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Maryland
319 Nonpoint Source Program
2012 Annual Report

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TABLE OF CONTENTS

Preface / Abbreviations Used

I. Mission and Goals of the NPS Program
II. Executive Summary
III. Overview
IV. Major Accomplishments, Successes and Progress
    A. Statewide
        1. Overall Best Management Practice Implementation Progress
        2. NPS Work Plan
        3. Success Stories
        4. Impairments
    B. Watersheds
        1. Aaron Run
        2. Back River
        3. Casselman River
        4. Corsica River
        5. Lower Jones Falls
        6. Lower Monocacy River
        7. Sassafras River
        8. Upper Choptank River
V. Areas of Concern/Recommendations/Future Actions

LIST OF TABLES

1 Watershed Plans In Maryland Accepted By EPA
2 Pollutant Load Reductions Reported by 319 Projects Completed in 2012
3 Pollutant Load Reductions in EPA-Accepted Watersheds for 2012
4 Back River Small Area Watershed Plans
5 Tidal Back River Watershed Implementation
6 Upper Back River Watershed Implementation
7 Tidal Back River Watershed Completed/Active NPS Projects
8 Upper Back River Watershed Completed/Active NPS Projects
9 Corsica River Watershed Implementation
10 Corsica River Watershed – Completed NPS Implementation Projects
11 Corsica River Watershed – Active NPS Implementation Projects
12 Jones Falls Watershed Implementation
13 Lower Moncacy River Watershed Implementation
14 Lower Moncacy River Watershed Completed/Active NPS Projects
15 Sassafras River Watershed Implementation
16 Sassafras River Watershed Completed/Active NPS Projects
17 Upper Choptank River Watershed Implementation
18 Upper Choptank River Completed/Active NPS Projects

US EPA ARCHIVE DOCUMENT

LIST OF FIGURES

1 2011 Total Nitrogen Sources In Maryland
2 2011 Total Phosphorus Sources In Maryland
3 Native Brook Trout gathered from Crabtree Run for Aaron Run photo
4 Map of Implementation and Planning Project Areas in 2012
5 Aaron Run Watershed Map
6 Brook Trout for Stocking in Aaron Run photo
7 Back River Watersheds Map
8 Casselman River Watershed Map
9 Casselman Site 11 Implementation photo
10 Corsica River Watershed Map
11 Centreville Public Meeting Poster
12 Corsica River Awareness Day Porous Concrete Demonstration photo
13 Centreville DPW Bioretention Site photos
14 Jones Falls Watershed map
15 Monocacy River Watershed map
16 Urbana Elementary School Bioswale photo
17 Sassarfras River Watershed map
18 Chicken Manure Injector photo
19 Crawford Treatment Wetland photo
20 Upper Choptank River Watershed map
21 Caroline County DPW yard stormwater BMP photo

LIST OF APPENDICES

A – Financial Information – Federal 319(h) Grant Maryland Funding Summary
B – List of Agency Cooperators – Maryland Nonpoint Source Program
C – 2011 BMP Implementation Progress in Maryland
D – 319 Projects Active/Completed in 2012
E – General Approach and Schedule to Implement Applicable Management Measures
F – Success Story – Cherry Creek Acid Mine Drainage Mitigation Cuts Pollutant Loads
G – Centreville Project Map March 2012

COVER PHOTOGRAPH

Picture of Three Bridges Branch near Centreville, Maryland, in Queen Anne's County. This section of the nontidal stream is in the vicinity of the long term monitoring being conducted by MDE's 319-funded Targeted Watershed project in support of implementing the Corsica River Watershed Restoration Action Strategy.

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Preface

Nonpoint source (NPS) pollution is defined as polluted stormwater runoff associated with rainfall, snowmelt or irrigation water moving over and through the ground. As this water moves, it picks up and carries pollutants with it, such as sediments, nutrients, toxics, and pathogens. These pollutants eventually reach lakes, rivers, wetlands, coastal waters, ground waters and, most of the time in Maryland, the Chesapeake Bay.

NPS pollution is associated with a variety of activities on the land including farming, logging, mining, urban/construction runoff, onsite sewage systems, streambank degradation, shore erosion and others. For example, stormwater flowing off the land carries the nutrients nitrogen and phosphorus into local streams and eventually into the Chesapeake Bay. Under natural conditions, this is beneficial up to a point. However, if excessive nutrients enter a lake or the Chesapeake Bay, and cause nuisance algae blooms, then these nutrients are deemed pollutants.

The pollution contributed by nonpoint sources is the main reason why many of Maryland's waters are listed as impaired because Water Quality Standards are not being met for designated uses like fishing, swimming, drinking water, shellfish harvesting and others.

Progress in managing NPS pollution in Maryland is presented in this report. It was produced by the Maryland Department of the Environment (MDE) to meet 319(h) Grant conditions (text box) and to demonstrate consistency with three essential elements:

1. EPA Strategic Plan Goal 2 Protecting America's Waters
2. EPA Strategic Plan Objective 2.2 Protect and Restore Watersheds and Aquatic Ecosystems
3. Work plan commitments plus time frame (overall progress is reported in this document).

The FFY12 319(h) Grant award contains a condition: "The [annual] report shall contain the following:

a. A brief summary of progress in meeting the schedule of milestones in the approved Management Program, and,

b. Reductions in nonpoint source pollutant loading and improvements in water quality that has resulted from implementation of the Management Program.

c. Descriptions of priority Watershed Based Plan accomplishments. Accomplishments should be based the implementation milestone goals/objectives as identified in each priority plan. The goal information can be displayed in the form of a watershed goal/accomplishment chart showing percent achieved, supplemented by a short narrative that should give the reader a clear understanding of the actions being taken and the outputs and outcomes which are occurring from the actions. If monitoring was completed, a summary of that information should also be included. For example, if 1000 feet of streambank stabilization was completed, then how does that compare to the needs identified in the watershed based plan i.e. what percent of streambank stabilization was completed compared to the overall needs as identified by the plan. Similar comparisons should also be provided for each significant pollutant load reduction. Data from the Watershed Plan Tracker may be used to satisfy this requirement.

Abbreviations Used	
319	Clean Water Act, Section 319(h)
AMD	Acid Mine Drainage
BAT	Best Available Technology
BMP	Best Management Practice
COMAR	Code of Maryland Regulations
DNR	Maryland Department of Natural Resources
EPA	Environmental Protection Agency, United States of America
FFY	Federal Fiscal Year (October 1 thru September 30)
MDA	Maryland Department of Agriculture
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
MEP	Maximum Extent Practicable
NGO	Non-Government Organization
NPS	Nonpoint Source
RFP	Request for Proposals
SCD	Soil Conservation District
SRA	Sassafras River Association
SRF	State Revolving Fund
SFY	State Fiscal Year (in Maryland, July 1 thru June 30)
SWAP	Small Watershed Area Plan (another name for a watershed-based plan)
SW Conversion	Converting an existing stormwater facility to provide water quality benefits
SW Retrofit	Adding stormwater management to existing development that had none
TMDL	Total Maximum Daily Load
Trust Fund	Maryland Chesapeake and Atlantic Coastal Bays Trust Fund
WIP	Watershed Implementation Plan for the Chesapeake Bay TMDL
WQA	Water Quality Analysis
WRAS	Watershed Restoration Action Strategy (aka watershed-based plan)
WRE	Water Resources Elements (components of a local comprehensive plan)
WWTP	Waste Water Treatment Plant (sewage treatment)

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I. Mission and Goals of the NPS Program

The mission for the 319 Nonpoint Source (NPS) Management Program relates directly to the December 1999 *Maryland Nonpoint Source Management Plan* long-term goal "Meet 100% of designated uses in all waters of the State".

During 2012, the program focused the majority of its efforts on meeting two Management Plan milestones in particular: "By 2010, correct all nutrient-related problems in the Chesapeake Bay and its tidal tributaries sufficient to remove the Bay and the tidal portions of its tributaries from the list of impaired waters under the Clean Water Act", and: "By 2010, correct all sediment-related problems in the Chesapeake Bay and its tidal tributaries sufficient to remove the Bay and the tidal portions of its tributaries from the list of impaired waters under the Clean Water Act".

In recent years, both the State and the EPA Chesapeake Bay Program agreed that these very ambitious milestones should be updated to be consistent with the Chesapeake Bay total maximum daily load (TMDL). In 2012, Maryland's Chesapeake Bay Watershed Implementation Plan (WIP) included the revised the date for achieving these milestones to 2025, with a check on progress in 2017.

To realize such as ambitious outcomes, the State's NPS programs are designed to: achieve and maintain beneficial uses of water; protect public health, and; improve and protect habitat for living resources. The State programs use a mixture of water quality and/or technology based approaches including regulatory and non-regulatory programs, and programs that provide financial, technical, and educational assistance.

Through program management and financial/technical support, Maryland's Section §319(h) NPS Program plays a lead role in helping to protect and improve of Maryland's water quality. The NPS Program promotes and funds State and local watershed planning efforts, implementation of NPS projects consistent with watershed plans, water quality monitoring to evaluate progress, stream and wetland restoration, education and outreach, and other measures to reduce, prevent and track nonpoint source pollution loads. The NPS Program also plays a role in promoting partnerships and governmental coordination to reduce nonpoint sources of pollution. Program partners include State agencies, local government (counties, municipalities, Soil Conservation Districts), private landowners and watershed associations.

Consistent with these priorities, the NPS Program's recent 319(h) Grant RFPs stated the following goals for funding implementation projects:

GOAL 1 To support meeting Total Maximum Daily Load (TMDL) nonpoint source reduction targets.

GOAL 2 To significantly contribute to reducing one or more nonpoint source water quality impairments in a water body identified in Maryland's 303(d) list of impaired water bodies leading toward full or partial restoration.

GOAL 3 To implement projects from EPA-accepted watershed-based plans that will produce measurable nonpoint source pollutant load reduction consistent with Goals 1 and 2.

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II. Executive Summary

This report documents the activities and accomplishments by the State of Maryland 319 NPS Program, including administration of the Federal §319(h) Grant, by the Maryland Department of Environment (MDE). MDE plays a lead role in helping to achieve protection and improvement of Maryland's water quality by promoting and funding state and local water quality monitoring, stream and wetland restoration, education and outreach, and other measures to reduce and track nonpoint source pollution loads.

MDE is the lead nonpoint source (NPS) management agency responsible for coordination of policies, funds, and cooperative agreements with state agencies and local governments. Several other state agencies have key responsibilities, including the Maryland Department of Natural Resources (DNR), Maryland Department of Agriculture (MDA), and Maryland Department of Planning (MDP). The NPS Program is housed within MDE's Science Services Administration (SSA). During the past 23 years, Maryland has received over $48.6 million through the 319(h) Grant. (See Appendix A)

In calendar year 2012, there have been notable successes and accomplishments:

- Projects funded by 319(h) Grant that were completed during the calendar year (Table 2) reported implementing best management practices resulting in pollutant load reductions: nitrogen 46,293 pounds/year; phosphorus 749 pounds/year, and; sediment 509 tons/year.
- Ten watershed plans in Maryland, including the Antietam Creek watershed plan completed in 2012, have been accepted by EPA.
- Aaron Run acid mine drainage (AMD) mitigation improved water quality to the point that native trout were successfully stocked for the first time in over 50 years.
- The Corsica River watershed progress report listed numerous accomplishments for the period 2005 thru 2011 including a decreasing trend for in-stream nitrogen concentration in two of three nontidal streams that were monitored over six years.
- Implementation progress reported for the EPA-accepted watershed plans (Table 3) included significant overall total pollutant load reductions in 2012: 46,447.7 lbs/yr nitrogen; 770.5 lbs/yr phosphorus, and; 4,441.1 tons/yr sediment.

The Program continues to face several challenges and concerns. Because of increasing development, there has been in an increase in the urban/suburban component of nonpoint source pollution. The national trend to decease funding to Section 319(h) funding that began in Federal Fiscal Year (FFY) 2011 continued thru FFY2012 and FFY2013. A similar trend continues thru 2012 in other federal and state budgets, which leads to an ever-tightening constraint on the amount of help, either technical or financial, that is available. Maryland is actively devoting significant nonfederal resources to nonpoint source implementation projects with much of the investment driven by the federal/state Chesapeake Bay effort. Several of the projects occur in watersheds that have EPA-accepted watershed plans. Based on findings to date, and in light of ongoing federal/state budget deliberations, MDE plans to re-evaluate use of Section 319(h) funding to ensure that Maryland maximizes the benefits derived from all available source of NPS implementation funding. With flexible use of Section 319(h) funding, it is anticipated that additional watersheds can be added to the list and that opportunities to demonstrate watershed-wide successes will grow.

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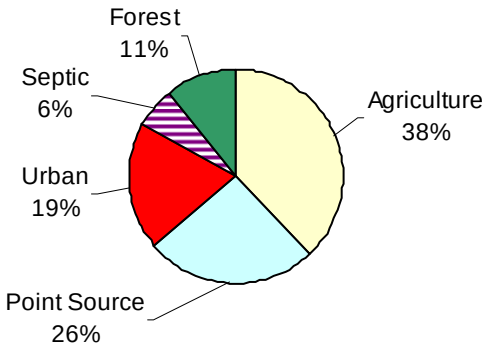
III. Overview

Maryland surface waters flow into three major drainage areas:

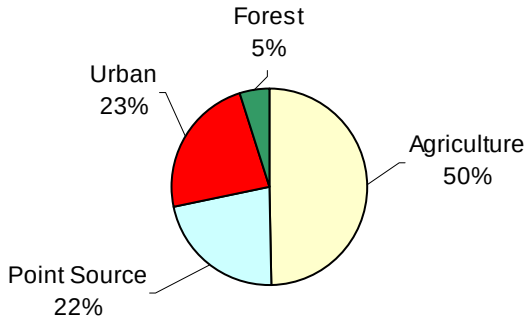
- The Chesapeake Bay watershed receives runoff from of Maryland's mid section and encompasses about 90% of the State. Most 319-funded implementation projects active in 2012 were in this watershed.
- Maryland's Coastal Bays receives runoff from Maryland's eastern-most coastal plain. In 2012, no 319-funded implementation was active.
- The Youghiogheny River watershed, which is part of the Ohio and Mississippi Rivers drainage, receives runoff from Maryland's Appalachian area. One implementation project with the 319 funding was active in this area.

Figure 1. 2011 Total Nitrogen Sources in Maryland



Overall, Maryland has over 9,940 miles of non-tidal streams and rivers. These waters and the Chesapeake Bay have provided a rich bounty that been the foundation for much of Maryland's rich heritage and prosperity. The State's water resources continue to provide food and water for its residents, jobs for the economy and a place where people may relax and enjoy the natural environment. Our quality of life, including drinking water, recreation/tourism, commercial and recreational fishing and wildlife habitats are ultimately dependant upon healthy waters supported by healthy watersheds.

Figure 2. 2011 Total Phosphorus Sources in Maryland



However, Maryland's water resources are under stress from a variety of causes -- with nonpoint source pollution being the greatest single factor. The state's waters are increasingly impacted by and remain impaired due largely to nonpoint sources of pollution and related habitat degradation, which are most commonly due to altered land uses. The lands that are altered from natural conditions contribute various forms of nonpoint point source pollution such as excessive levels of the nutrients nitrogen and phosphorus. The sources of excessive nitrogen and phosphorus in Maryland arise in large part from major land uses as shown in Figures 1 and 2 respectively.

* Data source for the pie charts is the 2011 Chesapeake Bay Model Phase 5.3.2 (N050312 run) delivered loads using constant delivery factors. The reported statistics include all of Maryland lands within the Chesapeake Bay Watershed except atmospheric deposition the main body of the Bay and nontidal waters.

Many agencies and programs in Maryland, including State agencies, Counties, Soil Conservation Districts and municipalities, have responsibilities in managing NPS pollution. Contacts for key Federal and State agencies and local governments who were actively engaged with some aspect of 319 NPS management responsibility in 2012 are listed in Appendix B.

The best methods for controlling NPS pollution are frequently called Best Management Practices (BMPs). These BMPs are designed to meet specific needs, like grassed buffers to control sediment and phosphorus that could leave farm fields, or wet stormwater ponds to capture sediment and nutrients in urban runoff. Every year, Maryland reports the cumulative total number of BMPs implemented in the State. The most recent reporting, which is through 2011, are summarized in Appendix C.

A wide array of approaches and programs help to prevent, reduce or eliminate pollution from nonpoint sources. The general approach employed in Maryland to manage NPS pollution is summarized in Appendix E.

Demonstrating success in achieving nonpoint source management goals and objectives is an important focus for the program. Each year, at least one success story is submitted to EPA. Appendix F presents the most recently submitted success story.

