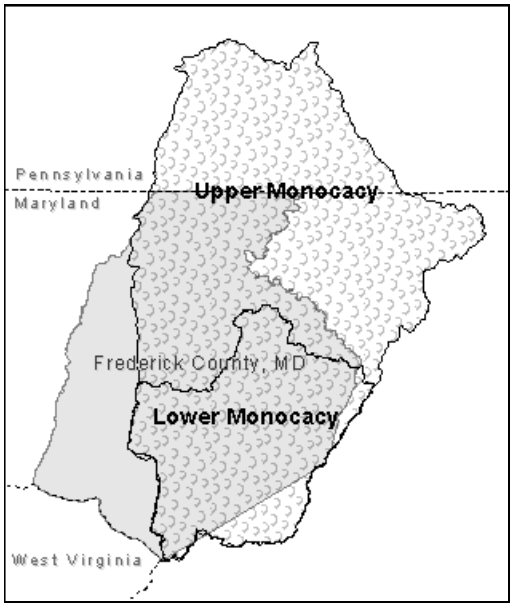
Upper Monocacy River
Watershed Restoration Action Strategy

Frederick County, Maryland

FINAL REPORT

June 2005



Submitted to
Maryland Department of Natural Resources,
Watershed Services, Coastal Zone Management Division

And

Maryland Department of the Environment
Technical Regulatory Services Administration

Prepared by
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In Consultation with
Upper Monocacy WRAS Steering Committee

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

This Report was developed under the provisions of the Upper 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. 14-05-956-EPA-057.

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ACKNOWLEDGEMENTS

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We gratefully acknowledge the efforts of the Upper Monocacy Steering Committee, whose membership is detailed in the Stakeholder Involvement Section of the document, for nearly two years of participation in the development of this plan. We also appreciate the participation of DNR staff members, including Niles Primrose, Ken Shanks, Ken Yetman, and Danielle Lucid in gathering and summarizing data for the Steering Committee. We further acknowledge the efforts of National Park Service staff who provided organizational support: Ursula Lemanski, Ward S. (Wink) Hastings and the staff of the Rivers, Trails and Conservation Assistance program.

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ABSTRACT

The Upper Monocacy River Watershed is part of the Potomac River Watershed and encompasses approximately 126,107 acres in Frederick County. Parts of the Upper Monocacy River Watershed are also located in Carroll County, MD and Adams County, PA. The area located within Frederick County is 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 worked closely with Maryland's Department of Natural Resources on a two part process. During the first step, 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 six subwatersheds of the Upper Monocacy, and surveyed fish and aquatic invertebrate communities. During the second part, the County organized an Upper Monocacy WRAS Steering Committee comprised of 44 representatives from 30 organizations and interest groups. The Steering Committee reviewed DNR data, organized six working groups to formulate goals and objectives, and reached out to owners of stream frontage through four public meetings. The purpose of the meetings was to share WRAS findings and learn about landowner concerns.

Examination of stream corridor conditions on approximately 130 miles of stream, Synoptic Survey data, and the Watershed Characterization resulted in the identification of 38 priority sites for recommended action that were expanded further during Steering Committee workshops and public meetings. As a result of this collaborative process, WRAS goals were adopted in five topical areas along with specific subwatershed strategies. Detailed Education and Outreach and Natural Resource Management Objectives accompanied by related nutrient reductions were developed. Also identified were needs for capacity building in the areas of organizational capacity, watershed management capacity, development capacity, and protection capacity. In addition, four program change initiatives were recommended.

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 Upper Monocacy from September 2003 to June 2005. The WRAS was initiated because of the negative human-induced impacts to water quality and habitat due to:

- Sediment and nutrient losses from agricultural lands;
- 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.

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, engineers, developers, interested citizens, and others.

DNR gathered, analyzed, and summarized existing data in its Upper Monocacy River Watershed Characterization. DNR also conducted original field studies for a Stream Corridor Assessment and Synoptic Survey. Data from the studies and field assessments revealing problems facing the watershed were presented to the Steering Committee in three full day workshops as well as several subsequent sessions. Six working groups emerged from the process: agricultural practices, citizen practices, sound land development, monitoring, natural resource management, and municipal, commercial and industrial practices. The working groups defined objectives, shaped strategies for each subwatershed, addressed comment sites and collectively developed a vision statement.

The Watershed Restoration Action Strategy (WRAS) for the Upper 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, protecting critical forested headwater areas and wetlands, and introducing best management practices (BMPs) in urban and agricultural areas for nutrient reduction benefits.

The leadership of Frederick County Government is committed to promoting initiatives to protect and restore watershed health. Staff and members of the Steering Committee present the Upper Monocacy Watershed Restoration Action Strategy to protect and restore watershed health with maximum leveraging of efforts through partnerships and voluntary participation by Frederick County citizens.

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Introduction

The Challenge

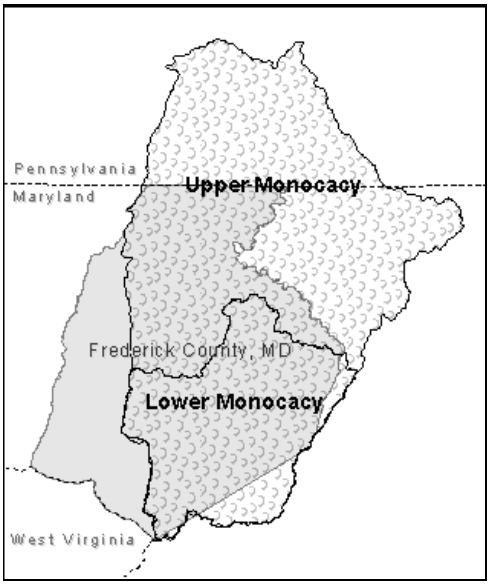
The Monocacy River Watershed, located primarily in Frederick County's fertile agricultural region, is rich in history, cultural heritage, and natural resources. The area is also confronted by complex water resource problems that negatively impact the quality of life for area residents, drinking water intakes along the Potomac River, 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.

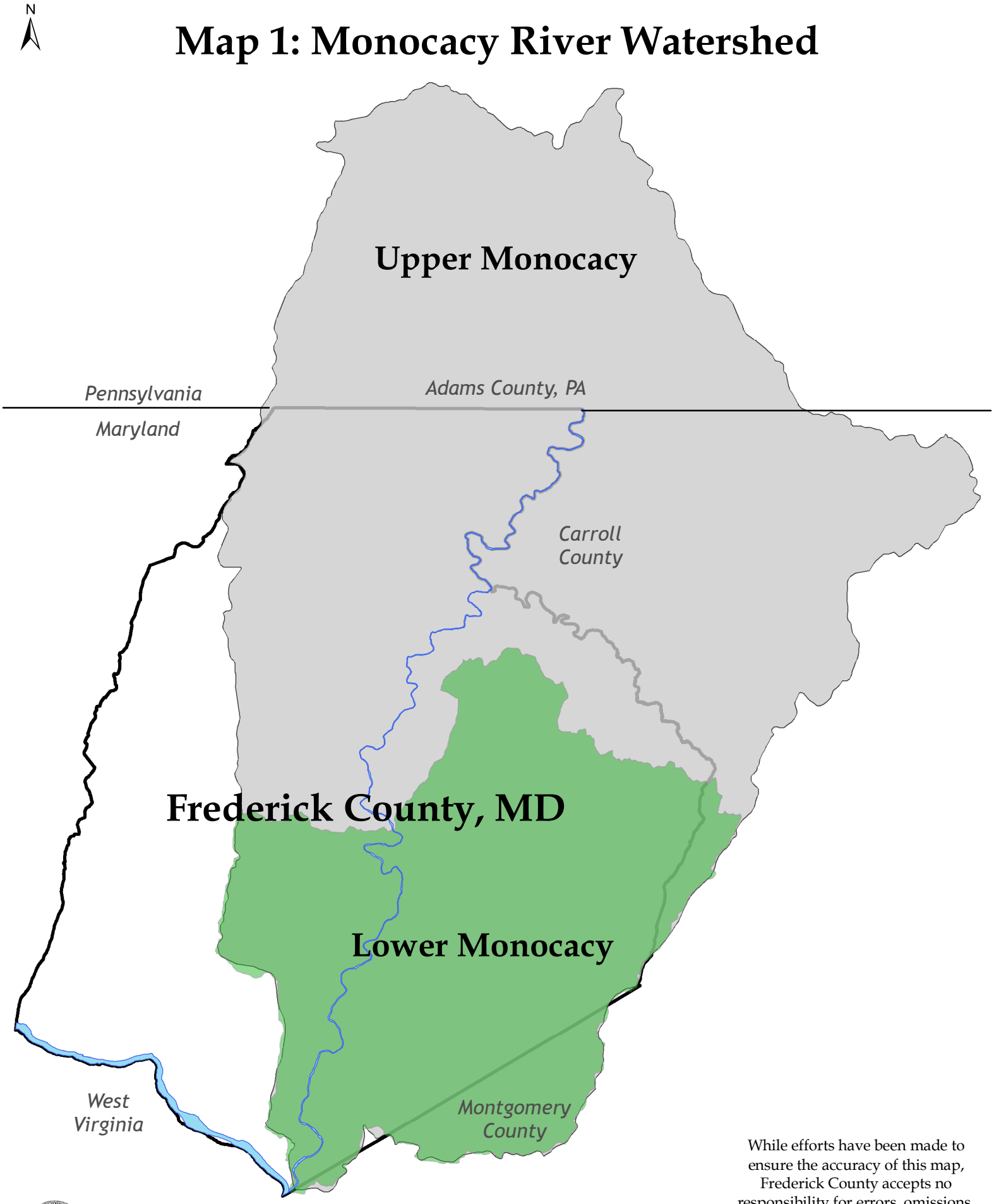
For the past few decades, various groups have undertaken initiatives to address water quality issues with varying results. However, beginning in December 2002, the County sought support for a more comprehensive action planning process for the Monocacy River Watershed.

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 Upper Monocacy River Watershed includes portions of Adams County, PA. and Carroll County, MD. The Lower Monocacy River Watershed is located primarily in Frederick County but includes small parts of Montgomery and Carroll Counties as well.

Map 1: Monocacy Watershed



Map 1: 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.

Project History and Background

The Department of Natural Resources (DNR) approved Frederick County's Upper Monocacy WRAS grant application during late Summer 2003, enabling the County to build upon and extend its earlier planning process focused on the Lower Monocacy watershed that began during December 2002. The Upper Monocacy Steering Committee began its work in September 2003, growing to more than 40 representatives of many different stakeholder groups. Some of these groups include the New Forest Society, the Emmitsburg Business and Professional Association, ThorpeWood, Catoctin Land Trust, Community Commons, the Frederick Forestry Board, Mount Saint Mary's University, the Towns of Emmitsburg and Thurmont, Hood College, and the City of Frederick. The Steering Committee members, their affiliations, and group assignments are shown in Table 4 on page 33.

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. 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 105 locations in the watershed. They also walked 130 miles of stream corridor in the Upper Monocacy with specific stream reaches in each of the six subwatersheds selected by the Steering Committee. The data was compiled into a Stream Corridor Assessment (SCA), the third report, and reviewed by the committee in Fall 2004. The three reports can be found on DNR's website at http://www.dnr.state.md.us/watersheds/surf/proj/wras.html.

WRAS grant support began during July 2004. Subrecipient grants supported outreach work by partners Community Commons, Catoctin Land Trust, the Thorpe Foundation. Training in illicit discharge detection and elimination was performed by the Center for Watershed Protection. WRAS outreach work included a "Greener Lifestyle" workshop series offered by Community Commons on native plants, rain barrels, composting, natural household cleaners, and natural lawn care practices. In addition, Steering Committee members, ThorpeWood and Catoctin Land Trust, reached out to property owners with a workshop on conservation easements, cohosted by partners, the Potomac Conservancy, the Frederick Forestry Board, Chesapeake Wildlife Heritage and the WRAS.

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.

The Monocacy River and its Watershed

The Upper Monocacy River Watershed, number 02140303, is located in both Maryland (Frederick County, with portions in Carroll County) and Pennsylvania (Adams County). It is part of the Potomac River Watershed. There are two types of designated uses for streams in the Upper Monocacy River Watershed. Natural Trout Waters and Public Water Supply (Use 3-P) predominates and is found in Tuscarora, Fishing, Hunting, Owens, and Friends (tributary of Toms Creek) and all of their tributaries. The second designated use is Recreational Trout Waters and Public Water Supply (Use 4-P) and includes all remaining streams in the watershed. 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). There is a statewide fish consumption advisory in effect for methyl-mercury, particularly for fish from lakes and impoundments. The advisory includes the Upper Monocacy but does not single out any particular part of the river system. Long-term water quality monitoring of the river's main stem shows that nitrogen levels, currently moderate, have been declining over time; phosphorus levels, still high, have not diminished; and suspended solids, currently at moderate levels remain steady. 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. Nearly half of the watershed (45%) is in agricultural use, specifically large dairy and beef operations, horses, horticulture, orchards and crop farms. Forestry covers a comparable part of the watershed at 45%. Despite the relatively high proportion of forest, an estimated 44% of the stream corridors have no or inadequate forest buffers. Compounding the problem, the watershed has 25% 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 10% of the watershed and is expanding rapidly. Sprawl growth is one dimension of that development pattern with five-acre lot development in forested Catoctin Mountain environs and small cluster subdivisions sprinkled through agricultural zones. Critical problems in four municipalities and other urbanized areas include degraded sewer system infrastructure in Thurmont and Emmitsburg resulting in raw or partially treated sewage entering streams, impervious surface expanding in naturally reproducing trout streams (Thurmont – Hunting and Owens Creeks; Frederick – Tuscarora Creek); inadequately treated sewage from the small package plant in the White Rock community releasing high nutrient loads into Tuscarora Creek; antiquated or nonexistent stormwater management in older subdivisions with resultant stream corridor degradation; inadequately maintained septic systems in older communities and in the floodplain; overuse of fertilizers, herbicides, and pesticides for turf; new home construction, and associated impacts from land conversion for the rapidly growing communities of newcomers.

Part 1: Assessment of Watershed Conditions

Summary of DNR Reports

During 2004, information about the 204 square mile Upper Monocacy River Watershed (Map 2) was generated by DNR staff who summarized existing data in the **Watershed Characterization**, walked and surveyed approximately 130 miles of stream corridor in their **Stream Corridor Assessment**, and sampled water in 105 locations as part of the **Synoptic Survey**. The reports are summarized below.

Watershed Characterization

Excerpted from full report dated January 2005; available at http://www.dnr.state.md.us/watersheds/surf/proj/wras.html)

The Characterization noted that the Upper Monocacy River Watershed encompasses over 30% of Frederick County, as well as portions of Carroll County, Maryland and Adams County, Pennsylvania. State regulation designates that all streams within the watershed meet the standards for either Natural Trout Waters and Public Water Supply (Use 3-P) or Recreational Trout Waters and Public Water Supply (Use 4-P). The streams listed below should meet the needs of a use 3-P stream - naturally reproducing native brook trout populations and protection of public water supply

- Tuscarora Creek and all tributaries
- Fishing Creek and all tributaries
- Hunting Creek and all tributaries
- Owens Creek and all tributaries
- Friends Creek and all tributaries

All other streams within the Upper Monocacy River Watershed should meet the needs of a use 4-P stream - short-term survival of trout and protection of public water supply (Map 3).

Water Quality – Use Impairments and Total Maximum Daily Loads (TMDLs)

EPA Requirement A-1

EPA Requirement A-2

BACTERIA

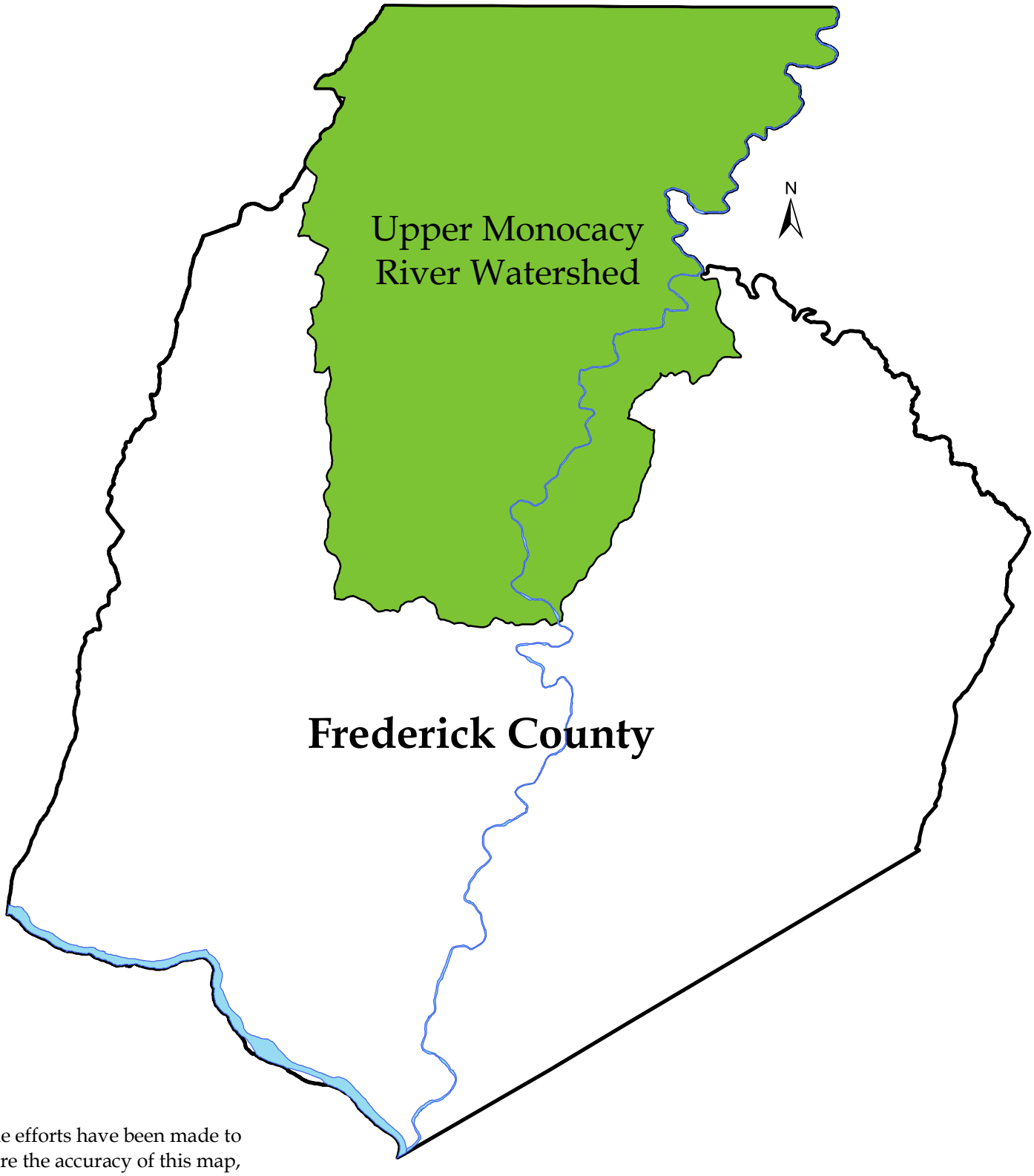
The Upper Monocacy River main stem was listed for impairment by fecal coliform bacteria from unspecified sources based on data collected at two long-term monitoring stations (MON0269, MON0528) 1995 through 1999.

BIOLOGICAL IMPARIMENTS

The 2002 303(d) list included the Upper Monocacy River Watershed for biological impairment based on assessment of fish and benthos by the Maryland Biological Stream Survey (MBSS) using their indices of biological integrity. The assessment of this information in the draft 2004 303(d) list indicates that the findings are not conclusive and recommends dropping the listing of biological impairment for the watershed.

However, biological impairment was listed in 2002 and/or 2004 for specific sites on Bussard Creek, Creagers Branch, Fishing Creek, Flat Run, Friends Creek, Glade Creek, High Run, Little Hunting Creek, Middle Creek, Motter's Run, Owens Creek, Piney Creek, Sandy Run, Steep Creek, Toms Creek, Turkey Creek, Tuscarora Creek and unnamed tributaries to the Monocacy River.

Map 2: Upper Monocacy River Watershed



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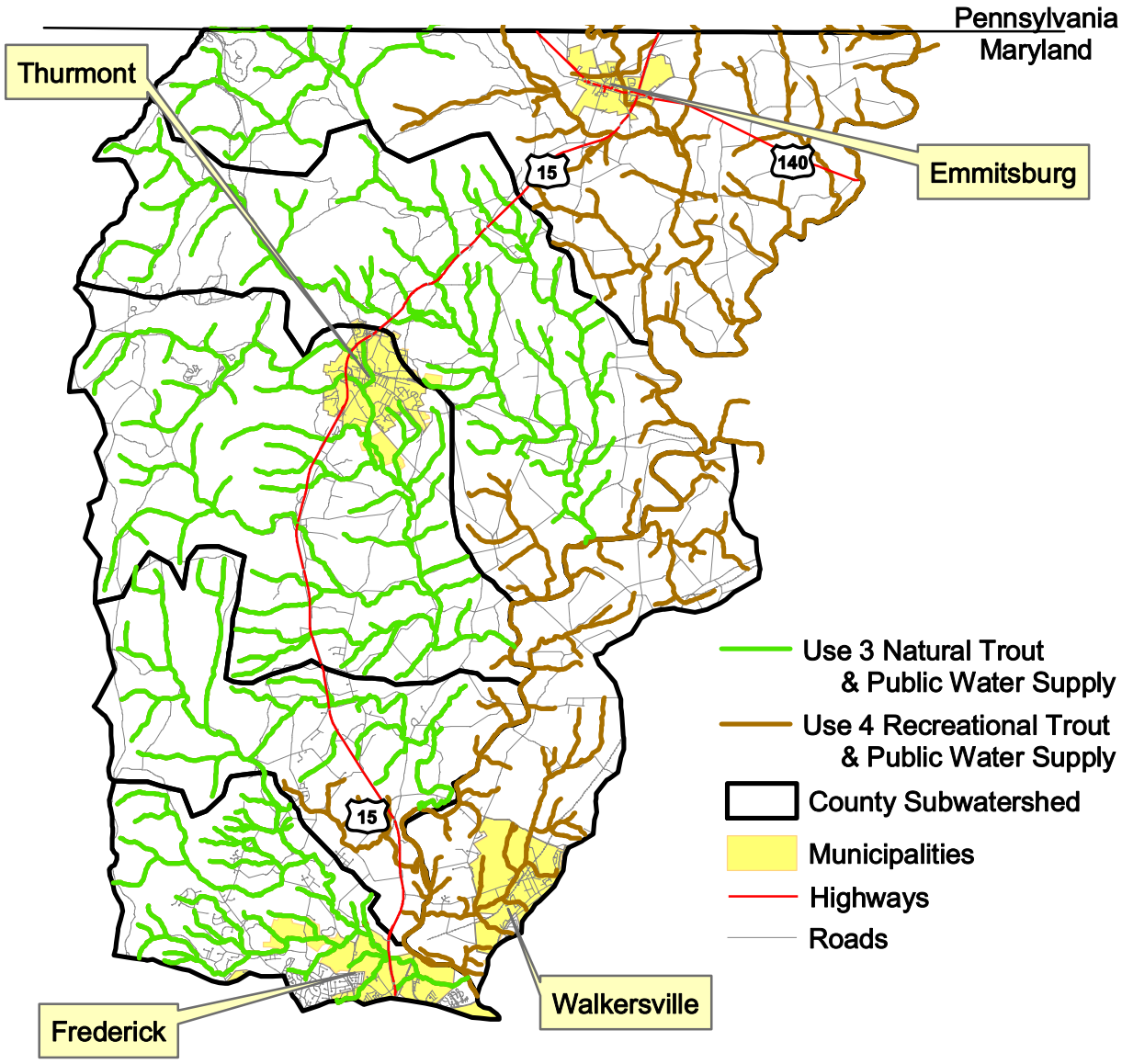
Map 3 Use Designations for Streams
Upper Monocacy River Watershed In Frederick County



0 1 2 4 Miles

1:200,000

Maryland Dept. of Natural Resources
Watershed Services LWAD
Use Data: COMAR 26.08.02.08
December 2004

NUTRIENTS

Hunting Creek Lake was listed in 2002 for nutrient impairment from unknown sources based on an assessment conducted in 1993-95. The Upper Monocacy River was listed in 1996 for nutrient impairment from nonpoint and natural sources.

SEDIMENT

The Upper Monocacy River was listed in 1996 for sediment impairment from nonpoint and natural sources.

TOTAL MAXIMUM DAILY LOADS (TMDLS)

As of July 2004, MDE had not developed any Total Maximum Daily Loads (TMDLs) in the Upper Monocacy River. However, based on the current list of impairments, Upper Monocacy River watershed TMDLs are anticipated for bacteria, nutrients, sediments and impairments associated with low indices of biological integrity. In its work on the Upper Monocacy River nutrient TMDL, MDE will explore the establishment of a quantified maximum threshold of nutrients in nontidal waters.

Natural Resources

SOILS

Prime agricultural soils account for about 14% of the watershed. The largest concentration of this soil is located in the Walkersville and City of Frederick area where much of it has been converted to development or may be converted in the foreseeable future. Highly erodible soil is concentrated on steep and/or mountainous areas of the watershed. Hydric soils are a small percentage of the watershed and tend to be scattered in small areas with the largest concentration located east of Emmitsburg.

GREEN INFRASTRUCTURE

Natural vegetation area in Green Infrastructure hubs totals about 39,500 acres. Most of this natural area is forest in large hubs on mountainous terrain. About half of this acreage is in local, DNR or Federal ownership. Two small hubs are identified along the Monocacy River: one northeast of Emmitsburg at the Pennsylvania border (about 350 acres of natural vegetation) and one near Legore Bridge Road bridge across the Monocacy River (about 170 acres of natural vegetation).

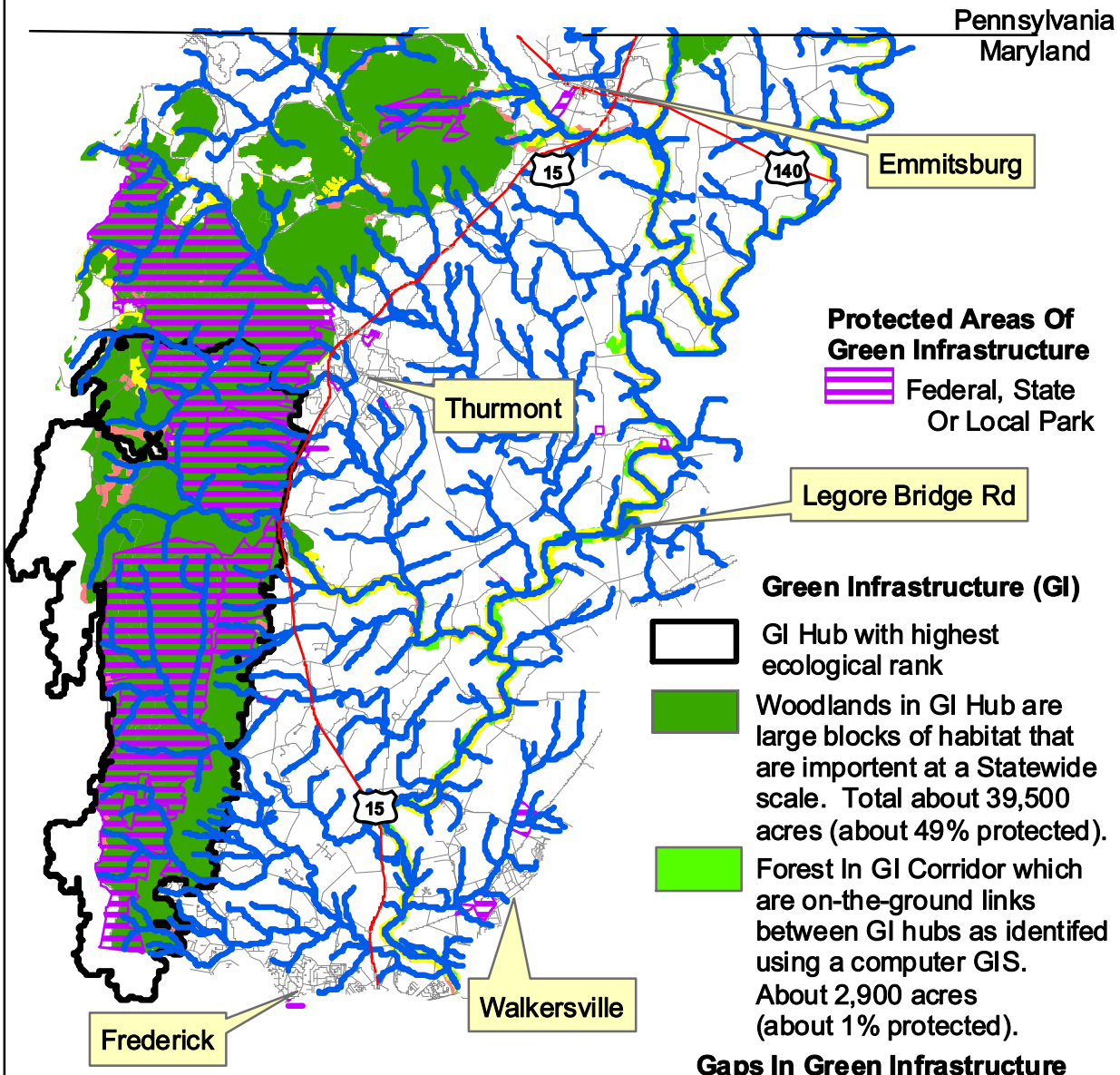
The large Green Infrastructure hubs on Catoctin Mountain that extend from Pennsylvania to Frederick as shown on the map (Map 4) all rank in the top one third relative to other hubs in this physiographic region of Maryland based on a comparison of ecological values. The highest ranked hub runs roughly from Thurmont to Frederick. Based on this ranking, protection of land in this hub may present the greatest potential ecological benefit.

The corridors connecting the Green Infrastructure hubs are characterized by discontinuous areas of natural vegetation that total about 2,900 acres. These natural areas are fragmented by other land uses like agriculture and development. About one percent of this acreage is in local, DNR or Federal ownership. A similar percentage is protected by agricultural easement.

WETLANDS

According to DNR's Wetlands Inventory, there are about 2,707 acres of wetlands in Frederick County's portion of the Upper Monocacy River Watershed. Of these, there are 16 sites grouped into 10 wetland areas that have been identified as Nontidal Wetlands of Special State Concern. Historic wetland loss in the Upper Monocacy is estimated to be 15,277 acres.

Map 4 Green Infrastructure
Upper Monocacy River Watershed In Frederick County



Maryland Dept. of Natural Resources
GIS: Watershed Services LWAD Dec. 2004
GI Hub / Corridor Data: DNR 2000
Land Use Data: MDP 2002

STREAM BUFFERS

The Upper Monocacy River watershed has about 424 miles of stream according to US Geological Survey data. About 380 miles are tributary streams and the remainder is the Monocacy River main stem and land around impoundments. Using this stream data with Maryland Department of Planning (MDP) 2002 Land Use / Land Cover data in computerized GIS, an interpretation of the land in local riparian stream buffers can be generated (Map 5).

