SFY 2020

Maryland's 319 Nonpoint Source Program Annual Report

Sunset on Spa Creek | Image courtesy of Michael Miles

Maryland
Department of
the Environment

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Acknowledgements

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Overview: Maryland's Clean Water Act Section 319 Nonpoint Source Management

Maryland's Nonpoint Source Management Program is required by the Federal Clean Water Act, Section 319, to protect the State's waterways from nonpoint source (NPS) pollution. Maryland has aligned this program with its commitments and responsibilities in the Chesapeake Bay Agreement[1], the Chesapeake Bay Total Maximum Daily Load (TMDL)[2], and Maryland's Phase III Chesapeake Bay Watershed Implementation Plan (WIP)[3]. This annual FY20 report covers the period of Chesapeake Bay model implementation from July 1, 2018, through June 30, 2019, and 319 project implementation from July 1, 2019 through June 30, 2020.[4]

Project Selection

To receive 319(h) Grant funding, applicants must be within a 319 Priority Watershed (Figure 1) that has an A-I Watershed Plan approved by the U.S. Environmental Protection Agency (EPA). A-I plans are submitted to EPA by any combination of Maryland State Agencies, local governments, and non-government organizations.

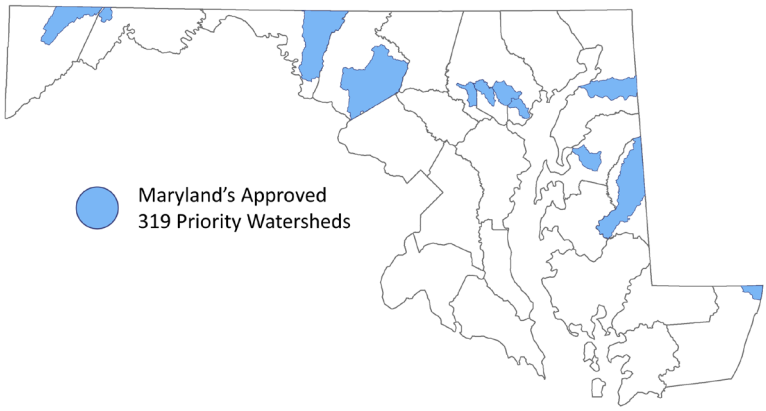


***Figure 1**: Maryland's 319 Priority Watersheds*

Program Administration

Maryland's 319 NPS Management Program, including the 319(h) Grant Program, is administered by Maryland Department of the Environment (MDE) with the assistance of the Maryland Departments of

[1] Chesapeake Bay Agreement: https://www.chesapeakebay.net/what/what_guides_us/watershed_agreement
[2] Chesapeake Bay TMDL: https://www.epa.gov/chesapeake-bay-tmdl/chesapeake-bay-tmdl-document
[3] MD P3 WIP: https://mde.maryland.gov/programs/Water/TMDL/TMDLImplementation/Pages/Phase3WIP.aspx
[4] Model results always lag a year behind the current FY reporting due to CBPO processes. MDE is looking to change this reporting method for FY21 to make data more current

Agriculture and Natural Resources; implementation is carried out by Maryland's local governments, Soil Conservation Districts, and local organizations. MDE coordinates with local partners to provide grant funding for in-ground projects and report annual progress to EPA.

Annual Reporting for Maryland's 319 Program

EPA requires MDE to produce annual reports demonstrating progress of Maryland's 319 NPS Management Program that show how the State meets 319(h) Grant conditions while maintaining consistency with EPAs three essential elements:

1. EPA Strategic Plan Goal 1: *Deliver real results to provide Americans with clean air, land, and water, and ensure chemical safety.*
2. EPA Strategic Plan Objective 2: *Rebalance the power between Washington and the states to create tangible environmental results for the American people*
3. EPA Strategic Plan Objective 3: *Administer the law as Congress intended, to refocus the Agency on its statutory obligations under the law.*

Nonpoint Source Pollution Threatens Maryland's Waterways

Water is inextricably tied to Maryland's national identity and culture. The State is traversed by innumerable rivers and streams that provide residents with drinking water, places for recreation, and critically important habitat for Maryland's abundant wildlife. The Chesapeake Bay supports a vibrant fishing industry that is valued at nearly $600 million per year and provides over one third of the annual United States blue crab harvest. The primary nonpoint source pollutants that threaten this resource are Nitrogen and Phosphorus.