Figure 3: Native brook trout were gathered in August 2012 from Crabtree Run, a healthy Western Maryland stream. These brook trout were relocated to Aaron Run where several years of effort to mitigate acid mine drainage has yielded water quality that now supports the new residents. Together Crabtree Run and Aaron Run are examples of the protection and restoration called for in the mission and goals of Maryland's nonpoint source programs.

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IV. Major Accomplishments, Successes and Progress

A. Statewide

1. Overall Best Management Practice Implementation Progress

Maryland's NPS Management Plan includes priority goals for correcting nutrient and sediment-related problems. To gauge progress toward meeting these goals, Maryland tracks implementation progress for selected categories of BMPs that have been recognized by the EPA Chesapeake Bay Program and the Chesapeake Bay States. Every year, Maryland updates the cumulative total of BMPs implemented in each category and the associated nitrogen and phosphorus load reduction. A summary of Maryland's most recently reported information thru 2011 is in Appendix C.

2. NPS Work Plan

Maryland's NPS work plan supported by the 319(h) Grant focuses on three primary areas that contribute to meeting the Maryland Nonpoint Source Management Plan goal "Meet 100% of designated uses in all waters of the State" as summarized below. Additional project status information is presented in Appendix D:

- Implementation to eliminate or reduce impairments consistent with TMDLs. Fifteen 319-funded projects included on-the-ground NPS implementation. These projects are located in the watersheds that are eligible for 319(h) Grant implementation funding shown in Figure 4. Additional information on progress in these watersheds is in the next section of this report:
- Monitoring and tracking to gauge progress. Eight 319-funded projects included either monitoring or tracking of implementation progress/results. For example, analysis conducted in 2012 considering a half dozen years of monitoring in the Corsica River watershed documented a trend to lower in-stream nitrogen concentration associated with NPS implementation
- Management/planning necessary to support associated State and local assistance needs. During calendar year 2012, 25 projects in Maryland received Federal 319(h) Grant funds. Two 319-funded projects included management in support of NPS implementation. For example, MDE personnel supported in part by the 319(h) Grant were central in developing and promoting local government understanding of Maryland's Chesapeake Bay Watershed Implementation Plan (WIP).

3. Success Stories

In the Cherry Creek watershed in Garrett County Maryland, significant pollutant load reductions and increased fish species diversity were documented in the Creek after a series of acid mine drainage mitigation projects. These findings and supporting information is summarized in Appendix F.

In order to identify candidate success stories, MDE regularly assesses available information from at least three sources to find documented cases of water quality / biological improvement:

- Impairments removed from the list of impaired water bodies (303(d) list) in Maryland's Integrated Report are reviewed biennially.
- 319(h) Grant-funded projects' progress and accomplishments are assessed by MDE and reported in each Annual Report. Recent assessments identified potential future success story candidates.
- Candidates for water quality improvement / success stories are solicited from other sources by MDE. This approach has yielded at least one success story each year. In 2012, MDE's Land Management Administration Abandoned Mines Land Division volunteered their Cherry Creek acid mine drainage mitigation results. (Appendix F.)

4. Impairments

Maryland's Integrated Report, which is updated every two years, presents the most complete listing of water impairments for the State. Comparing the 2012 report to the 2010 report, there were numerous new impairment listings and delistings [1]:

- 13 delistings resulted from Water Quality Analyses (WQA), reassessments using newer data that demonstrated water quality standards were being met (12) or corrected a flaw (1). These twelve delistings represent potential success story candidates.
- 21 delistings resulted from MDE biostressor analyses that allowed listings for "cause unknown" to be dropped and replaced with new pollutant-specific impairment listings;
- 24 new listings for conventional pollutants resulting from MDE biostressor analysis (some overlap with the 21 delistings) listed causes including total suspended solids, chlorides, sulfates, or total phosphorus.
- 18 new listings for non-pollutant impairments resulting from MDE biostressor analysis (some overlap with the 21 delistings) listed causes including channelization and lack of riparian buffer;
- Fecal coliform listings in shellfish harvesting waters included 9 new listings and 2 delistings (also see shellfish waters section);
- Chesapeake Bay segments with updated bioassessments resulted in 2 new listings, and;
- Fish tissue assessment for PCBs resulted in 2 new listings, and 2 delistings made on the basis of using a more refined assessment unit scale.

In 2012, MDE began offering on the Internet water quality assessment maps that allow users to visualize summarized impairments information for impairment categories like bacteria and nutrients. At the following link, a user can view the entire State or zoom in to visually explore streams from a more local perspective:
http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Pages/WaterQualityMappingCenter.aspx

[1] MDE. Maryland's 2012 Integrated Report of Surface Water Quality. Part C pages 30 thru 96.

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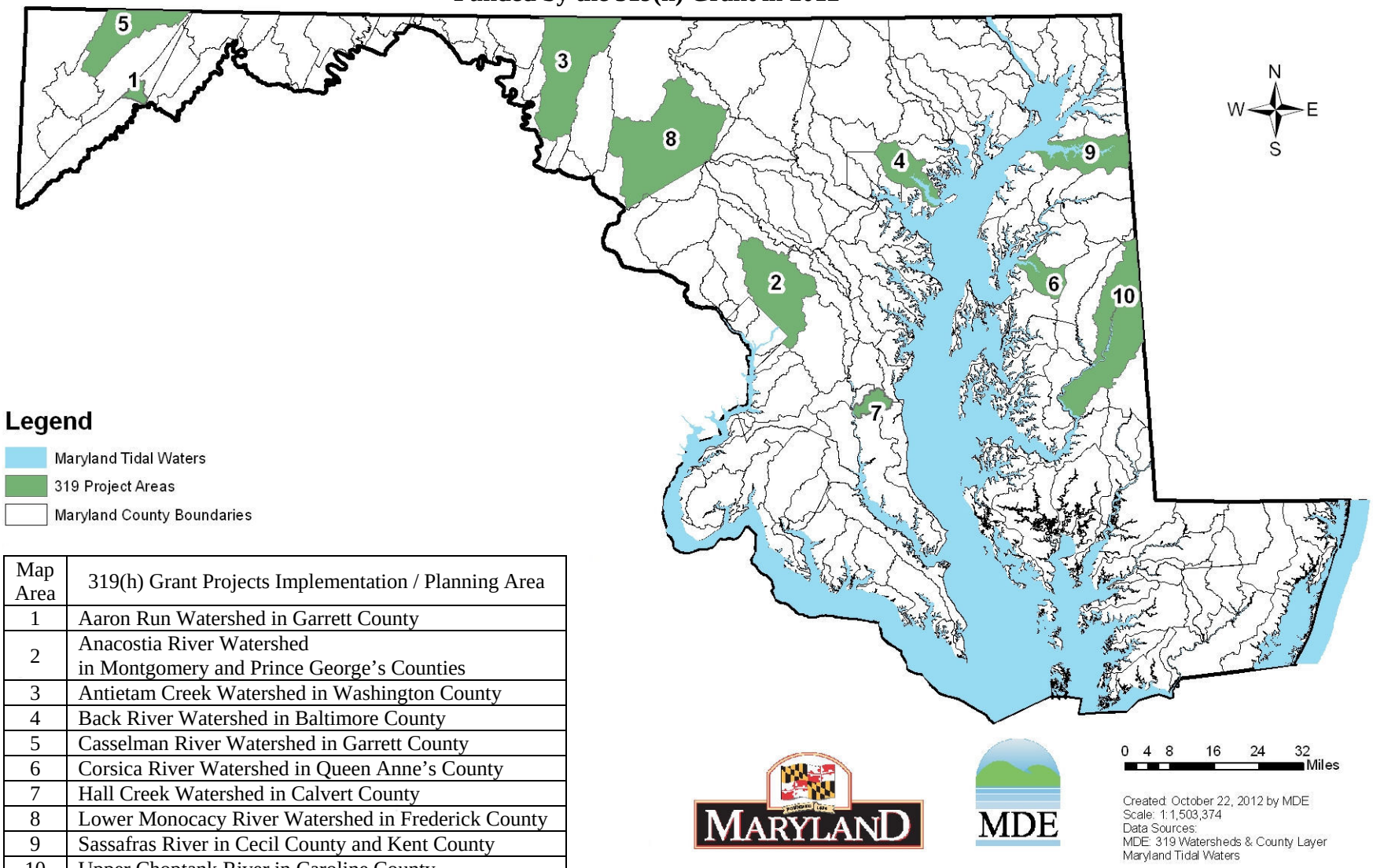
Figure 4
Map of Maryland Implementation and Planning Project Areas
Funded by the 319(h) Grant in 2012



Map Area	319(h) Grant Projects Implementation / Planning Area
1	Aaron Run Watershed in Garrett County
2	Anacostia River Watershed in Montgomery and Prince George's Counties
3	Antietam Creek Watershed in Washington County
4	Back River Watershed in Baltimore County
5	Casselman River Watershed in Garrett County
6	Corsica River Watershed in Queen Anne's County
7	Hall Creek Watershed in Calvert County
8	Lower Monocacy River Watershed in Frederick County
9	Sassafras River in Cecil County and Kent County
10	Upper Choptank River in Caroline County

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B. Watersheds

By the end of 2012, ten watershed plans in Maryland have been accepted by EPA as meeting Federal criteria. In these watersheds, implementation projects that are consistent with these plans are eligible to compete for 319(h) Grant funding. The table below lists these watershed plans and indicates the status of implementation progress reporting for 2012.

Table 1. Watershed Plans In Maryland Accepted by EPA

Watershed	Plan Description	Status
Antietam Creek	*Antietam Creek Watershed Restoration Plan.* Washington County Soil Conservation District, September 2012. (EPA accepted 2012) http://www.conservationplace.com/	Will report in 2013
Back River	*Upper Back River Small Watershed Action Plan.* Volume 1 and 2, Baltimore County Department of Environmental Protection and Resource Management, November 2008. *Tidal Back River Small Watershed Action Plan.* Volume 1 and 2, Baltimore County Department of Environmental Protection and Resource Management, February 2010. http://www.baltimorecountymd.gov/Agencies/environment/watersheds/ep_brmain.html (EPA accepted 2008 and 2010 respectively)	2012 Progress Reported
Casselman River	*Casselman River Watershed Plan for pH Remediation.* Maryland Department of the Environment, January 2010 revised 3/25/11. (EPA accepted 2011) http://mde.maryland.gov/programs/Water/319NonPointSource/Pages/casselman.aspx	2012 Progress Reported
Corsica River	*Corsica River Watershed Restoration Action Strategy.* Town of Centreville, Final Report September 2004. http://www.dnr.state.md.us/watersheds/surf/proj/wras.html (Accepted by EPA 2005.) Also, the Corsica River 6-Year Progress Report is available: www.townofcentreville.org/departments/environment.asp	2012 Progress Reported
Jones Falls	*Lower Jones Falls Watershed Small Watershed Action Plan.* Baltimore County, October 15, 2008. (EPA accepted 2008) http://www.baltimorecountymd.gov/Agencies/environment/watersheds/ep_jonesmain.html	2012 Progress Reported
Lower Monocacy River	*Lower Monocacy River Watershed Restoration Action Strategy (WRAS) Supplement: EPA A-I Requirements, Frederick County Maryland.* July 2008, Version 1.0. (EPA accepted 2008) http://www.watershed-alliance.com/mcwa_pubs.html	2012 Progress Reported
Spring Branch	*Spring Branch Subwatershed – Small Watershed Action Plan (Addendum to the Water Quality Management Plan for Loch Raven Watershed).* Baltimore County, March 2008. http://www.baltimorecountymd.gov/Agencies/environment/watersheds/ep_lrmain.html (EPA accepted 2008)	Completed See 2009 Annual Report
Sassafras River	*Sassafras Watershed Action Plan.* Sassafras River Association. (EPA accepted 2009) www.sassafrasriver.org/swap/	2012 Progress Reported
Upper Choptank River	*Upper Choptank River Watershed Based Plan Developed to be Consistent with EPA's 319(h) Nonpoint Source Program Grant "A through I Criteria".* Caroline County, November 2010. (EPA accepted 2010) http://www.carolineplancode.org/	2012 Progress Reported

Within several of the watersheds listed in Table 1, 319(h) Grant-funded implementation projects were completed during calendar year 2012. The total aggregate estimated pollutant load reduction reported for these projects is summarized in Table 2. Additional information on these completed projects is available in Appendix D.

Table 2. Pollutant Load Reductions Reported by 319 Projects Completed in 2012

Watershed	319 Project Completed	Nitrogen lbs/yr	Phosphorus lbs/yr	Sediment ton/yr
Back River - Upper	Stormwater Conversions	423.2	67.2	13.06
Corsica River	Centreville	5.3	1.1	0.29
	MDA	45,702.9	641.3	492.00
Lower Monocacy River	Bennett Creek	149.9	31.4	2.78
Upper Choptank River	DPW SWM retrofit	11.4	7.9	0.91
TOTAL		46,292.7	748.8	509.0

Table 3. 2012 Pollutant Load Reductions Reported by Watershed

Watershed	Sub Watershed	Nitrogen lbs/yr	Phosphorus lbs/yr	Sediment ton/yr
Back River	Tidal (all not in Upper subwatershed)	0	0	0
	Upper (all not in Tidal subwatershed)	475.2	79.2	15.1
Corsica River	all subwatersheds	45,708	642	492
Lower Jones Falls	all subwatersheds	0	0	0
Lower Monocacy River	Lake Linganore subwatershed in Frederick Co.	NA	0.6	0.1
	all subwatersheds in Frederick County including Lake Linganore	252.9	40.5	3,932.8
Sassafras River	all subwatersheds	0	0	0
Upper Choptank River	all subwatersheds in Caroline County	11.4	7.9	0.91
TOTAL		46,447.7	770.5	4,441.1

Notes: Table includes both 319 and non-319 load reductions that were reported in 2012. "0" means that no reports on load reductions were received. NA means not applicable.

In addition, several of these watersheds reported 2012 implementation progress accomplished using funding from sources other than the 319(h) Grant. Table 3 summarizes these overall pollutant reduction accomplishments.

More implementation progress details are reported in the following sections for seven on the watersheds listed in Table 1 and for Aaron Run where new improvements are reported.

2012 implementation reporting for three of these watersheds noted efforts to promote volunteer implementation and/or implementation progress that arose substantially thru volunteer effort:

- The Corsica River Implementers Committee includes active participation by the Chester River Association, which works with local people to install rain gardens and rain barrels.
- Frederick County works with the Monocacy / Catoctin Alliance and the Potomac River Alliance to promote volunteer implementation.
- The Sassafras River Association (SRA) is the entity primarily responsible for the creation of the Sassafras Watershed Action Plan and for implementation consistent with it. The SRA is activity receiving grants and participating in NPS BMP implementation.

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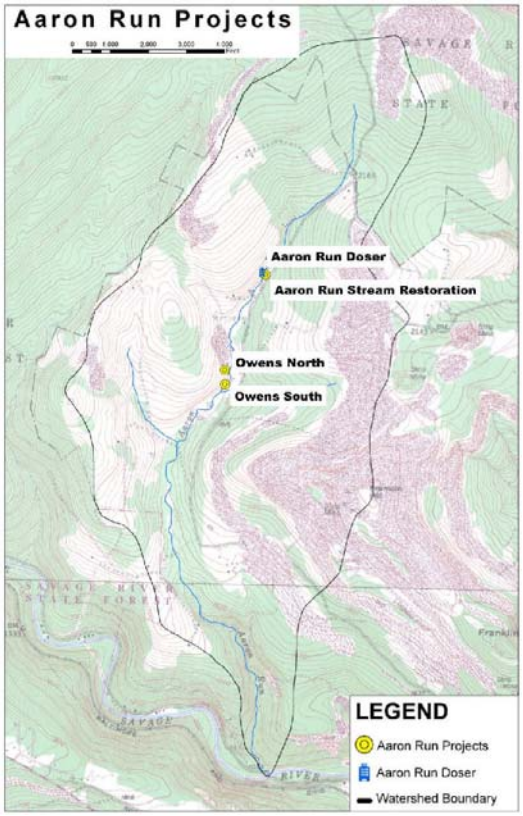


1. Aaron Run Watershed
Acid Mine Drainage Mitigation Completed

Location

Aaron Run is a tributary to the Savage River, which drains to the Potomac River and then to the Chesapeake Bay. The watershed area is about 3.5 square miles entirely within Garrett County, Md.