Of the 380 miles of tributary streams in the watershed, about 213 stream miles or 56% of local streams have natural vegetation in the riparian area. Thus, 44% of streams bisect developed and open lands (agricultural land or barren land). Significant stream miles bisect highly erodible soils and are not protected by naturally vegetated buffers.

Living Resources and Habitat

Information on living resources is presented here to provide a gauge of water quality and habitat conditions in the watershed. It is also a potential measure of efforts to manage water quality and watersheds for the living resources that depend on them (Map 6 and Map 7).

FISH

In general, the streams with headwaters in the Catoctin Mountains support high-quality cold-water fisheries that have the capacity to sustain naturally reproducing brook trout populations and naturalized brown trout. As these streams flow into lowland areas, they gradually warm up in stream segments with lower gradient, less shade, less naturally vegetated riparian buffer and more impacts of agriculture and development. It is a gradual transition with fish moving up and downstream in that vicinity. In the warm water stream areas, small mouth bass, channel catfish and red-breasted sunfish are the predominant game fish species.

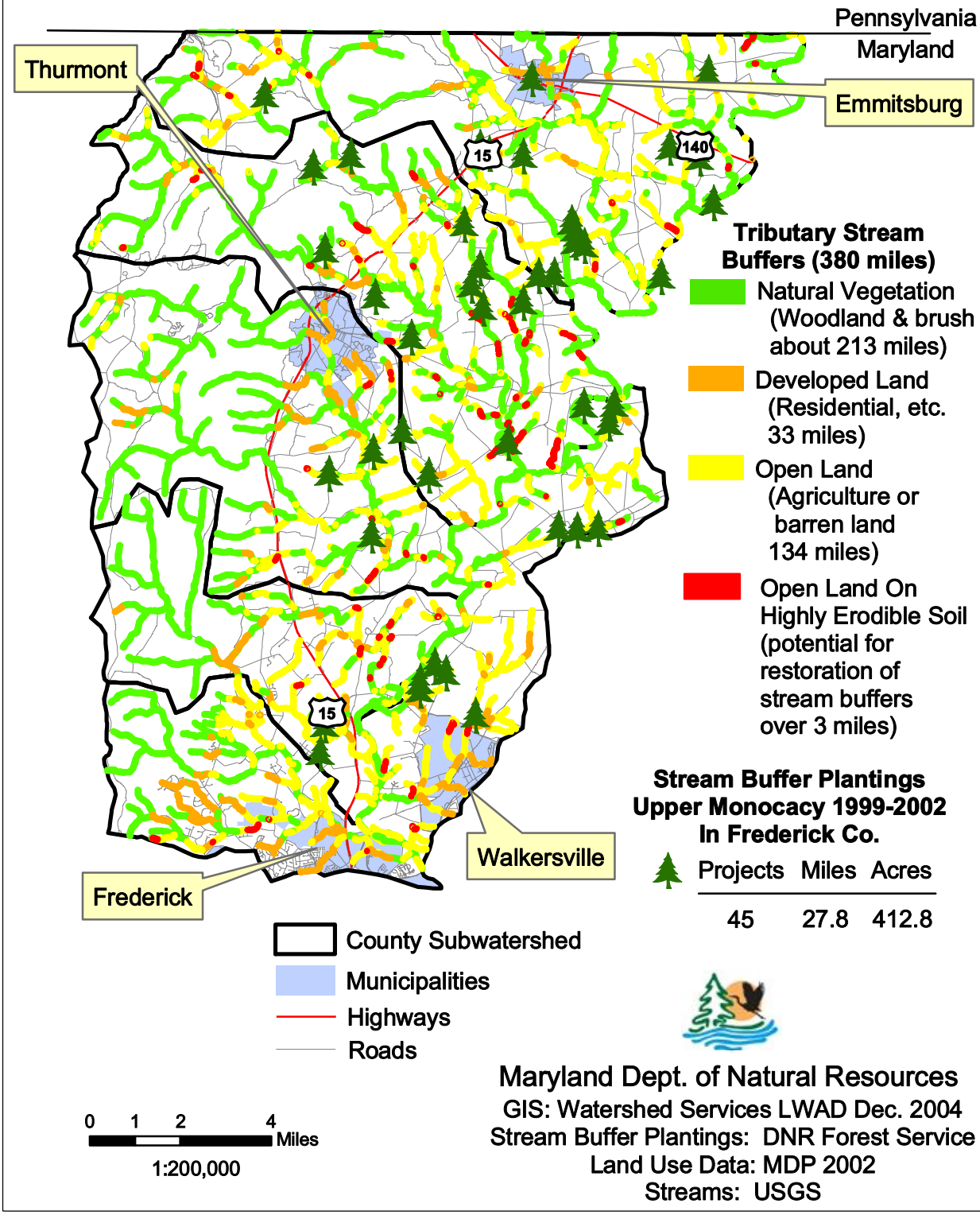
ECOLOGICALLY SENSITIVE AREAS (ESAS)

At least 26 ESAs are identified in the Upper Monocacy River Watershed in Frederick County. Each ESA contains one or more sensitive species habitats. However, the entire ESA is not considered sensitive habitat. The ESA is an envelope identified for review purposes to help ensure that applications for permit or approval in or near sensitive areas receive adequate attention and safeguards for the sensitive species / habitat they contain.

WETLANDS OF SPECIAL STATE CONCERN (WSSC)

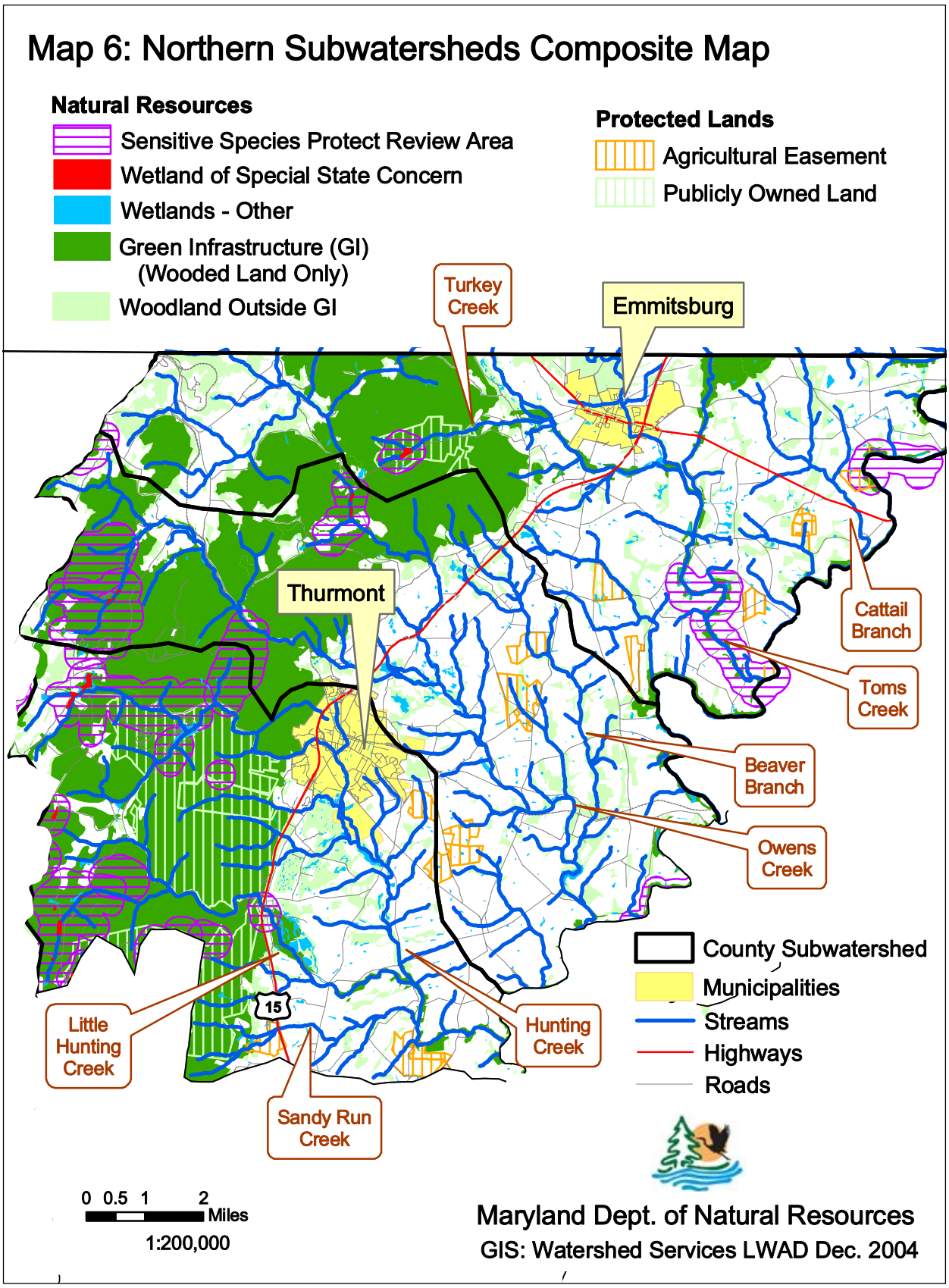
At least 20 WSSCs are designated in the Upper Monocacy River Watershed. These selected wetlands, which generally represent the best examples of Maryland's nontidal wetland habitats, are afforded additional protection in State law beyond the permitting requirements that apply to wetlands generally.

Map 5 Stream Buffers
Upper Monocacy River Watershed In Frederick County

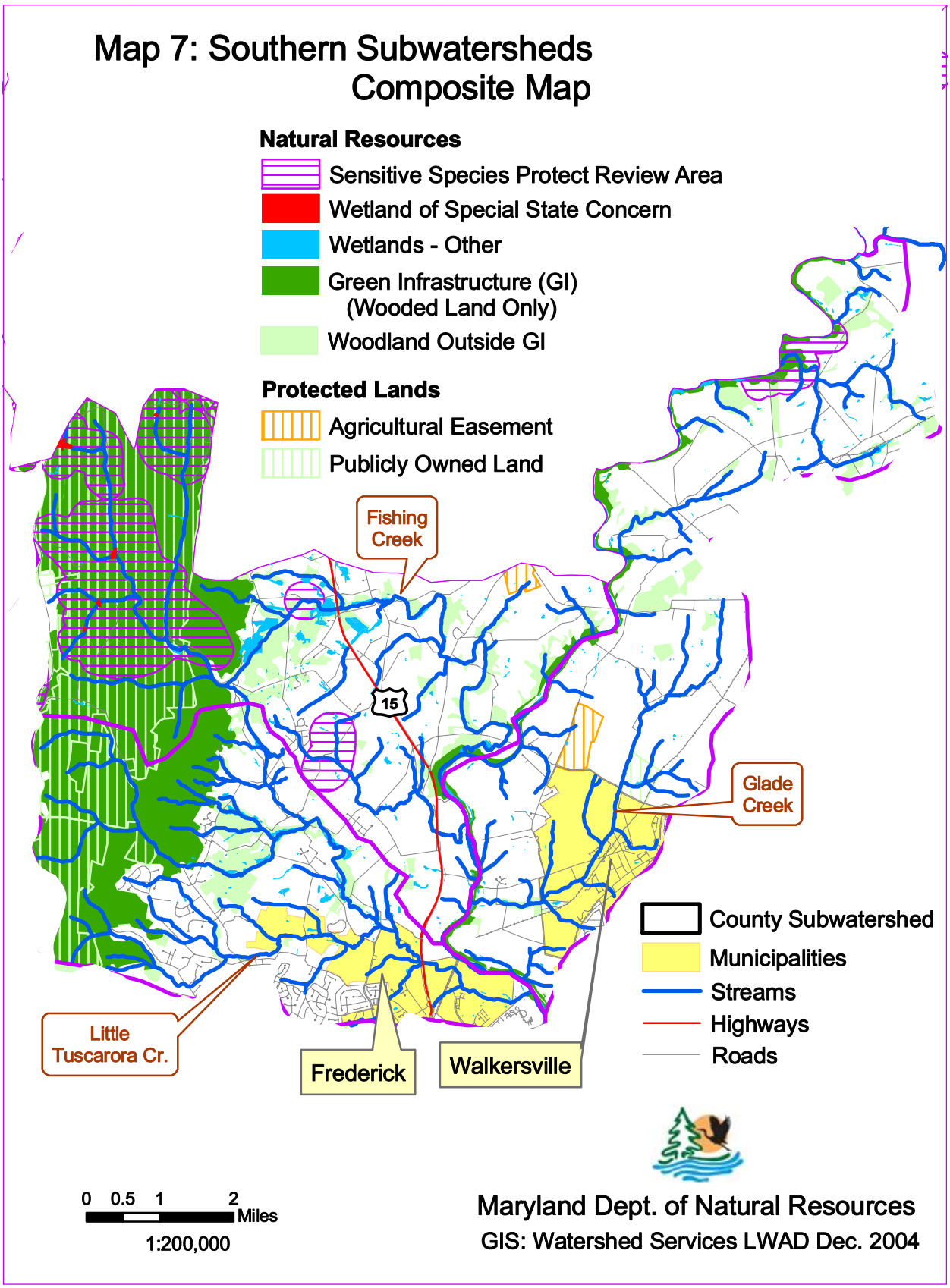


Maryland Dept. of Natural Resources
GIS: Watershed Services LWAD Dec. 2004
Stream Buffer Plantings: DNR Forest Service
Land Use Data: MDP 2002
Streams: USGS

Map 6: Northern Subwatersheds Composite Map



Map 7: Southern Subwatersheds Composite Map



Maryland Dept. of Natural Resources

GIS: Watershed Services LWAD Dec. 2004

Land Use and Land Cover

PRIORITY FUNDING AREAS (PFAS)

The Maryland State Department of Planning requires localities to identify Priority Funding Areas that meet certain criteria including density and public services. State-approved PFAs are locations where development is encouraged. Such areas are eligible for specified state funding. The Upper Monocacy River Watershed contains four PFAs:

- Emmitsburg, which is located in the northeastern portion of the watershed where Route 140 and Route 15 intersect;
- Thurmont, which is located in the central portion of the watershed where Route 15 intersects with both Route 77 and Route 550;
- Walkersville, which is located in the southern portion of the watershed east of the Monocacy River; and
- Frederick, which is located in the southern portion of the watershed just west of the Monocacy River

Comment areas are areas that do not meet all of the criteria for Priority Funding Areas, yet are still locally designated growth areas. All PFAs with the exception of Walkersville contain additional Comment Areas because they were designated by the county but determined by the Maryland Department of Planning (MDP) not to meet PFA criteria for zoning density. Approximately 8% of the watershed's residential acres are located in the Comment Areas (Map 8).

GROWTH TRENDS

As of October 2004, residential development within the Upper Monocacy River Watershed comprised 6% of its roughly 130,000 acres. Historical and current development patterns are somewhat sporadic and dispersed (Map 9). Of the watershed's residentially developed acres, 54% are located outside PFAs, 36% are located inside PFAs, and 10% are located in Comment Areas. The majority of residential development is low-density residential development (LDR).

LAND USE CHAGES BETWEEN 1973 AND 2002

Approximately 9,300 acres of agricultural and resource lands were converted to developed lands (residential, commercial and industrial) from 1973 to 2002.

RESIDENTIAL GROWTH PROJECTIONS

MDP's growth projections indicate that an additional 7,100 residential parcels will be improved between 2002 and 2025. Of these newly improved residential parcels, 62% will be developed inside PFAs, 2 % will be developed in Comment Areas, and 36% will be developed outside PFAs. The average residential lot size outside the PFAs is 23 times greater than it is inside PFAs.

PROTECTIVE ZONING OUTSIDE OF PFAS

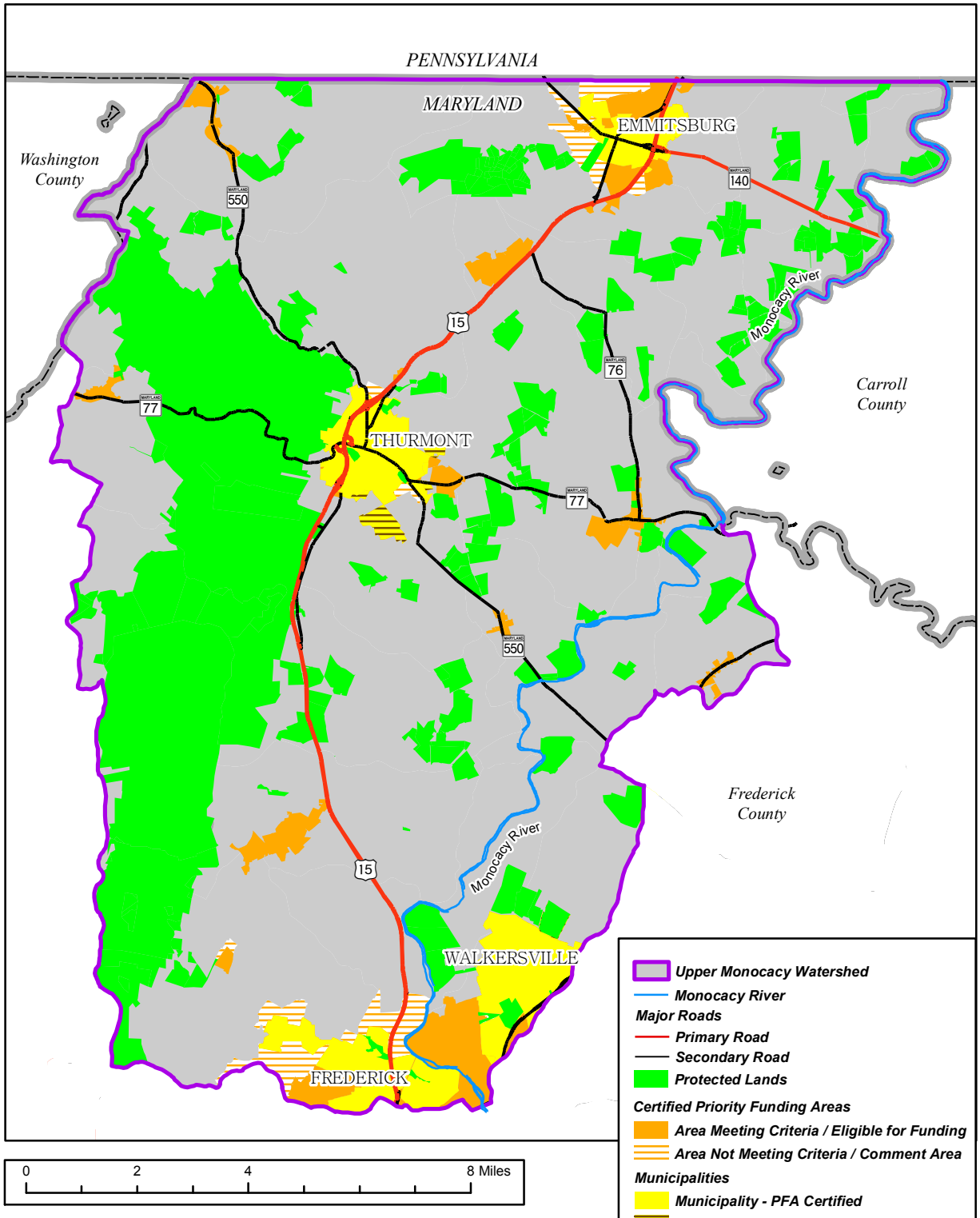
MDP assesses rural and resource zoning to measure its ability to protect lands from subdivision and fragmentation through its three "Generalized Zoning" categories. These categories are based on typical lot yields:

1) Most Protective Zoning, yields one residential lot or fewer per 20 acres of land
2) Moderately Protective Zoning, yields one lot per 10-20 acres
3) Least Protective Zoning, yields one lot per 1-10 acres

Of the nearly 120,000 acres outside PFAs and Comment Areas, restrictive zoning protects nearly 112,000 acres. Most Protective Zoning constitutes 60% of the watershed. While Least Protective Zoning characterizes almost 40%, with the majority occurring in Federal and State protected lands of the Catoctin Mountains and Catoctin Mountain Park.

Upper Monocacy Watershed

Map #8: Priority Funding Areas and Protected Lands



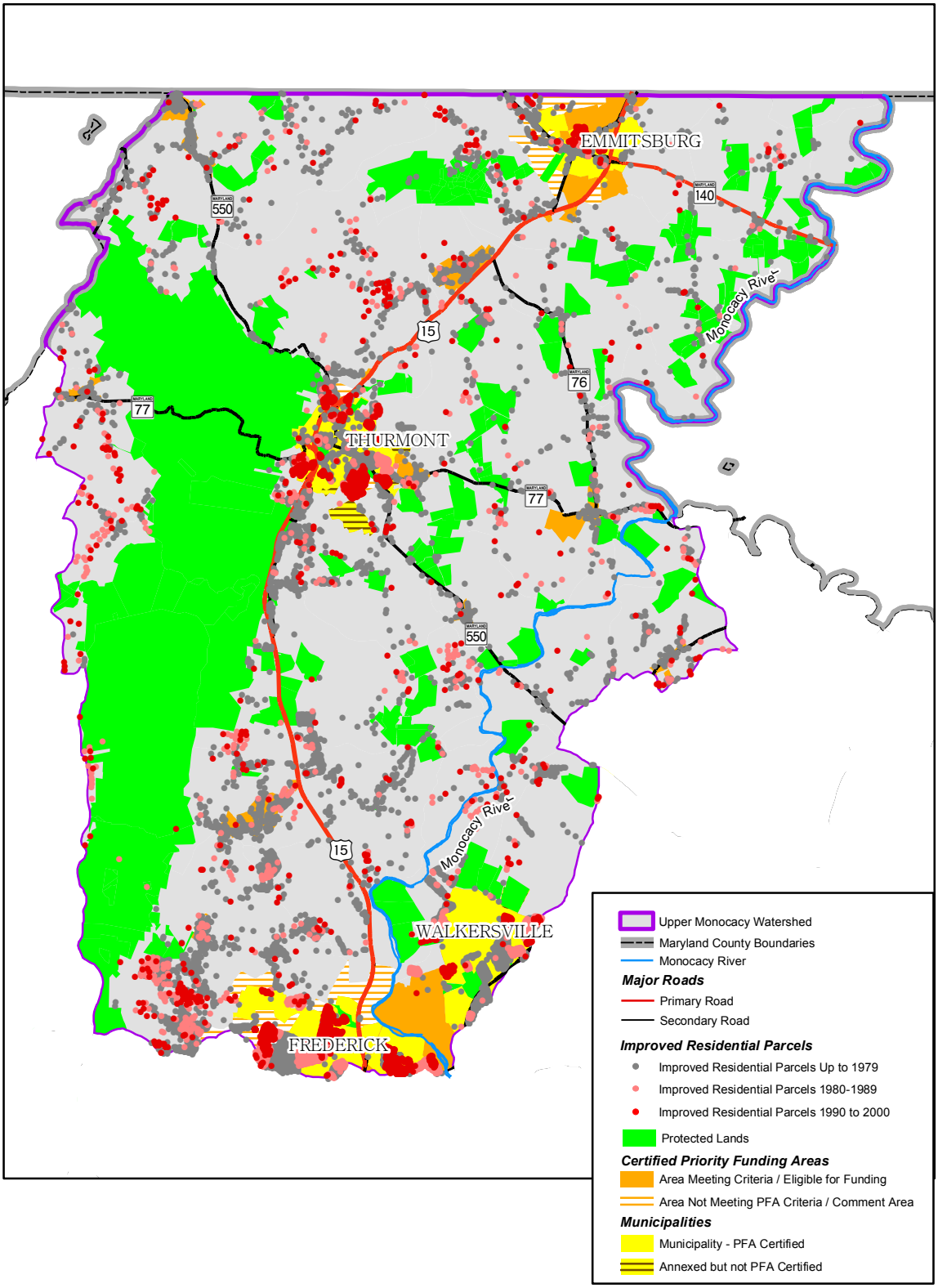
Note: County-wide protected lands data was updated in November 2004.

Maryland Department of Planning
Land Use Planning and Analysis
Robert L. Ehrlich Jr., Governor - Michael S. Steele, Lt. Governor - Audrey E. Scott, Secretary

November 2004

Upper Monocacy Watershed

Map 9: Improved Residential Parcels



IMPERVIOUS AREA

Roads, parking areas, roofs and other human constructions are collectively called impervious surface. Impervious surface blocks the natural seepage of rain into the ground. Unlike many natural surfaces, impervious surface typically concentrates stormwater runoff, accelerates flow rates and directs stormwater to the nearest stream.

Watersheds with small amounts of impervious surface tend to have better water quality in local streams than watersheds with greater amounts of impervious surface. The rural character in the northern area of the Upper Monocacy River Watershed contributes to very low average imperviousness between 1 and 2 percent for those subwatersheds. Two relatively suburbanized subwatersheds at the southern, downstream end of the WRAS area have significantly higher average imperviousness. The Glade Creek subwatershed that encompasses portions of the Walkersville area has an average imperviousness of nearly 2.4 percent.

For the Tuscarora Creek subwatershed, which includes some of the northern suburbs around the City of Frederick, imperviousness averages 3.3 percent. In this subwatershed, the impervious areas tend to be downstream near the City of Frederick. However, upstream areas in the subwatershed are characterized by steep forestland with a few large lot subdivisions and a smaller proportion of impervious area.

Synoptic Survey

(Excerpted from full report dated December 2004; available at http://www.dnr.state.md.us/watersheds/surf/proj/wras.html)

A nutrient synoptic survey was conducted during April 2004 in the Upper Monocacy River Watershed as part of the Upper Monocacy WRAS. Samples were analyzed from 105 sites throughout the watershed.

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 nitrogen compounds are carried dissolved in groundwater rather than in surface runoff. The higher nitrogen concentrations in the late winter and early spring reflect the higher proportion of nitrogen rich shallow groundwater present in the base flow at this time of year. Nitrogen concentrations are reduced in summer as the proportion of shallow groundwater is reduced through plant uptake, and replaced by deeper groundwater 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 the anoxic water column and/or sediment conditions, sediment in surface runoff from areas having had surface applied phosphorus, groundwater from phosphorus saturated soils, and point source discharges.

Ranges used for nutrient concentrations and yields (Table 1) 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 1. Nutrient Ranges and Rating

Rating	NO2+NO3 Concentration mg/L	NO2+NO3 Yield Kg/ha/day	PO4 Concentration mg/L	PO4 Yield 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 105 sites throughout the watershed. The sample from one site was lost in transit to the laboratory. While all sampling was conducted in Frederick County, some of the streams sampled drained portions of Adams County, Pennsylvania.

Nitrate/nitrite concentrations were found to be excessive in eleven subwatersheds, high in seven, moderately elevated in twenty-six others, and baseline in the remaining sixty-one subwatersheds. Instantaneous nitrate/nitrite yields were found to be excessive in twenty-eight subwatersheds, high in nineteen, moderate in twenty, and baseline in the remaining thirty-seven.

Excessive concentrations of orthophosphate were found in twenty-one subwatersheds, high concentrations in thirteen, moderate concentrations in thirty, and the remaining forty below baseline. Orthophosphate yields were found to be excessive in two subwatersheds, high in one subwatershed, moderate in eleven, and baseline in the remaining ninety. No anomalies were found in the insitu measurements of dissolved oxygen, or temperature.

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 subwatersheds 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 in-stream activities of livestock or construction can produce apparently elevated orthophosphate concentrations and yields at base flow.

Fifteen subwatersheds had relatively high conductivity (>300mmhos/cm) typical of limestone influence. Two subwatersheds had extremely high conductivity (> 800 mmhos/cm) that did not appear to be associated with the local limestone geology. Thirteen subwatersheds in the Fishing Creek drainage had extremely low conductivity (<50 mmohs/cm) indicative of streams susceptible to acid deposition degradation. Elevated pH values generally followed the high conductivity due to the buffering capacity of limestone influenced water.

Stream Corridor Assessment (SCA)

(Excerpted from full report dated November 2004; available at http://www.dnr.state.md.us/watersheds/surf/proj/wras.html)

EPA Requirement A-3

To support the development of the Upper Monocacy WRAS, a Stream Corridor Assessment (SCA) was completed in the Upper Monocacy River Watershed. The SCA was developed by Maryland's Department of Natural Resources (DNR) to help identify the locations of environmental problems and prioritize restoration opportunities on a watershed basis. As part of the SCA, 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, and unusual conditions. Each potential problem site is ranked on a scale of one to five for its severity, correctibility, 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.

SCA survey fieldwork for the Upper Monocacy River Watershed began in March 2004 and was completed by April 2004. To complete the survey, field crews walked over 130 miles of stream within the 6 subwatersheds of the Upper Monocacy: Glade Creek (18.02 miles), Tuscarora Creek (21.04 miles), Fishing Creek (19.52 miles), Hunting Creek (37.16 miles), Owens Creek (15.57 miles), Toms Creek (28.50 miles). (Map 10 and Map 11).

In the areas that were surveyed, field teams identified 251 potential environmental problem sites. At the time of the survey, the most frequently observed problem sites were inadequately forested stream buffers, reported at 102 sites (67.51 miles on the left bank and 67.81 miles on the right bank), and erosion sites, reported at 49 sites (or 22.74 miles of stream). Both inadequate buffers and erosion sites ranked from very severe to minor in severity. Other potential environmental problems recorded during the survey included: 33 fish barriers, 24 pipe outfalls, 17 trash dumping sites, 11 channel alterations, 8 unusual conditions, 7 exposed pipes, and no in- or near-stream construction sites. Additionally, crews recorded descriptive habitat condition data at 54 representative sites.

Identified Problem Sites

INADEQUATE BUFFERS

One hundred and two inadequate buffer sites were identified with a total left bank length of 67.51 miles and right bank length of 67.81 miles in the Upper Monocacy River survey. Approximately 48.5% of all right banks and 48.26% of all left banks were inadequately buffered. Glade Creek had the greatest number of inadequate buffers while Fishing Creek had the least.

As survey crews evaluate inadequate buffer sites, they are asked to consider livestock access and wetland potential, based on current conditions, bank height, and bank slope. Crews noted that 28 of the 102 sites had good wetland potential and there were 15 instances of livestock access.

EROSION SITES

Forty-nine erosion sites were identified equaling 22.74 miles of stream bank. 16.26% of the stream banks in the Upper Monocacy were recorded as eroding with Tuscarora Creek having the highest percentage (38.45%) and Hunting Creek having the lowest (2.26%).

