental concern, which include: flora and fauna, stream and water quality degradation, community outreach, better management practices, and future development.

In the process of inviting streamside landowners to these meetings, a database of contact information on citizens who are interested in watershed health was generated. This database was augmented during Earth Day celebrations on April 18<sup>th</sup> at Baker Park during which the WRAS process was described and additional names of interested citizens were added.

### **Other Studies and Watershed-Related Initiatives**

Other studies and initiatives conducted in the region include: *Watershed Assessment of Lower Bush Creek* by Versar Inc. for Frederick County DPW, March 2001; *Watershed Assessment of Ballenger Creek*, by Versar Inc. for Frederick County DPW, January 2001; *Watershed Assessment of Lower Linganore Creek*, by Versar Inc for Frederick County DPW, June 2002; *Watershed Plan – Environmental Assessment for Linganore Creek*, by the Soil Conservation Service, 1989; *An Assessment of Stream Restoration and Stormwater Management Retrofit Opportunities in Lower Bush Creek Watershed*, by Versar Inc. for Frederick County DPW, August 2003; *Road Maintenance Activities and Their Impacts on Runoff*, by Versar Inc. for Frederick County DPW, May 2002; *Barriers to Environmental Design in Maryland*, by 1000 Friends of Maryland, 2003; and the *Stream Corridor Assessment of Rock and Carroll Creeks*, by DNR, 1997. Currently underway is a Task Force Report on protecting drinking water supplies Lake Linganore.

Table 2: Public Comment at Linganore and Bennett Watershed Public Meetings

<b>Flora and Fauna</b>
Economic burden of deer grazing on the agricultural community especially during dry years
Sycamore blight and the lack of market value for sycamores at the end of the 15 year CREP commitment
Enforce noxious weed control for everyone
Beaver activity
Sub aquatic vegetation in Lake Linganore
Geese - are they going to become a new problem?
<b>Stream and Water Quality Degradation</b>
Maintenance of culverts to improve their capacity
Use of new technology for driveway/footpath crossings over streams
Increased run off from impervious surfaces within Urbana as more if it is paved and "turfed"
Flooding impacts on the rise especially after storms
Water run off into Pleasant Branch from upstream development and whether it has increased over the years
Chemical run off from golf courses as well as the excessive use of water to keep the course green
Tree blockages created after storms - how do we go about getting them removed to prevent further flooding?
Mining operation on Route 26 (near Hamilton's Lounge)- draining silt ponds on mining property into Linganore Creek
Building of the Route 75 bridge has created flooding on private land - pre-bridge storm water management practices need to be restored
<b>Community Outreach</b>
Assist in broader understanding that we all live within the watershed and are thus connected
Work with Home Owner Associations for better Storm Water Management
Provide guidance to landowners on how to cope with erosion
Provide information on environmental compliance
Organize more stream clean ups
Connect newcomers with locals
Have a permanent watershed planning/management person available to citizens to provide technical information/guidance and build commitment to protection and improvement
<b>Better Management Practices</b>
<b>Agricultural BMPs</b>
CREP plantings too close to stream and difficult to maintain
Fences along the stream catch debris during flooding
Keeping the soil on the land by implementing "No Till" practices
Fencing livestock out of streams - especially cattle along Pleasant Branch
No horse management practices
Tree shelters from CREP plantings create debris downstream
BMPs do not take flood conditions into consideration
Tax burden on landowner due to "off-limits" land
<b>Urban BMPs</b>
Information needed on how to take care of buffer plantings
Need programs that provide other plantings besides trees, such as warm and cool season grasses
Remarsh rather than reforest
What to plant and when
Nutrient Management Plans for everyone
<b>Development</b>
Loss of "rural" Frederick County character
Encourage developers to change their practices
Lake Linganore was originally planned with low impact development but is now experiencing high impact development
County needs to implement environmentally conscience building practices for developers

## Assessment of Watershed Conditions

During 2003, information about the 264 square mile Lower Monocacy River Watershed (Map 2) was generated by DNR staff who summarized existing data in the **Watershed Characterization**, walked and surveyed 75 miles of stream corridor in their **Stream Corridor Assessment**, and sampled water in 77 locations as a part of the **Synoptic Survey**. The reports are summarized below.

### Watershed Characterization

The Characterization noted that the Lower Monocacy River Watershed encompasses 40% of Frederick County, and portions of Carroll and Montgomery Counties. State regulation designates that all streams, rivers and impoundments in the watershed meet requirements for potable water. All streams north of US Route 70 should meet requirements for recreational trout use. Several streams should meet even more stringent requirements for natural trout: Carroll Creek, Ballenger Creek, Rocky Fountain Creek, Furnace Branch and Bear Branch. However, various impairments prevent use of many stream reaches for these uses (Map 3).

### Surface Water Impairments and Total Maximum Daily Loads (TMDL)

#### NUTRIENTS

Phosphorus and nitrogen contribute to poor conditions in the Lower Monocacy River and downstream in the Potomac River. Phosphorus contributes to problems in Lake Linganore such as algal blooms. A TMDL adopted in 2003 calls for a 90% reduction in the amount of phosphorus entering Lake Linganore in order to eliminate phosphorus-related impairments. To attain this reduction, nutrient controls will be needed at sewage treatment plants and on agricultural and residential lands.

#### SEDIMENT

Sediment eroded from lands and stream banks contributes to the filling of Lake Linganore and to poor conditions in the Lower Monocacy River. A TMDL adopted in 2003 calls for a 45% reduction in the amount of sediment entering Lake Linganore in order to eliminate sediment-related impairments. To attain this reduction, erosion controls and stormwater management will be needed.

#### FECAL COLIFORM

Fecal coliform bacteria, arising from human or animal sources, impairs various streams. A TMDL has not been drafted for this impairment. To reduce this problem, various improvements will be needed such as control of agricultural animals, manure management, improved septic maintenance, better sewage treatment, and improved pet waste management.

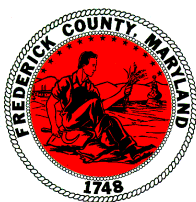
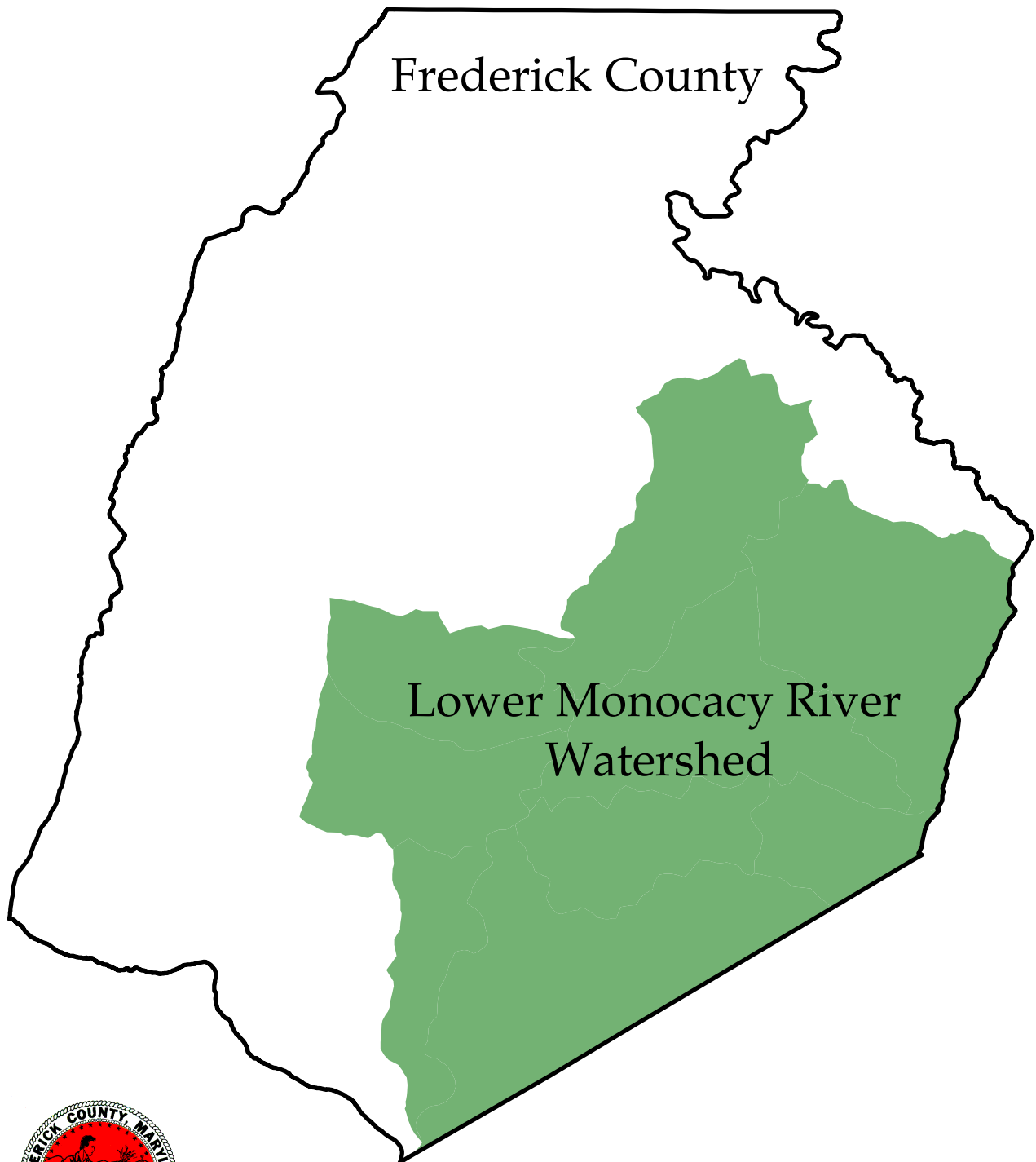
#### BIOLOGICAL IMPAIRMENTS

Impairments to fish and macroinvertebrate (insect) species affect 21 stream sites. The Maryland Biological Stream Survey (MBSS) assessment of local fish and/or benthic macroinvertebrate populations ranked these stream segments as either poor or very poor. A TMDL has not been drafted for this type of impairment.

### Land Use / Land Cover /Soils

Agriculture covers nearly half of the watershed (47%). Forest covers most areas that are too steep, wet or stony for other uses (30%). Development, comprising 22% of the watershed, is most concentrated in Carroll Creek, Ballenger Creek and Upper Bush Creek Watersheds. Lands that are protected from development include park property owned by the County, State or Federal government, agricultural preservation areas, and lands on which conservation easements have been recorded. An estimated 10% of the watershed (or 16,395 acres) is permanently protected from development.

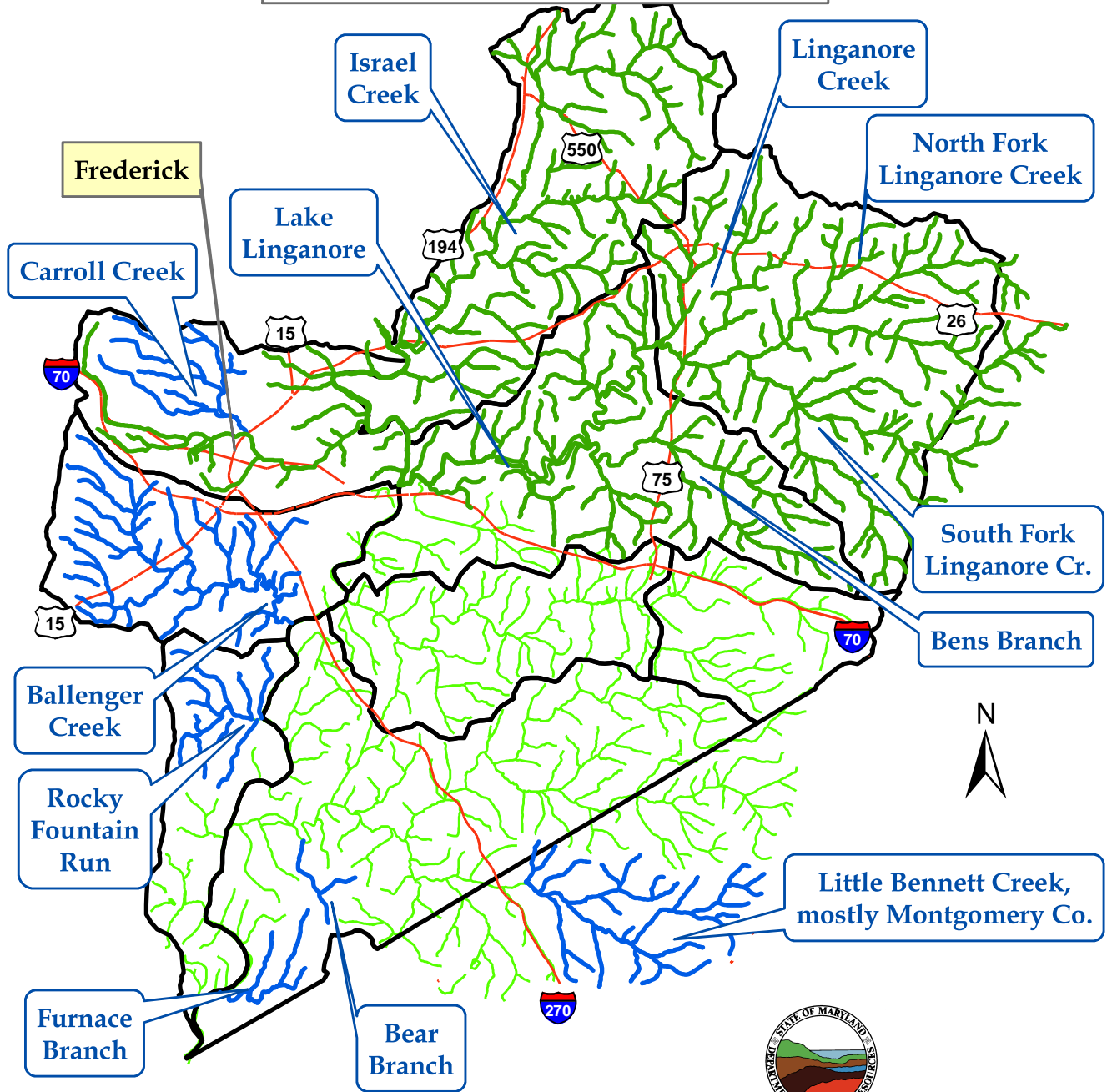
# Map 2: Lower Monocacy River Watershed



While efforts have been made to ensure the accuracy of this map, Frederick County accepts no responsibility for errors, omissions, or positional inaccuracies in the content of this map. Reliance on this map is at the risk of the user.



# Map 3: Designated Uses Lower Monocacy River WRAS

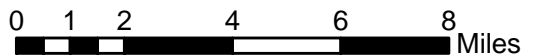


- Use 4P - Recreational Trout Stream
- 3P - Natural Trout Stream
- Use 1P Aquatic Life, Recreational Use
- Frederick Co. Subwatersheds
- Highways



**Maryland Dept. of Natural Resources  
Watershed Services LWAD**

Data: MDE March 2003 GIS: Oct. 2003



1:225,000

The Carroll Creek and Ballenger Creek Watersheds have the greatest impervious area compared to other watersheds -18.6% and 13.4% respectively. The average proportion of impervious surface across the watershed is 4.4% (Map 4). Wetlands are most common in the Bennett Creek Watershed (8%) and the Bush Creek Watershed (7%) but average 4% in the Lower Monocacy as a whole.

Another critical factor affecting water quality is the high proportion of highly erodible soils in the Lower Monocacy River, which averages 23% across the watershed and is as high as 30% in the Bennett Creek Watershed and 29% in the Lower Linganore Creek Watershed.

**Large Areas of Natural Land**

The Largest Green Infrastructure hub is the Sugar Loaf Mountain area. A large percentage of this hub is protected from development by a conservation easement. Several smaller Green Infrastructure areas are not protected from conversion to other uses including the Bennett Creek hub and corridor; Lower Bush Creek hub linked by corridor to the Monocacy main stem; Ballenger Creek headwaters has a small hub and a hub near Ballenger Creek Park; and Linganore Creek has a hub north of Lake Linganore, a hub on the South Fork near the County line and a corridor along most of the length of Linganore Creek. Nearly 22,000 acres of forest are identified as forest interior habitat. However, most of these lands are not protected from land use conversion (Map 5).

**Living Resources and Habitat**

Bear Branch has the only self-sustaining native brook trout population in the Lower Monocacy River Watershed. Ballenger Creek headwaters support a self-sustaining population of naturalized brown trout. Warm water fishery usually experiences adequate reproduction to support recreational fishing. The Monocacy River supports a popular sport fishery for smallmouth bass, channel catfish, redbreast sunfish and carp. Nine rare species of animals, mostly birds, are tracked by the State. Eleven species of sensitive plants, mostly Maryland-designated threatened species, are also tracked. These species are found in at least five ecologically significant areas (ESAs), four of which are in the Bennett Creek Watershed and two in the Monocacy Direct Watershed.

**Restoration Targeting**

Naturally vegetated stream buffers are absent on 65% of the streams in the watershed. The 1997 Stream Corridor Assessment of Rock and Carroll Creeks, which are in the City of Frederick vicinity, found seven miles of streams that lack naturally vegetated stream buffers.

**Restoration Progress**

Nearly 3,000 feet of stream in the vicinity of Rock and Carroll Creeks have been restored. Stream buffer plantings have been completed in several areas including 18 acres along 1.1 miles of stream in October 2000 and enhancement of marginal stream buffers with additional planting on 6 acres along one half mile of stream.

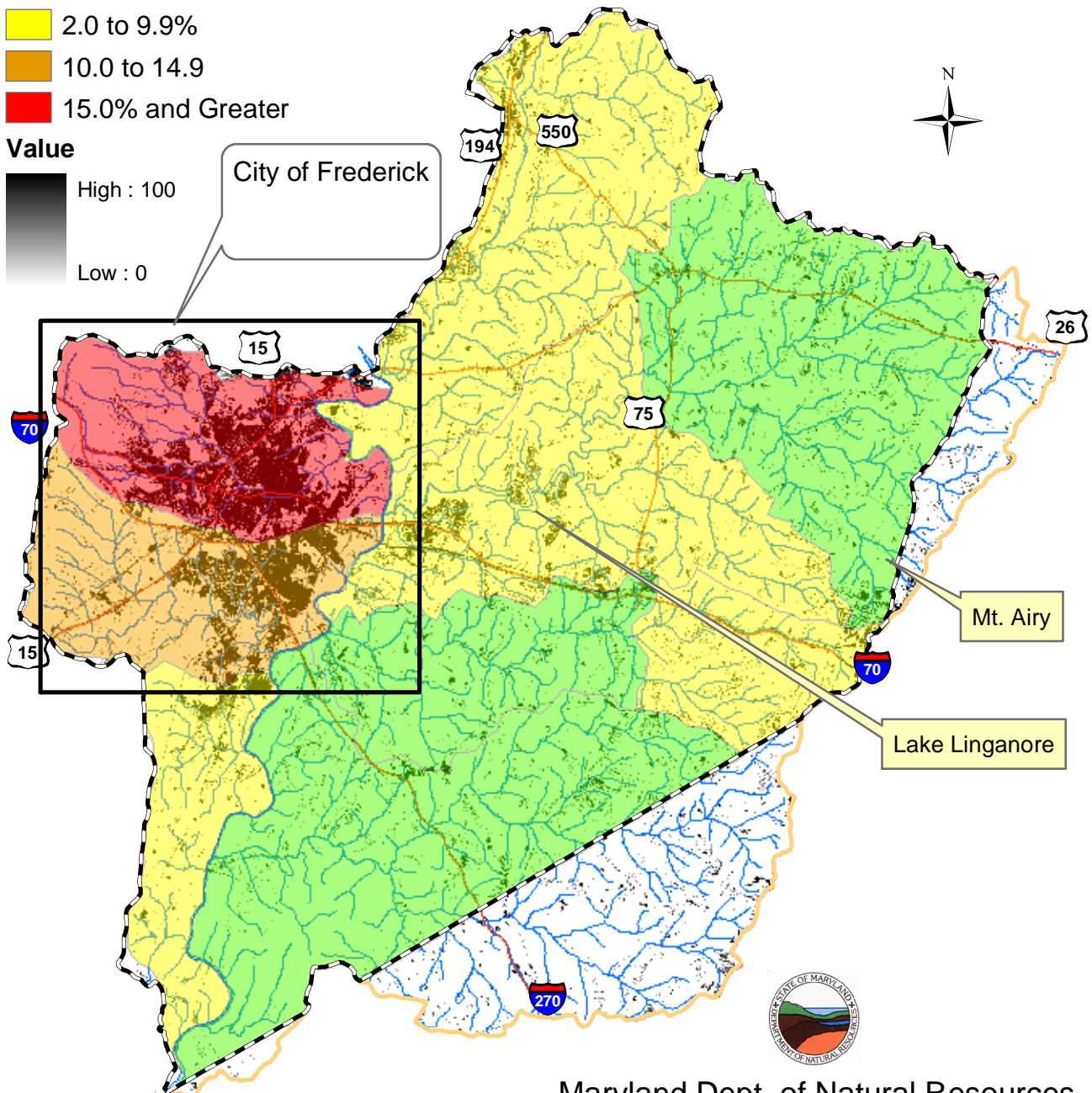
Additionally, the 2004 Backyard Buffer in a Bag Program, implemented by the Lower Monocacy WRAS Partners through its Citizen Outreach working group, designed, publicized and distributed bundles of trees to homeowners with riparian corridors. As a result, 1.2 miles of stream corridors have been planted.

# Map 4 Impervious Surface Lower Monocacy River Watershed

## Watershed Impervious Average

- Less than 2.0%
- 2.0 to 9.9%
- 10.0 to 14.9
- 15.0% and Greater

## Value



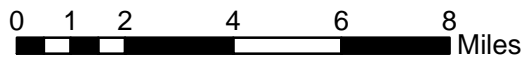
- WRAS Project Boundary
- Lower Monocacy Watershed Boundary
- Highways
- Streams

Maryland Dept. of Natural Resources

Watershed Service LWAD

Data Published: RESAC UOM 2002

GIS: Oct. 2003



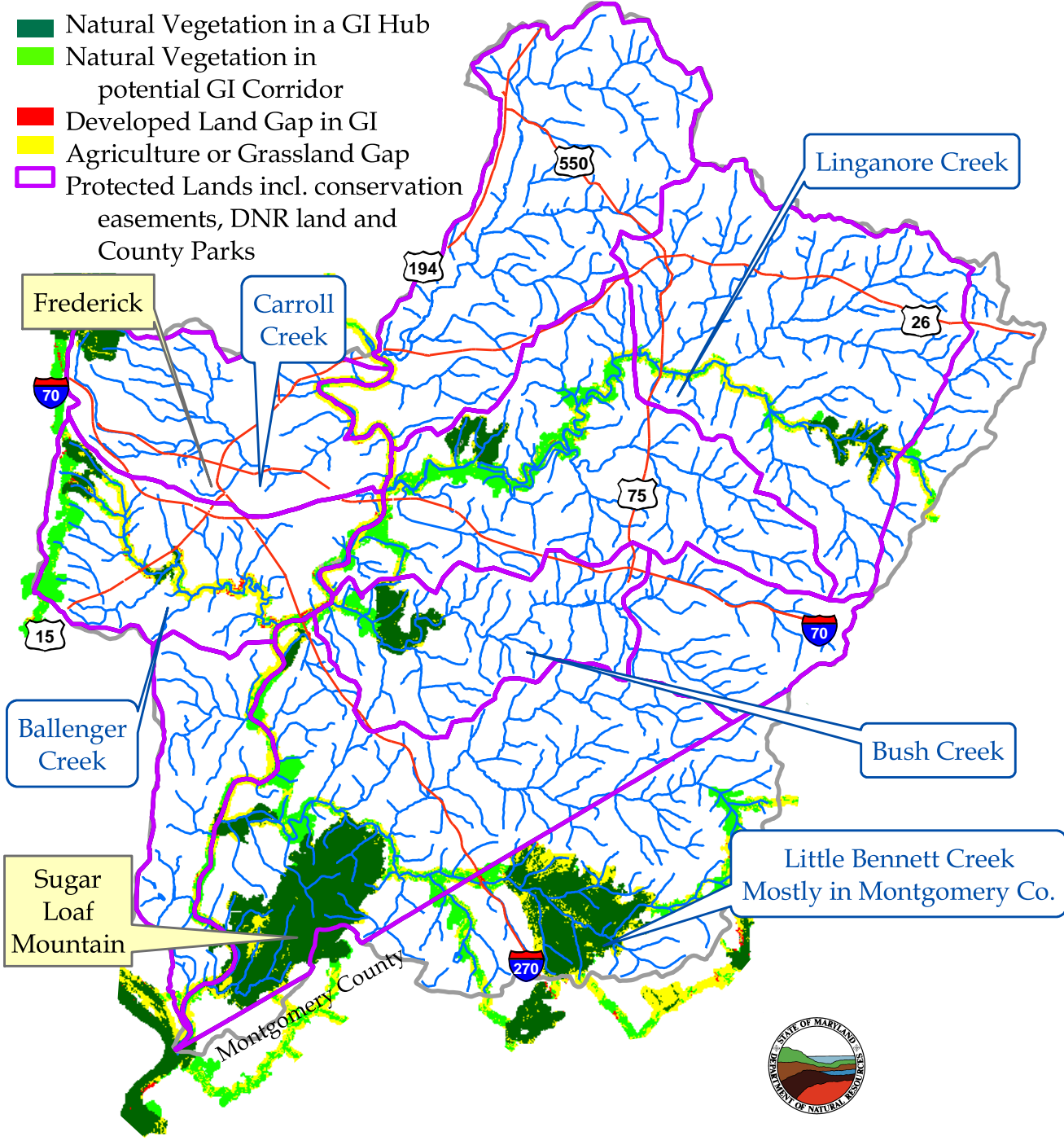
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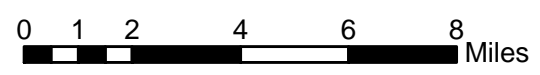


# Map 5: Green Infrastructure Lower Monocacy River WRAS

- Natural Vegetation in a GI Hub
- Natural Vegetation in potential GI Corridor
- Developed Land Gap in GI
- Agriculture or Grassland Gap
- Protected Lands incl. conservation easements, DNR land and County Parks



- Frederick Co. Subwatersheds
- Monocacy Watershed Boundary
- Highways
- Streams



1:225,000



Maryland Dept. of Natural Resources  
Watershed Service LWAD  
GIS: Oct. 2003

**Synoptic Survey**

**Summary of Nutrient Synoptic findings for the Lower Monocacy WRAS**

(Excerpted from full report dated April 2003)

A nutrient synoptic survey was conducted during April 2003 in the Lower Monocacy Watershed as part of the Lower Monocacy WRAS. Samples were analyzed from 77 sites throughout the watershed. Sampling was focused in the Linganore Creek and Bennett Creek Watersheds, with additional samples collected at the outlets of other major tributaries. Biological samples were collected at nine of the nutrient sites.

Nutrient synoptic sampling was scheduled for early spring to coincide with the period of maximum nitrogen concentrations in the free flowing fresh water streams. The major proportion of the nitrogen compounds are carried dissolved in the ground water rather than in surface runoff. The higher nitrogen concentrations in the late winter and early spring reflect the higher proportion of nitrogen rich shallow ground water present in the base flow at this time of year. Nitrogen concentrations are reduced in summer as the proportion of shallow ground water is reduced through plant uptake, and replaced by deeper ground water that may have lower nitrate concentrations, or has been denitrified through interaction with anoxic conditions in the soils below the streambed. Point sources can also contribute to in stream nitrate concentrations.

Orthophosphate is generally transported bound to suspended sediments in the water column. In stream orthophosphate concentrations can also be produced through mobilization of sediment bound phosphorus in anoxic water column and/or sediment conditions, sediment in surface runoff from areas having had surface applied phosphorus, ground water from phosphorus saturated soils, and point source discharges.

Ranges used for nutrient concentrations and yields (Table 3) were derived from work done by Frink (1991). The low-end values are based on estimated nutrient exports from forested watersheds, and the high-end values are based on estimated nutrient exports from intensively agricultural watersheds. As an additional benchmark, the Chesapeake Bay Program uses 1 mg/L total nitrogen as a threshold for indicating anthropogenic impact. The dissolved nitrogen fraction looked at in these synoptic surveys constitutes approximately 50% to 70% of the total nitrogen.

Table 3. Nutrient Ranges and Rating

Rating	NO2+NO3	NO2+NO3	PO4	PO4
	Concentration	Yield	Concentration	Yield
	mg/L	Kg/ha/day	mg/L	Kg/ha/day
Baseline	<1	<.01	<.005	<.0005
Moderate	1 to 3	.01 to .02	.005 to .01	.0005 to .001
High	3 to 5	.02 to .03	.01 to .015	.001 to .002
Excessive	>5	>.03	>.015	>.002

Samples were collected at 78 sites throughout the watershed. The sample from one site was lost in transit to the laboratory. Sampling was focused in the Linganore Creek and Bennett Creek Watersheds, with additional samples collected at the outlets of other major tributaries. Nitrate/nitrite concentrations were found to be excessive in eight watersheds, high in twenty-seven, moderately elevated in thirty-nine others, and baseline in the remaining four watersheds. Nitrate/nitrite yields were found to be excessive in thirty-eight watersheds, high in fifteen, moderately elevated in sixteen, and baseline in the remaining 8. Excessive concentrations of orthophosphate were found in eight watersheds, high concentrations in six, moderate concentrations in eighteen, and the remaining forty-five below baseline. Orthophosphate yields were found to be excessive in one watershed, high in one watershed, moderate in four, and baseline in the remainder. No anomalies were found in the in situ measurements of dissolved oxygen, or temperature. Twenty-one watersheds had relatively high conductivity (>300mmhos/cm) associated with limestone influence. Elevated pH values generally followed the high conductivity for the same reason.

### *A note of caution*

Estimates of annual dissolved nitrogen loads/yields from spring samples will result in inflated load estimates, but the relative contributions of watersheds should remain reasonably stable. More accurate nitrate/nitrite load/yield estimates need to include sampling during the growing season to account for potential lower concentrations and discharges. Storm flows can also significantly impact loads delivered to a watershed outlet. The tendency of orthophosphate to be transported bound to sediments makes any estimates of annual orthophosphate loads/yields derived from base flow conditions very conservative. More accurate estimates of orthophosphate loads/yields in a watershed must include samples from storm flows that carry the vast majority of the sediment load of a watershed. Residual suspended sediments from recent rains, or instream activities of livestock or construction can produce apparently elevated orthophosphate concentrations and yields at base flow.

Biological samples were collected at nine of the nutrient sites. Benthic macroinvertebrate community Index of Biotic Integrity ranged from poor to very poor at the nine sites sampled. The degradation in the benthic community was attributed to degraded habitat associated with storm water flows. Fish communities at the two sites sampled could be considered poor due to influences from Lake Linganore such as the introduction of sunfish and large mouth bass to the system.

The elevated nitrate/nitrite concentrations and/or yields appear to be associated with animal and row crop agriculture in the majority of the watershed. Application of manure for soil nutrient amendment in conjunction with direct animal access to streams is extensive throughout the watershed. These practices are known to contribute significantly to soil and water nutrient levels. The nitrate/nitrite contribution from septic system leach fields is also part of the source and could be significant in areas that have concentrated small lot development on well and septic, such as upper Bennett and Fahrney Branches. This latter association has been seen in a number of unsewered suburban areas in other watersheds.

In addition to the broad understanding of the watershed in the Characterization and the Water Chemistry analysis in the Synoptic Survey, DNR staff walked 75 miles of stream corridor in the Upper Linganore and Bennett Creek Watersheds and reported on their findings in a Stream Corridor Assessment.

The Synoptic Survey can be found in its entirety at <http://www.dnr.state.md.us/watersheds/surf/proj/wras.html>

## **Stream Corridor Assessment**

To support the development of the Lower Monocacy WRAS, a Stream Corridor Assessment Survey was completed in the Lower Monocacy drainage basin. The SCA survey was developed by Maryland's Department of Natural Resources as a management tool to identify the location of environmental problems and helps to prioritize restoration opportunities on a watershed basis. As part of the survey,

specially trained personnel walk a watershed's streams and record data and the location for several environmental problems that can be easily observed within the stream corridor. Some potential problems identified by the survey include: channel alterations, exposed pipes, erosion sites, fish blockages, inadequate buffers, pipe outfalls, representative sites, trash dumping sites, unusual conditions. Each potential problem site is ranked on a scale of one to five for its severity, correctability, and access for restoration work. Additional information on the survey methods can be found on DNR's website at [www.dnr.state.md.us/watersheds/surf/proj/wras.html](http://www.dnr.state.md.us/watersheds/surf/proj/wras.html).

SCA survey fieldwork for the Lower Monocacy River began in January 2003 and was completed by September 2003. Due to restraints on time and funding, only 75 miles of the approximate 600 miles of stream in the Lower Monocacy River Watershed were walked. The branches surveyed were: the Talbot, Town, and Woodville Branches in the Lower Linganore Creek Watershed, and the Bear, Fahrney, North, Pleasant, and Urbana Branches in the Bennett Creek Watershed. These branches were selected because it was felt that they were representative in general land use of the Lower Monocacy River as a whole.

In the areas that were surveyed, field teams identified 247 potential environmental problem sites. The most frequently observed potential problem sites were: inadequate buffered stream banks [115 sites (147,800ft./27.99 miles)], and erosion sites [81 sites (152,145ft./28.82 miles)]. Other potential problem sites identified during the survey were: fish barriers (57 sites), pipe outfalls (45 sites), channel alterations (35 sites), trash dumping sites (14 sites), unusual conditions (10 sites), and exposed pipes (1 site). Additionally, crews recorded descriptive habitat condition data at 43 representative sites.

#### **Inadequate Buffers**

One hundred and fifteen inadequate buffer sites were identified in the Lower Monocacy River survey. Most inadequate buffer sites were rated very severe to severe (73 out of 115 sites). Pasture or crop field were the cited land uses at 53 sites. Inadequate buffers totaled 28 miles, or 37% of streams surveyed. Fifty-four sites were 1,000 ft. or more. Livestock had access to the stream in 29 sites.

#### **Erosion Sites**

Eighty-one erosion sites were identified during the survey. Most erosion sites (52 out of 81 sites) were rated as very severe to severe. Lengths of erosion sites varied from 25 ft. to 6,550 ft. Fifty-one sites were over 1,000 ft. long. A total of 29 miles, or 39%, of stream miles surveyed had eroding stream bank problems.

#### **Fish Barriers**

Fifty-seven fish barriers were found in the areas of the Lower Monocacy River surveyed. Most fish blockages (29 sites) were identified as total blockages. All blockages but 1 were too high for fish to get over. Nearly half of the fish blockages identified (28) were on Woodville Branch.

#### **Pipe outfalls**

Forty-five pipe outfalls were observed during the Lower Monocacy River survey. Most sites were rated low to minor in severity (34 sites). Three sites were rated severe. Twenty-nine outfalls were found in the Linganore Creek Watershed (Talbot, Town, and Woodville Branches). Stormwater was the purpose for 26 pipes. Twenty-three pipes had discharge. Most of the discharges (25) were clear and had no odor. Only one of these pipes had a musky smell associated with it.

**Channel Alterations**

Thirty-five channel alterations were identified during the Lower Monocacy River survey. All channel alterations were given a moderate to minor severity rating. Ten channel alterations were associated with road crossings. Thirty-one out of 35 sites were found in Talbot and Town Branches.

**Trash Dumping**

Fourteen trash-dumping sites were identified during the survey of the Lower Monocacy River. Eleven out of 14 sites were in the Linganore Creek Watershed, and were all rated low severity to minor. The remaining 3 were all rated severe and found on the Pleasant Branch. One site on the Woodville Branch was on public property.

**Unusual Conditions**

Ten unusual conditions were observed during the Lower Monocacy River survey. Four sites were given severe ratings and had livestock in the stream. Six sites were given low severity ratings and involved red flock in the stream.

**Exposed Pipes**

One minor smooth metal exposed pipe was found on the Woodville Branch.

Table 4: Lower Monocacy Stream Corridor Assessment Summary

Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	35	1,592ft (0.30 Miles)	0	0	3	8	24
Erosion Sites	81	152,145ft (28.82 Miles)	21	31	9	15	5
Exposed Pipes	1	NA	0	0	0	0	1
Fish Barriers	57	NA	0	3	15	10	29
Inadequate Buffers	115	147,800ft. (27.99 Miles)	46	17	20	18	14
Pipe Outfalls	45	NA	0	3	8	12	22
Trash Dumpings	14	NA	0	3	2	5	4
Unusual Conditions	10	NA	0	4	0	6	0
<b>Total</b>	<b>358</b>		<b>67</b>	<b>61</b>	<b>57</b>	<b>74</b>	<b>99</b>
<b>Comments</b>	<b>11</b>						
<b>Representative Sites</b>	<b>43</b>						

## Priorities

### Watershed Priorities

The priorities revealed in the plan outlined here are layered. First, there are County priorities arising from environmental permits including the Total Maximum Daily Load (TMDL) and the National Pollutant Discharge Elimination System (NPDES). Related to these permits are public health concerns including source water protection and ground water impacts from decentralized septic systems or other practices. Secondly, there are County priorities arising from geologic conditions, regional plan updates and development patterns, broadly construed. Thirdly, there are priorities arising from stakeholder and partner interests and concerns, often focused on different aspects of the plan, e.g. forest buffers, wetland restoration, community outreach, or specific site locations as with the Audubon Society with two sanctuaries in the Upper Linganore Creek Watershed or Carrollton Manor Trust which targets areas in the Monocacy Direct Watershed. And finally, there are priorities arising from funding opportunities and cycles. These priority layers, mostly complementary, but occasionally competing or contradictory, are difficult to chart. A brief discussion follows which seeks to illustrate the variety of criteria contributing to priorities.

### Linganore Creek Watershed

Linganore Creek, classified as Class IV Recreational Trout Waters, drains approximately 88 square miles of agricultural, forested, and residential land located east-northeast of the City of Frederick. The watershed is a high WRAS priority because of the TMDL on Lake Linganore for phosphorus and sediment, the high proportion (26%) of highly erodible soil in the watershed, the relatively low proportion of forest cover (28.5%), few protected areas, the fact that headwaters of significant branches including Woodville Branch and Cherry Run are in developed and rapidly growing communities, both New Market and Mt. Airy, and more than half of the landscape is in agricultural use. As a result of the combination of these factors, the Linganore Creek Watershed is a priority watershed for several initiatives including those in agriculture (stream buffers, cover crops, “gap filling” BMPs including for horse operations, etc), citizen backyard buffering, headwater area protections, and a future agenda item to create a variable-width stream buffer ordinance which takes into consideration adjacent, steep slopes and is recommended for adoption both in New Market and Mt. Airy as well as the County.

#### NPDES WATERSHED ASSESSMENT

The Lower Linganore Creek Watershed was selected by the County’s National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit program as its third watershed to be studied because of extensive existing and planned development around Lake Linganore and the presence of surface water intakes for water supplies serving the County, the City of Frederick, and a country club. The focus of this watershed assessment, completed in June 2002, was to assess conditions in the watershed, identify water quality problems, describe opportunities to improve water quality, and develop a water quality plan. In addition, the scope of this study was expanded to include computer modeling to assess watershed and subwatershed runoff and pollutant loading characteristics. Ten stream monitoring stations were established on the main stem and tributaries of Lower Linganore Creek. Field activities involved testing water quality, quantifying physical conditions through geomorphic surveys, completing qualitative habitat assessments, sampling benthic macroinvertebrates, and conducting electrofishing surveys. Spring, summer, and fall 2001 surveys indicated that the stream supports a variety of fish and macroinvertebrate biota, including several sport fish species.

Analysis of habitat condition, benthic Index of Biotic Integrity (IBI), and fish IBI scores showed that most ratings fell within the second highest category (i.e. fair). Half of the stations received fish IBI scores of poor and very poor, which is indicative of high numbers of tolerant fish species. To some degree, these conditions are typical for streams in this region, and reflect the area's long agricultural history as well as more recent urban development.

Problems affecting water quality in Lower Linganore Creek and its tributaries are predominantly those arising from both urban and agricultural nonpoint sources. General problems evident in the watershed include alteration of natural flow regimes (i.e. rapid conveyance of stormwater into stream channels), sediment deposition, and physical habitat degradation. In many cases, problems resulted in minor or moderate impacts, particularly where vegetated or forested buffer or existing stormwater management facilities have provided some protection from the impacts of nearby land uses. Taken individually, many of the activities in the watershed likely have little detrimental effect; however, the cumulative effect of these activities throughout the watershed can be of greater concern. Water quality impacts within Lower Linganore Creek loosely fall into ten groups centered around the following issues: cumulative impacts, hydrologic modification, livestock access to stream, cropland runoff, failing septic systems, new construction, future development, industrial/commercial development, existing structures, and inadequate SWM controls. Site-specific and/or general programmatic opportunities were identified for each problem that would help improve water quality within the watershed. Sites were sorted by overall rating for the entire watershed, and by subwatershed, to help prioritize problems and focus future improvement efforts.

WATERSHED WATER QUALITY PLAN

The most promising opportunities to address water quality problems in the Lower Linganore Creek watershed were selected as components of a watershed water quality plan. Further implementation will depend upon cost, available funding, feasibility, and the likelihood of success in improving or sustaining stream habitat and water quality. Recommendations include general programmatic approaches that can be expected to provide benefit to large areas or even Countywide, as well as more site-specific opportunities to implement best management practices (BMPs) at particular locations. Additional recommendations include stream corridor restoration at two locations along Bens Branch, and the further investigation of an automotive scrap yard, which may release contaminants to soil, groundwater, or surface water resources. Actions will address the primary threats to water quality, including stormwater runoff from existing development, livestock access to streams, agricultural runoff, and future construction and development. Table 5 summarizes actions recommended in the watershed water quality plan and presents the proposed implementation schedule. A preliminary cost estimate was also developed for each recommendation.

STREAM RESTORATION/ STORMWATER MANAGEMENT FACILITY RETROFIT ASSESSMENT AND CIP PROJECTS

The NPDES MS4 permit program plans to conduct a more refined study of potential capital projects beginning in 2004-2005. This study will use data from the Watershed Assessment and Water Quality Plan, the WRAS, and additional Stream Corridor Assessment miles to evaluate potential sites for the County's Capital Improvement Program. The entire Linganore Creek watershed will be evaluated. The implementation phase of these projects will begin July 2005 and continue through July 2008.