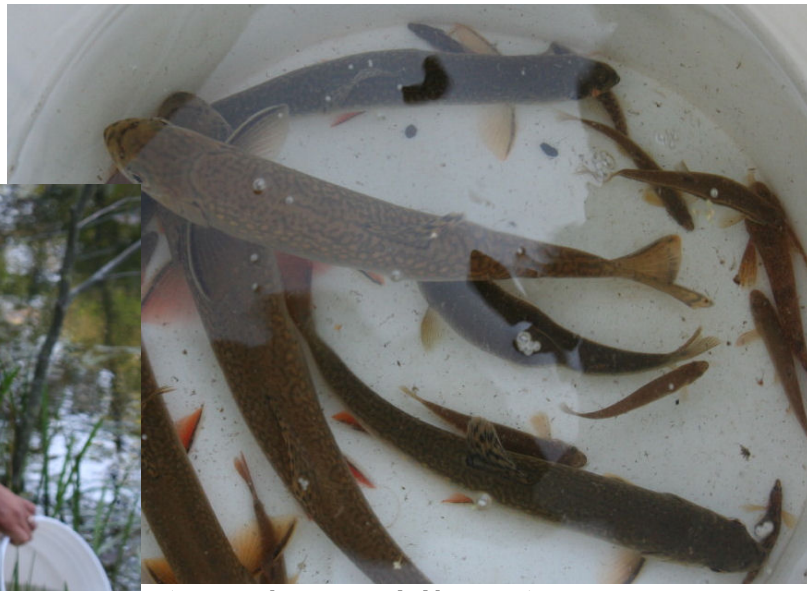
Goal

One legacy of past coal mining in this watershed is continuing acid mine drainage (AMD). The intent of the 319(h) Grant-funded projects was to mitigate AMD in the Aaron Run mainstem to allow for re-establishment of native brook trout populations and recovery of fish populations.

Implementation

Beginning October 2005, 319(h) Grant funds helped to fund assessment of acid mine drainage sources in the Aaron Run watershed, selection of mitigation sites/technologies, project designs and implementation of the projects. Implementation was completed August 2011 and pollutant load reductions were reported in Maryland's 2011 Annual Report. In 2012, the Maryland Department of Natural Resources Fisheries Service found that conditions had improved sufficiently to support re-introduction of native brook trout. MDE monitoring of water quality began in 2012 and will continue in 2013 to document overall project success.

Figure 5. Above: Aaron Run watershed.
Figure 6. Right: Brook trout for stocking in Aaron Run. Below: DNR Fisheries Service personnel introduce the new Aaron Run residents August 2012.



(Map & photos provided by MDE)

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2. Back River Watersheds

Location

The Back River watershed is located in Baltimore County and Baltimore City. It is divided into two subwatersheds as shown in the map and table below. A watershed plan for the Tidal and for Upper Back River subwatershed was accepted by EPA.

Implementation

Projects that are implementing watershed plan goals are summarized on the next pages. All projects using 319(h) Grant funds to date have been in Baltimore County's portion of the Upper Back River watershed. Other implementation progress contributing to watershed plan goals included in the tables was reported by Baltimore County, including projects conducted by nongovernmental organizations.

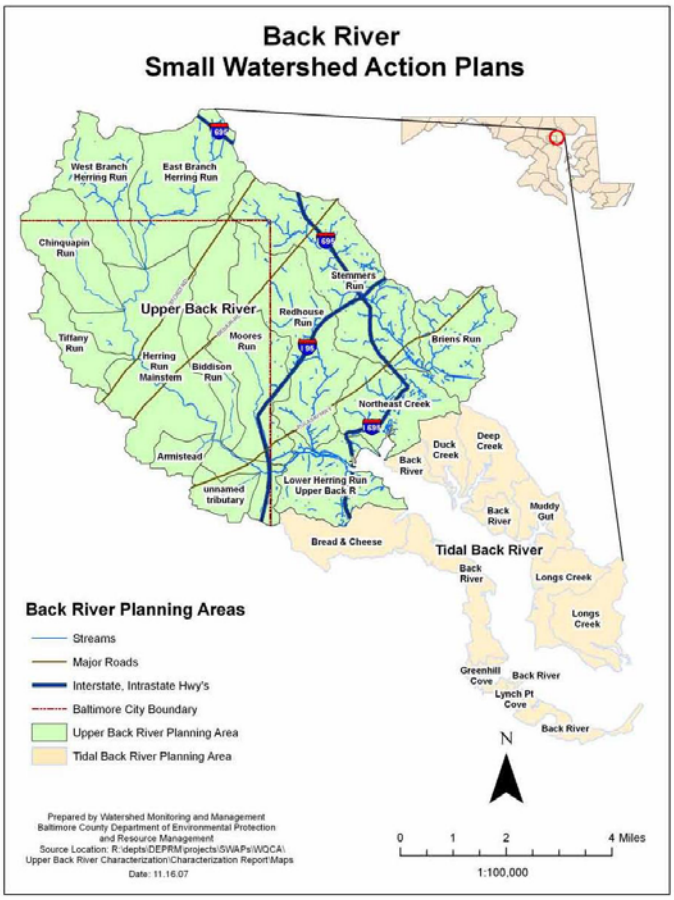

Figure 7. Back River Watersheds.

Table 4. Back River Small Area Watershed Plans	
Upper Back River Watershed	**Tidal Back River Watershed**
Pollutant Load Reduction Goals - Total nitrogen: 48,190 pounds - Total phosphorus: 6,056 pounds Total drainage area: 27,716.7 acres (43.3 mi^2) Total open tidal water: NA Baltimore Co.: 55.5%; Baltimore City: 44.5%. Impervious cover: 30.7 % Land Use - Agriculture: --- - Commercial: 9.9% - Forest: 11.5% - Industrial: 6.5% - Institutional: 8.0% - Residential low density: 8.5% - Residential mid density: 26.5% - Residential high density: 20.4% - Urban open: 6.2% - Water/Wetlands: ---	Pollutant Load Reduction Goals - Total nitrogen: 6,498 pounds - Total phosphorus: 679 pounds Total Drainage area: 7,720 acres (12 mi^2) Total open tidal water: 3,947 acres (6.2 mi^2) Baltimore County: 100% Impervious cover: 18.4% Land Use - Agriculture: 4.4% - Commercial: 7.2% - Forest: 32.1% - Industrial: 3.5% - Institutional: 4.4% - Residential low density: 2.4% - Residential mid density: 23.0% - Residential high density: 8.6% - Urban other: 11.4% - Water/Wetlands: 3.0%

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Table 5. Tidal Back River Watershed Plan - 2012 Implementation Progress Summary (1)

Goals			Progress (3)				
			Implementation		Pollutant Reduction		
Category (2)	Unit	Goal	2008-2012	Percent of Goal	Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment (tons/yr)
Reforestation - Forest Land Mgmt	acres	35	3.3	9.4%	NR	NR	NR
Buffer Reforestation, Forest Stand Mgmt	acres	156	0	0.0%	NR	NR	NR
Nutrient Management	acres	186	0	0.0%	NR	NR	NR
Downspout Disconnect, Roof Runoff Mgmt	acres	31	0.13	0.4%	NR	NR	NR
Stream Channel Restoration	feet	17,040	0	0.0%	NR	NR	NR
Street Trees, Tree/Shrub Establishment	acres	1.7	0	0.0%	NR	NR	NR
Stormwater Retrofits & Mgmt Wetlands	acres	6.4	0	0.0%	NR	NR	NR
Stormwater Conversion, Urban Wet Pond	units	2	0	0.0%	NR	NR	NR
Shoreline Protection/Enhancement	units	NA	0	NA	NR	NR	NR
				Total Pollutant Reduction	0	0.0	0.00
				Watershed Plan Nutrient Reduction Goal	6,498	679	---
				Percent of Goal Achieved	0.0%	0.0%	---

1. 2012 is Calendar year. NA is not applicable. NR is not reported. BMP is best management practice.
2. Categories for watershed plan goals tracked by EPA for progress.
3. Data reported by local government for 2008-2012 includes local government and NGO NPS implementation.

Table 6. Upper Back River Watershed Plan - 2012 Implementation Progress Summary (1)

Goals			Progress (3)				
			Implementation		Pollutant Reduction		
Category (2)	Unit	Goal	2008-2012	Percent of Goal	Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment (tons/yr)
Reforestation - Forest Land Mgmt	acres	50	4.2	8.4%	NR	NR	NR
Buffer Reforestation, Forest Stand Mgmt	acres	200	1.4	0.7%	NR	NR	NR
Nutrient Management	acres	3,000	0	0.0%	NR	NR	NR
Downspout Disconnect, Roof Runoff Mgmt	acres	180	0.5	0.3%	NR	NR	NR
Stream Channel Restoration (5)	feet	66,000	3,000	4.5%	609	32.1	5.37
Street Trees, Tree/Shrub Establishment	units	4,000	115	2.9%	NR	NR	NR
Stormwater Retrofits & Mgmt Wetlands	units	50	1	2.0%	52	12	2
Stormwater Conversion, Urban Wet Pond	units	17	4	23.5%	NR	NR	NR
				Total Pollutant Reduction	661	44.1	7.37
				Watershed Plan Nutrient Reduction Goal	48,190	6,056	---
				Percent of Goal Achieved	1.4%	0.7%	---

1. 2012 is Calendar year. NA is not applicable. NR is not reported. BMP is best management practice.
2. Categories for watershed plan goals tracked by EPA for progress.
3. Data reported by local government for 2008-2012 includes local government and NGO NPS implementation.

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Table 7. Tidal Back River Watershed - Completed NPS Implementation Projects and Reported Pollutant Load Reduction								
Project Name/Description		**Funding Source (1)**	**Funding Amount (2)**		**Total Cost (3)**	**Nitrogen (lb/yr)**	**Phosphorus (lb/yr)**	**Sediment (ton/yr)**
			Federal	**State**				
Baltimore County	Pleasure Island Beach Shoreline Enhancement (5,000 feet)	SRF Grant		$2,717,100.00	$4,285,123.00	1,010	53.5	NR
		TOTAL for completed projects	$0.00	$2,717,100.00	$4,285,123.00	1,010	53.5	NR
Tidal Back River Watershed - Active NPS Projects with Projected Future Implementation Pollutant Load Reduction								
Baltimore County	Tidal Back River Greening: sites include 7 schools, a park & ride and a community center.	Trust Fund SFY13		$787,388	$1,500,000	441	133	24

Table 8. Upper Back River Watershed - Completed NPS Implementation Projects and Reported Pollutant Load Reduction								
Project Name/Description		**Funding Source (1)**	**Funding Amount (2)**		**Total Cost (3)**	**Nitrogen (lb/yr)**	**Phosphorus (lb/yr)**	**Sediment (ton/yr)**
			Federal	**State**				
Baltimore County	Redhouse Run/Overlea stream restoration & stormwater control	319 FFY2000 $16	$130,000.00		$530,000.00	52	9.46	2.67
		Other		$228,899.00				
	Redhouse Run/St. Patricks stream restoration	319 FFY2007 #18	$418,500.00		$883,016.00	609	32.1	5.37
		Other		$186,121.00				
	Upper Back River Stormwater conversions	319 FFY2008 #21	$95,883.81		$159,806.35	51.7	11.5	2.06
		Trust Fund SFY13		$175,000.00	$703,955.00	371.5	56	11
		TOTALS	$644,383.81	$590,020.00	$2,276,777.35	1,084.2	109.1	21.1
Upper Back River Watershed - Active Projects with Projected Future Implementation Pollutant Load Reduction								
Baltimore County	Bread & Cheese Creek stream restoration & stormwater control	319 FFY2010 #11	$556,443		$1,000,000	200.5	29.6	6.75
		Trust Fund SFY13		$250,000				
	Herring Run/Overlook Park stream restoration & buffer planting	319 FFY2011 #7	$358,032		$1,200,000	1031.1	347.2	786
		Other		$275,004				

(1) 319 is the Federal 319(h) Grant. FFY is Federal Fiscal Year. # is project number. For more information see Appendix D.
Trust Fund is the Maryland Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, which offers grants for NPS projects. SFY is State Fiscal Year.
SRF is the State Revolving Fund. The table indicates if the project listed received a SRF grant or a SRF loan. The table shows only NPS projects.
Other is a State funding contribution to the project reported by Baltimore County that did not more explicitly specify the source.
(2) Excludes match and leveraged funds. Completed projects = total grant/loan funds expended for project. Projects in progress = grant or loan allocation.
(3) Total includes grant funds, plus match if required, plus additional leveraged funds if reported.

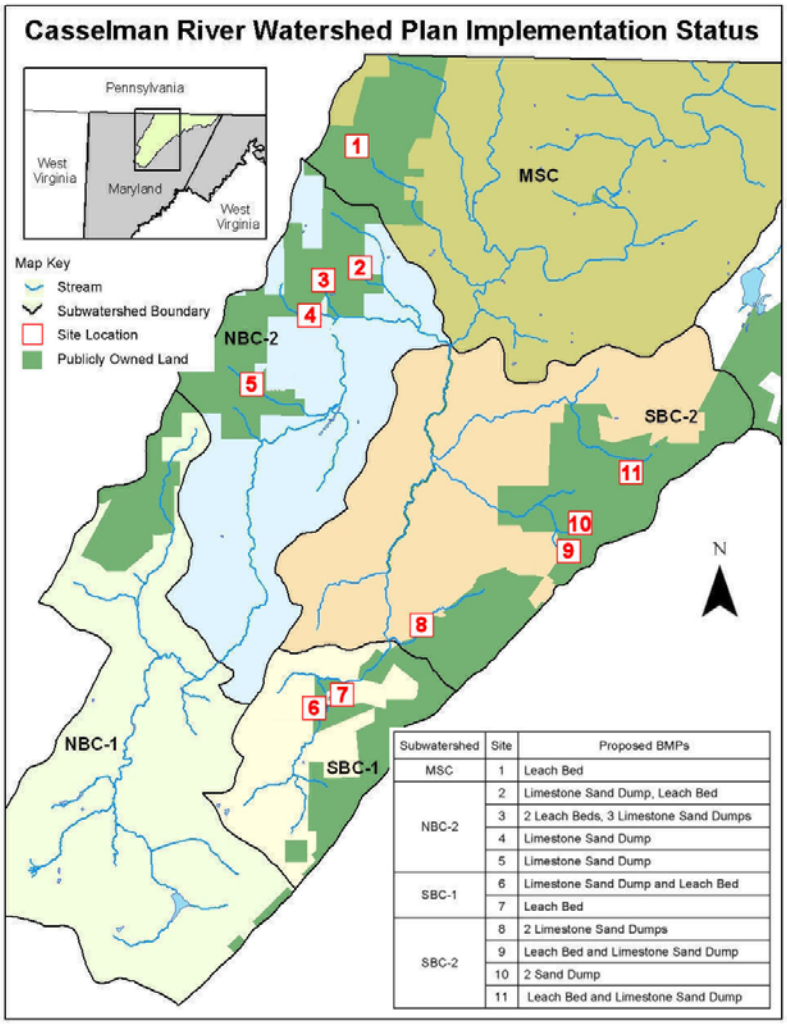
3. Casselman River Watershed Implementation

Location

In Maryland, the Casselman River flows about 20 miles from Savage River State Forest into Pennsylvania. The watershed area is 66 square miles and is part of the Mississippi River drainage. Land use in the watershed can be aggregated into three broad categories:
- 89% woodland,
- 9% agriculture,
- 2% developed lands.

Goal

The watershed plan goal is to meet pH water quality standards in the Code of Maryland Regulations (no less than 6.5 pH and no greater than 8.5 pH) by increasing alkalinity (mg $CaCO_3$/l).



Subwatershed	Site	Proposed BMPs
MSC	1	Leach Bed
NBC-2	2	Limestone Sand Dump, Leach Bed
	3	2 Leach Beds, 3 Limestone Sand Dumps
	4	Limestone Sand Dump
	5	Limestone Sand Dump
SBC-1	6	Limestone Sand Dump and Leach Bed
	7	Leach Bed
SBC-2	8	2 Limestone Sand Dumps
	9	Leach Bed and Limestone Sand Dump
	10	2 Sand Dump
	11	Leach Bed and Limestone Sand Dump

Figure 8. Casselman Phase 1 sites.

Implementation

In autumn 2012, Phase 1 construction funded in-part by 319(h) Grant FFY2009 funds began at sites 1, 2, 4, 5, 6, 8, 9, 10 and 11. (See map)

Figure 9. At Site 11 in September 2012, workers are installing the siphon intake structure to capture water from an upstream location at the site. Water from the stream is used to fill two crushed limestone leach beds, which will discharge alkaline-laden water further downstream to raise pH to meet water quality standards.

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4. Corsica River Watershed Implementation

Location

The Corsica River, which is 6.5 miles in length, is located in Queen Anne's County. The watershed area is 40 square miles and is part of the larger Chester River Watershed. Land use in the watershed aggregates nto three broad categories:
- 66% agriculture,
- 26% woodland,
- 8% developed lands.