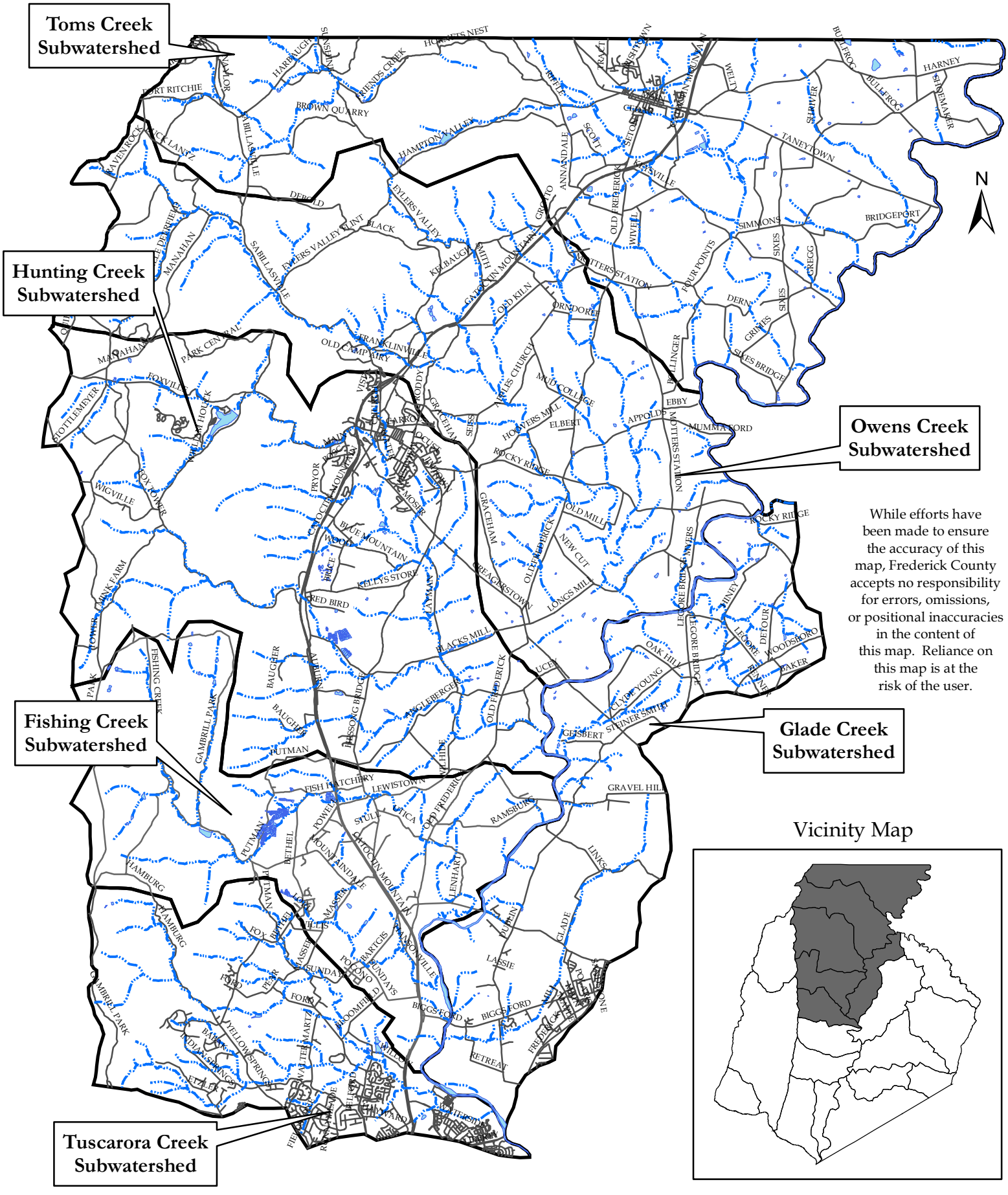
FISH BARRIERS

Thirty-three fish barriers were identified in the Upper Monocacy River survey. Total barriers blocking full upstream movement of fish were observed at 22 sties. Partial barriers were found at 9 sites and temporary barriers were found at 2 sites. The types of barriers include: road crossings, dams, debris, channelized stream, cement crossing, railroad crossing, and natural falls.

PIPE OUTFALLS

Twenty-four pipe outfalls were identified in the Upper Monocacy River survey. Of the outfalls observed, 9 were dry when surveyed and 13 had a clear discharge with no associated odor. The two remaining pipe outfalls had a colored discharge. Those with a dry weather discharge were given a more severe ranking based on the type of discharge.

Map 10: Upper Monocacy River Watershed Stream Reaches



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Vicinity Map

Map 11: Upper Monocacy River Watershed Stream Walked

Walked Stream Reaches

Toms Creek Subwatershed

Hunting Creek Subwatershed

Owens Creek Subwatershed

Fishing Creek Subwatershed

Glade Creek Subwatershed

Tuscarora Creek Subwatershed

N

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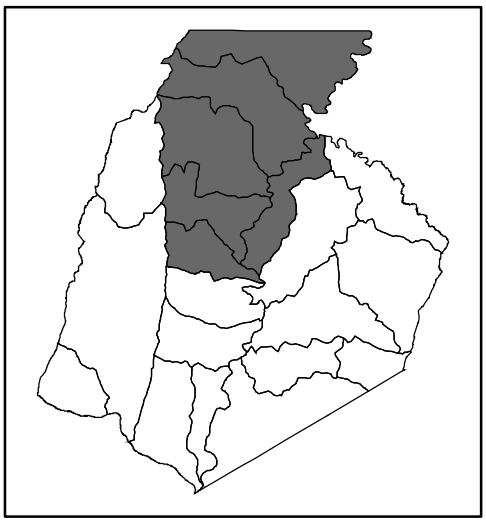
Vicinity Map



TRASH DUMPING

Seventeen trash dumping sites were identified in the Upper Monocacy River survey. The types of trash contained at the sites include: residential waste, tires/construction, construction, residential/tires, industrial, and residential/farm. All sites were found on private land with 6 of the sites not suitable for volunteer clean up.

CHANNEL ALTERATIONS

Eleven channel alterations were identified in the Upper Monocacy River survey. Channel alterations were found in Hunting Creek, Fishing Creek, and Tuscarora Creek. Six sites were concrete, two were earth channels, and 3 were rip-rap.

UNUSUAL CONDITIONS

Survey teams record unusual conditions to note the location of anything out of the ordinary observed during the survey or to provide additional written comments on a specific problem site. Eight unusual conditions were identified in the Upper Monocacy River survey. The conditions noted varied from a dry stream to wetland potential to livestock access and others.

EXPOSED PIPES

Seven exposed pipes were identified in the Upper Monocacy River survey. Four of the pipes were exposed above the stream while the other three were exposed across the bottom of the stream.

REPRESENTATIVE SITES

Survey crews evaluated fifty-four representative sites in the Upper Monocacy River survey. Those sites that were given poor or marginal ratings will be examined for restoration potential while sites given optimal and suboptimal ratings will be examined for preservation potential.

Table 2: Sites by Type of Problem

Identified Problems	Total Number of Sites	Total Estimated Length	Very Severe	Severe	Moderate	Low Severity	Minor	Unknown
Channel Alteration	11	N/A	0	0	0	5	6	0
Erosion Site	49	120,153 feet (22.74 miles)	1	9	16	12	11	0
Exposed Pipe	7	N/A	0	1	1	5	0	0
Fish Barrier	33	N/A	3	5	8	11	6	0
Inadequate Buffer	102	Left: 356,517 feet (67.51 miles) Right: 358,215 feet (67.81 miles) Total: 711,732 feet (178.98 miles)	7	18	33	31	13	0
Pipe Outfall	24	N/A	0	2	4	9	9	0
Trash Dumping	8	N/A	0	5	6	3	3	0
Unusual Condition	8	N/A	1	2	2	1	1	1
Total	**251**		**12**	**42**	**70**	**77**	**49**	**1**
Representative Sites	54							
Comments	8							

Table 3: Sites by Subwatershed

Stream Name	Channel Alteration	Erosion Site	Exposed Pipe	Fish Barrier	Inadequate Buffer	Pipe Outfall	Trash Dumping	Unusual Condition	Total	Comment	Representative Site
Fishing Creek	6	13 sites (4.85 miles)	3	7	18 sites (left bank: 6.6 miles; right bank: 7.4 miles)	5	3	4	**59**	--	11
Glade Creek	--	9 sites (3.9 miles)	1	5	15 sites (left bank: 14.92 miles; right bank: 14.64 miles)	1	1	1	**33**	3	8
Hunting Creek	4	4 sites (0.84 miles)	--	4	16 sites (left bank: 10.64 miles); right bank: 10.99 miles)	1	2	1	**32**	--	9
Owens Creek	--	7 sites (2.90 miles)	--	2	17 sites (left bank: 7.48 miles; right bank: 7.01 miles)	2	3	1	**32**	1	8
Toms Creek	--	3 sites (2.16 miles)	1	8	20 sites (left bank: 15.03 miles; right bank: 15.44 miles)	13	4	--	**49**	--	12
Tuscarora Creek	1	13 sites (8.09 miles)	2	7	16 sites (left bank: 12.84 miles; right bank: 12.33 miles)	2	4	1	**46**	4	6

Summary of Subwatersheds

GLADE CREEK SUBWATERSHED

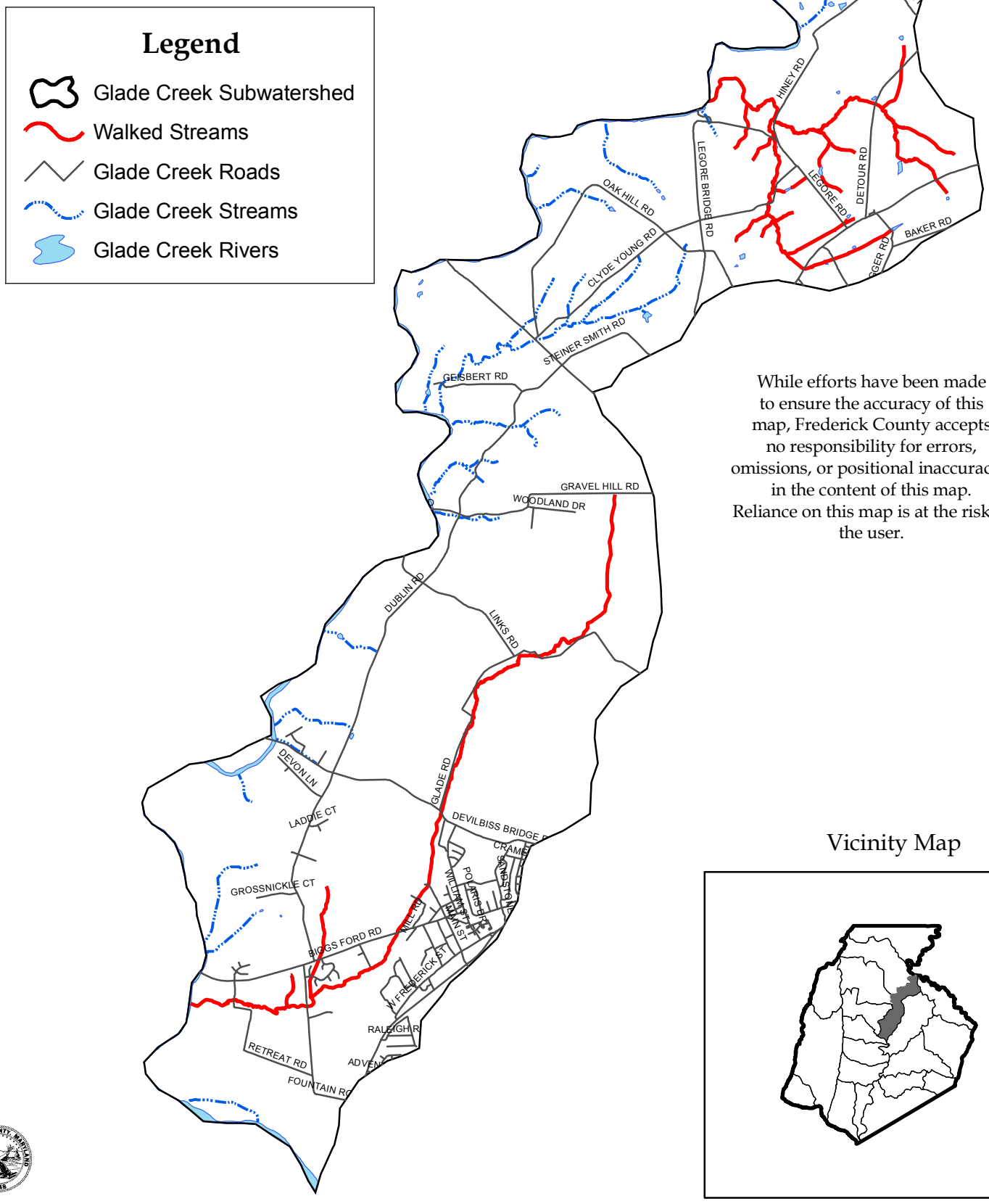
Two stream segments, totaling 18.02 miles, were walked within the Glade Creek subwatershed: Glade Creek and an unnamed tributary referred to as Legore Bridge. The Glade Creek subwatershed is the only subwatershed in the Upper Monocacy that drains into the Monocacy River from the east (Map 12).

The headwaters of Glade Creek originate in the town of Woodsboro. The creek then flows southwest towards the Monocacy River. After leaving Woodsboro, Glade Creek flows through the Glade Valley Golf Club. It continues flowing south parallel to Glade Road where it passes just west of Heritage Farm Park before crossing Devilbiss Bridge Road and entering Walkersville. While flowing through Walkersville, Glade Creek flows through the subdivisions of Winter Brook, Colony Village, and Fountain Rock. As it leaves Walkersville it begins to flow west running parallel to Biggs Ford Road crossing Fountain Rock Road and Retreat Road. It drains into the Monocacy River just south of Biggs Ford Road.

The Legore Bridge section has its headwaters originating in the New Midway area at Woodsboro Pike (MD 194). The tributaries that drain into this section of the Monocacy River flow northwest through the subdivision of Sharrer Heights crossing Clyde Young Road, Legore Road, Detour Road and Hiney Road. It drains into the Monocacy River just north of the Legore Bridge.

An average of 14.78 miles out of 18.02 miles of walked stream were noted as having inadequate buffers. This is equal to approximately 82% of the streams walked. 3.9 miles out of the 18.02 miles walked were noted as being eroded equaling approximately 21% of the walked streams. Crews gave 8 sites the highest rating for wetland potential, noted that 2 sites had recently established buffers, and found 6 cases of livestock access to the stream. Glade Creek has the highest percentage of inadequate buffers of all six subwatersheds. The land use in this

Map 12: Glade Creek Subwatershed Walked Stream Reaches



watershed is primarily agricultural with growth pressure coming from Walkersville. Though the watershed has the highest percentage of inadequate buffers, it does not have as much erosion as might be expected. This may be due to the fact that the soil is not as highly erodible and there is less of a gradient change from the headwaters to the confluence than the subwatersheds on the western side of the Monocacy with headwaters located in the Catoctin Mountains.

TUSCARORA CREEK SUBWATERSHED

A total of 21.04 miles were walked within the Tuscarora Creek subwatershed for the SCA. These miles include Little Tuscarora Creek and its tributaries that drain into the main stem of Tuscarora Creek and flow south to its confluence with the Monocacy River (Map 13).

The headwaters of Little Tuscarora Creek are located within Gambrill State Park. From there, the creek flows east towards the City of Frederick. It flows parallel to Etzler Road before crossing Rocky Springs Road, Indian Springs Road, and Yellow Springs Road. After crossing Yellow Springs Road, Little Tuscarora Creek enters Frederick City limits. In this area, its tributaries flow through numerous subdivisions including Clover Hill, Meadowbrook, and North Crossing. Little Tuscarora Creek drains into the main stem of Tuscarora Creek just northwest of Catoctin Mountain Highway (US 15) at Opossumtown Pike.

The main stem of Tuscarora Creek continues to flow east, passing through the Willow Brook subdivision and then crosses Catoctin Mountain Highway (US 15). It then flows through the subdivisions of Tuscarora Knolls and Woman's Mill before draining into the Monocacy River just north of Liberty Road (MD 26).

An average of 12.59 miles out of 21.04 miles of stream walked were noted as being inadequately buffered equaling approximately 60% of the walked streams. 8.09 miles out of the 21.04 miles walked were noted as being eroded equaling approximately 40% of the walked streams. Crews gave 4 sites the highest rating for wetland potential, one site was noted as having a recently established buffer and there were no cases of livestock access to the stream. Tuscarora Creek has the highest percentage of eroded stream banks of all six subwatersheds. Though the subwatershed does not have the highest percentage of inadequate buffers, a lot of the watershed has highly erodible soil. There is also an elevation and stream gradient change increasing stream flow velocities. The lower portion of the subwatershed is also facing development pressures from Frederick City as well as an increase in impervious surfaces.

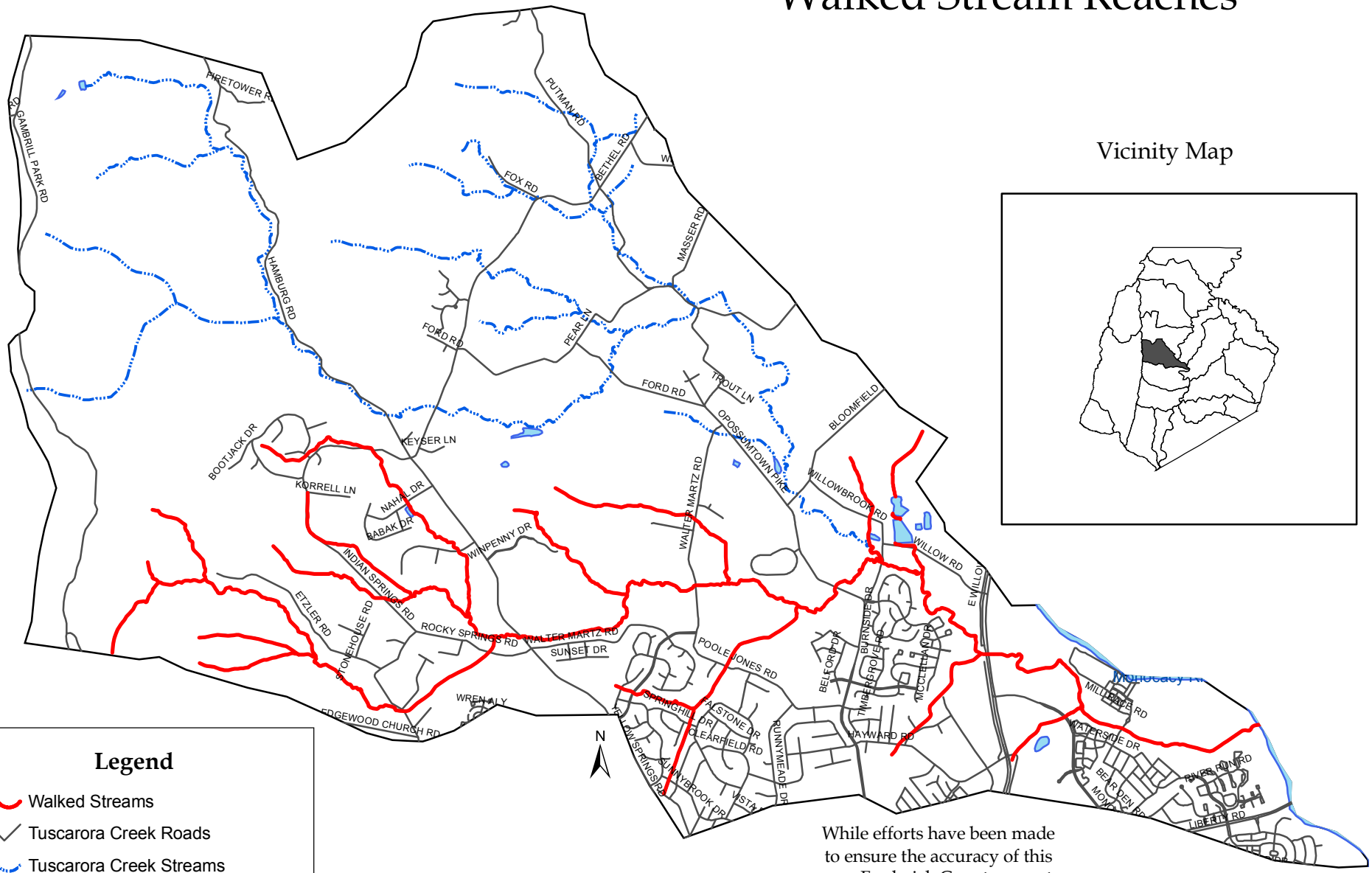
FISHING CREEK SUBWATERSHED

The section of Fishing Creek that was walked for the SCA includes the main stem and its tributaries below the Fishing Creek Reservoir to its confluence with the Monocacy River. A total of 19.52 miles were walked within this subwatershed. The headwaters of Fishing Creek are located in the Frederick City Watershed (Map 14).

After leaving the Fishing Creek Reservoir, Fishing Creek flows east through a series of fish ponds before crossing Catoctin Mountain Highway (US 15). Once crossing US 15, Fishing Creek flows through the rural hamlets of Lewiston and Utica. After passing through Utica, the creek takes a more southerly flow as it crosses Lenhart Road and Devilbiss Bridge Road before draining into the Monocacy River.

The tributaries of Fishing Creek flow through numerous subdivisions including Lewisdale Estates, Ziegler Estates, and Utica Mills Estates, to name a few.

Map 13: Tuscarora Creek Subwatershed
Walked Stream Reaches

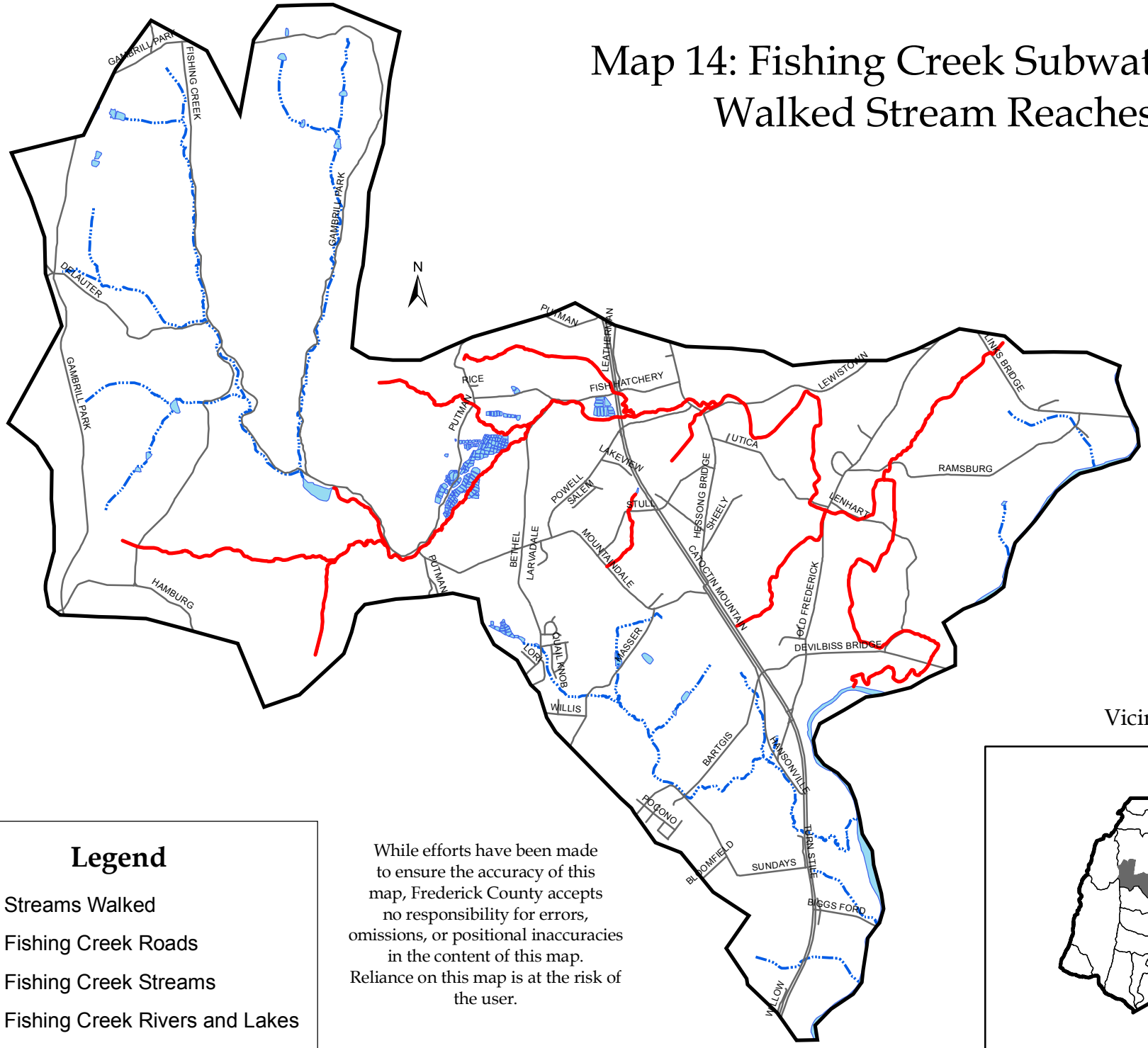


Vicinity Map

Legend

- Walked Streams
- Tuscarora Creek Roads
- Tuscarora Creek Streams
- Tuscarora Creek Rivers and Lakes
- Tuscarora Creek Subwatershed
- County Boundary

Map 14: Fishing Creek Subwatershed Walked Stream Reaches



Legend

- Streams Walked
- Fishing Creek Roads
- Fishing Creek Streams
- Fishing Creek Rivers and Lakes

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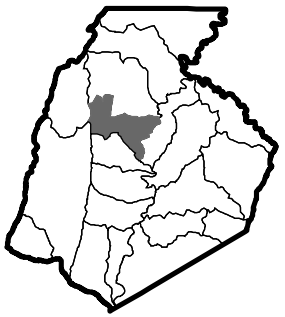
Vicinity Map



An average of 7 miles of the 19.52 miles of stream walked were noted as having inadequate buffers equaling approximately 36% of the walked streams. 4.85 miles out of the 19.52 miles of walked streams were noted as being eroded equaling approximately 25% of the walked streams. Crews gave 5 sites the highest rating for wetland potential, found no recently established buffers and four cases of livestock access to the stream. As mentioned above, the headwaters of Fishing Creek are located in the Frederick City Watershed, which is the drinking water source for Frederick City, increasing the need for protection and restoration of streams in this subwatershed.

HUNTING CREEK SUBWATERSHED

Three sections of stream within the Hunting Creek subwatershed were walked for the SCA totaling 37.16 miles (Map 15).

1. The first section of stream includes the main stem of Hunting Creek starting at its confluence with Bear Branch in Cunningham Falls State Park. As Hunting Creek leaves the park, it flows through the town of Thurmont. Just after leaving Thurmont, 3 tributaries drain into the creek: High Creek, Muddy Creek, and Graceham Run. All of Graceham Run was walked, High Creek was not walked, and the only section of Muddy Run that was walked is the stretch west of Catoctin Mountain Highway (US 15) to the confluence with Hunting Creek.

   From here, Hunting Creek flows south crossing Hessong Bridge Road and runs parallel to Layman Road until it crosses Blacks Mill Road and reaches the confluence of Little Hunting Creek.

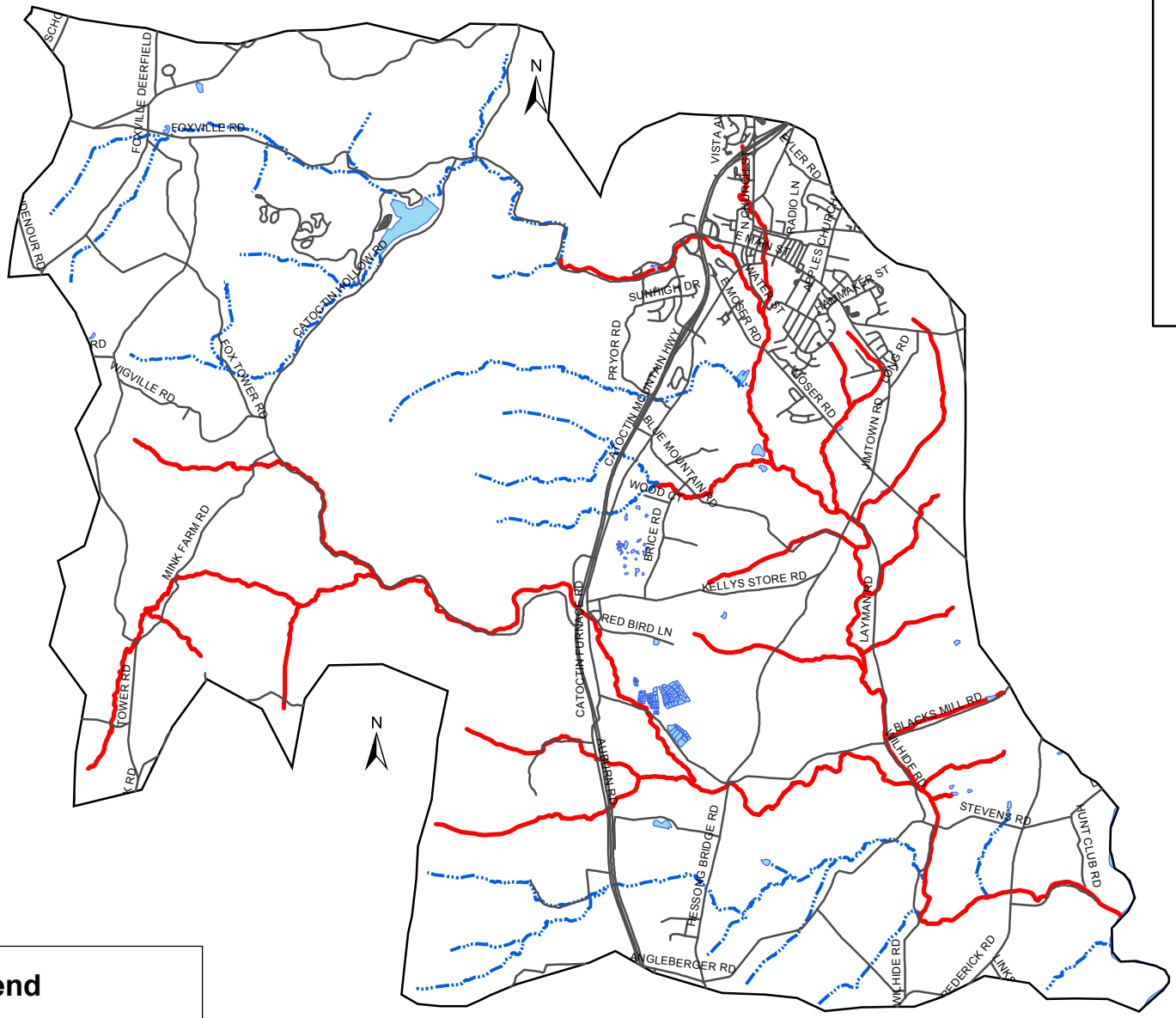
2. The second section of stream includes Bussard Branch and Little Hunting Creek. The headwaters of Bussard Branch are located just west of the Frederick City Watershed. It flows east until its confluence with Little Hunting Creek at Catoctin Hollow Road.