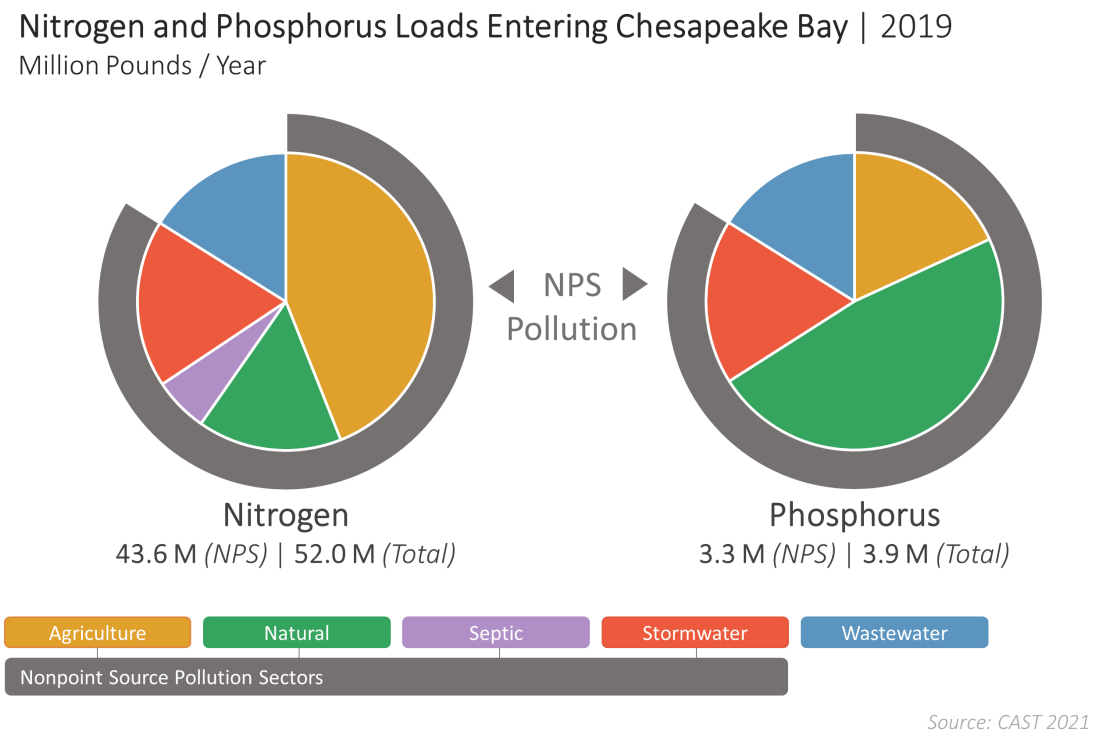


Figure 2: *Maryland's nitrogen and phosphorus loads delivered to Chesapeake Bay in 2019*

NPS pollution threatens the health of Maryland's waterways and comes from both agricultural and developed areas (Figure 2). Natural loads include anthropogenic impacts within the natural system, like erosion flows from stormwater runoff that can scour stream banks, as well as true natural sources of nitrogen and phosphorus, such as forests, and wetlands. While the NPS pollution focus in Maryland's waters include nitrogen, phosphorus, and sediment, State watersheds are also impaired by other NPS pollution, such as acid mine drainage and toxic contaminates.

NPS pollution is costly to manage because it originates from diffuse sources across wide areas. The high cost and difficulty of managing this pollution is challenging for local governments that must balance local needs with protecting and restoring aquatic resources.

Reducing NPS pollution is accomplished through implementing best management practices (BMPs). This generic name for pollution reduction practices covers a collection of actions, policies, and physical structures that are used to reduce pollution entering waterways[4]. Funding for BMPs comes from local, state, federal, and NGO funding sources, including the 319(h) Grant.

[4] Examples of BMPs – Maryland's Chesapeake Cleanup Center: https://mde.maryland.gov/programs/Water/TMDL/TMDLImplementation/Pages/pollution-in-the-chesapeake.aspx

Overall Progress: Maryland's 319 NPS Management Program | SFY 2020

Reporting Updates for SFY 2020

319 Project Funding:
Two watersheds received 319(h) Project Grant funding in SFY 2020: Antietam Creek, and Jones Falls: Lower.

Document Accounting:
MDE simplified BMP accounting by tracking 319 grant funded projects by funding date rather than project completion date. Further, this report now tracks funds allocated to projects rather than project expenditures to more accurately reflect the funds given to a particular watershed for restoration.

Watershed Modeling:
Since the past report, the Chesapeake Bay Program made significant updates to the Chesapeake Assessment Scenario Tool (CAST) model. MDE uses the CAST model to estimate nutrient and sediment reductions in this report. The CAST 2019 update has made significant changes to Maryland's nutrient and sediment loads.