Table 5: Timetable for the Recommended Actions to Improve Water Quality in the Lower Linganore Creek Watershed

Event	Plan Approval	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6	
		1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half	1 <sup>st</sup> Half	2 <sup>nd</sup> Half
<b>Programmatic Opportunities</b>													
- Source water protection plan for Linganore Creek		on-going											
- Continued Interagency Coordination		on-going											
- Monitor Agricultural Preservation Districts													
- Easement and site maintenance agreements													
- Retrofit and restoration feasibility analysis													
<i>Select watersheds and subwatersheds</i>													
<i>Conduct feasibility analysis in first subwatershed</i>													
<b>Best Management Practices</b>													
- Facilitate local SWM control efforts in older developments near lake			on-going										
- Reduce livestock access to streams		on-going											
- Maintenance issues													
- Opportunities to improve water quality on County-owned properties													
<i>Inquiries to ES3 (Linganore High School)</i>													
<i>Retrofit to ES3 (Linganore High School)</i>													
<i>ES2 (County public safety training facility) project</i>		on-going											
- Unpaved construction roads		on-going											
<b>Stream Corridor Restoration</b>													
- Bens Branch across from Millime Court													
<i>Feasibility evaluation</i>													
<i>Design</i>									†				
<i>Construction</i>										‡			
- Bens Branch at Gas House Pike													
<i>Feasibility evaluation</i>													
<i>Design</i>									†				
<i>Construction</i>										‡			
<b>Further Investigations at Specific Sites</b>													
- (ICD1) Countryside Auto Parts													

Notes:  
 † - schedule begins with approval of feasibility evaluation  
 ‡ - schedule begins with approval of designs

WRAS RESULTS

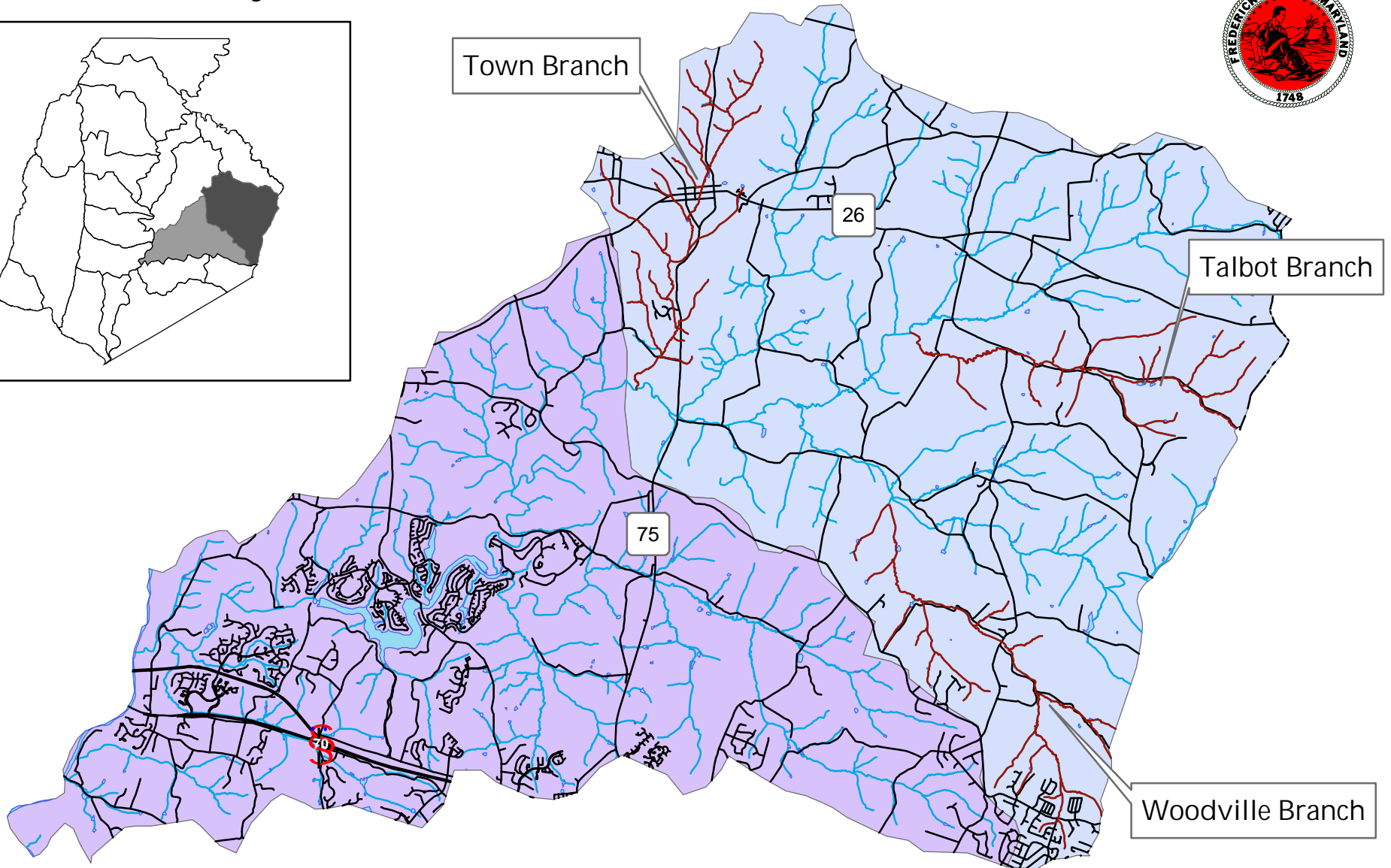
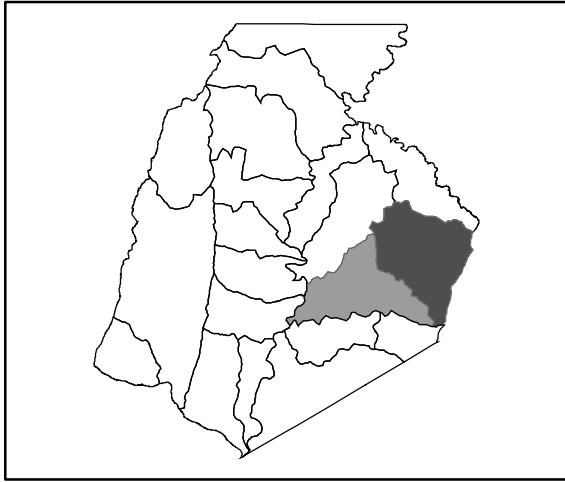
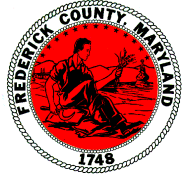
Additionally, the Stream Corridor Assessment discussed earlier evaluated the relative health of three streams in the Upper Linganore Creek Watershed: Woodville, Talbot and Town Branches. The data showed that Town Branch was contributing far more sediment and phosphorus to Lake Linganore than were the other two streams assessed. As a result, the WRAS Steering Committee has begun to identify projects on Town Branch to positively impact water quality. At this writing (5/2004), three land owners in the Libertytown area have been contacted by the WRAS Coordinator to discuss projects, two of which would be stream buffering, and the other a wetland expansion. Additionally, the Soil Conservation District is assisting many agricultural landowners with installation of best management practices including tree plantings under the CREP program. Finally, residential owners with stream frontage have been offered free trees under the Backyard Buffer in a Bag partnership program discussed earlier and some are participating in the program.

TOWN BRANCH

This branch, which is 11.58 miles long, originates north of Libertytown in agricultural areas, runs south along Route 75, through the urbanized center of Libertytown where 19 channel alterations total 0.15 miles in length, to Linganore Creek. There were two areas with recent CREP. The branch is the first WRAS priority (of Town, Talbot and Woodville) in the Upper Linganore Creek Watershed because it appears to have the most sediment transport to Lake Linganore and six instances of livestock accessing the creek. Except for the urbanized portion in Libertytown, most of the corridor is agricultural with small rural subdivisions to the northwest on Daysville Road (Denny's Delight), to the northeast (Liberty East), and to the south in the Winter Springs area off Arlington Road and Britton Court.



# Frederick County



**Map 6: Linganore Creek Watershed**

Road Features from County Roads shapefile current as of 1999.  
Watersheds shapefile current to date, developed in 2002 by Divisions of Planning and Public Works. Hydrography (Rivers, Lakes and Streams shapefiles) current as of 2003, prepared by DPW OTS from 2000 orthophotography.

While efforts have been made to ensure the accuracy of this map, Frederick County accepts no responsibility for errors, omissions, or positional inaccuracies in the content of this map. Reliance on this map is at the risk of the user.



Table 6: Town Branch Site Summary

Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	19	795ft. (0.15 Miles)	0	0	2	6	11
Erosion Sites	9	19,885ft (3.77 Miles)	1	6	2	0	0
Exposed Pipes	0	NA	0	0	0	0	0
Fish Barriers	6	NA	0	1	3	0	2
Inadequate Buffers	22	45,850ft. (8.68 Miles)	12	5	3	1	1
Pipe Outfalls	13	NA	0	0	3	4	6
Trash Dumpings	5	NA	0	0	0	1	4
Unusual Conditions	0	NA	0	0	0	0	0
Total	74		13	12	13	12	24
Comments	4						
Representative Sites	7						

TALBOT BRANCH

Talbot Branch is an 11.92-mile tributary of the North Fork of Linganore Creek. It flows from the Carroll County line on the east in a westerly direction south of Route 26, mostly paralleling from east to west Black Ankle Road, Talbot Road and briefly Woodville Road. It then leaves its roadside course, flowing south from Woodville Road, crossing Burrier Road to the confluence with the North Fork just south of Unionville. Small tributaries flow into the creek from the north and the south, the largest of which flows from the north, just south of Route 26 near Elk Run Vineyards and Winery. Much of the corridor is well buffered with only 2.19 of 11.92 corridor miles having inadequate buffers and a similar extent of significant erosion sites. Some of Talbot Branch drains subdivisions including Talbot Estates, Ledfords Overlook, and Harvest Hills. The Synoptic Survey shows nitrate/nitrite concentrations moderate, yields excessive, and orthophosphates baseline in concentration and yield.

Table 7: Talbot Branch Site Summary




Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	12	372ft. (0.07 Miles)	0	0	1	2	9
Erosion Sites	4	10,200ft (1.93 Miles)	2	2	0	0	0
Exposed Pipes	0	NA	0	0	0	0	0
Fish Barriers	2	NA	0	0	0	1	1
Inadequate Buffers	8	11,580ft. (2.19 Miles)	4	0	3	1	0
Pipe Outfalls	6	NA	0	1	1	2	2
Trash Dumpings	1	NA	0	0	0	1	0
Unusual Conditions	1	NA	0	1	0	0	0
Total	34		6	4	5	7	12
Comments							
Representative Sites	2						

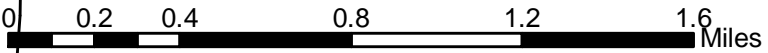


Map 7:  
Lower Monocacy WRAS  
Linganore Creek Watershed  
Town Branch  
Inadequate Buffer Sites

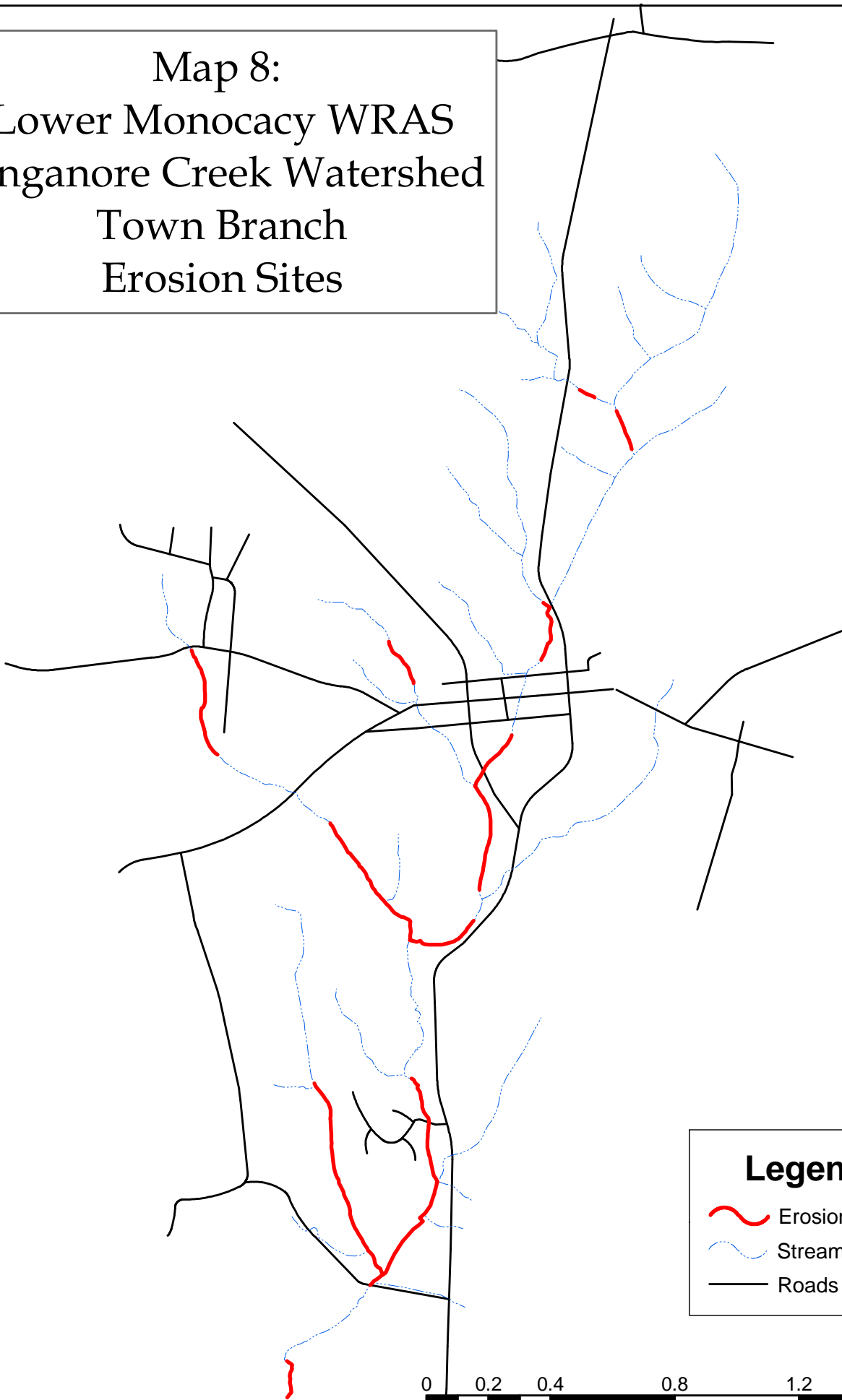


**Legend**




-  Inadequate Buffer
-  Streams
-  Roads

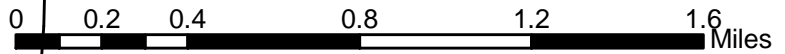


Map 8:  
Lower Monocacy WRAS  
Linganore Creek Watershed  
Town Branch  
Erosion Sites



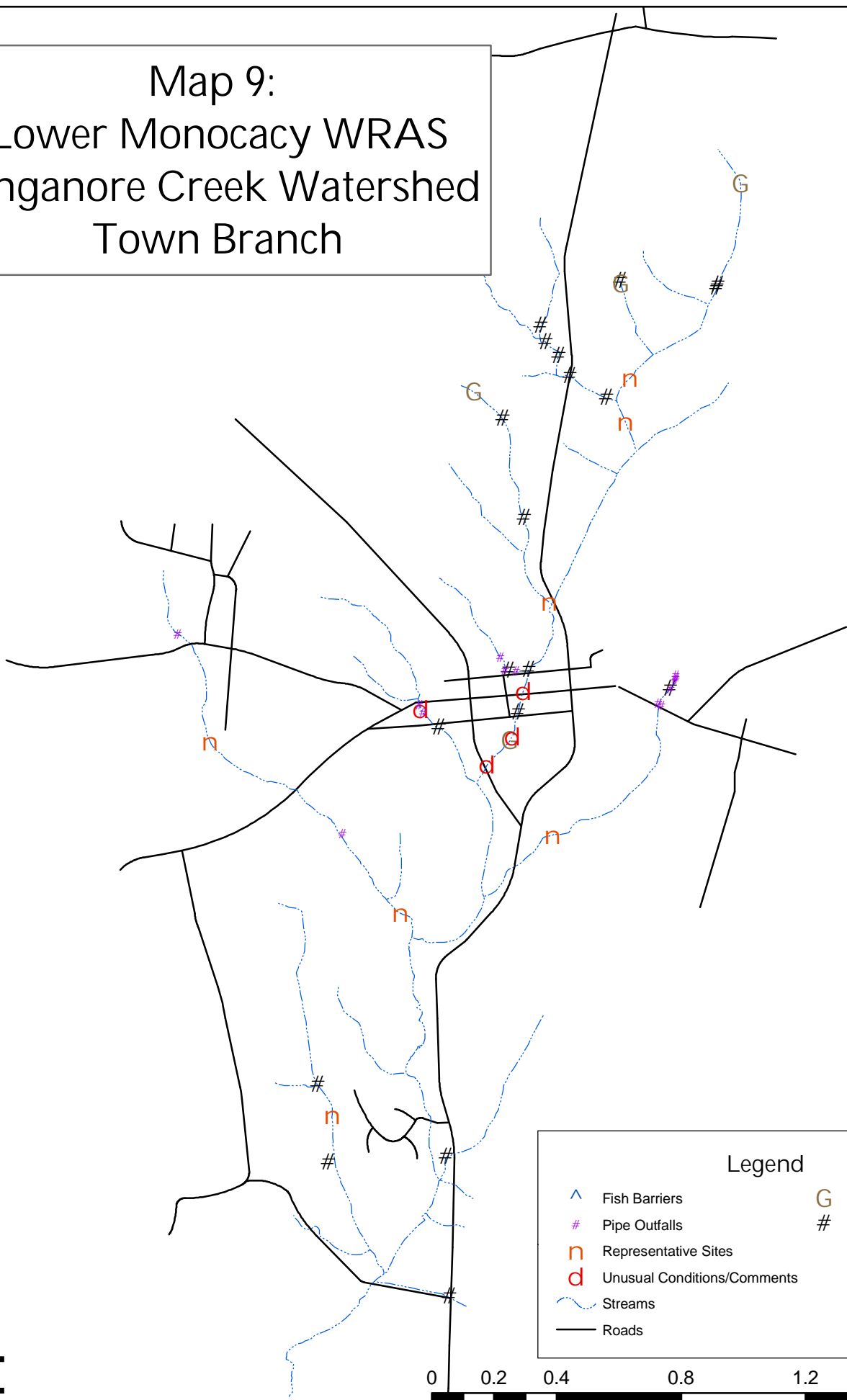
**Legend**

-  Erosion Sites
-  Streams
-  Roads



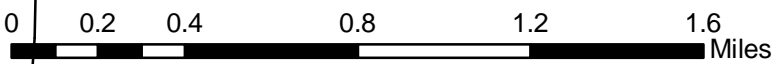


# Map 9: Lower Monocacy WRAS Linganore Creek Watershed Town Branch

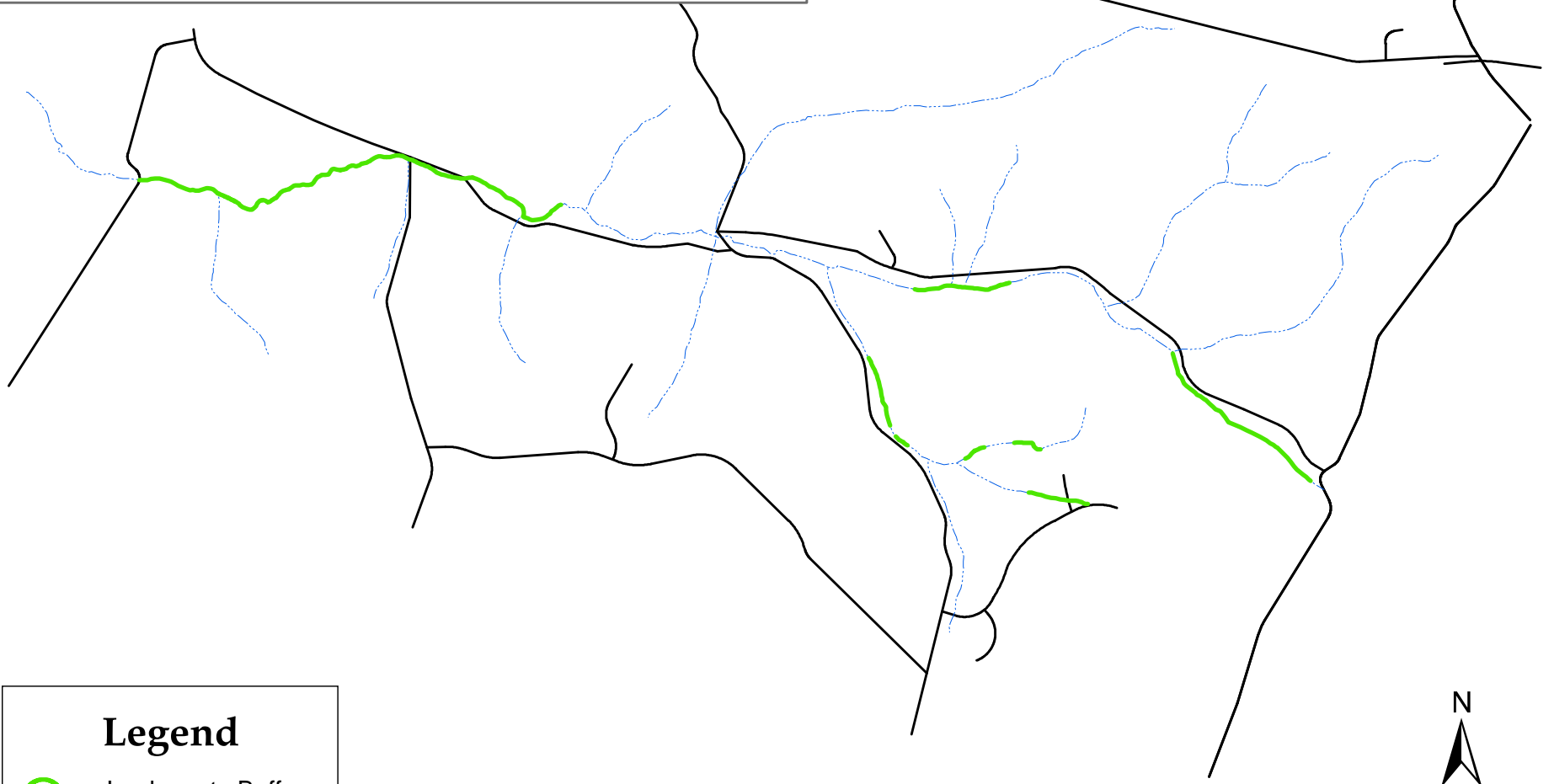


**Legend**




Fish Barriers	Trash Dumping
Pipe Outfalls	Channel Alterations
Representative Sites	
Unusual Conditions/Comments	
Streams	
Roads	

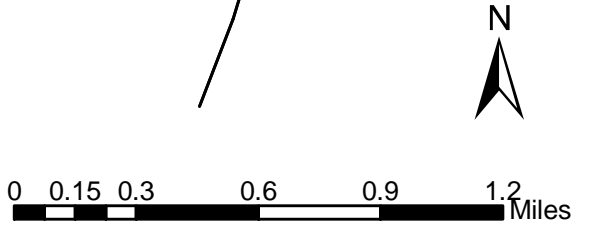


Map 10: Lower Monocacy WRAS  
Linganore Watershed  
Talbot Branch  
Inadequate Buffer Sites

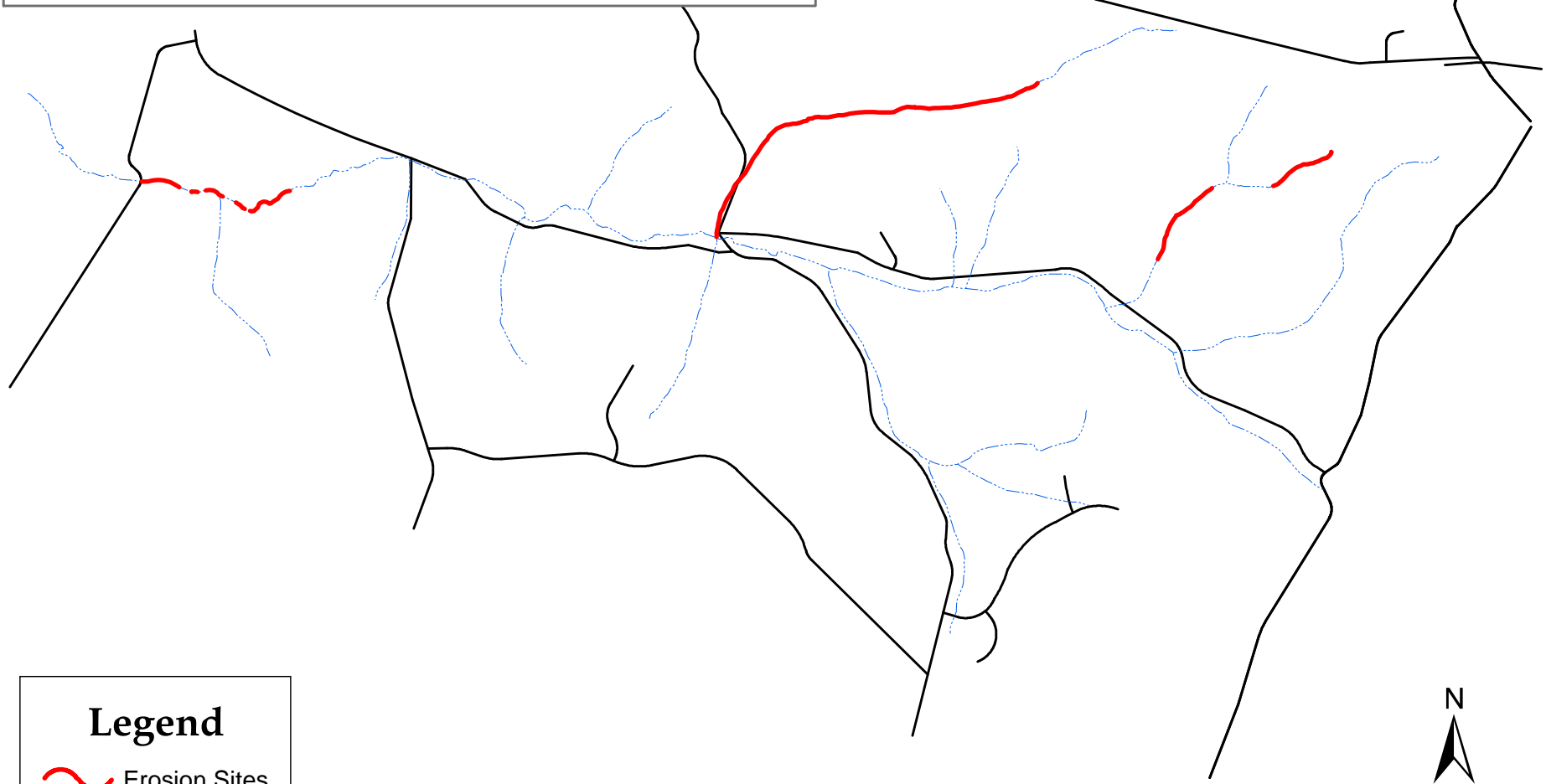


**Legend**




-  Inadequate Buffers
-  Streams
-  Roads

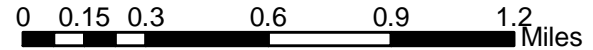


# Map 11: Lower Monocacy WRAS Linganore Watershed Talbot Branch Erosion Sites

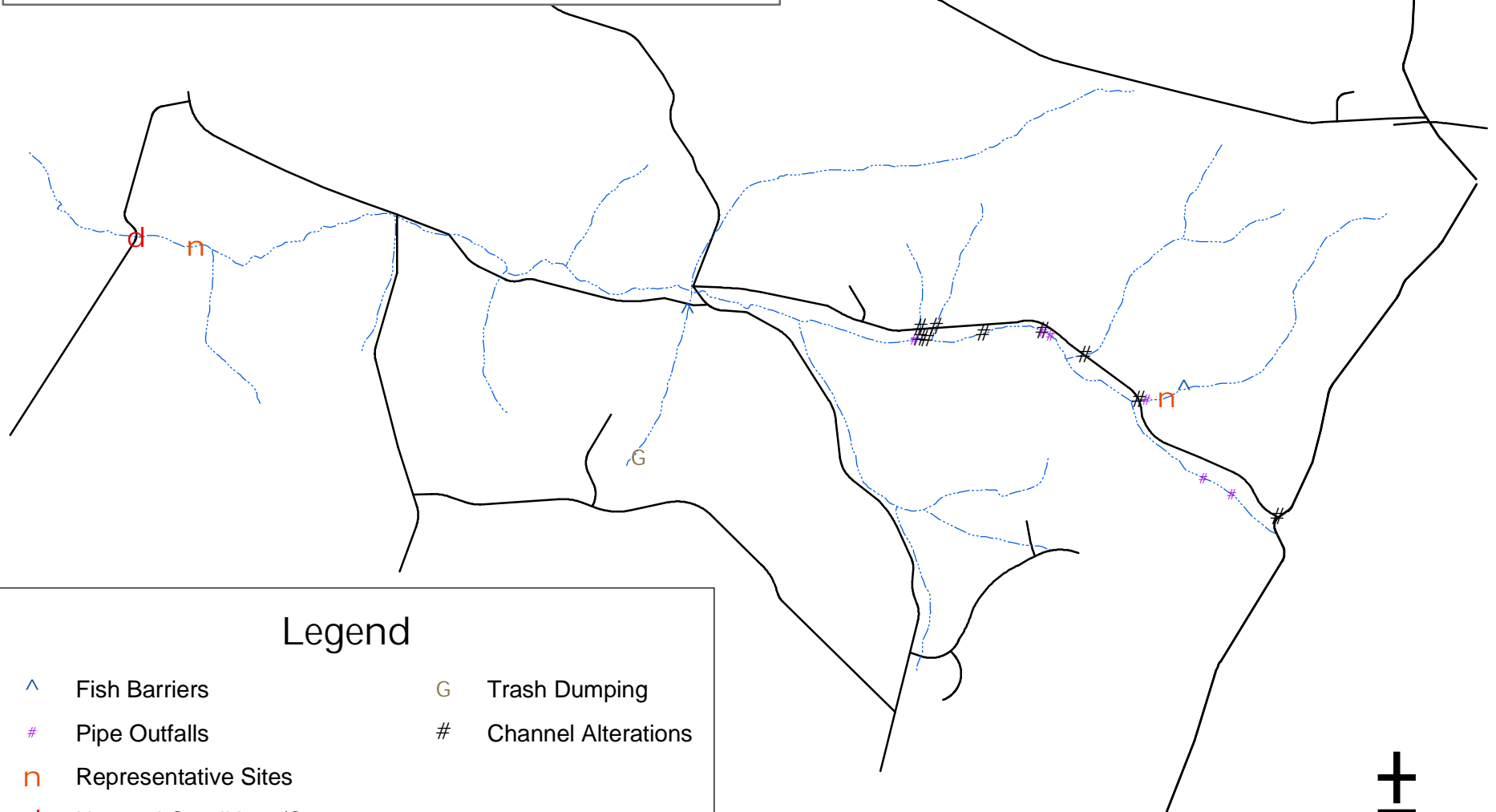


**Legend**

-  Erosion Sites
-  Streams
-  Roads

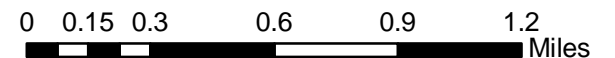


# Map 12: Lower Monocacy WRAS Linganore Watershed Talbot Branch



## Legend

- |                             |                     |
|-----------------------------|---------------------|
| Fish Barriers               | Trash Dumping       |
| Pipe Outfalls               | Channel Alterations |
| Representative Sites        |                     |
| Unusual Conditions/Comments |                     |
| Streams                     |                     |
| Roads                       |                     |





WOODVILLE BRANCH

The Woodville Branch is 13.33 miles long with its headwaters in the town of Mt. Airy (both the Carroll and Montgomery County portions). It includes tributaries from agricultural lands and large lot subdivisions as it travels east to its confluence with the South Fork of Linganore Creek. Areas just north of Mt. Airy (along Bohn Road and to its north) are targeted for possible future annexation. The branch is the third WRAS priority in the Upper Linganore Creek Watershed because it appears to have the least current sediment transport to Lake Linganore and no evidence of livestock accessing the creek. A large series of beaver dam structures midway down the branch serve as dams trapping sediment and nutrients.

Table 8: Woodville Branch Site Summary

Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	0	NA	0	0	0	0	0
Erosion Sites	24	41,180ft (7.80 Miles)	3	10	2	6	3
Exposed Pipes	1	130ft.	0	0	0	0	1
Fish Barriers	29	NA	0	2	11	3	13
Inadequate Buffers	29	25,320ft. (4.79 Miles)	7	4	6	6	6
Pipe Outfalls	11	NA	0	1	2	5	3
Trash Dumpings	5	NA	0	0	2	3	0
Unusual Conditions	2	NA	0	0	0	2	0
Total	101		10	17	23	25	26
Comments	3						
Representative Sites	12						

**Bennett Creek Watershed**

The Bennett Creek Watershed is also a priority area in the Lower Monocacy because of its location in the path of development, bordering Montgomery County. Bennett Creek has experienced “leap frogging” development because of Montgomery’s building restrictions and adjacent Little Bennett State Park. Older developments in the Kemptown and Windsor Knolls areas were built prior to storm water management requirements resulting in “flashy” streams with eroding stream corridors. Some older septic systems in the area merit attention. The Bennett Creek Watershed also contains the Stronghold Preserve, which boasts the only pristine trout-bearing stream in all of the Lower Monocacy River Watershed.




NPDES PRIORITIES

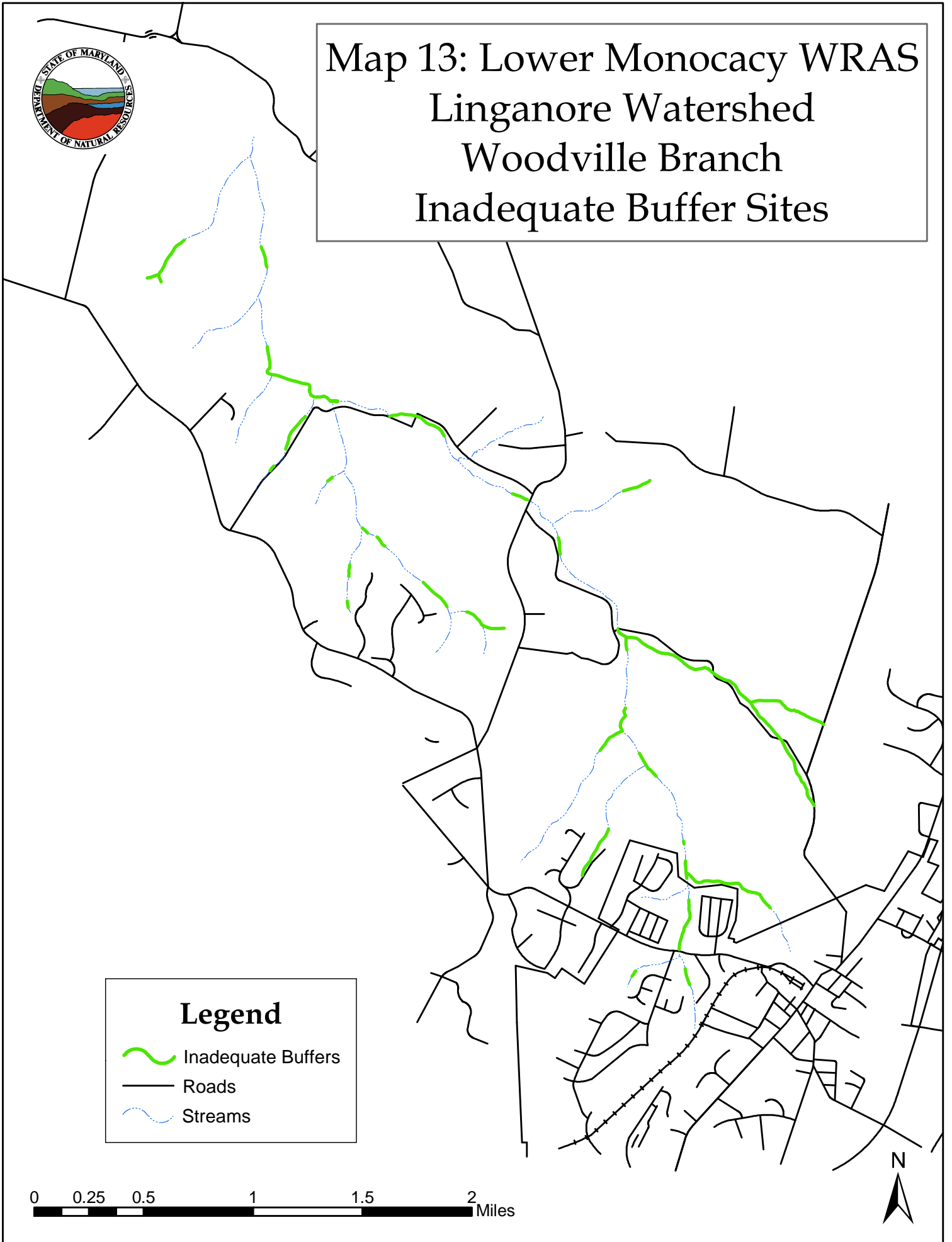
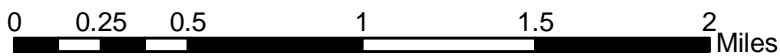
The Bennett Creek Watershed has been selected by the County’s National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit program as its fourth watershed to be studied. The watershed has not yet been assessed by the NPDES program, but is scheduled in the County’s Capital Improvements Program beginning FY’08 and ending FY’10. The Stream Restoration/Stormwater Management Facility Retrofit Assessment for this watershed will likely occur in FY’07.



# Map 13: Lower Monocacy WRAS Linganore Watershed Woodville Branch Inadequate Buffer Sites

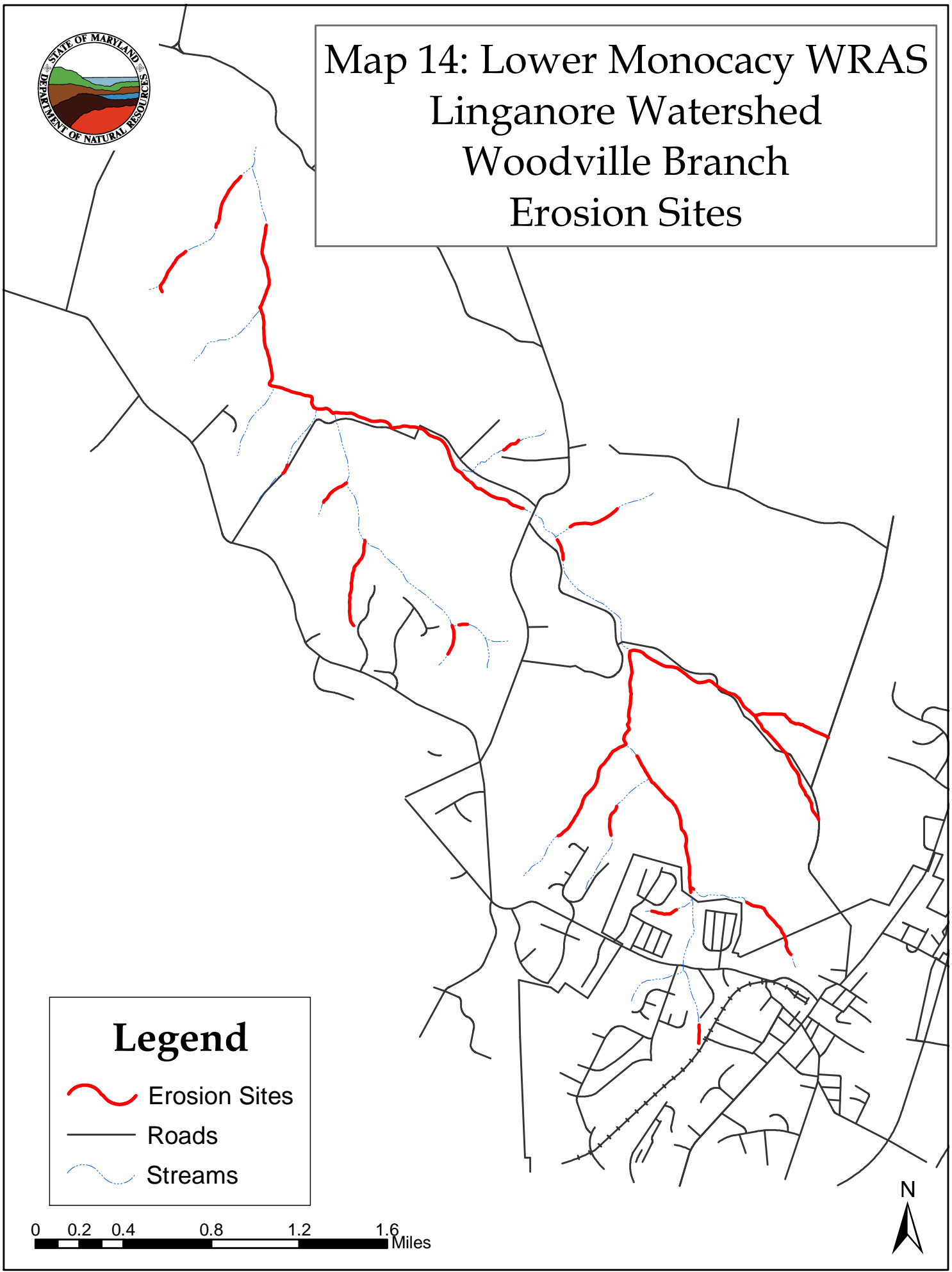
**Legend**

-  Inadequate Buffers
-  Roads
-  Streams








# Map 14: Lower Monocacy WRAS Linganore Watershed Woodville Branch Erosion Sites



## Legend

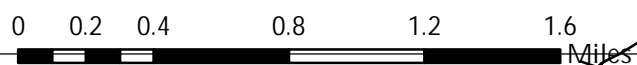
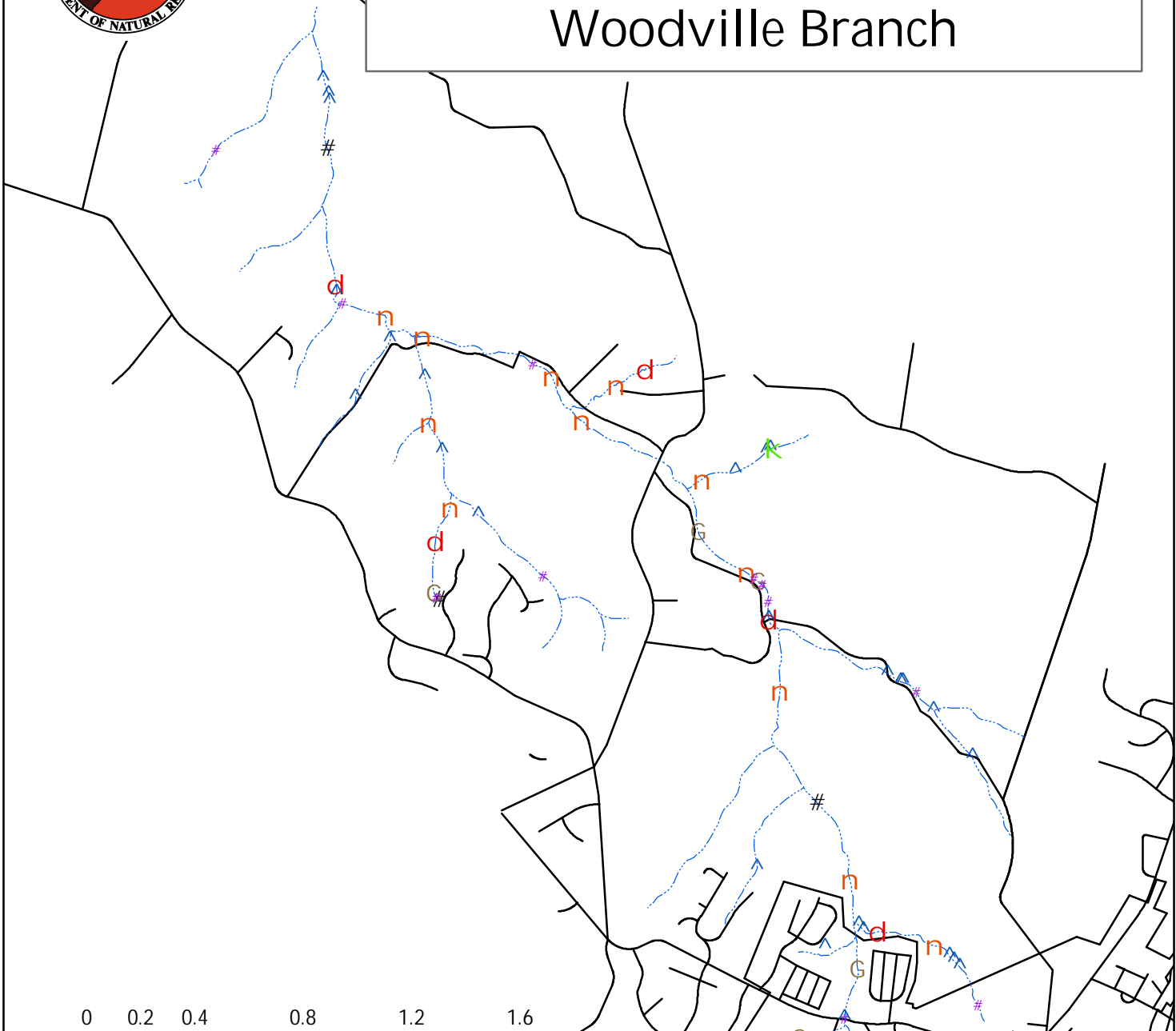
-  Erosion Sites
-  Roads
-  Streams

0 0.2 0.4 0.8 1.2 1.6 Miles





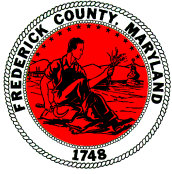
# Map 15: Lower Monocacy WRAS Linganore Watershed Woodville Branch



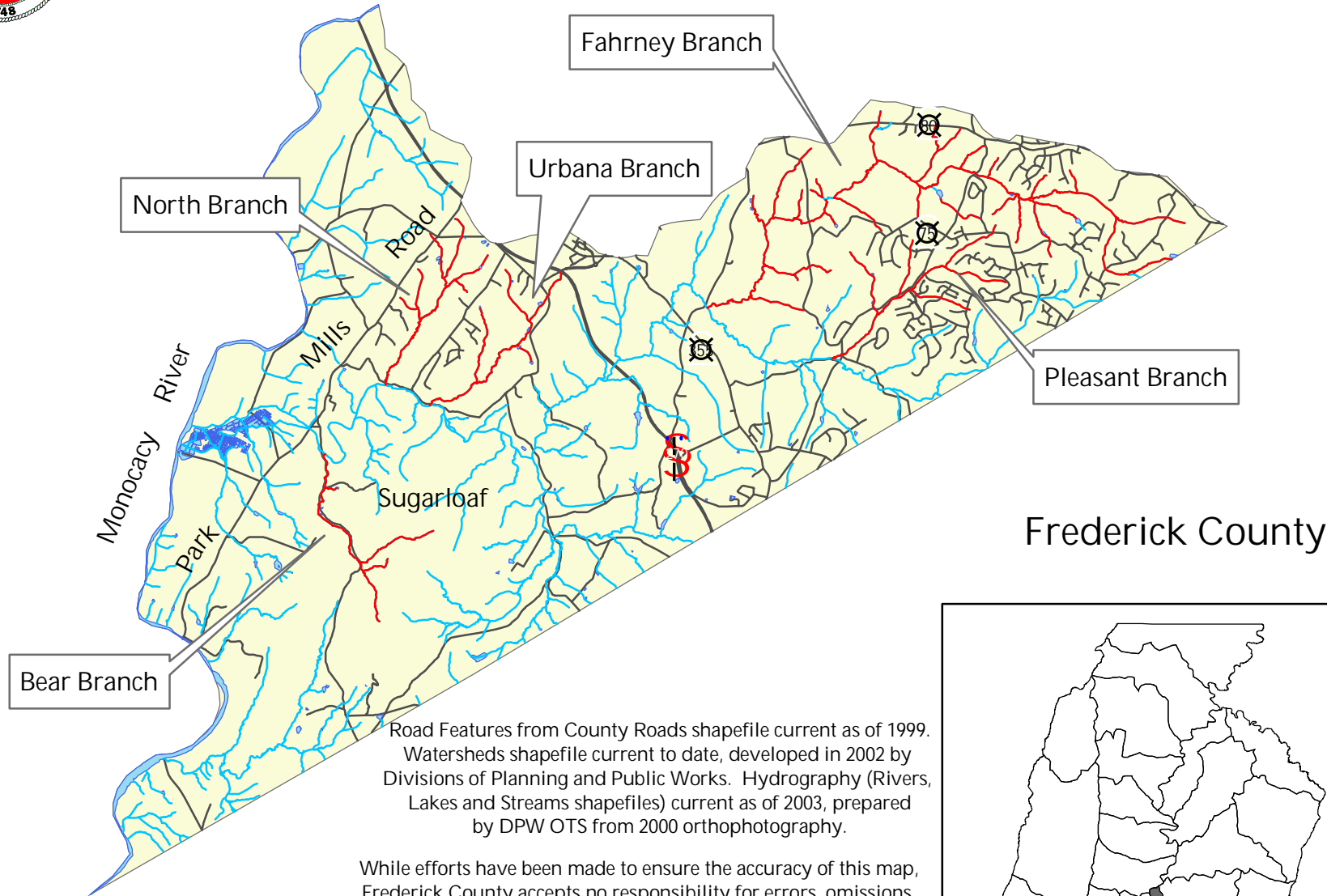
### Legend

- K** Exposed Pipes
- ^** Fish Barriers
- #** Pipe Outfalls
- n** Representative Sites
- d** Unusual Conditions/Comments
- Roads
- ~ Streams
- G** Trash Dumping
- #** Channel Alterations





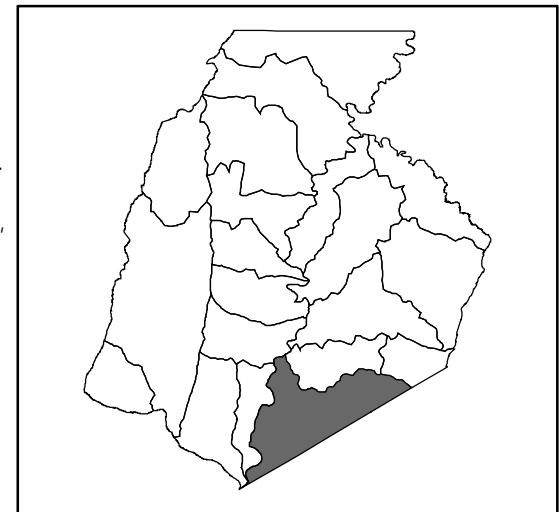
# Map 16: Bennett Creek Watershed



Frederick County

Road Features from County Roads shapefile current as of 1999.  
Watersheds shapefile current to date, developed in 2002 by  
Divisions of Planning and Public Works. Hydrography (Rivers,  
Lakes and Streams shapefiles) current as of 2003, prepared  
by DPW OTS from 2000 orthophotography.