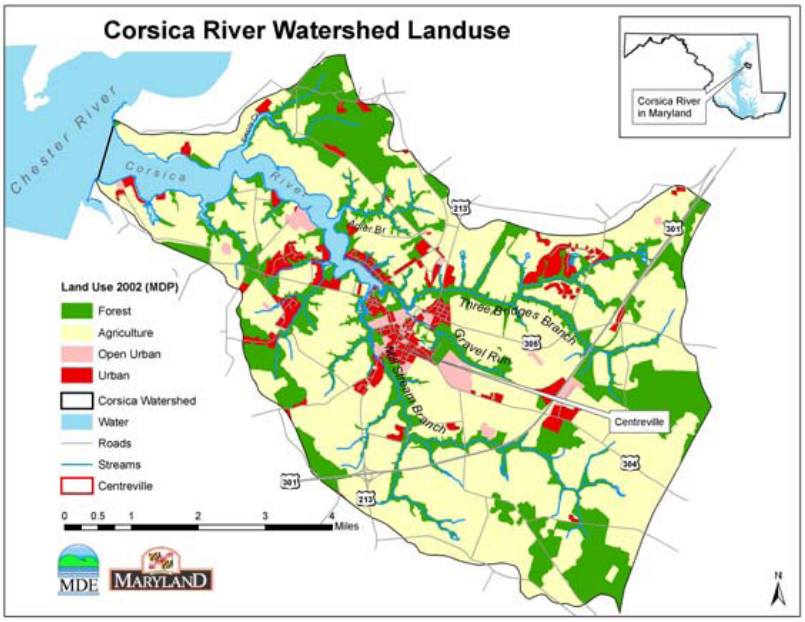

Figure 10. Corsica River Watershed

Goals

The NPS annual TMDL load allocation for nitrogen is 268,211lbs and for phosphorus is 19,380 lbs. Corsica River watershed ambient NPS nutrient loads already met the TMDL when it was approved by EPA, so the TMDL serves as a benchmark to prevent degradation (TMDL page 4 and 20). In addition, other goals were established as listed in the following implementation progress tables.

Implementation

A report on implementation progress from 2005 thru 2011 is available at: http://www.townofcentreville.org/departments/environment.asp
The next pages and Appendix G summarize currently available watershed implementation progress.

Figure 11. The Town of Centreville explored creating a stormwater utility as a funding source that would help address urban runoff and related watershed management issues.

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Table 9. Corsica River Watershed Plan - 2012 Implementation Progress Summary

Goals			Progress (3)					
			Implementation Progress (4)			Total Pollutant Reduction Reported 2005 thru 2012		
Category (2)	Unit	Goal	2012	2005 thru 2011	Percent of Goal Achieved	Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment (tons/yr)
Agricultural BMPs	units	50	6	0	12%	35,082	4,727	843
Cover Crop (5)	acres	5,500	4808	NA	87%	45,576	625	NR
Agricultural Buffers	acres	100	0	94.3	94%	2,173	141	NR
Forest Buffers (urban)	acres	200	2	12	7%	28	8	NR
Manure Transfer (5)	tons	27.4	0	NA	0%	0	0	NA
Oyster Bed Restoration	acres	20	1	10	55%	NA	NA	NA
Rain Gardens & Bioretention	units	408	65	308	91%	150	20	1.5
Septic Tank Upgrades	systems	30	4	14	60%	73.0	NA	NA
Stormwater Retrofits	acres	300	0	112.5	37.5%	61.7	5.9	NR
Stream Restoration	miles	2	0.001	0	0.1%	0.8	0.1	0.1
Waste Storage Facilities (ag)	units	1	0	1	100%	210.0	42.0	NA
Wetland Restoration	acres	108	0	88.3	82%	NR	NR	NR
					Total Pollutant Reduction	83,355	5,569	844
					Watershed Plan Nutrient Reduction Goal	100,132	6,306	---
					Percent of Goal Achieved	83.2%	88.3%	---

1. 2012 = Calendar year. NA = not applicable. NR = not reported. BMP = best management practice.
2. Categories for watershed plan goals tracked by EPA for progress.
3. Data is provided by the Town of Centreville in cooperation with the Corsica Implementers Group.
4. All 319(h) Grant-funded implementation is reported.
5. Accomplishments for cover crops and manure transfer are considered annual practices. Therefore, reporting in this table is limited to the most recent calendar year. Accomplishments for prior years were previously reported.

Figure 12. A perennial favorite at the annual Corsica River Awareness Day held each September is the demonstration by the local fire department showing the ability of porous concrete to infiltrate water gushing from a fire hose without any runoff to the adjacent ground.

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Table 10. Corsica River Watershed - Completed NPS Implementation Projects and Reported Pollutant Load Reduction

Project Name/Description		Funding Source (1)	Funding Amount (2)		Total Cost (3)	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)
			Federal	State				
Centreville	Watershed Restoration	319 FFY05 #2	$232,666.15		$387,776.92	0	0	NR
	Watershed Restoration	319 FFY06 #3	$241,974.82		$403,291.37	62	6	NR
	Symphony Village Bioswale	Trust Fund SFY11		$20,000.00				
	Watershed Restoration	319 FFY09 #1	$270,427.25		$450,712.08	5.33	1.05	0.29
	Stormwater Retrofit near WWTP	Trust Fund SFY11		$30,000.00				
		General Funds		$60,000.00				
	Banjo Lane Coastal Plain Outfall	Trust Fund SFY11		$30,000.00				
		General Funds		$10,000.00				
	Rain Barrel Program, 200 purchased/distributed	Trust Fund SFY11		$10,000.00				
MDA / Queen Anne's Soil Conservation District	Agricultural Technical Assistance	319 FFY04 #18	$32,379.50		$53,965.83	4847	114	NR
		319 FFY05 #12	$145,554.24		$242,590.40	767	79	463
		319 FFY2006 #9	$14,272.71		$23,787.85	NR	NR	NR
		319 FFY07 #6	$22,187.16		$36,978.60	286	10	755
		319 FFY08 #7	$50,780.00		$84,633.33	46	3	62
		319 FFY09 #4	$58,539.00		$97,565.00	19,740	6,664	33
		319 FFY10 #10	$61,590.00		$102,650.00	53,259	802	NR
		319 FFY11 #10	$66,700.59		$111,167.65	45,703	642	492
Queen Anne's County	Corsica and Beyond	319 FFY06 #13	$124,281.44		$207,135.73	NR	NR	NR
	Bioretention Swale	319 FFY08 #19	$50,000.00		$83,333.33	0.22	0.35	0.739
	County Office Bldg Stormwater	Trust Fund SFY11		$200,000.00	$200,000.00	12	2	0.47
	Bloomfield Park N. Bldg. Permeable Paving	SRF Grant		$200,000.00	$250,000.00	864	173	NR
	Bloomfield Park Permeable Pavers	Trust Fund SFY11		$50,000.00	$50,000.00	2	0.33	0.08
TOTAL for completed projects			$1,371,353	$610,000.00	$2,735,588	125,593.6	8,496.7	1,806.6

(1) 319 is the Federal 319(h) Grant. FFY is Federal Fiscal Year. # is project number. For more information see Appendix D.
Trust Fund is the Maryland Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, which offers grants for NPS projects. SFY is State Fiscal Year.
SRF is the State Revolving Fund. The table indicates if the project listed received a SRF grant or a SRF loan. The table shows only NPS projects.
General Funds are State funds used for NPS implementation (Md Department of Natural Resources budget).

(2) Excludes match and leveraged funds. Completed projects = total grant/loan funds expended for project. Projects in progress = grant or loan allocation.

(3) Total includes grant funds, plus match if required, plus additional leveraged funds if reported.

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Table 11. Corsica River Watershed - Active NPS Implementation Projects with Projected Future Pollutant Load Reduction

Project Name/Description		Funding Source (1)	Funding Amount (2)		Total Cost (3)	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)
			Federal	State				
Centreville	Town/Powell Street Retrofit (near Fire Dept.)	Trust Fund SFY13		$50,000	$57,500	1	1	0
	Pennsylvania Ave BioSwale	Trust Fund SFY13		$50,000	$60,000	2	0	0
	Stream Restoration near WWTP	Trust Fund SFY12		$250,000	$250,000	NR	NR	NR
	Watershed Restoration	319 FFY11 #8	$298,998		$498,330.00	3.3	0.3	0
	Watershed Restoration	319 FFY12 #7	$115,002		$191,670.00	20.6	1.8	1,215
MDA / SCD	Agricultural Technical Assistance	319 FFY12 #9	$67,512		$112,520.00	NR	NR	NR
Queen Anne's County	Bloomfield Park Permeable Pavers	Trust Fund SFY13		$69,416	$399,416	25	2	0
	Elementary School Bioretention	Trust Fund SFY13		$13,066	$63,066	NR	NR	NR
	Board of Ed. Bioretention	Trust Fund SFY13		$10,518	$72,650	NR	NR	NR
	Board of Ed. Bioswale and Rain Garden	319 FFY11 #11	93,198.00		$155,330.00	NR	NR	NR
	Board of Ed. Phase 2, Kramer, et al	319 FFY12 #10	$114,276		$190,460.00	60.7	7.6	3.03

(1) See footnotes with Table 10a on previous page.

Figure 13. In the Town of Centreville, stormwater runoff from the Department of Public Works facility previously flowed overland across a materials staging area directly to the Corsica River (flowing right to left in the photos). To help protect the River, the edge of the materials staging area in the riparian zone (left) was converted in late 2011 to intercept runoff from the majority of the facility in a bioretention site (center). Project design and construction was supported in part by FFY2009 319(h) Grant funds. During Super Storm Sandy in late 2012, the bioretention site functioned as designed and maintained stability of the riparian zone (right).

5. Lower Jones Falls 2012 Implementation Status

Location

The Lower Jones Falls watershed encompasses 16,550 acres (25.9 mi^2) that drains portions of Baltimore County (30.09%) and Baltimore City (69.91%). About 54 miles of streams in the watershed flow into the tidal Patapsco River and then the Chesapeake Bay. Land use in the watershed is 55.9% residential (11.1% low density, 23.7% mid density and 21.1% high density). Various developed land uses cover 21.7% of the watershed (6.9% commercial, 2.4% industrial, 10.5% institutional and 1.9% highway). Open land uses account for the remaining 22.2% of the watershed area (6.1% open urban, 13.6% forest, 1.3% agriculture, 0.6% bare ground, 0.6% extractive and 0.3% water). Overall impervious cover is 31.8%.

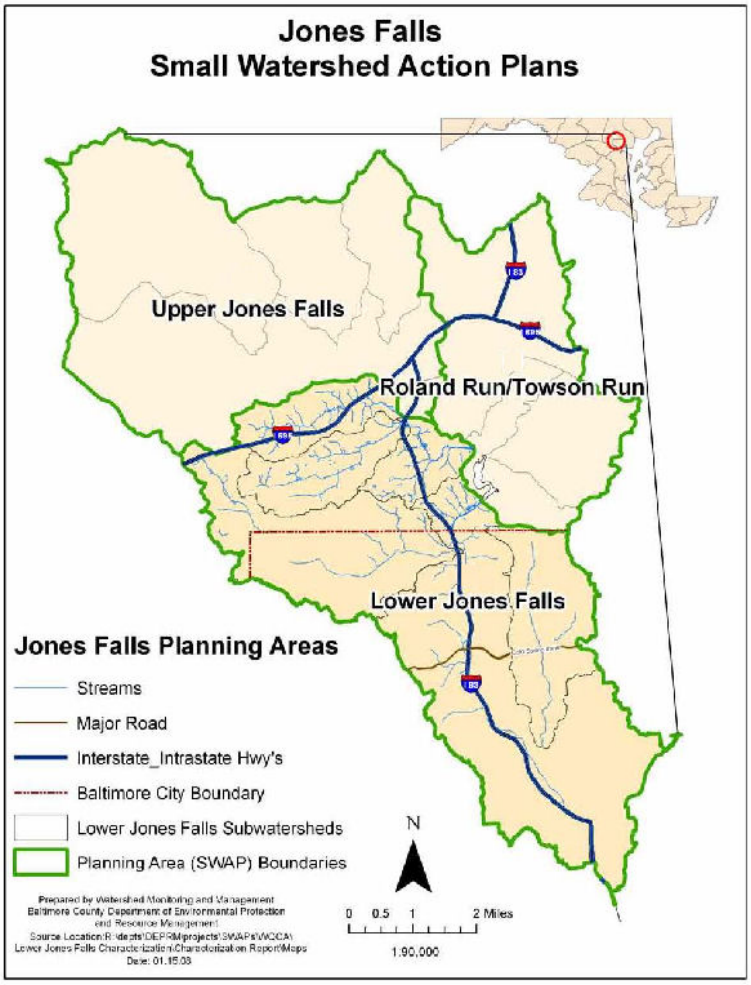

Figure 14. Jones Falls Watershed.

Goals

The Lower Jones Falls Watershed Small Watershed Action Plan (Plan) was developed by Baltimore County in 2008 (CWA 104(b) funding) in partnership with Baltimore City and the Jones Falls Watershed Association. The Plan was accepted by EPA in 2009 and it calls for the nutrient load reductions shown in the following table (including sanitary sewer overflow abatement).

Baltimore County anticipates that the watershed goals will be updated due to recent changes in the Chesapeake Bay Watershed Model and issuance of the Chesapeake Bay TMDL.

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Implementation in the Lower Jones Falls Watershed

Implementation progress reported since the completion of the watershed is summarized in the table below. All of the progress show was reported by Baltimore County. All implementation projects in the Lower Jones Falls watershed have not involved the 319(h) Grant, Maryland's Chesapeake and Atlantic Coastal Bays 2010 Trust Fund or the State Revolving Fund.

Table 12. Lower Jones Falls Watershed Plan - 2012 Implementation Progress Summary (1)

Goals			Progress (3)				
Category (2)	Unit	Goal	Implementation		Total Pollutant Reduction Reported		
			2008-2012	Percent of Goal	Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment (tons/yr)
Reforestation - Forest Land Mgmt	acres	2	0.9	45.0%	NR	NR	NR
Buffer Reforestation, Forest Stand Mgmt	acres	NA	0.7	NA	NR	NR	NR
Nutrient Management	acres	2,210	0	0.0%	NR	NR	NR
Downspout Disconnect, Roof Runoff Mgmt	acres	250	0.1	0.0%	NR	NR	NR
Stream Channel Restoration (5)	feet	20,000	0	0.0%	NR	NR	NR
Street Trees, Tree/Shrub Establishment	units	1,000	0	0.0%	NR	NR	NR
Stormwater Retrofits, Urban SWM Wetlands	acres	100.0	1.29	1.3%	NR	NR	NR
Stormwater Conversion, Urban Wet Pond	units	NA	0	NA	NR	NR	NR
				Total Pollutant Reduction	0	0	0
				Watershed Plan Nutrient Reduction Goal	111,160	14,357	NA
				Percent of Goal Achieved	0%	0%	NA

1. 2012 is Calendar year. NA is not applicable. NR is not reported. BMP is best management practice.
2. Categories for watershed plan goals tracked by EPA for progress.
3. Data is reported by local government, which includes results of nongovernmental organization activities.

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6. Lower Monocacy River

Location

The Lower Monocacy River watershed encompasses 194,700 acres (304 mi^2) that drains portions of Frederick County (87%), Montgomery County (10%) and Carroll County (3%). The mainstem of the Monocacy River is 58 miles long. About 304 square miles of watershed drain into the tidal Potomac River and then the Chesapeake Bay. Overall impervious cover is 4% but it is concentrated in two subwatersheds: Carroll Creek (18.6%) and Ballenger Creek (13.4%). Land use in the watershed is:

- 47% Agricultural
- 30% Forest
- 22% Developed land uses

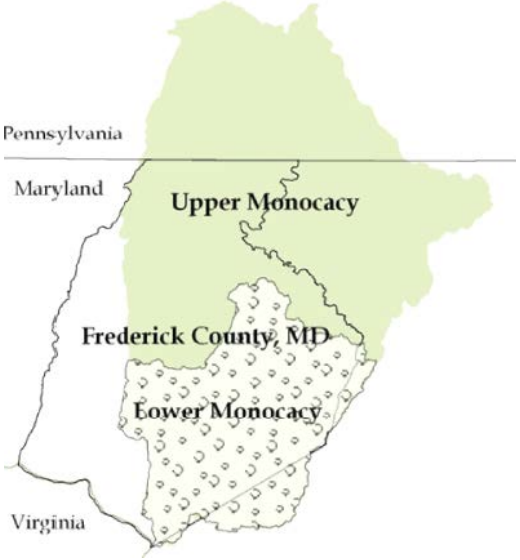

Figure 15. Monocacy River Watershed.