Funding: Federal and State Contributions

Maryland has received about $40.6 million dollars through the 319(h) Grant over the past 17 years [5] with about $10.4 million of those dollars funding in the ground projects (Figure 3, *Page 4*). While the 319(h) Grant is a small part of Maryland's total spending on NPS pollution, it helps local governments leverage limited funds. Helping local governments maximize their potential resources is a core component of Maryland's Chesapeake Bay Phase III WIP, which is designed to be locally driven and achievable. For detailed funding information, see Appendix A.

[5] Maryland's first A-I Plan (*Corsica River)* was approved in 2004.

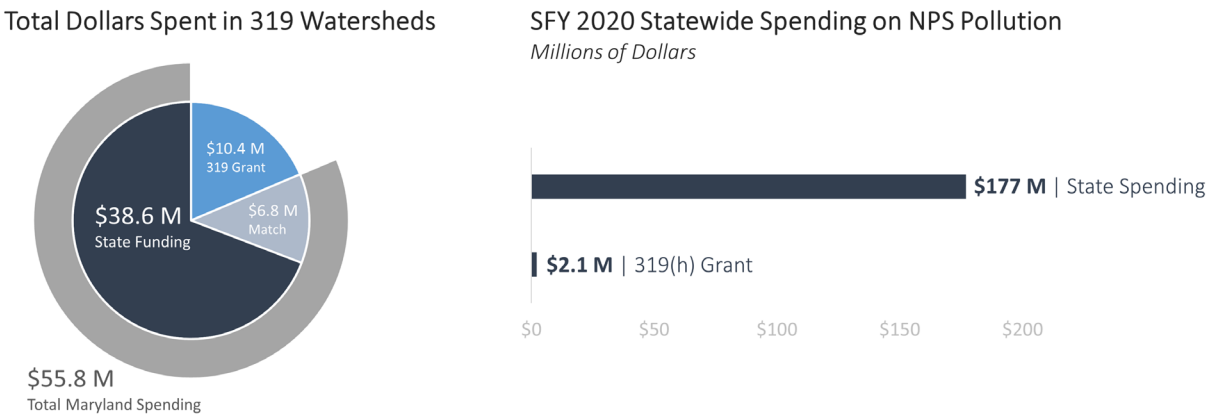


Figure 3: *319(h) Grant spending vs Maryland State spending on NPS pollution*

BMP Load Reductions for Nitrogen, Phosphorus, and Sediment in 319 watersheds

The State's 319 Priority Watersheds continue to make steady progress in reducing nitrogen and phosphorus loads. Table 1 provides a summary of the reductions attributable to nonpoint source BMP implementation by all State programs and greater details about BMP numbers and loads are provided in Appendix B[6]. When evaluating the overall progress for 319 Priority Watersheds, some watersheds are farther along towards their goals while others have just started. For detailed information on individual watershed progress, please see the *Priority Watersheds* section of this report (*page 9*).

Table 1: *Overall 2019 NPS BMP pollution reductions in 319 Priority Watersheds (Million Pounds/Year)*

	Total Reduction	Agriculture	Urban
Nitrogen	1.34M	1.27M	0.07M
Phosphorus	0.28M	0.07M	0.21M
Sediment	97M	84M	13M

Overall Load Reductions for Nitrogen, Phosphorus, and Sediment

Outputs of the CAST 2019 model show that Maryland's statewide combined NPS nitrogen and phosphorus loads reaching local waterways have decreased by 1.2 million pounds per year and 143 thousand pounds per year since 2010, respectively, while sediment increased by about 129 million pounds per year (Figure 4, *Page 5*). Increases in storms and subsequent flow combined with data deficiencies led to an increase in pollutant loads across the board from FY19 report to FY20. In Progress year 2019 (FY20) Nitrogen loads increased by 190,000 lbs, phosphorus increased by 6,378 lbs, and

[6] It is important to recognize that the reductions provided in Table 1 and Appendix B represent estimated BMP reductions only and does not factor in any additional modeling factors.

sediment increased by 21 million lbs throughout the State. More recent progress reports show that this is an anomalous year and not indicative of overall effectiveness of our nonpoint source BMPs.

Maryland tracks nutrient and sediment reductions since 2010 to align with the start of the Chesapeake Bay Restoration Blueprint. Changes in nitrogen, phosphorus, and sediment loads can be attributed to land use changes and the implementation of BMPs, including BMPs funded by the 319(h) Grant.