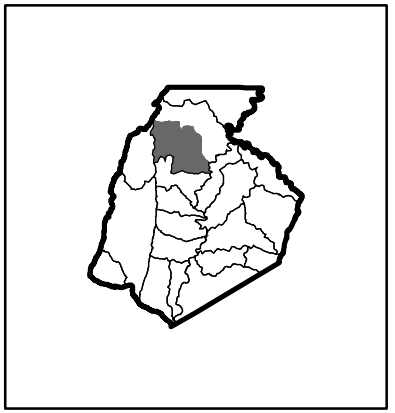
   The headwaters of Little Hunting Creek are located west of Cunningham Falls State Park near Leisure Mountain. The creek flows southwest along Catoctin Hollow Road through Cunningham Falls State Park. After its confluence with Bussard Branch, the creek continues to flow parallel to Catoctin Hollow Road until it crosses Catoctin Mountain Highway (US 15) where it begins to follow Blacks Mill Road to its confluence with Hunting Creek.

3. The third section of stream is the main stem of Hunting Creek from the confluence with Little Hunting Creek to its confluence with the Monocacy River.

   Hunting Creek flows south along Wilhide Road until just beyond its confluence with Sandy Run. Sandy Run was not walked for the SCA. At this point, Hunting Creek turns and flows east crossing Old Frederick Road and Shyrock Road. Hunting Creek drains into the Monocacy River where Shyrock Road meets the river.

An average of 10.18 miles out of the 37.16 miles of walked stream were noted as having inadequate buffers equaling approximately 29% of the walked streams. 0.84 miles out of the 37.16 miles of walked streams were noted as being eroded equaling approximately 2% of the walked streams. Crews gave 7 sites the highest rating for wetland potential, found no recently established buffers and no cases of livestock access to the stream. Hunting Creek had both the lowest percentage of inadequate buffers and erosion. All inadequate buffers and erosion sites are located east of US 15 where both development and agricultural activities predominate.





Vicinity Map

Legend

- Hunting Creek Subwatershed
- Walked Streams
- Hunting Creek Streams
- Hunting Creek Rivers and Lakes
- Hunting Creek Roads

Map 15: Hunting Creek Subwatershed Walked Stream Reaches

OWENS CREEK SUBWATERSHED

Beaver Branch and its tributaries were the only sections of stream that were walked in the Owens Creek subwatershed and totaled 15.57 miles (Map 16).

The headwaters of Beaver Branch are located near the intersection of Catoctin Mountain Highway (US 15) and Motters Station Road (MD 76) at Mount Saint Mary's University. Beaver Branch flows south through the subdivisions of Wivell Estates and Thornbrook, crossing Catoctin Mountain Highway (US 15) and Kiln Road. It continues south crossing Orndorff Road, Old Frederick Road, and Appolds Road. Beaver Branch drains into Owens Creek just south of Rocky Ridge Road (MD 77).

A total of 32 problem sites were identified on Beaver Branch. An average of 7.2 miles out of the 15.57 miles of walked stream were noted as having inadequate buffers equaling approximately 47% of the walked streams. 2.9 miles out of 15.57 miles of walked stream were noted as being eroded equaling approximately 19% of the walked streams. Crews gave one site the highest rating for wetland potential, found 5 sites with recently established buffers and 2 cases of livestock access to the stream.

TOMS CREEK SUBWATERSHED

Four stretches of stream within the Toms Creek subwatershed were walked consisting of 28.5 miles. These streams include: Friends Creek, Flat Run, Middle Creek, and Cattail Branch (Map 17).

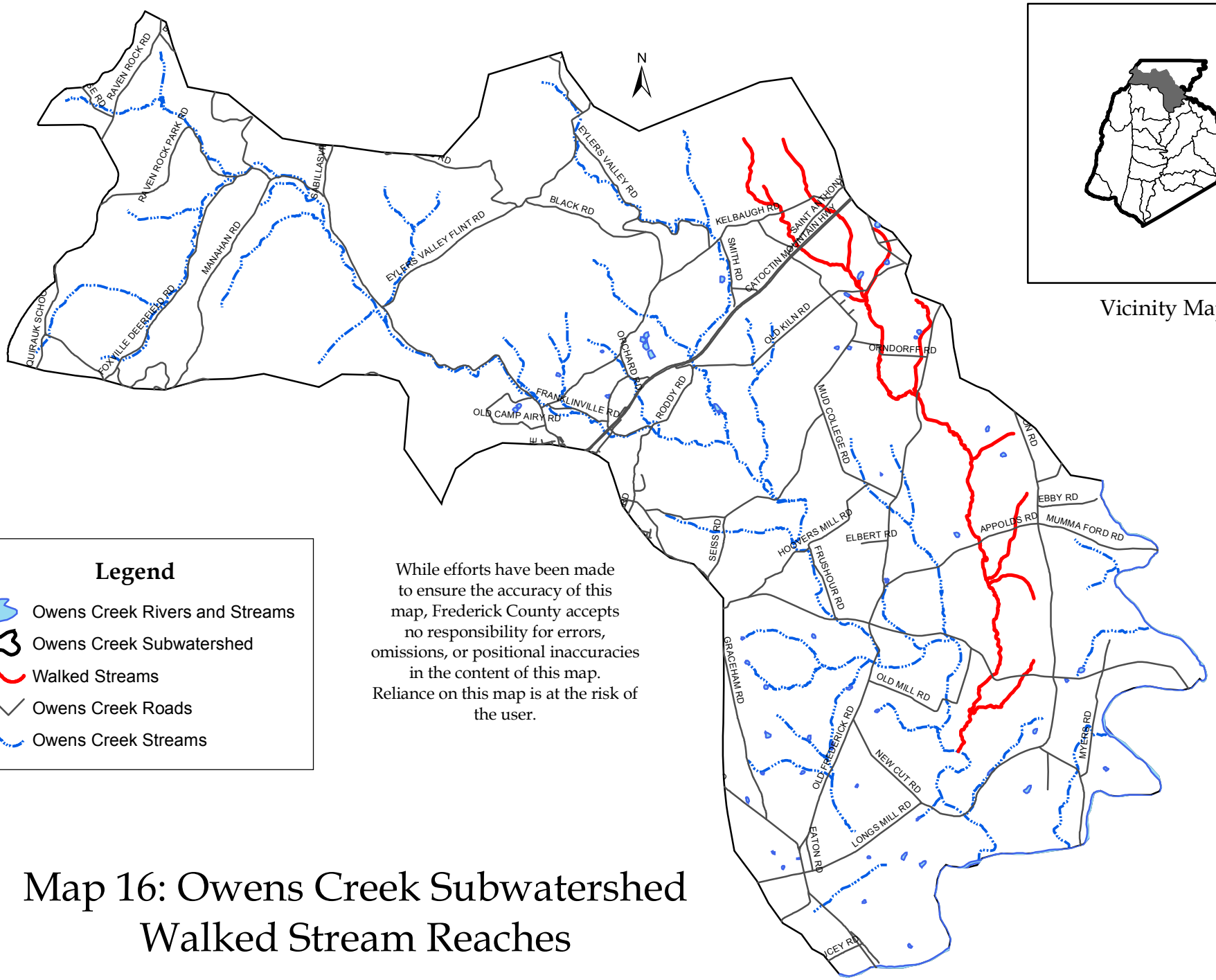
1. The headwaters of Friends Creek are located along Skunk Hollow Road, Fort Ritchie Road and Highland Road in Sabillasville east of Sabillasville Road (MD 550). They join to form Friends Creek and flow east crossing Harbaugh Road. At this point, tributaries from the north (Adams County, PA.) and the south join Friends Creek as it flows along Valley Road and then Friends Creek Road. It follows Friends Creek Road all the way to the Adams County, PA/MD state line.

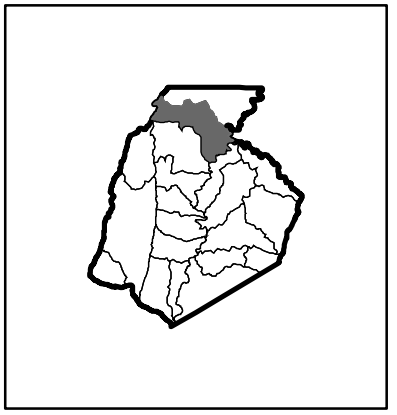
2. Flat Run flows south from Adams County, PA through the Northgate subdivision into the town of Emmitsburg. While flowing through Emmitsburg, it crosses Seton Ave N (Business 15), Main St. E, and Catoctin Mountain Highway (US 15). It drains into Toms Creek just south of Taneytown Pike (MD 140).

3. Middle Creek flows south from Adams County, PA crossing Harney Road and Taneytown Pike (MD 140). It joins Toms Creek just west of Four Points Bridge.

4. The main stem of Cattail Branch was walked. Its headwaters are located just north of Harney Road. Cattail Branch flows south along Shriver Road and begins to flow east as it crosses Bollinger School Road. It continues flowing southeast and crosses Taneytown Pike (MD 140) and Bridgeport Road before draining into the Monocacy River.

A total of 49 problem sites were identified in Toms Creek. An average of 15.2 miles out of the 28.5 miles of walked stream were noted as having inadequate buffers equaling approximately 53% of the walked streams. 2.16 miles out of the 28.5 miles of walked streams were noted as being eroded equaling approximately 7.6% of the walked streams. Crews gave 4 sites the highest rating for wetland potential, found 3 sites with recently established buffers, and 3 sites with livestock access. The land uses through which the walked stream reaches of Toms Creek subwatershed





Vicinity Map

Legend

- Owens Creek Rivers and Streams
- Owens Creek Subwatershed
- Walked Streams
- Owens Creek Roads
- Owens Creek Streams

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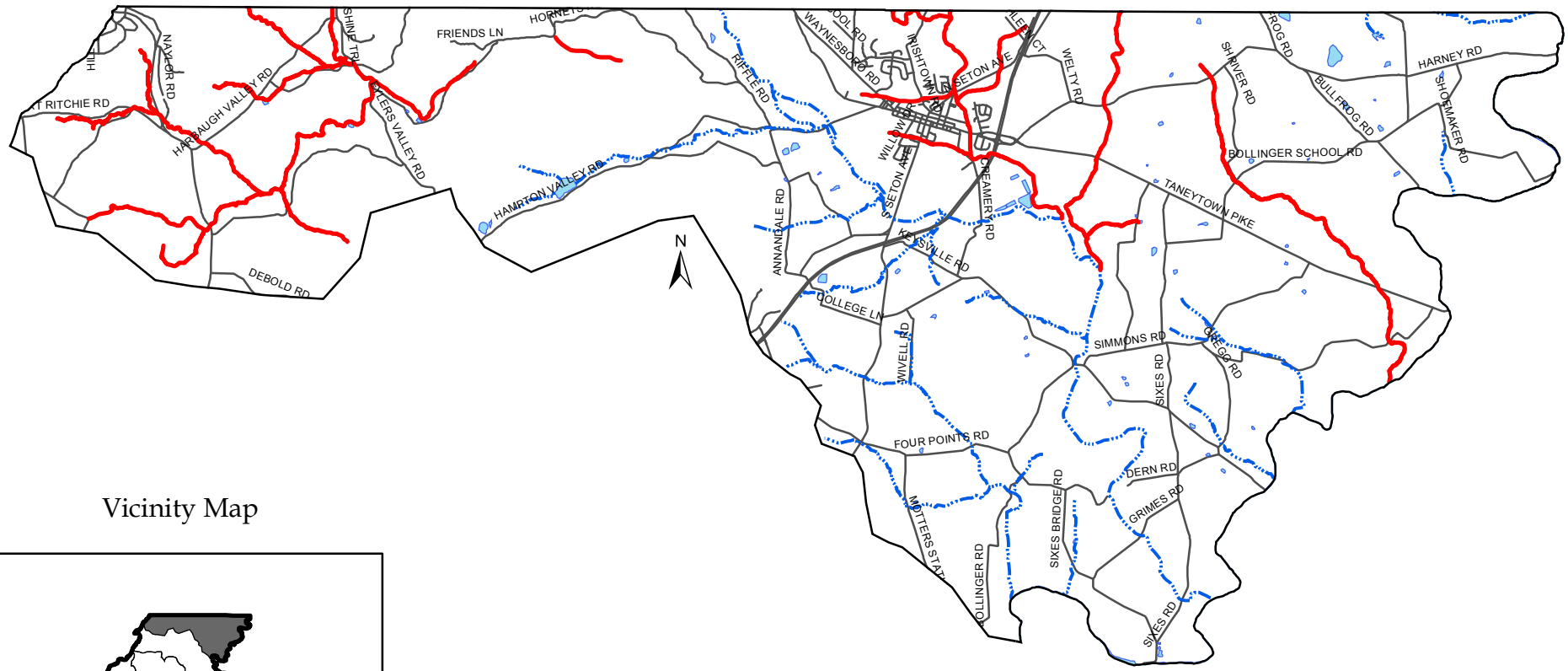
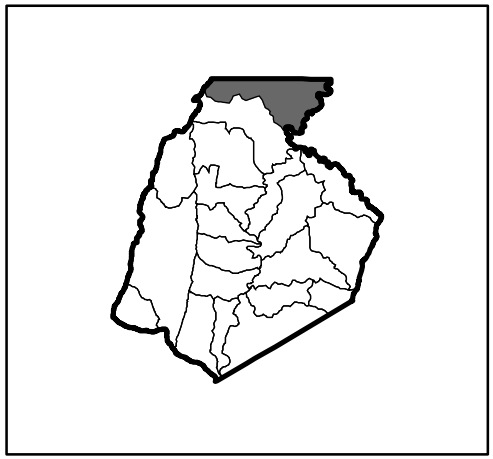
Map 16: Owens Creek Subwatershed Walked Stream Reaches

Map 17: Toms Creek Subwatershed
Walked Stream Reaches



Vicinity Map



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Legend

- Walked Streams
- Toms Creek Streams
- Toms Creek Roads
- Toms Creek Rivers and Lakes

flows are quite varied. There are pockets of development, agriculture, and pristine forested areas. Work within this subwatershed should include both restoration and protection (map 17).

Analysis: 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 September 2003, and grew organically in the twenty months that followed. Table 4 lists members of the Steering Committee and their affiliations. The Steering Committee subdivided into working groups to develop objectives for the WRAS plan. Member working group assignments are indicated in the Table below.

Table 4: Stakeholders

Participant	Affiliation	Agricultural Practices	Natural Resource Management	Sound Land Development	Citizen Practices	Municipal, Industrial , and Commercial Practices	Monitoring
Aaron Morehouse	ThorpeWood		X		X		
Adam Griggs	Hood College		X				X
Barry Lucey	Agricultural landowner	X					
Betsy Johnson	Community Commons				X		
Bryan Seipp	Potomac Conservancy				X	X	
Carole Larsen	Frederick Co. Planning Dept.			X			
Christi Harshman	Homewood Retirement				X	X	
Chris Judd	Tuscarora Landowner			X			
Darrell McCartney	Forestry Board	X	X	X			
Don Briggs	Catoctin Land Trust		X				
Elizabeth Prongas	New Forest Society		X				
Geordie Newman	Chesapeake Wildlife Heritage	X	X				
Hans Kefauver	Soil Conservation District	X					
James Voigt	Catoctin Mt. Park		X				
Jared Bartley	Canaan Valley Institute	X		X			
Jennifer Dotson	ICPRB		X		X		
Jen Staiger	Mt St. Mary's University						
Jessica Hunicke	DPW/WRAS & DNR SCA		X		X		

Participant	Affiliation	Agricultural Practices	Natural Resource Management	Sound Land Development	Citizen Practices	Municipal, Industrial, and Commercial Practices	Monitoring
Jim Gallion	Master Gardener				X		
Joe Metzger	Maryland Native Plant Soc., Catoctin Chapter						X
John Mullican	DNR Fisheries		X				
Kai Hagan	FRAN						
Kay Schultz	WRAS Coordinator	X	X				
Kelly Neff	MDE, wetlands		X				
Ken Shanks	DNR						
Ken Yetman	DNR						
Kim Dixon	Community Commons	X			X		
Marcia Watters	Sierra Club/Attorney						
Mark Seibert	Soil Conservation Dist.			X			
Mel Poole	Catoctin Mt. Park			X			
Michael Lucas	Town of Emmitsburg			X			
Niles Primrose	DNR						X
Pat Baumgartner	Trib Team Member	X					
Paul Allen	Agricultural Landowner	X					
Paul Eriksson	Watershed Forester		X		X		
Paul Lee	City of Frederick						
Rick Hood	Organic Farmer	X					
Rick May	Town of Thurmont						
Robert Black	Orchard Owner	X					
Sam Castleman	ThorpeWood						
Shannon Moore	DPW/NPDES					X	X
Tim Goodfellow	Frederick Co. Planning Dept	X		X			
Ursula Lemanski	NPS River & Trails						
Wink Hastings	NPS River & Trails						

The Steering Committee met bimonthly beginning in September 2003 for the nine months preceding the start of the grant period. In addition to selecting the stream reaches to be walked by SCA teams, the Steering Committee focused its meetings on learning about watershed issues faced by the towns of Emmitsburg (3/2004) and Thurmont (5/2004); the diversity and challenges to the fisheries in the watershed (7/2004); initiatives and concerns faced by upstream neighbors-

Adams County Watershed Alliance (3/2004) and Carroll County Water Resource Management staff (9/2004), among others. **Note:** Minutes of Steering Committee Meetings in Appendix E.

Given the considerable data available from the 130 miles of stream reaches walked, members of the Steering Committee joined in smaller teams and met for three days to analyze the SCA, Characterization and Synoptic Survey data (one-half day of analysis for each of the subwatersheds), including:

- Glade and Tuscarora on August 25th,;
- Fishing and Hunting on September 2nd; and
- Owens and Toms on September 16th.

Thirty-eight (38) priority sites were identified for proposed action during this process.

Community dialogue training was offered to key stakeholders by the Wye Oaks Center on the Eastern Shore during January 2004. Attending were Frederick County team members, a Hood college representative, organic farmer, and representatives of nonprofit partners ThorpeWood and Community Commons. On October 4th, a full day evaluation training session by the Ecosystem Management Team from the University of Michigan was provided to the Upper Monocacy WRAS Steering Committee, its neighbors from Adams County, PA and representatives of the Upper Potomac Tributary team (Appendix D). Another session designed to improve capacity was a Citizen Participation workshop featuring Hans Bleiker sponsored by the National Park Service on November 15th (Appendix D). The Steering Committee devoted a full day to a Strategy development working session on December 8th at ThorpeWood to help shape the content and process for the WRAS plan. During this strategy session, the Committee decided to divide into working groups to help translate agreed upon goals into concrete implementation objectives.

The WRAS Coordinator continued her outreach to expand the Steering Committee and involve farmers, educators and others. She made a presentation to the Frederick Farm Bureau on October 19, 2004 at their regular meeting and identified farmer representatives to participate in the WRAS in the Lower and Upper Monocacy River Watersheds (Appendix D). Steering Committee members assisted in the identification and recruitment of a representative from Mount St. Mary's University, as well.

National Water Monitoring Day was celebrated with an event at a WRAS Field Trial Site in the Monocacy Natural Resource Management Area where four different methods of tree protection from deer browse are being studied. Partners were pleased with the good news coverage of the event (Appendix A). Additionally, a WRAS partner, the New Forest Society, was awarded a grant by the Canaan Valley Institute to establish a tree grow out station and increase its service of providing replacement trees to CREP participants. Steering Committee members assisted with the planting of native nuts and seeds on October 23, 2004.

Frederick County Government has been recognized by the Chesapeake Bay Program with a Gold Chesapeake Bay Partner Community Award for its institutionalization of efforts to protect the Bay. The Board of County Commissioners and staff have been active at the state level with Bay-related committees, Tributary Teams, and other interjurisdictional efforts. Commissioners voted on the Chesapeake Bay Finance Authority initiatives on March 31, 2005 and stated that they "support the efforts to work together for solutions to clean up, restore, and protect the Chesapeake Bay."

The County offered a day long Sediment and Erosion Control Workshop on December 3, 2004 cosponsored with the Frederick and Catoctin Soil Conservation Districts and the Frederick

County Builders Association. The workshop targeted the homebuilding and development communities. The County's environmental consultant, Versar, presented information on the impacts to streams from sediment as well as data from long term monitoring work on Peter Pan Run, just downstream from Villages of Urbana (Appendix D).

ThorpeWood, the Catoctin Land Trust, the Potomac Conservancy, Chesapeake Wildlife Heritage and the WRAS cosponsored a Landowner Workshop at Hawkwood Farm on November 20, 2004 (Appendix D). Seventeen participants attended. The Steering Committee met on January 6th at ThorpeWood to celebrate its progress and make commitments for 2005. New Steering Committee members attended including three farmers and a professor from Mount Saint Mary's University. Working groups of the Steering Committee met to formulate their segment of the WRAS objectives and recommendations during Winter/Spring 2005. Working groups expanded with the addition of five citizens introduced to the WRAS process at Community meetings.

Community Commons continued its greener lifestyle workshops with a Natural Lawn Care Workshop at Fountain Rock Nature Center on February 26th in the Glade Creek subwatershed. Eleven people attended and an additional six requested information packets. Community Commons also completed its notebook, **"Stories Told From the Land: The Unique Relationship Between People and Place in Shaping Frederick County, Maryland."** The document is available to the public to help build a "place-based" watershed ethic. See summary report (Appendix B).

ThorpeWood's summary report (Appendix B) provides a synopsis of activities in its small landowner conservation initiative as well as its assistance to grass roots watershed groups. As the report indicates, two conservation workshops and one forest stewardship workshop were conducted. Four landowners are moving toward establishing conservation easements on their properties.

The Center for Watershed Protection was engaged to assist the County and municipalities with training in identifying and addressing Illicit Discharges. The Center provided training, both classroom and field testing for 30 municipal and County employees as well as Steering Committee representatives on April 28th and gave copies of its handbook to participants (Appendix D).

The residential riparian planting initiative, the Backyard Buffer Program, was offered to homeowners with stream frontage during Spring 2005. The Backyard Buffer Program is offered by the Potomac Watershed Partnership, including Steering Committee members Potomac Conservancy, Western Maryland RC&D. See Appendix A for the press release announcing the program on February 15, 2005. Appendix A also includes the Frederick News-Post's photo of the Coordinator's presentation to the Frederick Kiwanis Club (February 15, 2005); the Community News announcement (February 6, 2005) of the Watershed Meeting in Tuscarora Creek; the community restoration project at Cloverhill and related press release (March 16, 2005); and the progress on the Upper Monocacy WRAS featured in the March edition of the DPW News; and numerous additional press releases and press clippings.

The Steering Committee gathered for a final strategy review and refinement working session on May 16, 2005 at ThorpeWood. Assisted by Ursula Lemanski from the National Park Service, the Steering Committee reviewed and commented upon the working group recommendations for natural resource and community education objectives and discussed program change possibilities. The Committee split into three groups focusing on developing strategies for addressing fish blockages and forest connectivity issues in each of the six subwatersheds. In addition, the Committee affirmed its intentions to move toward developing the Monocacy & Catoctin

Watershed Alliance (MCWA) as a successor organization to the Monocacy WRAS Steering Committees to continue to collaborate and oversee the implementation of the collaborative watershed restoration plans.

A final WRAS plan review opportunity was offered to Steering Committee members during early June 2005.

Public Participation

The WRAS Planning Initiative sought to include the public in the decision making process by hosting three community meetings targeted to owners of streamside property within the subwatersheds, during which data was presented and comments/concerns were gathered:

- Glade Creek subwatershed on January 25th at Walkersville High School;
- Tuscarora Creek subwatershed on February 10th at Yellow Springs Elementary School; and
- Fishing, Hunting, Owens and Toms Creek subwatersheds on March 3rd at Catoctin High School.

The WRAS Coordinator continued her outreach to involve farmers with a special agricultural landowner meeting and lunch (venison stew) at the Thurmont Grange Hall on March 17th. Twenty-four citizens participated in the meeting and six Steering Committee members co-hosted the event. Additional outreach included a presentation to the Frederick Lions Club at Homewood Retirement facility on January 25th. Copies of media coverage can be found in Appendix A and public participation materials are in Appendix C.

Table 7 outlines major areas of citizen environmental concern, including: flora and fauna, stream and water quality degradation, community outreach and education, best management practices (BMPs) – agricultural BMPs and urban BMPs, development, program changes, and issues requiring further study.

In the process of inviting streamside landowners to community meetings, a database of contact information on citizens who are interested in watershed health was generated. The database enables staff to track interest and participation in education, protection and restoration activities.

Other Studies and Watershed-Related Initiatives

Other studies and initiatives conducted in the region include the annual Progress Report for 2004 on Little Hunting Creek, Hunting Creek, and the Monocacy River by DNR Fisheries. The reports summarize information about trout populations, hourly stream temperatures and macroinvertebrate samples. The report indicates that trout in Little Hunting Creek had severe 2002 drought impacts. Fish abundance, size and health have improved in 2004; abundance is expected to further increase in 2005. Recommendations include continuing the annual electrofishing surveys at the three established stations to document the status of the wild brook and brown trout populations.

The Progress Report on Hunting Creek indicated that the creek continues to provide anglers with an abundant and high quality wild brown trout fishery supplemented by hatchery brook and rainbow trout in the tailwater. Natural reproduction of brown trout was good in 2004 and is expected to increase in abundance and standing crop during 2005. All stations showed good to excellent water quality. Macroinvertebrate data show excellent quality with mayflies increasing at all stations. Management recommended that electrofishing survey monitoring be continued; that an additional site between Cunningham Falls and the reservoir be monitored; that year-round

temperatures be monitored at the gauging station, and that they work with Cunningham Falls State Park personnel to smooth the transition to lower ports within the dam control tower as the water temperature at the gauging station approaches 18.3 C (65 F).

The 2004 Progress Report on the Monocacy indicated that the relative abundance of smallmouth bass was found to be very low in the river. However, young-of-year abundance was in line with previous surveys. Overall, the population showed poor physical condition suggesting impacts of environmental conditions in the watershed resulting from the drought, among other things. Management recommendations include continuing annual seining surveys to determine smallmouth bass yearclass strength and monitor abundance of forage species; conduct late summer or early fall electrofishing surveys (at least every three years) of the upper and lower river to assess the effectiveness of the catch-and-release regulations by examining the adult smallmouth bass size structure, relative abundance, and physical condition; and stocking fingerling smallmouth bass in the Upper Monocacy to supplement existing natural reproduction and improve relative abundance.

Part 2: Watershed Goals, Strategies, and Objectives

Goals and Strategies

The Upper Monocacy Steering Committee considered data from the Maryland Department of Natural Resource's Watershed Characterization, Synoptic Survey, and Stream Corridor Assessment (SCA), as well as members' historical knowledge of the area during several workshops from August 2004, through May 2005. Examining this data in light of community input at public meetings, Steering Committee values and grant mandates, the group identified key strategies to improve water quality and habitat in the Upper Monocacy River Watershed. Listed below are first, the general strategies for the Upper Monocacy River Watershed followed by outline strategies for each of the six subwatersheds.

Frederick County's Comprehensive Plan, which provides an overall vision, includes growth management and natural resource protection goals with objectives to:

- Recommend low impact development techniques;
- Preserve working farms and the quality of life in the region;
- Encourage cooperation between the County and outside groups and agencies;
- Protect private property owners from degradation of environmental quality;
- Promote environmental stewardship;
- Provide protection for riparian buffers, wetlands, flood plains and other environmentally sensitive areas; and
- Encourage the promotion of natural resources for tourism.

Some of the Plan's objectives have been translated into Regional Plans and the County's Zoning Ordinance. However, without specific implementable policies and practices, the Plan cannot ensure the protection of its watersheds.

General Goals

Foster an Environmental Ethic

- Build watershed awareness including recognition of water quality problems and solutions
    - By publicizing water quality initiatives in the watershed
    - By involving the community in identifying and installing restoration projects
    - By involving citizens in active conservation initiatives
    - By promoting cooperative efforts among citizens and public and private organizations

Rationale: Protecting and restoring water quality depends upon a growing citizen awareness of the connection between human behavior and water quality.

Restore Waterways

- Restore riparian corridors
    - By planting vegetated buffers along stream reaches with inadequate natural vegetation
    - By restoring wetlands, particularly downstream from agricultural and developed areas

Rationale: Science confirms that forested stream corridors filter pollutants, absorb nutrients and improve water quality. Wetlands provide flood control, recharge groundwater, foster species diversity, and improve water quality by removing, retaining or neutralizing pollutants.

- Improve impaired streams
    - By eliminating livestock access
    - By further implementing Best Management Practices (BMPs)

        - Enhance/retrofit existing inadequate structures/practices
        - Install new practices
    - Address priority areas (discussed below)

Rationale: Research indicates that livestock access degrades and pollutes streams, destabilizes stream banks, causes erosion, and contributes nutrients and fecal coliform bacteria. Destabilized streams shed quantities of sediment and phosphorus downstream and are not readily nor inexpensively returned to balanced functioning.

Protect Waterways

- Identify and preserve pristine areas
- Protect and expand existing green infrastructure, large forest blocks and connectivity among such areas using riparian corridors by
    - Educating owners about available conservation strategies
    - Assisting interested owners of large and small acreages to establish long term or permanent protections

Rationale: Ecological functions that protect water quality depend upon natural vegetated areas. Without conserving and protecting strategic and significant natural areas, water quality will further degrade with growing human impacts.

Protecting Natural Resources During Land Development

- Protect water quality and habitat through appropriate zoning
- Improve development processes in order that new development has reduced impacts on water quality and habitat
- Encourage wise land development by amending the Frederick County subdivision ordinance to encourage and facilitate conservation design
- Educate citizens and the real estate community about the link between land use, water quality and wildlife

Rationale: Although added residential and commercial growth removes vegetation and increases hard surfaces, development can minimize its impacts using existing and cost effective low impact development techniques such as site fingerprinting (minimizing grading and clearing). Such techniques minimize the disturbance to the natural ecological cycles that protect water quality.

Build Capacity in Public and Private Sectors

- Create permanent position for County-wide coordinator of community-based watershed protection and restoration initiatives
- Seek funding for outreach and education, restoration and protection initiatives and move promptly into action
- Increase County ability to gather and utilize monitoring data for research, evaluation and community education

- Promote inter-agency collaboration and cooperation among government, nonprofit and private organizations with information sharing, education and action initiatives

Rationale: Managing the Upper Monocacy River Watershed to improve water quality and habitat depends upon increasing capacity in the public and private sectors. Optimizing partner contributions depends upon increasing capacity.

Subwatershed Specific Strategies

Glade Creek Subwatershed

Conditions: The Glade Creek subwatershed is the only Upper Monocacy subwatershed east of the river. It has a large proportion of prime agricultural soils, underlying karstic conditions, the growing municipality of Walkersville with considerable development pressures west of Devilbiss Road and small, unincorporated rural village areas around New Midway. Synoptic Survey data show excessive nitrogen and phosphorus concentrations. SCA data show that Glade Creek has the lowest proportion of forested buffers (20%) in the Upper Monocacy River Watershed.