Goals and Implementation

The Lower Monocacy River Watershed Restoration Action Plan was developed by Frederick County in 2004 to address the 168,960 acres (264 mi^2) within the County. In 2008, the County used local funds to revise the Plan and EPA accepted the revision. The Plan's 25-year goals and implementation progress are presented on the next page.

Figure 16. (above and right). The Urbana Elementary School Bioswale project was initiated in 2011 and completed in 2012 using FFY08 319(h) Grant funds. (Map and photos are courtesy of Frederick County.)

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Table 13. Lower Monocacy River Watershed Plan Implementation Progress Summary

Lower Monocacy Goals				Lower Monocacy Implementation Progress				
Parameter		Unit	Units Needed	2012	Previous Years		Total	Goal % Achieved
					2008-2011	Pre- 2008		
Nitrogen	Agriculture	lbs/yr	582,949	NR	NR	NR	NR	NR
	Urban	lbs/yr	67,049	102.9	1,535.6	571.0	2,209.4	3.30%
Phosphorus	Agriculture	lbs/yr	57,337	NR	NR	NR	NR	NR
	Urban	lbs/yr	11,615	9.1	122.8	33.4	165.3	1.42%
Sediment	Agriculture	lbs/yr	18,342,280	NR	NR	NR	NR	NR
	Urban	lbs/yr	2,348,084	3,930.0	32,450.6	13,149.7	49,530.4	2.11%
Lake Linganore Goals				**Lake Linganore Implementation Progress**				
Phosphorus	Agricultural	lbs/yr	601,489.60	NR	NR	NR	NR	NR
	Urban	lbs/yr	92,106.30	0.6	22.4	25.6	48.6	0.05%
	Forest	lbs/yr	4,186.70	NR	NR	NR	NR	NR
Sediment	Agricultural	tons/yr	38,401	NR	NR	NR	NR	NR
	Urban	tons/yr	3,615	0.1	5.0	4.6	9.6	0.27%
	Forest	tons/yr	1,033	NR	NR	NR	NR	NR

2012 is Calendar year. NA is not applicable. NR is not reported. Parameters are the watershed plan goals/progress being tracked. Data is provided by Frederick County. Other entities may not be reporting accomplishments that would contribute to meeting goals. The Lake Linganore drainage is a subwatershed with a TMDL that is within the larger Lower Monocacy River watershed.

Table 14. Lower Monocacy River Watershed - Completed NPS Implementation Projects and Reported Pollutant Load Reduction

Project Name/Description		Funding Source (1)	Funding Amount (2)		Total Cost (3)	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)
			Federal	State				
Frederick County	Lower Monocacy Watershed Restoration	319 FFY05 #17	$216,237.00		$360,395.00	615.9	43.9	8.2
	Urban Wetlands, Bennett Creek Pilot	319 FFY07 #4	$196,732.92		$327,888.20	101.3	18.5	1.6
		319 FFY08 #4	$228,361.26		$380,602.10	149.9	31.4	2.782
TOTAL for completed projects			$641,331.18	$0	$1,068,885.30	867.1	93.8	12.6
Lower Monocacy River Watershed - Active NPS Projects with Projected Future Implementation Pollutant Load Reduction								
Frederick County	Lower Monocacy Green Infrastructure	319 FFY10 #9	318,396		$530,660	247	25.9	4.9
	Villages of Lake Linganore Stormwater Management	SRF Loan 2007A		$3,114,000	$14,146,142	NR	NR	NR
		SRF Loan 2007B		$3,232,142		NR	NR	NR

(1) 319 is the Federal 319(h) Grant. FFY is Federal Fiscal Year. # is project number. For more information see Appendix D.
Trust Fund is the Maryland Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, which offers grants for NPS projects. SFY is State Fiscal Year.
SRF is the State Revolving Fund. The table indicates if the project listed received a SRF grant or a SRF loan. The table shows only NPS projects.
(2) Excludes match and leveraged funds. Completed projects = total grant/loan funds expended for project. Projects in progress = grant or loan allocation.
(3) Total includes grant funds, plus match if required, plus additional leveraged funds if reported.

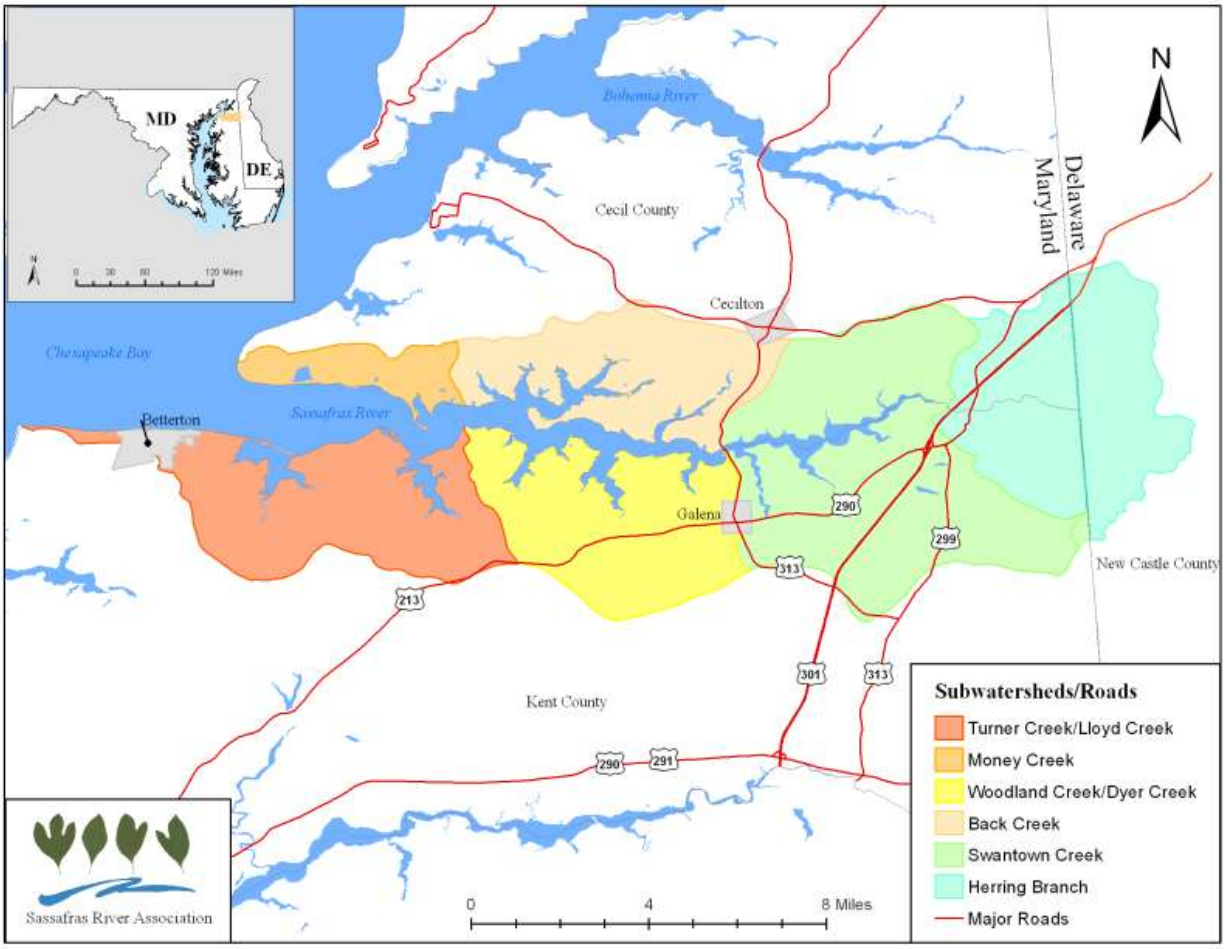

Figure 17. Sassafras River watershed map.

7. Sassafras River Watershed

Location

The Sassafras River watershed encompasses 62,000 acres (96.9 mi^2) that drains portions Kent County, MD (57%), Cecil County, MD (28%) and New Castle County, DE (8%) with 13% of the watershed being surface water. The 20.6 mile-long Sassafras River mainstem flows into the Chesapeake Bay. Impervious area covers 2.2% of the watershed. Land use in the watershed is: 57% agricultural; 24% forest; 4% developed; 14% water, and; 1% wetland.

Goal

The Sassafras River Watershed Action Plan (SWAP) was developed by the Sassafras River Association (SRA), a private nonprofit organization, in 2009. The Plan lists numerous goals to be achieved within 10 years. The table on the next page lists some of these goals that are being tracked for implementation progress.

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Table 15. Sassafras River Watershed Action Plan - 2012 Implementation Progress Summary

Goals			Progress (2)					
			Goal Implementation Progress			Total Pollutant Reduction Reported		
Goal Number and Name	Unit	Units Needed	2012	Previous Years (2009-2011)	Percent of Goal Achieved	Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment (tons/yr)
#1 Road retrofit, stream restored	project	3		0	0%	NR	NR	NR
#2 Stormwater retrofits	project	4		1	25%	NR	NR	NR
#5 Septic system upgrades	project	150		NR	0%	NR	NR	NR
#12 Stabilize eroding ravines	miles	1		0	0%	NR	NR	NR
#13 Stabilize eroding shoreline	miles	0.5		0	0%	NR	NR	NR
#14 Increase buffers (stream/shore)	miles	3		0	0%	NR	NR	NR
#17 Agricultural cover crops	acres/yr	5,000		NA	0%	NR	NR	NR
#20 Innovative ways of more efficient and effective use of nutrients (3)	acres/yr	100	20	0	20%	NR	NR	NR
#21 Wetland creation	projects	5		1	20%	NR	NR	NR
#22 Agricultural BMPs	acres	500		NR	0%	NR	NR	NR

1. 2012 = Calendar year. NA = not applicable. NR = not reported. 2. Implementation progress is tracked and reported by the Sassafras River Association. Only completed projects are reflected.

Figure 18. An innovative approach to manure nutrient management promoted by the Sassafras River Association is the "subsurfer" equipment pictured here. It is designed to carefully meter out manure being injected into the soil to match cropping needs and reduce potential for water quality impacts. The pilot project is reported for 2012 in Table 15 under Goal #20. (photo by the Sassafras River Association.)

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Table 16. Sassafras River Watershed - Active NPS Projects with Projected Future Implementation Pollutant Load Reduction

Project Name/Description		Funding Source (1)	Funding Amount (2)		Total Cost (3)	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)
			Federal	State				
Kent SCD w/ SRA	Galena Elementary School stormwater wetland	319 FFY12 #8	$15,000		$25,000	0.317	0.06	NR
Sassafras River Association	Rt 301 Stormwater Conveyance	Trust Fund SFY13		$440,000	$880,000	35	465	211,000
	Budds Landing RSC	Trust Fund SFY13		$170,864	$205,864	NR	90	42,200
	Crawford Treatment Wetlands	Trust Fund SFY13		$145,582	$349,000	2,992.75	863.1	12.454
	Phipps Treatment Wetlands	Trust Fund SFY12		$130,000	$130,000	NR	NR	NR

Figure 19. The Crawford Treatment Wetland is an innovative vertical flow treatment wetland being constructed downstream from a concentrated animal feeding operation (CAFO). It is designed to capture sediment and remove nutrients before directing treated water to the natural stream. The practice will be the first of its kind to capture and treat both surface stormwater from the CAFO and groundwater from surrounding crop fields. Funding is provided by the National Fish and Wildlife Foundation and Maryland's Chesapeake Bay Trust and Maryland's Chesapeake and Atlantic Coastal Bays Trust Fund. (photo provided by the Sassafras River Association.)

8. Upper Choptank River

Location

The Upper Choptank River watershed encompasses 163,458 acres (255 mi^2) and drains parts of three Maryland counties (Caroline, Talbot and Queen Anne's) and parts of Delaware. The 20.6 mile-long Sassafras River flows into the Chesapeake Bay. Impervious area covers 2.2% of the watershed. Land use in the watershed is: 58% agricultural; 31% forest; 8% developed and; 3% water.

Goal

In the 2010 Upper Choptank River watershed plan, which was developed by Caroline County, the goals to reduce nonpoint source nutrient loads are:

- Total nonpoint source nitrogen reduction: 704,000 pounds/year
- Total nonpoint source phosphorus reduction: 34,500 pounds/year.

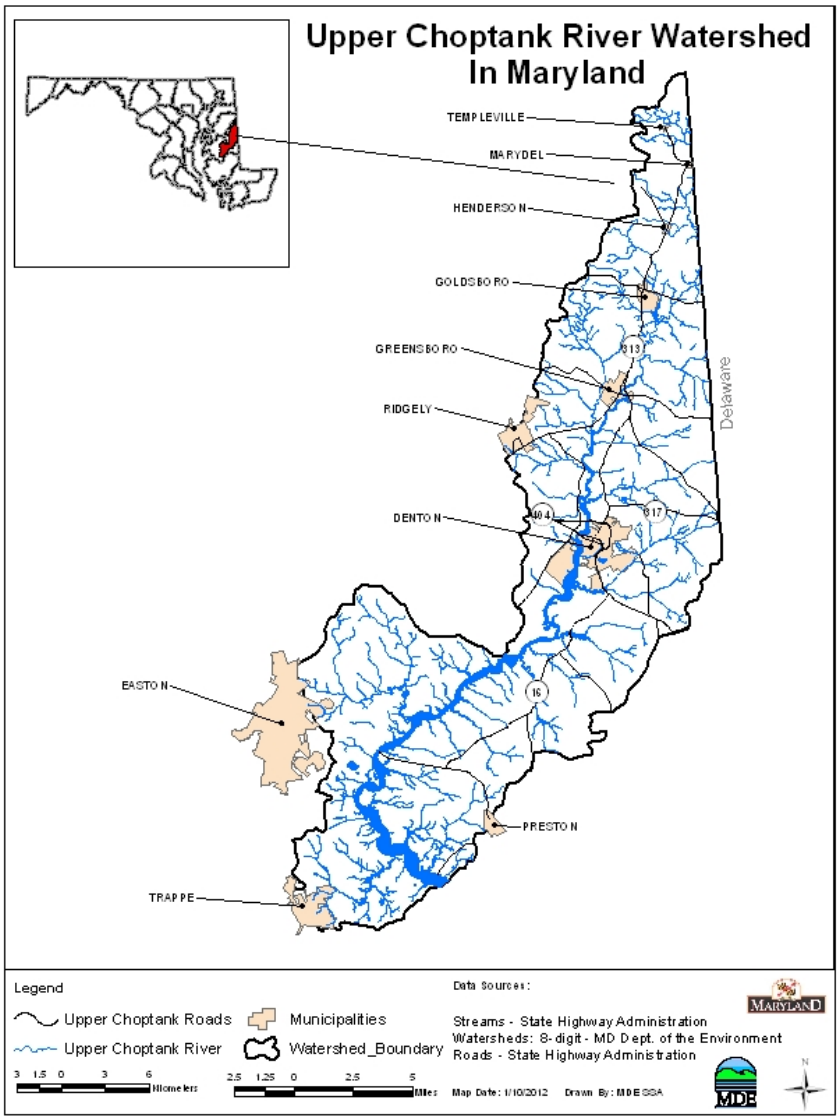

Figure 20. Upper Choptank River Watershed.

Implementation

Implementation progress reporting to meet watershed plan goals appears on the next page.

Figure 21. Caroline County retrofitted their Dept. of Public Works yard parking area with a stormwater infiltration trench in 2012 using 319 Grant funds and County personnel for design and construction. This photo was taken a few weeks after rushes were planted to stabilize the BMP and absorb some of the runoff. The County's intent is to employ the experience gained from this project for additional stormwater BMP implementation.

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Table 17. Upper Choptank River Watershed Plan Implementation Progress Summary (1)

Categories (2)	Units	2012				2010 Thru 2011				Overall Total 2010 Thru 2012			
		Project Count	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)	Project Count	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)	Project Count	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)
Ag Cover Crops	acres	18497.7	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Ag BMPs (all others)	# of BMPs	307	NR	NR	NR	NR	23,455.6	2,498.2	NR	NR	23,455.6	2,498.2	NR
Urban BMPs (3)	# of BMPs	0	0	0	0	30	675	185	19	30	675	185	19
	TOTAL		0	0	0		24130.6	2683.2	19		24,130.6	2,683.2	19
										Watershed Plan Goal	704,000	34,500	NA
										Percent of Goal Achieved	3.4	7.8	NA

1) Caroline County provided data. 2012 is calendar year. NA is not applicable. NR is not reported.

2) The Upper Choptank watershed plan's numerous BMP goals are aggregated in this table.

BMP progress in Table 17 does not include information reported in Table 18.