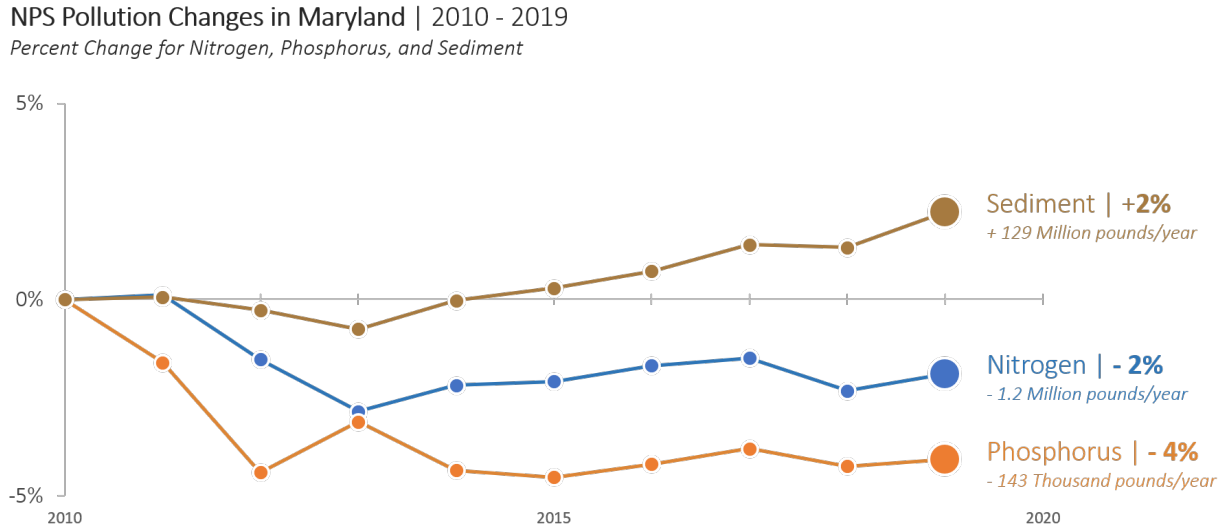


Figure 4: *Maryland's statewide nitrogen, phosphorus, and sediment NPS reductions*

Summary

Maryland's 319 NPS Management Program is a core component of the State's watershed restoration and protection strategy and is designed to align with Maryland's Chesapeake Bay Phase III WIP, the Chesapeake Bay TMDL, and Chesapeake Watershed Agreement. The 319(h) Grant is a small but important portion of Maryland's spending on NPS pollution programs and BMPs. These grant funds are critical in supporting local governments with by giving them additional financial leverage to protect local aquatic resources while also fulfilling the needs of residents.

Reductions in nutrient and sediment NPS pollution are a priority for Maryland, as detailed in the State's NPS Management Plan and Phase III WIP. Maryland has made significant efforts reducing NPS pollution from agricultural despite modeled increases for certain crop types and in urban sources despite growth in the sector. Under Maryland's Phase III WIP and 319 NPS Management Plan, the State will continue reducing NPS pollution to meet its 2025 Chesapeake Bay TMDL targets, protect and restore local waters, and sustain its aquatic resources into the future.

Progress | Maryland's 319 NPS Management Program

How Maryland Tracks Progress for its NPS Management Program

Maryland tracks its NPS Management Plan progress based on the funding allocated to NPS pollution programs, BMP implementation, and NPS pollution reductions. Starting in 2019, the State moved to tracking all nutrient and sediment reductions towards its Chesapeake Bay cleanup targets (Nitrogen trends are in Figure 5) on Maryland's Chesapeake Bay Annual Progress website[7].