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or positional inaccuracies in the content of this map.  
Reliance on this map is at the risk of the user.



Major new development in the Urbana vicinity, including the Villages of Urbana, disturbs large acreages, the effects of which are being monitored by the County’s NPDES program which is comparing effects on Peter Pan Run from old and new storm water management practices. Large new commercial facilities such as FNMA are potential partners for “greener” landscape practices. Sugarloaf Mountain’s conservation easements protect the largest forested area in the Lower Monocacy where the only trout stream with native reproducing brook trout, Bear Branch, is located. The Sugarloaf area is one of four “Sensitive Species” habitat areas in the Bennett Creek Watershed.

**BEAR BRANCH**

Bear Branch is a 3.06-mile stream with headwaters in Sugarloaf Mount Park. It was selected as an example of a healthy stream since it is rated for and apparently supports a reproducing trout population. Overall, the stream is pristine but degraded by the presence of Mt. Ephriam Road that parallels 2/3 of the creek with a road crossing and culvert that form two fish blockages. An estimated 200 feet of the stream are inadequately buffered with 1/5 mile with moderate erosion sites. Downstream unbuffered stream reaches may naturally regenerate. Black walnut trees are common in these areas.

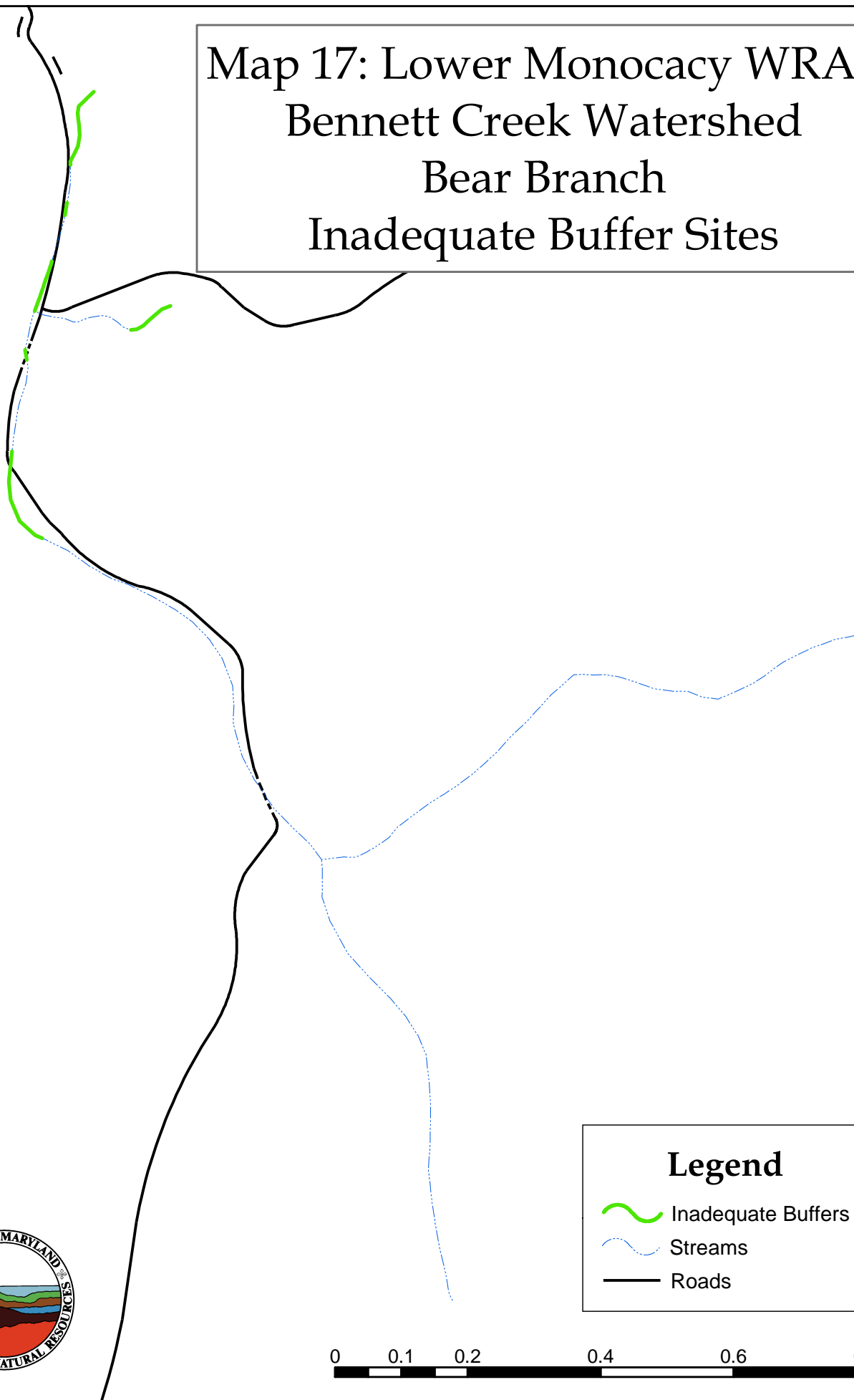
**Table 9: Bear Branch Site Summary**

Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	0	NA	0	0	0	0	0
Erosion Sites	3	1,025ft (0.19 Miles)	0	0	3	0	0
Exposed Pipes	0	NA	0	0	0	0	0
Fish Barriers	2	NA	0	0	0	1	1
Inadequate Buffers	3	2,250ft. (0.43 Miles)	0	1	0	1	1
Pipe Outfalls	0	NA	0	0	0	0	0
Trash Dumpings	0	NA	0	0	0	0	0
Unusual Conditions	0	NA	0	0	0	0	0
<b>Total</b>	<b>8</b>		<b>0</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>2</b>
Comments	0						
Representative Sites	1						




**FAHRNEY BRANCH**

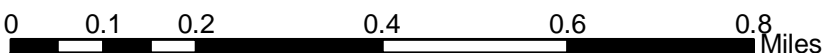
Fahrney Branch is a 17.97 mile stream with headwaters in Rattlewood Golf Course that straddles the Montgomery/Frederick County line northwest of Kemptown. After paralleling the County line and dipping into Montgomery County, the creek returns to Frederick County just south of Kemptown Elementary School. One of its tributaries flows from west to east along the northern perimeter of Kemptown Community Park. The stream continues flowing west, crossing Route 75 south of Fingerboard Road, continuing west crossing under Price Distillery Road to its confluence with Bennett Creek at Big Woods Road, just north of Route 355 and south of Urbana High School. Roughly half of the stream corridor is eroded with 15 areas rated as severe or very severe and 9 rated with low severity or minor. Inadequate vegetated buffers are also found along half of the stream with 19 locations very severe or severe, 5 moderate, and 5 minor or low severity.

# Map 17: Lower Monocacy WRAS Bennett Creek Watershed Bear Branch Inadequate Buffer Sites

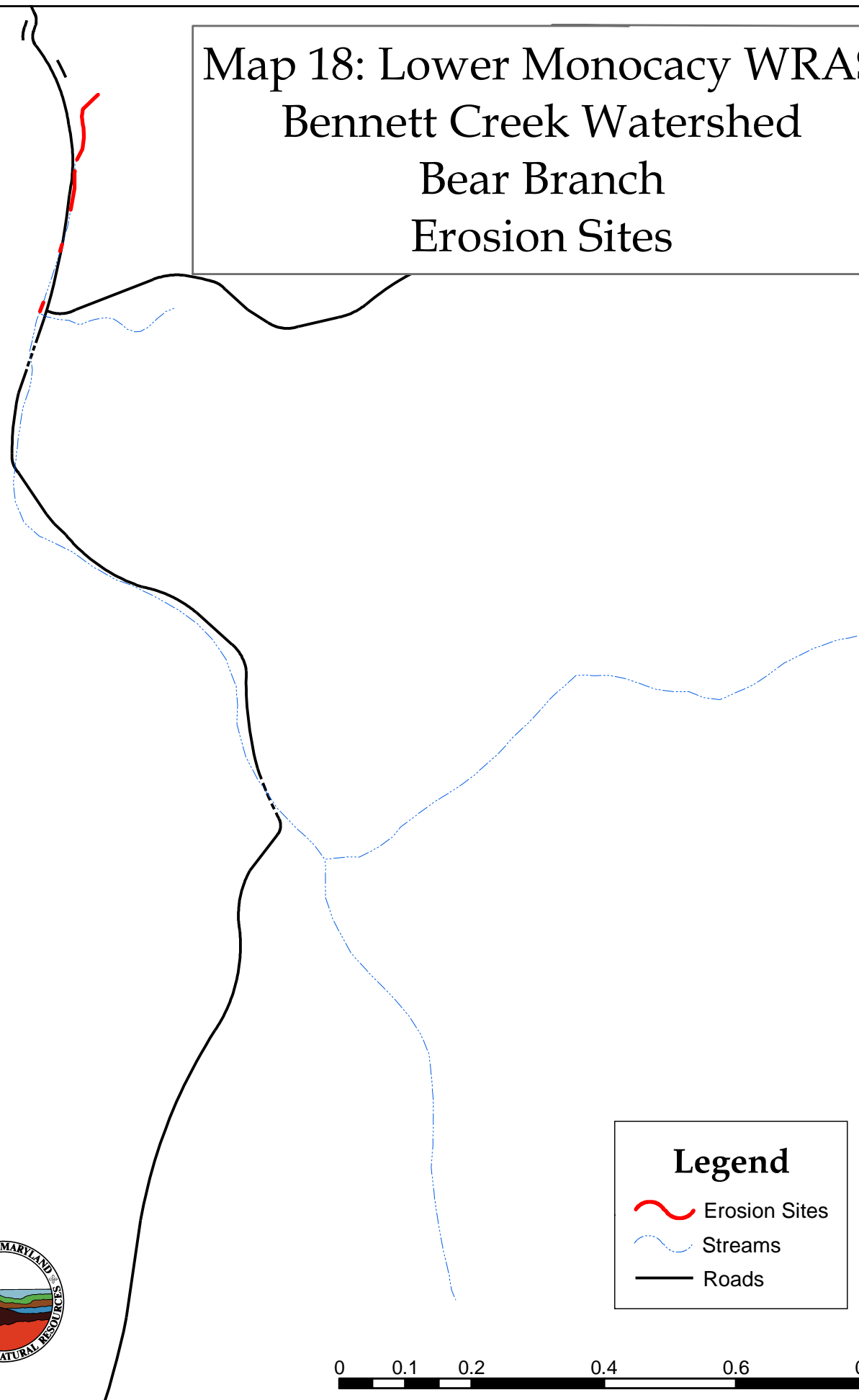


**Legend**




-  Inadequate Buffers
-  Streams
-  Roads

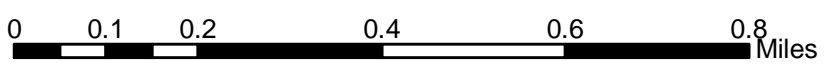


# Map 18: Lower Monocacy WRAS Bennett Creek Watershed Bear Branch Erosion Sites



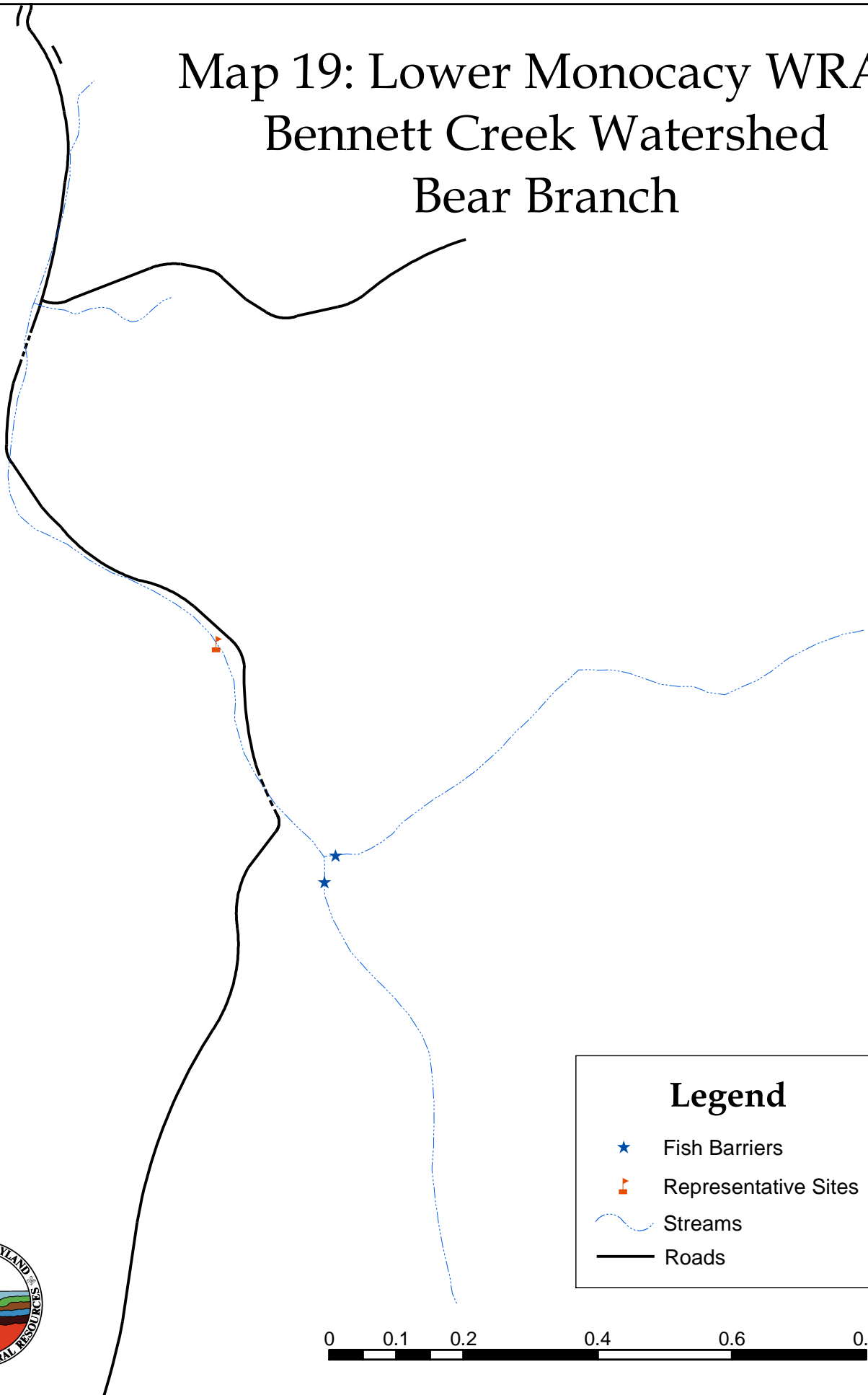
**Legend**

-  Erosion Sites
-  Streams
-  Roads





# Map 19: Lower Monocacy WRAS Bennett Creek Watershed Bear Branch



## Legend

- ★ Fish Barriers
- ▤ Representative Sites
- ~ Streams
- Roads



0 0.1 0.2 0.4 0.6 0.8 Miles

Water quality data from the Synoptic Survey in April 2003, shows that nitrate/nitrite concentrations are high while yields are excessive. For orthophosphates, nutrients are less severe than nitrate/nitrites with high concentrations only in one of the three samplings (at Price Distillery Road) and moderate concentration in the upstream and downstream samplings. Orthophosphate yields are even better with all three sampling points showing baseline levels.




Table 10: Fahrney Branch Site Summary

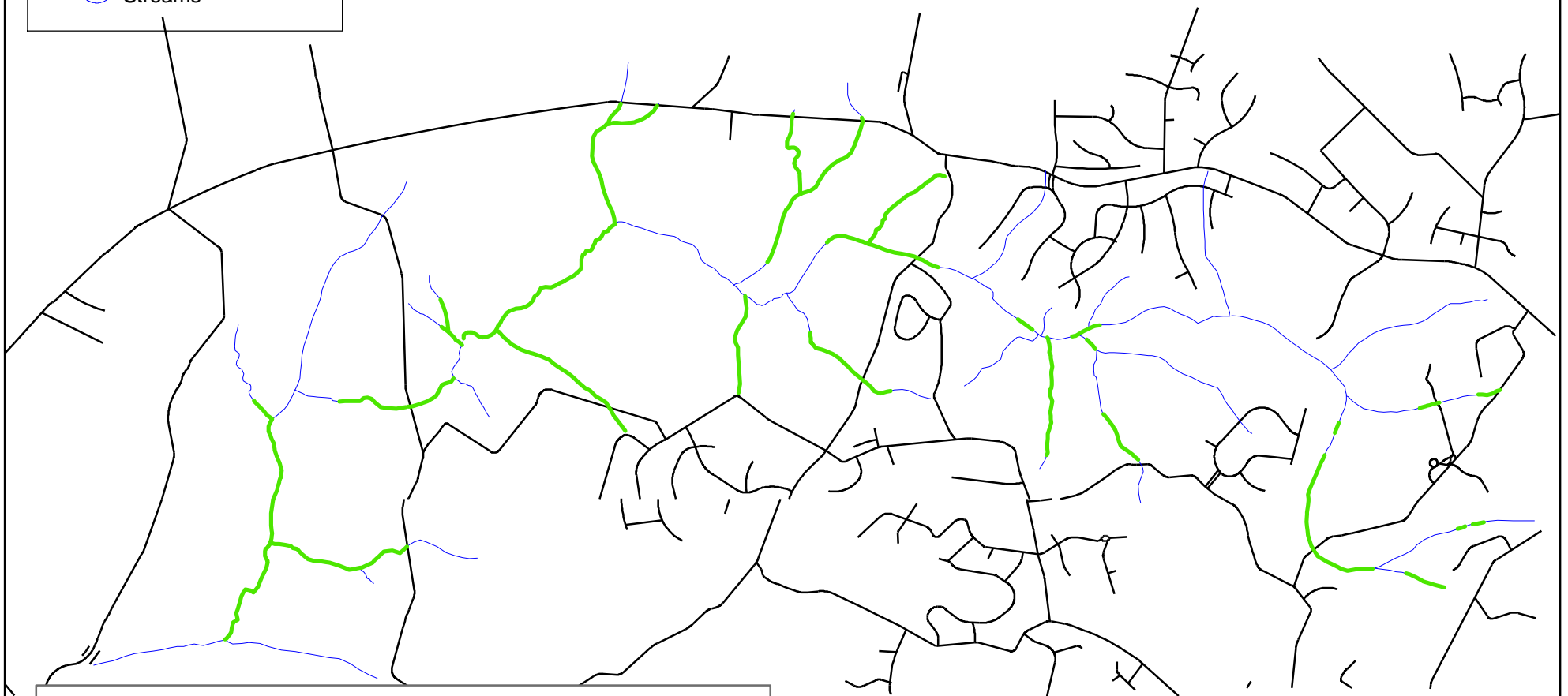
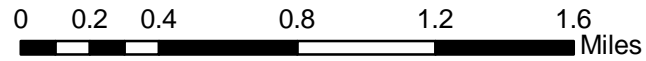
Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	0	NA	0	0	0	0	0
Erosion Sites	24	41,515ft (7.86 Miles)	9	6	0	7	2
Exposed Pipes	0	NA	0	0	0	0	0
Fish Barriers	6	NA	0	0	0	1	5
Inadequate Buffers	29	42,250ft. (8 Miles)	13	6	5	3	2
Pipe Outfalls	5	NA	0	1	1	0	3
Trash Dumpings	0	NA	0	0	0	0	0
Unusual Conditions	4	NA	0	2	0	2	0
Total	68		22	15	6	13	12
Comments							
Representative Sites	10						

NORTH BRANCH

North Branch is a 3.76 mile stream reach with headwaters just south of Interstate 270 in the residential area along Fingerboard Road. It flows south through Worthington Manor Golf Course, along the rear of residential development in Hope Valley Hills to its confluence with Bennett Creek just south of Peters Road. Slightly less than half of the stream corridor has inadequate buffers (1.5 miles) and erosion (1.65 miles) rated as severe or very severe. Water sampling during April 2003 near the confluence with Bennett Creek showed high levels of nitrate/nitrite with moderate concentrations and high yields. Orthophosphate measurements showed baseline levels for yield and concentration

# Legend




-  Inadequate Buffers
-  Roads
-  Streams



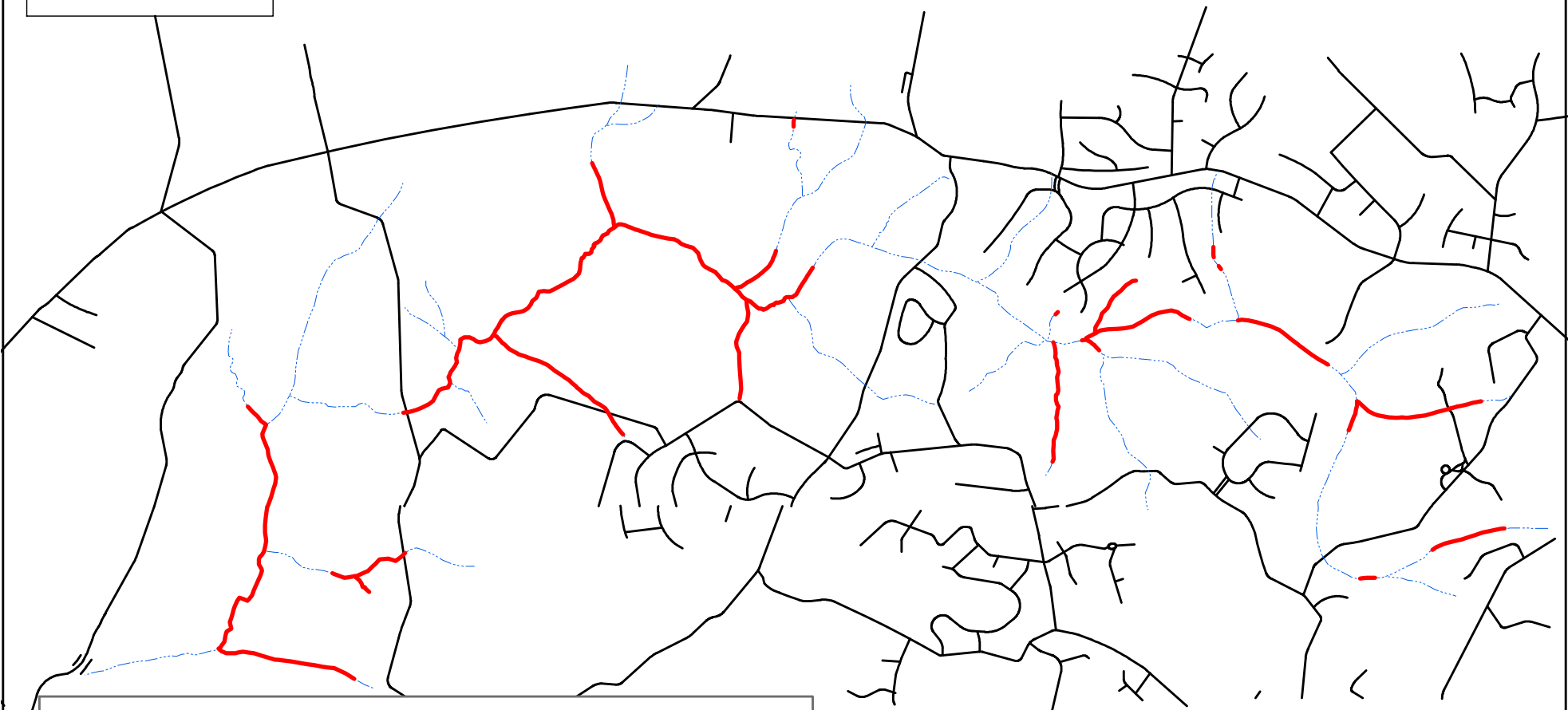
Map 20: Lower Monocacy WRAS  
Bennett Creek Watershed  
Fahrney Branch  
Inadequate Buffer Sites



# Legend

-  Erosion Site
-  Streams
-  Roads

0 0.2 0.4 0.8 1.2 1.6 Miles

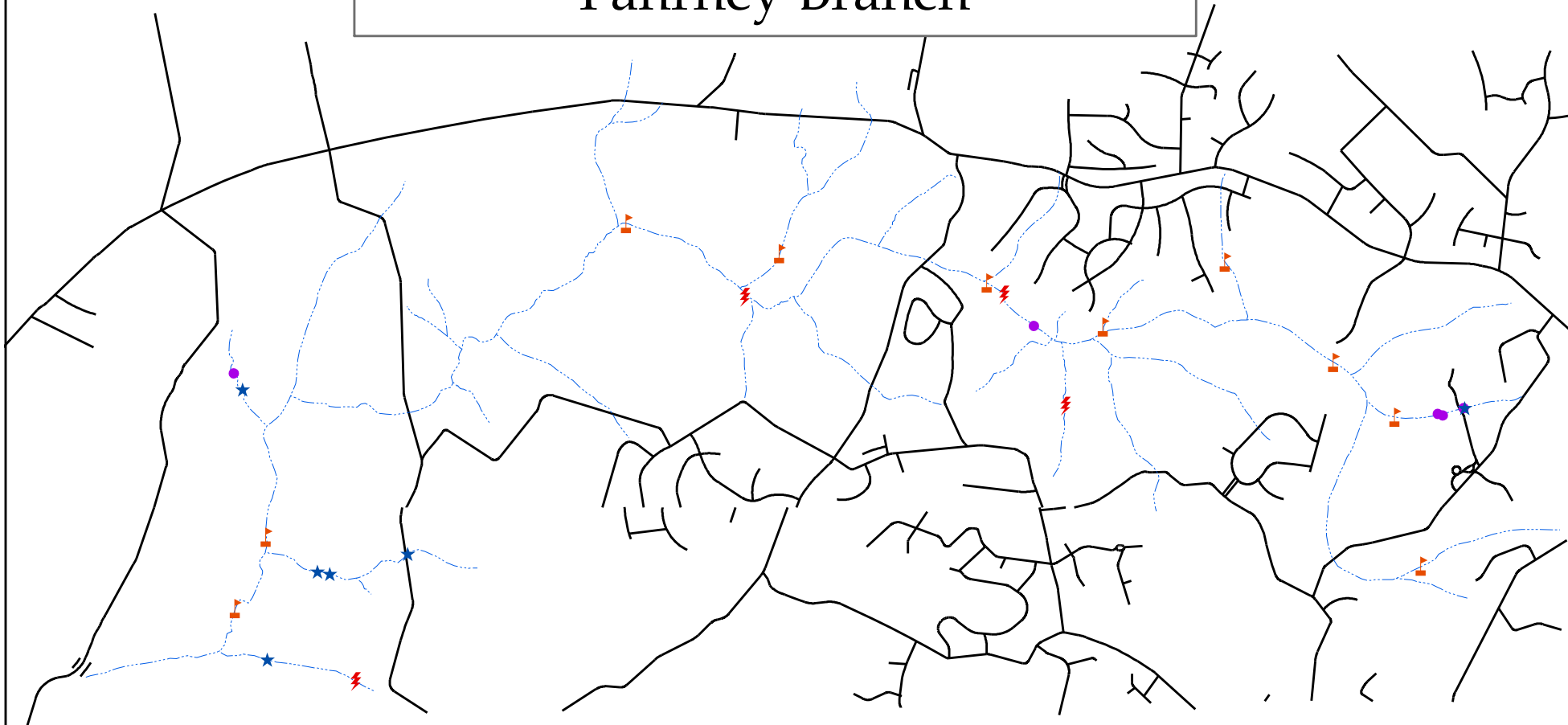


Map 21: Lower Monocacy WRAS  
Bennett Creek Watershed  
Fahrney Branch  
Erosion Sites





# Map 22: Lower Monocacy WRAS Bennett Creek Watershed Fahrney Branch



## Legend

- ★ Fish Barriers
- Pipe Outfalls
- ▲ Representative Sites
- ⚡ Unusual Conditions/Comments
- ~ Streams
- Roads

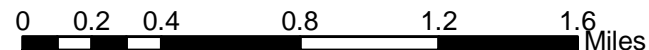


Table 11: North Branch Site Summary

Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	0	NA	0	0	0	0	0
Erosion Sites	3	8,710ft (1.65 Miles)	1	2	0	0	0
Exposed Pipes	0	NA	0	0	0	0	0
Fish Barriers	2	NA	0	0	0	0	2
Inadequate Buffers	3	7,900ft. (1.50 Miles)	2	0	1	0	0
Pipe Outfalls	0	NA	0	0	0	0	0
Trash Dumpings	0	NA	0	0	0	0	0
Unusual Conditions	1	NA	0	1	0	0	0
Total	9		3	3	1	0	2
Comments							
Representative Sites	2						

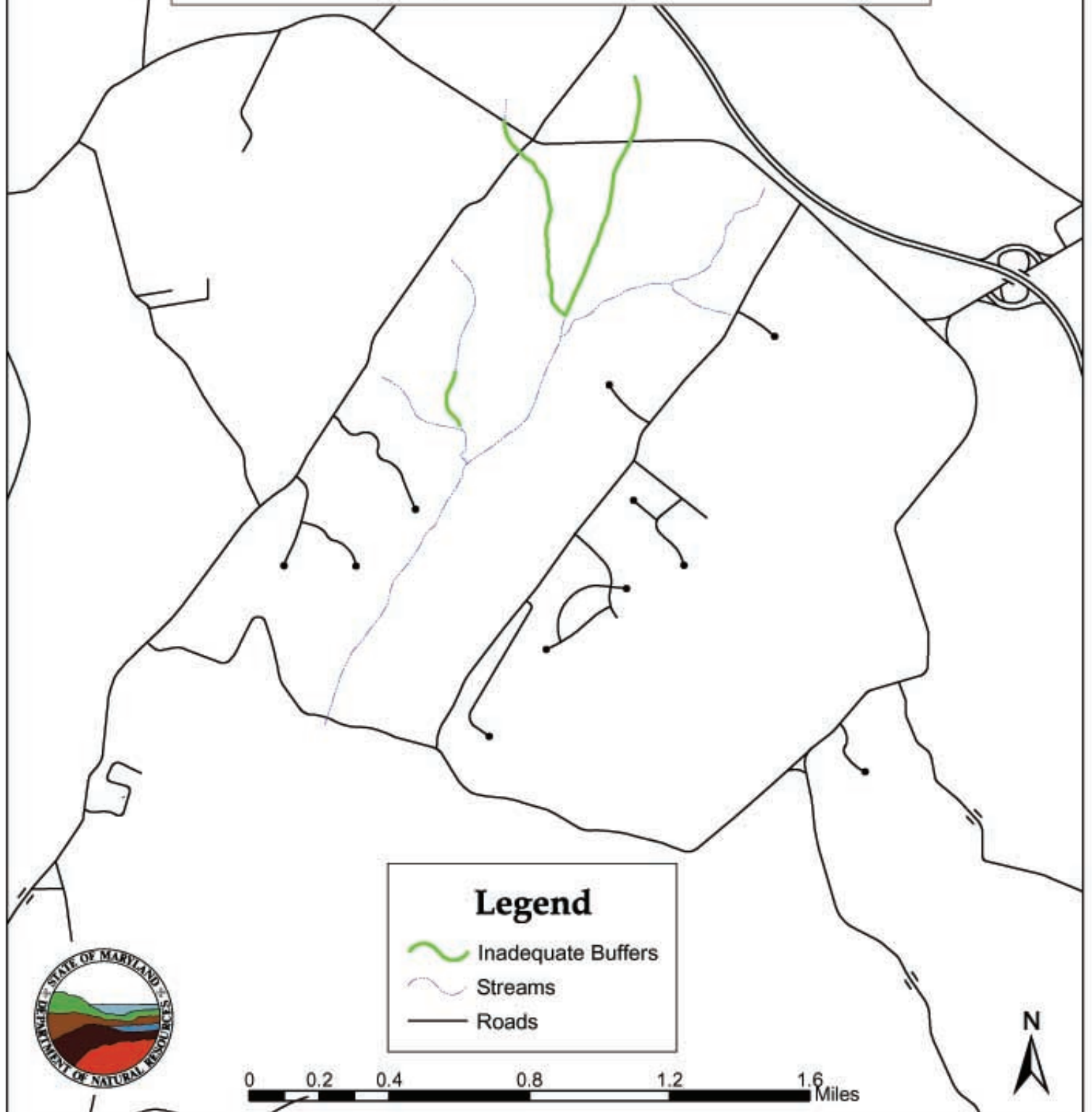
PLEASANT BRANCH

Pleasant Branch is a 5.76 mile tributary of Bennett Creek which flows from east to west, roughly parallel first to Browningville Road. Its two upstream forks meet at Windsor Knolls Middle School where it heads south and slightly west paralleling Green Valley Road to its confluence with Bennett Creek, just west of Route 75 at Price Road. The dominant land use in this area is residential with some large estate lots with horses and a school property. Teams noted some trash dumping and agricultural parcels with three instances of livestock access to the stream. The water sampling in April 2003 revealed high nitrate/nitrite concentrations and excessive yields and baseline orthophosphate yields and concentrations at the Windsor Knolls Middle School grounds. Public sewers are only available in the Windsor Knolls subdivision. North of Windsor Road, wells and septic fields are likely. The other residential development in this watershed relies on septic systems.