Strategies: WRAS strategies in Glade Creek will seek to increase riparian buffers on agricultural and urban land. Considerable agricultural land preservation partners and other interested farmers will receive assistance in installing best management practices (BMPs) including buffers. An interested property owner in the New Midway community is a key supporter of outreach to a headwater area with severely degraded stream reaches. Anticipated community restoration partners include the Town of Walkersville, New Midway Elementary School and Fountain Rock Park. The Park superintendent and neighbors strongly advocate renovation of the historically robust Fountain Rock spring that once supported a trout fishery. Another key partner owns a forest hub designated an Ecologically Sensitive Area (ESA) with wetlands just upstream from Legore Bridge, a historically troublesome trash dumping site. The WRAS anticipates wetland protection and possible expansion of this key site near Legore Bridge and downstream of degraded agricultural and urban lands (with possible septic leaching). Citizens desire that the Glade Valley Golf Course reduce its impacts on natural resources.

Tuscarora Creek Subwatershed

Conditions: Tuscarora Creek is the southern most of the five subwatersheds with streams flowing easterly from their headwaters in the Catoctin Mountains on the west into the Monocacy River. The City of Frederick's northern limits are in the Tuscarora Creek subwatershed and continue to move further north as agricultural land is converted to development, occasionally encroaching on floodplains. Much of the watershed is designated by the State as a Priority Funding Area (PFA) despite its sensitive ecological character. The historical brook trout fishery reportedly now survives in the Clifford Branch of the creek, having been decimated by residential and commercial development in the more southerly Little Tuscarora Creek system. Public reports of historically abundant fisheries including "stonerollers" are colorful contrasts to the present degraded fishery. The watershed has numerous springs and wetlands with place names like Bootjack Springs Estates, Yellow Springs Road and School, Indian Springs and Rocky Springs Roads, to name a few. The Synoptic Survey indicates moderate nitrogen concentrations and high and excessive yields in the downstream half of the watershed. Phosphorus pollution is generally baseline or moderate in the watershed except for the Whiterock Run and Fox Road areas where phosphorus concentrations are high and excessive.

Strategies: The strategy for the Tuscarora Creek subwatershed includes protection and improved management of remaining forested headwaters, springs and wetlands and the restoration of degraded resources. It acknowledges the sensitive nature of the area as a trout fishery, supplemental water source for Frederick City, and concentration of wetlands and springs. It also acknowledges the high and excessive nutrient impacts from the Whiterock package treatment plant on one of the headwater tributaries, and the downstream, developed portion of the watershed with the highest imperviousness in the entire Upper Monocacy River Watershed. Community restoration partners include the Cloverhill and Willowbrook homeowner associations, Homewood at Crumland Farms, the local Yellow Springs Elementary School, as well as leadership by private citizens who desire to establish conservation demonstration landscapes. The City of Frederick's Municipal Forest is currently challenged by trash dumping along Hamburg Road (which parallels the Clifford Branch, the best trout fishery in the Tuscarora Creek subwatershed), and off road vehicle use, among other difficulties. Helping implement the management recommendations of the Forest Stewardship Plan is among the WRAS capacity building strategies. Community outreach and education goals include encouraging stream buffers; waging an education campaign to challenge citizens and landscape contractors to minimize fertilizer and increase soil tests; and encourage on-site stormwater retention and treatment with rain barrels, rain gardens, grassed swales, pervious pavement, etc.

Fishing Creek Subwatershed

Conditions: The western portion of the Fishing Creek subwatershed, just north of Tuscarora Creek, is forested and protected in public ownership by the City of Frederick. The Fishing Creek reservoir is a drinking water source for the City of Frederick. Fishing Creek's main stem and tributaries are trout streams with brook trout above the reservoir (excellent in the Steep Creek fork) and a few naturalized brown trout in some of the downstream reaches. In addition, a large portion of the forested headwaters and two other significant acreages are designated as Ecologically Sensitive Areas (ESAs). One of the three remaining wooden covered bridges in Frederick County is located downstream in the watershed, near a new District park being developed by the County on a donated farm, to be called Utica Park. Significant wetlands occur in the area, some near fish hatcheries. The small Lewistown unincorporated community of about 200 homes includes a Fire Hall and Elementary School. The Frederick County Health Department's last sanitary sewer survey (1994) found 27 Lewistown properties with problem sewers. Synoptic Survey data show moderate nitrates and high phosphates. Some area citizens have pushed for the installation of another package treatment plant (which the County has not approved) in order to expand housing locally. The major north – south highway, Route 15, cuts through the watershed and brings with it both stormwater run off and development impacts.

Strategy: The strategy to address watershed health issues in Fishing Creek is multifaceted. It focuses on forest management, trail maintenance and repair, establishing forest connectivity with forested riparian buffers, assessing alternatives to replace failing decentralized septic systems, protecting and restoring wetlands, and improving habitat for cold and warm water fisheries. A survey and forest stewardship plan was recently completed for the City's watershed. It gives priority to the maintenance and repair of trails in the watershed including the development of the old trolley right of way as well as the closure of unauthorized trails that are contributing to forest degradation. Anticipated community restoration partners will include the Trail House, Cold Deer Sportsman Club, the Lewistown Fire Hall and Elementary School, and the State Highway Administration. The reestablishment of forest connectivity will begin by targeting four upstream buffer gaps west of Route 15. WRAS partners anticipate working with the Stephen O. Eaton and

other fish hatcheries to reduce their impacts on the creek and its aquatic life. The Utica Park's phase 2 development will include the establishment and protection of wetlands.

Hunting Creek Subwatershed

Conditions: The Hunting Creek subwatershed has most of its headwaters in the protected Catoctin Mountain Forests, including the federal Catoctin Mountain Park, Cunningham Falls State Park, and the local Thurmont Watershed area. Unfortunately, key headwaters upstream of these parks are being developed, one forested lot at a time. Native brook trout populate the creek above Hunting Creek Lake. Brown trout are stocked and some naturalized below the lake. The Town of Thurmont impacts the stream considerably, with development beginning in the foothills west of Route 15 and following the creek as it flows under Route 15 and through town. Stormwater impacts are clearly visible. A water tower for the City of Thurmont's public water supply overflows periodically (reported at community meeting, 3/05), adding to the impacts of stormwater flows on properties along the creek. The infrastructure and infiltration problems of the Thurmont sewage treatment plant during storm events often cause bypasses of the plant with partially treated or untreated diluted wastes flowing onto downstream farms and into the creek. Additionally, Maple Run Golf course, just south of the plant, further impacts the stream. Catoctin High School, Thurmont Middle, Elementary and Primary Schools are located in Thurmont. The Middle and High Schools participate in an environmental academy promoting education and careers in the natural resources field. The Thurmont Lions Club is sponsoring a Trails development program on public property along the Creek. DNR owns the Frank Bentz Pond that has been used over the years for trout fishing. The town recently committed to taking over the ownership and management of the pond and is seeking a permit to upgrade the deteriorating dam.

Strategy: The Hunting Creek subwatershed strategy has three primary thrusts: 1) addressing the health and safety risks from the Thurmont sewage system; 2) protecting privately held forested headwaters with conservation easements, and 3) restoring degraded stream reaches, working with collaborations of community restoration partners and land owners especially at priority sites. The strategy promotes best management practices (BMPs) on urban and agricultural properties, particularly vegetated stream buffers, livestock fencing, grassed swales, rain gardens, and rain barrels.

ThorpeWood and its sister organizations, Catoctin Land Trust and Thorpe Foundation, are key WRAS partners in the subwatershed, implementing Headwaters and Highlands education and outreach programs for the community. Chesapeake Wildlife Heritage is another nonprofit WRAS partner that coaches interested land owners, helping them to assess their properties and prepare applications for funds to establish wetlands and forested buffers.

In an effort to restore degraded stream reaches, the WRAS strategy focuses its outreach to land owners with inadequate buffers on Little Hunting Creek from Route 15 east to the main stem. Community restoration partners include the Catoctin Mountain Park whose staff have adopted a threatened and fragile wetland and seep area outside the park; local Boy Scout troops and churches; the New Forest Society (a nonprofit committed to fostering reforestation); the Maryland Native Plant Society; and Catoctin High School Environmental Academy. The Steering Committee anticipates collaboration with additional community stakeholders including the volunteer Brotherhood of the Junglecock (an alliance of fly fishermen and women), the Thurmont Sportsman's Club, the Lions Club, Hunting Creek Hatchery, the Maple Run Golf

Course and the State Highway Administration, whose stormwater impacts require mitigation, particularly in Thurmont.

Owens Creek Subwatershed

Conditions: The Owens Creek subwatershed mirrors the Hunting Creek subwatershed, flowing out of the mountains, across Route 15 along the northern edge of Thurmont and easterly through farms to its confluence with the Monocacy River. The majority of the mountainous headwaters are forested, with some public ownership and protection by Catoctin Mountain Park and other areas privately owned and without permanent conservation protection. Although the majority of headwater areas are forested, one 0.75-mile headwater reach in the Manahan, Foxville, and Deerfield Road area is inadequately buffered. In addition, four ecologically sensitive areas with wetlands of special state concern occur in the mountain portion of the watershed. One small headwater stream reach is a naturally reproducing trout stream. The balance of the stream and tributaries upstream from Route 15 are catch and release areas for stocked trout fishing. Substantial farmland is bisected by the stream as it flows beyond Thurmont as is a large tract owned by Redland Brick, an industrial operation that extracts material for making bricks and denudes significant land surface. Five downstream catchments have excessive phosphorus concentrations.

Strategy: The Owens Creek subwatershed strategy includes outreach and education, protection, and restoration through partnering. Priorities for outreach and education include the Forestry Board's outreach about forest management plans (already begun at ThorpeWood in 3/05 with 30 participants attending). Outreach and education would also provide information to owners of small and large acreages about conservation easements and the value of protecting natural resources, particularly forested headwaters. Education for the agricultural community and its neighbors will include orientation to sludge application requirements, livestock stream protection alternatives, invasive species control, and wetland restoration opportunities. Collaborations with the New Forest Society, ThorpeWood, Chesapeake Wildlife Heritage, and the New Market Grange will help implement the Owens Creek strategy.

Restoration priorities will include establishment of forested riparian stream corridors on developed and agricultural lands and on-site residential practices for stormwater treatment including rain gardens, rain barrels and grassed swales. The priority focus for planting riparian corridors will be the 0.75-mile headwater area near Foxville and Deerfield Roads. The Backyard Buffer program will provide trees and shrubs for citizens to plant along inadequately buffered creeks running through their properties. Additional restoration partners may also include the industrial owner, Redland Brick, and community partners, Rocky Ridge Fire Hall, Sabillasville Elementary, Camp Airy, and Mount St. Mary's University. University students will assist with stream assessment, monitoring and restoration projects.

A stream corridor assessment is needed on the main stem of Owens Creek and Stony Branch, a small tributary that flows directly into the Monocacy. The assessments are a part of the Capacity Building section discussed later in this report.

Toms Creek Subwatershed

Conditions: Toms Creek subwatershed is the northernmost watershed in Frederick County. One of its tributaries, Friends Creek, originates in the far northwestern corner of the County, winds northeast across the state line into Adams County, PA and, combining with other tributaries, heads south back into Maryland as Toms Creek, northeast of Emmitsburg. Although some of Friends Creek and Turkey Run headwater areas are forested, others are developed including the

unincorporated community of Blue Ridge Summit and the rural village, Sabillasville, with individual wells and septics built on the banks of Friends Creek. Past practice in Sabillasville has included piping grey water into the street to avoid over taxing septic systems. Just upstream from Sabillasville is the large institutional owner, the Maryland Department of Juvenile Justice and its Victor Cullen Center, currently vacant. As the creek meanders, it flows through highland areas including Eylers and Harbough valleys that have been farmed for generations.

Another tributary, Flat Run, flows into Toms Creek south of town. The Emmitsburg sewage treatment system has serious infiltration and infrastructure problems resulting in spills of raw sewage into Flat Run. Currently under a Maryland Department of the Environment (MDE) Consent Order, the town has a multifaceted strategy to replace its antiquated collection and distribution system. Another tributary, apparently impacted by sewage effluent is St. Mary's Run that flows through the campus of Mount Saint Mary's University. Downstream of Emmitsburg, farmland predominates where some farm owners reportedly apply sewage sludge to their properties. Another large dairy farmer has cleared considerable land for expanded crop operations. The Cattail Branch area at the eastern edge of the watershed has high and excessive nutrients, nitrate and phosphate concentrations (4/04 Synoptic Survey samplings).

Strategy: In order to address the health and safety impacts of raw sewage spills, the WRAS strategy supports the Town of Emmitsburg's replacement of its failing infrastructure with a variety of financing strategies including a CDBG grant, sewer tap fee surcharges, fixture-based pricing of commercial sewer taps, and flush tax resources.

The Toms Creek strategy includes urban and agricultural elements. The developed portion of the watershed including Emmitsburg, Sabillasville, and Blue Ridge Summit will be targeted for outreach and education on rain gardens, rain barrels and other on site water retention strategies and offered trees and shrubs through the Backyard Buffer program for riparian plantings. Institutional land owners in the developed portion of the watershed, potential partners on restoration projects, include the Mount Saint Mary's University, Sisters of Charity, Mother Seton Center, the National Emergency Training Center, Emmitsburg and Sabillasville Elementary schools. The University's recent addition of an environmental science minor will help generate student and faculty interest in participating in stream assessment and monitoring to measure baseline and post project water quality impacts from restoration projects.

The agricultural portion of the watershed is substantial. Outreach and education will be targeted in the headwater farming communities in highland valleys as well as along Cattail Branch and its tributaries where nutrients are excessive and several farms are enrolled in agricultural preservation programs. Education will encourage stream protection from livestock, planting riparian corridors, and applying sludge or manure strictly within guidelines for stream protection. Additionally, agricultural land owners practicing good environmental stewardship with well documented records, will likely qualify for grants under the new Farm Security Program, just launched in the Monocacy River Watershed (4/05).

Implementation Objectives

In order to translate the general WRAS goals into action, the Committee's working groups identified specific objectives. The objectives presented in the Natural Resource Management Objectives Table (Table 5) and the Education and Outreach Objectives Table (Table 6) are the result of extensive work by the Steering Committee. As discussed in the "Stakeholder Involvement and Public Participation" section, members of the Steering Committee met during

three full day workshops for SCA, Characterization, and Synoptic Survey data analysis. What resulted was the identification of thirty-eight (38) comment sites where the Steering Committee felt effective actions could be taken.

Next, a workshop was held for all Steering Committee members during which the above-analyzed data was presented and members were asked to identify additional opportunities, assets, and threats to restoration and protection projects in the six subwatersheds. What resulted was the identification of sixty-seven (67) Steering Committee comment sites. Some of these sites were general comments about the area while others were directly related to an opportunity for restoration or protection. Not all are addressed in the two Objective tables.

Finally, several public meetings were hosted by the Steering Committee in order to share the findings of the three reports with the public as well as harvest ideas for restoration, protection, and policy changes, to name a few. Some of the information gathered from the public meetings was general in nature and was compiled into a General Public Comment Table (Table 7). The remainder of the data gathered from the meetings resulted in the identification of twenty-one (21) Public comment sites.

Each site was given a unique identifying number specific to its subwatershed. Information about each site was compiled into a Comment Table (Table 8) and the locations of the sites were mapped in a computer-mapping program. In order to best target the efforts of the Steering Committee members, each comment site was directly related to a problem site identified in the SCA Report, if possible. To determine how many of the comment sites the WRAS was able to address, each site was then linked and correlated with the associated Natural Resource Management (NRO) or Education and Outreach Objective(EOO).

Natural Resource Management Objectives	Responsible Party	Priority Sites (if applicable)	Schedule	Measurable indicators			Monitoring/ Performance Measures & Party Responsible	Public Involvement, Outreach, or Education Component	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
				Land use	Total # of units applied	Type of unit applied				
Restoration Projects										
Agricultural BMPs										
1) Fence livestock herds out of streams beginning in Glade and Fishing Creek subwatersheds and then moving to Owens and Toms Creek subwatersheds.	**Agricultural Practices Working Group**, Land owners, SCD, Chesapeake Wildlife Heritage, CBF, USFWS, Large Animal Vet Assoc, NCCC, & MCWA	GC2	3 properties/year Phase 1: Glade & Fishing Creek Year 1 of Phase 2: Glade & Fishing (con't) Year 2 of Phase 2: Owens & Toms Creek Phase 3: Owens & Toms Creek (con't)	Pasture	25,315 4.79 21	Linear feet (assume 35 ft wide) Miles Acres	See Education and Outreach Objectives (EOO) # 18, 19	EOO # 1	Studies show improved herd health	Cost for cattle fencing: ~$2.60/linear foot Cost for horse fencing: ~$6.00/linear foot 7 cattle sites and 8 horse sites
2) Establish vegetated buffers along streams, averaging 50' on each side	**Agricultural Practices Working Group**, Land owners, SCD, Chesapeake Wildlife Heritage, Chesapeake Bay Foundation, Large Animal Veterinarians, MCWA	GC2, GC4, GC7, FC3, FC4, TM10, TM13, TM15, TM16, TM19, TM3, OC2	Phase 1: Glade Creek Phase 2: Toms & Owens Creek Phase 3: Hunting & Fishing Creek	Pasture and Croplands	10	Miles	EOO # 18, 19	EOO # 24	Buffers lower stream temperature, stabilize stream banks, add vegetative matter for aquatic food chain & improved wildlife habitat.	Reforestation: ~$33-70/ac-yr Funding Source: CREP for agricultural lands. Would need to obtain a grant for urban lands.
Community Restoration Projects										
3) Provide backyard buffer tree bundles to homeowners to plant an average of 25' of stream side buffers with native tree/shrub species	**Citizen Practices Working Group,** Potomac Watershed Partnership, MD Forest Service, Conservation Action Team, Boy Scout troops, and other volunteers	FC3, FC10, TM5, TM24	Phase 1: Spring 2006 and ongoing annually for 5 years	Open urban	6	miles	EOO # 18,19	Homeowners seek out and plant trees and shrubs under the program. They receive materials about proper planting techniques and further internet resources.	Increases watershed and water quality awareness	Seedlings: $0.60/seedling ($3,000 for 5,000); Stakes:$2,100 for 1,500; Bags: $0.21/bag Instructions: $0.05-0.09/page @ 6 pages/bundle; Mailings: $0.37/homeowner Funding Source: Potomac Watershed Partnership grant
4) Use the project plan for the Clover Hill community developed by MD DNR Forest Service to organize and implement Phase 1: a stream buffer planting project through the Clover Hill Community Park property including educational signage	**Citizen Practices Working Group,** Community Commons, ICPRB, MD DNR Forest Service, and other MCWA partners	TC3	Phase 1	open urban	1000 0.3	linear feet acres	Clover Hill Civic Association will monitor tree growth and mortality	30 volunteers from the community and 40 school children organized by Community Commons; EOO # 16	A public "park" quality 3' x 5' sign will be installed in 2005. A project plan has been developed for the project by the MD DNR Forest Service	Phase 1: Grant from the Chesapeake Bay Trust for $1,719 and in kind services for $1465 for a total of $3184.
5) Use the community restoration project plan for the Clover Hill community developed by MD DNR Forest Service to organize and implement additional phases including: reforesting main channel of stream, stream restoration, rain garden installation, and refurbishing of wooden bridges.	**Citizen Practices Working Group,** Community Commons, ICPRB, MD DNR Forest Service, Potomac Conservancy, and other MCWA partners	TC3	Phase 2: main channel reforestation and rain garden construction Phase 3: stream restoration & bridge refurbishing.	Stream reforestation: Open urban Rain garden: Medium Density Residential (MDR)	1	acre	Clover Hill Civic Association will monitor tree growth and mortality	Utilize volunteers from the Clover Hill Community and local school children	A project plan has been developed for the project by the MD DNR Forest Service	Stream reforestation: ~$1,400.00. Stream restoration: $10,000. Rain garden: depending on multiple factors will typically range from $5,000-$8,000 but can be significantly more
6) Organize and implement a variety of restoration projects in the Willowbrook subdivision, possibly partnering w/ Homewood whose property is across the creek. Potential projects to include a large community rain garden, rain barrels, stream restoration/buffer planting, "Greener Lifestyles" workshops.	**Citizen Practices Working Group,** Willowbrook HOA, Community Commons, Potomac Conservancy, ICPRB, MD DNR Forest Service, and other MCWA partners	TC4	Phase 1: "Greener Lifestyle" and rain barrels Phase 2: community rain garden Phase 3: stream restoration/buffer planting.	MDR and open urban	Approx. 2900 ft of stream run through the area		Willowbrook HOA, DNR Forestry, ICPRB, Community Commons	Utilize volunteers from the Willowbrook Community; EOO # 16 and 30	Citizens are very interested in stream health. Preliminary/educational stream walk already performed.	CBT initial grant of $2,500 for seed money for phase 1 projects.

Natural Resource Management Objectives	Responsible Party	Priority Sites (if applicable)	Schedule	Measurable indicators			Monitoring/ Performance Measures & Party Responsible	Public Involvement, Outreach, or Education Component	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
				Land use	Total # of units applied	Type of unit applied				
Other Restoration Projects										
7) Increase wetland acreage through mitigation, restoration, and preservation.	**Natural Resources Working Group,** MDE, Catoctin Land Trust, ThorpeWood, Principal Site Planner, local landowners, Frederick County DPW, EPA	FC1, FC4, FC8, HC1, TC2, TC5, TC7, TC9, GC18, HC14, OC40	Phase 1: 100 acres Phase 2: 100 acres Phase 3: 100 acres	cropland	300	acres	MDE, CLT	Landowner workshops, targeted landowner outreach, site visits and property evaluations and education/outreach to landowners about the functions and values of wetlands; EOO # 3	Wetlands are becoming integral in stormwater management and treatment of impervious surfaces- resulting in sediment and nutrient reduction	Potential funding source for agricultural properties: CREP. Staff time for Frederick County DPW employee for outreach and wetland delineation work, $ for restoration.
8) Extend trout habitat beyond current range in Toms, Owens, Hunting, Fishing, and Tuscarora Creeks by enhancing and improving habitat: *****Reforestation of 20 miles of 25 ft buffering (as part of NRO#2) *****preservation of 2000 acres of currently forested land (acres are part of the NRO#9 below)	**Natural Resources Working Group,** ThorpeWood, Catoctin Land Trust, DNR Fisheries, Frederick County Tourism Council, Chesapeake Wildlife Heritage, NRCS, Potomac Conservancy	TC11, GC6, OC25, HC18, HC6, HC8	Phases 1-3	Reforestation: All Preservation: forest	60.6 2000	Acres acres	CLT; Brook trout population monitored by Inland Fisheries Division	Community outreach and education about importance of fishery.	Headwater streams are supporting native brook trout populations; tax incentives for easements.	Reforestation: ~$33-70/ac-yr Funding Source: CREP for agricultural lands Costs for surveys and legal work.
Protection Initiatives										
9) Protect additional forest and farmland with conservation easements and/or deed restrictions	**Natural Resources Working Group (forest lands), Agricultural Practices Working Group (ag land),** Catoctin Land Trust, Potomac Conservancy, MET	TC1, GC16, TM9, TM23	Ongoing Phase 1: Protect 2,300 acres. Initially target critical headwater streams and water influence zones. Phases 2 & 3: Protect 3,850 acres in each phase	cropland, pasture, and forest	10,000	Acres	CLT	Landowner workshops, targeted landowner outreach, site visits and property evaluations; EOO # 23, 29, 31, and, 32	Protected lands help maintain the rural landscape, enable working forests and farms and counter sprawl development pressure.	Donated easements generate tax benefits for donor, NFWF, Frederick County Agricultural Preservation Incentives Program (ex: IPP)
Resource Management Initiatives										
10) Increase the number of forest management plans (currently 300) by 10% in the Upper Monocacy Watershed	**Natural Resources Working Group,** Frederick Forestry Board and DNR foresters	OC15	Phases 1-3, ongoing 10 plans/phase	Forest	# of plans written	Acres	Develop a program to require follow up for forest management plans to determine what kind of actions have been taken on the property	EOO # 31	Tax incentives for landowners with forest management plans?	Salary for forester
Sewage Treatment Initiatives										
11) Replace 3,000 feet of 10” sewer trunk line on Little Run in Toms Creek subwatershed. Complete mitigation plan including reconfigure manhole S-15 with larger drop energy manhole dissipater, replace 670 lineal feet of 14” gravity flow trunk line with a 26’ gravity flow line. And relocate 470 lineal ‘ of the 14 ‘ force main so as to facilitate future industrial growth.	**Development Working Group,** Town of Emmitsburg, MDE, MdDHCD	TM20, TM14		urban			Consent order requires monitoring of BOD, TSS, pH, TRC . The Town also is obligated to report Sanitary Sewer overflows (SSOs) to MDE whenever they occur. Consent order sets interim perf. Standards for BOD and TSS at outfall 001 during construction.		Required under Consent Order with MDE to reduce I&I problems resulting in sanitary sewer overflows. Mitigation plan should eliminate primary source of SSOs and discharge of sewage into Flat Run Creek.	$260,730 in Community Development Block Grant economic development assistance funds from MD DHCD.
12) Replace 1,497’ and reline 5,397’ of 8” sewer trunk line in Thurmont with excessive inflow and infiltration from storm water resulting in sanitary sewer overflows into Hunting Creek and its watershed.	**Development Working Group,** Town of Thurmont	HC16	Bid administration, summer, 2005; construction begins fall, 2005.	Urban			Town’s engineer/municipal workers will inspect construction. Evaluation of system will continue.	Town’s education and outreach includes web site, water bill inserts, and cosponsored workshops with WRAS.	Ordinance in development by Town to address grease problems in the system.	$1.1 million from the State’s Revolving Loan Fund.

Natural Resource Management Objectives	Responsible Party	Priority Sites (if applicable)	Schedule	Measurable indicators			Monitoring/ Performance Measures & Party Responsible	Public Involvement, Outreach, or Education Component	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
				Land use	Total # of units applied	Type of unit applied				
Monitoring Initiatives										
13) Develop a tool to model pollutant loads and imperviousness by land use class and catchment. Include module to estimate reductions from BMPs and calculate actual reductions from project implementation.	**Monitoring Working Group,** Frederick County DPW	N/A	Phase 1: Develop tool to predict Nitrogen, Phosphorus, Sediment releases and model reductions from 100 types of BMPs. Phase 2: Expand model to include other types of pollutants and impervious area. Phase 3: Improve estimates using national BMP database and other sources.	all	all	acre	N/A	EOO # 18, 19 and 2	Allows pollutant reductions from restoration efforts to be estimated and tracked.	Staff time for tool development - ~ $25,000 from Frederick County general funds, NPDES.
14) Develop monitoring plans to evaluate effectiveness of pollutant loading tool at reducing quantity pollutants.	**Monitoring Working Group**	N/A	Phase 3				N/A	EOO #18, 19, and 20	Provides real numbers for pollutant reductions	Staff time for development of monitoring plan – possible consultant work ~ $30,000
Improved Development Practices										
15) Encourage and assist Homewood to develop a Low Impact Development (LID) approach for Phase 2 of their facility construction currently (5/05) in the conceptual design phase.	**Development Working Group,** Homewood at Crumland Farm, Engineering Firm, City of Frederick Reviewers	TC4	Phase 1: Conceptual Design: Summer 2005; Design development: 2005-2006; Construction,: 2006-2007	Cropland	28	acre	Pre and post project monitoring would be performed by Hood College's Monocacy Monitoring Project.	This LID demonstration project would be the focus of a tour for public education; EOO # 27	LID is becoming more popular as a method for controlling stormwater.	Project financing would cover costs. Grants for supplemental design cost would be sought.