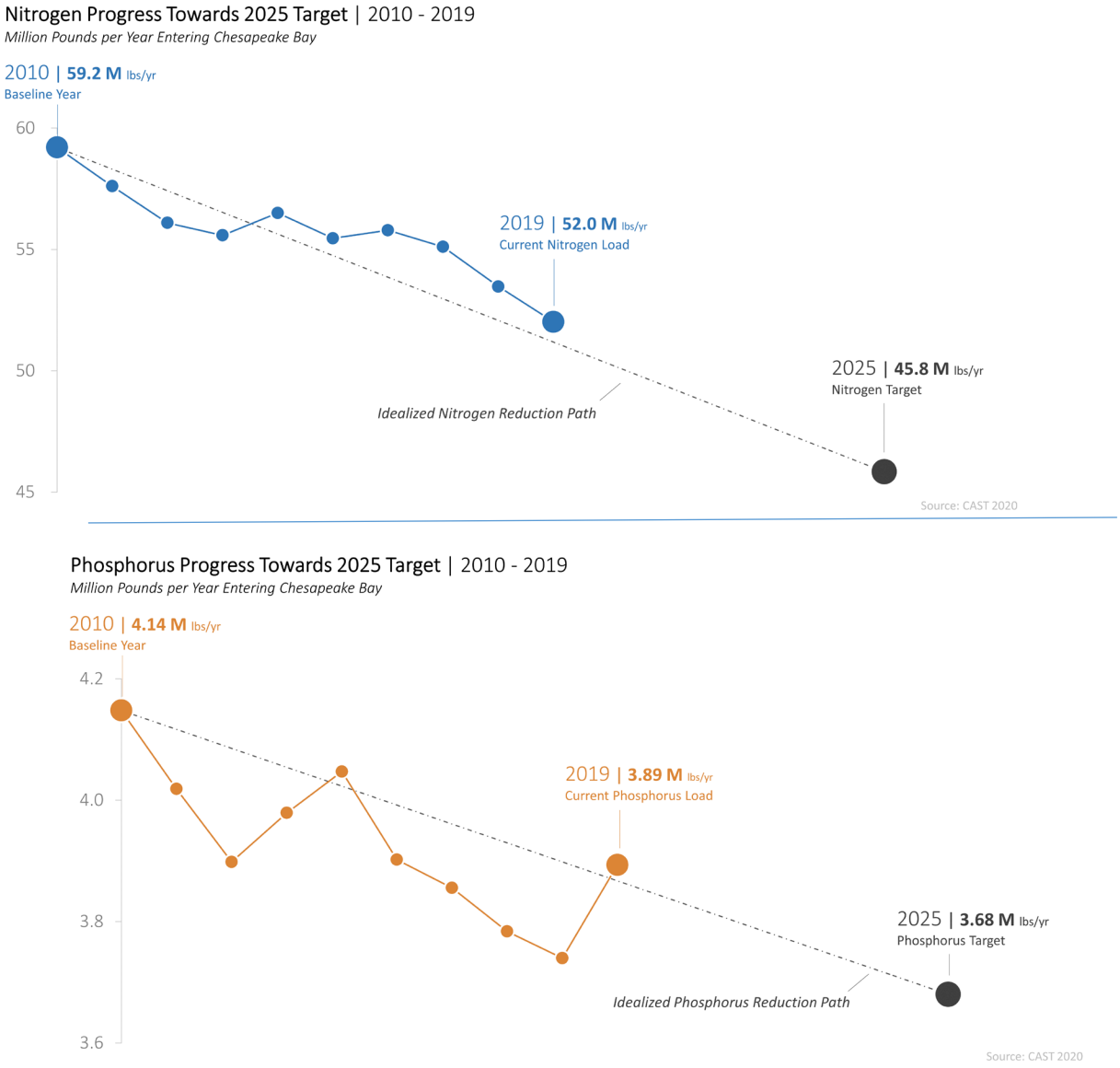


Figure 5: *Maryland's total nitrogen and phosphorus reduction progress towards its 2025 Chesapeake Bay cleanup target*

[7] Maryland's Chesapeake Bay Annual Progress: https://storymaps.arcgis.com/stories/234759335b7249d88442a7bff53a8784

BMP Implementation

Table 2: *Summary of Maryland's 319 Priority Watersheds Nonpoint Source BMPs*

BMP Name	Unit	Total BMPs in Watershed
Agriculture Practices		
Ag Stormwater Management	Acres Treated	-
Alternative Crops	Acres	8.35
Ammonia Emission Reductions (Biofilters)	Animal Units	-
Ammonia Emission Reductions (Lagoon Covers)	Animal Units	-
Ammonia Emission Reductions (Litter Amendments)	Animal Units	16,592.88
Barnyard Runoff Control & Loafing Lot Management	Acres	160.88
Broiler Mortality Freezers	Dry Tons (Carcasses)	-
Capture & Reuse	Acres	-
Cover Crop - Commodity	Acres	52,295.80
Cover Crop - Traditional	Acres	67,554.04
Crop Irrigation Management	Acres	-
Dairy Precision Feeding	Animal Units	-
Denitrifying Ditch Bioreactors	Acres	1,338.51
Forest Buffers	Acres in Buffers	1,253.02
Forest Buffers on Fenced Pasture Corridor	Acres in Buffers	19.21
Grass Buffers	Acres in Buffers	3,158.53
Grass Buffers on Fenced Pasture Corridor	Acres in Buffers	22.70
Horse Pasture Management	Acres	55.06
Land Retirement	Acres	2,238.72
Manure Incorporation	Acres	9,225.36
Manure Transport	Dry Tons	3,343.30
Non Urban Shoreline Management	Feet	-
Non Urban Stream Restoration	Feet	25,483.12
Nutrient Manament - Core Nitrogen	Acres	73,343.52
Nutrient Manament - Core Phosphorus	Acres	73,343.52
Nutrient Manament - Placement Nitrogen	Acres	4,114.37
Nutrient Manament - Rate Nitrogen	Acres	14,808.03
Nutrient Manament - Rate Phosphorus	Acres	5,196.84
Nutrient Manament - Timing Nitrogen	Acres	1,911.08
Pature Alternative Watering	Acres	5,221.58
Placement Phosphorus	Acres	3,090.32
Prescribed Grazing	Acres	2,391.00
Saturated Buffer	Acres	1,338.51
Soil and Water Conservation Plan	Acres	86,880.48