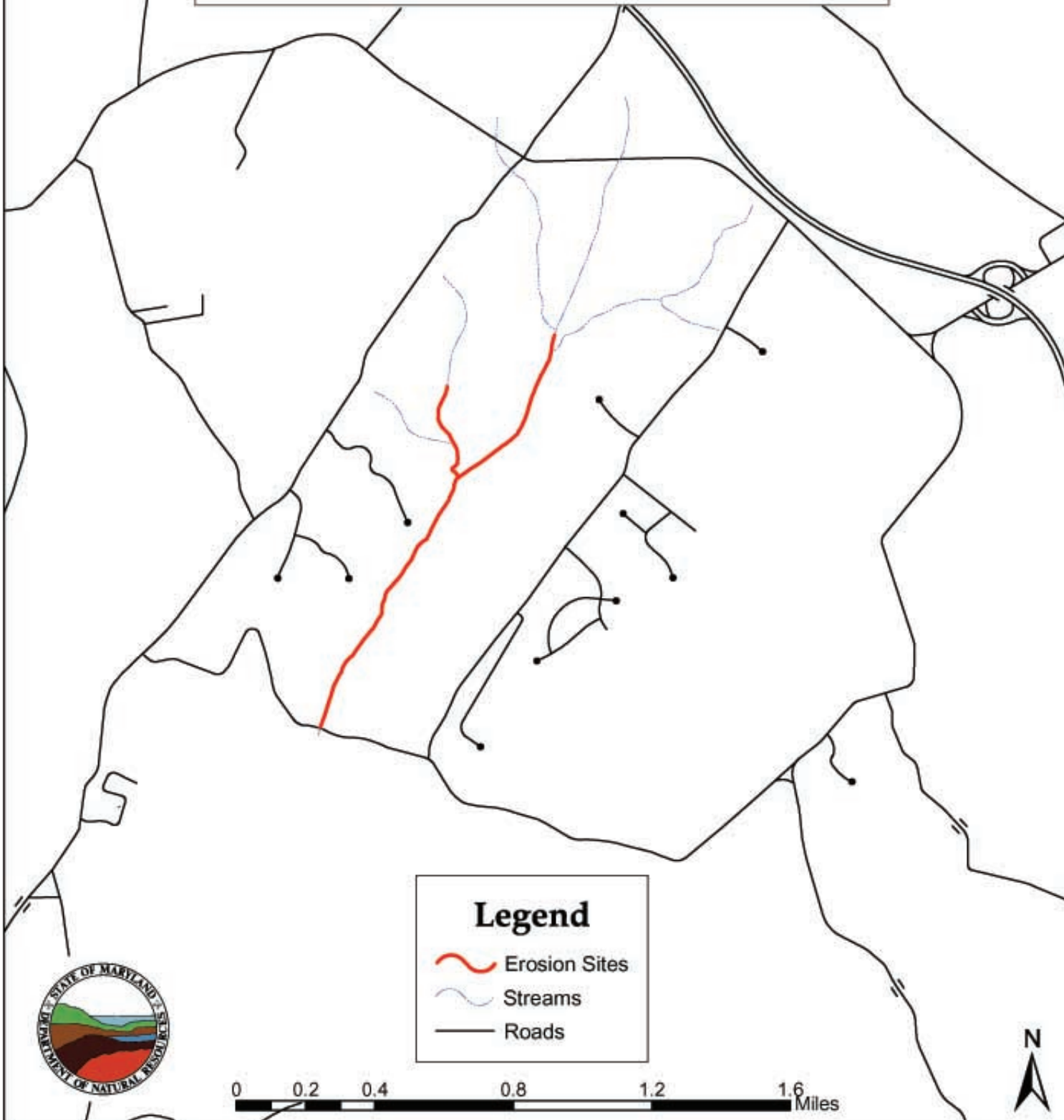
Table 12: Pleasant Branch Site Summary

Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	3	375ft. (0.07 Miles)	0	0	0	0	3
Erosion Sites	9	14,430ft (2.73 Miles)	3	2	2	2	0
Exposed Pipes	0	NA	0	0	0	0	0
Fish Barriers	9	NA	0	0	1	3	5
Inadequate Buffers	12	7,500ft. (1.42 Miles)	4	0	2	3	3
Pipe Outfalls	7	NA	0	0	1	1	5
Trash Dumpings	3	NA	0	3	0	0	0
Unusual Conditions	2	NA	0	0	0	2	0
Total	45		7	5	6	11	16
Comments	4						
Representative Sites	6						

# Map 23: Lower Monocacy WRAS Bennett Creek Watershed North Branch Inadequate Buffer Sites



Map 24: Lower Monocacy WRAS  
Bennett Creek Watershed  
North Branch  
Erosion Sites



**Legend**

-  Erosion Sites
-  Streams
-  Roads

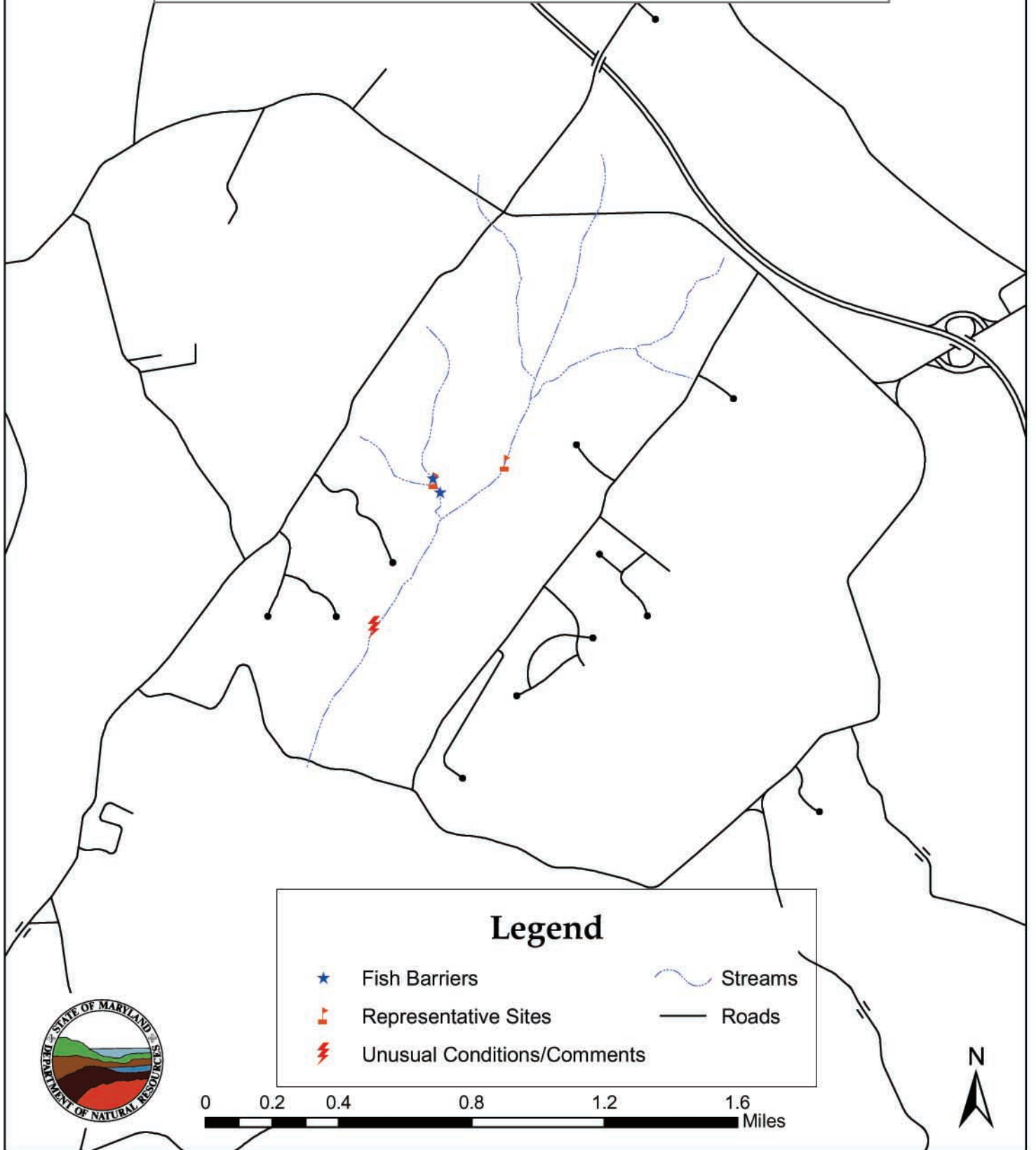


0 0.2 0.4 0.8 1.2 1.6 Miles





# Map 25: Lower Monocacy WRAS Bennett Creek Watershed North Branch



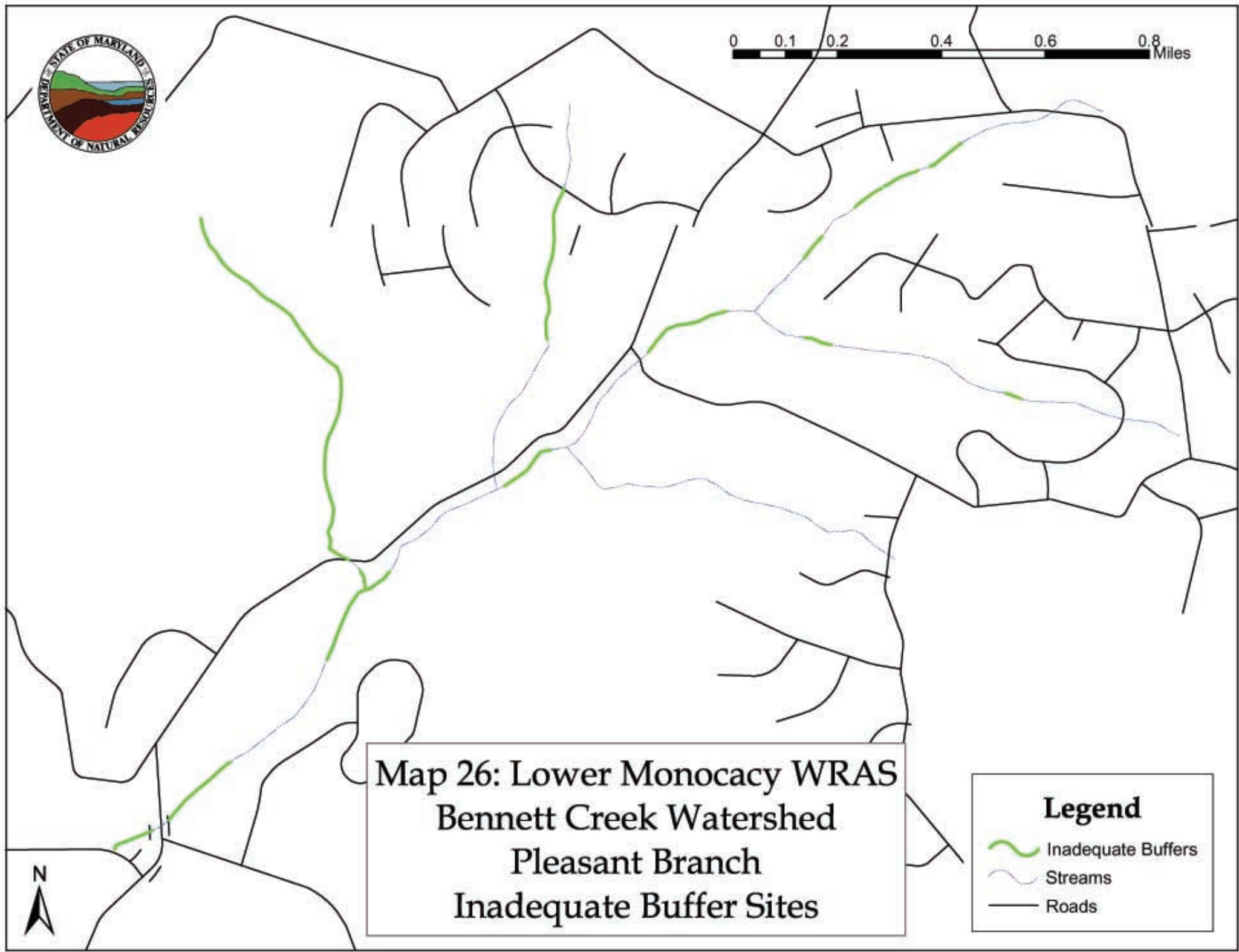
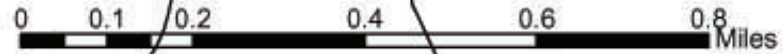
## Legend

- ★ Fish Barriers
- 🚧 Representative Sites
- ⚡ Unusual Conditions/Comments
- ~ Streams
- Roads



0 0.2 0.4 0.8 1.2 1.6 Miles





**Map 26: Lower Monocacy WRAS  
Bennett Creek Watershed  
Pleasant Branch  
Inadequate Buffer Sites**

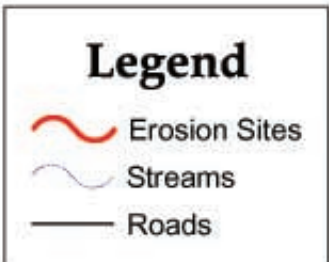
**Legend**

-  Inadequate Buffers
-  Streams
-  Roads

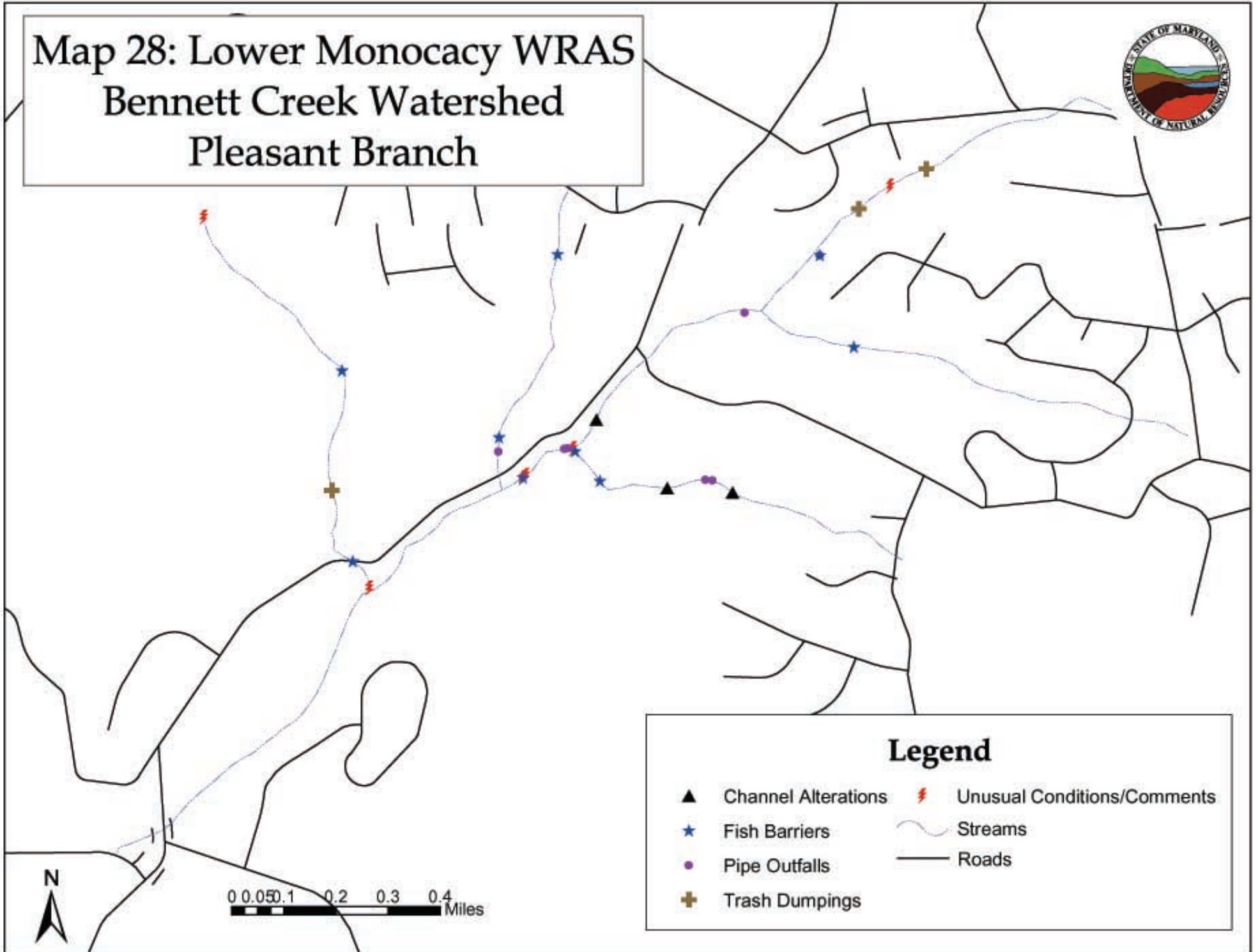




Map 27: Lower Monocacy WRAS  
Bennett Creek Watershed  
Pleasant Branch  
Erosion Sites



# Map 28: Lower Monocacy WRAS Bennett Creek Watershed Pleasant Branch



## Legend

- ▲ Channel Alterations
- ★ Fish Barriers
- Pipe Outfalls
- ✚ Trash Dumpings
- ⚡ Unusual Conditions/Comments
- ~ Streams
- Roads

URBANA BRANCH

Urbana Branch is a 4.49 mile long tributary of Bennett Creek with headwaters just northeast of Interstate 70 in the Urbana Elementary school property. The stream flows south and west, crossing the interstate, Route 80, and Peters Road to its confluence with Bennett Creek. One of its two headwater forks flows from the Urbana Overlook subdivision area near Roderick Drive and Raymonds Way south to the confluence of the two forks near Thurston Road. Summary SCA data show that 2.88 miles of the stream corridor are eroded with all 5 instances rated as severe or very severe. Inadequate stream buffers were noted along 1.24 miles of corridor with 5 ranked severe or very severe and 4 ranked low severity or minor. One instance of stream channel alteration 24 feet long was noted.

The April 2003 water sampling results indicate that the stream has moderate levels of nitrate/nitrite concentration and yields and baseline levels of orthophosphate yields and concentrations.

Table 13: Urbana Branch Site Summary

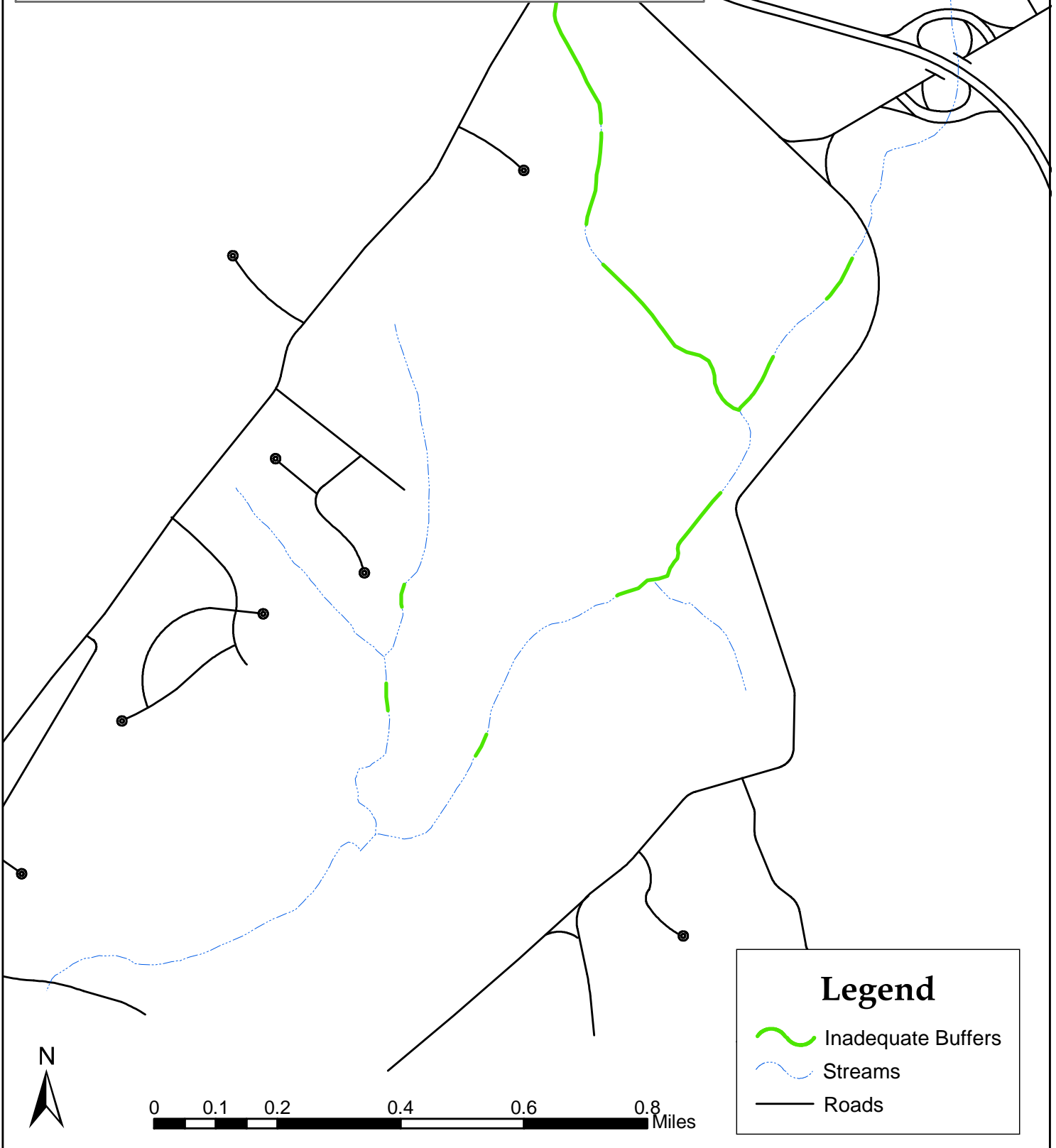
Potential Problems Identified	Number	Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor
Channel Alterations	1	24ft.	0	0	0	0	1
Erosion Sites	5	15,200ft (2.88 Miles)	2	3	0	0	0
Exposed Pipes	0	NA	0	0	0	0	0
Fish Barriers	1	NA	0	0	0	1	0
Inadequate Buffers	9	6,550ft. (1.24 Miles)	4	1	0	3	1
Pipe Outfalls	3	NA	0	0	0	0	3
Trash Dumpings	0	NA	0	0	0	0	0
Unusual Conditions	0	NA	0	0	0	0	0
Total	19		6	4	0	4	5
Comments							
Representative Sites	3						

**Ballenger Creek Watershed**




The Ballenger Creek Watershed is approximately 14,955 acres (23.4 square miles) in size. The watershed adjoins the Carroll Creek Watershed, the location of the City of Frederick. Most of the Ballenger Creek Watershed is relatively flat, ideal for both farming and development with soil deposits from uplands and is experiencing rapid development. Nearly 2/3 of Ballenger Creek is designated as a Priority Funding Area, an area targeted for development. Currently 40% of the watershed is developed, 41% agricultural and only 15% forested. A naturally reproducing brown trout population in Ballenger Creek, rated Use 3P Natural Trout Waters, is threatened.

Ballenger Creek Watershed lies within the Western Division of the Piedmont Physiographic Province, a region characterized by gently rolling terrain and slow-flowing streams. The eastern third of the watershed is underlain by a limestone formation known as the Frederick Valley, in which karst terrain features are evident. To further compound the challenge, sinkholes are common in this watershed. Subsurface limestone structures dissolve, which permits surface water to impact ground water.

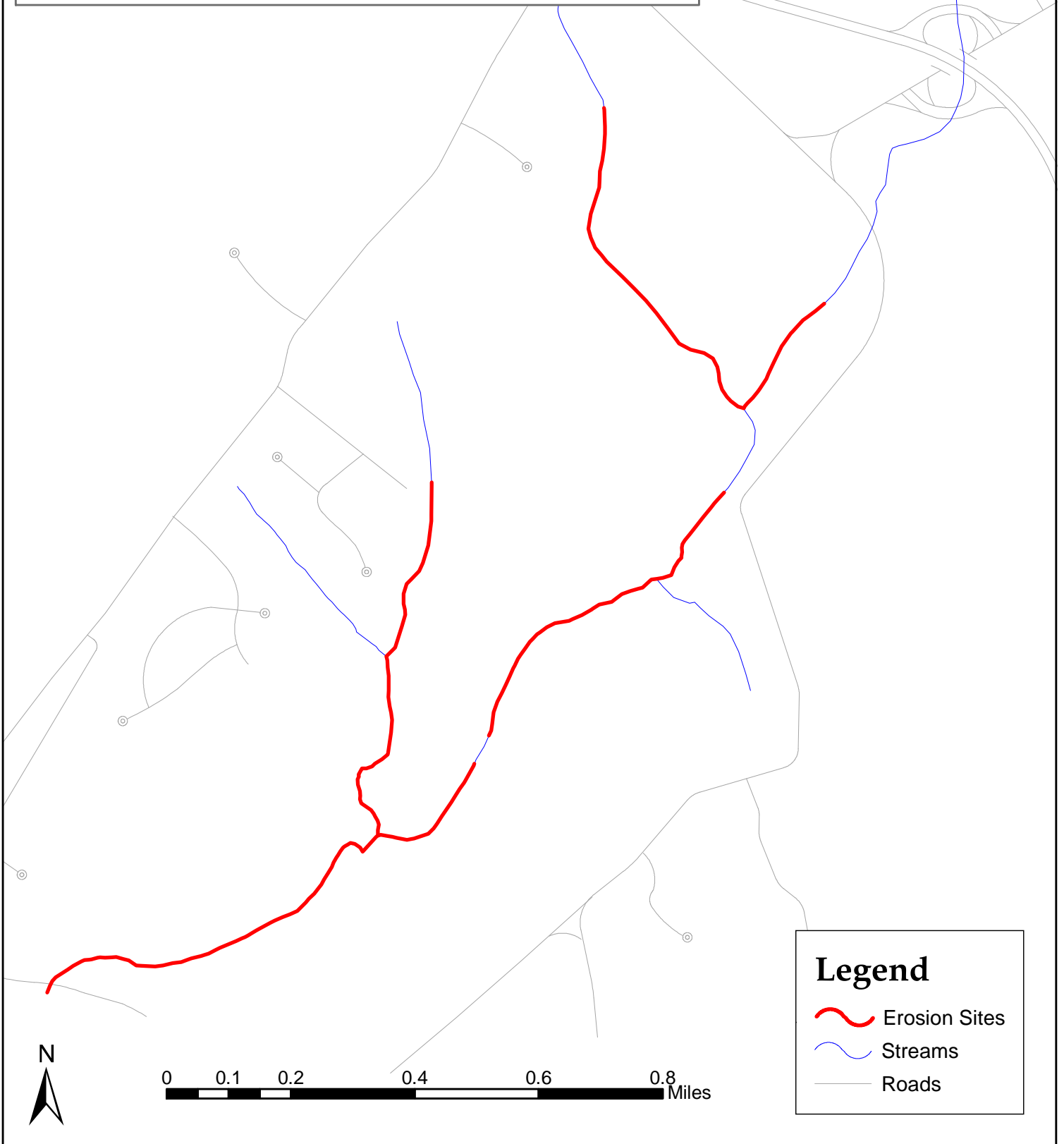
# Map 29: Lower Monocacy WRAS Bennett Creek Watershed Urbana Branch Inadequate Buffer Sites






**Legend**

-  Inadequate Buffers
-  Streams
-  Roads

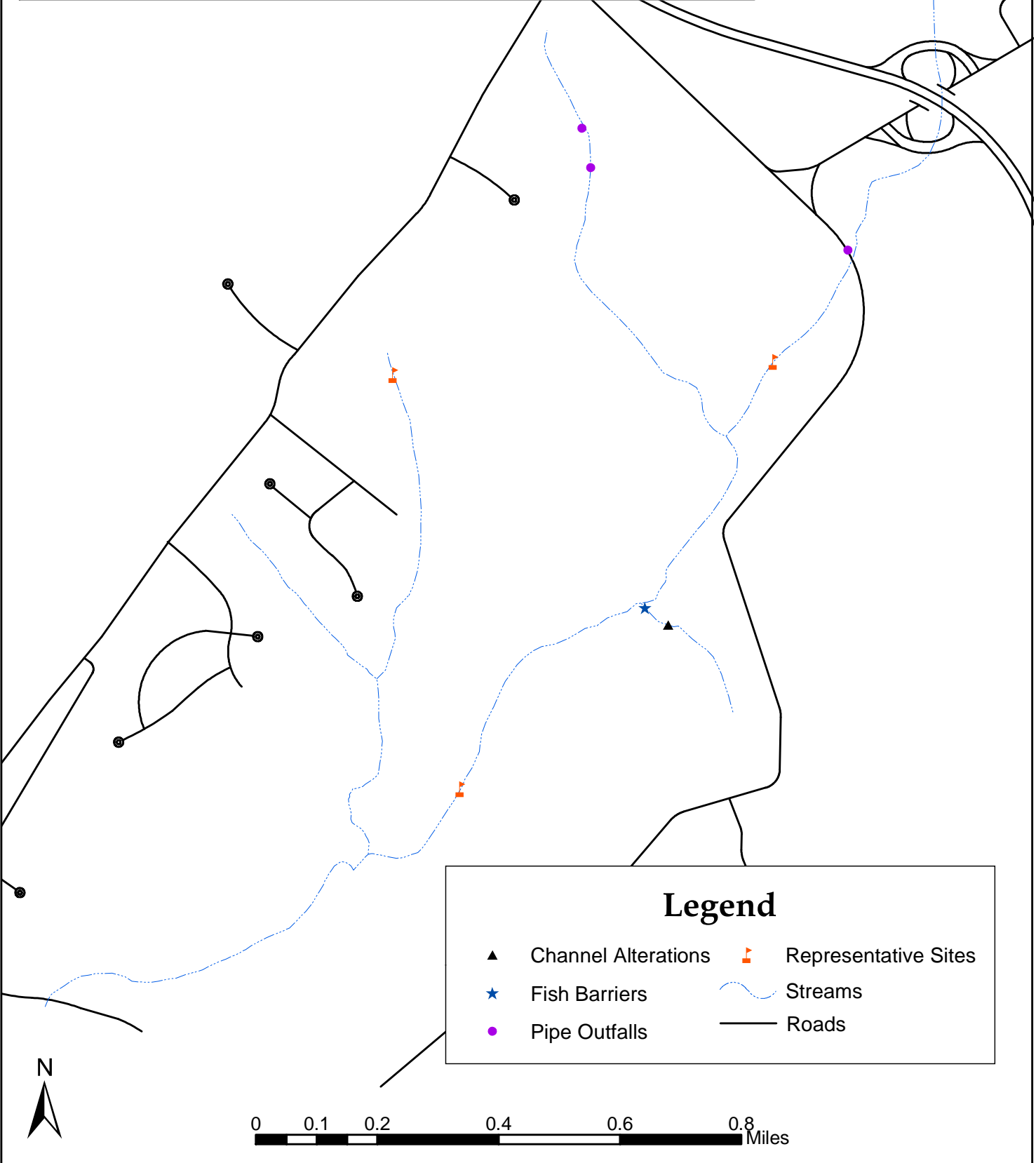
# Map 30: Lower Monocacy WRAS Bennett Creek Watershed Urbana Branch Erosion Sites



**Legend**

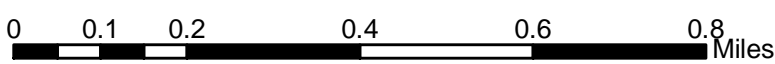
-  Erosion Sites
-  Streams
-  Roads

# Map 31: Lower Monocacy WRAS Bennett Creek Watershed Urbana Branch



## Legend

- ▲ Channel Alterations
- ★ Fish Barriers
- Pipe Outfalls
- ▤ Representative Sites
- ~ Streams
- Roads





In general, land use in the north-central portion of the watershed, bordering the City of Frederick, consists largely of residential subdivisions, while the area east of U.S. Route 270 is largely commercial/industrial and includes a limestone quarry. The western half of the watershed contains a mix of agricultural uses as well as low-density residential properties. Scattered, large forested tracts remain within the watershed, often in areas of steeper slopes along the Catoclin front. Vegetation and land cover in the Ballenger Creek Watershed consist of agricultural land, forested areas (deciduous and coniferous), oldfield (transitional vegetation), wetlands, and developed areas (residential, commercial and industrial). Wetlands in the watershed are generally very linear and are associated with Ballenger Creek and its tributaries. Extensive industrial and commercial establishments impact the area's stormwater as 13.4% of the area is impervious, three times the overall Lower Monocacy River Watershed average of 4.4%.

#### NPDES WATERSHED ASSESSMENT

Ballenger Creek was selected as the second watershed to be assessed under Frederick County's National Pollution Discharge Elimination System (NPDES) stormwater permit (Permit Number MD0068357) because of extensive recent and future development in the watershed, given its close proximity to the City of Frederick. The focus of this watershed assessment, completed January 2001, was to assess conditions in the watershed, identify water quality problems and opportunities to improve water quality, and develop a water quality plan. The assessment involved a stream characterization survey, collection of visual inspection data from the surrounding watershed, and use of a variety of ancillary data sources.

Six long-term monitoring stations were established on the main stem of Ballenger Creek. Field activities involved testing water quality parameters, quantifying physical habitat, conducting a qualitative habitat assessment, and sampling benthic macroinvertebrates and fish. Spring and fall field surveys during 2000 indicate that the stream supports a variety of fish and invertebrate biota, including several sportfish species. Analysis of habitat condition, benthic Index of Biotic Integrity (IBI), and fish IBI scores show that most ratings fall within the second highest category for each index (i.e., good or sub-optimal). Additional stream data from Maryland Biological Stream Survey supplemented the County's field data collection efforts and showed that conditions in Ballenger Creek's headwater streams and upper reaches generally ranged from poor to fair. Given the long history of human habitation and agricultural land use in the region, streams are far from pristine; however, much of Ballenger Creek and its tributaries appear to be in moderately good condition at present. Wildlife surveys indicated good biodiversity of birds and mammals, particularly in the watershed's vegetated areas. A visual inspection was conducted to characterize the types and locations of watershed stressors likely to impact water quality. Stressors observed in Ballenger Creek fell into several categories, including hydrologic alterations, agriculture, new construction, industrial/commercial land use, maintenance at some stormwater management (SWM) facilities, and karst features.

Problems affecting water quality in Ballenger Creek and its tributaries are predominantly associated with urban and agricultural nonpoint sources. General problem types evident in Ballenger Creek and its tributaries include alterations of natural flow regimes, sediment deposition, and physical habitat degradation. In many cases, problems are minor, particularly where the presence of existing SWM facilities or extensive forest buffer has provided some protection from the impacts of nearby land uses. More severe impacts were apparent at particular locations, especially in the lower sections of Ballenger Creek where karstic features re-route surface runoff and streamflows underground, create instabilities in existing best management practices (BMPs), and otherwise increase the complexity of SWM issues. Taken individually, many of the activities in the watershed likely have little detrimental effect; however, the cumulative effect of these activities

throughout the watershed can be of greater concern. Water quality problems within Ballenger Creek fall into ten groups centered around the following issues: karst, hydrologic modification, livestock access to stream, cropland runoff, failing septic systems, new construction, future development, industrial/commercial development, existing structures, and stream restoration. Site-specific and/or general programmatic opportunities were identified for each problem that would help improve water quality within the watershed.

WATERSHED WATER QUALITY PLAN

The most promising opportunities that address water quality problems in Ballenger Creek were selected as part of a watershed water quality plan. Further implementation will depend upon cost, available funding, feasibility, and the likelihood of success in improving or sustaining stream habitat and water quality. Items include general programmatic approaches as well as more site-specific opportunities. Actions will address the primary threats to water quality, including stormwater runoff from existing development, stormwater management issues in karst areas, livestock access to streams, agricultural runoff, and future construction and development. A proposed schedule and preliminary cost estimate was developed for each recommendation. The main recommendations from this report follow:

- Form a County NPDES management committee (Completed through the WRAS)
- Develop a Karst Ordinance (scheduled for FY'05)
- Develop a Karst Overlay Zone (scheduled for FY'05-06)
- Coordinate Soil Conservation activities with other counties (ongoing)
- Develop a Road Maintenance Program to protect water quality and habitat (complete)
- Restore Forests (ongoing)
- Construct a demonstration BMP for karst terrain
- Conduct Stream Restoration at Ballenger Creek Elementary School (in progress)
- Conduct Stream Restoration at Ballenger Creek Park (completed by DNR)
- Collaborate with Parks and Recreation on Ballenger Creek Trail (ongoing)
- Investigate scrapyards (complete, no problems found)

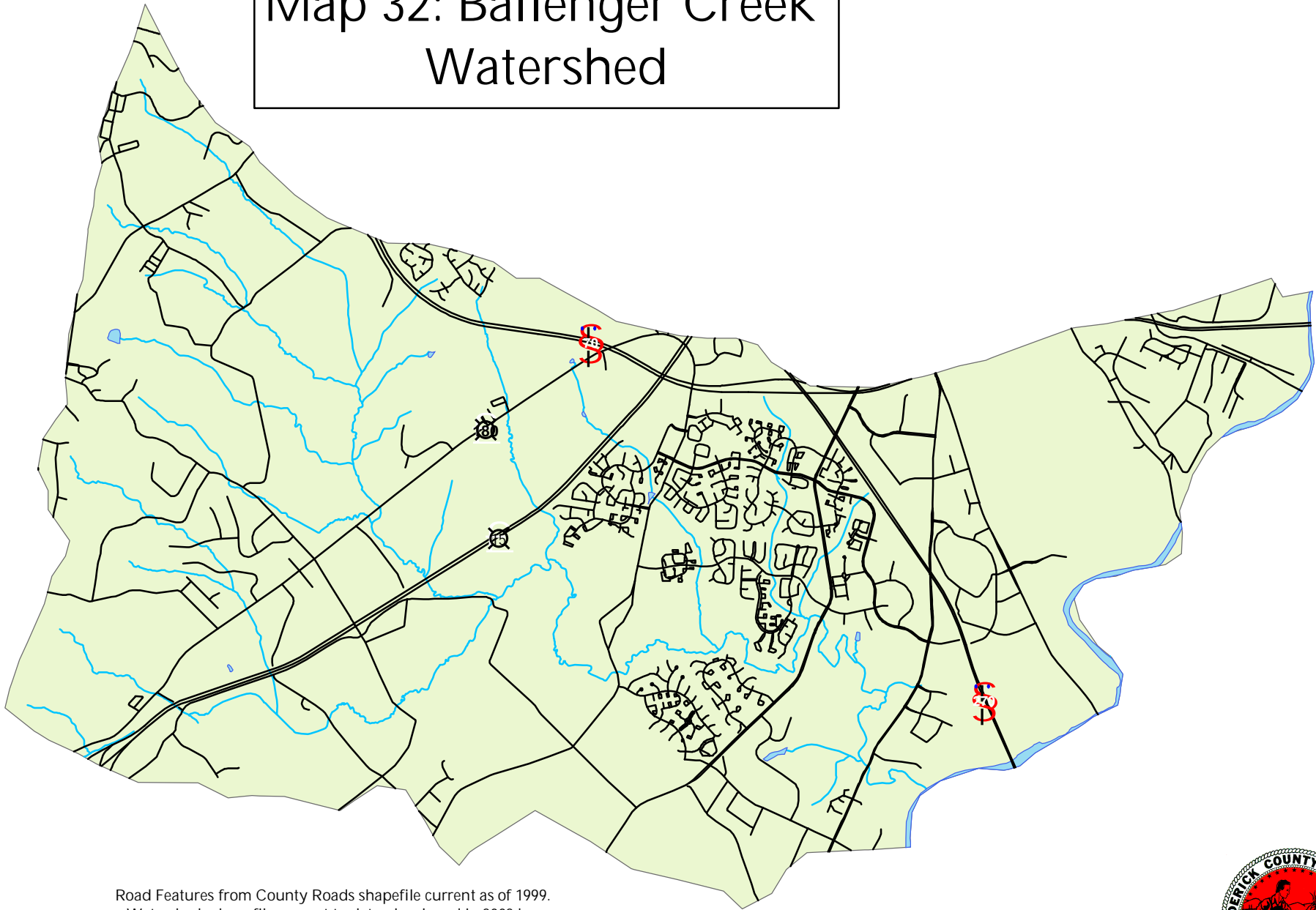
STREAM RESTORATION/ STORMWATER MANAGEMENT FACILITY RETROFIT ASSESSMENT AND CIP PROJECTS

This assessment, designed to create projects for the County's Capital Improvement Program, will begin in 2004. Ballenger Creek is slated to begin design on CIP projects in FY'05 and complete construction by the end of FY'07.

**Monocacy Direct Watershed**

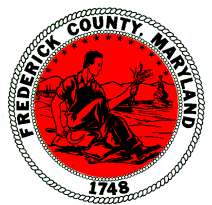
The Monocacy Direct Watershed adjoins the Monocacy River to the west, and stretches to the north and south of Buckeystown. A WRAS Steering Committee member and partner, Carrollton Manor Land Trust, focuses its land protection outreach and education here. This watershed includes Rocky Fountain Run and its tributaries, rated Use 3P Natural Trout Waters (like Bear Branch in Bennett Creek and Ballenger Creek). In addition to land protection outreach, the Steering Committee has begun to assess the potential for restoration of Rocky Fountain Run and is working with a large industry whose quarry impacts the stream to assess possible landscape protection activities to generate water quality improvements. Additionally, at least a dozen septic systems in Buckeystown are in the Monocacy flood plain. The WRAS anticipates partnering with Carrollton Manor Land Trust for outreach education and maintenance assistance to area homeowners.

# Map 32: Ballenger Creek Watershed

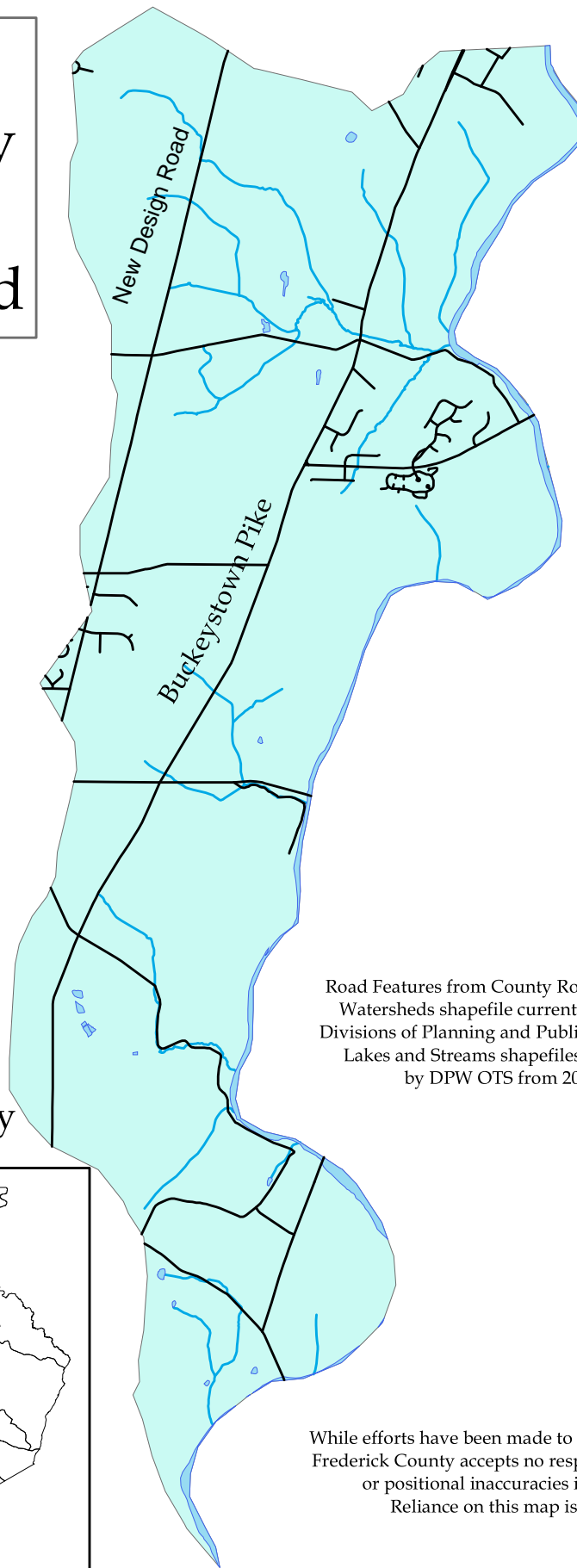
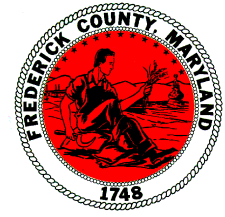


Road Features from County Roads shapefile current as of 1999.  
Watersheds shapefile current to date, developed in 2002 by  
Divisions of Planning and Public Works. Hydrography (Rivers,  
Lakes and Streams shapefiles) current as of 2003, prepared  
by DPW OTS from 2000 orthophotography.

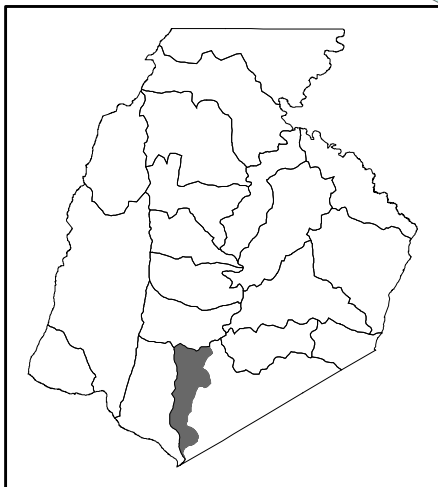
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# Map 33: Monocacy Direct Watershed



Frederick County



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**Bush Creek Watershed**

The Lower Bush Creek watershed is characterized by rolling topography of the Western Division of the Piedmont Physiographic Province. Agriculture is the dominant land use within the watershed with approximately a third of the watershed still forested. Given the long history of human habitation and agricultural land use in the region, streams are far from pristine; however, much of Lower Bush Creek and its tributaries appear to be in reasonably good condition at present. The stream supports a variety of fish and invertebrate biota, including several sportfish species. Remaining forest and wetland areas support good biological diversity. Potential pollutants are most likely to stem from nonpoint sources; currently agricultural sources are somewhat problematic, while future development is expected to pose the most significant threat to water quality. The Bush Creek Watershed is heavily impacted by development pressures as it adjoins the Linganore Creek Watershed to the south and includes the developed areas to the south of Mt. Airy and New Market among others.

NPDES WATERSHED ASSESSMENT

Lower Bush Creek was selected as the first watershed to be assessed under Frederick County’s National Pollution Discharge Elimination System (NPDES) stormwater permit (Permit Number MD0068357) because of the onset of construction at the Villages of Urbana Planned Unit Development (PUD). This new development is within the Peter Pan Run subwatershed, a portion of the Lower Bush Creek watershed. Construction at the PUD site, including construction of a sewer line along Peter Pan Run, made it critical to assess baseline conditions in this stream and the surrounding watershed.

WATERSHED WATER QUALITY PLAN

Proposed actions from the WWQP for Lower Bush Creek follow:

- Improve Sediment and Erosion Control in the Urbana PUD (ongoing)
- Develop procedures to work with Soil Conservation Districts regarding Ag impacts (ongoing)
- Use Ag BMPs with, or in lieu of urban BMPs (ongoing)
- Incorporate Water Quality Impacts in Development Review
- Better Training on Erosion and Sediment Control
- Conduct Public Outreach (ongoing)

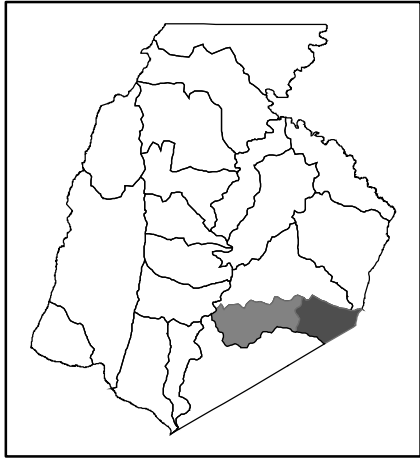
STREAM RESTORATION/ STORMWATER MANAGEMENT FACILITY RETROFIT ASSESSMENT AND CIP PROJECTS

This assessment, completed in 2004, identifies potential sites for County CIP projects. Project sites are being investigated. Funds for these projects are available from FY’04 through FY’06.