Education and Outreach Objectives	Responsible Party	Related Comment Sites (if applicable)	Schedule	Measurable Indicators	Other partners	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
Farmer/Agricultural Outreach							
1) Outreach to farmers whose livestock have stream access to discuss stream protection, stream crossings and alternative watering strategies	Agricultural Practices Working Group	GC2	3 properties/year Phase 1: Glade & Fishing Creek Year 1 of Phase 2: Glade & Fishing (con't) Year 2 of Phase 2: Owens & Toms Creek Phase 3: Owens & Toms Creek (con't)	Number of farms contacted to offer assistance. Number of farms visited to provide assistance. Number of farms with applications submitted to SCD for CREP or other BMP funding.	SCD, Chesapeake Wildlife Heritage, Chesapeake Bay Foundation, MCWA. Enlist FFA & 4-H Clubs (Catoctin & Walkersville High, Thurmont & Walkersville Middle Schools) in Education & Action partnerships.	Herd health benefits. Fishery benefits. Education benefits to next generation of farmers.	Funding for targeted watershed initiative needed, estimated at $150K for each of 4 subwatersheds w/ livestock access.
2) Develop a "House Call" program for outreach to properties identified in the SCA with problems and those properties requesting information during the SCA process	Agricultural Practices Working Group	FC13, TM22	Phase 1: Glade Creek Phase 2: Toms & Owens Creek Phase 3: Hunting & Fishing Creek	Number of farms contacted to offer assistance. Number of farms visited to provide assistance. Number of farms with applications submitted to SCD for CREP or other funding.	Frederick County DPW, SCD, MCWA	Translating powerful GIS tools and extensive site-specific data into user-friendly form. Leverages technology and knowledge for farmer education and water quality benefits.	Laptop with GIS capability, employee time to develop presentation and make house call, averaging $250 - $350/each.
Citizen Outreach							
Teacher/Student Outreach							
3) Provide the Wonders of Wetlands! (WOW!) training for Frederick County teachers. First priority given to teachers who attended the Planning of Wetlands! (POW!) training.	Citizen Practices Working Group	TC7	Phase 1: Fall 2005 or Spring 2006	number of teachers in attendance and the number of students they teach	Frederick County DPW, Community Commons, Environmental Concern	Possible substitute money from a grant	$500-$750 for 20-25 teachers from NPDES outreach budget
4) Naming unnamed tributaries: Frederick County DPW will work with Frederick County Public School juniors/seniors to develop an interview process to determine historical/locally recognized names for unnamed tributaries. Can be used as a required graduation project	Citizen Practices Working Group	general public comments	Phase 1: Establish relationship with teachers to develop project requirements & techniques Phase 2: Involve students in the process; ongoing Phase 3: Publish the results after USGS had accepted name designations	number streams named, number of local residents interviewed	Frederick County DPW, Community Commons and local high school teachers and juniors and seniors	Build place-based identity by connecting the younger generations with the older generations of Frederick County	Funds required for facilitation and coordination of process and funds for publishing results.
5) Continue to implement and expand the "Tale of Two Watersheds" Program: Trains local teachers and provides them with the necessary equipment to monitor the health of local streams with their students -	Natural Resources Working Group	N/A	Phases 1 - 3, ongoing	Internal evaluation of the programs effect on student behavior/attitudes about water quality and the environment	ThorpeWood, Hood College, DNR, FCPS	Encourages hands-on training of students	$50,000/yr
6) Improve existing Monocacy Basin Stream Monitoring Project by incorporating more robust protocols that interface with state efforts and establish QA/QC process	Monitoring Working Group	N/A	Phase 1: Complete by May 2006	QAAP or similar plan. Written protocols.	Hood College, ThorpeWood, Frederick County DPW, DNR	Student monitoring could also be used to evaluate community restoration projects, tie in to Frederick County Government efforts, identify problem areas	Funding for development of a monitoring protocol; and establishing a QA/QC process and document. The DPW NPDES program is investing in the QA/QC process.
7) Continue to implement and expand the school yard habitat program and educational efforts to build/foster a greater environmental ethic among the community children.	Natural Resources Working Group	TM18, TM21, TM25, TC7	Phases 1 - 3, ongoing	Number of schools participating, number of students, parents and teachers involved. Number of types of habitat created. Length or acreage of habitat created.	Frederick County Public Schools, Community Commons, ThorpeWood, Hood College, and Frederick County DPW	Children are the citizens that will be making the decisions for the future of Frederick County. It is important to educate them and instill an environmental ethic	CBT funding of two part time staff to serve as Resources for previous and new Schoolyard Habitat schools, $25,000/year. Average project cost = $1400 ; (for project supplies only

Education and Outreach Objectives	Responsible Party	Related Comment Sites (if applicable)	Schedule	Measurable Indicators	Other partners	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
Landowner Practices Outreach							
8) Develop Interactive Website for MCWA providing water quality data, answers to FAQs, watershed happenings, event calendar & who to contact for information, including an online server for monitoring data using ArcIMS software. Create high-level access to site with opportunity to drill down for greater specificity.	Citizen Practices Working Group and Monitoring Working Group	N/A	Year 1 of Phase 1: Website development and publishing, ongoing updates; Year 2 of Phase 1: continues into Phases 2 & 3: Monitoring component: develop with Report Card (EOO # 20)-probably a 5 year effort	Number of hits and sign ups/responses to programs	Frederick County DPW & MCWA	Sign ups for projects, information for citizen database, increased awareness, interactive mapping; http://cuereims.umbc.edu/MWMC/ http://seris.info/RiverLink/main.html http://www.healthebay.org/brc/default.asp http://www.fosr.org/maps/ http://www.purewaterforum.org/waterwindow/	$25,000 startup, $5,000/yr after initial year; ArcIMS online Monitoring Server: ~$100,000 if County hires a consultant
9) Organize a revolving OpEd piece or Letters to the Editor written by MCWA members in order to promote greater visibility and priority for water quality issues.	Citizen Practices Working Group	N/A	Phase 1; continue quarterly	Effectiveness of outreach vector in Caraco, D. 2001. The Watershed Treatment Model *Version 3.0). Center for Watershed Protection: Ellicott City, Maryland. -- number of people reached (get an estimate of number of papers sold over a period of time to assume number of people reached/educated)	Local newspapers and Frederick County's Implementation Coordinator.	Increased sign-ups and citizen awareness of programs	To coordinate article composition and submission - $2,000
10) Develop a "Green Pages" section for the phone book which would have important numbers and contact information for local organizations and efforts to address frequently asked questions about water quality issues.	Citizen Practices Working Group	N/A	Year 2 of Phase 1	Number of people who receive the phone book	Community Commons & MCWA	Allows citizens to access contact information of organizations that are able to provide information in the areas in which they are interested.	Intern project, $4,000. Funding for publication.
11) Increase awareness of and participation in the Bay-Wise program offered by the Master Gardeners using the Bay-Wise MD Yardstick as citizen guide	Citizen Practices Working Group	N/A	Phases 1 - 3, ongoing	Number of presentations at civic meetings; number of yards certified as Bay-Wise; number of yards certified as Demonstration landscapes.	Frederick County DPW, Master Gardeners, MD Cooperative Extension Service, and MCWA	Encourages interactive learning about native gardening and environmentally friendly yards	Design, printing, framing, & purchase of exhibit, $2,500; design/printing of brochures, $1,200; banner, $500.
12) Create additional fact sheets addressing citizen concerns about: fertilizer; deicing salt; septic system maintenance; drinking water in Frederick County; benefits of riparian forest buffers and associated pruning for maximum benefit; and land conservation/preservation options for landowners including information on who to call	Citizen Practices Working Group	OC9, OC13, GC18, TC1, TM4, TM9, TM24	Phase 1	Number of brochures passed out, number of easements awarded	Frederick County DPW & Planning (fertilizer, deicers, septics), Community Commons, DNR Forest Service (Riparian Buffers), Potomac Conservancy (Pruning Trees) Chesapeake Wildlife Heritage, ThorpeWood, Catoctin Land Trust, and other MCWA members (easements)	These would be in addition to the “Greener Lifestyles” brochures	Chesapeake Bay Trust grant to pay for design and printing, estimated at $3,000.
13) Put inserts into the County's water bills drawing attention to the MCWA website (EOO #8) for information on seasonal issues, events, relevant fact sheet, etc.	Citizen Practices Working Group	N/A	Year 2 of Phase 1, ongoing	Number of hits to a website or requests for additional information	Frederick County DPW, Towns of Thurmont, Emmitsburg, and Walkersville	Increases awareness and provides additional sources of information for interested citizens. Uses mailing that is already going out.	Staff time to develop quarterly inserts, 8 hrs/qtr or roughly $1,000/year.
14) Explore modifying the Big Sweep program to include dumpsites within stream reaches throughout the County. Include a targeted effort to collect and recycle scrap tires from residual farm trash sites	Citizen Practices Working Group and Agricultural Practices Working Group	FC2, OC1, TM7, central placement of dumpster in Thurmont for area farms	Phase 1: Initial trial performed in Spring 2005; add'l sites to be included Spring 2006; ongoing	Total lbs. of trash collected by how many people; number of tires removed	Frederick County, MCWA partners, Volunteer Frederick, Community Commons, Frederick Farm Bureau, Land owners, Emmanuel Tire Co.Recycler	Will help to address some of the trash dumping sites identified through the Stream Corridor Assessment (SCA)	Staff time to identify and coordinate sites
15) Create publicly accessible demonstration sites for native plant landscaping, native conservation cover crops, reforestation, and wetland restoration. Include interpretive signage and educational programming to engage visitors. For those sites that have already been “restored”, add interpretive signage.	Natural Resources Working Group and Citizen Practices Working Group	TC3, TC4, TC 7, GC9, GC10, FC12	Phase 1: Design sign, install at existing locations and identify possible locations Phase 2: Creation of new sites; ongoing Phase 3: Create driving tour brochure of restoration sites throughout watershed	# of people visited	MCWA partners, Chesapeake Wildlife Heritage	Some of these demonstration sites already exist at ThorpeWood and can be used as examples of how to create public access to the site. Educates citizens about the types of restoration that is available, the benefits, and increases awareness about water quality issues.	~$15,500 for a reforestation, meadow, and wetland site plus costs for signs and brochures

Education and Outreach Objectives	Responsible Party	Related Comment Sites (if applicable)	Schedule	Measurable Indicators	Other partners	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
16) Engage community members in the planting of seedlings in mini-nurseries ("grow-out" stations) and the subsequent streamside buffer plantings for local restoration efforts	Natural Resources Working Group	HC2, OC12	Phase 1, ongoing	Number of nurseries, number of volunteers, number of nuts planted; number of 3 year old plants transplanted.	ICPRB, New Forest Society, CVI, ThorpeWood, Potomac Conservancy	Savings from native grow out instead of tree purchase. Community involvement. Local seed stock for local plantings.	Supplies for nursery including soil, containers, mulch, watering system, estimated $2,500/nursery
17) Establish roadside signage along major roads noting the entry into the six subwatersheds of the Upper Monocacy River	Natural Resources Working Group	N/A	Phase 1		ThorpeWood, MCWA, Catoctin Land Trust	Creates a sense of awareness about the connectivity of the landscape	NFWF/ThorpeWood grant; ~$4,000 for 50-80 signs
Water Quality/Monitoring Outreach							
18) Develop local monitoring program for adult volunteers using stream wader protocol; develop priority areas for monitoring.	Monitoring Working Group	Areas on 303(d) list for biological impairments due to benthic macroinvertebrates, Sites of specific interest to volunteer groups, Sites that coincide with community restoration projects.	Phase 1: Obtain and tailor protocol; Phase 2: Establish monitoring priorities and conduct small-scale pilot; Phase 3: Conduct larger scale program	Number of sites collected. IBIs and other scores from sampling sites. Number of volunteer hours, number of volunteers trained.	Frederick County DPW to develop protocols with DNR, fund training for volunteers, coordinate site access. Hood College to provide lab access and staffing. Sierra Club, Community Commons, ThorpeWood & others to provide monitoring volunteers. DNR-would help to establish & update protocol. Other MCWA members may participate.	Helps to monitor community restoration projects. May also determine if waterbodies listed in 1996 303(d) list should be delisted.	Training 2K per year. Materials - research with DNR stream waders Lab access- Hood College Lab staff hours- DNR Volunteer hours- DNR Prioritization of sites- 1 staff month at DPW Data Management - DNR
19) Assist community restoration projects with monitoring. Includes providing them with existing data to determine sites for monitoring, helping to establish appropriate monitoring for project, conducting QA/QC on monitoring efforts, tracking monitoring results in central database.	Monitoring Working Group	FC3, FC4, GC5, GC6, HC1, HC2, OC3, TM2, TM4, TM5, TM12, TC3, TC4, TC6, TC7, TC8, TC9, HC14, HC18, TM18, TM16, TM19, TM21, TM24, TM25, OC7, OC11, OC16, HC6, HC8, HC13	Phases 1-3: coordinate with monitoring data task to evaluate effective indicators. Monitoring efforts will be ongoing.	Number of site monitoring plans including execution and results. Evaluation of local BMP effectiveness may interface with national BMP database. Types of monitoring might include, MBSS Fish/Benthic, Chemical, Physical, etc.	Fred Co DPW , MCWA, MD Water Monitoring Council; Professor at UMD is conducting riparian buffer research and may have ideas about monitoring protocols.	Most partners in the MCWA are not monitoring experts and would benefit from this technical assistance. This would also create centralized reporting and consistent protocols.	Estimated QA/QC work by County consultant at cost of $15,000; County staff investment of 6 months of work to establish initial system; & ongoing support of 10% of staff person's time to prepare information for community restoration partners.
20) Develop and publish water quality report card. Create water quality indicators that are meaningful to the public. Use integrated water monitoring data as basis for indicators.	Monitoring Working Group	All sites	Phase 1: Send questionnaires and compile data; Phase 2: develop indicators and evaluate indicators; Phase 3: develop format, print and distribute.	Number of copies distributed. Improvements/degradations to streams each reporting period.	Frederick County Government . Models: State of the Streams Report, Montgomery County MD; http://www.muskokaheritage.org/watershed/watershedreportcard.asp; http://www.thamesriver.org/Watershed_Report_Cards/Watershed_Report_Cards.htm;	Public wants access to information about water quality. Public is concerned about degrading stream health and fisheries. No reporting in place aside from websites which do not present or compile data.	Includes compiling indicators: probably 3 staff months. Each 2-sided sheet probably costs $500 to design and $500 to print 2000.
Commercial/Industrial Outreach							
21) Create a "Watershed Welcome" packet to include the brochures listed in EOO#12 for Real Estate Brokers to provide to people purchasing property in Frederick County	Development Working Group	N/A	Phase 1: Meetings with Board of Realtors; development and preparation of prototypes Phase 2: Preparation of quantities	Number of packets distributed, number of add'l requests for information, hits to website	MCWA, Community Commons, Board of Realtors	This project will help build watershed awareness and ethic among real estate community and new home buyers.	Staff time to coordinate development, $3,000; Design and packaging, $1,000. Printing/assembly $3,000 for initial 1,000.
22) Work with golf courses to evaluate impacts from land management and encourage participation in Audubon program.	Monitoring Working Group	HC4, HC17, general public comments	Phases 1 and 2: monitor sites; Phase 3: review data, create outreach program with golf courses	Monitored site improvements	Frederick County Government, Holly Hills- already has Audubon certification, and golf courses of the Upper Monocacy	Golf Courses are well-connected to political leaders, other decision-makers	$10,000 MBSS monitoring (already some taking place at Holly Hills).
Informational Workshops							
23) Benefits of conservation easements and agricultural preservation programs to preserve farmland	Agricultural Practices Working Group	HC10, HC11, FC13, GC14, GC2, GC4, OC2	Phase 1: Winter, ongoing	Number of those attending workshop.	Chesapeake Wildlife Heritage, ThorpeWood, Catoctin Land Trust, Potomac Conservancy	Workshop would help to educate farmers about protection options to save the rapidly decreasing farm community in Frederick County	NFWF
24) Benefits of grassed/forested stream buffers to improving/protecting water quality	Agricultural Practices Working Group	GC7, OC2, HC9, TC8	Phase 1: Winter 2006, ongoing	Number of those attending workshop	Frederick Farm Bureau, MCWA, New Forest Society	Broadens understanding of link between buffers & water quality	NFWF or CBT possible source. Cost estimate, $500

Education and Outreach Objectives	Responsible Party	Related Comment Sites (if applicable)	Schedule	Measurable Indicators	Other partners	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
25) Educate farmers about the tax and water quality benefits of letting marginal pasture go fallow and naturally regenerate.	Agricultural Practices Working Group	N/A	Phase 1: Winter, ongoing	Number of those attending workshop; number of acres allowed to go fallow	Frederick Forestry Board, DNR Forester, MCWA	It is a natural process and thus more cost effective than some other strategies.	Coordination of workshop series, refreshments, advertising, postage, $500.
26) Host a one-day seminar for landscapers, nurseries, landscape architects, etc on the benefits of using native plants, where to buy, fire-wise planting, hazard mitigation plans, etc	Citizen Practices Working Group	N/A	Phase 1: Winter, ongoing	Number of Landscape Companies Represented, number of Nurseries represented, number of Gov't agencies represented, number of attendees, % increase in nurseries/landscapers offering native plants and fire wise services.	Potomac Conservancy , Potomac Watershed Partnership MD DNR-Forest Service, U of M Cooperative Extension, Maryland Native Plant Society, Ducks Unlimited, Thorpewood, Community Commons, SCD, Master Gardeners	Increase the number of outlets available to citizens to purchase native plants or landscape designs that incorporate Native Plants and Fire wise strategies. Decrease the use of harmful invasive plants.	Chesapeake Bay Trust, NFWF, Forestry Work Group-Chesapeake Bay Program, EPA---$5,000-$7,500
27) Sponsor a workshop on Low Impact Development (LID), Conservation Design/Green Building and the Impacts of Imperviousness on water quality. Include site visit to Homewood phase 2 construction (if LID construction is used)	Development Working Group	TM26, TM17	Phase 1: Winter, ongoing	Number of participants. Number of companies participating. Participant evaluation survey results on satisfaction and learning value.	MCWA, Frederick County, Canaan Valley Institute, New Forest Society, Emmitsburg and Thurmont Ministerium, Mother Seton Center, Mount Saint Mary's University, Canaan Valley Institute, and area churches	LID techniques help preserve predevelopment hydrology and WQ and minimize imperviousness. Build awareness and understanding of link between development and water quality.	$2,000 with honoraria and bus tours to demonstration sites.
28) Effects of trash dumping on water quality and wildlife habitat	Natural Resources Working Group	GC17, OC9, TC12, TM7, FC2, OC1	Phase 1: Spring, ongoing	Number of those attending workshop	ThorpeWood, Community Commons, Volunteer Frederick, Frederick County DPW Frederick Farm Bureau, MCWA, Land owners, Emmanuel Tire Co/Recycler	Neighbor to neighbor spread of knowledge and awareness.	$300 per workshop.
29) Benefits and aspects of land protection through estate planning, conservation easements, and wetland protection	Natural Resources Working Group	OC15, TC1, TM9	Phase 1: Summer/Fall, ongoing	Number of those attending workshop.	Potomac Conservancy, Catoctin Land Trust, ThorpeWood, Community Commons, Chesapeake Wildlife Heritage	Taking place at ThorpeWood where “green” practices have already been implemented providing demonstration in real life	$300/workshop
30) Teach and show homeowners six "greener" lifestyle practices: increase participation by 5% each year	Citizen Practices Working Group	TC8	Phase 1-3, ongoing	Number of those attending workshops.	Community Commons. MCWA partners including Master Gardners, Potomac Conservancy, Friends Meeting School, NPDES prgram, Frederick Co Solid Waste Coordinator	Rain barrels retrofitted by developmentally disabled. Other partners replicate native plan workshops including Friends of the Lake and the MD Native Plant Society, Frederick Chapter. Creating a travelling series for HOA meetings, club meetings, etc.	$15,000/yr
31) Benefits of forest management techniques, sustainable forestry practices, and improvement of timber stands and wildlife habitat	Natural Resources Working Group	TC1, OC15	Phase 1: Summer, ongoing	Number of those attending workshop.	ThorpeWood, State Forest Service, DNR Forestry, Potomac Conservancy, Frederick Forestry Board, MD Extension, Sustainable Forestry Initiative, Forest Stewardship Council, Tree Farm, Society of American Foresters	Aimed at those who are unfamiliar with what is available	$300; MD Extension, MD DNR Forest Service, Society of American Forests
32) Educate landowners on how to manage invasive plants and the benefits of landscaping with native plants for water quality and wildlife habitat	Natural Resources Working Group	TC1, OC40	Phase 1: Spring/Summer, ongoing	Number of those attending workshop.	ThorpeWood, Frederick Forestry Board, Community Commons, DNR Heritage, MD Extension Service, Master Gardeners	Taking place at ThorpeWood where “green” practices have already been implemented providing demonstration in real life; annual workshop by Forestry Board	$300/workshop
Events and Celebrations							
33) Celebrate National Water Monitoring Day	Monitoring Working Group	N/A	Phase 1: Prepare beginning 6/1/05 for event on 10/18/2005, annual event.	Press coverage. Numbers in attendance. Partner groups.	MCWA Monitoring Group	Could be used to promote existing project or monitoring effort.	Use existing staff to coordinate event and seek press coverage. Low Cost

Education and Outreach Objectives	Responsible Party	Related Comment Sites (if applicable)	Schedule	Measurable Indicators	Other partners	Innovations or additional leverage or benefit	Cost estimate & Funding sources (if applicable)
34) Celebrate Earth Day at Baker Park	Citizen Practices Working Group	N/A	Phase 1: late April, ongoing	Number of Exhibitors, Number of Attendees, and Number of those self listed wanting further information. Follow up on participation in projects using the citzen's database.	Community Commons and Common Market, cosponsors. Partners exhibiting or speaking including Potomac Conservancy, Hood College, MCWA, Organic Farmers Association, ThorpeWood, etc.	Excellent opportunity for networking among environmental community. Excellent opportunity to grow the base constituency and educate neighbors. Trees given away.	$15,000
35) Cosponsor a Frederick County "Local Food" Celebration	Agricultural Practices Working Group	N/A	Year 2 of Phase 1, ongoing	Frederick Office of Economic Development's Annual Data about Local Consumption; literature values for environmental pollutant savings from local consumption; Number of attendees	Frederick County Organic Growers Association, Frederick Co Economic Dev/Agric Specialist, Future Harvest - CASA , MD Organic Farming Association; Frederick Produce Company, Emmitsburg Ministerium, New Forest Society, Canaan Valley Institute, local Grange, Ministerium, Farm Bureau, area businesses, schools, and civic associations	Promotes use of local/ organic agriculture to local restaurants, schools, & citizens. Promotes developing community supported gardens (CSGs), the Emmitsburg Farmers Market & other local farmers markets	$10,000

Table 7: General Public Comments

Flora and Fauna
Beaver are a terrible problem from Bridgeport and north along the river.
White tail deer are a major problem to forest understory, farm crops, and cause automobile accidents on roads.
Instead of having forest adjoin the road rights of way, create grassed areas that are mowed once or twice a year to help drivers see deer attempting to cross the highway.
Promote a greater community awareness of the food value of deer.
More tree planting adds deer habitat and contributes to the crop losses of farmers.
Stream and Water Quality Degradation
Farmers are often blamed for putting too much fertilizer on their crops. However, farmers put the least amount possible to minimize cost.
Golf Courses and Homeowners Associations should be required to submit nutrient management plans just like farmers.
Fish populations have diminished drastically (noted particularly in Tuscarora and Glade watersheds).
Citizens feel that the government is not taking responsibility for the degradation of the environment and should be required to fix the problems caused by poor development approval decisions.
Neat vs. Natural: The public wants spotless golf courses, mowed lawns, and nice ball fields but this is contrary to water quality protection.
Community Outreach and Education
Need to name the unnamed tributaries in order to promote greater awareness of streams and their conditions.
Landowners would like to receive more specific information about their land and the environmental problems surrounding their area.
Educate people on alternatives to mowed grass. Promote "no mow" zones throughout the County.
Educate hunters about the effects of their lead shot on water quality and the environment.
Educate people on the effects of trash dumping.
Best Management Practices (BMPs)
Agricultural BMPs
Why are farmers the only ones required to submit nutrient management plans?
Trees tend to die in tubes or become overgrown but if tree tubes are not used, the deer eat them.
The fencing requirements of the Soil Conservation District (SCD) are too strict.
Current SCD programs encourage poor practices and do not reward those that already have good management practices on their land.
Urban BMPs
How much ice melt and road salt is the County using and why have they not switched to sand and cinders like other counties?
How much fertilizer/herbicides are being applied to ball fields, roadsides, and median strips? How much comes from landowners, public lands, agricultural lands, commercial lands, etc?
There is an overuse of fertilizer by citizens and farmers are often used as the "whipping boy".
Development
The key issue in the Tuscarora Creek watershed is development and its negative impacts on water quality
Restoration and protection work needs to be done in a top down fashion. There needs to be a planning committee that adopts a master plan to protect water quality and its rules need to be strong and strictly enforced.
Program Changes
Phosphates need to be banned from dishwashing detergents.
How can development occur along stream corridors without adequate public policy protections in place?
Rather than plan a development and then go back and fix what is wrong, we need to lay it out before construction and establish "green corridors" to protect water quality and wildlife.
The APFO needs to be amended to include the protection of stream buffer zones not just schools and roads. We all need to take responsibility and work to protect the environment.
Need to encourage the state of Maryland to facilitate innovative manure management and the use of manure as a source of fuel, resulting in a byproduct of bedding that is high quality and saves the farmer a considerable amount of money.
The County should encourage the municipalities to establish "no mow" zones or otherwise acknowledge the habitat benefit of having natural vegetation. Municipalities typically require that grasses be maintained no higher than 3", thus precluding natural meadows.
Issues Requiring Further Study
What was the extent of the impact on water quality as a result of the spill from Rotorex?
Are the standards for the Maryland Biological Stream Survey (MBSS) being adjusted down like what has happened in the Chesapeake Bay?
What is happening with the sewage treatment plant at Victor Cullen? Is it being maintained?
What role does the atmospheric deposition of nitrogen have in the total nutrient load in this area?
There are large stacks of railroad ties that are being stacked along Owens Creek? Are they having negative impacts on the water quality?
People tend to dump carcasses on the roadway after processing the deer. What is the Department of Natural Resources (DNR) advice on how to deal with this situation or are there other methods of disposal so that they are not washing into the creeks?
What happens to sediment deposits in the stream? Are they eventually cleaned out by storms? What can/should a landowner do that has a stream that is badly impacted by sediment? Is there a way to get permission to remove the sediment that has washed into the stream from a large rain and place it back on your land?

Comment Sites

Table 8: Site Specific Comment Table

EPA Requirement C-2

Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
Glade Creek (Map 18)			
SCA Review - August 25, 2004			
GC1	N/A	See Capacity Building section	Obtain/Develop mapping of wellhead and recharge protection area for Walkersville public water supply-ultimately have the county adopt the towns' wellhead protection ordinance
GC2	IB 1917401	NRO#1, NRO#2, EOO#1, EOO#23	Candidate for CREP-needs livestock fencing and stream buffering
GC3	EP 0711203	N/A	Investigate exposed pipes with County's Utilities and Solid Waste Management
GC4	IB 1917401	NRO#2, EOO#23	Large acreage farm owner-potential partner for agricultural outreach to promote stream buffers
GC5	IB 2421301	EOO#19	Potential community restoration project with New Midway Fire Department-stream buffering
GC6	FB 2420302	NRO#8, EOO#19	Write to the railroad company to notify of fish barrier-culvert blocking fish passage in low water
GC7	IB 2719204	NRO#2, NRO#7, EOO#24	Elevated nitrates and absence of grass swales in headwater areas-require BMPs
Steering Committee Comment - December 8, 2004			
GC8	N/A	N/A	Town of Walkersville has future annexation issues. Opportunity for stream buffer restoration in large area
GC9	IB 1917401	EOO#15	Heritage Farm Park - Have buffer plantings and is owned by town. Good buffer example for others used by SCD
GC10	N/A	EOO#15	Fountain Rock Park - county park and nature center. Cold water capped spring
GC11	IB 0712201	N/A	NRCS to look at which landowners have cattle in stream
GC12	N/A	N/A	Quick recharge from surface to streams because of karst may cause high nutrient loads
GC13	N/A	N/A	Targeted outreach is due to agricultural issues. 319 funding. Innovative BMPs in past. Extensive cooperation with some farm operators. Rapport established at GC9 and above. Less work done below. High likelihood of preservation above GC9. Manure management system major investment and improvement. Annexation below.
GC14	N/A	EOO#23, See Program Change section	Development conversion from agriculture along stream and river. Upcoming with no real protection.
GC15	N/A	N/A	IPP preservation farm. Contact Tim Blazer for more information

Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
GC16	N/A	NRO#9	Interest from ThorpeWood to connect with landowners regarding donated easements. Need for Conservation Buyers Program.
GC17	TD 2819201; ES 2819202	EOO#28	Sensitive species area in watershed characterization. May be affected by erosion and trash. Trash dumping is a major issue in such an area
GC18	N/A	NRO#7, EOO#12, See Capacity Building section	Spring used by folks for drinking water.
Tuscarora Creek (Map 19)			
SCA Review - August 25, 2004			
TC1	N/A	NRO#9, EOO#12, EOO#29, EOO#31, EOO#32	Pristine forested area adjacent to protected land-target with conservation easements
TC2	N/A	NRO#7, See Capacity Building section	Investigate current/potential wetland and spring areas for updating GIS layers and identifying restoration/protection sites
TC3	ES 0408302; IB 0407301	NRO#4, NRO#5, EOO#15, EOO#19	Community restoration with Clover Hill HOA
TC4	ES 0410301; ES 0510302; IB 0310301; IB 0510301	NRO#6, NRO#15, EOO#15, EOO#19	Potential community restoration project with partner Homewood/UCC-elderly facility
Steering Committee Comment - December 8, 2004			
TC5	IB 0607201	NRO#7	Potential wetlands; have Kelly Neff/MDE evaluate
TC6	N/A	EOO#19	25-acre parcel with owner interest in using as a demonstration and outreach site. Ideal location from which to reach out to owners in the Mtn. Laurel Estates subdivision and surrounding area. Winter springs in this area abound with risks for spring contamination. Future training should include spring protection strategies.
TC7	IB 0607201	NRO#7, EOO#3, EOO#7, EOO#15, EOO#19	Yellow Springs Elementary - the school desires to develop a wetland. There are potential nearby partners that include the Lyons Club park near the school and the Brook Hill United Methodist Church. Possible partnership exploration with MDE
TC8	ES 0510302; IB 0510301	EOO#19, EOO#24, EOO#30	Worman's Mill is a possible restoration site. Substantial erosion and possible location for a "greener lifestyles" workshop.
TC9	IB 0310301	NRO#7, EOO#19	Wetland/buffer project with Monocacy Middle and Elementary Schools

Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
TC11	N/A	NRO#8	Protect brook trout fishery resource
TC12	FB 0311301; IB 0311302	EOO#28	State Farm is potential partner. Possible willing to clean up the dumpsite on adjoining property, near its wildflower field to be a good neighbor.
Fishing Creek (Map 20)			
SCA Review - September 2, 2004			
FC1	IB 1512313	NRO#7	3 dried ponds with wetland potential-CREP potential on other side of the stream
FC2	TD 1610301	EOO#14, EOO#28	Explore modifying Clean Sweep program or creating Stream Sweep program for trash dumping
FC3	IB 1513401	NRO#2, NRO#3, EOO#19	Lewistown Fire Department-Backyard Buffer program-potential site for handing out trees to Lewistown landowners
FC4	IB 1114402	NRO#2, NRO#7, EOO#19	Potential wetland restoration and buffer planting with Parks & Rec
Steering Committee Comment - December 8, 2004			
FC5	N/A	N/A	City of Frederick may alter the capacity of reservoir (20% supply)
FC6	N/A	N/A	Cold Deer Sportsman's' Club own many of the cabins (Mountaindale) with potential
FC7	N/A	See Capacity Building section	Frederick City Watershed - Convene group to protect the watershed from being developed; Frederick City Watershed: Rural dumping and four-wheeler access-need a meeting to establish "Friends" group for watershed. Need recreation use plan
FC8	IB 1310201	NRO#7	Potential wetland site to grow native plants; Old fish pond site, inadequate buffer, stream problems, potential wetland sites
FC9	N/A	N/A	Covered bridge - only 1 of 3 remaining in the County
FC10	IB 1513401	NRO#3	Lewiston Fire Hall - backyard buffer candidate
FC11	N/A	N/A	Crestview Estates with no buffer and potential 2 mile buffer
FC12	N/A	EOO#15	Potential for trail on the old trolley line
FC13	IB 1617102; ES 1516101	EOO#2, EOO#23	Inadequate buffer with a lot of erosion downstream. Potential to work with the property owner (ag preservation participant)
Hunting Creek (Map 21)			
SCA Review - September 2, 2004			
HC1	N/A	NRO#7, EOO#19	ThorpeWood wetland restoration site
HC2	IB 2014101	EOO#16, EOO#19	Catoctin High School riparian senior projects/buffering

Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
HC3	IB 1914102	N/A	MD Native Plant Society potential restoration for railroad easement
HC4	N/A	EOO#22	Perform stream testing up and downstream from treatment plant and the golf course-survey team noted that stream is very green
HC5	IB 0616201	N/A	Landowner is potential community organizer of upstream restoration
Steering Committee Comment - December 8, 2004			
HC6	IB 0713201	NRO#8, EOO#19	Restoration sites to benefit trout habitat. Reforestation for trout habitat on Little Hunting Creek and Hunting Creek
HC7	ES 1012201	N/A	Sensitive species area - change fish barrier under Rt. 15 - SHA responsibility?
HC8	IB 0813201	NRO#8, EOO#19	Riparian restoration - Assist operator of Hunting Creek Hatchery and downstream property owner to plant shrubs and trees along tributaries and ditches draining to fish ponds to help cool water before it enters Hunting Creek
HC9	ES 0419201; IB 0616201	EOO#24	Thurmont Sportsman's Club - Examine property to see whether additional habitat/water quality improvements can be established, perhaps warm and cool season grasses for ground nesting bird habitat
HC10	IB 0616201	EOO#23	Agricultural preservation property near the Sportsman's club. May have potential as a partner for outreach to neighbors in this area. Additional potential partner, the fly-fishing group in the Thurmont area (Brotherhood of the Junglecock). They have a big gathering every spring and teach fishery and land stewardship to youngsters. They have a strong history with fly-fishing.
HC11	IB 1717201	EOO#23	Agricultural preservation landowner. Possible partner for outreach to others
HC12	N/A	N/A	Past sewer leak (several years ago). Also sensitive species area
HC13	IB 1914102	EOO#19	Middle School - Award for "greenest school" in Frederick County. Active teacher with leadership. May partner with additional restoration projects. Also elementary and primary schools are potential partners.
Public Comment - March 3, 2004			
HC14	N/A	NRO#7, EOO#19	Extensive wetland and seep area with threatened vegetation near the intersection of Stottlemeyer Rd and Rt. 77. Potential wetland restoration site and Adopt a Road priority.
HC15	ES 1814302	N/A	Extreme erosion south of the town offices where restoration efforts have failed in the past.
HC16	N/A	NRO#12	Area below wastewater treatment plant and Maple Run Golf Course south of Thurmont thought to smell like sewage.
HC17	N/A	EOO#22	Maple Run Golf course was reported as a contributor of pollution to the creek