Sorbing Materials in Ag Ditches	Acres	1,338.51
Tillage - Conservation	Acres	62,136.22
Tillage - Continuous High Residue	Acres	81,016.92
Tillage - Low Residue	Acres	42,502.19
Timing Phosphorus	Acres	-
Tree Planting	Acres	181.20
Water Control Structures	Acres	1,338.51
Wetland Creation	Acres	66.01
Wetland Enhancement and Rehabilitation	Acres	-
Wetland Restoration	Acres	285.34
Urban/Suburban Practices		
BioRetention	Acres Treated	75.54
BioSwale	Acres Treated	65.58
Conservation Landscaping Practices	Acres Treated	-
Dry Ponds	Acres Treated	2,072.82
Erosion and Sediment Control	Acres	32.06
Extended Dry Ponds	Acres Treated	8,903.33
Filtering Practices	Acres Treated	361.42
Floating Treatment Wetlands	Acres Treated	-
Grey Infrastructure(IDDE)	Acres Treated	-
Impervious Disconnection	Acres Treated	0.06
Impervious Surface Reduction	Acres	5.77
Infiltration Practices	Acres Treated	534.28
Permeable Pavement	Acres Treated	4.66
Runoff Reduction Performance Standard	Acres Treated	1,250.35
Septic Connections	No. Systems	61.65
Septic Denitrification	No. Systems	570.80
Septic Pumping	No. Systems	-
Storm Drain Cleanout	Lbs of Sediment	-
Storm Water Treatment Performance Standard	Acres Treated	7,084.60
Street Sweeping	Acres	-
Urban Filter Strips	Acres Treated	-
Urban Forest Buffers	Acres in Buffers	72.72
Urban Forest Planting	Acres	1,010.26
Urban Nutrient Management	Acres	56,563.37
Urban Shoreline Management	Feet	14.13
Urban Stream Restoration	Feet	12,623.97
Urban Tree Planting	Acres	104.13
Vegetated Open Channel	Acres Treated	36.64
Wet Ponds & Wetlands	Acres Treated	5,438.97
Resource Practices		
Dirt&Gravel Road E&S	Feet	-
Forest Harvesting Practices	Acres	278.51

Non-Tidal Algal Flow-way	Acres	-
Tidal Algal Flow-way	Acres	-

The State tracks progress towards its Phase III WIP BMP implementation goals for NPS pollution using the Chesapeake Assessment Scenario Tool (CAST), an online version of the Bay model. Using CAST, MDE measures nutrient reductions. Sector specific information can be found on the State's Chesapeake Bay Annual Progress Website.

MDE is the primary State agency for tracking point source and nonpoint source implementation. Urban BMP Implementation is tracked via several methods including municipal separate storm sewer system (MS4) permit reporting and Direct outreach with county/municipal communities. Forestry BMP data comes from our Department of Natural Resources, which maintains its own internal BMP database. Similarly agricultural BMPs come from the Maryland Department of Agriculture's Conservation Tracker database. These practices are assembled and put through a documented QA/QA process before being submitted to EPA for inclusion into the model using the National Environmental Information Exchange Network (NEIEN).

Urban BMPS and certain forestry BMPs are tracked using specific GPS coordinates, others are reported at the county scale. The Chesapeake Bay Program then uses a tool called scenario builder to distribute BMPS inside and outside of the Chesapeake Bay watershed. The BMP scenario is then combined with several other baseline inputs (i.e., animal counts, land use, atmospheric emissions) to come up with projected load reductions associated with all these factors accounted for.

MDE is currently developing an BMP accounting tool which will allow for BMP tracking and associated load reduction assessment in subsequent 319 Annual Reports. This tool is based on CAST calculations for load reductions and will provide more consistent information about BMP progress and load reductions throughout Maryland. In the Casselman River and Upper Jennings Run, restoration efforts to remediate low pH impairment listings are reported by MDE's Abandoned Mines Program in an annual report.