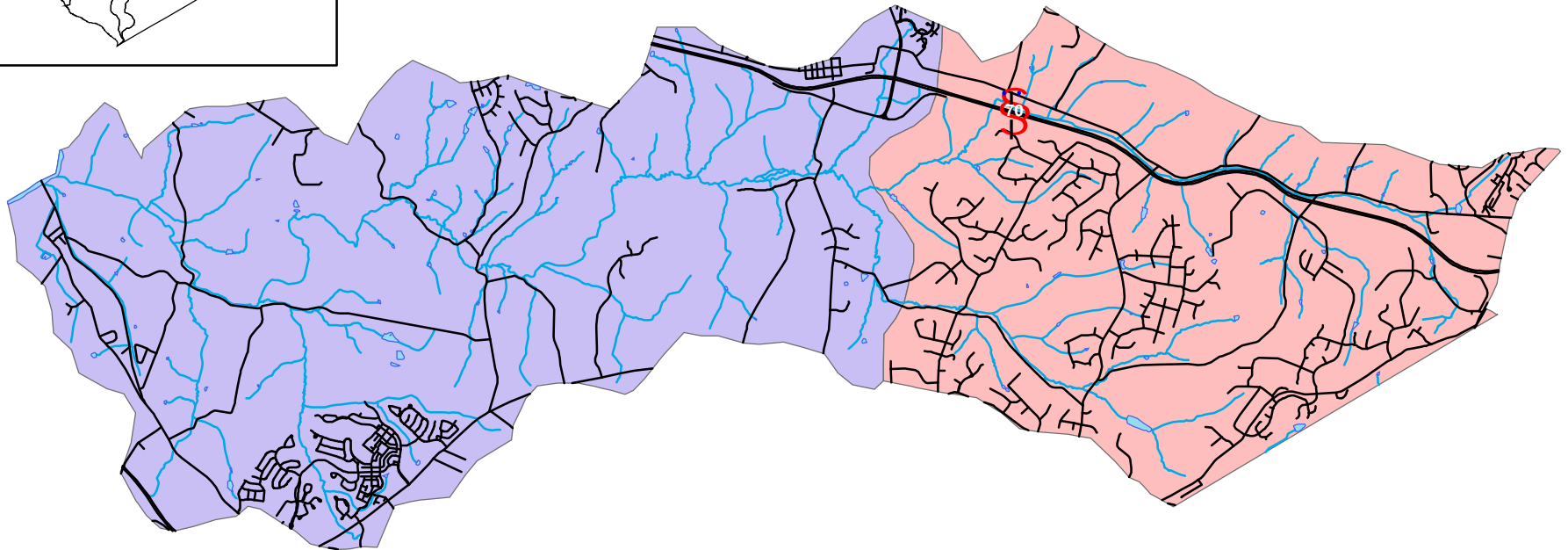
**Israel Creek Watershed**

Israel Creek Watershed includes the southern half of the fast growing Walkersville region. It is further impacted by karstic conditions similar to Ballenger Creek.

# Frederick County

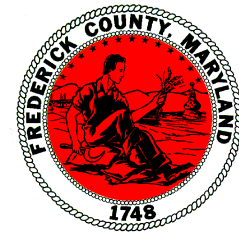


## Map 34: Upper and Lower Bush Creek Watershed

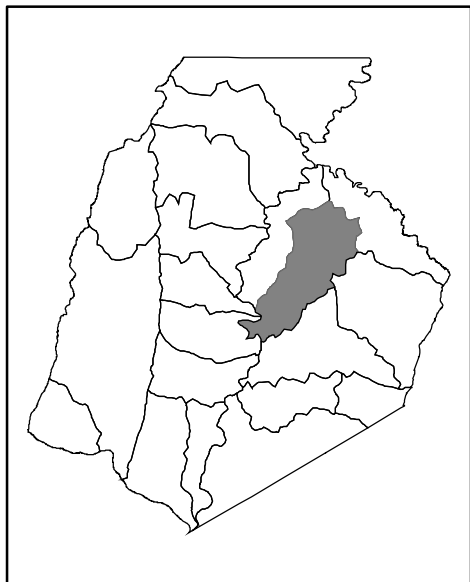


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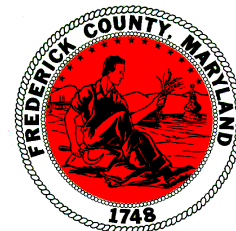
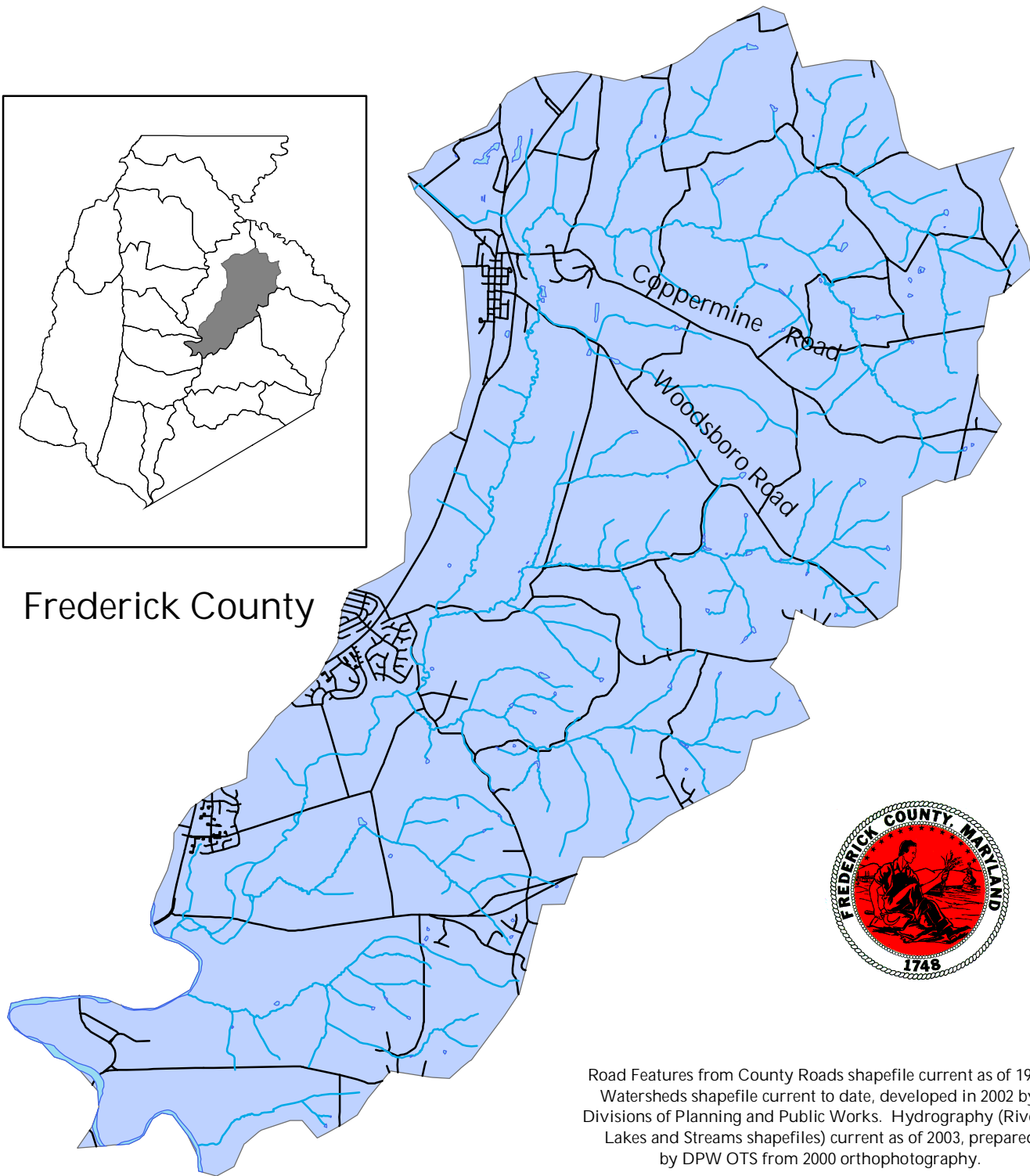
Road Features from County Roads shapefile current as of 1999.  
Watersheds shapefile current to date, developed in 2002 by Divisions of Planning and Public Works. Hydrography (Rivers, Lakes and Streams shapefiles) current as of 2003, prepared by DPW OTS from 2000 orthophotography.



# Map 35: Israel Creek Watershed



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Road Features from County Roads shapefile current as of 1999.  
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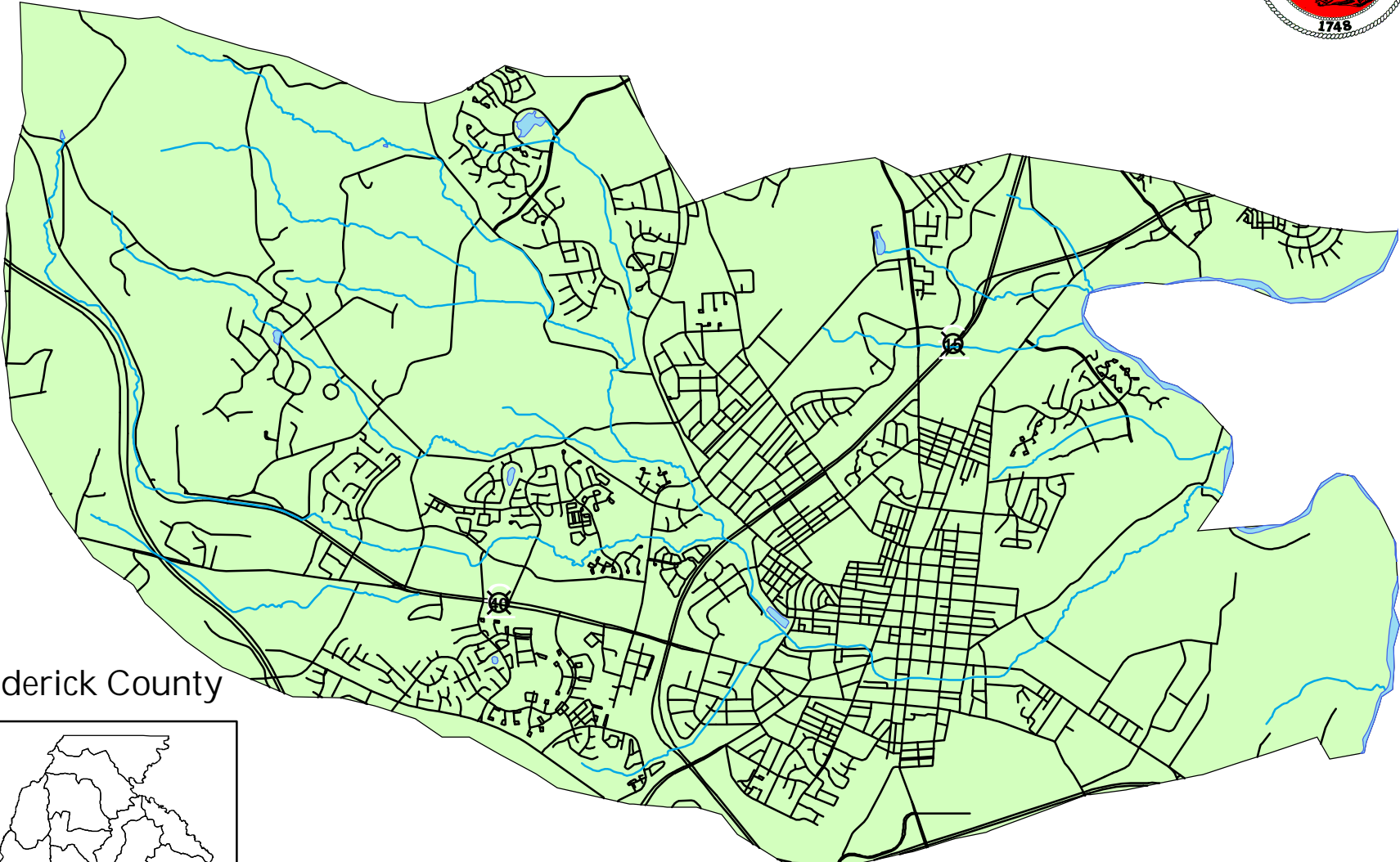
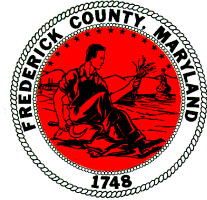
**Carroll Creek Watershed**

The Carroll Creek Watershed where Frederick City is located, has the highest percent of imperviousness (18.6%) in the Lower Monocacy River Watershed as well as a tributary rated Use 3P Natural Trout Waters. However, Carroll Creek is the focus of previous work on stream corridor assessment and stream restoration with a number of partners including DNR, the City of Frederick, Potomac Conservancy and Chesapeake Bay Foundation. The focus of the WRAS has included neither Israel Creek nor Carroll Creek Watersheds.

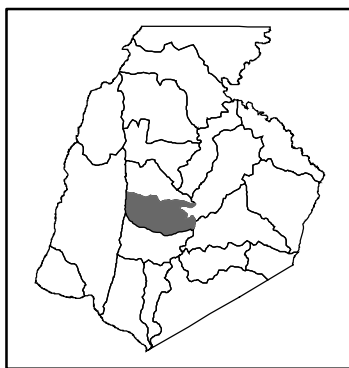




# Map 36: Carroll Creek Watershed



Frederick County



Road Features from County Roads shapefile current as of 1999.  
Watersheds shapefile current to date, developed in 2002 by  
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by DPW OTS from 2000 orthophotography.

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**SCA Priority Sites by Watershed**

Steering Committee members reviewed data collected during the Stream Corridor Assessment process to target specific problem sites with restoration assuming landowner cooperation. Those that are listed as being targeted with the Backyard Buffer in a Bag program were sent a flyer/application for free trees. The sites are not listed in order of priority. To see where each site is located within the Watershed, please reference the accompanying maps.

**Table 14: Linganore Creek Watershed Priority Restoration Sites**

Site Number	Problem	Suggested Restoration (if any)
<b>Town Branch (Map 37)</b>		
Site 11	5600' of inadequate buffer through multiple farm lots with possible livestock access	Target with CREP Needs fencing
Site 12	Half mile of inadequate buffer and downstream erosion through crop land	Target with CREP
Site 13	Crop land and a pasture that is unbuffered with possible livestock access	70 acres have already been put into CREP Needs fencing
Site 14	Area of inadequate buffer north of Libertytown - area for potential development	Target with Backyard Buffer Possibly target for restoration during the development
Site 15	Area of unbuffered stream along the property of the Libertytown Volunteer Fire Department	Possible site for community tree planting. Discussions begun with President of Volunteer Fire Dept.
Site 16	Areas of stream channelization through Libertytown	Encourage the use of rain barrels and rain gardens Install J hooks or root wads along stream bed to slow down water
Site 17 & 18	Inadequate buffers throughout the Liberty East, Denny's Delight and Wisperren Oaks subdivisions	Target with Backyard Buffers
Site 19	Large agricultural lot with inadequate buffer causing severe downstream erosion	Target with CREP
Site 19b	Farm with inadequate buffer, downstream erosion, and cattle accessing the stream	Target with CREP Needs fencing
Site 20	Long stretches of inadequate buffers	Target with CREP
Site 21	Inadequate buffer and cattle accessing the stream	Target with CREP Needs fencing
<b>Talbot Branch (Map 38)</b>		
Site 39	1200' of inadequate buffer with cattle and horses accessing the stream	Target with CREP and/or EQUIP Needs fencing
Site 40	3600' of inadequate buffer and 1800' of erosion with animals accessing the stream	Target with CREP and/or EQUIP Needs fencing
<b>Woodville Branch (Map 39)</b>		
Site 1	Large agricultural area with inadequate buffer-potential for future development	Target with CREP and/or Branch Out Suggest to Mt. Airy that the town adopt variable width stream corridor ordinance
Site 1b	Large agricultural area with inadequate buffer and erosion	Target with CREP and/or Branch Out Suggest the Mt. Airy that the town adopt variable width stream corridor ordinance
Site 2	4 large lot residential owners with	Target with Backyard Buffer

LOWER MONOCACY WATERSHED RESTORATION ACTION STRATEGY

Site Number	Problem	Suggested Restoration (if any)
	inadequate buffers and erosion	
Site 3	Two Mt. Airy town parks that have unbuffered areas, Prospect Avenue Park and East West Park	Approach the town of Mt. Airy for a co-sponsored town buffering initiative
Site 4	Many residential yards mowed to the stream	Target with Backyard Buffer
Site 5	Large residential lot with inadequate buffer	Target with Backyard Buffer
Site 6	1367' of inadequate buffer along an agricultural field between two forested areas - buffering would connect the two forested areas	Target with CREP
Site 7	Area within Ravenwood Estates has inadequate buffer and animals accessing the stream with some erosion	Target with Backyard Buffer Work with homeowner association if possible
Site 8	Two agricultural preservation properties with inadequate buffers and erosion	Follow up on whether these farmers are in the process of installing BMPs
Site 9	2 miles of erosion with inadequate buffers	
Site 10	Severe erosion and unbuffered headwaters	Target with CREP and/or Branch Out

Table 15 Bennett Creek Watershed Priority Restoration Sites

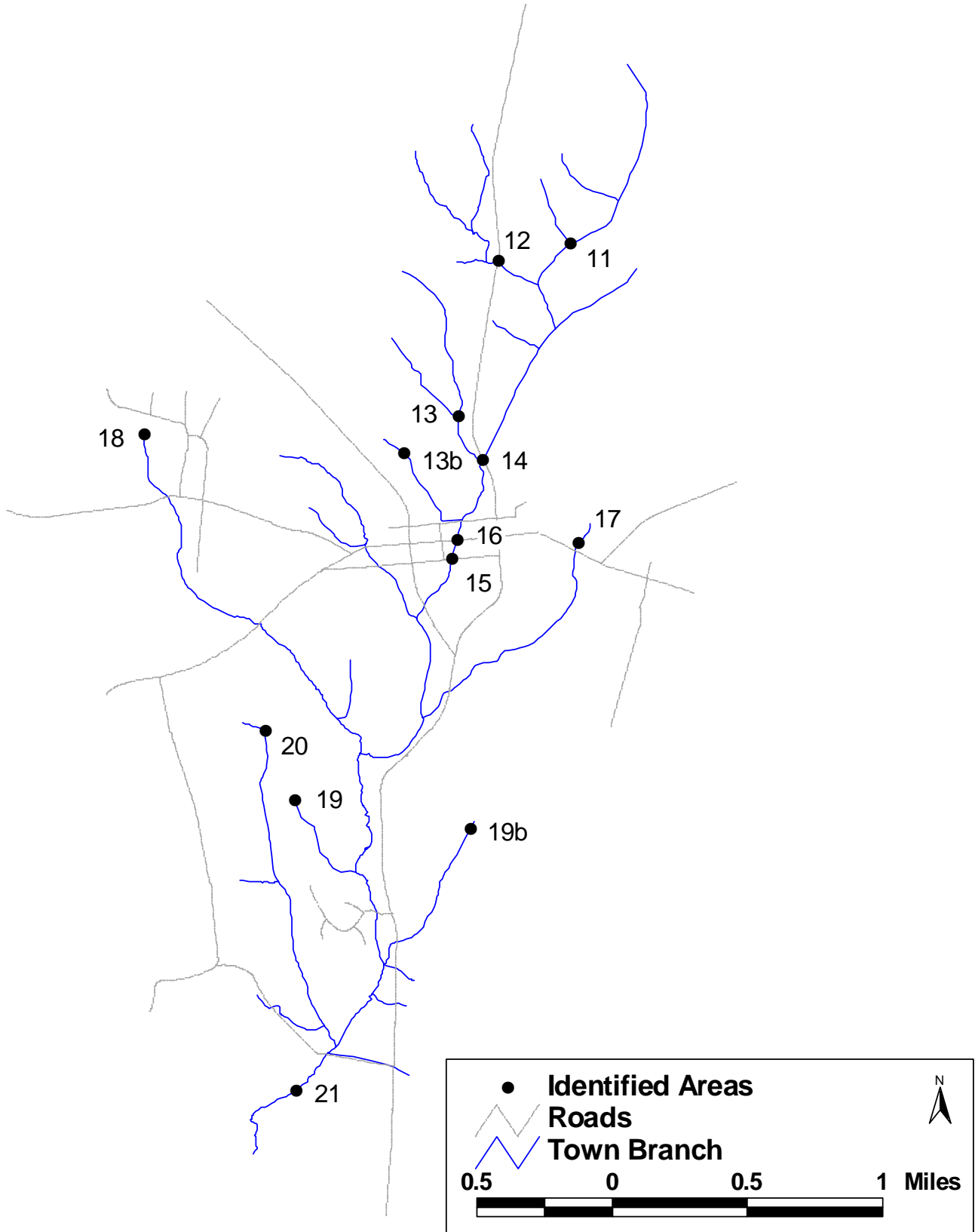
Site Number	Problem	Suggested Restoration (if known)
Bear Branch (Map 40)		
Site 41	Two fish barriers on a naturally reproducing trout stream	
Fahrney Branch (Map 41)		
Site 22	East of Route 75 is slated for future development	Possible area for low impact development at the time of rezoning and development
Site 23	Area with an inadequate buffer at Kemptown School	Possible school yard habitat project with Community Commons
Site 24	Inadequate buffer with cases of horses accessing the stream	Target with CREP and/or Backyard Buffer Needs fencing
Site 25	3800 feet of inadequate buffer with cattle accessing the stream	Target with CREP and/or Backyard Buffer Needs fencing
Site 28	One mile of inadequate buffer and erosion with cattle accessing the stream	Target with CREP and/or Backyard Buffer Needs fencing
Site 29	One a one half miles of inadequate buffer and erosion with animal access to stream-part of the area has already been CREPed and there is no access to the stream (possible monitoring site)	Target with CREP and/or Backyard Buffer Needs fencing
North Branch (Map 42)		
Site 46	Concrete fish barrier formed by culvert under a farm road linking two farms	
Site 47	8710 feet of erosion and extended lengths of inadequate buffer due to building of a golf course-prior DNR work shows that the downstream erosion has occurred since its construction	Possible storm water management retrofit
Site 48	Cattle accessing the stream	Needs fencing

LOWER MONOCACY WATERSHED RESTORATION ACTION STRATEGY

Site Number	Problem	Suggested Restoration (if known)
Pleasant Branch (Map 43)		
Site 30	Dam and road crossing of unknown origin/purpose forming a fish barrier in the Pleasant Grove area	
Site 31	Inadequate buffer through the Windsor Knolls School	Possible school yard habitat with Community Commons
Site 32	Inadequate buffer and erosion through Meadow Brooke, Quail Run, and Freemont Hills subdivisions	Target with Backyard Buffer
Site 33	Inadequate buffer and erosion through the Friendship, Freemont Court and Adgate Drive areas	Target with Backyard Buffer and possible storm water management structures
Site 42	Trash dumping site	
Site 34	Inadequate buffer and erosion within subdivision	Target with Backyard Buffers
Site 35	2500' of 5' high eroded stream bank and 1700' of inadequate buffer with horses accessing stream	Target with CREP Needs fencing
Site 36	Fish barrier at road crossing of Route 75	Site for State Highway Administration Restoration assistance
Site 37	Large estate lots with inadequate buffer with horses accessing the stream	Target with Backyard Buffer Needs fencing
Site 38	Inadequate buffer with livestock accessing the stream	Target with CREP Needs fencing
Urbana Branch (Map 44)		
Site 49	Inadequate buffer	Target with Backyard Buffer
Site 50	1750' of inadequate buffer (1300' of lawn) and animals accessing the stream	Target with Backyard Buffer Needs fencing
Site 51	Inadequate buffer	Target with Backyard Buffer

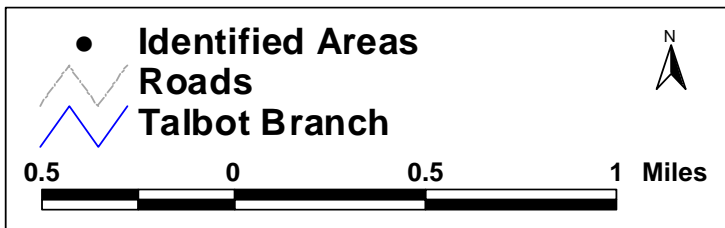
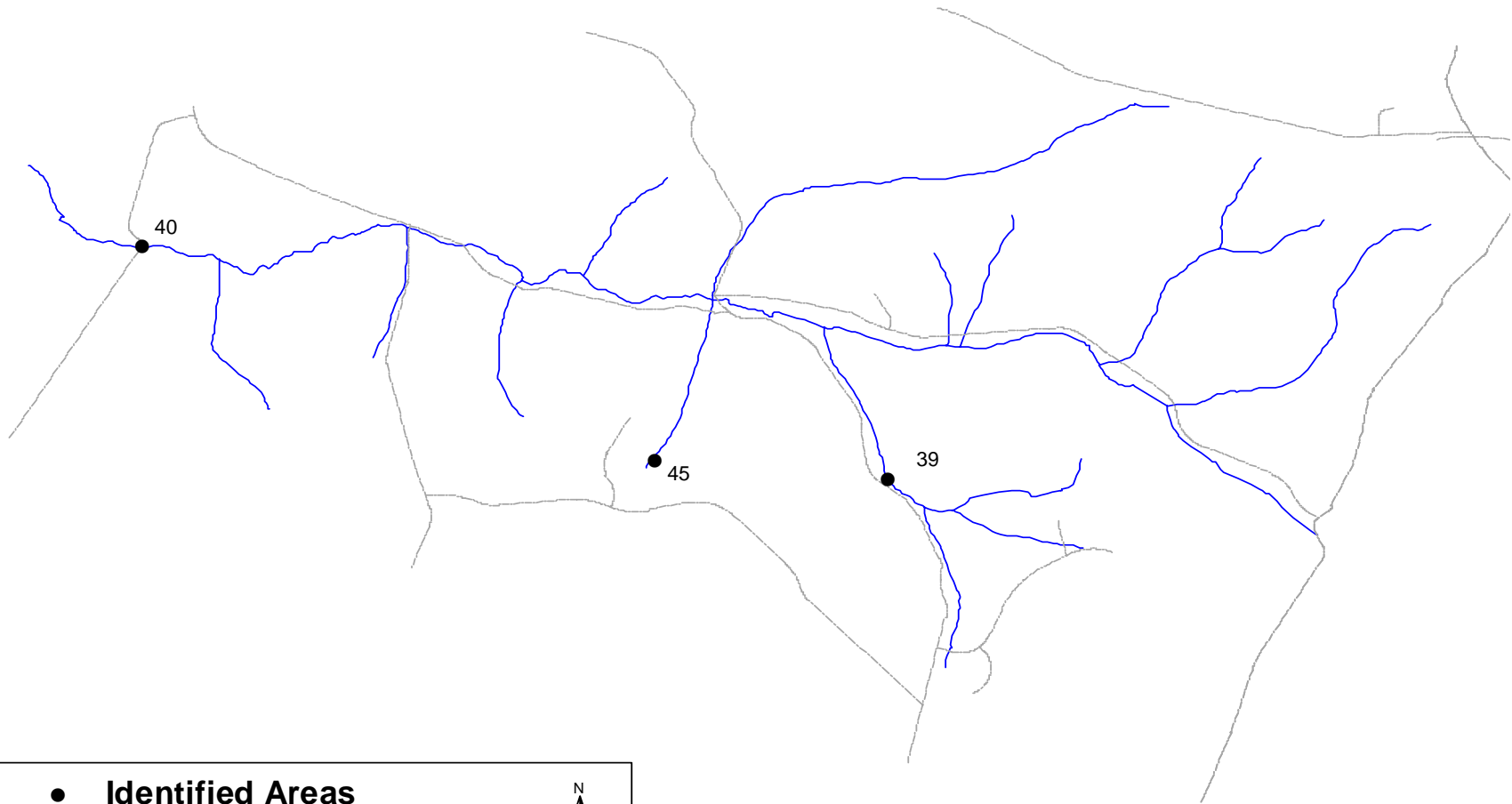
# Map 37:

## Town Branch Identified Areas



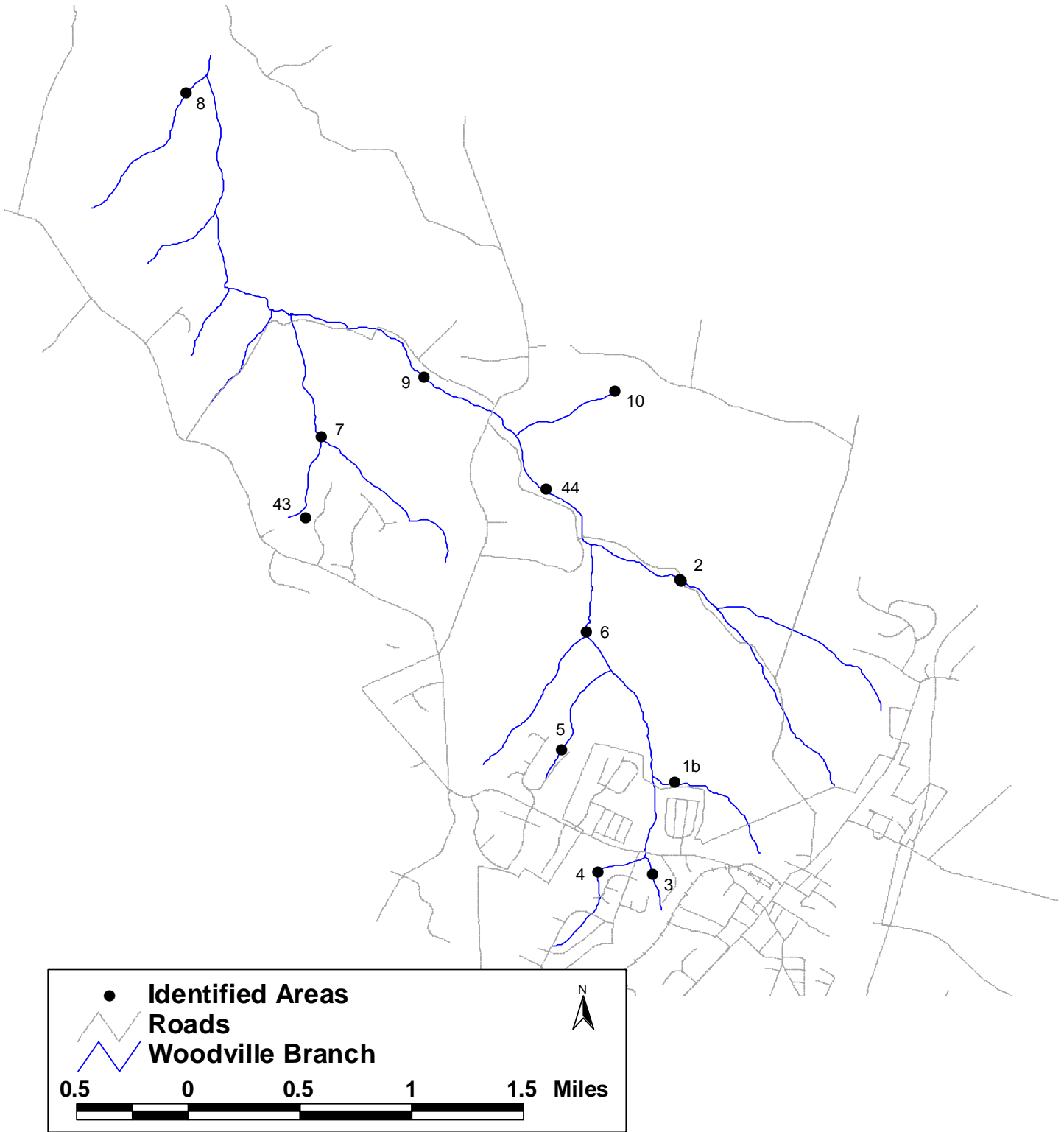
# Map 38:

## Talbot Branch Identified Areas



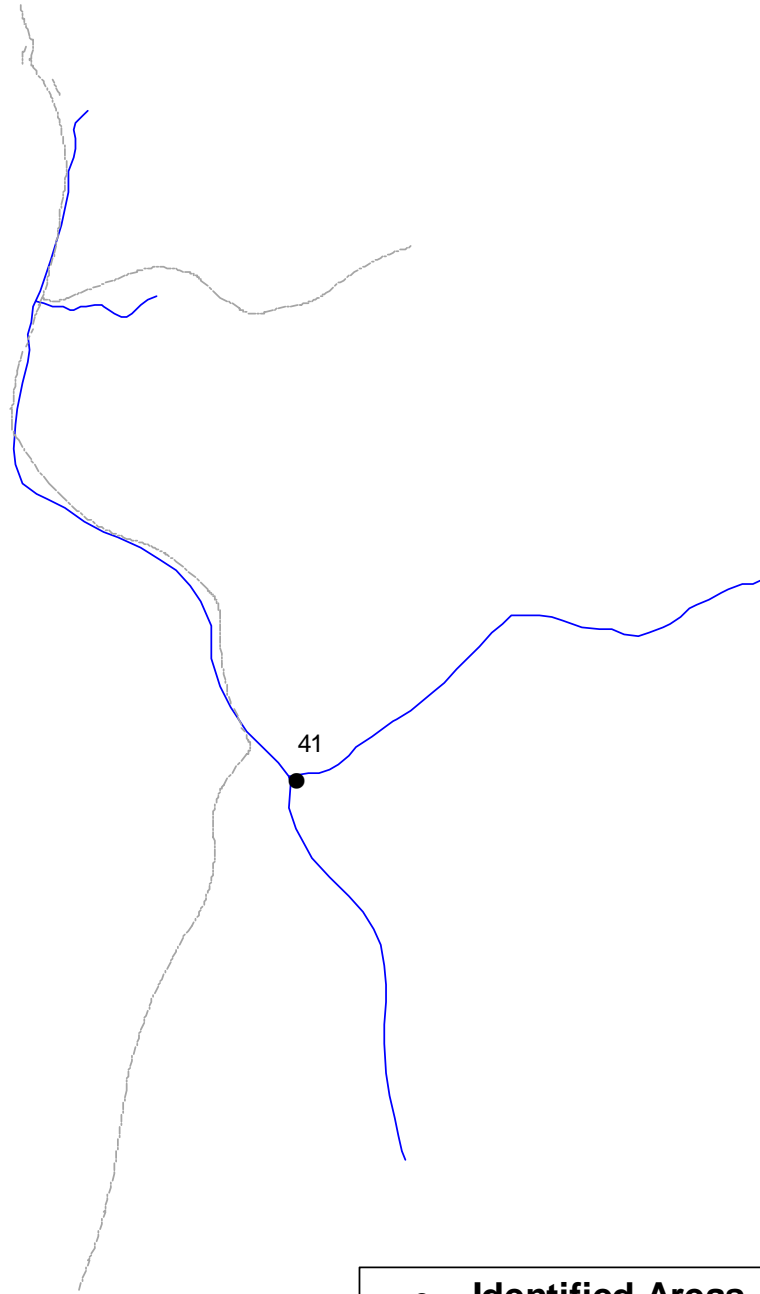
# Map 39:

## Woodville Branch Identified Areas





# Map 40:

## Bear Branch Identified Areas



● Identified Areas  
— Roads  
— Bear Branch

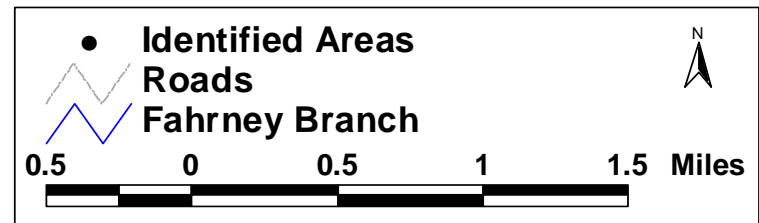
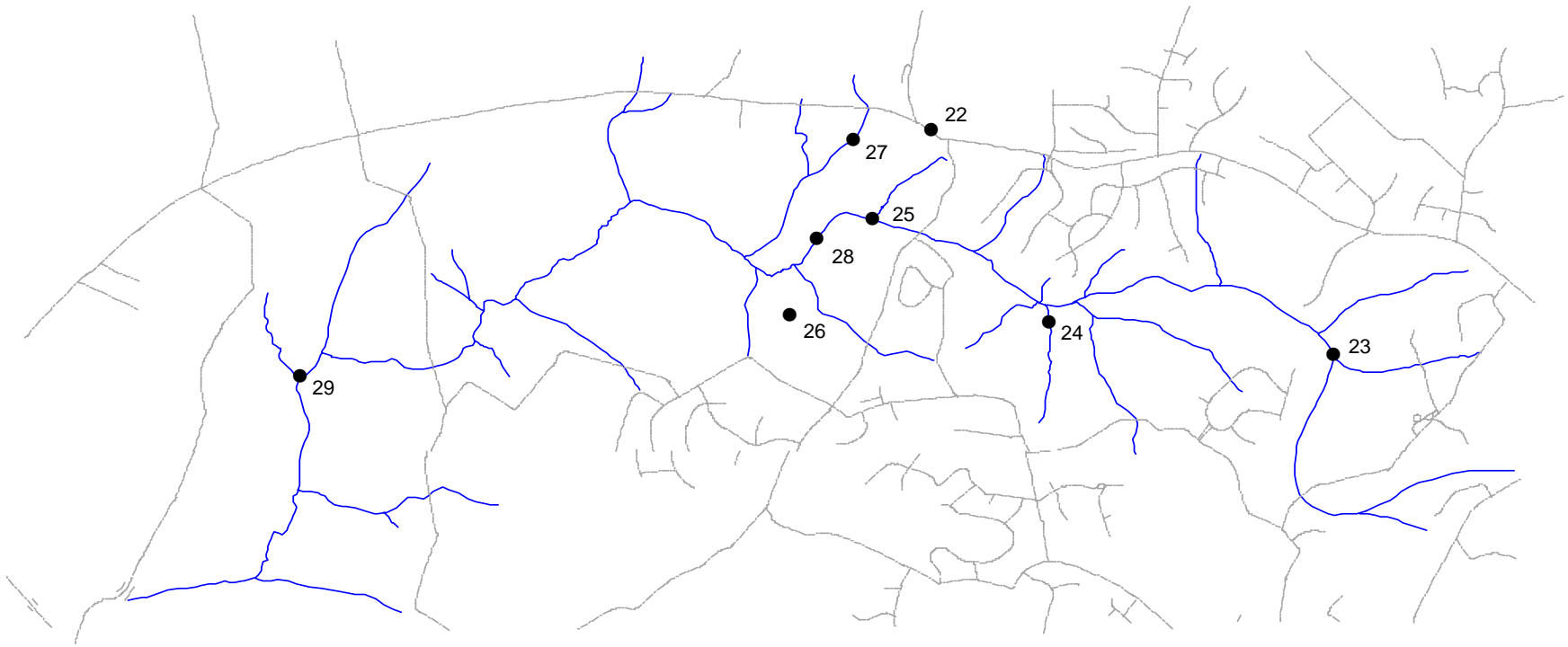
0.2 0 0.2 0.4 0.6 Miles





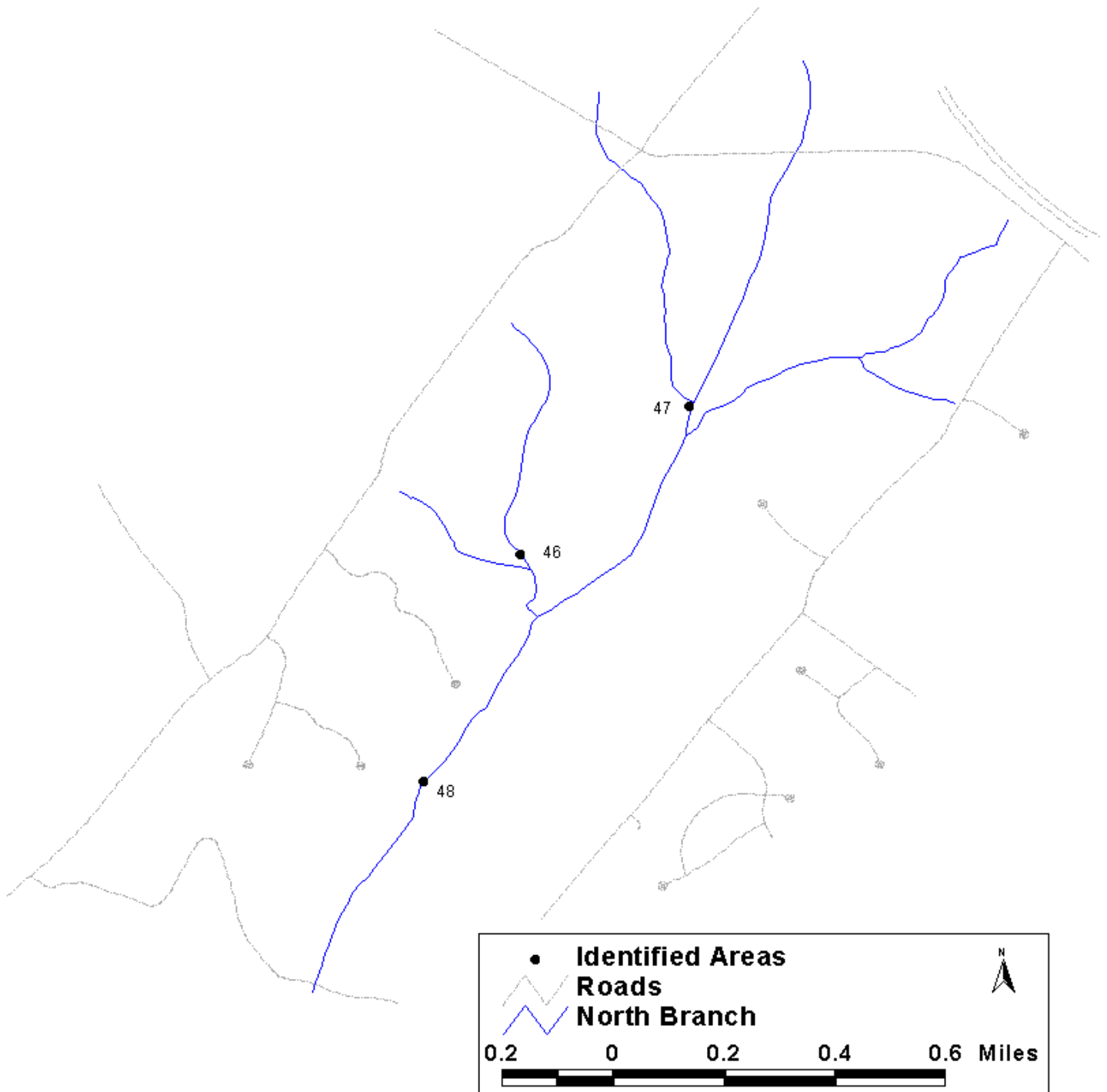
# Map 41:

## Fahrney Branch Identified Areas



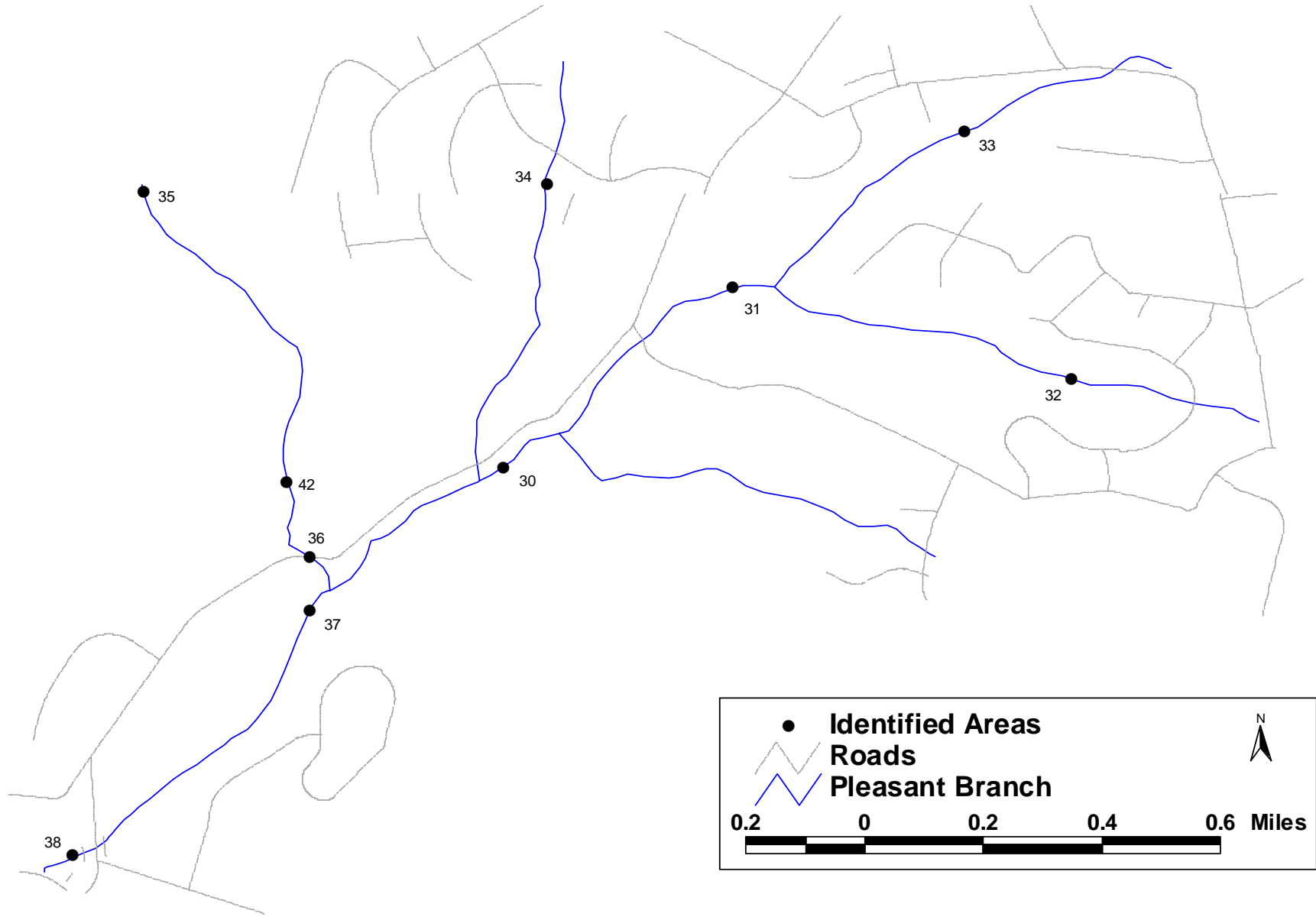
# Map 42:

## North Branch Identified Areas



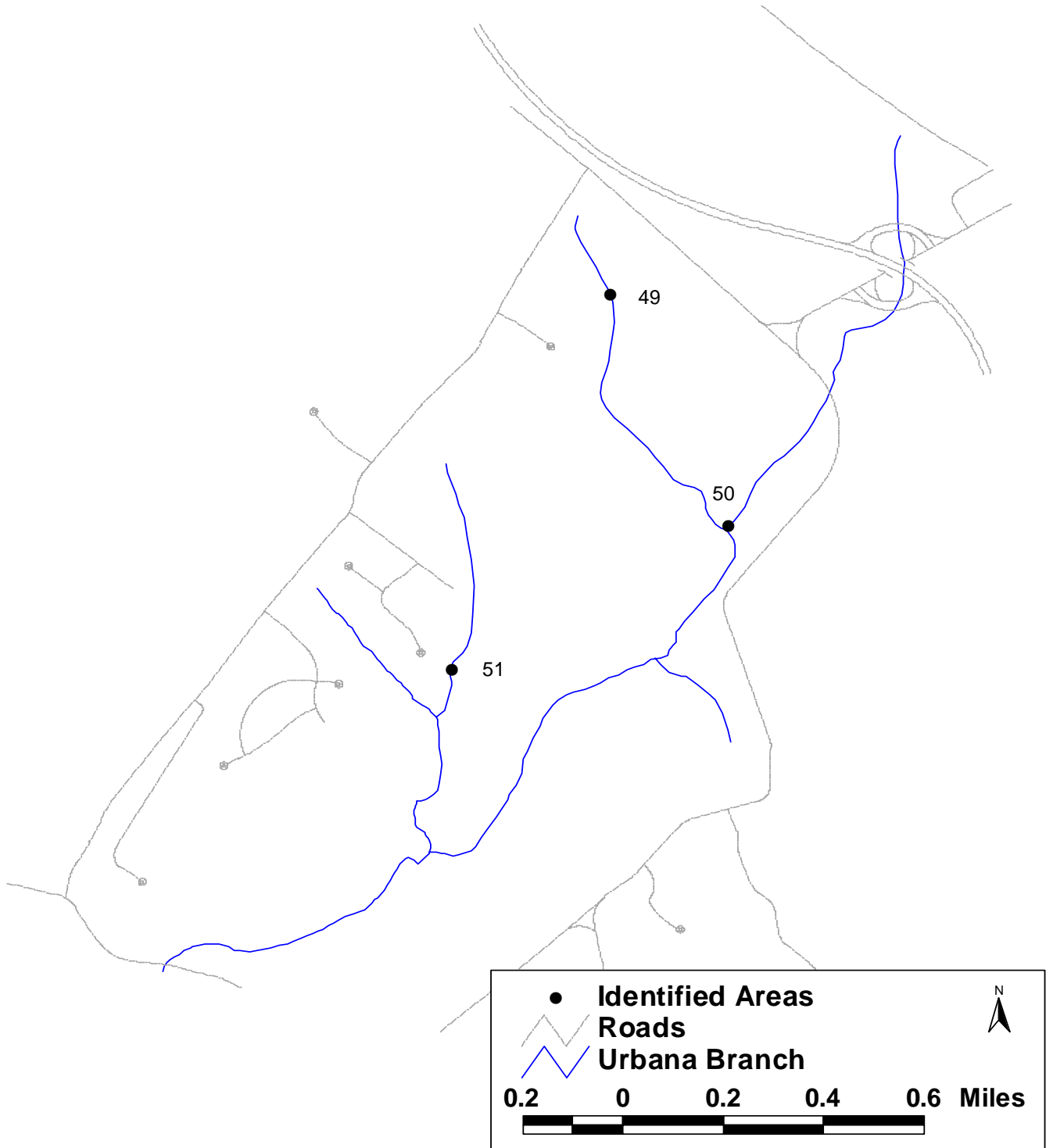
# Map 43:

## Pleasant Branch Identified Areas



# Map 44:

## Urbana Branch Identified Areas



Natural Resource Management Priorities

Each of the activities in the table below was conceived by the WRAS steering committee to produce measurable nutrient reductions. The steering committee partners are committed to executing the projects pending the availability of funds. Calculations of nutrient reductions are produced by applying a nutrient removal efficiency percent for a particular Best Management Practice (BMP) to an estimate of existing nutrient load for the area covered by the BMP. The removal efficiencies were researched through several sources, including the January 2003 *Technical Reference for Maryland's Tributary Strategies*, Chesapeake Bay Program Urban Storm Water Workgroup's *Recent Changes in Tracking and Reporting Stormwater Management*, the Center for Watershed Protection's (CWP's) *Watershed Treatment Model (WTM)*, and the 2003 *A Summary Report of Sediment Processes in Chesapeake Bay and Watershed* by USGS.

Table 16: Natural Resource Management Priorities

Natural Resources Management Objective	Responsible Party	Schedule	Measurable indicators/performance measures	Monitoring & party responsible; nutrient reduction/unit	Public involvement, outreach, or education component	Innovations or additional leverage or benefit	Cost and Funding Sources
<i>WRAS Plan Element: Agricultural and Forest Sectors. Conserve and preserve viable working farms and forests (land-based livelihoods) serving as good stewards of water, habitat and soil resources.</i>							
Plant an additional 10 miles of forest buffers per year 50' wide (beyond the current 10-20 mi/yr)	SCD, DNR Forester, NRCS Watershed Forester	Planning & Fundraising, 7/04 – 12/04; Implementation, 2005 and ongoing; program updates and revisions, annually.	60.6 acres buffered equals yearly reductions of 282 lbs TN, 345 lbs TP and 406 lbs TSS	DNR	Soil Conservation District Board and Farm tours, Agricultural Ext agent articles.	Wildlife benefits as well as filtration and nutrient reduction benefits.	Secure funding for bonus payments to cover cost share by landowners. Cost share of 12.5% estimated at \$250/acre.
Fence 10 livestock operations out of streams annually (beyond the current average 22 operations fenced out/ yr) including horse operations	SCD, farmers, NCCC/DNR for free labor for fence installation & invasive species management.	Planning and Fundraising, 11/04 – 6/05; implementation, 7/05 and ongoing. Program updates & revisions/yr.	No. of livestock operations out of stream. Each 10 acres protected equals yearly reductions of 61 lbs TN, 61 lbs TP, and 61 lbs TSS.	DNR	Soil Conservation District Board & farm tours; Trib Team tours; Ag Ext agent for dairy operations; Large Animal Vets (see below)	Herd Health improves. Farm profitability increases; aquatic life improves.	Cost w/out NCCC team labor is \$2.60/ft or \$13,728/mi. Estimated 1/3 mi/ operator or \$46K/yr for 10 operators. Availability of Conservation Corps for labor would reduce cost by half.
Plant an additional 2,500 acres/yr in cover crops (small grain enhancement program) beyond the estimated cover crop funding from other sources	SCD & MDA, Grant administration. Cooperative Ext & NRCS, technical assistance.	Planning and Fundraising, 7/04 – 6/04.5 Planning & Design, 6/05 – 3/06; Construction, 9/05 – 12/06; Inspection/maintenance, 3/06–12/07	2500 acres protected from erosion each year translates to 27,185 lbs TN, 4,687 lbs TP, 7.030 lbs TSS reduced.	DNR party responsible for monitoring and assessment	SCD will involve public in learning from demos through its District board meetings, agricultural tours, and staff outreach	The small grain enhancement program would permit farmers to harvest the cover crop for on farm use or sale.	\$50,000 annual cost at \$20/acre for 2,500 acres.
Linganore Watershed Agricultural Implementation Partnership Project to assist key farm owners in the Linganore watershed improve practices or add BMPs	Frederick SCD, Lead. MDA, Grant admin. Cooperative Ext & NRCS, technical assistance. DNR, monitoring & assessment.	Planning & Design, 6/04 – 3/05; Construction, 9/04 – 12/05; inspection/maintenance, 3/05 – 12/05	No. of farms assisted – 13 targeted of 18 identified. Testing BMPs for nontraditional operations such as horse and bull farms.	DNR party responsible for monitoring and assessment.	SCD will involve public in learning from demos through its District board meetings, agricultural tours, staff outreach. The Cooperative Extension. Service & NRCS will also educate others about new strategies & resources	The targeted operators are ineligible for existing programs but have long standing pollution problems that impact Lake Linganore and its TMDL. This project will leverage important water quality impacts.	FFY 04 Proposal CWAP Incremental 319, \$250,000 with 50% from 319 and 50% matching from EQUIP.

Natural Resources Management Objective	Responsible Party	Schedule	Measurable indicators/performance measures	Monitoring & party responsible; nutrient reduction/unit	Public involvement, outreach, or education component	Innovations or additional leverage or benefit	Cost and Funding Sources
Increase the number of rotational grazer dairy farmers and other organic farmers by 3/yr by increasing incentives and funding	SCD, Ag Extension Service, dairy specialist, farmers, MDA	Program planning and fund raising, 7/04 – 12/04; implementation, 05 and ongoing; future revisions and updates as needed.	Modeled impacts of reductions of nitrogen, phosphorus, sediment and fecal coliform	DNR	Soil Conservation District Board & farm tours; Trib Team tours; Ag Ext agent for dairy operations; Large Animal Vets (see below)	Permanent cover on land prevents erosion. Greater herd exercise promotes animal health. Fresh grass rotation minimizes manure storage and application & hay transport & fossil fuel use.	Funding from Equip would be augmented with this program that would also provide a bonus or further incentive. Cost estimate of \$25,000/farm for 3 farms or \$75K/yr.
Increase the sales of agricultural and forest products by 10% each year for three years locally at farmers markets, CSA's, road side stands, and through local restaurants and grocery stores.	Frederick County Agricultural Business Development Specialist in Frederick County's Economic Development Office.	Planning & fundraising, winter 04/5; implementation, 05 and beyond.	Reduction in atmospheric deposition of nutrients from distance shipping.	Modeled impacts.	Buy local campaign. Harvest tour of farms. Features at local groceries and food markets and restaurants. Added element to watershed welcome packet.	Buying local products helps the local economy with recycling resources. It also results in fresher and healthier food and better connections among w/shed residents.	Improved marketing to expand program effectiveness to reach goal - \$20,000 to promote Home Grown Here, Virtual Farmers Market, Family Festival at the Farm.
<b>WRAS Plan Element: Natural resources goal: To provide for no net loss of forests or wetlands, protect mature forest, increase native meadows, and restore cold water fishery in Rocky Fountain Run</b>							
Replace forest cover that is cleared for dev. with CREP, FRO, WHIP, or natural regeneration	Principal Planner, Forest Resource Ordinance, SCD, DNR Forestry, NRCS, Potomac Conservancy, ICPRB, Frederick Forestry Board	Develop a consensus on the ratio of replacement for forest loss resulting from logging or development – by 12/04; continue & expand reforestation – ongoing.	Acres lost to clearing through grading and logging permits; acres reforested from FRO and CREP and natural regeneration or fallow fields.	DNR	Public outreach by Frederick Forestry Board, DNR Forestry, press series, forestry classes by agricultural extension agent expand to feature water quality benefits.	Improved air quality, hydrologic cycle, nutrient uptake, wildlife habitat, pollution filtration, and climate moderation.	Addressed elsewhere in these natural resource goals.
Increase wetland acreage by 50 acres by 2010 through mitigation and expansion and improve quality of wetland systems	MDE, Principal Planner, Site Plans, Army Corps of Engineers, Alliance for the Chesapeake Bay, Potomac Conservancy, Frederick County, Public Schools, Homeowner Associations, and other land owners	Ongoing Process. Identification of Potential Wetland Restoration Sites, organize task force, 9/04, set work program and goals, 11/04, develop draft list, 3/05; assess sites, 6/05; draft list of priority sites 9/05	50 Acres of wetland restored or expanded equates to reductions per year of 430 lbs TN, 528 lbs TP, and 634 lbs TSS; assumes conversion from low-till farming.	DNR	Public involvement in wetland expansion by land owners and employees of business and public owners including public school children, County employees, etc.	Pollution filtration, water quality and habitat enhancements.	Hiring of wetland restoration biologist to help coordinate planning, selection, owner outreach and installation of wetlands. \$40,000/year.

Natural Resources Management Objective	Responsible Party	Schedule	Measurable indicators/performance measures	Monitoring & party responsible; nutrient reduction/unit	Public involvement, outreach, or education component	Innovations or additional leverage or benefit	Cost and Funding Sources
Protect 1000 acres of forest with conservation easements by 2010	Potomac Conservancy, MET, Frederick Forestry Board, DNR Forestry, Catoctin Land Trust, Carrollton Manor Land Trust	Planning and fundraising, 04; develop acquisition strategy, 05; implement strategy, 05 and ongoing; refine and adjust strategy.	No. of acres permanently protected under conservation easements.	DNR	Joint outreach campaign would be conducted to educate community about value of protecting mature forests. Press campaign, etc.	Broad protection strategy with numerous partners with varied skills will optimize success and help link to a variety of landowners. Habitat benefits.	At \$3,000/acre this would cost \$3 million over 5 years or \$600,000/yr.
Increase acres of native meadows for ground nesting birds by 250 acres by 2010	DNR wildlife specialist & public & private owners; SCD staff & ag land owners; NRCS; Audubon Society of Central MD, Izaak Walton League	Public education campaign – 04 – 05; enrollment in CREP, WHIP, and other programs, ongoing.	No. of acres added per year maintained by DNR wildlife specialist. Observation of Barn owls, species of concern, quail, meadowlarks & field sparrows. Data from breeding bird survey.	DNR	Continuing outreach campaign aided by Audubon Society of CMD and Izaak Walton League	Conservation cover filters pollutants, provides for greater diversity of meadow species, and provides habitat for ground nesting birds attracting Barn Owls.	At \$1,000/acre for 50 acres/year costs will cost \$50,000/yr.
Improve and enhance habitat for cold water fishery in Rocky Fountain Run	Potomac Conservancy, DNR Fisheries, Carrollton Manor Land Trust, Essroc	Fish survey – 9/03; creek walk on Essroc stream reach, 5/04; plan for stream corridor improvement, 9/04; implement plantings, 4/05; stock fish, 5/05 or 06, if appropriate.	Stream temperature & suspended solids monitored monthly under Essroc permit. Stream corridor plantings; outreach to upstream owners for livestock fencing and stream plantings. Fish survival.	DNR, Essroc, DNR Fisheries	Carrollton Manor Land Trust local partner will help educate neighbors. Essroc can help involve its employees from the locality. Other landowners will learn about the importance of stream buffering.	Potential “angle” to help enlist other landowners in buffering the stream	Modest cost for potential trees anticipated from Releaf program through Potomac Conservancy.
<b>WRAS Plan Element: Improve water quality and habitat by helping citizens adopt “greener” lifestyle practices</b>							
Provide backyard tree buffer plantings to homeowners to plant an average of 50’ of stream side buffers with native species for a total of 10 miles of stream buffers over 5 yrs	DNR Watershed Foresters, Lead. Potomac Watershed partnership. DPW NPDES brochure; WRAS and partners, outreach; NCCC bundling trees.	First Year: Brochure, 01/04. Outreach, 2 – 4/04. Distribution of trees, 4/24/04. Planting, May & June, 04. Similar schedule for subsequent years.	No. of feet of stream frontage buffered. No. of homeowners educated about benefits of riparian vegetation. 60.6 acres buffered equals yearly reductions of 282 lbs TN, 345 lbs TP and 406 lbs TSS	Contact landowners about whether the trees were planted and their health, the number of feet buffered determines the nutrient reduction calculation.	Newspaper articles and editorial; public meetings in Linganore and Bennett Watersheds; booth or table at Earth Day at Baker Park, 4/04 and subsequent years as well.	Word of mouth, media coverage, effective program at a low cost	Funding for trees by Potomac Watershed partnership. Funding for brochure printing by Fred Co NPDES.

Natural Resources Management Objective	Responsible Party	Schedule	Measurable indicators/performance measures	Monitoring & party responsible; nutrient reduction/unit	Public involvement, outreach, or education component	Innovations or additional leverage or benefit	Cost and Funding Sources
Provide targeted outreach and assistance to homeowners with inadequate septic systems	Carrollton Manor Land Trust, WRAS Implementation Coordinator, Frederick Co. Health Department	Program planning and fundraising, 8/04 – 3/05; pro-gram development, 4 – 6/05; implementation – 7/05+	No. of owners in targeted areas increasing maintenance; reduced nitrogen in waterways. Yearly reductions per septic at 0.2 lbs TN	DNR	Major outreach planned using local media and realtors association	Groundwater impacts of reduced nitrogen anticipated. More knowledgeable base of realtors.	Anticipated part time County prog coord, \$40K, inspection subsidies, \$200x100=20K. Cost per septic pumped is \$42/yr.
<b>WRAS Plan Element: To promote greater enjoyment of the landscape and rivers by improving land and water trail quality and accessibility and promoting use by residents and visitors</b>							
Analyze and map trails, assess their quality & maintenance & signage, & develop a plan for increasing connectivity	Frederick County Parks and Recreation, City of Frederick, College environmental clubs, FOL, The Trail House, NPDES, National Park Service Rivers and Trails, etc.	Collection of existing data 9/04 - 3/05; GIS digitization of data into trail map layer 3/05 – 10/05; Laminated map printouts 10/05 – 12/05; Field assessment of trail segments, traffic volume and ownership research 12/05 – 12/06; Determination of heavy use areas, missing corridors, maintenance needs 12/06-6/07; Report with recommendations by 12/07	Map of trailways. Trail report. Improvements to existing trail system. Traffic on improved/newly created trails converts to reduced pollutants from reduced car trips.	College Students to monitor trail conditions.	Excellent public outreach. Press event at kickoff to invite public solicitation of trail use, needs. Public meeting to review proposed trail enhancements. Public presentation of trail map at press event.	Community building activity. Provides access routes to people without cars. Creates pilot trail program for other areas. Promotes support for existing County trail program.	\$70,000 to develop map and publication, pay for staff coordination, minimal payment of college interns to conduct field assessment. Funds to coordinate group-planning process.
<b>WRAS Plan Element: To establish a monitoring program that integrates data from a variety of sources, targets additional sampling sites, interprets and reports findings periodically to the public, program operators and policy makers.</b>							
Create a Monocacy Watershed Report Card for the following audiences: General public, political leadership and decision makers, educators and students.	Frederick County NPDES, Lower Monocacy WRAS Monitoring Subcommittee, Versar Inc	1) Collect and evaluate existing data by 9/04; 2) develop indicators and resolve issues of scale by 1/5; 3) compile existing monitoring data by 7/5; 4) design publication by 1/6; 5) print and distribute publication by 2/6; 6) reassess and develop new indicators and continue to collect monitoring data on yearly basis	# of Report cards distributed, increased sign-ups with available programs, increased level of concern, and increased level of actions. McClafferty, J. 2002. A Survey of Chesapeake Bay Watershed Residents: Knowledge, Attitudes and Behaviors Towards Chesapeake Bay Watershed Water Quality Issues. Final project report prepared for EPA’s Region 3 Chesapeake Bay Program. CMI-HDD-02-01	Lower Monocacy WRAS Monitoring Subcommittee, Versar Inc.	Excellent outreach and education potential. Anticipate involving local college. Project designed to educate/inform public. Previous media attention to issues guarantees broad media coverage. Press event to release document.	Increased motivation based on the monitoring results, increased public pressure on public officials for improved water quality. Promotion of illicit discharge detection and elimination. Channels public interest into involvement. Promotes understanding of connections between behavior and watershed health.	1) \$13,000 for staff time, group coordination and data processing; 2) \$5,000 staff time and group coordination to develop indicators; 3) \$45,000 to resolve inconsistencies between different data sources, create database template, enter data, coordinate group; 4) \$4,000 for group coordination, graphic design services; 5) \$5,500 to print and distribute publication; 6) \$30,000 yearly for local college to run program with students to conduct monitoring and prepare analysis for report card, update and maintain database, resolve data conflicts.



Natural Resources Management Objective	Responsible Party	Schedule	Measurable indicators/performance measures	Monitoring & party responsible; nutrient reduction/unit	Public involvement, outreach, or education component	Innovations or additional leverage or benefit	Cost and Funding Sources
Clickable Online Map to present Monitoring Data and other information relating to water quality to the following audiences: General public, political leadership and decision makers, educators and students. Combine with report card initiative.	Frederick County NPDES program; Lower Monocacy WRAS Monitoring Subcommittee, Versar Inc.	1) Develop Arc IMS server capability and internal County policies to serve data to the public. Coordinate with state online mapping efforts and serve on data committee 9/04-9/06; 2) create web interface to serve data and present information in tabular form by 9/08; 3) create GIS-ready data in format for public view by 9/09; 4) continue to collect data and update site on yearly basis.	Number of website hits.	NPDES program or designee to keep track of existing monitoring programs.	Project designed to educate/inform public. Previous media attention to issues guarantees broad media coverage. Press event for project kickoff. Internet access to question about water quality in specific areas integrates and builds with existing programs. Allows viewers in-depth portrait of water quality in their backyard. Anticipate involvement of local college.	Can be combined with other County initiatives for online data, such as mapping of commercial areas or public services. Can be combined with Report Card to distribute synthesized information. Will combine with Web initiative.	1) ArcIMS server in place at county government for intranet. \$25,000 to develop server for internet use, coordinate with state agencies and project team 2) Web interface requires both graphic and informational design, \$75,000; 3) Data likely to already be in appropriate format if project done concurrently with report card, \$3000 for group coordination; 4) Site updates will need to incorporate new data types, update and refresh old data \$23,000/year.
TMDL implementation tracking in Lake Linganore.	Frederick County NPDES Program and Monitoring Committee	1) Monitoring large inputs to lake for sediment and phosphorus loads underway. Estimates for TMDL to be revised by 5/05 in cooperation with MDE. 2) Revised allocations to be proposed based on actual loadings, different land use scenarios; 3) tracking of BMPs in ag, urban stormwater and point source inputs to be performed on yearly basis to ensure TMDL is met.	Sediment and Phosphorus reductions from major infalls to Lake Linganore. Installation of Best Management Practices with nutrient reductions calculated as % of load. Reductions in impervious area, unbuffered highly erodible soils and other appropriate indicators.	MDE, DNR Niles Primrose for Sediment and Phosphorus Monitoring and Monitoring Committee for BMP implementation and calculations of load reductions.	Lake Linganore highly visible issue in Frederick County. Will receive significant press coverage. Press event to announce reductions in nutrients, sediment.	Reduced dredging costs on lake. Revision of TMDL that sets limits for sediment and phosphorus loads at 100% forest cover. TMDL implementation.	1) \$10,000 per year to monitor sediment and phosphorus for 10 years; 2) coordinator time to develop revised calculations and facilitate group/agency coordination, \$15,000; 3) BMP tracking, coordination with external groups to ensure BMP implementation, track various indicators, maintain databases and spreadsheets, \$25,000.

Community Education and Outreach Priorities

WRAS coalition members concluded that developing capacity through organizational development, teamwork, coordination and leadership development are the most critical factor to improve water quality in the Monocacy Basin. As a result, infrastructure-building serves as a foundation for the outreach and education activities outlined below. A literature review was conducted to link the activities to existing studies that correlate outreach vectors and messages with retention, action, and improvements to water quality and habitat. The literature review can be found in *Strategic Plan to Improve Water Quality Through Public Outreach in Frederick County, Maryland*, published in November 2003 by Frederick County Government and Versar, Inc.

Table 17: Community Education and Outreach Priorities

Education or Outreach Activity	Responsible Party	Schedule	Measurable Indicators	Other partners	Additional leverage/benefits	Costs and Funding
<b>WRAS Plan Element: Agricultural and Forest Sectors: Conserve and preserve viable working farms and forests (land-based livelihoods) serving as good stewards of water, habitat and soil resources.</b>						
Outreach to livestock farmers in targeted stream corridors in Linganore Watershed	Upper Potomac Tributary Team, SCD	Develop partnership, summer, 04; develop plan including targets, fall, 04; conduct outreach meetings, winter, 04/05.	Additional livestock farms that protect water resources; modeled impacts from stream protection.	The large animal vet association will help educate farmers about the cost and health benefits from keeping animals out of creeks. Chesapeake Bay Foundation.	Herd health. Cost savings. Water quality improvements. Educated vets and farmers.	None anticipated beyond regular partner operations & existing funding for BMPs.
<b>WRAS Plan Element: Improve water quality and habitat by helping citizens adopt “greener” lifestyle practices</b>						
Teach and show homeowners six “greener” lifestyle practices: increase participation by 5% each year.	Community Commons.	Workshop series in 2003 in Lower Monocacy and 2004 in Upper Monocacy. Need funding for future years	No. of those attending workshops. Pre- and post-testing-Use Taylor and Wong 2002 figures for behavior change. Taylor, A. and T. Wong. 2002. Non-Structural Stormwater Quality Best Management Practices – A Literature Review of Their Value and Life-Cycle Costs, cooperative Research Center for Catchment Hydrology, Australia.	Master gardeners, Frederick News Post, Potomac Conservancy, Friends Meeting School, NPDES program, Frederick Co Solid Waste Coordinator.	Rain barrels retrofitted by developmentally disabled. Other partners replicate native plant workshops including Friends of the Lake and the MD Native Plant Society, Frederick Chapter.	Grant funding offered by WRAS to Community Commons and by Potomac Conservancy for rain garden installation in 2003, 2004. \$15,000/yr.
Develop Interactive Website	Frederick County Government	Begin 7/05, ongoing	Number of hits and sign ups/responses to programs	Monocacy Watershed Coalition	Sign ups for projects, information for citizen database, increased awareness, interactive mapping	\$25,000 startup \$5,000/year after initial year.
Outreach at Earth Day celebration at Baker Park	Common Market and Community Commons, cosponsors.	Event occurred 4/18/04 at Baker Park, Frederick. Need funding for future years.	No. of Exhibitors and No. of Attendees, and No. of those self listed wanting further information. Follow up on participation in projects using the citizen’s database.	Partners exhibiting or speaking including FOL, Potomac Conservancy, Hood College, WRAS, Organic Farmers Association, Thorpewood, Frederick Chapter of the American Chestnut Foundation, etc.	Excellent opportunity for networking among environmental community. Excellent opportunity to grow the base constituency and educate neighbors. Trees given away.	\$15,000

Education or Outreach Activity	Responsible Party	Schedule	Measurable Indicators	Other partners	Additional leverage/benefits	Costs and Funding
Provide a basic packet of information to a homeowner purchasing a house within the watershed to increase awareness. Include a developed brochure to educate new buyers about care of septic tank and drainage field for water quality protection.	Community Commons, Frederick County Health Department	Begin 7/06, ongoing if funding is available	McClafferty, J. 2002. A Survey of Chesapeake Bay Watershed Residents: Knowledge, Attitudes and Behaviors Towards Chesapeake Bay Watershed Water Quality Issues. Final project report prepared for EPA's Region 3 Chesapeake Bay Program. CMI-HDD-02-01	Frederick County Board of Realtors, Monocacy Watershed Coalition, Homeowner Associations, Developers.	Allows new citizens to learn about our programs and sign up.	\$25,000/year. Could be partially offset by partner contributions.
Design and produce a lawn transformation reality program	Community Commons and the Alliance for the Chesapeake Bay	Funding applications, 3/04; awards, 8/04; program planning, 11/04; implementation, 4/05	No. of viewers of reality program educated. TV recall data in Caraco, D. 2001. The Watershed Treatment Model (Version 3.0). Center for Watershed Protection: Ellicott City, MD. Ranking of Outreach Techniques in Swann, C. 1999. A Survey of Resident Nutrient Behavior in the Chesapeake Bay Watershed, Report for the Chesapeake Research Consortium for Watershed Protection, Ellicott City, MD. Hood monitoring pre and post lawn transformation to assess impacts over three year period	Local college	Media coverage-TV is the most effective outreach vector and increased citizen outreach and education.	\$45,000
Establish and maintain a data base of homeowner watershed involvement & give periodic updates to members through an E-newsletter.	WRAS Assessment Coordinator and Implementation Coordinators	Complete preliminary email distribution list by 0704. Send watershed updates out quarterly beginning in July, 04. Ongoing	The number of landowners interested in watershed news and opportunities to participate. The growth in the database quarterly. 48% usefulness from Powell, J. and J. Bails. 2000. Measuring Soft Stuff- Evaluating Public Involvement in an Urban Watershed Restoration. Watershed Management Conference, Water Environment Federation, Vancouver. <a href="http://www.rougeriver.com/pdfs/education/watershed2000-05.pdf">http://www.rougeriver.com/pdfs/education/watershed2000-05.pdf</a> . November 4, 2003. Swann, C. 1999. A Survey of Resident Nutrient Behavior in the Chesapeake Bay Watershed, Report for Chesapeake Research Consrt for Watershd Prot, Ellicott City MD	The data base will grow through a variety of outreach activities including community meetings (3/04), earth day (4/04), stream monitoring, tree planting, etc.	The database will be able to target residents by watershed and thus can be used to help implement specific targeted strategies such as those proposed for Liganore or Bennett.	\$4,000/year and ongoing.
Help promote greater visibility and priority for water quality and water resources beginning with a series of watershed articles in the local press launching an ongoing public education campaign	WRAS Program Assistant and WRAS Implementation Coordinator	Begin Fall 2004	Effectiveness of outreach vector in Caraco, D. 2001. The Watershed Treatment Model (Version 3.0). Center for Watershed Protection: Ellicott City, Maryland.	Monocacy Watershed Coalition	Increased sign-ups and citizen awareness of programs	\$2,000

Education or Outreach Activity	Responsible Party	Schedule	Measurable Indicators	Other partners	Additional leverage/benefits	Costs and Funding
Create a Monocacy Watershed Report Card	Frederick County NPDES	Fall of 2004 with a product available by Fall 2005	# of Report cards distributed, increased sign-ups with available programs, increased level of concern, and increased level of actions. McClafferty, J. 2002. A Survey of Chesapeake Bay Watershed Residents: Knowledge, Attitudes and Behaviors Towards Chesapeake Bay Watershed Water Quality Issues. Final project report prepared for EPA's Region 3 Chesapeake Bay Program. CMI-HDD-02-01	Monitoring Subcommittee-Shannon Moore, Chair.	Increased motivation based on the monitoring results, increased public pressure on public officials for improved water quality.	\$20,000 for first year and \$15,000/year thereafter.
Develop a logo & signage for the Monocacy Watershed Coalition	Monocacy Watershed Coalition members	Developed logo by 7/04 and signage by 7/05		Frederick County DPW Roads Dept., Audubon Society, Friends of the Lake	More visibility and awareness of watershed among area citizens and visitors.	Logo- \$1,500 for a graphic designer; Signage-\$25,000.
Native Plant of the Month Club developed to better educate homeowners about the benefits of native plants	Community Commons	Planning the program, fall, 04; seek initial funding and develop outreach plans and materials, winter, 04/5; implement program, 3/05 and ongoing	Number of participants in the Plant of the Month Club; growth in membership Taylor, A. and T. Wong. 2002. Non-Structural Stormwater Quality Best Management Practices – A Literature Review of Their Value and Life-Cycle Costs, Cooperative Research Center for Catchment Hydrology, Australia.	Master Gardeners and the Frederick Chapter of the MD Native Plant Society	Education in the use of native plants, creates an economy to support the purveyors of native plants, and creates an increased awareness of the importance of native plants. More quantity of feed and cover for wildlife.	\$5,000 start-up
Watershed Calendar	ICPRB	Planning and funding process, summer 04; production, fall 04; distribution, jan05	# of calendars sold	Lake Linganore Conservation Society, local photographers	Increased citizen awareness and education. It is a practical outreach	\$5,000 start-up
<b>WRAS Plan Element: Natural resources goal: To provide for no net loss of forests or wetlands, increase native meadows, and restore cold water fishery in Rocky Fountain Run</b>						
Offer workshops and demonstrations in native conservation cover crop management	DNR Forestry, Frederick Forestry Board, DNR Wildlife, Private land owners	Ongoing with at least annual workshops	No. of participants educated.		Control of weeds and invasives in native meadows. Benefits for ground nesting birds.	Provided by Frederick Forestry Board and DNR.
Offer workshops in invasive plant management	Frederick Forestry Board, WRAS Steering Committee, DNR Forestry	Ongoing with at least annual workshops	No. of participants in the workshop; press coverage before or after.	Steering Committee members from Lower and Upper WRAS base of recruitment.		\$1,800 from the Forestry Board, DNR and workshop participants. Material help from NPDES program.
Offer native plants for sale to area citizens & provide advice and workshops in creating "bay friendly" yards	Audubon Society of Central MD, Friends of the Lake, Master Gardeners, Frederick Chapter of MD Native Plant Society	Training and sales by at least four Coalition members each spring.	No. of participants in workshops; press coverage before or after	WRAS Implementation Coordinator; Agricultural Extension Agent; DNR, Monocacy Coalition members	Broader interest in and availability of native plants will improve habitat and conserve water as well as create stronger demand among local nurserymen.	\$10,000

Education or Outreach Activity	Responsible Party	Schedule	Measurable Indicators	Other partners	Additional leverage/benefits	Costs and Funding
<b>WRAS Plan Element: To foster an ethic and practices of water resource protection by Frederick county, its municipalities, nonprofits, homeowner associations, developers, businesses and industries</b>						
Develop & implement a program for naming unnamed tributaries	DPW NPDES	Planning and design, 2004; implementation, 2005.	No. of Streams named. Expanded database of citizens interested in watershed health.	Carrollton Manor Land Trust, Community Commons, Audubon Society, FOL, Izaak Walton League, Frederick Forestry Board	Positive impacts on watershed awareness. Program strategy fosters connections among long time county residents and relative newcomers.	Anticipated cost of \$12,000 for signage and publicity.
Develop & implement a sediment control & water resource protection program for small lot development. Develop brochures to hand out with grading permits, develop outreach video on BMPs	DPW NPDES & Environmental Compliance Office, collaborating with the Frederick Homebuilders Assoc.	Brochure Development and Video 2005.	Number of brochures/videos distributed. Number of viewings of video on County cable channel. Outreach metrics based on message, retention, vector.	County Video Services, Community Commons, Local Cable Network	Neighborhood watch element allows citizens to police activities in their neighborhoods in addition to controlling their own practices.	Brochure and Video Development - \$5000.
<b>WRAS Plan Element: To engage local citizens, elected officials, municipal, county, and business leaders, and the development community in an education and outreach campaign focusing on managing growth &amp; development pressures in our local watersheds and communities</b>						
Prepare a short course on the development process (rezoning to building permit) that can be delivered to civic, community and/or nonprofit organ.	Growth and Development Work Group	2005	Number of participants who follow-up with CC and Work Group	Community Commons and Growth & Development Work Group	Assists the County Planning and Development Review staff progress	\$5,000 for Audio-Visual Equipment
Target 25 elected officials and local governmental agency staff with informal dialogues & structured workshops related to conservation design, low impact development, and land protection.	Community Commons & Growth & Development Work Group	2005	Tracking of communication with officials. Feedback form review and program evaluation. Program change at county level.	Community Commons and Growth and Development Work Group	Assist in building momentum toward conversation design in new developments.	Growth and Development staff position, \$50,000.
Target 25 developers or building industry professionals with informal dialogues and structured workshops related to conservation design, low impact development, and land protection.	Community Commons and Growth and Development Work Group	2005	Follow up communication with participants. Feedback form review and program evaluation. Interest in related programs offered by Community Commons & the Monocacy Watershed Coalition.	Community Commons and Growth and Development Work Group, Frederick Homebuilders Association, local chapter of American Planning and Architects Associations; Builders for the Bay.	Promotion of collaborative process and consensus building at the local level.	Growth and Development Program Staff position, \$50,000.
Sponsor annual lecture series appropriate to the general public on issues related to growth and development pressures.	Community Commons & Growth and Development Work Group.	2005	Feedback form on level of knowledge on topic areas. Registration to more in-depth sessions. Application to become involved on Work Group or other Committee level.	Monocacy Watershed Coalition, Homeowners Associations, with anticipated coverage by local print and broadcast media.	Could promote through Development Review or builders association to draw diverse participation.	Growth and Development Program Staff position, \$50,000

LOWER MONOCACY WATERSHED RESTORATION ACTION STRATEGY

Education or Outreach Activity	Responsible Party	Schedule	Measurable Indicators	Other partners	Additional leverage/benefits	Costs and Funding
Determine extent, if any, of change in project design, unit yield and cost, from the application of conservation design or LID principles and share results with local developers, engineers, and consulting groups.	Community Commons and Growth and Development Work Group	2005	Offers cost-benefit analysis and economic incentives to builders and buyers. Gives value to environmental benefits.	Frederick Homebuilders Association, local chapter of American Planning and Architects Associations; Builders for the Bay.	Partnership building among diverse constituents. Offers conservationists a marketing strategy for implementation of conservation and low impact development principles.	Growth and Development Program staff position, \$50,000.
Promote the transfer and use of afforestation and related Forest Resource Ordinance funding to implement Agricultural Best Management Practices in targeted watersheds within Frederick County.	Development Review Office, Frederick County Government, Monocacy Watershed Coalition	2005-6	Habitat and resource restoration in acres. Educated public through volunteerism.	Growth and Development Work Group, Community Commons, Monocacy Watershed Coalition	Policy change implementation and outreach at local level.	Fees available through Forest Resource Ordinance and related regulatory mechanisms at county.

## Issues Requiring Further Study

The health of the Lower Monocacy Watershed results from cumulative human impacts over two and a half centuries since agricultural settlements began to dominate the region. Restoring watershed health will require changing practices, policies and ethics that have evolved and become habitual over generations. Actions to best achieve such changes are not always self-evident. For that reason, significant collective study, partnerships, coalition building and political assessment are necessary as a part of making wise and effective changes. Listed below are a number of WRAS issues and concerns on our collective future agendas.

### Capacity Building

Frederick County's current public and private capacity for watershed management is inadequate. Local governments – the County, Frederick City, the cities of New Market or Mt. Airy - nor conservation nonprofits like Community Commons or Carrollton Manor Land Trust presently have the capacity to achieve the goals and objectives enumerated here. Enhancing local capacity requires both technical and financial assistance. It requires leadership, collaboration and partnering. Seven specific actions planned for the future to enhance capacity include:

- **Resource Management System:** borrowing relevant parts of Ft. Detrick's Natural Resource Management System for County use in Monocacy Watershed management;
- **Conservation Corps Labor for BMPs:** exploring the addition of a Maryland Conservation Corps team for conservation tasks for at least 16 weeks per year, perhaps eventually reestablishing a year round crew at Echo Lake for work in Frederick County;
- **GIS Layers:** establishing GIS layers for agricultural BMPs beginning with CREP planting areas, pre-1976 subdivisions (without storm water management), and areas with threatened or failing septic systems, in addition to enhancing other water-quality layers;
- **Training for County Staff:** arranging for County Construction Management and Development Review personnel to receive LEED and LID training and for Sediment and Erosion Control Inspectors to receive trainings from the International Sediment and Erosion Control Association;
- **Stakeholder Expansion:** expanding WRAS Stakeholders to include the Committee for Frederick County;
- **WRAS Implementation Coordinator:** establishing a WRAS Implementation Coordinator to help manage the implementation of the plan; and
- **Natural Resource Assessments and the Development Process:** the County, through its NPDES and WRAS programs, has invested a significant amount of efforts into source data collection and review to determine areas critical to water quality and habitat that would benefit from restoration or preservation. Some of these areas also happen to be on sites that are zoned or planned for future development. The County should make use of the research conducted during several phases of the development process. First, areas of special concern like forest interior, native brook trout watersheds, karst geology, and sensitive species habitat should receive special consideration in the Comprehensive Plan. Any restrictions in these areas (for example, stormwater management facilities in native brook trout watersheds need to protect forest canopy and filter hot runoff from any developed area before it reaches the stream) should be resolved and made publicly available for initial stages of development planning. Development Review Engineers need to have access to the lists of stormwater management retrofit and restoration priorities from the NPDES-required assessments to ensure that future development restores instead of exacerbates existing water quality and habitat issues. This coordination would also save the County money with implementation. The Parks and Recreation Department should coordinate with the NPDES/ WRAS priorities because some projects would benefit from coordinating with restoration projects (for example, the Ballenger Creek Linear Trail, slated to be developed along stream corridors, could benefit from stream restoration activities.) Other County offices could potentially benefit in the same way with better coordination at the early and later phases of project development.

## Innovative Techniques

- **Conservation Credits:** Farms in the path of development are being held and leased to tenants who take from the land without respect for its natural resources. Erosion and stream degradation are rampant on many such properties. The County will explore new techniques to enable conservation practices to be credited to future developers and thus, address economic realities while encouraging natural resource protection.
- **Natural Regeneration of Stream Buffers:** Another “new”, actually “old” technique that merits further attention is encouraging the natural regeneration of stream corridors. With 2/3 of its streams without adequate vegetated buffers in the Lower Monocacy Watershed, water quality suffers. The cost of generating forested corridors by planting and protecting small trees is large. Another, perhaps more affordable and complementary strategy is to protect riparian corridors from cultivation and livestock and permit natural regeneration to occur, especially in areas where seed stocks are readily available. A comprehensive campaign to encourage natural regeneration would be developed collaboratively.
- **Nutrient Trading:** County and state agricultural leaders will further explore whether or not nutrient trading between point and nonpoint entities can help reduce pollution loads with greater efficiency than other strategies.
- **Nutrient Management Plans for All:** And bridging the gap between agricultural and developed lands, the Coalition will consider the proposal of one farmer that everyone who owns land in the County design and adopt a nutrient management plan – not only farmers as is true at present.