Table 18. Upper Choptank River Watershed - Completed NPS Implementation Projects and Reported Pollutant Load Reduction

Project Name/Description		Funding Source (1)	Funding Amount (2)		Total Cost (3)	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (ton/yr)
			Federal	State				
Caroline County	DPW Stormwater Retrofits	319 FFY2010 #7	$46,213.30		$77,022.17	11.39	7.89	0.91
TOTAL for completed projects			$46,213.30	$0	$77,022.17	11.4	7.9	0.91
Upper Choptank River Watershed - Active NPS Implementation Projects with Projected Future Pollutant Load Reduction								
Caroline County	Upper Choptank Restoration	319 FFY2012 #6	140,001		$233,335	8	0.9	NR

(1) 319 is the Federal 319(h) Grant. FFY is Federal Fiscal Year. # is project number. For more information see Appendix D.
Trust Fund is the Maryland Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, which offers grants for NPS projects. SFY is State Fiscal Year.
SRF is the State Revolving Fund. The table indicates if the project listed received a SRF grant or a SRF loan. The table shows only NPS projects.
General Funds are State funds used for NPS implementation (Md Department of Natural Resources budget).

(2) Excludes match and leveraged funds. Completed projects = total grant/loan funds expended for project. Projects in progress = grant or loan allocation.

(3) Total includes grant funds, plus match if required, plus additional leveraged funds if reported.

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V. Areas of Concern/Recommendations/Future Actions

Key challenges addressed by the NPS Program in collaboration with other state efforts include:

Urban/Suburban Nonpoint Source Pollution is increasing: Maryland has seen tremendous population growth over the last several decades and the trend is projected to continue. From 2000 to 2010, Maryland's population increased about 477,000 to nearly 5,774,000 with an accompanying increase in population density from 542 to 596 per sq/mi. over the same period. An accompanying trend is a decrease in the number of people per household. These trends contribute to increasing development acreage, increasing impervious area as a percentage of the landscape and a tendency for increasing urban stormwater runoff and the nonpoint source pollutant loads associated with it. The State has had two long-standing programs in place to control pollution generated from the development of land. MDE is responsible for administering these two programs that are erosion and sediment control and stormwater management. For over 40 years, Maryland's erosion and sediment control program has required that specific vegetated techniques and structural practices be implemented and plans be designed, reviewed, and approved to control runoff from construction sites. This statewide program has undergone numerous changes and improvements over the last four decades, the last of which occurred recently.

In January 2012, MDE completed a comprehensive two year process of modifying the regulations governing erosion and sediment control. This effort culminated in the adoption of the "2011 Standards and Specifications for Soil Erosion and Sediment Control" (Standards). These Standards improved the design of practices found in previous versions of the document (last edition dated 1994) and was based on current technology and experience and exhaustive public input from various development related communities. Accompanying the Standards were changes to the Code of Maryland Regulations (COMAR 26.17.01) that further improved construction site runoff management. Major improvements included limiting the amount of earth allowed to be disturbed for any project to 20 acres, and decreasing the time that soil is allowed to remain bare. Stabilization is now required to be applied within 3 days to site perimeters and controls and 7 days to inactive areas (previously 7 and 14 days, respectively).

The State's stormwater management program has also undergone numerous changes since it was first implemented in 1982. Recently however, MDE overhauled the way new development runoff is controlled by requiring the use of environmental site design (ESD). This represented a significant sea change in how stormwater management is to be designed. Prior to the passage of the Stormwater Act of 2007 (Act), Maryland allowed large, structural practices to be used to manage runoff from new and redevelopment projects. The Act mandated that MDE alter this approach in order to use ESD to better mimic natural hydrology.

Code Of Maryland Regulations (COMAR 26.17.02) modifications adopted in May 2009 now require better site planning, nonstructural techniques, and small-scale structures to be used to replicate the runoff characteristics of "woods in good condition" and reach a standard of maximum extent practicable (MEP). MEP is to be reached using alternative surfaces, green roofs, rainwater harvesting, rain gardens, micro-bioretention, and landscape infiltration. MDE revised Chapter 5 of the 2000 Maryland Stormwater Design Manual, provided guidance and

ESD examples, and reviewed and approved all county and municipal stormwater management ordinances all in an effort to improve Maryland's program. Local implementation for private development and MDE implementation for State and federal construction projects has been ongoing since May 2010.

Additional information related to urban/suburban nonpoint source pollutant control: http://mde.maryland.gov/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Pages/Programs/WaterPrograms/SedimentandStormwater/home/index.aspx

Another ongoing effort to improve NPS management in Maryland is State Agency input and assistance to local governments regarding their Comprehensive Plans, which are used by Counties to establish long term direction for their decisions regarding use of land, resources, etc. During 2009-2010 when local governments were working to integrate Water Resource Elements (WRE) into their Comprehensive Plans, MDE assisted by: 1) developing NPS analysis tools for use by local governments, 2) providing direct staff assistance in using these tools and in meeting NPS program objectives, and 3) reviewing and commenting on the local government's drafts. Now in continuing these efforts, MDE receives proposed changes to local Comprehensive Plans through the State's Clearing House Review process and offers recommendations and assistance designed to promote effective NPS management by local government.

Resource Constraints/Measurable Environmental Results: As federal and state budgets grow tighter, there is a push for all programs to demonstrate their effectiveness at producing results. The national Nonpoint Source Program is under pressure to demonstrate program effectiveness through measurable environmental results. Over the past two decades, the Maryland NPS Program has focused on a *targeted watershed* approach to help target resources in a way that would generate measurable results. Although the logic is compelling, findings of a retrospective assessment of results for the past two decades are not as compelling. Maryland's NPS Program, in coordination with EPA Region III, will evaluate the findings in a manner that has the greatest potential to generate measurable results. In coordination with EPA Region III, the NPS Program will selectively target program resources consistent with the following priorities:

Protection of high quality (Tier II) waters: The 319 Program is supporting implementation of Maryland's anti-degradation regulations by funding biological monitoring. This is being targeted to Tier II waters in which there are proposed development activities. This monitoring supports MDE decision-making and provides data to evaluate the effectiveness of the anti-degradation policies and support future policy refinements.

Biological Restoration Initiative: Maryland uses biological data from streams as one gauge of potential degraded conditions. If the percentage of degraded streams in a watershed exceeds a certain threshold, Maryland formally identifies that watershed on the State's list of impaired waters. Because watersheds that are just below the threshold of impairment may have a higher potential for restoration than those that are significantly more degraded, resources from the 319(h) NPS Program are being directed to these marginally impaired watersheds in an effort to remove them from the State's impaired waters list. The 319(h) Grant funding for this Biological Restoration Initiative (BRI) was coordinated in 2010 with the State's Chesapeake and Coastal Bays Trust Fund (Trust Fund) grant program trough the Trust Fund's targeting scheme. Coordination between Federal 319(h) Grant and the State Trust Fund will continue. It is

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anticipated that this coordination will assist in providing leveraging opportunities for funding in the future.

Reducing nutrient and sediment pollution to the Chesapeake Bay: Nutrient and sediment pollution are the main causes of impairment of our tidal waters. These pollutants have been the focus of EPA's development of TMDLs for the Chesapeake Bay. The 319 Program provided resources to support the development of Maryland's Phase I and Phase II Watershed Implementation Plans (WIP). In addition to this Chesapeake Bay restoration planning, the 319 Program is coordinating implementation grant proposals through Maryland's Trust Fund, which targets resources to areas with the greatest nutrient loading to the Bay and to the BRI target areas discussed above. As attention turns from WIP planning to tracking, reporting and validation of implementation the 319 Program will continue to play a vital role in refining and implementing these systems in coordination with the Chesapeake Bay Regulatory and Accountability Program (CBRAP) grant.

Improvement of Impaired Waters: Maryland has a two-track system for targeting resources to improving impaired waters. Both priority tracks are designed to address EPA's Strategic goals of improving living resources and showing observable water quality improvement. They also increase the likelihood of generating success stories discussed below.

One track is to identify waters with high recovery potential for removal from Maryland's 303(d) list. These waters tend to be impaired just slightly beyond the threshold of water quality standards or are conducive to restoration in other ways, e.g., the State has significant control over the sources of impairment. During 2009, MDE assessed the list of waters with biological impairment and ranked them to identify watersheds that have the highest potential for removal from Maryland's 303(d) list. Beginning in 2010, MDE integrated these priorities into the 319(h) grant selection criteria and into the State's criteria for dispersing Trust Fund grant. 319 grant funds were subsequently directed to field assessments of the causes of stream degradation and opportunities for remediation for several highly ranked waters.

Another example of this first track of priority attention is the continued 319 Program funding of acid mine drainage (AMD) restoration projects in Western Maryland. Because theses projects can be engineered to control sources of acidity, they have a high potential for meeting pH water quality criteria thereby resulting in their removal from Maryland's 303(d) list.

One challenge with this track is that soliciting implementation partners and directing funding to these types of projects must compete with the high-profile Chesapeake Bay restoration initiative. The 319 Program will make a concerted effort to balance resources in view of the dominant interest in Bay restoration.

The second track is to show incremental improvement in water quality short of removal from the 303(d) list. The waters prioritized for this objective tend to be intensely degraded with apparent low-cost opportunities for remediation. Due to the intense level of degradation, improvements tend to be more readily observable than cases of less degradation. A classic example of this is the situation of over grazing in or near streams, which cause multiple impacts including elevated bacteria, nutrients and sediments as well as physical stream degradation. Targeting these cases presents the opportunity to address multiple kinds of impairment with the same restoration

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actions. The 319 Program's pioneering use of the synoptic survey monitoring technique, which collects numerous samples within a watershed, provides information at a fairly high resolution for use in both targeting and evaluation of progress in the future.

Documenting Success Stories: Maryland is committed to documenting NPS management & implementation success stories. A challenge in doing this is that site-specific environmental monitoring of NPS best management practice implementation documenting before/after change in terms of in water quality or in-stream biology improvement requires significant effort and investment. This investment is frequently not part of the BMP project itself. Commonly, generating sufficient monitoring documentation requires years of data collection in a local watershed where the environmental improvements produced by the BMPs are not obscured by weather variability and other sources of impairment. Additionally, long term monitoring before and after installation of BMPs has sometimes shown that environmental improvements in receiving streams may take years to appear due to environmental conditions like travel time through groundwater and effects of historic pollutant storage that can linger long after BMPs are installed. Consequently, it is difficult: 1) to identify partners who had initiated their success story monitoring years prior to BMP implementation, 2) to find adequate monitoring data/analysis to verify results, and 3) to assemble documentation that can survive critical technical review. The success story presented in Appendix F, *Treating Acid Mine Drainage Improves Cherry Creek*, met these challenges and was submitted to EPA in 2012.

To help meet these challenges in the future, MDE continues to seek out partners who volunteer to help generate success story documentation. Additionally, MDE is focusing a percentage of 319(h) Grant funded monitoring on generating monitoring data in watersheds with targeted NPS BMP implementation so that documentation for potential success stories can be developed.

US EPA ARCHIVE DOCUMENT

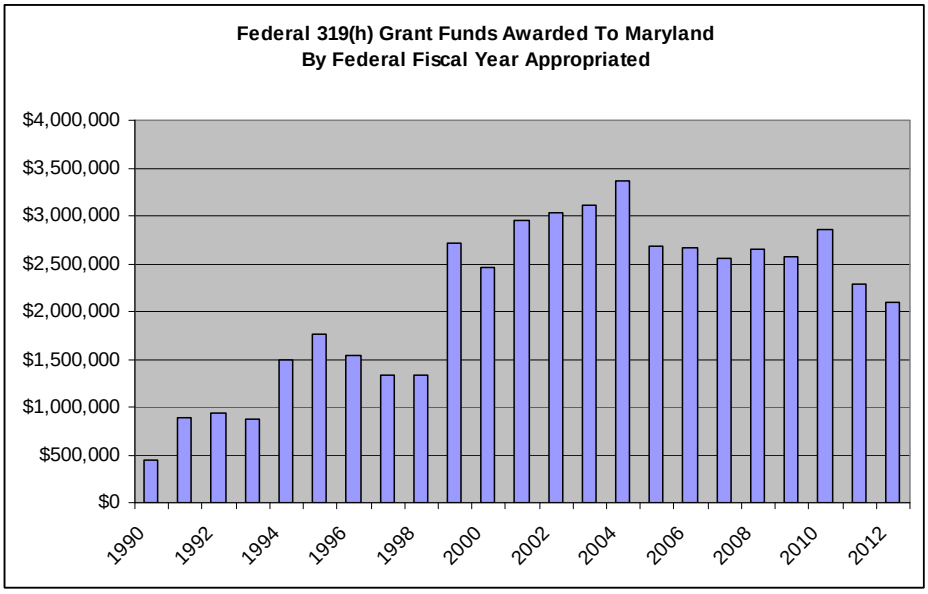
Appendix A – Financial Information

Contents

- Federal 319(h) Grant Funds Awarded To Maryland
  - Overview
  - Award Amounts
- Nonpoint Source Expenditures Reported (Maintenance of Effort Reporting)
  - Overview

Overview of Federal 319(h) Grant Funds Awarded to Maryland

Grant funding from the Federal Clean Water Act Section 319(h) was first awarded to the State of Maryland in 1990. The adjacent chart shows the relative grant award for each award beginning in 1990. The table on the next page lists the award amount and the amount of nonfederal match for each award.



The year shown for each grant award is the Federal Fiscal Year (FFY) that the federal funds were appropriated. Upon award, each grant has a maximum life of five years.

As the chart shows, grant award received by Maryland from the FFY 2012 appropriation was the smallest since FFY1998 (not adjusted for inflation). This smaller award is a result of a reduction in the national 319(h) Grant appropriation, which similarly affected all States. The allocation to Maryland is based on a national formula for distribution of 319 (h) Grant funds among the States, which has remained unchanged since the early 1990s.

US EPA ARCHIVE DOCUMENT

Appendix A – Financial Information

Award Amounts for Federal 319(h) Grant Funds Awarded To Maryland

Since 1990, about $48.6 million in Federal 319(h) Grant funds have been awarded to Maryland as shown in the table below.

Federal 319(h) Grant Funds Awarded To Maryland By Federal Fiscal Year Appropriated

Federal Fiscal Year (1)	319(h) Grant Allocation (2)	Non-Federal Match (3)	Total Grant + Match
1990	$447,771	$298,514	$746,285
1991	$890,039	$593,359	$1,483,398
1992	$939,298	$626,199	$1,565,497
1993	$877,070	$584,713	$1,461,783
1994	$1,494,413	$996,275	$2,490,688
1995	$1,755,964	$1,170,643	$2,926,607
1996	$1,541,980	$1,027,987	$2,569,967
1997	$1,327,699	$885,133	$2,212,832
1998	$1,327,699	$885,133	$2,212,832
1999	$2,708,298	$1,805,532	$4,513,830
2000	$2,467,576	$1,645,051	$4,112,627
2001	$2,958,486	$1,972,324	$4,930,810
2002	$3,035,576	$2,023,717	$5,059,293
2003	$3,104,500	$2,069,667	$5,174,167
2004	$3,369,190	$2,246,127	$5,615,317
2005	$2,675,598	$1,783,732	$4,459,330
2006	$2,666,655	$1,777,770	$4,444,425
2007	$2,551,736	$1,701,157	$4,252,893
2008	$2,653,500	$1,769,000	$4,422,500
2009	$2,575,782	$1,717,188	$4,292,970
2010	$2,860,785	$1,907,190	$4,767,975
2011	$2,283,639	$1,522,426	$3,806,065
2012	$2,091,000	$1,394,000	$3,485,000
Total	$48,604,254	$32,402,836	$81,007,090

1) Federal Fiscal Year is the year of appropriation. Shaded years closed grants. Other years shown are active grants.
2) Federal grant amount awarded to Maryland by Federal Fiscal Year.
3) Matching funds required for each grant award (40%) from nonfederal sources.