Other Progress Metrics

Other progress metrics, including tracking 319(h) Grant expenditures, is another way in which Maryland tracks NPS pollution reduction progress. You can find detailed information for individual watersheds in the *Priority Watersheds* section of this report (*page 9*). For more detailed information on statewide 319(h) Grant spending, please see Appendix A. For detailed information on individual 319(h) Grant funded projects in Priority Watersheds, see Appendix D.

319 Success Story

Each year, Maryland is required to demonstrate a successful watershed restoration project. This year's success story will be posted, once available, on MDE's 319 website[8].

[8] MDE's 319 Website: https://mde.maryland.gov/programs/water/319nonpointsource/pages/index.aspx

Additional Funding | Maryland's 319 NPS Management Program

In addition to 319(h) Grant funds, Maryland supplies significant State resources to finance programs and projects designed to reduce NPS pollution. In particular, Maryland's Chesapeake and Atlantic Coastal Bays Trust Fund (Trust Fund) is one of the State's primary funding sources for reducing NPS pollution. Maryland's Trust fund provides grant money to local governments and Non-profit Organizations for implementing NPS pollution water quality restoration projects.

Maryland's Trust Fund targets the most efficient and cost-effective nonpoint source projects. To date, the Trust Fund has provided more than $406 million for projects that have resulted in cumulative nitrogen, phosphorus, and sediment reductions of 1.2 million, 189 thousand, and 188 million pounds, respectively between SFY 2013 and SFY 2020. For further information, see the Chesapeake and Atlantic Costal Bays Trust Fund website[9].

National Water Quality Initiative | Maryland's 319 NPS Management Program

The National Water Quality Initiative (NWQI) is run by the U.S. Department of Agriculture - National Resources Conservation Services (USDA - NRCS). The NWQI helps farmers and forest landowners voluntarily improve water quality and aquatic habitat by focusing on watersheds with impaired streams. Maryland currently has two watersheds that are primarily agricultural with NWQI status: Catoctin Creek in Frederick County, and Prettyboy Reservoir in Baltimore and Carroll Counties. Surface waters in Catoctin Creek are impaired by sediments, nutrients, impacts to biological communities, and fecal coliform. Prettyboy Reservoir is impaired by mercury and phosphorus, while the streams draining to Prettyboy reservoir are impaired by fecal coliform and temperature.

Maryland was among the first States in 2012 to create a cooperative monitoring agreement to support the NWQI effort. MDE collaborated with NRCS to conduct in-stream monitoring in the Catoctin Creek watershed from 2013 through 2018. The State performed synoptic monitoring from 2013 through 2015 to determine which watersheds had the highest nutrient loadings. From 2016 through 2018, the State conducted bi-weekly ambient surface water monitoring at 25 stations throughout the watershed to assess the effectiveness of agricultural BMP implementation. Station locations were identified based on the results of the prior synoptic monitoring and where agricultural BMPs were implemented.

During SFY 2019, the bi-weekly sampling continued at the 25 stations throughout the watershed. Sampling concluded in December 2018. Results from the study can be found in Catoctin Creek Water Quality Monitoring Report, NWQI (MDE 2019). Study results indicate that nutrient loadings may have decreased at some stations downstream of implemented BMPs. However, based on a power analyses conducted to determine the minimum number of required samples to detect a change, two more years of data are needed to reach a statistically significant conclusion.

[9] Trust Fund Website: https://dnr.maryland.gov/ccs/Pages/funding/trust-fund.aspx

In the fall of 2020, MDE and NRCS discussed the possibility of establishing a new agreement to perform monitoring in the Prettyboy Reservoir watershed located to the north of Baltimore MD to further assess the effectiveness of agricultural BMP implementation. In January 2021, MDE prepared a map of potential sampling sites for NRCS to evaluate. Due to covid delays, the agencies have continued discussion, however, the specifics have yet to be worked out. MDE is hopeful that a formal cooperative agreement can be developed between NRCS and MDE in the summer 2021.

Maryland's Priority Watersheds | 319 Priority Watersheds

Current Status of Maryland's 319 Priority Watersheds

Maryland tracks progress for 319(h) Grant implementation funding and NPS pollution reductions in its 319 Priority Watersheds (Table 3). As of SFY 2020, twelve watersheds had approved A-I Watershed Plans and were eligible for 319(h) Grant funding. An additional four watersheds are developing A-I plans to be eligible for future funding through the 319(h) Grant Program.