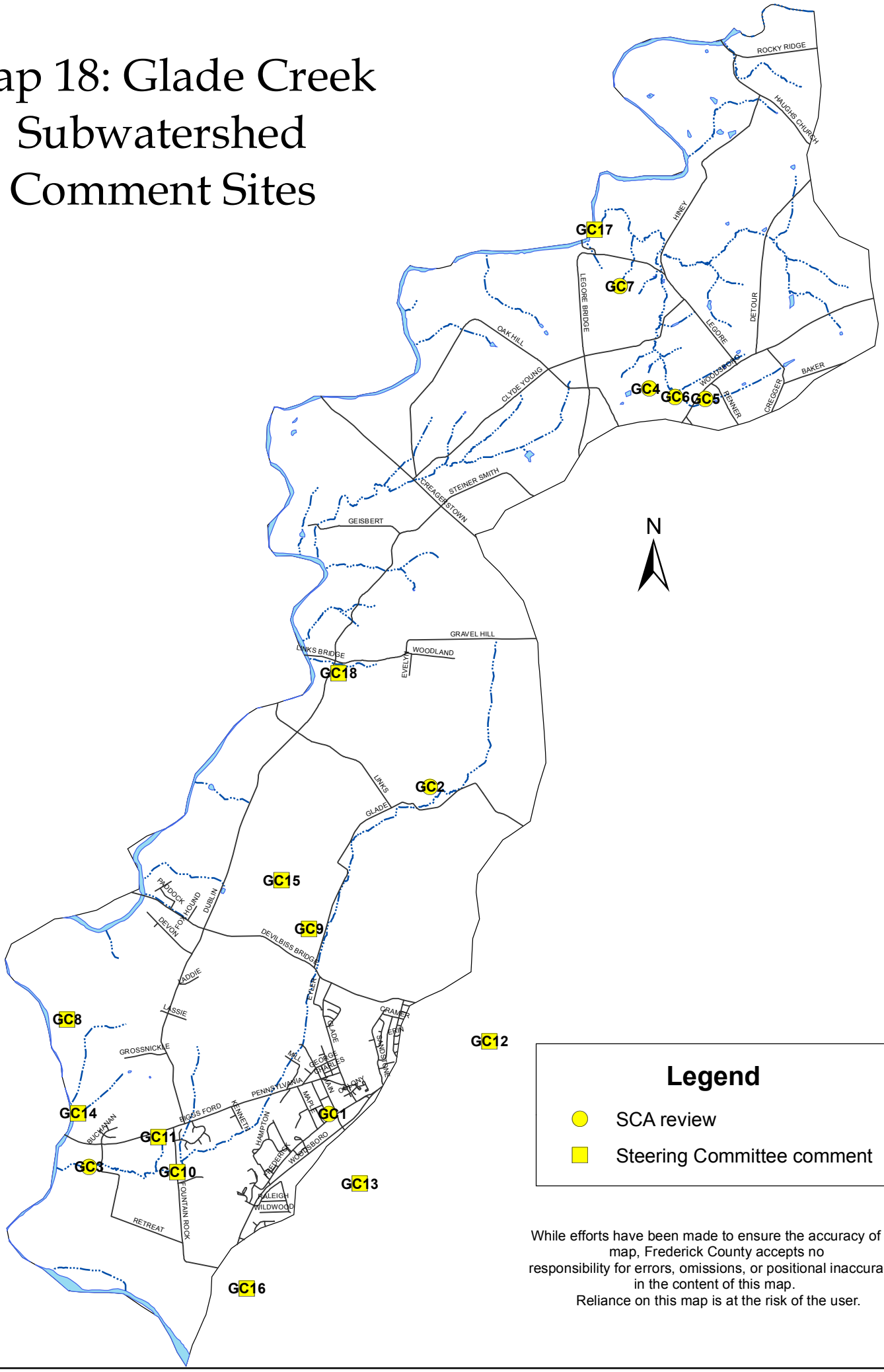
Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
HC18	N/A	NRO#8, EOO#19	During the last drought, Muddy Run dried up and the fish population has not be successful at repopulating the stream reach. Is it possible to reestablish this population?
Owens Creek (Map 22)			
SCA Review - September 16, 2004			
OC1	TD 1021201; TD 1322101; TD 2517101	EOO#14, EOO#28	Explore modifying Clean Sweep program or creating Stream Sweep program for trash dumping
OC2	IB 2319101	NRO#2, EOO#23, EOO#24	Unbuffered pasture-candidate for CREP
OC3	FB 2419103	EOO#19	Contact SHA to explore baffle installation in culvert under Hwy 15
OC4	IB 1522201	N/A	Require misc. subdivision lots (divided farm lots) to show natural resource characteristics for property
OC5	N/A	N/A	Develop program to acknowledge stream stewardship as incentive to implement BMPs on property during site plan approval process
Steering Committee Comment - December 8, 2004			
OC6	N/A	N/A	Landowner enrolled in CREP
OC7	N/A	EOO#19	Catoctin High School - Partner with ThorpeWood; may have grow out station and school yard habitat
OC8	N/A	N/A	Catoctin Mountain Orchard - Friendly farmer; liaison to business/farm community. Active in the Rt.15 scenic corridor
OC9	N/A	EOO#28	Gorgeous view - SHA says if someone controls trash, they will create touristy overlook
OC10	N/A	N/A	Camp Airy - Aaron Strauss foundation - Jewish boys' summer camp; boy scouts also may use and want an environmental program
OC11	N/A	EOO#19	Sabillasville Elementary – Potomac Conservancy may do a rain garden demo
OC12	IB 1820201	EOO#16	Small grow out station for New Forest Society
OC13	N/A	EOO#12	Lots of camps in park area
OC14	N/A	N/A	Outdoorsman, turkey farmer, CREP, church connections (they planted and he donated $ to the church)
OC15	N/A	NRO#10, EOO#31, EOO#29	Forestry Board would like to do a program in Toms and Owens Creek about forest management plans, buffers, and long range planning
OC16	N/A	EOO#19	Mt. St. Mary's drainage - forest property, preservation opportunity, seminary student projects?
OC17	N/A	N/A	Covered bridge - county park

Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
OC18	N/A	N/A	Covered bridge - county park
OC19	N/A	N/A	Catoctin Mountain National Park on Manahan, Foxville Deerfield
OC20	N/A	N/A	Horse farm
OC21	see OC25	N/A	Redland Brick - very interested in the process
OC22	N/A	N/A	Volunteer Fire Company and Fire Hall (potential gathering place?)
OC23	N/A	N/A	The Big Slide
OC24	N/A	N/A	Native trout were stocked somewhere around here years ago.
Public Comment - March 3, 2004			
OC25	IB 1122202; PO 1122203	NRO#8	Redland Bricks' land area includes considerable past mining where there is no vegetation on the rock that has been excavated. More areas are planned for clearance and extraction.
OC26	N/A	N/A	Liquid manure is applied on snowy/frozen ground on several farms including Oak Bluff and Rocky Ridge
OC27	N/A	N/A	NVR Housing - 30-40 acres exposed
OC28	N/A	N/A	Old dumpsite, which is still in use, includes dumping by out of state landscape company. Neighbors periodically clean up the site and seek to get license tag of illegal out of state dumper.
OC29	N/A	N/A	Old dump
OC30	RE 1122201	N/A	Old drain tile, north side of Rt. 77
OC31	N/A	N/A	Altered waterway
OC32	N/A	See Capacity Building section	Excessive flooding, flood water backs up behind Rt. 15
OC33	N/A	N/A	Pipe outfall
OC34	N/A	N/A	Altered channel
OC35	N/A	See Capacity Building section	Bridges dam water at high flow
OC36	N/A	N/A	Altered stream channel
OC37	N/A	N/A	Bridge for road into campground dams water
OC38	N/A	See Capacity Building section	Flooding
OC39	N/A	N/A	Reforestation site
OC40	N/A	NRO#7, EOO#32	Large wetland in which the invasive mile a minute weed is a terrible problem
Toms Creek (Map 23)			
SCA Review - September 16, 2004			

Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
TM1	N/A	See Capacity Building section	Complete Toms Creek stream layer to include those stretches missing from GIS layer (Friends Creek)
TM2	FB 1907201	EOO#19, See Capacity Building section	Research approach to poorly installed culverts on homeowner lands creating fish blockages
TM3	IB 2204203	NRO#2	CREP candidate
TM4	IB 2204201	EOO#12, EOO#19	Target residential Inadequate Buffers with Backyard Buffer program
TM5	IB 2104201	NRO#3, EOO#19	Potential community restoration with Victor Cullen Hospital and Backyard Buffer demonstration site
TM6	EP 2105201	N/A	Investigate exposed pipe
TM7	TD 2105203	EOO#19, EOO#28	Explore modifying Clean Sweep program or creating Stream Sweep program for trash dumping
TM8	FB 2307303	See Program Change section	Switch type of culvert on future road crossings to eliminate fish blockages
TM9	RE 2320201	NRO#9, EOO#12, EOO#29	Target with conservation easements to build and protect contiguous forest area
TM10	IB 2216101	NRO#2	Possible open space-install buffer prior to development if still zoned as agric land
TM11	PO 2217104	N/A	Investigate with Emmitsburg Town planner-cast iron pipe
TM12	IB 2117301	EOO#19	Community restoration potential with Mother Seton School-buffering and biofiltration/rain garden
TM13	IB 1824301	NRO#2	Investigate Agricultural Preservation status-are water quality BMPs installed and inspected regularly?
Steering Committee Comment - December 8, 2004			
TM14	N/A	NRO#11	CDBG Block Grant application to fully mitigate sewerage spills; raw sewerage spill into Flat Run, major source of spill
TM15	ES 1923301; IB 1923302	NRO#2	High concentration of farms in agricultural preservation program and may be open to conservation security program or other BMPs. Accelerate inspection and monitoring of soil and water conservation plans
TM16	PO 2117303; IB 2117301	NRO#2, EOO#19	Sisters of Charity is a large landowner. Community Commons and back yard school habitat project
TM17	IB 2216101	EOO#27	Proposed development of 100 houses. Potential package plant sewage treatment discharging to Silver Fancy Farm, Little Run tributary
TM18	IB 2117301	EOO#7, EOO#19	Emmitsburg Elementary has a wildlife habitat project and is working with Community Commons on a backyard school habitat project
TM19	N/A	NRO#2, EOO#19	Mt. St. Mary's University, buffer work on Stony Branch
TM20	N/A	NRO#11	Little Run project to replace 3000 feet of sewer line
TM21	N/A	EOO#7, EOO#19	New Forest Society, Mother Seton, ThorpeWood, Emmitsburg Elementary - buffer on Toms Creek

Comment Site ID	SCA Report ID	Natural Resource Management (NRO) or Education and Outreach (EOO) Objective ID	Note
TM22	ES 1923301; IB 1923302	EOO#2	Mason-Dixon Farm is a large dairy farm located on the northern County line. Need to share information on water quality issues and conditions.
TM23	N/A	NRO#9	Emmitsburg owns land around the reservoir. Working with Forestry to manage potential work with TNC
TM24	N/A	NRO#3, EOO#12, EOO#19	2 backyard buffer projects on Harney Rd
TM25	N/A	EOO#7, EOO#19	Sabillasville Elementary - Community Commons backyard habitat project
TM26	N/A	EOO#27	Northwest County Civic Association is currently opposing development projects, interested in preserving the rural character and water quality

Map 18: Glade Creek Subwatershed Comment Sites



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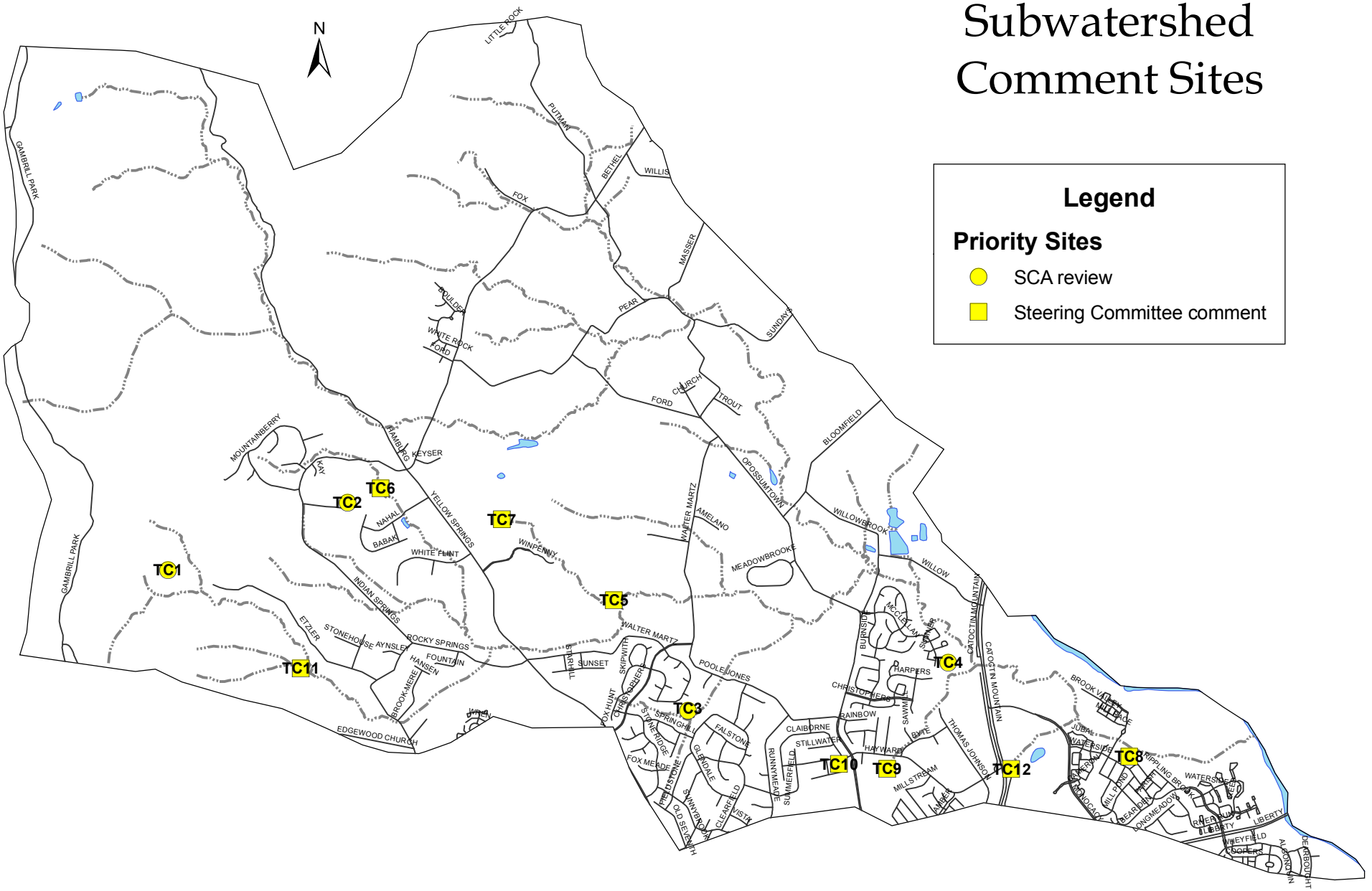
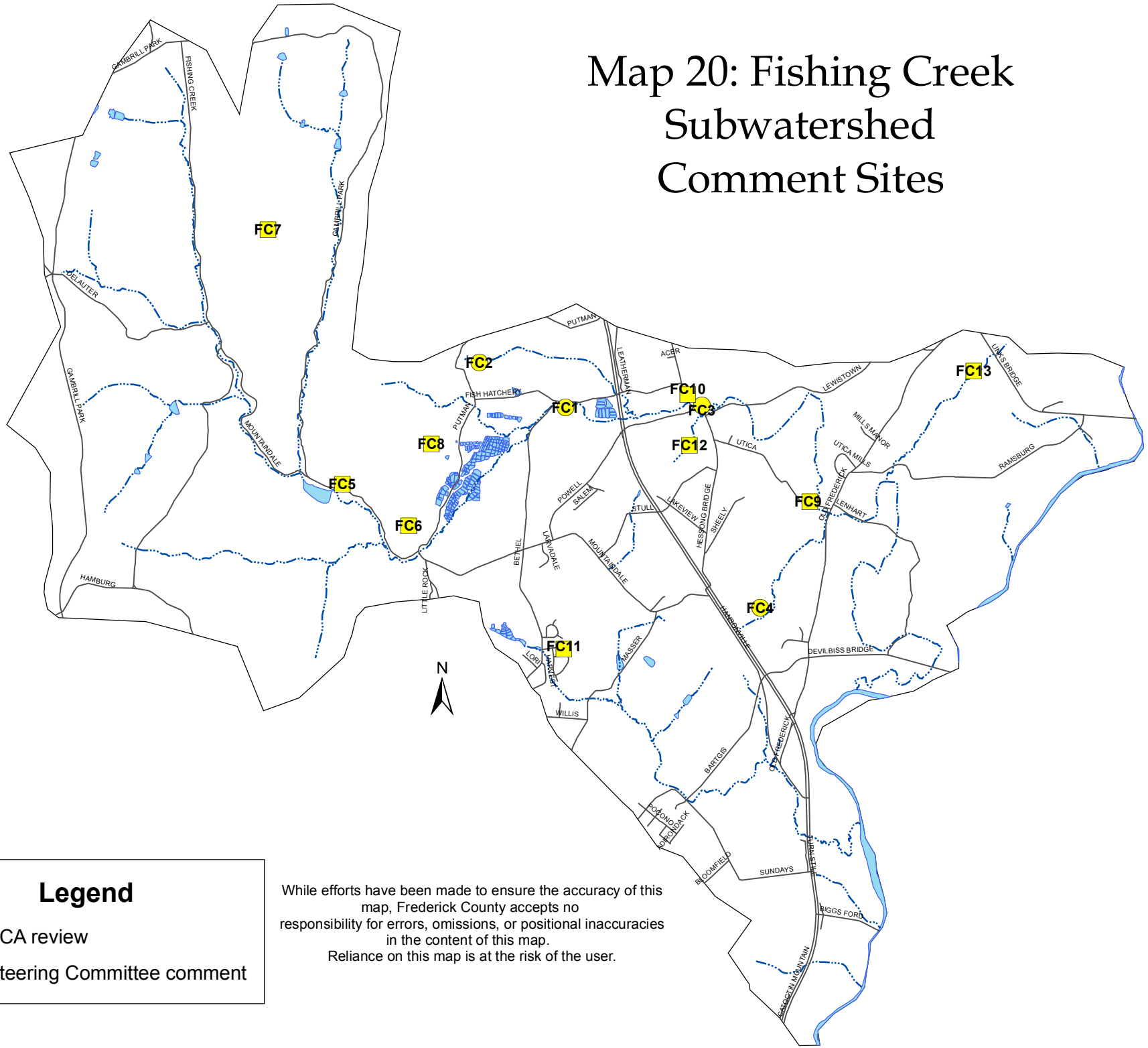
Reliance on this map is at the risk of the user.

Map 19: Tuscarora Creek Subwatershed Comment Sites



Map 20: Fishing Creek Subwatershed Comment Sites



Legend

- SCA review
- Steering Committee comment

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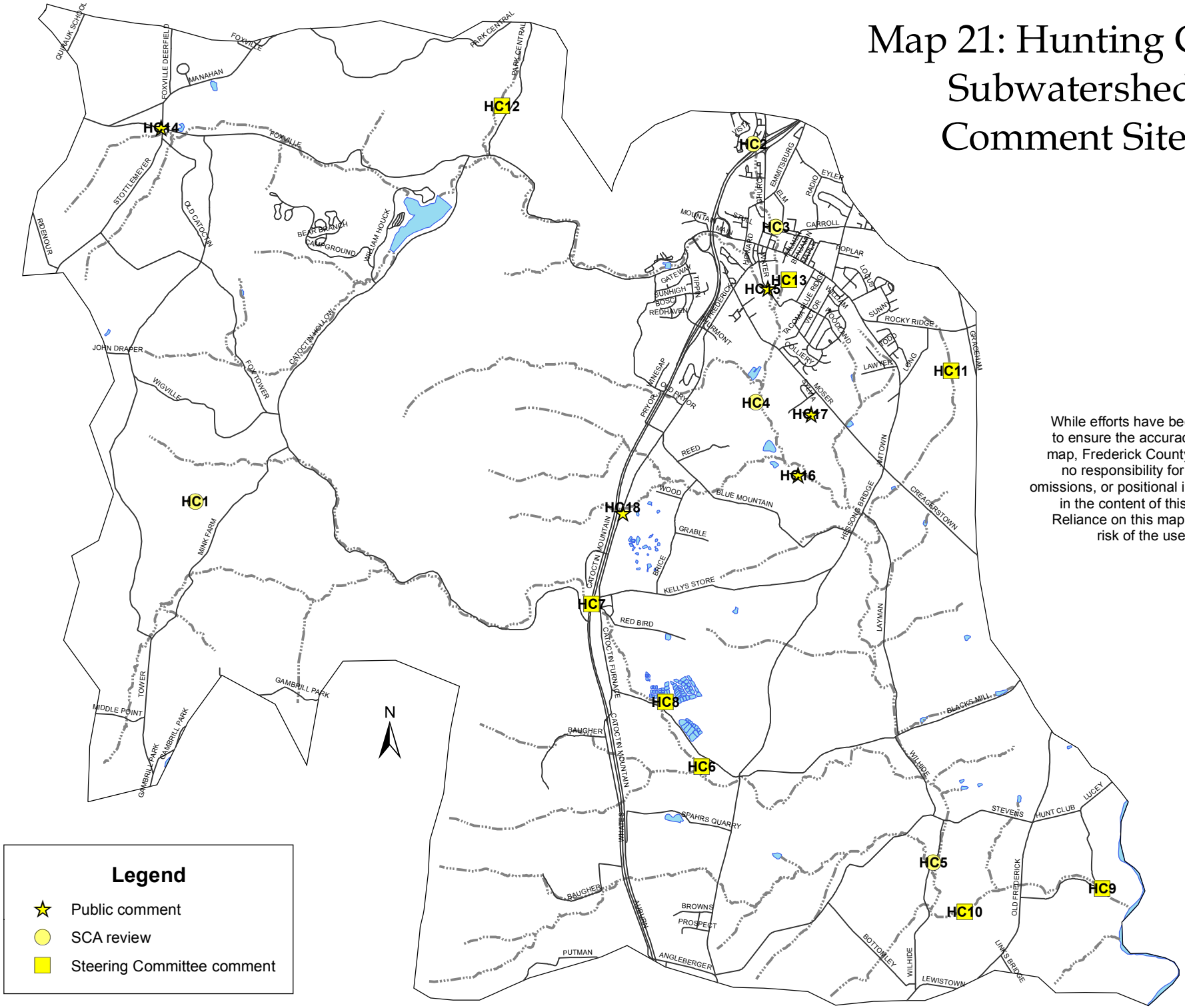
Map 21: Hunting Creek Subwatershed Comment Sites



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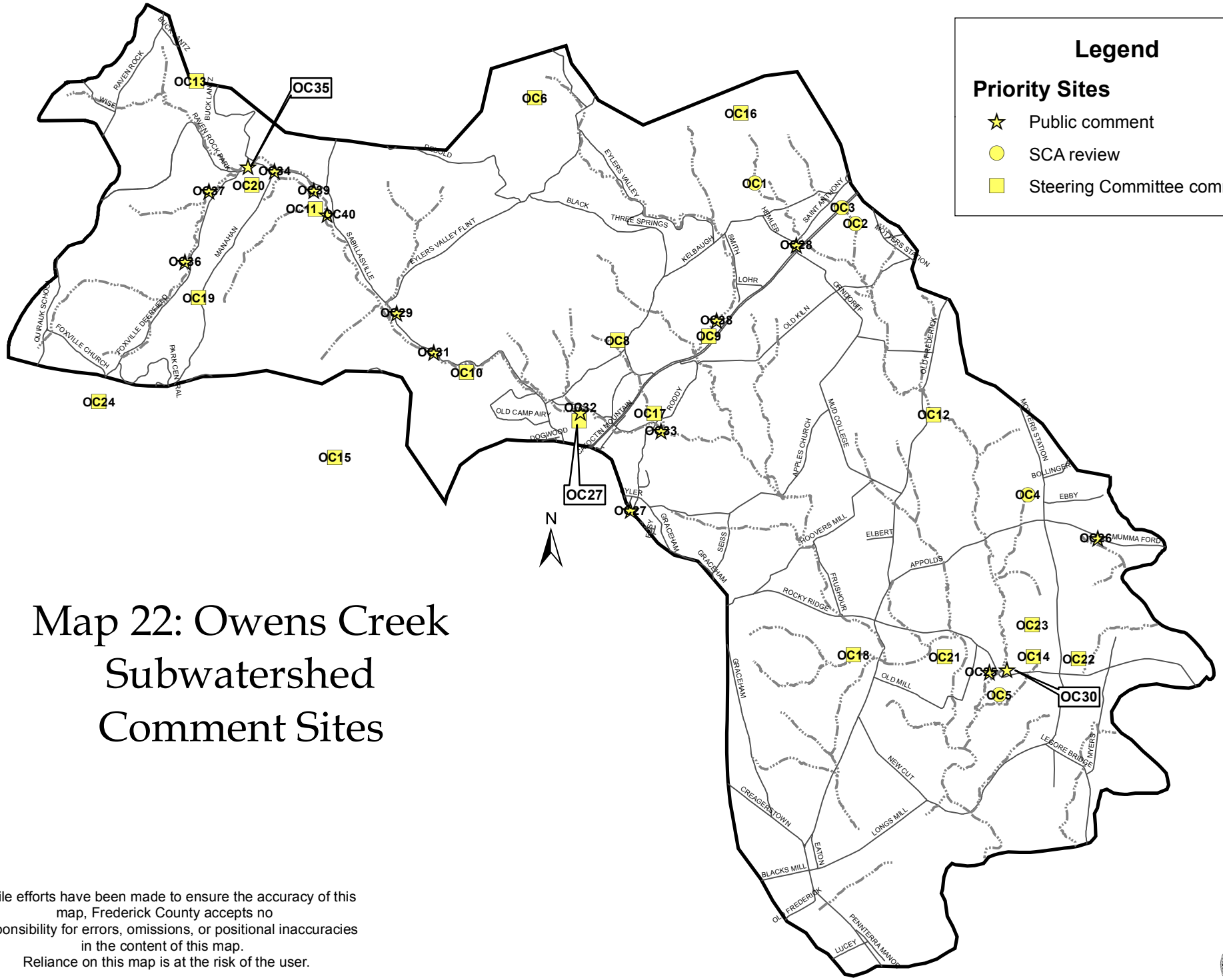
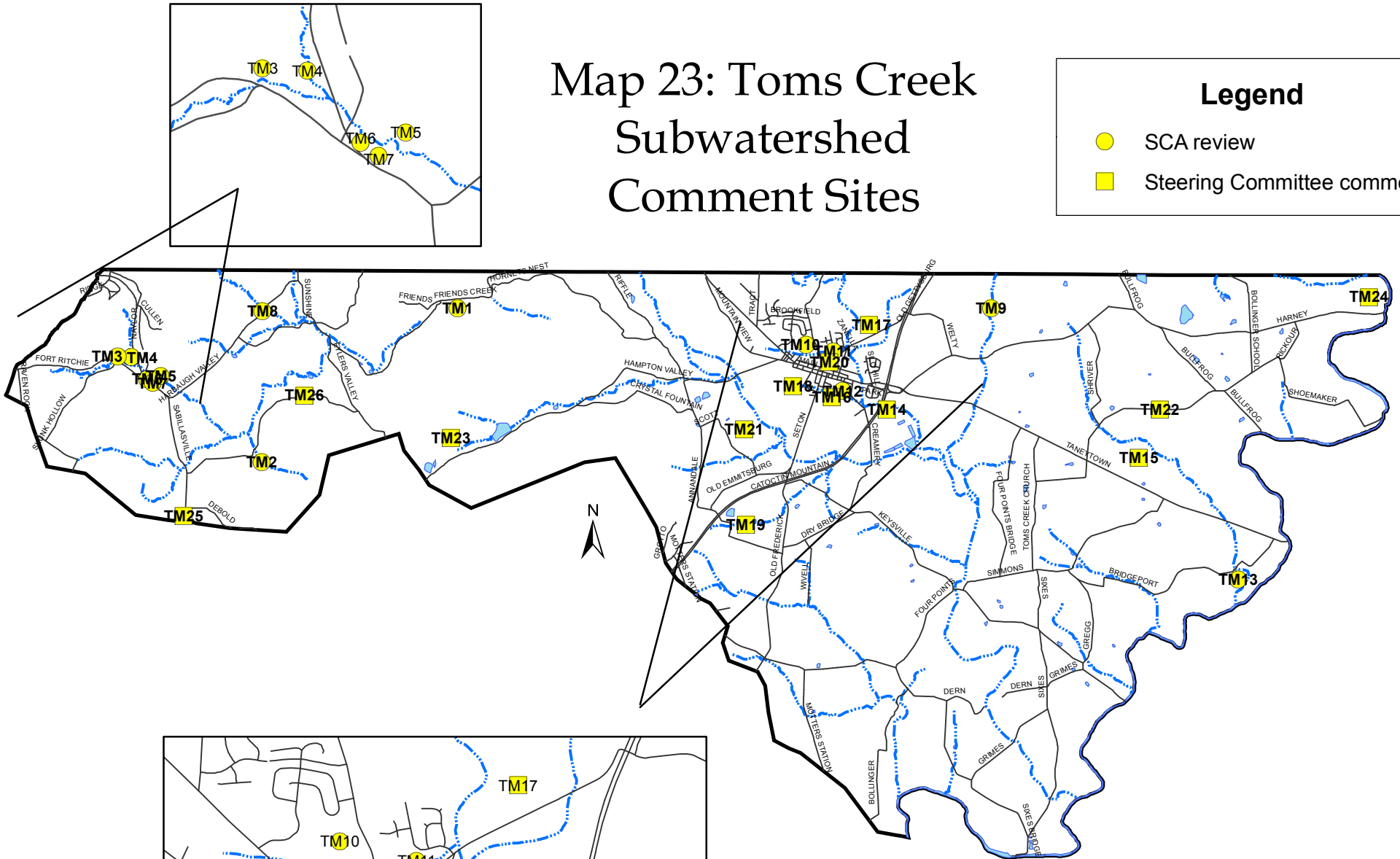


Map 22: Owens Creek Subwatershed Comment Sites

Map 23: Toms Creek Subwatershed Comment Sites



Legend

- SCA review
- Steering Committee comment

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.