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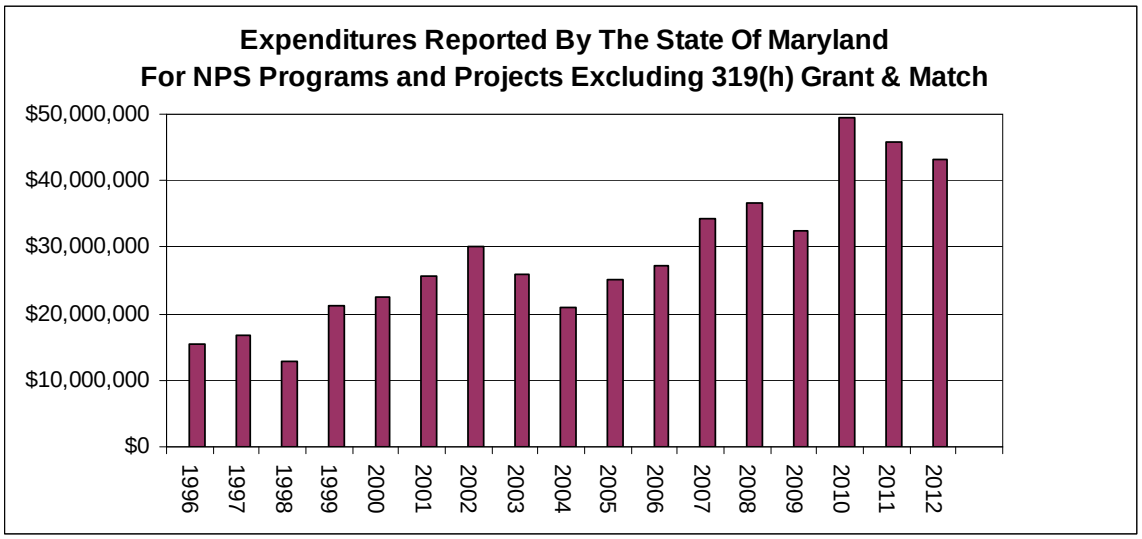
Appendix A – Financial Information

Overview Of Nonpoint Source Expenditures Reported

When Federal Clean Water Act Section 319(h) was enacted in the 1987 Amendments to the Act, Congress included provisions that the 319(h) Grants to the States would not be used to replace State expenditures that already were occurring. The requirement that the States continue their previously existing level of investment in nonpoint source programs and projects is referred to as Maintenance Of Effort (MOE). As a prerequisite for receiving the next 319(h) Grant award, each State is required to document that their nonfederal expenditures for nonpoint programs and projects in the prior year, excluding the match required for the previous 319(h) Grant, were at least as much as the dollar amount for their MOE.

Maryland's MOE is $8,447,270. The chart below shows that Maryland has consistently reported annual nonfederal expenditures for nonpoint programs and projects, excluding federal funds and match for the 319(h) Grant, greater than $10 million.



The expenditures reported by Maryland to EPA to meet MOE requirements as summarized in the chart is the cumulative dollar amount of expenditures reported by three State agencies for a single State fiscal year (July 1 through June 30):

- Maryland Department of Agriculture;
- Maryland Department of the Environment, and;
- Maryland Department of Natural Resources.

Expenditures for nonpoint programs and projects by other State agencies, local governments, private organizations or other entities has not been included in Maryland's MOE reporting to EPA. Therefore, it is likely that the total annual expenditure for nonpoint source programs and projects in Maryland is significantly greater than the dollar amount reported to meet MOE requirements.

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Appendix B
List of Agency Cooperators - Maryland Nonpoint Source Program (1)

State Lead Agency	Maryland Department of Environment Science Services Administration 1800 Washington Blvd., Baltimore MD 21230 410-537-3902	Jim George - Director, Water Quality Protection and Restoration Program Ken Shanks - TMDL Implementation Division Eric Ruby - § 319(h) Grant Manager §319(h) Staff – Susan Douglas Projects – James Forrest, Jen Jaber, Robin Pellicano, Sekhoane Rathhebe, Gregorio Sandi, Ian Spotts
State Other Agencies	(Maryland) Chesapeake Bay Trust 60 West Street, Suite 45, Annapolis MD 21401	Jana Davis, Executive Director
	Maryland Department of Environment 1800 Washington Blvd., Baltimore MD 21230 160 South Water Street, Frostburg MD 21532	Jay Sakai – Director, Water Management Administration Brian Clevenger – Manager, Sediment, Stormwater & Dam Safety Program Jag Khuman – Director, Water Quality Finance Administration Constance Lyons Loucks – Chief, Acid Mine Drainage Section, Land Mgmt
	Maryland Dept. of Natural Resources 580 Taylor Avenue, Annapolis MD 21401	Matt Fleming – Director, Watershed Services Kevin Smith – Ecosystem Restoration Services Daniel Boward, Chief, Data Management and Administration Program
	Maryland Department of Agriculture 50 Harry S. Truman Parkway, Annapolis MD 21401	John Rhoderick- Office of Resource Conservation Projects – Janet Crutchley
	Maryland Department Of Planning 301 W. Preston Street Suite 1101, Baltimore MD 21201	Joe Tassone- Landuse Planning and Analysis
Federal	US Environmental Protection Agency Region III Nonpoint Source Program Water Protection Division, Mail Code 3WP10 1650 Arch Street, Philadelphia PA 19103-2029	Fred Suffian, Team Leader David Greaves, Maryland Project Officer
	US Department of Agriculture Natural Resources Conservation Service (Maryland Office) 339 Busch's Frontage Road, Suite 301 Annapolis MD 21401-5543	Jon F. Hall, Maryland State Conservationist Thomas Morgart, Asst. State Conservationist for Programs (incl. NWQI)

US EPA ARCHIVE DOCUMENT

Appendix B
List of Agency Cooperators - Maryland Nonpoint Source Program (1)

Local Other Agencies & Contributors (2)	Allegany County	WIP team lead: Angela R. Patterson, Land Use & Planning
	Anne Arundel County	WIP team lead: Ron Bowen, Director Public Works
	Baltimore City	Plan Contact: Kimberly Burgess, Director, Public Works, Surface Water Division
	Baltimore County	Project contact: Robert Ryan, Manager Capital Programs and Operations Plan/WIP team lead: Steve Stewart, Watershed Management and Monitoring
	Calvert County	WIP team lead: David Brownlee, Dept. of Planning
	Caroline County *	Plan/Project/WIP team lead: Kathleen Freeman, Director Planning & Codes Admin. Project contact: Debbie Herr Cornwell*, Assistant Director for Planning
	Carroll County	WIP team lead: Brenda Dinne, Planning Department
	Centerville, Town of	Project contact: Eva Kerchner, Watershed Manager
	Charles County	WIP team lead: Steven Ball, Director Planning and Zoning
	Dorchester County	WIP team leader: Michael Moulds, County Engineer
	Frederick County	WIP team lead: Shannon Moore, Manager and WIP contact, Public Works Project contacts: Jessica Seipp, Heather Montgomery
	Garrett County	WIP team leader: John E. Nelson, Director Zoning & Licensing Division
	Harford County	Plan/Project contacts: Christine Buckley, Betsy Collins, Public Works WIP team lead: Pat Pudelkewicz, Planning & Zoning
	Howard County	WIP team leads: Evelyn Tomlin, Environmental Services; Howard Saltzman, Public Works
	Kent County	WIP team lead: Wayne L. Morris, Director Public Works
	Kent Soil Conservation District	Project contact: Karen Miller, District Conservationist
	Montgomery County	WIP team lead: Steve Shofar, Dept. of Environmental Protection
	Prince George's County	Sam Moki, Dept. of Environmental Resources

US EPA ARCHIVE DOCUMENT

	Queen Anne's County	Project contacts: John Scarboro and Lee Edgar, Public Works WIP team lead: Steve Cohoon, Planning and Zoning
	Queen Anne's Soil Conservation District	via MDA
	Sassafras River Association	Plan/Project contact: Pamela Duke, Executive Director
	Somerset County	Gary Pusey, Director Technical and Community Services
	St. Mary's County	WIP team lead: Sue Veith, Land Use and Growth Management
	Talbot County	WIP team lead: Sandy Coyman, Director of Planning
	Washington County	Project Contact: Scott Hobbs, Chief Engineering and Construction, Public Works WIP team lead: Julie Pippel, Dept. of Water Quality
	Washington Soil Conservation District	Plan/Project contact: Elmer Weibley, District Manager
	Wicomico County	WIP team lead: Keith Hall, Transportation and Long Range Planning

(1) Cooperators list is limited to contact persons for
   a. 319(h) Grant Projects that were active any time between January 1, 2012 and December 31, 2012.
   b. WIP team lead: County lead contacts for the Chesapeake Bay Watershed Implementation Plan in 2012.

(2) Local includes all forms of local government.

* Agency or group that make a significant contribution to the Annual Report.

Appendix C
2011 BMP Implementation Progress In Maryland

From MDE's Analyzing and Tracking Nonpoint Source Data Project, FFY12 319(h) Grant
Robin Pellicano, January 2013

Type of Practice	Statewide Total	Nitrogen Reduction Approx. (lb/yr)	Phosphorus Reduction Approx. (lb/yr)
Animal Composters on Ag Lands	31	282	7
Animal Waste Management Systems-Livestock	1,408	1,694,950	191,920
Animal Waste Management Systems-Poultry	1,278	287,178	32,517
Cover Crops	384,671	694,050	31,718
Dry Detention Ponds and Hydro Structures	48,554	17,729	2,194
Dry Extended Detention Ponds	26,157	57,307	5,911
Filtering Practices	15,859	46,326	4,300
Forest Conservation	98,667	0	0
Forest Harvesting Practices	22,876	15,659	204
Grassed Buffers	48,327	473,092	55,982
Heavy Use Poultry Pads	288	0	0
Infiltration Practices	14,583	53,249	4,614
Nutrient Management Plan Implementation	1,053,603	1,199,314	211,238
Retirement Of Highly Erodible Lands	21,165	100,061	1,050
Riparian Forest Buffers on Ag Lands	21,374	248,168	30,474
Riparian Forest Buffers on Urban Lands	545	642	1,863
Runoff Control	1,157	845	52
Septic Connections to Sewers	828	6,047	0
Septic Denirification	3,779	17,386	0
Soil Conservation Water Quality Plans	791,859	901,371	158,761
Stream Protection w/Fencing	543	7,419	726
Stream Protection w/o Fencing	46,463	317,330	31,051
Stream Restoration	178,669	8,135	14
Tree Planting on Agricultural Lands	19,638	228,014	27,999
Water Control Structures	827	6,210	0
Wet Ponds	54,415	119,214	12,296
Wetland Restoration on Ag Lands	8,614	100,012	12,281

1. For each type of practice in the table, data represents cumulative totals through June 2011 using CBP Model Phase 5.3.2.

2. Nutrient load reduction estimates for each type of practice represent the affect of each BMP acting independently. The nutrient reduction estimates do not account for the potential aggregate affect of multiple BMPs interacting together. For example, an agricultural field may have both cover crops and grassed buffers.

3. These values do not constitute all BMPs implemented. Some BMP reductions are not able to be easily calculated.

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Appendix D
319 Projects Active/Completed in 2012

Contents

- Active Projects In Calendar Year 2012 Using Federal 319(h) Grant Funds
- Implementation Projects Using Federal 319(h) Grant Funds Completed In Calendar Year 2012

Addition Information

The US Environmental Protection Agency maintains a nationwide database on the Internet that includes information on projects funded by the 319(h) Grant. Additional project information is available: http://iaspub.epa.gov/pls/grts/f?p=110:199:618139948454479
On the home page, select "Find Projects". Then, select "Maryland", grant year, project #.

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Active Projects In Calendar Year 2012 Using Federal 319(h) Grant Funds					
Map Area	**Watershed Name (Md 8-Digit #)**	**TMDL or WQA**	**Impairment ***	**Project Name (Lead Agency, Grant Year)**	**Status**
2	Anacostia River 02140205	Bacteria, PCBs, Sediment, Nutrients, Trash	Bioassessment, biological oxygen demand, fecal coliform, heptachlor epoxide, mercury in fish tissue, nitrogen, PCBs, phosphorus, total suspended solids, trash	Green Streets – Green Jobs Partnership (Chesapeake Bay Trust FFY10 #12)	Project start 2010 Completion 2012
3	Antietam Creek 02140502	Bacteria, BOD, Sediment	Bioassessment, biological oxygen demand, fecal coliform, mercury in fish tissue, nitrogen, PCB in fish tissue, phosphorus, total suspended solids	Watershed Plan (Washington SCD FFY08 #20)	Project start July 2010 Completed 2012
				Little Antietam Cr at Greensburg Road Stream Bank Restoration (Washington County FFY12 #11)	Project start anticipated 2013 Anticipate completion 2015
4	Back River 02130901	Bacteria, Chlordane, Nutrients, PCBs, Zinc	Bioassessment, chlordane, fecal coliform, mercury in fish tissue, nitrogen, phosphorus PCB in fish tissue, total suspended solids, zinc	Stormwater Conversions (Baltimore Co. FFY08 #21)	Project start 2011 Completed 2012
				Bread and Cheese Creek Restoration (Baltimore Co. FFY10 #11)	Project start 2011 Anticipate completion 2013
				Herring Run at Overlook Park Stream Restoration and Buffer Planting (Baltimore Co. FFY11 #7)	Project start April 2012 Anticipate completion 2014
				Scotts Level McDonogh Road Watershed Restoration Project (Baltimore Co. FFY12 #5)	Project start anticipated 2013 Anticipate completion 2015
5	Casselman River (Youghioghy River trib.) 05020204	pH, WQA Nutrients	Chlorides, Low pH, mercury in fish tissue, nitrogen, phosphorus	Acid Mine Drainage Remediation Implementation (MDE FFY09 #6)	Project start July 2008 Anticipate completion 2014
6	Corsica River (Chester River tributary) 02130507	Bacteria, PCBs, Nutrients	Estuarine bioassessment, fecal coliform, nitrogen, phosphorus, PCB in fish tissue, total suspended solids	Centreville Corsica River Watershed Restoration Project (Centreville FFY09 #1)	Project start April 2006 Completed 2012
				Agricultural Technical Assistance (MDA / Queen Anne's SCD FFY11 #10, FFY12 #9)	Multi Year/Grant Project
				Watershed Restoration Project (Centreville FFY11 #8)	Project start 2012 Anticipate completion 2013

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Active Projects In Calendar Year 2012 Using Federal 319(h) Grant Funds

Map Area	Watershed Name (Md 8-Digit #)	TMDL or WQA	Impairment *	Project Name (Lead Agency, Grant Year)	Status
				Monitoring Urban Stormwater and On-Site Domestic Systems (MDE FFY11 #2)	FFY11 #2 started 7/1/2011 FFY11 #2 ended 9/30/2012 Work continues in FFY12 #4
				Corsica River Watershed Restoration (Centreville FFY12 #7)	Project start anticipated 2013 Anticipate completion 2014
8	Lower Monocacy River 02140302	Bacteria, Sediments	Bioassessment, fecal coliforms, PCB in fish tissue, phosphorus, sedimentation, total suspended solids	Bennett Creek Watershed Urban BMP Demonstration Project (Frederick County, FFY08 #4)	Project start July 2008 Completed 2012
				Green Infrastructure Project (Frederick County, FFY10 #9)	Project start 2010 Anticipate completion 2013
9	Sassafras River 02130610	Phosphorus, PCB	Bioassessment, enterococcus, PCB in fish tissue, phosphorus, total suspended solids	Galena Elementary School SWM Retrofit (Kent Soil Conservation District FFY12 #8)	Project start anticipated 2013 Anticipate completion 2014
	Statewide	N/A	N/A	Grant Administration (MDE FFY11 #3, FFY12 #2)	Multi Year/Grant Project
				Md Bioassessment Stream Survey (DNR, monitoring FFY10 #8, FFY11 #9)	Multi Year/Grant Project
				Nonpoint Source Program (MDE FFY11 #4, FFY09 #13, FFY12 #3)	Multi Year/Grant Project
				Targeted Watershed (MDE monitoring/analysis FFY11 #5, FFY12 #4)	Multi Year/Grant Project
				Analysis and Local Technical Assistance (MDE FFY11 #1, FFY12 #1)	Multi Year/Grant Project
				Urban Stormwater Management Implementation Tracking (MDE FFY11 #6)	FFY11 #6 started 7/1/2011 FFY11 #6 ended 6/30/2012 Work continues in FFY12 #1
				Water Quality Protection Pilot (MDE FFY10 #13)	Project start 2011 Anticipate completion 2012
10	Upper Choptank River 02130404	None	Bioassessment, fecal colifoms, nitrogen, phosphorus, PCB in fish tissue, total suspended solids	Caroline County Dept. of Public Works SWM Retrofit Project (Caroline County FFY10 #7)	Project start 2011 Completed 2012
				Upper Choptank Watershed Restoration (Caroline County FFY12 #6)	Project start anticipated 2013 Anticipate completion 2015

* The 2012 Integrated Report of Surface Water Quality in Maryland, in accordance with Clean Water Act Sections 303(d), 305(b) and 314.