## Program Changes

The Steering Committee and its advisors have identified several programs and/or policies that might be more effective with revisions. The County and its partners will consult other jurisdictions to see what techniques have worked well and had the desired effects of protecting natural resources. The partners will also collaborate on the most appropriate manner of introducing such changes to have the best potential for adoption. Most such program change ideas relate to the development process but others affect agricultural preservation programs.

- **Variable Width Stream Buffer Ordinance:** The WRAS working group on managing growth and development will examine Frederick County’s current and some alternative stream corridor ordinances to assess their costs and benefits and recommend one for adoption by the County and municipalities.
- **River Setback:** The Monocacy River Scenic Advisory board is exploring a setback that would protect the river corridor from development.
- **Incentives for Natural Resource Protection during Development:** The revisions of current regulations to create incentives for natural resource protection would begin with literature review of related policies nationwide. Focus group meetings would be conducted with planners and elected officials. Policy drafting would include legal review. Members anticipate a density bonus for developers who protect a site's natural and cultural features.
- **Conservation Design Principles:** The County previously adopted Community Conservation Design Guidelines and Development Principles but has not yet incorporated these principles into subdivision, building, and zoning ordinances. Thus, new development doesn’t reflect conservation design.
- **Grading Permits:** The state is in the process of considering more lax regulations for grading permits (increasing the cutoff for a major grading permit from 15,000 square feet of disturbance to 20,000 square feet, and increasing the cubic yards of disturbance from 500 to 1000), which would decrease the already small revenue stream that currently supports sediment and erosion control inspections in the County.
- **Increased Inspections and Improved Ordinances:** The need exists to develop an ordinance to encompass grading activities for home lots after main grading phase has passed; this will ensure that actual drainage on lots conforms to plans and that stormwater goes to appropriate facilities as designed. The Standard Plan Agreement currently in effect does not control grading activities on lots. County inspectors are interested in increasing their required inspections to include small lots but do not have the resources even now to do so. Even without adding new programs, additional sediment and erosion control inspectors would allow for a greater frequency of inspections of more developments. Notably, the lack of qualified sediment and erosion control inspectors in the state was recently presented by the Maryland Tributary Teams to the Governor of Maryland as the number one action item needed to improve water quality.
- **Engineering Certification:** A program change should be put in place to require geotechnical engineers to inspect and certify stormwater management facilities (SWMF) on as-built plans, not just the engineer of record, before money can be released by the County to the developer. Currently, the engineer of record certifies that facilities are in general



conformance but does not accept liability for structures as built. A temporary stopgap “letter of authority” is being signed by some engineers of record but refused by others due to liability reasons. SWMF need to operate in accordance to plan for both safety and water quality reasons.

- **Septic System Inspection and Maintenance:** Another area for review is the regulation and maintenance of septic systems in areas without public sewers. With the recently passed “flush tax” revenue available in the future, the County will consider procedural or policy changes that would reduce the ground water impacts from nutrient leach from septic systems.
- **Agricultural Preservation Programs:** Since the agricultural preservation programs that the County sponsors seek to permanently protect the agricultural land base and have public investment in doing so, some team members feel that the programs should increase their leverage in protecting water quality by increasing the proportion of participating farms that are inspected annually (from 10% to 15%), requiring revised soil/water conservation plans to address protection or restoration of aquatic resources, and adding an inspection regimen to the more recent Installment Purchase Program.
- **CREP Program Revisions:** The popular agricultural BMP program for buffer plantings, CREP, is also in the process of changing in a negotiation between the state and federal government.
- **Forests and Wetlands:** Other changes to be considered relate to forests and wetlands. The County has no current procedure for identifying quality forests to protect, critical forests or riparian corridors to connect, or wetland sites for establishment. Team members would consider this capacity building challenge and propose a change in this area.
- **ATV/Dirt Bike Use:** Finally, the recreational use of All Terrain Vehicles has impacted natural resources in many areas, particularly sensitive riparian corridors. Members of the Coalition are consulting the Canaan Valley Institute, which has addressed this problem in another jurisdiction, to see what has been tried and learned. Currently, dirt bike and ATV trails operating as commercial entities have no requirements from Planning and Zoning for permits. The impact from these activities warrants further investigation.

## Appendix A: Community Participation

Letter dated February 26, 2004, to Bennett Creek Watershed Residents/Landowners

Letter dated February 26, 2004, to Linganore Creek Watershed Residents/Landowners

News Articles Regarding Public Meetings:

- “Watershed Meeting”, March 9, Windsor Knolls Middle School for the Bennett Creek Watershed; and “Resident Input Sought on Linganore Watershed”, page C-6, The News-Post, March 7, 2004.
- “Local Water Study Bearing Fruit, Pollution Sources Targeted”, by Nancy Hernandez, page A-5, The News-Post, March 13, 2004.



COMMISSIONERS

John L. Thompson, Jr.  
*President*

Michael L. Cady  
*Vice President*

John R. Lovell, Jr.

Jan H. Gardner

Bruce L. Reeder

COUNTY MANAGER

Douglas D. Browning, CPA

DIVISION OF PUBLIC WORKS

DIRECTOR

Alan J. Hudak, P.E.

DEPARTMENT OF PROGRAM  
DEVELOPMENT AND  
MANAGEMENT



DIVISION OF PUBLIC

**WORKS**

**FREDERICK COUNTY, MARYLAND**

*Department of Program Development and Management*

118 North Market Street Frederick, Maryland 21701

(301) 696-2952 FAX (301) 694-1808 TDD (301) 694-1672

*Serving with Pride County Wide*

February 26, 2004

Dear Bennett Creek Watershed Resident/Landowner,

Over the past year, the County has been coordinating a watershed planning process with groups of individuals and public and private organizations. The first stage of this process was a stream corridor assessment within the Bennett Creek Watershed during which specific data about the health of the watershed was collected. Using the data, we intend to develop a plan during May 2004 to guide future voluntary actions within the County. As a Bennett Creek Watershed resident/landowner, you can help us shape that plan by attending a community meeting on Tuesday, March 9<sup>th</sup>, at Windsor Knolls Middle School from 6 - 8 pm.

The meeting will focus on seeking guidance from the residents as to where to direct our efforts based on the information gathered. We will also discuss opportunities that offer a variety of ways in which individuals can become involved in fostering our natural resources. These opportunities include a wide selection of activities from stream clean ups to tree planting, water monitoring to bird watching, and trail maintenance to canoe paddling, to name a few.

In order to plan for appropriate space and refreshments, please RSVP to by phone at (301) 694-1741 or by email at [kschultz@fredco-md.net](mailto:kschultz@fredco-md.net). Babysitting will be available if you contact us by March 4<sup>th</sup>.

We look forward to meeting you and hearing your recommendations. Thank you for your time and commitment.

Sincerely,

Kay Schultz  
WRAS Program Coordinator  
Watershed Restoration Action Strategy



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February 26, 2004

Dear Linganore Creek Watershed Resident/Landowner,

Over the past year, the County has been coordinating a watershed planning process with groups of individuals and public and private organizations. The first stage of this process is a stream corridor assessment within the Linganore Creek Watershed during which specific data about the health of the watershed is collected. The stream corridor assessment was begun last year and will be completed this spring. Using the data, we intend to develop a plan to guide future voluntary actions within the County. As a Linganore Creek Watershed resident/landowner, you can help us shape that plan by attending a community meeting on Tuesday, March 23<sup>th</sup>, at New Market Elementary School from 6 - 8 pm.

The meeting will focus on seeking guidance from the residents as to where to direct our efforts based on the information gathered. We will also discuss opportunities that offer a variety of ways in which individuals can become involved in fostering our natural resources. These opportunities include a wide selection of activities from stream clean ups to tree planting, water monitoring to bird watching, and trail maintenance to canoe paddling, to name a few.

In order to plan for appropriate space and refreshments, please RSVP to by phone at (301) 694-1741 or by email at [kschultz@fredco-md.net](mailto:kschultz@fredco-md.net). Babysitting will be available if you contact us by March 18<sup>th</sup>.

We look forward to meeting you and hearing your recommendations. Thank you for your time and commitment.

Sincerely,

Kay Schultz  
WRAS Program Coordinator  
Watershed Restoration Action Strategy

## Appendix B: Press Coverage

- “Name Change Fanciful, or Possible?” [from Frederick County to Monocacy County], Commentary by Kai Hagen, The News-Post, Friday, May 16, 2003.
- “Ignoring the Monocacy is a Crime”, Commentary by Kai Hagen, The News-Post, Friday, May 30, 2003.
- “Reducing Nonpoint Source Pollution, Our Largest Water Quality Problem”, by Bill Strang, for the Friends of the Lake, Laketalk, Lake Linganore at Eaglehead Community News, July, 2003.
- “Garden Makes Prolific Rains Positive”, by Erin Cunningham, The Frederick County Leader, a publication of The News-Post, June 13, 2003.
- “Frederick, EPA Funding Assists City in Turning Over Old Lots, Grant Goes to Carroll Creek Corridor Cleanup”, The Washington Post, Metro, Sunday, August 10, 2003.
- “Groups Scrutinize Linganore, Various Organizations Study Lake’s Water Quality,” by Nancy Hernandez, page A-5, The News-Post, January 4, 2004.
- “Nine County Schools Enter Habitat Program”, page A-8, The News-Post, February 4, 2004.
- “Watershed Meeting” [at Windsor Knolls Middle School on Tuesday, March 9] and “Resident Input Sought on Linganore Watershed”, The News-Post, page C-6, March 7, 2004.
- “Local Water Study Bearing Fruit, Pollution Sources Targeted” by Nancy Hernandez, The News-Post, page A-5, March 13, 2004.
- “Our Environment – Recommendations for Action”, Enviroline, Laketalk, Lake Linganore at Eaglehead Community News, March, 2004.
- “Resident Input Sought on Linganore Watershed”, Laketalk, Lake Linganore at Eaglehead Community News, March, 2004.
- “Free Trees May Help Clean Water”, by Nancy Hernandez, The News-Post, page A-5, March 20, 2004.
- “Backyard Buffers’ Program a Good One”, Editorial, The News-Post, page A-10, March 25, 2004.
- “Young Volunteers Walk County Streams, Americorps Helps Out”, by Nancy Hernandez, The News-Post, page A-12, March 29, 2004.
- “Students See Forest Through New Trees”, by Nancy Hernandez, The News-Post, page A-5, April 10, 2004.
- “Student Makes the Grade with Tree-Planting Project”, by Nancy Hernandez, The News-Post, page A-5, April 17, 2004.
- “Stumping for Tree Planting”, by Nancy Hernandez, The News-Post, page A-6, April 29, 2004.

## Appendix C: Publications

“Watershed Restoration Action Strategy, Monocacy River, Frederick County, MD” Brochure (inserted in front binder pocket)

“My Home in the Watershed: Linganore Creek, Watershed Restoration Action Strategy, Frederick County, MD” Flyer (inserted in front binder pocket)

“My Home in the Watershed: Bennett Creek, Watershed Restoration Action Strategy, Frederick County, MD” Flyer (inserted in front binder pocket)

“Composting: Do the Rot Thing”, Building a Greener Lifestyle for Frederick County, Community Commons (inserted in rear binder pocket)

“Design and Construction of a Rain Garden”, Building a Greener Lifestyle for Frederick County, Community Commons (inserted in rear binder pocket)

“Gardening with Native Plants”, Building a Greener Lifestyle for Frederick County, Community Commons (inserted in rear binder pocket)

“Harvesting Rainwater Using Rain Barrels”, Building a Greener Lifestyle for Frederick County, Community Commons (inserted in rear binder pocket)

“Maintaining Your Lawn While Protecting Water Quality”, Building a Greener Lifestyle for Frederick County, Community Commons (inserted in rear binder pocket)

“Natural Household Cleaners”, Building a Greener Lifestyle for Frederick County, Community Commons (inserted in rear binder pocket)

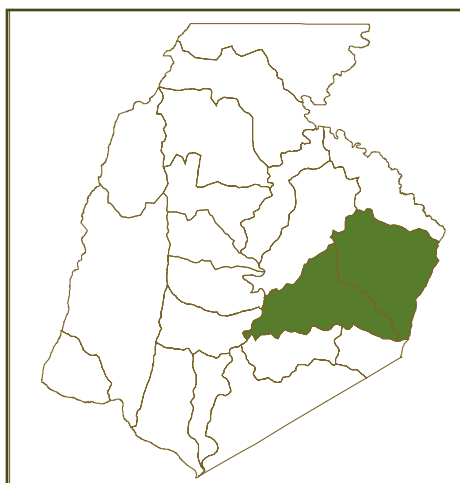
# My Home in the Watershed: Linganore Creek

WATERSHED RESTORATION ACTION STRATEGY

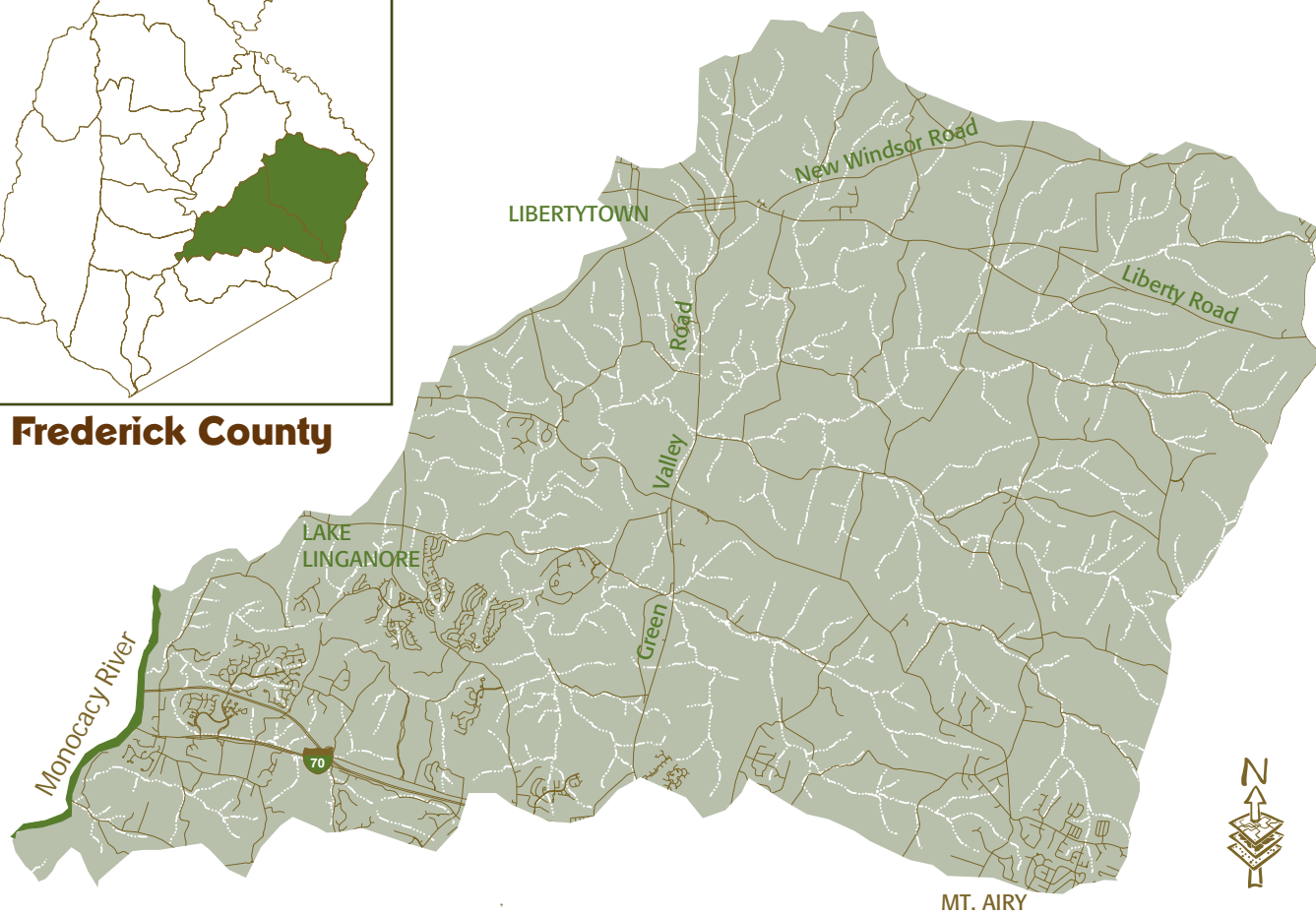
FREDERICK COUNTY, MD

**Yes, it's true** your address is getting a bit more complicated. You not only have a regular postal mail address anymore but perhaps an email address as well. Still, just as you were beginning to learn about email addresses, here's another important part of locating where you live: your watershed address!!

## Linganore Creek Watershed



**Frederick County**



### WHERE DO YOU LIVE IN THE LINGANORE CREEK WATERSHED?

Are you on Weldon Creek, a tributary of the North Fork of Linganore Creek? Or perhaps on Oldfield Branch, a tributary of Dollyhyde Creek which runs into Linganore Creek? Do you live near the Carroll County line to the eastern edge of the watershed on Woodville Branch or near the confluence of Linganore Creek and the Monocacy River at the edge of Frederick? Perhaps you live near a tiny tributary, on the more than 500 miles of streams in the Linganore Creek watershed. Ask some neighbors to join you in visiting your nearest stream to check it out. Maybe they remember how it looked 10 or 20 years ago. Although it may not have a name on the map, it likely has a name among its neighbors. It is your link with Linganore Creek and Lake, the Monocacy and Potomac Rivers, the Chesapeake Bay and Atlantic Ocean beyond.

## Watershed Facts

**Size & Location:** The Linganore watershed is very big! It is 83 square miles or 12.5% of Frederick County. Linganore Creek and its many tributaries total more than 500 stream miles! The watershed is a triangle to the east of Frederick, generally the land north of Interstate 70 and south of Route 26 continuing to the Carroll County line.

**What Does the Landscape Look Like?** More than half of the watershed is agricultural. Forests comprise 29% and development, 17%. The developed portion of the County includes the municipalities of New Market and a small part of Mt. Airy as well as the communities of Libertytown and the several villages of Lake Linganore at Eaglehead.

**Protected Lands:** A variety of agricultural preservation programs have helped protect several area farms from future development. Park lands and wildlife sanctuaries in the area include the Libertytown Community Park, and the natural areas of the Mt. Airy Izaak Walton League north of Mt. Airy and the Audubon Society properties north of New Market and northwest of Mt. Airy. Do you feel enough areas are protected?

**Green Infrastructure:** Maryland's Department of Natural Resources has looked at forests in the County and identified large forest blocks, called hubs. DNR has proposed that hubs be protected from development and connected by corridors of trees along stream valleys. These corridors can provide cover for wildlife passage as well as help improve stream health. The trees filter out sediment and other pollutants washed off the landscape and help stabilize stream banks and limit erosion. The trees also shade the stream, helping keep the water cool and contribute leaves and branches, food for small aquatic insects that fish feed upon. Roughly 2/3 of the stream corridors in Frederick County do not have enough trees along both sides to improve water quality and limit erosion.

**Why Is My Stream Important?** Portions of Linganore Creek are considered recreational trout waters or waters that should be able to support a stocked cold water fish. The lake and creeks are also used for recreation and for public water supply. Because Lake Linganore is a drinking water source for Frederick City and County, a Task Force was assembled to create a Source Water Protection Plan nearing completion (2/2004). The lower half of the Linganore watershed was assessed by Frederick County in 2002. The resulting Watershed Water Quality Plan is available from [www.co.frederick.md.us/NPDES](http://www.co.frederick.md.us/NPDES). The plan proposes sites for restoration and protection and recommends changes to certain County programs and practices.

**How clean is our water?** The State found that certain portions of the Linganore Creek system are impaired or in poor health including a tributary to the south fork of Linganore Creek, and portions of Talbot and Woodville Branches and Weldon Creek. Water quality in Lake Linganore is polluted by sediment and phosphorus and the Department of the Environment has capped the allowable pollution in the lake by negotiating a Total Maximum Daily Load (called a TMDL). MDE studies showed that 75% of the phosphorus and 80% of the sediment flow into the Lake from agricultural lands. Residential and other developed properties generate 11.5% of the phosphorus and 7.6% of the sediment. Wastewater Treatment Plants in the watershed contribute 13.5% of the phosphorus and 12.4% of the sediment.

**Measuring Stream Health By What Can Live Here:** One measurement tool to assess a stream's health is to collect fish and small bugs that live in streams and analyze them. Some species require very clean water



*This view shows a healthy riparian buffer as well as wonderful fish and macroinvertebrate habitat within the stream.  
Photo Courtesy of Kai Hagen*

*A watershed is an area of land that drains to a specific body of water – a stream, river, lake, bay or wetland.*

and will not live in polluted water. So the species in the stream show a pretty reliable picture of stream health. The state assesses every stream in Maryland at least every three years. Volunteer samplers are trained and gather samples from additional locations. Linganore samplings in 1990 – 95 were 75% good and 25% fair. Half of the samplings during 1996 – 2000 were either poor or very poor. The County's fish sampling in 2002 found 50% of locations showing poor or very poor health. This shows a troubling trend in the last decade.

**Who is Responsible for Fixing Linganore Creeks Pollution Problems?** Everyone! Everyone who lives in the watershed shares responsibility and has a role to play in helping improve water quality. Public facilities treat wastewater and release the treated water into our creeks. Certain industries and businesses are regulated in how they manage their water and waste. Farmers must have nutrient management plans. Small actions by many individuals add up to undrinkable and unswimmable water. Positive actions by everyone can restore water quality again. The County's 2002 study found problems with livestock access to streams, cropland runoff, failing septic, new construction, extent of roadways and roofs, inadequate stormwater management, and landowner practices (including fertilizer use, mowing, etc.).

**Soil Erosion?** Roughly a quarter of the soils in the Linganore Creek watershed are considered highly erodible. In some parts of the watershed, steep banks along stream corridors make erosion a bigger problem than it might be in less steep terrain. It is especially important to have adequate vegetation in these areas.

**Wetlands?** Although many wetlands have been drained and filled over the past 100 years, 1,628 acres of wetlands remain in the Linganore subwatershed or 3% of the area. In addition, more than 2,800 additional acres in the Linganore Creek watershed are hydric soils or areas that hold moisture and were once wetlands.

**Fish Consumption Limitations:** The state has studied fish from our streams, ponds and lakes to see what pollution they contain. Because of Methyl-Mercury concentrations, they recommend that no one eat more than 8 servings of Bluegill per month from lakes and impoundments and no one eat more than 4 servings of bass, pickerel, pike or walleye per month from lakes or impoundments. Usually fish in rivers and streams can be eaten by the general population and should be limited to 4 – 8 servings by pregnant women or children.

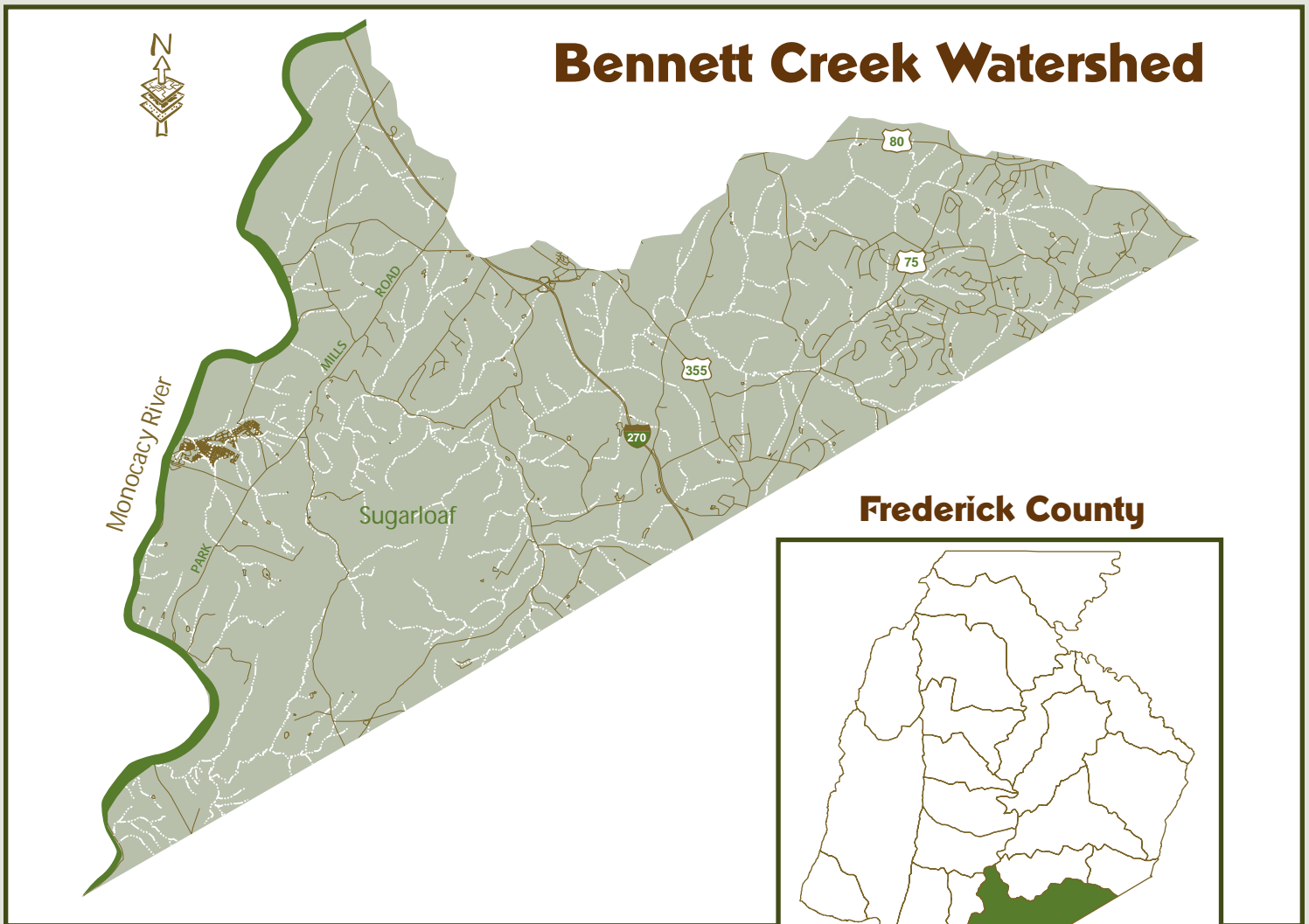


# My Home in the Watershed: Bennett Creek

WATERSHED RESTORATION ACTION STRATEGY

FREDERICK COUNTY, MD

**Yes, it's true** your address is getting a bit more complicated. You not only have a regular postal mail address anymore but perhaps an email address as well. Still, just as you were beginning to learn about email addresses, here's another important part of locating where you live: your watershed address!!



## WHERE DO YOU LIVE IN THE BENNETT CREEK WATERSHED?

Are you on Fahrney Branch near Kemptown Community Park or school? Or perhaps on Pleasant Branch, which flows south along Route 75 through Pleasant Grove and Windsor Knolls Middle School's property? Do you live south of Interstate 270 near Urbana or North Branches? Perhaps you live along Bennett Creek itself or near a small tributary, on the more than 200 miles of streams in the watershed. Ask some neighbors to join you in visiting your nearest stream to check it out. Maybe they remember how it looked 10 or 20 years ago. Although it may not have a name on the map, it likely has a name among its neighbors. It's your link with Bennett Creek, the Monocacy and Potomac Rivers, the Chesapeake Bay and Atlantic Ocean beyond.

## Watershed Facts

**Size:** The Bennett Creek watershed is very big - 48 square miles or 7% of Frederick County. It is a triangular area to the south and east - the portion of the County adjoining Montgomery County and the Interstate 270 corridor and extends south to Sugarloaf Mountain.

**What Does the Landscape Look Like?** The Bennett Creek watershed has the largest proportion of forest cover in the Lower Monocacy with 45% of the land forested. Roughly 40% of the remaining watershed land use is agricultural with the balance of land, 15% in development (2000 state planning data). The developed portion of the watershed does not include any incorporated municipalities. Instead it includes primarily 1970's residential development in the Kemptown and Pleasant Grove communities and current development in the Urbana area.

**Protected Lands:** A variety of agricultural preservation programs have helped protect some of the farms in the watershed from future development. The Bennett watershed has three significant park lands including the private Sugarloaf Mountain Park, the State of Maryland Monocacy Natural Resources Management Area along the Monocacy River and the federal Monocacy National Battlefield. Do you feel enough areas are protected?

**Green Infrastructure:** Maryland's Department of Natural Resources (DNR) has looked at forests in the County and identified large blocks called hubs. DNR has proposed that hubs be connected by corridors of trees along stream valleys for wildlife passage and water quality benefits. Streams are healthiest whose banks have trees, since a border of trees (at least 50 feet wide on each side of the stream) helps filter out soil or pollutants washed off the landscape and helps stabilize stream banks and limit erosion. The trees also shade the stream, helping keep the water cool, and they drop leaves and branches, food for small aquatic insects that fish feed upon. Roughly 2/3 of the streams in the County do not have vegetation growing along the stream banks to protect water quality and limit erosion.

**Why Is My Stream Important?** Most of the streams in the watershed are used for recreation and public water supplies; however, two small creeks flowing out of Sugarloaf Mountain area, Bear Branch and Furnace Branch, are clean and cold enough for trout to reproduce naturally; as is one of Bennett Creek's tributaries located primarily in Montgomery County, Little Bennett Creek.



*An example of an inadequate buffer due to recent subdivision development.*

*Photo Courtesy of Shannon Moore*



*This view shows a healthy riparian buffer as well as wonderful fish and macroinvertebrate habitat within the stream.*

*Photo Courtesy of Kai Hagen*

**How clean is our water?** The State found that certain portions of the Bennett Creek system are unhealthy. One measurement tool to assess a stream's health is to collect fish and small bugs that live in streams and analyze them. Some species require very clean water and will not live in polluted water. So the species in the stream show a pretty reliable picture of stream health.

The state assesses every stream in Maryland at least every three years. Volunteer samplers are trained and gather samples from additional locations. Two sites that were studied along Bennett Creek revealed that the natural stream life including stream "bugs" and fish were either poor or very poor. In other words, only very pollution tolerant species were found. Bennett Creek samplings in 1996 and 2000 showed mixed results. 25% of the sampling sites ranked good, 46% ranked fair and 29% ranked poor.

*A watershed is an area of land that drains to a specific body of water – a stream, river, lake, bay or wetland.*

### **Who Is Responsible for Fixing Bennett Creek's Pollution Problems?**

Everyone! Everyone who lives in the watershed shares responsibility and has a role to play in helping improve water quality. Certain public sewage treatment plants treat wastewater and release the treated water into our creeks. Certain industries and businesses are regulated in how they manage their water and waste. Farmers must have nutrient management plans. Septic systems require inspection and maintenance. Small, often careless actions by many individuals can add up to undrinkable and unswimmable water. Positive actions by each of us can restore water quality again.

**Soil Erosion?** Almost a third of the soils in the Bennett Creek watershed are considered highly erodible. In some parts of the watershed, steep banks along stream corridors make erosion a bigger problem than it might be in less steep terrain. It is especially important to have adequate vegetation in these areas.

**Wetlands?** Although many wetlands have been drained and filled over the past 100 years, 2,404 acres of wetlands remain in the Bennett Creek watershed or 8% of the area, the highest proportion of wetlands in the Lower Monocacy watershed. More than 2,000 additional acres in the Bennett Creek watershed are hydric soils that hold moisture and were likely once wetlands.

**Fish Consumption Limitations:** The state has studied fish from our streams, ponds, and lakes to see what pollution they contain. Because of Methyl-Mercury concentrations, they recommend that no one eat more than 8 servings of Bluegill per month from lakes and impoundments and no one eat more than 4 servings of bass, pickerel, pike or walleye per month from lakes or impoundments. Usually fish in rivers and streams can be eaten by the general population and should be limited to 4 – 8 servings by pregnant women or children.



# BUILDING A GREENER LIFESTYLE FOR FREDERICK COUNTY

## Composting: *Do the Rot Thing*

### RESOURCES:

- **Frederick County Government Office of Recycling**  
9031 Reichs Ford Road  
Frederick, MD 21701  
301-694-1848, 301-696-2960  
[www.co.frederick.md.us/Recycling/](http://www.co.frederick.md.us/Recycling/)
- **Demonstration Center at the Frederick County Landfill**
- **United States Environmental Protection Agency**  
[www.epa.gov](http://www.epa.gov)  
1-800-490-9198
- **City of Toronto**  
has a comprehensive composting website at [www.city.toronto.on.ca/compost/index.htm](http://www.city.toronto.on.ca/compost/index.htm)

### WHY COMPOST?

Composting food and yard scraps is a great way to make inexpensive, high quality fertilizer for lawn and garden. It also reduces the volume of the garbage stream entering our municipal waste facilities.

In 2001, US residents, institutions, and businesses produced more than 229 million tons of garbage. That amounts to about 4.4 pounds per person per day (up from 2.7 pounds per person per day in 1960)! Of this, 12.2 percent was yard trimmings and 11.4 percent was food scraps. **That's almost 25 percent of landfill mass that could be composted.**

Adding compost to soil improves the structure, texture, and aeration. Plants grown in compost are stronger and more resistant to disease and insects and, therefore, require less insecticide. Healthy soil absorbs and filters runoff, protecting streams from erosion and pollution.



*A simple compost bin made of cement blocks.*

### COMPOSTING METHODS

If possible, locate the compost pile in a partially shaded spot. Choose a site that is convenient - has easy access from the kitchen, good drainage, and available water. When building a pile, start with a brown layer (see chart). Always bury food scraps in the pile or top them with another compostable material.

#### • Heap

The simplest method of composting is to pile the materials on top of each other directly on the ground.

#### • Bin

The ideal size for a compost bin is 1 cubic yard (3 x 3 x 3 feet). Wood bins can be made from four used shipping pallets that are tied together with wire. A fifth pallet can be used as a floor to provide better air circulation to the pile.

A wire bin can easily be made from making a circular loop out of fencing or chicken wire. Simply pick up the bin and allow the compost to fall through the open bottom. Place the bin next to its last location and fork the top of the pile into the bottom of the new location.

There are also several types of composting bins and tumblers commercially available.



*Commercially available bins are easy to set up.*

# ELEMENTS OF COMPOST

## Raw Material

OK	NO
<ul style="list-style-type: none"> <li>• Fruit and vegetable scraps</li> <li>• Egg shells</li> <li>• Coffee grounds and filters</li> <li>• Tea bags</li> <li>• Leaves</li> <li>• Grass</li> <li>• Yard clippings</li> <li>• Lint</li> <li>• Fresh garden trimmings, flowers, and plant leaves</li> <li>• Barnyard manure (horse, cow, chicken)</li> <li>• Shredded paper, cardboard, paper towels, napkins or tissues</li> </ul>	<ul style="list-style-type: none"> <li>• Meat</li> <li>• Dairy products</li> <li>• Oil or grease</li> <li>• Pet waste</li> <li>• Fish scraps</li> <li>• Diseased plants</li> <li>• Bones</li> <li>• Sawdust from plywood, treated or painted wood</li> <li>• Clippings recently treated with herbicides or pesticides</li> <li>• Insect-infested plants</li> <li>• Cooked vegetables and fruit</li> </ul>
Browns (Carbon)	Greens (Nitrogen)
<ul style="list-style-type: none"> <li>• Leaves</li> <li>• Straw</li> <li>• Woody Materials</li> </ul>	<ul style="list-style-type: none"> <li>• Grass</li> <li>• Food Scraps</li> </ul>



*This attractive bin allows air to flow through the pile and easy access with a hinged door.*

An equal amount of greens and browns should keep a compost pile in balance. Too many greens will produce a smelly, soggy mess, while too many browns will take a long time to decompose.

Compost piles should be as damp as a wrung-out sponge. Piles may need to be sprinkled with water occasionally during the summer. They may need to be covered with a tarp if there are extended periods of wet weather.

For quicker composting, aerate the pile every two to three weeks by turning with a pitchfork or poking holes in the pile with a broom handle.

Compost is ready to use when the raw materials are no longer visible. Finished compost is dark brown and has an earthy smell. The bottom of the pile may be ready before the top.

## MIKRO- AND MACRO- ORGANISMS

Macroorganisms include earthworms, sow bugs, and other insects. Microorganisms include bacteria, fungi, and enzymes. These elements will come to your pile naturally as long as the pile is not located on concrete or a paved surface. Place your bin on the ground so organisms can colonize the compost pile.

### DID YOU KNOW ....

*More than 67 percent of the municipal solid waste produced in the United States (including paper) is compostable material.*

**-US EPA**



**Community Commons**

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## Design and Construction of a Rain Garden

### RAIN, RAIN- SOAK IN!

Where does the rainwater go that runs off your rooftop, driveway and sidewalk? This “stormwater runoff” is usually conveyed to curbs, gutters, drains or sewers, then piped to a stormwater detention pond and gradually released to the nearest stream or



*Workshop participants plant a rain garden at the Friends Meeting School in Ijamsville, MD.*

lake. However, stormwater was not regulated until the mid 1980's, which means that roads and buildings constructed before stormwater regulations might not have any treatment before water reaches the stream. How old is your home? Your road?

A novel, progressive alternative to the conventional ‘pipe and pond’ approach to stormwater management is the use of a Rain Garden to store and treat run-off and recharge groundwater. A rain garden functions like a miniature wetland—rainwater from paved surfaces, downspouts and lawn is collected in shallow, low-lying areas planted with native flowers and other vegetation to be stored temporarily, absorbed by plants and percolated into the ground. Pollutants such as fertilizer, pesticide residue or even oil and heavy metals are effectively trapped by the rich organic soil and root systems in the rain garden, permitting clean water to slowly soak down through the soil and rocky subsoil until it recharges groundwater supplies.

Rain gardens are suitable for any land use situation—residential, commercial, and industrial.

Native plant species that can tolerate the extremes of wet soils and dry periods are preferred for use in a rain garden. They are best adapted to the local climate, are deep-rooted, and are attractive to butterflies, hummingbirds and other nectar and berry feeders. The rain garden plant palette can include swamp milkweed, asters, columbine, ironweed, lobelia, blue flag, bluebells, bluestem grasses, bee balm, ferns, sedges and switchgrass, boneset, liatris, cardinal flower, and much more.

Many of these natives are now sold by local nurseries, where experienced horticultural staff can help match suitable plants with your rain garden needs. You will need to consider sun or shade exposure, how moist your garden soil is and the duration of wetness, and also think about how well your plants selections can tolerate drought periods.

**Rain gardens can be your personal contribution to cleaner water, healthier fish and wildlife populations and a greatly improved environment for you and your community.** Each rain garden may seem small, but collectively they produce substantial neighborhood and regional environmental benefits. Rain gardens work for us in several ways by:

- Increasing the amount of water filtering into the ground, which recharges groundwater and helps reduce the amount of pollutants washing off to lakes and streams;
- Helping sustain adequate flows in streams during dry spells;
- Providing valuable wildlife habitat;
- Enhancing the beauty of your yard and the neighborhood;
- Helping protect communities from flooding and drainage problems;
- Helping protect streams and lakes from damaging flows and reducing erosion of the stream banks;
- Reducing the need for costly municipal storm water treatment structures.

### RESOURCES:

- **Potomac Conservancy and Montgomery County Department of Environmental Protection**  
[www.rainscapes.org](http://www.rainscapes.org)
- **Maryland Native Plant Society:**  
[www.mdflora.org](http://www.mdflora.org)
- **Chesapeake Bay Foundation:**  
[www.cbf.org](http://www.cbf.org)  
search for “rain gardens”

## BUILDING A RAIN GARDEN

Key steps in the process include sizing, choosing appropriate plants, construction, planting and maintenance. You might decide to do all or some of the steps yourself or you might select a professional landscaper to help.

There are several ways to construct a rain garden. Low-lying areas that collect water can become rain gardens by improving the soil and planting native plants. Other options include constructing a garden to collect runoff from parking lot and other paved surfaces or by redirecting flow from gutter downspouts.

To do this last option choose at least one downspout that can be redirected toward an area that slopes gradually away from your house. Keep rain garden about 10-15 feet from the house. Use a hose or rope to create an outline of your rain garden.



*Twine and stakes used to lay-out area for rain garden*

soil amendments have settled appropriately and to guarantee that water will not pond in the garden more than 3 days. If designed properly, excess rainfall will flow over the garden and continue across your lawn, and water 'harvested' by the garden will be absorbed within 24–48 hours. If water ponds for 3 days or more, you will need to improve the soil with more organic amendments and possibly lower the downslope side of the garden to improve runoff.



*Photo Courtesy of the Potomac Conservancy*



*Same rain garden immediately after excavation and soil amendments and mulch added, prior to planting*

Create an area that will act like a sponge to soak up hundreds of gallons of rainwater. Heavy clay soils will not function properly in a rain garden—you will need to amend or replace the clay with compost. Use the compost by itself or mix it with topsoil, sand, or some of the excavated soil. Most of the material you remove can be used to build-up or 'berm' the sides of the garden.

Before planting, let your garden handle several rainstorms to ensure that your



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# BUILDING A GREENER LIFESTYLE FOR FREDERICK COUNTY

## Gardening with Native Plants

### NATIVE PLANTS -Teresa Gallion, M.G., Wildlife Gardening Adventures

Here in Frederick County, from the forests to the valleys, streams and rivers, fields and meadows, plant communities are made up of hundreds of species carpeting wild places. These plant communities transform energy from the sun and nutrients from the soil into food for themselves and wildlife. They provide wildlife with cover and places to raise their young, as well as keeping water sources clean. These diverse plant communities are the foundation of all ecosystems—including your yard.

True natives established their homes purely by natural means—humans had no part. Using this definition, we can generally judge what is native by time: plants that were growing here before Europeans arrived are considered native. You can reintroduce and conserve our native plant species by including them in your home garden. Native plants are naturally adapted to the local environment and are often more disease and water fluctuation resistant than non-natives. You will be protecting our natural resources because your garden will require fewer chemicals, less water, and less maintenance.

Native plants and animals coevolved, meaning that they have spent thousands of years becoming dependent on one another. As a useful part of the food web, native plants far outperform exotic plants that have characterized landscaping for much of the past century.



*A native plant garden can provide beauty, a connection with the natural world, and environmental benefits.*

Native plants can be a wonderful addition to your garden design. Planted in the proper location, natives are considered low-maintenance. A little research can save you a lot of trouble. Think about how diverse the mid-Atlantic region is. You wouldn't expect to plant grasses native to the Chesapeake Bay area in a woodland garden in the Catoctin Mountains and be successful. Plant for where your garden is. A well drained, full sun location is perfect for the butterfly attracting *Liatris spicata* while the moisture tolerant Cardinal flower (*Lobelia cardinalis*) will do well along the edge of a pond. There are so many beautiful, hardy, wildlife-friendly possibilities for home gardeners.

Most nurseries carry some native plants, and some nurseries specialize and carry a greater selection. Some plants will be more readily available than others will. If you have a favorite that you can't obtain, be sure to ask your local nursery to consider adding it to their stock.

Native plants should not be removed from the wild unless an area is about to be developed. Even then, it is difficult to transplant wild-collected plants and to duplicate their sod and other growth requirements in a home garden. Plants that are grown from seed or cuttings by nurseries have a much greater tolerance for garden conditions. Help to preserve natural areas by purchasing plants that have been grown, not collected.

### NON-NATIVE PLANTS

Non-native or exotic plants introduced from other parts of the world or other parts of the country have degraded many natural ecosystems. Some of these non-native plants were brought here intentionally, for their medicinal, ornamental, or food value. Others hid in soil, crop seed, or ballast water. Although many non-native plants are considered beneficial and do not escape into the natural environment, it is difficult for most gardeners to know the risks of every ornamental plant. Some of these introduced plants are invasive, meaning that there are few or no naturally occurring measures such as insects or competitors to control them. Invasive plants can spread rapidly and smother or out-compete native vegetation. Ecosystems impacted by invasive, non-native plants have a reduced ability to clean our air and water, stabilize the soil, buffer floods, and provide wildlife food and shelter.