Capacity Building

The Upper Monocacy WRAS Steering Committee identified more than a dozen important capacity building initiatives in four areas in order to increase the Monocacy River Watershed community's ability to protect and restore water quality and habitat. Each is briefly described below and depends to varying extents on further development, leadership, human, technical and financial resources.

Organizational Capacity

The Upper Monocacy and the Lower Monocacy WRAS Steering Committees desire to establish a nonprofit **Monocacy & Catoctin Watershed Alliance (the Alliance).** The Alliance would coordinate the implementation of the WRAS plans with ongoing responsibility to protect and restore water quality and foster collaboration and partnership among members. Currently the Alliance includes more than 50 representatives of more than 35 organizations that have been collaborating in projects growing out of the Lower and Upper Monocacy WRAS planning initiatives. In order to create a sense of identity, the Alliance has developed its own logo and a traveling outreach and education exhibit. Next steps to develop its capacity include coaching from a technical assistance provider such as the River Network in formulating an organizational development plan and securing a nonprofit corporate structure and tax exemption. Darrell McCartney, Steering Committee member representing the Frederick Forestry Board and the Frederick Sportsmen's Council, is spearheading the development of the Alliance and is investigating the feasibility of adopting the existing but presently out of use structure for the Monocacy Watershed Conservancy.

Steering Committee members recommend that **Frederick County's Watershed Management Section develop an ongoing staff capability to access resources for implementation of community restoration projects and other elements of watershed plans.** Funding would be sought to establish a **permanent Implementation Coordinator** position that would work closely with the Alliance and its members.

Recognizing that the Upper Monocacy River tributaries are not only in Frederick County but also in Carroll County, Maryland and Adams County, Pennsylvania, the partners intend to **coordinate their restoration and protection initiatives with activities in these adjoining jurisdictions** and seek to adopt a coordinated strategy with both.

The Town of Thurmont desires to map its storm drains in GIS, delineate its wellhead protection areas, and receive technical assistance in developing ordinance language for wellhead protection. Methods for delineating wellhead protection and draft ordinance language for wellhead protection would be shared with other interested municipalities including Emmitsburg. Thurmont indicated that it has too few personnel during storm events for adequately forecasting, monitoring and checking problem areas.

Watershed Management Capacity

Frederick County's Board of County Commissioners (BoCC) has directed County staff to develop the concept for a **Water Resource Management Task Force** that would recommend an ordinance and procedural guidance to better manage water resource quantity and quality for current and future generations. This BoCC priority provides a unique opportunity to begin to address the multiple issues impacting water resources in the County. Steering Committee member, Shannon Moore, the County's National Pollutant Discharge Elimination System

(NPDES) Director, and Mike Marshner, the County's Director of the Division of Utilities and Solid Waste were directed to develop the concept. Frederick County Planning Department staff is also interested in formulating a recommendation to the BoCC. Possible work products of the Task Force could be the creation of overlay zones for various resources where restrictions of certain practices would be enforced. These overlay zones might include, but are not limited to, aquifer recharge areas, reservoir recharge areas, Total Maximum Daily Load (TMDL) areas, source water protection areas, karst overlay zones, stream buffers, flood plains, and wetlands. An anticipated outcome would be improved coordination among stormwater management, surface water quality monitoring and available water supply.

> The Commissioners are particularly concerned about the overuse of fertilizers by homeowners, the degrading clarity of the Monocacy River, livestock access to streams, and risks to clean water supply. To this end, the Commissioners voted on December 14, 2004 to authorize preparation of an Integrated Water Resource Plan for Frederick County, support the continuance of state planning efforts, and request staff recommendations on the shape and focus of efforts to protect drinking water quality and quantity.

In a related capacity building issue, the Steering Committee recommends **better management, further enhancement and expansion of wetlands in the watershed**. It is recommended that the County partner with the Maryland Department of Natural Resources (DNR) and the U.S. Environmental Protection Agency (EPA) to expand current wetland GIS layers to include significant wetland resources that are unmapped. With this additional information, interested community members could join Alliance members in prioritizing locations for wetland protection and enhancement. Such projects would be among the community restoration strategies deriving from the WRAS plan.

The Steering Committee urges **effective prevention of soil erosion, sediment pollution, and stream degradation during the process of timber harvesting or clearing of forest for development**. In consultation with the timber harvesting industry and the County's Environmental Compliance Section, the Natural Resources working group would reexamine requirements and procedures governing logging and land clearing, including proper permitting, reporting, functional sediment and erosion control devices, defining and enforcing limits of clearance, and clean up, re-grading, and stabilization. The Committee supports efforts to monitor and improve the effectiveness of sediment control and waterway protection measures. A related capacity building initiative would **employ sufficient inspectors to adequately inspect timber sites** before, during, and after logging so as to assure that water quality is adequately protected and contractors and landowners are held accountable.

Building on the work under the WRAS grant in training municipal and County officials in Illicit Discharge Detection and Elimination (IDDE), the County proposes to enhance its existing **Illicit Discharge Detection and Elimination program** using the Center for Watershed Protection's Model. As part of the IDDE program, the Committee suggests performing Stream Corridor Assessments (SCAs) on an additional 100 miles within the Upper Monocacy River Watershed. Additional IDDE data sheets would be added to the survey in order to identify and test outfalls. The additional streams surveyed would be selected by the Alliance in light of proposed restoration project locations, among other considerations. The National Civilian Community Corps (NCCC) would perform this task.

Frederick County intends to **update its GIS stream layer to include streams and tributaries that are currently missing from the layer.**

Additional GIS work would be done to establish or improve the quality of GIS layers defining riparian corridors and forests, agricultural best management practices, and protected lands.

Observing the fish blockages resulting from stream crossings, the Steering Committee proposes that, **in future culvert building and repair, the County use new design standards to prevent blocks, accommodate bank-full flow and provide access to the floodplain**. Since many of the streams in the Upper Monocacy have naturally reproducing trout populations, it is important to engineer stream crossings that do not block fish passage. Current culvert designs are also threatened by floodwaters caused by altered flood plain conveyances from human impacts. The County is working to create better road closure procedures for roads that currently flood.

Recognizing that white tailed deer populations exceed the numbers that the local ecosystem can support and are severely damaging the forest under story plants, the Steering Committee recommends **expansion of the Farmers and Hunters Feeding the Hungry Program with $7,500 in funding from private sources to process an additional 150 white tailed deer** during the 2005-2006 hunting season. Building on the experience of Stronghold and other natural resource management areas in the Lower Monocacy, the Committee understands that a well-managed hunting program can go a long way towards bringing deer numbers into line with what the habitat can support. Vegetated buffers and water quality partially depends upon the ability of farmers and hunters to control deer populations and are improved by harvesting the lean protein for local feeding programs.

Steering Committee members agree on the need for management improvements in the **City of Frederick Watershed.** The Forest Stewardship plan includes draft recommendations that address permitted recreational uses, access, trail maintenance and repair, trash management and other management issues impacting water quality and habitat in the area. The plan also recommends closing unauthorized trials. Currently, use of ATVs is prohibited, though not effectively enforced. Partners anticipated to assist with plan development and implementation include the Trail House, Cold Deer Sportsman's Club, RC&D, DNR, and Team Link.

Development Capacity

In an effort to address existing capacity building issues regarding development, the Steering Committee recommends acknowledging and building upon the considerable stakeholder involvement that has already been invested resulting in two work products, each of which includes significant recommendations consistent with the vision and goals in the County's Comprehensive Plan.

Recognizing the rapid pace of development in the County, a diverse group of development, environmental, local government, civic, nonprofit, business and other community professional convened as the "Frederick County Site Planning Roundtable" during 1999. The Roundtable identified, through a consensus building process, local codes and ordinances that act to prohibit or impede better site designs and adopted Recommended Model Development Principles for Frederick County, MD in 2000 providing recommendations on how codes might be amended to foster more environmentally friendly development.

In a later, somewhat parallel effort, a fifteen person Citizens Zoning Review Committee, broadened to include some representatives of the agricultural community, spent 15 months of work reviewing the County's zoning ordinance, soliciting citizen input and engagement during the process. A comprehensive set of recommendations were arrived at through a consensus process and presented to the Board of County Commissioners of Frederick County in July 2003. The

Commissioners have considered each of the Committee's recommendations. Those that have been approved will be incorporated in a revised zoning ordinance.

The Roundtable report has not yet been translated into actionable items for the Board of County Commissioners to consider. **The Steering Committee recommends that adequate financial and human resources be secured to translate the Roundtable recommendations into actionable items for Board consideration.** As the report concludes, "these proposed recommendations for improving development in Frederick County are only the first step in what must be a county-wide commitment to protecting water resources.

Observing the continuing use of conventional land development techniques, the Steering Committee recommends that key personnel from the **reviewing and inspecting entities** overseeing new development projects be convened to **collectively identify current obstacles to conservation design** in consultation with members of the Land Development Council of the Frederick Builders Association. The results of this consultation process would help further focus the development of actionable items growing out of the Roundtable recommendations.

Research has shown that water quality impacts from decentralized septic systems are significant as traditional septic systems remove an estimated 20% of nitrogen on average when working properly (*The Practice of Watershed Protection, Article 123, "Dealing with Septic System Impacts", Appendix F).* The Steering Committee recommends that **Frederick County increase its capacity to inspect and monitor septic system functioning** so as to better protect ground water from nutrient impacts.

Protection Capacity

Current resource conservation zoning permits five-acre building lots. This zoning classification does not protect land from sprawl. Sprawl development fragments forests and threatens the contiguity of the green infrastructure hub around the Catoctin Mountains. The Steering Committee suggests that this challenging threat be addressed with further study and stakeholder consultation. Such a consultation process would **seek to identify several techniques that could be used to protect this important headwater area.** Protection techniques might include the transfer of development rights to receiving Priority Funding Areas in Emmitsburg or Thurmont, the granting of conservation easements to land trusts, increasing the minimum lot size, requiring on site treatment of stormwater and low impact development techniques assuring that pre-development hydrology regimes are maintained, among others.

Program Change

The program changes proposed here address three issues: nutrient contamination of ground water from septic systems; sprawl development in agricultural zones; and stream protection during land conversion.

Reducing Pollution from Decentralized Septic Systems

Conventional septic systems remove only 20% of the nitrogen from household waste (Appendix F) as mentioned earlier, thus contributing to nutrient contamination of ground water. The Steering Committee recommends that Sellers of properties with septic systems be required to have the septic system inspected and pumped prior to sale. Further, the Committee recommends that the BoCC encourage the use of more innovative systems in new construction or renovations, especially systems that reduce or eliminate nutrient impacts on ground or surface waters, including nutrient recycling toilets. The Committee also recommends that the County provide incentives or

rewards to owners/developers who use denitrification septic systems or nutrient recycling systems.

Buffer Residential Development in Agricultural Zones

Frederick County's working farms and forests are threatened by the impacts of sprawl development. To minimize the friction and complaints arising from adjacent farm and residential development, the Steering Committee recommends that the BoCC adopt a buffering requirement for new residential development in agricultural zones, specifying that the developer install a forested buffer along residential lot lines that adjoin agricultural uses.

Stream Buffer Protection

The Steering Committee observes that development impacts on streams are destabilizing streams and increasing pollution. The Committee recommends that the Board of County Commissioners "create a variable width, naturally vegetated buffer system along all perennial and intermittent streams that also encompasses critical environmental features such as the 100-year floodplain, steep slopes and freshwater wetlands," Principle No. 16, "Development Roundtable," page 12. The Roundtable further noted that the County should implement the policies outlined in the Comprehensive Plan and evaluate the expansion of the buffer to account for slopes, highly erodible soils, soils that define upland drainage swales, and other sensitive environmental features. The Committee proposes a consultative process with stakeholders including the Land Development Council of the Frederick Builders Association and the County and Soil Conservation District review staff, and other interested parties to help translate stream protection into ordinance language that is broadly supported.

Evaluation

Interim Measurable Milestones

EPA Requirement G

The Steering Committee plans a six-year WRAS implementation period depending upon funding availability. The six-year implementation phase will be divided into three two-year phases during which partners will work toward objectives listed in Tables 5 and 6.

- Phase 1: 2006-2007 and 2007-2008
- Phase 2: 2008-2009 and 2009-2010
- Phase 3: 2010-2011 and 2011-2012

No single objective has been given priority since the Upper Monocacy Steering Committee represents a diverse group of partners with unique priorities and agendas. Rather, the objectives discussed in Tables 5 and 6 are a comprehensive prioritization of the problems identified during the two year planning process in the Upper Monocacy River Watershed. It is important to keep in mind that many of the Education and Outreach Objectives (EOOs) are directly related to "on-the-ground" Natural Resource Management Objectives (NROs) which, in turn, may result in the successful completion of an objective that is planned for future years. The phasing schedule that has been outlined provides partners with guidance in order to better plan for implementation, but objective-based demonstration/pilot projects will be implemented as funding becomes available.

Table 9 summarizes the Goals and Strategies discussed beginning on page 39, the associated measurable indicators, and a monitoring component. As partners implement various objectives, they will consider the measurable indicators listed in Tables 5, 6, and 9 and take the necessary

steps for evaluation. The number of objectives successfully completed as well as the associated measurable indicators will be summarized in the evaluation. The Criteria for Load Reductions and the Monitoring sections below explain how the Committee proposes to track project success and the associated nutrient reduction.

Table 9: Evaluation Table

Item	Goals	Measurable Indicators	Monitoring Component
1	Foster an Environmental Ethic	Media coverage, no. of community volunteers for restoration projects, citizens installing Bay-wise landscapes, partnerships & members involved	Resurvey every three years to assess impact of outreach and education on citizen watershed awareness. Modeled load reductions from increased awareness.
2.	Restore Waterways a. Restore riparian corridors	No. of participants in outreach workshops; no. of farm and site visits; applications submitted for CREP and WHIP, etc.; acreage and linear feet proposed in applications.	Frederick Forester monitors CREP establishment success. Conservation Volunteer Corp would augment forester's inspections & inspect community restoration sites with biennial and targeted inspections.
	b. Improve impaired streams by eliminating livestock access and installing/enhancing BMPs	No. of participants in out-reach workshops; no. of farm and site visits; applications submitted for CREP; no. of livestock herds fenced out of streams; linear feet of stream protected from livestock.	Good quality photographic evidence of stream condition prior to fencing, 1 year, 3 and 5 years after fencing.
3	Protect Waterways by a. Educating owners about available conservation strategies	No. of participants in outreach workshops; level of satisfaction of participants regarding quality of information provided.	NA
	b. Assisting owners establish long term or permanent protections	No. of owners interested in protection; no. of owners/acreage moving toward permanent protection. Linear feet of stream/acreage protected permanently.	Monitoring by Easement holders Potomac Conservancy, Catoctin Land Trust, Mid MD Land Trust, MD Agricultural Protection Programs, and SCD.
4.	Protect Natural Resources during Land Development a. By educating citizens, building officials and the real estate community about the link between land use, water quality and wildlife.	No. of participants in outreach workshops; level of satisfaction of participants regarding quality of information provided.	NA
	b. By revising the Frederick County (and municipal) zoning ordinance/s to lessen forest fragmentation, amending the subdivision ordinance to encourage conservation design, and improving development processes.	Copies of proposed program changes. Interim reports on the schedule for considering program changes. Press and other records of the process. Information on action by Planning Commission and BoCC.	Continued monitoring by County under NPDES program of development impacts at Villages of Urbana. Proposed comparative long term monitoring of subdivision developed with low impact development techniques.
5.	Build Capacity in Public and Private Sectors.	Establish a nonprofit corporate structure and operating procedures for the Monocacy Catoctin Watershed Alliance. Secure funding for a WRAS Implementation Coordinator. Assist partners secure funding for implementation projects.	NA

Criteria for Load Reductions

EPA Requirement H

County watershed management staff, consulting with MDE's Jim George, drafted a pollutant modeling system and project tracking tool to help monitor the pollutant impacts regulated under the TMDL on Lake Linganore. The goal of this tool is to model the pollutant load coming off of the landscape under current land use and conditions. This helps to identify areas where BMP implementation is projected to be most cost effective, providing the highest nutrient reduction with the fewest dollars invested. A project tracking tool was also built that will allow the County to track specific information about completed projects: types of BMPs implemented, the number of acres treated, which partners were involved, the land use of the area where the BMP was installed, a description of the project, monitoring, and cost.

Once the tracking tool is complete, it will be adapted to model pollutant load reductions in the Upper Monocacy River Watershed. It will be used to monitor the progress and success of project implementation. It will also provide a greater understanding of the effectiveness of BMP implementation in the Frederick County area. This initiative offers great promise but requires considerable investment of staff time, funding and information sharing protocols.

Monitoring

EPA Requirement I

The final aspect of evaluation will include monitoring. In order to understand baseline conditions, there will be initial use of existing monitoring data on biological impairment, nitrates, phosphates, total suspended solids as well as data about the health of the macroinvertebrate and fish communities from the ongoing MBSS and Stream Waders programs and the annual Progress Reports by Fisheries biologists on Little Hunting Creek, Hunting Creek and the Monocacy River. In addition to using data from existing sources, program effectiveness will be assessed by four new methods to be established by Frederick County and its partners (dependent upon funding):

1) Social survey research;

    - Many of the objectives listed in the WRAS do not have a direct nutrient reduction with which they can be associated but rather, result in the change in behavior of citizens. In order to measure the effectiveness and success of the implementation of such objectives, partners will design and administer a survey measuring citizen watershed awareness. The survey design will build on previous survey research summarized by the Center for Watershed Protection in its handbook, The Practice of Watershed Protection. It is the goal of the Committee to provide post-workshop surveys in addition to outreach at the Earth Day Celebration. Those citizens attending workshops will be asked if they would we willing to complete a follow up survey (6-12 months later) to investigate whether they are still utilizing the practices they learned in the workshop. Community education and outreach initiatives will be adaptively structured and delivered based upon survey results.

2) Monocacy Watershed Report Card issued every two years;

    - Building an effective system of policies, procedures and partners to produce a Monocacy Report Card is a two-phase process. It begins with an assessment and definition of water monitoring protocols by existing sources. The County is in the process of preparing a Quality Assurance and Quality Control (QA/QC) Program for professional-level monitoring, Hood College and ThorpeWood are coordinating QA/QC process and protocols for student monitoring, and the State's MBSS and Stream Wader procedures are readily adapted to adult monitoring programs. In combination, these sources will be used to build a reliable, integrated data set for Report Card analysis. Report Card partners will select long term monitoring sites to assess the relative health of tributary streams to the Monocacy River with longitudinal comparisons. The second phase of evaluation will include the initial testing of Report Card monitoring protocols, data collection methods, analyses and public presentation format. Using the test case experience, improvements will be made and the first Monocacy Watershed Report Card will be presented to the Frederick County Board of County

Commissioners and area citizens. Thereafter, a subsequent assessment will be published biannually with possible web-based updates in intervening years.

3) Watershed management geographic information tool; and

   - A critical evaluation building block requires increased County GIS work delineating and mapping wetlands, protected areas, community restoration projects and agricultural best management practices (BMPs). These data layers will augment the existing GIS information system with numerous layers itemized in Appendix I. In instances where it can be applied, GIS layers will be linked to the project-tracking tool discussed earlier.

4) Nutrient and project tracking database system for the watershed (discussed above).

Appendix A: Media Coverage

- "Local Governments Recognized for Efforts to Protect Local Waters and Chesapeake Bay," May 20, 2004, Chesapeake Bay Program Press Center.
- "Stirring: safer substances," page A-1, June 21, 2004, The Frederick News-Post.
- "Watershed Meeting," Community Report, page D-6, February 6, 2005, The Frederick News-Post.
- "Natural Lawn Care Protects the Health of Your Family and the Chesapeake Bay Watershed," Press Release, February 10, 2005, Community Commons.
- "Natural Lawn Care Workshop" flyer, for event Saturday, February 26th, 2005.
- "Kiwanis Speaker," page A-14, February 10, 2005, The Frederick News-Post.
- "Clean Water is in the Bag, Homeowners Can Plant Trees to Help Improve Streams," Press Release, February 15, 2005.
- "Watershed Groups to Help Restore Streamside Buffer," Potomac Basin News Release, Interstate Commission on the Potomac River Basin, March 16, 2005.
- "Planting, festival among Earth Day events," page A-7, March 27, 2005, The Frederick News-Post.
- "Monocacy Watershed Happenings," March 2004, DPW News.
- "Young volunteers walk county streams, Americorps helps out," Nancy Hernandez, page A-12, March 29, 2004, Frederick News-Post.
- "Frederick County Wins Gold Chesapeake Bay Partner Community Award," June 2004, DPW News.
- "Frederick County helps to protect Chesapeake," Nancy Hernandez, The Frederick News-Post.
- "2004 Chesapeake Bay Partner Community Award Recipients: Frederick county, Md. – Gold Award," page 1 – 2, Backgrounder.
- "Chesapeake Bay Partner Community Gold Winner Award: Frederick County, Maryland, 2004."
- "What's in the Water: Local Activist Seeks Answers," by William Lafferman, June/July 2004, Common Ground, the newsletter for the Common Market Food Store, Frederick, MD.
- "Conservation effort a watershed event," Nancy Hernandez, page A-1, October 22, 2004, The Frederick News-Post.
- "Builders, inspectors team up to protect waterways," Nancy Hernandez, page A-1, The Frederick News-Post.

- "Residential Household Hazardous Waste Dropoff Day," Saturday, November 13, 2004.
- "Students transform school lawns into gardens," Nancy Hernandez, page A-5, June 14, 2005, The Frederick News-Post.

Appendix B: Subrecipient Reports

- Community Commons – Commitments for the Upper Monocacy WRAS

  Building a Greener Lifestyle Workshop Series

  "Stories told from the land: the unique relationship between people and place in shaping Frederick County, Maryland"

  Frederick County Paddle Trips

  Randall Arendt workshop

- ThorpeWood – Commitments for the Upper Monocacy WRAS

  April 19, 2005, Letter summarizing WRAS work.

  Catoctin Land Trust and ThorpeWood's report on Preservation, Education and Grassroots Initiatives

Appendix C: Public Participation

- Upper Monocacy WRAS Public Meeting Agenda

  Toms, Owens, Hunting and Fishing Creek Community Meeting, March 3, 2005

- Upper Monocacy WRAS Community Meeting Notices

  Glade Creek Meeting: January 25, 2005

  Tuscarora Creek Meeting: February 10, 2005

  Fishing, Hunting, Owens and Toms Creek Meeting: March 3, 2005

- March 10, 2005, Letter of Invitation to Agricultural Landowners to participate in a watershed meeting on March 17, 2005 at the Thurmont grant Hall in Thurmont, MD

- ThorpeWood Letter to Landowners who were unable to attend workshop on conservation easements during February 2005, offering workshop materials and site visits from Chesapeake Wildlife Heritage along with contact information.

Appendix D: Education Activities

- Assessing Direction and Measuring Progress – Watershed Strategies Evaluation Workshop Agenda, October 4, 2004, led by Drs. Steven Yaffee and Sheila Schueller, Ecosystem Management Initiative, School of Natural Resources and Environment, University of Michigan.
- Letter of Invitation to the Watershed Strategies Evaluation Workshop (extended to WRAS Steering Committee members, colleagues in Monocacy watershed from Carroll County, MD, and Adams County, PA, Tributary Team members, and representatives of other watershed organizations in the Potomac watershed).
- Citizen Participation Workshop featuring Hans and Annemarie Bleiker with the Institute for Participatory Management and Planning, presenting the Systematic Development of Informed Consent, offered by the National Park Service's Rivers, Trails and Conservation Assistance program at ThorpeWood, November 15, 2004.
- Frederick Farm Bureau letter dated August 20, 2004, preliminary to arranging for the WRAS Coordinator to make a presentation to the Frederick Farm Bureau during October, 2004, as a result of which, the Farm Bureau identified two representatives to participate in the WRAS planning process, one in the Lower Monocacy Watershed and another in the Upper Monocacy watershed.
- Sediment and Erosion Control Workshop Flyer, December 3, 2004, for builder and developer communities, open to the public, cosponsored by Frederick County Division of Public Works, the Frederick and Catoctin Soil Conservation Districts, and the Frederick County Builders Association.
- Versar's Sediment and Erosion Control Workshop PowerPoint Presentation, 35 slides, and poster entitled, "Those Ole Muddy Waters: Impacts of Sediment on Frederick County's Streams."
- Local Landowner Workshop on conservation easements and other strategies, November 20, 2004, invitation letter, agenda, meeting notice.
- Workshop on Creating a Forest Management Plan, Thursday, February 17, 2005, a part of the *Headwaters and Highlands* Workshop Series by ThorpeWood.

- Workshop on Native Wonders & Exotic Blunders: The beauty and benefits of landscaping with native plants, March 3, 2005, a part of the *Headwaters and Highlands* Workshop Series by ThorpeWood.

- Illicit Discharge Detection and Elimination Training on April 28, 2005, for public works officials from Frederick County and its municipalities as well as members of the WRAS Steering Committee, conducted by the Center for Watershed Protection, sponsored by the Upper Monocacy WRAS.

- Invasive Plant Control Workshop Agenda and Notice, workshop cosponsored by the Frederick County Forestry Board, the MD Forest Service and the Monocacy WRAS, on May 14, 2005, at the Stronghold Property on Sugarloaf Mountain, concentrating on control of honeysuckle, ailanthus, and multiflora rose.

Appendix E: Steering Committee Minutes

- March 18, 2004 Meeting Minutes
- May 19, 2004 Meeting Minutes
- July 22, 2004 Meeting Minutes
- September 23, 2004 Meeting Minutes

Appendix F: Program Changes

- The Practice of Watershed Protection, Article 123, "Dealing with Septic System Impacts"

Appendix G: Evaluation

EPA Requirement C-1

- Best Management Practices (BMPs) List

- Nutrient and Sediment Reduction Table

Appendix H: GIS Layers

Appendix I: General List of Funding Sources

EPA Requirement D

Upper Monocacy WRAS Plan Natural Resource Management and Community Education and Outreach Objectives each are actions to implement the plan. Several of the objectives listed refer to specific funding sources that are either already known to be available or likely to be available.

Some common sources that will be used to implement the WRAS are as follows:

GLOBAL RELEAF
www.americanforests.org/global_releaf/grants

NATIONAL FISH AND WILDLIFE FOUNDATION
http://www.nfwf.org/programs/grant_apply.htm

CHESAPEAKE BAY SMALL WATERSHED GRANTS PROGRAM/COMMUNITY LEGACY GRANTS
http://www.nfwf.org/chesapeake/ or http://www.chesapeakebay.net/smallwatergrants.htm

- Support communities in developing and implementing watershed management plans;
- Encourage innovative local programs or projects that improve water quality and restore important habitats within the Chesapeake Bay basin;
- Develop the capacity of local governments, citizen groups and other organizations to promote community-based stewardship and enhance local watershed management;
- Promote a greater understanding of the Chesapeake Bay and the connection between the health of the Bay and condition of local watersheds; and
- Strengthen the links between communities and the Chesapeake Bay Program.

CHESAPEAKE BAY TRUST
www.chesapeakebaytrust.org

Projects that unite business, government, and citizen groups in activities that contributes to the restoration and protection of the Bay. Priority to education projects and the performance of restoration activities

NATURAL RESOURCE CONSERVATION SERVICE
http://www.nrcs.usda.gov/programs/

THE KODAK AMERICAN GREENWAYS AWARDS PROGRAM
http://www.conservationfund.org/?article=2372

Grant Criteria:

Grant recipients are selected according to criteria that include:

- Importance of the project to local greenway development efforts;
- Demonstrated community support for the project:
- Extent to which the grant will result in matching funds or other support from public or private sources;

- Likelihood of tangible results;
- Capacity of the organization to complete the project.

ENVIRONMENTAL PROTECTION AGENCY (EPA)
http://www.epa.gov/ogd/grants/funding_opportunities.htm

MARYLAND DEPARTMENT OF THE ENVIRONMENT (MDE)
http://www.mde.state.md.us/AboutMDE/grants/index.asp

Small Creeks and Estuaries Restoration

Wellhead Protection

Scrap Tires

WEB LINKS TO FUNDING RESOURCES

- http://www.environmentalgrants.com/EGF2002inq.htm
- http://cfpub.epa.gov/fedfund/
- http://www.chesapeakebaytrust.org/
- http://www.dnr.state.md.us/bay/czm/nps/funding.html
- http://www.epa.gov/owow/nps/funding.html
- http://www.marylandhistoricaltrust.net/noncapgr.html
- http://www.nal.usda.gov/wqic/funding.html
- http://www.ncseonline.org/NLE/Links/LinksDetail.cfm?custom21=NLE%20Yellow%20Pages&custom22=Foundations&CFID=6157032&CFTOKEN=57818906
- http://fdncenter.org/
- http://www.mdsg.umd.edu/
- http://www.captainplanetfdn.org/
- http://www.enviroscapes.com/
- http://www.epa.gov/owow/nps/Section319III/
- http://fdncenter.org/pnd/news/story.jhtml?id=6800107
- http://www.dnr.state.md.us/grantsandloans/cppintro.html
- http://www.dnr.state.md.us/met/index.html
- http://12.46.245.173/cfda/cfda.html
- http://www.sha.state.md.us/
- http://www.dbm.maryland.gov/portal/server.pt?space=CommunityPage&cached=true&parentname=MyPage&parentid=2&in_hi_userid=1332&control=SetCommunity&CommunityID=219&PageID=0
- http://fdncenter.org/pnd/spotlight/spotlight.jhtml?id=8100002
- http://www.chesapeakebay.net/budget.htm
- http://www.werf.org/funding/funding_werf.cfm
- http://www.co.frederick.md.us/grants/
- http://www.estuaries.org/policyandfunding.php
- http://www.efc.umd.edu/resource_cntr/techniques.cfm

- http://www.pawatersheds.org/funding.asp
- http://www.nfwf.org/programs/programs.htm
- http://www.chesapeakebay.net/smallwatergrants.htm
- http://www.lgean.org/html/whatsnew.cfm?id=690
- http://marylandroads.com/ImprovingOurCommunity/OPPE/tep.asp
- http://www.tgci.com/
- http://www.conservebirds.org/grants.htm
- http://www.watershedrestoration.water.ca.gov/urbanstreams/money4cks/
- http://www.mdp.state.md.us/CLHOUSE/grant_resource.htm
- http://www.mdredbookonline.com/
- http://www.epa.gov/Region3/grants/
- http://www.umbc.edu/artsciences/geog.html
- http://www.epa.gov/owow/watershed/initiative/
- http://www.dnr.state.md.us/bay/services/summaries.html