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Implementation Projects Using Federal 319(h) Grant Funds Completed In Calendar Year 2012

Map Area	Watershed Name (Md 8-Digit #)	Project Name (Lead Agency)	Funding* (rounded to nearest dollar)		Accomplishments
			Federal $ Grant Year	Match $	
4	Back River 02130901	Stormwater Conversions Baltimore County	$95,884 FFY08 #21	$63,923	The goal for the project was to design/construct conversions of five existing stormwater management facilities that would reduce NPS nutrient and sediment impacts. Four of the five conversions were implemented: 1- Pond #553 (Grimsdale-Lloyd property) was converted from dry-detention to a shallow marsh facility. Pollution load reductions are: 10.8 lbs/yr total nitrogen, 2.0 lbs/yr total phosphorus and 611 lbs/yr sediment. 2- Pond #305 (Baltimore Street Bypss) was converted from dry-detention to a shallow marsh facility. Pollution load reductions are: 11.2 lbs/yr total nitrogen, 3.6 lbs/yr total phosphorus and 1,451 lbs/yr sediment. 3- Pond #932 (Van Dyke Manor) was converted from dry-detention to a shallow marsh facility. Pollution load reductions are: 14.9 lbs/year total nitrogen, 2.7 lbs/yr total phosphorus and 1,023 pbs/yr sediment. 4- Pond #1829 (Rolling Crest) was converted from dry-detention to a shallow marsh facility. Pollution load reductions are: 14.8 lbs/yr total nitrogen, 3.2 lbs/yr total phosphorus and 1,034 lbs/yr sediment. 5- The fifth site could not be constructed because the property owner did not convey property rights and/or right-of-entry. Overall, the project was completed using only $95,884 of the $422,373 319(h) Grant funds allocated for the project.

US EPA ARCHIVE DOCUMENT

Implementation Projects Using Federal 319(h) Grant Funds Completed In Calendar Year 2012

Map Area	Watershed Name (Md 8-Digit #)	Project Name (Lead Agency)	Funding* (rounded to nearest dollar)		Accomplishments
			Federal $ Grant Year	Match $	
6	Corsica River (Chester River tributary) 02130507	Centreville Corsica River Watershed Restoration Project Centreville	$270,428 FFY09 #1	$180,285	Project results included: 1) Watershed manager was partially grant-funded. 2) Town ordinance adopted to reduce parking (imperviousness) requirements. 3) Conducted public outreach/education including Corsica Awareness Day, rain barrel workshops, green business program, maintained web site. 4) Implemented two new BMPs: one bioretention (DPW yard) and regenerative stormwater conveyance (RSC adjacent to WWTP site) for a total pollutant load reduction of: -- Nitrogen: 5.33 pounds per year -- Phosphorus: 1.05 pounds per year -- Sediment: 0.29 tons per year
		Agricultural Technical Assistance Md Dept of Agriculture with the Queen Anne's SCD	$66,701 FFY11 #10	$44,467	Project results for the period July 2011 through June 2012 included: 1) Soil Conservation Planner position was fully grant-funded, who promoted: cover crops; soil conservation planning; CREP; best management practices and conducted BMPs assessments. 2) Identified farmettes for manure management, conducted outreach, and relocated/transport excess manure. 3) Identified farmettes for nutrient management plan funding. 4) Continued small scale composting demonstrations. 5) Implemented numerous BMPs with technical assistance from this project: -- Cover crops: 5,525 acres -- Fencing (animals out of streams/buffers): 7,245 feet -- Heavy use area protection: 0.18 acres -- Manure transfer (out of watershed): 116.2 tons -- Outreach and education: 117 units (contacts reported) -- Riparian herbaceous cover: 36 acres -- Roof runoff management: 1 unit -- Wetland restoration: 3.5 acres Total pollutant load reduction reported in final report: -- Nitrogen: 45,702.89 pounds per year -- Phosphorus: 641.29 pounds per year -- Sediment: 492 tons per year

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Implementation Projects Using Federal 319(h) Grant Funds Completed In Calendar Year 2012

Map Area	Watershed Name (Md 8-Digit #)	Project Name (Lead Agency)	Funding* (rounded to nearest dollar)		Accomplishments
			Federal $ Grant Year	Match $	
8	Lower Monocacy River 02140302	Bennett Creek Watershed Urban BMP Demonstration Project Frederick County	$228,361 FFY08 #4	$152,241	Projects results included: 1) Identified potential restoration sites in Bennett Creek watershed. Participated in public outreach events and meetings of the Monocacy & Catoctin Watershed Alliance. 2) Conducted Years 3-4 of the Urban Wetlands Program including biological integrity assessment and identified sites for wetland creation/restoration. 3) Implementation completed thru this project: - Tree plantings -- Kemptown Elementary School – 0.25 acres -- Urbana Community Park – 2.2 acres -- Urbana Elementary School - 1.5 acres -- Windsor Knolls Middle School – 6 acres and 2.5 acres -- Worthington Manor Golf Course – 4.8 acres - Rain gardens / bioretention sites -- Bar-T Mountainside – 2 acres and 0.5 acres treated -- Green Valley Elementary School – 0.12 acres treated -- Kemptown Park – 0.42 acres -- Urbana Elementary School bioswale – 6 acres -- Urbana High School LID retrofit – 2.83 acres - Warm Season grass meadow -- Worthington Manor Golf Course – 16.5 acres Total pollutant load reduction reported in final report: -- Nitrogen: 149.9 pounds per year -- Phosphorus: 31.4 pounds per year -- Sediment: 2.782 tons per year

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Implementation Projects Using Federal 319(h) Grant Funds Completed In Calendar Year 2012

Map Area	Watershed Name (Md 8-Digit #)	Project Name (Lead Agency)	Funding* (rounded to nearest dollar)		Accomplishments
			Federal $ Grant Year	Match $	
10	Upper Choptank River 02130404	Caroline County Dept. of Public Works SWM Retrofit Project Caroline County	$46,213 FFY10 #7	$30,809	The project's objective was to implement one project to reduce NPS from the County's Public Works parking lot. Project results included completion of two BMPs: The primary project objective was met by planning, design and construction by County personnel who implemented a bio-retention rain garden. This BMP intercepts runoff from the County Dept. of Public Works (DPW) parking lot before it reaches the local stream, which was piped underneath the center of the DPW facility many years ago. In addition County personnel also planned, designed and constructed a pocket wetland on the DPW facility property that intercepts runoff from a different part of the DPW property and from the adjacent State Highway Administration property before it reaches the same stream. Both BMPs provided County personnel with experience needed to apply their enhanced skills to implement additional BMPs. Also, because both BMPs are on County property, they can be used to demonstrate these two types of BMPs for public education purposes. Together, these two BMPs were accomplished using the grant/match funding that was originally allocated for the project. The County's planning also identified a third opportunity on the DPW facility property for installing another NPS BMP, which remains available for future implementation.

* Federal $: Project expenditures reimbursed by Federal grant. Match $: Project expenditures covered by non-Federal fund sources as required by the 319(h) Grant. Some projects may also have included funding sources in addition to the Federal grant and match, which is not reported here.

Appendix E

General Approach and Schedule to Implement Applicable Management Measures

From the *Maryland Nonpoint Source Management Plan*, December 1999

Page 1 0f 2

Category / Priority		Implementation Timeline (Years)		
		1998-2002	2003-2007	2009-2012
Agriculture	Statewide	Farmers using commercial fertilizers must have n & P based plans by 2002	Soil Conservation Water Quality Plans (SCWQP) on 50% of all farms by 2003	
		Farmers using animal manure or sludge must have n & P based plans by 2002	SCWQP implemented on 25% of all farms by 2003	
			Farmers using animal manure or sludge must have N&P based plans by July 1, 2004	
	Watershed Focus	Tributary Strategies	Agricultural Priority Watersheds**	
		Agricultural Priority Watersheds**		
Forestry	Statewide	Riparian Forest Buffer (RFB) goal of 43 mi/yr	RFB goal of 43 mi/yr	600 miles of RFB created by 2010
	Watershed Focus	Coastal Bays		
		Special Streams Project		
		Monocacy		
		Anacostia		
		Susquehanna		
		Town Creek		
		Rock & Carroll Creek		
Urban runoff: developing and developed areas	Statewide			
	Watershed Focus	Washington - Baltimore Metro Area, Roland Run, Redhouse Run, Severn River SWM plan		
		Anacostia Watershed		

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Appendix E

General Approach and Schedule to Implement Applicable Management Measures

From the *Maryland Nonpoint Source Management Plan*, December 1999

Page 2 0f 2

Category / Priority		Implementation Timeline (Years)		
		1998-2002	2003-2007	2009-2012
Marinas and Recreational Boating	Statewide	96 Certified Clean Marinas by 2002	125 Certified Clean Marinas by 2004	270 Certified Clean Marinas by 2010
				Marine Sewage Pumpout Program goal of 460 facilities by 2010
	Watershed Focus	Chesapeake Bay		
		Coastal Bays		
		Deep Creek Lake		
Channelization and Channel Modification, dams, and shoreline erosion	Statewide			
	Watershed Focus	Chesapeake Bay Shoreline		
		CWAP Priority Watersheds		
		Anacostia Northwest Branch		
		Anacostia Town Park Stream		
Wetlands	Statewide	3000 acres by 2002	10,500 acres by 2007	15,000 acres by 2010
	Watershed Focus	CWAP Priority Watersheds		
		Coastal Bays		

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Appendix F – Success Story

Cherry Creek
Acid Mine Drainage Mitigation
Cuts Pollutant Loads

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Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Maryland

Treating Acid Mine Drainage Improves Cherry Creek

Waterbody Improved

Abandoned coal mines contributed high levels of acidity and metals to Maryland's Cherry Creek, which flows into Deep Creek Lake. As a result, the Maryland Department of the Environment (MDE) added the Deep Creek Lake watershed, including Cherry Creek, to the state's 1996 Clean Water Act (CWA) section 303(d) list of impaired waters for pH. Acid mine drainage (AMD) mitigation projects were implemented in Cherry Creek, which now consistently meets the total maximum daily load (TMDL) goal for pH. In addition, acidity, iron and aluminum levels have declined.

Problem

Western Maryland's Cherry Creek begins near Savage River State Forest, flows about eight miles through a 7900-acre watershed, and empties into Deep Creek Lake (Figure 1). Outflow from the lake enters the Youghiogheny River, which is in the Ohio River Basin. The Cherry Creek watershed is composed of 69 percent woodlands and 12 percent wetlands; the remainder is mixed agriculture and developed lands. Deep Creek Lake is a manmade recreational impoundment that is popular for fishing and boating.

The name Cherry Creek can be traced to the waterbody's deep reddish color, which was historically caused by bog tannins from sphagnum wetlands. These wetland complexes include coniferous forest and marshes, and they contribute natural organic acidity to the stream.

In the 1920s Cherry Creek was a natural trout stream and the site of a trout-rearing station. During the next several decades, AMD associated with coal mining increased. In 1957 a large fish kill caused by low pH brought an end to trout stocking in Cherry Creek. A 1973 study reported that almost the entire main stem of Cherry Creek was severely or moderately polluted by AMD. That study also estimated that one-fourth of the acid load in the stream is derived from mines; the rest is from natural sources. In the 1980s it was estimated that Cherry Creek was the source of half the acidity entering Deep Creek Lake.

Before project implementation, AMD generally caused the in-stream pH to fall to between 4.0 and 4.3,with a pH as low as 3.2 during periods of low flow. To address this impairment, the TMDL approved for Cherry Creek calls for a pH of 4.6 or higher. That level takes into account the naturally low pH arising from the sphagnum wetlands that characterize Cherry Creek.

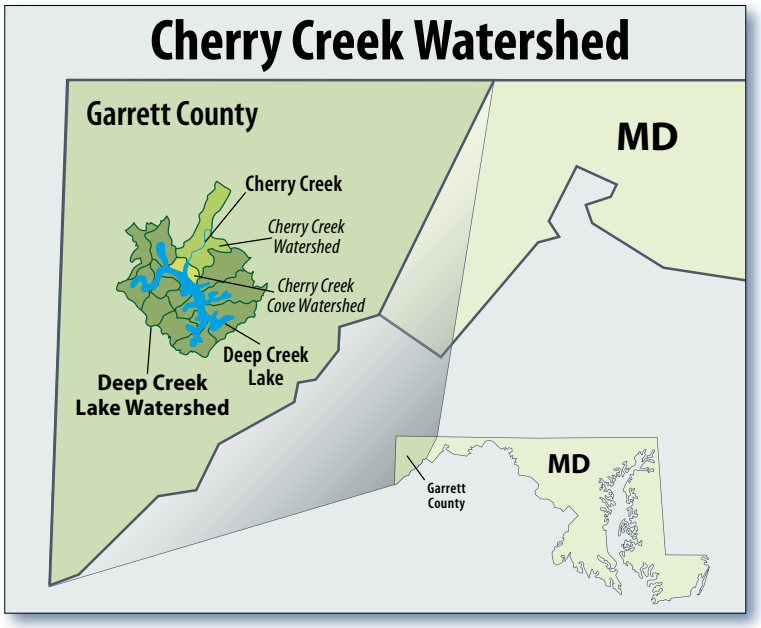

Figure 1. The Cherry Creek watershed is in western Maryland.

Project Highlights

Between 1986 and 1989, MDE created a series of treatment wetlands to help reduce AMD impacts in the Cherry Creek watershed. The Department constructed additional AMD treatment systems between 1998 and 2001, including successive acid treatment systems and more treatment wetlands. Several commercial AMD treatment systems were also introduced, including an Aluminator® (a successive

Figure 2 . Partners installed a successive alkalinity-producing system at the Everhart project site.

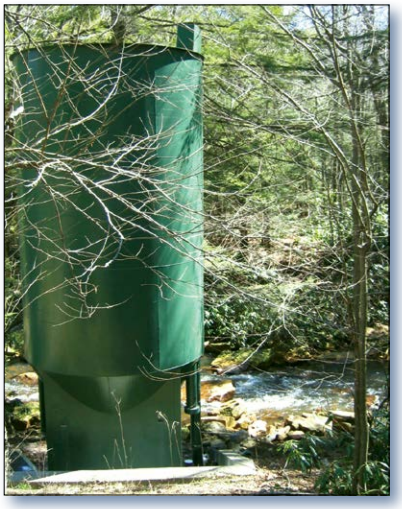

Figure 3 . Partners installed a limestone doser adjacent to Cherry Creek.

alkalinity-producing system that includes a treatment cell designed to precipitate aluminum while keeping iron in a soluble form), a Pyrolusite® cell (bioremediation using limestone and bacteria to remove metals), and a Boxholm® doser (a system that introduces lime to the water at a given rate). (See Figures 2 and 3.) The Cherry Creek mitigation effort used approximately 6,760 tons of limestone, not including the lime used for the doser.

Results

In-stream sampling conducted after AMD implementation (2003–present) shows that pH is generally greater than 6.0 and is always greater than 5.2, meeting the TMDL goal (a pH of 4.6 or greater). Data also show that individual AMD treatment sites have significantly reduced concentrations of pollutants while also increasing alkalinity (Table 1).

Fish surveys show that fish populations have increased. In 1971 only three species of lake fishes were found in Cherry Creek, and they were found only near the confluence of the creek with Deep Creek Lake. In 2004, after implementation of AMD mitigation, a survey found seven fish species in the stream. The survey report stated that rainbow trout, brown trout and smallmouth bass were common enough to support some recreational fishing and that the range of several fish species extended from the stream mouth upstream about 1.5 miles to the vicinity of the lime doser. According to the 2004 survey report, fish have not progressed farther upstream because of a complete blockage by an old mill dam and inflow from a small unnamed tributary, which might be contributing additional AMD. A 2012 analysis of all benthic macroinvertebrate data for Cherry Creek found that the Benthic Index of Biological Integrity might have improved, but the stream's condition continues to be classified as poor overall. The sources of this continuing biological impairment are believed to include AMD.

Partners and Funding

MDE's Abandoned Mine Lands Division was the primary implementer of the Cherry Creek AMD mitigation projects. The total capital cost for the restoration project was $496,000 over 15 years; funds were provided by the State of Maryland; the U.S. Department of the Interior, Office of Surface Mining; and the U.S. Environmental Protection Agency. In addition, the private Sprenger Lang Foundation paid for the purchase and construction of the lime doser, which is located on property owned by the Rock Creek Trust. Funds for operation and maintenance of the doser ($30,000 annually) come from the State of Maryland and the U.S. Department of the Interior. Other partners that help manage and monitor Cherry Creek include the Maryland Department of Natural Resources' Fisheries Service and the University of Maryland's Appalachian Lab.

Table 1. Monitoring Data for Cherry Creek Project Sites, Before and After Installation of AMD Treatment (Average)

Project Site	pH [a]		Acidity [b]		Alkalinty [b]		Iron [b]		Aluminum [b]	
	Before	After	Before	After	Before	After	Before	After	Before	After
Everhart site	3.5	6.1	300	21	0.0	23	65	1.5	4.9	0.1
Glotfelty site	5.3–5.9	6.9	372	0.0	N/A [c]	N/A [c]	111–147	0.83	1.5–3.5	0.1
Teets site	3.1	7.1	486	0.0	0.0	106	73	1.2	37	0.1

[a] In standard units. [b] In milligrams per liter (mg/L). [c] Not available.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA #
December 2012

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