A widely preferred definition of a weed is that it is a plant that is out of place. Looking at it that way, a dandelion in your lawn is certainly a weed, but so is a rosebush in a cornfield. Federal and local government agencies have identified weeds of horticultural importance. Johnson grass, Multiflora rose, 4 kinds of thistle and Shattercane are recognized as noxious weeds. These plants are pests. They grow so quickly and take over ground where they spread that they are referred to as 'invasive.' These are weeds and should not be encouraged. Many exotic plants that have been imported to this area such as Japanese honeysuckle (*Lonicera japonica*) and English Ivy (*Hedera helix*) take over environments that native plants once occupied. When native species are crowded out, the loss impacts other plants and animals. But don't let the word 'weed' in a plant name mislead you. Butterfly weed (*Asclepias tuberosa*), Joe Pye weed (*Eupatorium maculatum*) and New York ironweed (*Veronia noveboracensis*) are wonderful blooms for your butterfly garden.

## RESOURCES:

- **Alliance for the Chesapeake Bay - Bayscapes**  
[www.acb-online.org/project.cfm?vid=85](http://www.acb-online.org/project.cfm?vid=85)  
410-377-6270  
"Bayscapes are environmentally-sound landscapes benefiting people, wildlife, and the Chesapeake Bay."
- **Lady Bird Johnson Wildflower Center**  
[www.wildflower.org](http://www.wildflower.org)  
Great internet resource, including a native plant database that is searchable by state with links to images, articles, and regional fact sheets.
- **Maryland Native Plant Society**  
[www.mdflora.org](http://www.mdflora.org)  
Dedicated to Protecting, Conserving, and Restoring Maryland's Native Plants and Habitats.
- **Montgomery County Maryland Department of Environmental Protection – Natural Landscaping Webpage**  
[www.montgomerycountymd.gov/mc/services/dep/Landscape/natural.html](http://www.montgomerycountymd.gov/mc/services/dep/Landscape/natural.html)  
Webpage has a lot of good information and links.
- **National Wildlife Federation Backyard Wildlife Habitat Program**  
[www.nwf.org/backyardwildlifehabitat/](http://www.nwf.org/backyardwildlifehabitat/)
- **US Fish and Wildlife Service Chesapeake Bay Field Office**  
[www.fws.gov/r5cbfo/bayscapes.htm](http://www.fws.gov/r5cbfo/bayscapes.htm)
- **Wild Ones - Native Plants, Native Landscapes**  
[www.for-wild.org](http://www.for-wild.org)  
877-FYI-WILD
- **Wildlife Gardening Adventures Native Garden Consultants**  
Jim and Teresa Gallion, 301-898-0678

## TIDBITS



Photo Courtesy of Wildlife Gardening Adventures

### Monarch Butterfly on Laitris

Inappropriate use often kill beneficial insects and other wildlife. Less than 10% of all insects are harmful to plants. Pesticides have the potential to cause serious human health problems when not handled properly or applied according to the label directions. By eliminating or minimizing the use of pesticides and fertilizers, these pollutants will not run-off into streams, lakes and bays. This improves the quality of the water and the resident aquatic life.

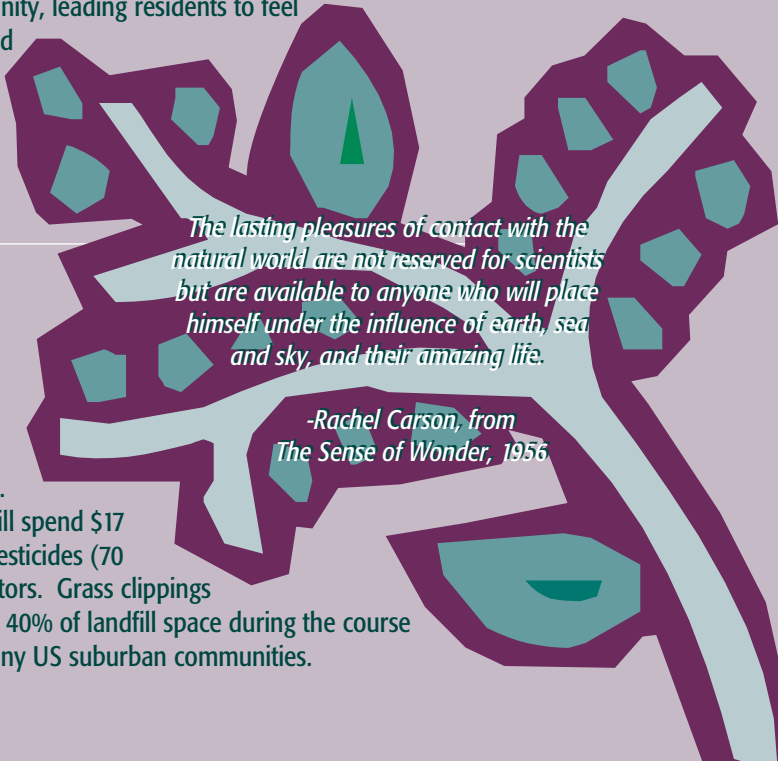
Some people believe that trees in urban areas can hide would-be criminals, thus increasing the likelihood of crime. But a series of scientific studies by researchers at the University of Illinois at Urbana-Champaign demonstrates that the opposite may be true. Residents living in 'greener' surroundings actually report lower levels of fear, fewer incivilities, and less violent behavior. There were also fewer crimes reported in these areas. Reasons why green spaces may inhibit crime include: vegetation alleviates mental fatigue, one of the precursors to violent behavior; green spaces are used more, deterring potential criminals through fear of being watched; and greenery promotes a sense of community, leading residents to feel safe and be more civil toward one another.

Source: *Human-Environment Research Laboratory, University of Illinois, [www.herl.uiuc.edu](http://www.herl.uiuc.edu)*

According to the US Environmental Protection Agency, Americans mow 31 million acres of lawn every year. It takes 300 million gallons of gas and 1 billion hours to complete the chore. And for this privilege they will spend \$17 billion on everything from pesticides (70 million pounds) to lawn tractors. Grass clippings consume an estimated 25 to 40% of landfill space during the course of the growing season in many US suburban communities.

In 1994 President Clinton recognized the natural landscaping movement by issuing an Executive Memorandum that not only recommended natural landscaping at all federal facilities and federally funded projects, but presented guidelines for doing so. The use of native plants around the Vice Presidential mansion is one example of how the government is implementing this new mandate.

In conventional landscaping, pesticides are often wrongly applied at times when target insects are not vulnerable. Overuse and



*The lasting pleasures of contact with the natural world are not reserved for scientists but are available to anyone who will place himself under the influence of earth, sea and sky, and their amazing life.*

-Rachel Carson, from  
*The Sense of Wonder, 1956*







# BUILDING A GREENER LIFESTYLE FOR FREDERICK COUNTY

## Harvesting Rainwater using Rain Barrels

### WATER: A LIMITED NATURAL RESOURCE

In 2002, Maryland was in a severe drought. Groundwater levels dropped, streams dried up, and the Monocacy River experienced record low flows. Area residents were faced with water restrictions and bans on outdoor use. The City of Frederick even had an emergency plan to buy water and haul it to residents if the drought continued and the City's water supplies became further reduced. Water conservation became a top issue in the media and a frequent discussion topic as more people realized the full magnitude of our finite water supply.

A concept that gained notoriety during this difficult time was using a rain barrel to harvest and reuse rainwater for landscape purposes. A 4,000-year-old practice widely used in less-developed countries, collecting rain in a barrel is an easy and sound way to extend water resources. Besides, where landscaping is concerned, plants prefer natural rain water to either treated or well water.

Since 2002, the weather pendulum has swung to the other extreme. Rainfall has been abundant, and the worry has shifted from drought to flooding.



Hard, impervious surfaces like roofs, parking lots, and roadways act as funnels, turning life-giving rain into damaging stormwater runoff. As it flows, stormwater picks up pollutants, including fertilizer, chemicals, grease, gasoline, and silt, and dumps them into streams, rivers, and the Chesapeake Bay. Stormwater is also responsible for erosion and the resulting loss of habitat for plants, aquatic life, and animals.

While a rain barrel is a great tool to use during a drought, it can also help during times of abundant rainfall. Businesses and homeowners

who use rain barrels to catch the water from their roofs can stem the tide of stormwater before it begins! Captured rainwater can be stored and used to supply plants between rainfall events, or channeled into rain gardens where it can seep into the ground instead of running off. We all live in a watershed and should manage our property as though the Chesapeake Bay was at the end of our driveway. In a way, it is!

Too much rain? Not enough? Rain barrels are a good solution in either case!

### WATERWISE LANDSCAPE MANAGEMENT

Plants, flowers, and trees add beauty to our yards, nourish our being, and reinforce our connection to the natural world. With a little care and planning, we can manage water resources in the garden to benefit both our plants and the environment.

#### Seven steps to a water-wise landscape:

- Improve soil quality and structure (enrich with organic matter).
- Select native and/or drought tolerant plants.
- Group plants with similar water needs.
- Use mulch to help the soil retain moisture.
- Practice good watering habits (water deeply and early in the day).
- Collect and reuse "gray water" from the bathtub, laundry or kitchen.
- Capture and store rainwater to use during dry weather.

### RAIN BARREL PRIMER: SELECTION

Not all rain barrels are created equal, and it pays to know what features to consider when either making your own rain barrel or purchasing one that is ready-made.

A rain barrel should be made of a dark, UV-stable material that will not allow sunlight to reach the collected water. Sunlight plus water equals algae! While not harmful to plants, algae is unsightly and will clog the spigot. UV-stable material will extend the life of a rain barrel exposed to long periods of direct sunlight.

Select a barrel that is made of non-toxic material. ***Never purchase or construct a rain barrel unless you are absolutely certain of the history of the container used.***

Never use a plastic trash can as a rain barrel. Even good quality trash cans can warp and split from the weight of collected water. Trash cans are also difficult to make child-safe and mosquito-proof.

A well-designed rain barrel will feature a large overflow to help manage excess water once the barrel is full and during periods of heavy rainfall. An overflow the size of a garden hose is too small to handle heavy rainfall rates typical of the eastern U.S.

Look for a rain barrel that can be easily linked to additional barrels to double or even triple storage capacity.

The barrel should have a rigid lid that is fully screened and securely fastened. The lid should be designed to minimize the drowning risk for humans or animals. It should use screen to keep debris and mosquitoes out of the captured water.

The barrel's spigot should be made of high-quality metal— NEVER plastic— and should be located at the bottom of the barrel so that all of the captured water can be accessed.

Rain barrels should not be constructed using adhesives or sealants because they will eventually fail and leak. These problems are often difficult or impossible to repair and result in a barrel destined for the landfill.

**IMPORTANT NOTE!** Before setting up a rain barrel, **BE SURE** you will be in compliance with all applicable laws, rules and ordinances pertaining to collecting and storing rainwater. If your town or subdivision does not allow rain barrels, work closely with elected officials or the homeowner's association to address concerns and, hopefully, shape a new conservation policy! It is easy to screen rain barrels from view using plant material, lattice or fencing. When drafting guidelines for use, be sure to prohibit collection of rain water in an unsafe container that poses a drowning and mosquito hazard.

## RAIN BARREL PRIMER: SAFETY



Even the best conservation practice is not worth implementing if it cannot be done safely. Keep these simple safety tips in mind:

- Situate the barrel on a firm, level foundation. A 60-gallon rain barrel weighs at least 500 pounds when full, and poses a tipping hazard when placed on a soft, unlevel surface.
- Secure the barrel to prevent tipping.
- Never use an open container to collect and store rainwater. Open containers pose a drowning hazard for humans and animals.
- Always screen a rain barrel to discourage mosquitoes from breeding and spreading West Nile Virus.

- Heavy rains may cause the barrel intake to exceed overflow capacity. Monitor the water level in the barrel and return the downspout to normal function when barrel is full.
- Collected rainwater is not intended for human or animal consumption.
- Make sure overflow points away from the foundation of the building to minimize any risk of property damage.

## RAIN BARREL PRIMER: YIELD FORMULA

It is amazing how little rainfall it takes to fill a 60-gallon rain barrel.

### Rainfall yield formula:

One inch of rain falling on 1000 square feet yields approximately  
**623 gallons of water!**

Rain falling on a 750-square-foot section of roof will fill a 60-gallon barrel with only  
**1/8-inch of rain.**

It does not take a large roof or a lot of rainfall to add up to big savings.

Save treated or well water for drinking or bathing. With no dissolved minerals or chemicals, rainwater is the best water source for plants...and it is free!

**USAGE TIP...**  
Elevate the barrel slightly to increase water pressure and improve access to the spigot



## RESOURCES:



Information used by permission.  
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For more information, contact

- **Catch the Rain**  
Bonnie Duggan  
Rainwater Harvesting Consultant  
[www.catchtherain.com](http://www.catchtherain.com)  
301-663-3601



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**BUILDING A  
GREENER LIFESTYLE  
FOR FREDERICK COUNTY**

**Maintaining your Lawn while Protecting Water Quality**

**LAWN FACTS**

**Lawnmowers and air pollution.**

One hour of pushing a new, gas-powered lawn mower around your yard produces about the same amount of pollutant emissions as driving your car for 50–70 miles. By some estimates, up to five percent of summer hydrocarbon emissions in suburban areas are due to lawnmower emissions.

**Lawns are not Sponges.**

Most lawn soils are extremely compacted, and recent research indicates that about half of all rainstorms produce at least some runoff from lawns. So, be careful what you put into your lawn—there’s a good chance it may end up in the nearest stream, creek and the Chesapeake Bay!

**Polluting Streams**

The most comprehensive national pesticide monitoring study to date, conducted by the US Geological Survey, detected higher levels of insecticides in urban streams than in those in agricultural areas.

**A Labor of Love**

In Maryland alone, homeowners spend an estimated 72 million hours collectively each year on lawn care.

**Turf Nation**

According to industry estimates, there are more than 50 million acres of managed turf in the US. By comparison, the total watershed area of the Chesapeake Bay is just over 40 million acres.

**Lawns that are as hard as a rock.**

Several studies have shown that about a third of all lawns are so highly compacted during the construction process that they have the same hydrologic properties as concrete.

**The DDT Legacy**

Despite being banned more than 20 years ago, researchers routinely find low levels of the chemicals DDT and DDE in urban stormwater and sediment samples in our region. The legacies of these persistent pesticides are a sobering reminder that small actions can have long-term consequences.

**IS GREEN GRASS**

**REALLY GREEN?**

Most of us have childhood memories of running barefoot through the grass. In mid-Maryland, the growing season for turf grass is close to 200 days—lots of time for running through the grass!

According to a study by the Center for Watershed Protection in Ellicott City, Maryland, nearly 90% of residents in the



*Is this your lawn? Is there an alternative? What’s wrong with this picture?*

Chesapeake Bay Watershed have a lawn, and the amount of turf that is

fertilized in the Bay Watershed is equivalent to 800,000 football fields. In Maryland, the area devoted to managed turf or lawns consume more land area than corn, soybeans, and wheat combined!

Is your lawn a healthy, diverse green ecosystem, pleasant to the eye with low cost, ecologically sound maintenance or an economic and environmental liability from overfertilizing and overwatering?

**Estimated Distribution of Turf Grass by Sector in the Chesapeake Bay Watershed (courtesy Center for Watershed protection)**

<b>Sector</b>	<b>%</b>
Home Lawns	70%
Roadside Right-of-Way	10%
Municipal Open Space	7%
Parks	4%
Schools	3%
Golf Courses	3%
Churches	2%
Cemeteries	1%
Others (e.g., airports, sod farms)	1%

**RESOURCES**

**• Backyard Actions for a Cleaner Chesapeake Bay:**

[www.mda.state.md.us](http://www.mda.state.md.us),  
[www.hgic.umd.edu](http://www.hgic.umd.edu)

**• Healthy Habits for Clean Water:**

<http://www.epa.gov/npdes/stormwater>

**• Environmental Lawn Care - Grasscycling:**

[www.grasscycling.askdep.com](http://www.grasscycling.askdep.com)

**• Envirocast: Weather and Watershed Newsletter.**

The Grass Crop of the Chesapeake Bay Watershed

[www.stormcenter.com/envirocast/2003-05-01/envirocast.php](http://www.stormcenter.com/envirocast/2003-05-01/envirocast.php)

**• Reducing Turf**

Grow It! Don't Mow It. Wild Ones Website.  
[www.for-wild.org](http://www.for-wild.org)

## LAWN CARE TIPS

The choices we make in maintaining our lawns can make a real difference in the health of our streams, rivers, and the Chesapeake Bay. Read-on to consider some easy tips to simplify lawn care and protect our water resources:

- **Keep the fertilizer spreader in the garage this summer.**  
Unless you plan to have livestock grazing on your lawn, you simply don't need to fertilize your grass every year. Many people never fertilize and still have green lawns. Have your soil tested to determine the type and amount of fertilizer or other soil amendments needed for a healthy lawn. Fertilize in the fall, not springtime, using slow release forms of nitrogen. Aerate your soil to reduce compaction and help lessen fertilizer run-off from your lawn. Fertilizers and pesticides, when improperly applied to lawns, can enter and pollute waterways.
- **Measure your yard.**  
Most lawn care product application rates are based on 1,000 square feet. Do you really know how big your yard is? Take an afternoon to recline on your patio or deck and visualize 1,000 square feet (think of a square ten paces by ten paces). The most common reason why folks over-fertilize is that they over-estimate the size of their yard when buying and using lawn care products (several regional lawn experts now recommend that great lawn results can be achieved with as little as 10 pounds of nitrogen per 1,000 square feet per year—something not reflected in current product packaging).
- **Check the weather forecast before you fertilize or spray.**  
If rain is expected within the next 24 hours, delay application until the next dry period.
- **Never apply herbicides or insecticides within 5 feet of pavement.**  
If you must remove weeds near pavement, simply pull them by hand. Also make sure to rinse out applicators away from paved areas too. A recent California study showed that lethal insecticide levels in one small urban stream were caused by a half-dozen homes that failed to follow these simple rules. Don't leave fertilizer on sidewalks or driveways where it can be washed into the nearest stream.
- **Be a careful consumer.**  
Read all product labels carefully. If the product has too many warnings on the label, consider replacing it with a safer alternative. Consider

these less toxic insecticides: insecticidal soaps, pyrethrum, rotenone and neem, horticultural oils, B.t. (*Bacillus thuringiensis*). The following natural fertilizers contain relatively low concentrations of nutrients, but add valuable organic matter to soil: cottonseed meal, blood meal, bone meal, fish emulsion, and manure.

- **Don't overwater the lawn.**  
Established lawns will survive a few weeks without rain. Watering by hand or light, frequent water applications will make roots reach the soil surface for moisture, causing thatch and promoting weed growth. An abundance of water results in excessive leaf growth, depleting a lawn's natural energy reserves and weakening its disease resistance. Artificially high moisture and surface humidity can spread and foster disease pathogens. Cool weather grasses, like ryegrass or Kentucky bluegrass and some fescues go dormant and brown in the hot summer months and should not be watered. Grass is not always the best choice for steep slopes, shady areas, or walkways—consider native groundcover landscaping.
- **Mow Higher and Less Frequently.**  
You can control weeds by shading them out. Set your mower height to three inches and you will have both a healthier lawn and fewer weeds. Experts caution that cutting grass too short is the second leading cause of problem lawns.
- **Don't Bother with Herbicides; you really can't win.**  
An average acre of soil contains more than 200 million 'weed' seeds in the top six inches of soil, which germinate under the right moisture, light, and temperature conditions. Indeed, when you turn over grass and expose the underlying soil, about five percent of these seeds can germinate, or about 250 weeds per square foot. Don't get involved in a battle you can't win, and remember that the naked eye generally cannot distinguish between a perfect lawn and one containing at least a few weeds.

- **Honey, I shrunk the lawn!**

A great way to save time and energy is to reduce the turf area on your property by about 5 percent each year. Start with the soggy and/or steep areas that are difficult to mow. Dig out the lawn and replace it with flower and shrub beds. There are many attractive ways to do this. Place 3–4 inches of mulch and plant some container-grown plants.

- **Select a Good Natural Lawn Company.**

About 25% of us use the services of a lawn care company to take care of our yards. While it is nice to have somebody else to do the sweating, a good slacker should insist on a company that uses organic fertilizers and natural pest management techniques. Although just about every lawn care company has the word 'green' in its name, this doesn't necessarily mean that it practices environmentally-responsible lawn care. Before you sign a contract, check them out to see if they use natural or organic methods and conduct a soil test. Make sure the firm and its personnel are licensed and certified by the Maryland Department of Agriculture's Pesticide Regulation Section.



Community Commons

The Building a Greener Lifestyle series is a public outreach component of the Frederick County WRAS (Watershed Restoration Action Strategy). Community Commons coordinated the series to empower citizens to take action in their own homes and yards towards improving water quality.

More information about the WRAS can be found at [www.co.frederick.md.us/cleanstreams](http://www.co.frederick.md.us/cleanstreams) or by calling 301.694.1741.

Community Commons can be reached at 301.662.3000 or at [www.communitycommons.org](http://www.communitycommons.org).





# BUILDING A GREENER LIFESTYLE FOR FREDERICK COUNTY

## Natural Household Cleaners

### FOR MORE RECIPES

#### Internet:

- **Boulder County Recycling webpage**  
<http://www.ecocycle.org/hazwaste/recipes.cfm>
- **Children's Health Environmental Coalition**  
<http://www.checnet.org/healthhouse/education/>
- **Los Angeles County Department of Public Works**  
<http://ladpw.org/epd/hhw>

#### Books:

- **Clean House, Clean Planet**  
by Karen Logan
- **The Green Kitchen Handbook**  
by Annie Berthold-Bon
- **Home Safe Home**  
by Debra Dadd-Redalia

### SUPPLIES

- **Gaiam**  
[www.Gaiam.com](http://www.Gaiam.com)  
Carries 7th Generation products, available in bulk quantities, 877-989-6321
- **Green Home**  
[www.greenhome.com](http://www.greenhome.com)  
Has a wide selection of cleaning products, 877-282-6400

### REFERENCES

- **Household Products Database**  
<http://hpd.nlm.nih.gov/products.htm>  
National Institutes of Health, National Library of Medicine  
Search the database for household products to find out what is in them and their potential health effects.
- **The Consumer Union Guide to Environmental Labels**  
[www.eco-labels.org](http://www.eco-labels.org)  
This site is where to go if you are ever confused about terms used in advertising or on a label. What do "biodegradable" and "earth smart" mean? And who regulates these claims? This site can answer these questions.

### NATURAL HOUSEHOLD CLEANERS



*Common household products such as castille soap, baking soda, vinegar, and lemon can make powerful natural household cleaners.*

Cleaners can be classified as more or less environmentally preferable. At the high end (preferable) would be products that are almost entirely vegetable derived, perhaps with some mineral content. At the low end (not preferable) are products that are entirely petroleum derived, do not readily biodegrade, and contain highly toxic or carcinogenic components. In the middle are products that are petroleum based and are biodegradable and less toxic, as well as cleaners that contain both plant and petroleum components.

Conventional cleaners are among the most dangerous chemicals found in the home, but these

chemicals are not always listed on the labels. The Consumer Product Safety Commission regulates the labeling of products. Many cleaners contain known carcinogens (cancer-causing substances), endocrine disruptors (cause reproductive illnesses), and some emit large doses of VOCs (volatile organic compounds) that contribute to smog.

When possible, use non-toxic products to clean your home. Many of these products are just as effective as their chemical counterparts, are safer to use, and less expensive. One way to ensure you are using safe cleaners is to make your own using natural ingredients.

Basic ingredients include baking soda, castile soap, vinegar, and water. Essential oils provide pleasant smells and may make a dirty job more enjoyable.

- Baking Soda (sodium bicarbonate) works as a deodorizer and mild abrasive. It is non-toxic to humans, inexpensive, and versatile.
- Castille soap removes dirt by dissolving oils that bind dirt to surfaces. Soaps made from vegetable sources are better for the environment than those made from petroleum sources; they biodegrade more quickly and come from a renewable resource.
- White, distilled vinegar (acetic acid) is a powerful deodorizer that repels grease, can help prevent mold and mildew, and dissolves soap film and mineral deposits. Choose vinegar made from vegetable sources.
- Borax cleans and deodorizes. It is an excellent disinfectant, and softens water. Borax can usually be found with laundry products in grocery stores.

TO CLEAN OR DEODORIZE...	TRY...
Windows and windshields	Club soda
Tubs, sinks, and toilet	Paste of baking soda, castille soap, and water
Open and clean sink and tub drains	Mix 1/4 cup vinegar and baking soda. Let stand a few minutes and rinse with boiling water.
Silverware, candlesticks, etc.	Paste of baking soda and water, or toothpaste
Mildew	Mix 1/2 cup vinegar with 1/2 cup borax in warm water. Apply with a sponge or spray bottle.
Garbage disposal	Grind ice or citrus peels in disposal.
Ceramic tiles	Mix 1/4 cup vinegar with 1/2 gallon hot water.
Carpet Odor	Sprinkle carpet with baking soda, cornmeal, or cornstarch. Allow to sit 1/2 hour and vacuum up.

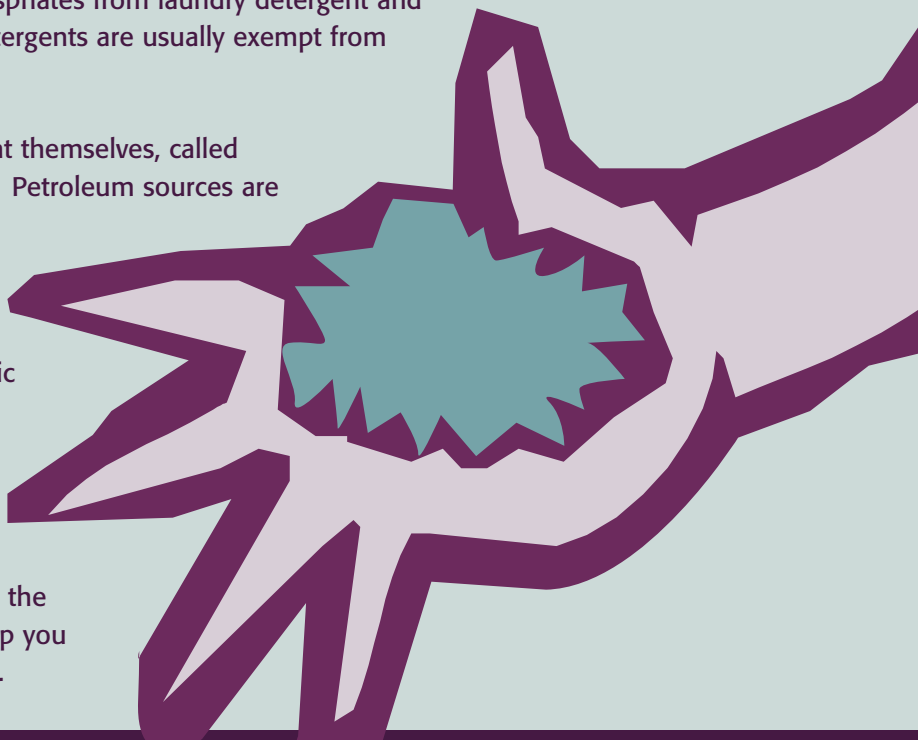
## ENVIRONMENTAL IMPACTS OF CONVENTIONAL CLEANERS

Phosphates are minerals that act as water softeners. They can be very effective cleaners, but also act as fertilizers. When cleaning products are washed down the drain, phosphates enter waterways and cause rapid growth of algae, polluting the water. Many states have banned phosphates from laundry detergent and other cleaning products. Automatic dishwasher detergents are usually exempt from these restrictions.

The key ingredient in many cleaners is the detergent themselves, called surfactants. Most surfactants are petroleum based. Petroleum sources are a limited resource and their extraction often causes pollution.

Responsible use of bleach means minimal use. If needed for disinfection, clean first with a non-toxic product and follow-up disinfection with bleach.

It is important to determine the life cycle of a product before purchase. Ask questions about the manufacturing process, packaging, shipping, performance, and resource recovery (can you reuse the package?). The answers to these questions will help you determine if the product is environmentally friendly.



Community Commons

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**Appendix D: County Capital Improvement Program Proposal for  
Water Quality and Habitat Projects Fiscal Years 2005-2010**

FREDERICK COUNTY CAPITAL IMPROVEMENTS PROGRAM  
FISCAL YEARS 2005-2010

PROJECT NAME: Lower Bush Creek Watershed CIP ACCT # \_\_\_\_\_ DEPARTMENT: \_\_\_\_\_ DIVISION OF PUBLIC WORKS

PROJECT DESCRIPTION/JUSTIFICATION:

In accordance with Frederick County NPDES permit MD0068357, from sites that were identified in a Watershed Management Plan, Watershed Restoration Action Strategy (WRAS) grant and a Restoration/Retrofit Assessment, determine final Site Selection and Feasibility Analysis/preliminary design for projects in the Lower Bush Creek Watershed. The projects may include stream restoration and/or stormwater management facility retrofits. The retrofits will correct problems with water quality treatment or standing water, and the stream restoration projects will address erosion and water quality problems. Feasibility for stream restoration projects will include geomorphologic cross-sections, hydrologic modeling and cost estimates for a design/build project. Feasibility for retrofit projects will include modeling and cost estimates for separate design and build phases, land ownership and access. Resolve right-of-way/land ownership, access, utility issues. Design and build stormwater management control.

ACRES:

BLDG. SQ.FT.:

CAPACITY:

		DATES MO/YR	COSTS (000)	SOURCE OF FUNDS	PROJECT TOTAL (000)	PRIOR APPROVAL (000)	FY 2005 (000)	FY 2006 (000)	FY 2007 (000)	FY 2008 (000)	FY 2009 (000)	FY 2010 (000)	COSTS AFTER 2010 (000)
LAND ACQUISITION:	OPTION SETTLEMENT	7/04 7/05	35.00	GENERAL FUND	287.36	60.13	55.00	172.23					
A & E	START COMPLETE	7/03 7/04	47.47	G.O. BONDS	0.00								
SITE IMPROVEMENTS:	START COMPLETE	7/04 7/05	15.00	WATER/SEWER FUNDS	0.00								
CONSTRUCTION	START COMPLETE	7/05 7/06	158.24	SOLID WASTE FUNDS	0.00								
INSPECTION:	START COMPLETE	7/04 7/06	18.99	ENTERPRISE FUND BONDS	0.00								
EQUIPMENT:	START COMPLETE		0.00	FEDERAL GRANT	0.00								
PROJECT MGMT:	START COMPLETE	7/03 7/04	12.66	STATE GRANT	0.00								
	TOTAL COST		287.36	OTHER	0.00								
				TOTALS	287.36	60.13	55.00	172.23	0.00	0.00	0.00	0.00	0.00

NOTES: New project.

ESTIMATED IMPACT  
ON OPERATING COSTS:

DETAILED STAFF INCREASES:

Salaries/  
Fringes

FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	AFTER 2010



FREDERICK COUNTY CAPITAL IMPROVEMENTS PROGRAM  
FISCAL YEARS 2005-2010

PROJECT NAME: Ballenger Creek Watershed CIP ACCT # \_\_\_\_\_ DEPARTMENT: \_\_\_\_\_ DIVISION OF PUBLIC WORKS

PROJECT DESCRIPTION/JUSTIFICATION:

In accordance with Frederick County NPDES permit MD0068357, from sites that were identified in a Watershed Management Plan, Watershed Restoration Action Strategy (WRAS) grant and a Restoration/Retrofit Assessment, determine final Site Selection and Feasibility Analysis/30% design for projects in Ballenger Creek Watershed. The projects may include stream restoration and/or stormwater management facility retrofits. The retrofits will correct problems with water quality treatment or standing water, and the stream restoration projects will address erosion and water quality problems. Feasibility for stream restoration projects will include geomorphologic cross-sections, hydrologic modeling and cost estimates for a design/build project. Feasibility for retrofit projects will include modeling and cost estimates for separate design and build phases, land ownership and access. Resolve right-of-way/land ownership, access, utility issues. Design and build stormwater management control.

ACRES:

BLDG. SQ.FT.:

CAPACITY:

		DATES MO/YR	COSTS (000)	SOURCE OF FUNDS	PROJECT TOTAL (000)	PRIOR APPROVAL (000)	FY 2005 (000)	FY 2006 (000)	FY 2007 (000)	FY 2008 (000)	FY 2009 (000)	FY 2010 (000)	COSTS AFTER 2010 (000)
LAND ACQUISITION:	OPTION SETTLEMENT	7/05 7/06	35.00	GENERAL FUND	317.50	0.00	64.71	55.00	197.79				
A & E	START COMPLETE	7/04 7/05	51.09	G.O. BONDS	0.00								
SITE IMPROVEMENTS:	START COMPLETE	7/05 7/06	15.00	WATER/SEWER FUNDS	0.00								
CONSTRUCTION	START COMPLETE	7/06 7/07	182.35	SOLID WASTE FUNDS	0.00								
INSPECTION:	START COMPLETE	7/05 7/07	20.44	ENTERPRISE FUND BONDS	0.00								
EQUIPMENT:	START COMPLETE		0.00	FEDERAL GRANT	0.00								
PROJECT MGMT:	START COMPLETE	7/04 7/05	13.62	STATE GRANT	0.00								
	TOTAL COST		317.50	OTHER	0.00								
				TOTALS	317.50	0.00	64.71	55.00	197.79	0.00	0.00	0.00	0.00

NOTES: New project.

ESTIMATED IMPACT  
ON OPERATING COSTS:

DETAILED STAFF INCREASES:

Salaries/  
Fringes

FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	AFTER 2010

FREDERICK COUNTY CAPITAL IMPROVEMENTS PROGRAM  
FISCAL YEARS 2005-2010

PROJECT NAME: Upper and Lower Linganore Creek Watershed CIP ACCT # \_\_\_\_\_ DEPARTMENT: DIVISION OF PUBLIC WORKS

PROJECT DESCRIPTION/JUSTIFICATION:

In accordance with Frederick County NPDES permit MD0068357, from sites that were identified in a Watershed Management Plan, Watershed Restoration Action Strategy (WRAS) grant and a Restoration/Retrofit Assessment, determine final Site Selection and Feasibility Analysis/30% design for projects in Linganore Creek Watershed. The projects may include stream restoration and/or stormwater management facility retrofits. The retrofits will correct problems with water quality treatment or standing water, and the stream restoration projects will address erosion and water quality problems. Feasibility for stream restoration projects will include geomorphologic cross-sections, hydrologic modeling and cost estimates for a design/build project. Feasibility for retrofit projects will include modeling and cost estimates for separate design and build phases, land ownership and access. Resolve right-of-way/land ownership, access, utility issues. Design and build stormwater management control.

ACRES:

BLDG. SQ.FT.:

CAPACITY:

		DATES MO/YR	COSTS (000)	SOURCE OF FUNDS	PROJECT TOTAL (000)	PRIOR APPROVAL (000)	FY 2005 (000)	FY 2006 (000)	FY 2007 (000)	FY 2008 (000)	FY 2009 (000)	FY 2010 (000)	COSTS AFTER 2010 (000)
LAND ACQUISITION:	OPTION SETTLEMENT	7/06 7/07	35.00	GENERAL FUND	287.36	0.00		60.13	55.00	172.23			
A & E	START COMPLETE	7/05 7/06	47.47	G.O. BONDS	0.00								
SITE IMPROVEMENTS:	START COMPLETE	7/06 7/07	15.00	WATER/SEWER FUNDS	0.00								
CONSTRUCTION	START COMPLETE	7/07 7/08	158.24	SOLID WASTE FUNDS	0.00								
INSPECTION:	START COMPLETE	7/06 7/08	18.99	ENTERPRISE FUND BONDS	0.00								
EQUIPMENT:	START COMPLETE		0.00	FEDERAL GRANT	0.00								
PROJECT MGMT:	START COMPLETE	7/05 7/06	12.66	STATE GRANT	0.00								
	TOTAL COST		287.36	OTHER	0.00								
				TOTALS	287.36	0.00	0.00	60.13	55.00	172.23	0.00	0.00	0.00

NOTES: New project.

ESTIMATED IMPACT  
ON OPERATING COSTS:

DETAILED STAFF INCREASES:

Salaries/  
Fringes

FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	AFTER 2010

FREDERICK COUNTY CAPITAL IMPROVEMENTS PROGRAM  
FISCAL YEARS 2005-2010

PROJECT NAME: Bennett Creek Watershed CIP ACCT # \_\_\_\_\_ DEPARTMENT: \_\_\_\_\_ DIVISION OF PUBLIC WORKS

PROJECT DESCRIPTION/JUSTIFICATION:

In accordance with Frederick County NPDES permit MD0068357, from sites that were identified in a Watershed Restoration Action Strategy (WRAS) grant, conduct a Restoration/Retrofit Assessment with Stream Corridor Assessment and modeling. Determine final Site Selection and Feasibility Analysis/30% design for projects in Bennett Creek Watershed. The projects may include stream restoration and/or stormwater management facility retrofits. The retrofits will correct problems with water quality treatment or standing water, and the stream restoration projects will address erosion and water quality problems. Feasibility for stream restoration projects will include geomorphologic cross-sections, hydrologic modeling and cost estimates for a design/build project. Feasibility for retrofit projects will include modeling and cost estimates for separate design and build phases, land ownership and access. Resolve right-of-way/land ownership, access, utility issues. Design and build stormwater management control.

ACRES:

BLDG. SQ.FT.:

CAPACITY:

		DATES MO/YR	COSTS (000)	SOURCE OF FUNDS	PROJECT TOTAL (000)	PRIOR APPROVAL (000)	FY 2005 (000)	FY 2006 (000)	FY 2007 (000)	FY 2008 (000)	FY 2009 (000)	FY 2010 (000)	COSTS AFTER 2010 (000)
LAND ACQUISITION:	OPTION SETTLEMENT	7/08 7/09	35.00	GENERAL FUND	392.17					164.94	55.00	172.23	
A & E	START COMPLETE	7/07 7/08	147.47	G.O. BONDS	0.00								
SITE IMPROVEMENTS:	START COMPLETE	7/08 7/09	15.00	WATER/SEWER FUNDS	0.00								
CONSTRUCTION	START COMPLETE	7/09 7/10	158.24	SOLID WASTE FUNDS	0.00								
INSPECTION:	START COMPLETE	7/08 7/10	18.99	ENTERPRISE FUND BONDS	0.00								
EQUIPMENT:	START COMPLETE		0.00	FEDERAL GRANT	0.00								
PROJECT MGMT:	START COMPLETE	7/07 7/08	17.47	STATE GRANT	0.00								
	TOTAL COST		392.17	OTHER	0.00								
				TOTALS	392.17	0.00	0.00	0.00	0.00	164.94	55.00	172.23	0.00

NOTES: New project.

ESTIMATED IMPACT  
ON OPERATING COSTS:

DETAILED STAFF INCREASES:

Salaries/  
Fringes

FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	AFTER 2010
		(90.00)				

FREDERICK COUNTY CAPITAL IMPROVEMENTS PROGRAM  
FISCAL YEARS 2005-2010

PROJECT NAME: Tuscarora Creek Watershed CIP ACCT # \_\_\_\_\_ DEPARTMENT: \_\_\_\_\_ DIVISION OF PUBLIC WORKS

PROJECT DESCRIPTION/JUSTIFICATION:

In accordance with Frederick County NPDES permit MD0068357, from sites that were identified in a Watershed Restoration Action Strategy (WRAS) grant, conduct a Restoration/Retrofit Assessment with Stream Corridor Assessment and modeling. Determine final Site Selection and Feasibility Analysis/30% design for projects in Tuscarora Creek Watershed. The projects may include stream restoration and/or stormwater management facility retrofits. The retrofits will correct problems with water quality treatment or standing water, and the stream restoration projects will address erosion and water quality problems. Feasibility for stream restoration projects will include geomorphologic cross-sections, hydrologic modeling and cost estimates for a design/build project. Feasibility for retrofit projects will include modeling and cost estimates for separate design and build phases, land ownership and access. Resolve right-of-way/land ownership, access, utility issues. Design and build stormwater management control.

ACRES:

BLDG. SQ.FT.:

CAPACITY:

		DATES MO/YR	COSTS (000)	SOURCE OF FUNDS	PROJECT TOTAL (000)	PRIOR APPROVAL (000)	FY 2005 (000)	FY 2006 (000)	FY 2007 (000)	FY 2008 (000)	FY 2009 (000)	FY 2010 (000)	COSTS AFTER 2010 (000)
LAND ACQUISITION:	OPTION SETTLEMENT	7/10 7/11	35.00	GENERAL FUND	392.17							164.94	227.23
A & E	START COMPLETE	7/09 7/10	147.47	G.O. BONDS	0.00								
SITE IMPROVEMENTS:	START COMPLETE	7/10 7/11	15.00	WATER/SEWER FUNDS	0.00								
CONSTRUCTION	START COMPLETE	7/11 7/12	158.24	SOLID WASTE FUNDS	0.00								
INSPECTION:	START COMPLETE	7/10 7/12	18.99	ENTERPRISE FUND BONDS	0.00								
EQUIPMENT:	START COMPLETE		0.00	FEDERAL GRANT	0.00								
PROJECT MGMT:	START COMPLETE	7/09 7/10	17.47	STATE GRANT	0.00								
	TOTAL COST		392.17	OTHER	0.00								
				TOTALS	392.17	0.00	0.00	0.00	0.00	0.00	0.00	164.94	227.23

NOTES: New project.

ESTIMATED IMPACT  
ON OPERATING COSTS:

DETAILED STAFF INCREASES:

Salaries/  
Fringes

FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	AFTER 2010
				(90.00)		

FREDERICK COUNTY CAPITAL IMPROVEMENTS PROGRAM  
FISCAL YEARS 2005-2010

PROJECT NAME: Catoctin Creek Watershed CIP ACCT # \_\_\_\_\_ DEPARTMENT: \_\_\_\_\_ DIVISION OF PUBLIC WORKS

PROJECT DESCRIPTION/JUSTIFICATION:

In accordance with Frederick County NPDES permit MD0068357, from sites that were identified in a Watershed Restoration Action Strategy (WRAS) grant, conduct a Restoration/Retrofit Assessment with Stream Corridor Assessment and modeling. Determine final Site Selection and Feasibility Analysis/30% design for projects in Catoctin Creek Watershed. The projects may include stream restoration and/or stormwater management facility retrofits. The retrofits will correct problems with water quality treatment or standing water, and the stream restoration projects will address erosion and water quality problems. Feasibility for stream restoration projects will include geomorphologic cross-sections, hydrologic modeling and cost estimates for a design/build project. Feasibility for retrofit projects will include modeling and cost estimates for separate design and build phases, land ownership and access. Resolve right-of-way/land ownership, access, utility issues. Design and build stormwater management control.

ACRES:

BLDG. SQ.FT.:

CAPACITY:

		DATES MO/YR	COSTS (000)	SOURCE OF FUNDS	PROJECT TOTAL (000)	PRIOR APPROVAL (000)	FY 2005 (000)	FY 2006 (000)	FY 2007 (000)	FY 2008 (000)	FY 2009 (000)	FY 2010 (000)	COSTS AFTER 2010 (000)
LAND ACQUISITION:	OPTION SETTLEMENT	7/12 7/13	35.00	GENERAL FUND	392.17								392.17
A & E	START COMPLETE	7/11 7/12	147.47	G.O. BONDS	0.00								
SITE IMPROVEMENTS:	START COMPLETE	7/12 7/13	15.00	WATER/SEWER FUNDS	0.00								
CONSTRUCTION	START COMPLETE	7/13 7/14	158.24	SOLID WASTE FUNDS	0.00								
INSPECTION:	START COMPLETE	7/12 7/14	18.99	ENTERPRISE FUND BONDS	0.00								
EQUIPMENT:	START COMPLETE		0.00	FEDERAL GRANT	0.00								
PROJECT MGMT:	START COMPLETE	7/11 7/12	17.47	STATE GRANT	0.00								
	TOTAL COST		392.17	OTHER	0.00								
				TOTALS	392.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	392.17

NOTES: New project.

ESTIMATED IMPACT  
ON OPERATING COSTS:

DETAILED STAFF INCREASES:

Salaries/  
Fringes

FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	AFTER 2010 (90.00)