For detailed funding information, see Appendix A. MDE tracks nitrogen, phosphorus, and sediment reductions for all watersheds regardless of the watershed plan specifications; for all NPS pollution tracking and detailed nitrogen, phosphorus, and sediment loads tracking, see Appendix B. For detailed watershed 319(h) Grant funded project load reductions, see Appendix D.

Table 3: *Summary of Maryland's 319 Priority Watersheds*

Priority Watershed	**Plan Start Date**	**Funding** *(Total)* State | 319 | Total	**Reductions** (lbs/yr) TN | TP | TSS
Antietam Creek	2012	$ 1.2M | $ 3.1M | $ 4.2M	-7.1K | -4.7K | -1.8M
Assawoman Bay	2020	$ 56K | $ 0.4 | $ 0.4	0.7K | 0.01K | 25K
Back River-Tidal	2010	$18.8M | $ 1.8M | $20.5M	0.0K | 0.1K | -1.1M
Back River-Upper	2008	$ 0.0M | $ 0.0M | $ 0.0M	0.6K | 0.8K | -0.3M
Casselman River	2011	$ 0.0M | $ 0.1M | $ 0.1M	-13.4K | -0.1K | -7.2M
Choptank-Upper	2010	$ 0.7M | $ 0.8M | $ 1.5M	52.5K | 5.9K | 4.5M
Corsica River	2004	$ 1.7M | $ 2.1M | $ 3.8M	22.4K | 4.1K | -1.2M
Gwynns Falls-Middle	2014	$ 3.2M | $ 1.1M | $ 4.3M	-1.4K | -0.2K | -1.0M
Jennings Run	2019	$ 0.0M | $ 0.0M | $ 0.0M	0.0K | 0.0K | 0.0M
Jones Falls-Lower	2008	$ 6.8M | $ 0.5M | $ 7.3M	4.6K | 2.1K | 0.7M
Monocacy River-Lower	2008	$ 1.6M | $ 1.1M | $ 2.8M	0.6K | 10.1K | -18.4M
Sassafras River	2009	$ 4.6M | $ 0.4M | $ 5.0M	39.4K | 0.8K | 2.2M
Watershed Totals		**$38.6M | $10.4M | $49.0M**	**98.3K | 19.0K | -23.6M**

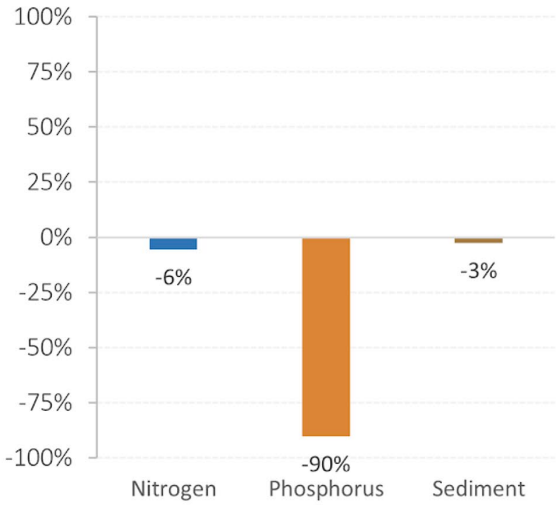
Antietam Creek – Plan Approved 2012 | 319 Priority Watersheds

Watershed Profile

Antietam Creek

Percent Progress Towards Target*

Nitrogen, Phosphorus, Sediment



*Watershed plan includes bacteria – See Appendix B

Land Use | 2019

Total Acres | **119K**

Agriculture | **39%**

Developed | **22%**

Natural | **38%**

NPS Reduction Progress

From 2012 to 2019, Antietam Creek is -6% towards its 127K lbs/yr nitrogen reduction goal, -90% towards its 5K lbs/yr phosphorous reduction goal, and -3% towards its 71.3 M lbs/yr sediment reduction goal.

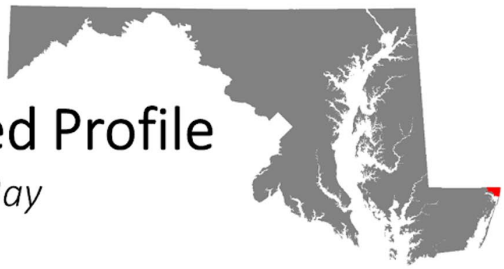
Watershed Funding| SFY12 – SFY20

Millions of Dollars

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$2.6M	1.3K	0.5K	10.4M
All Else	$1.2M	-8.4K	-5.2K	-12.2M
Total	**$3.7M**	**-7.1K**	**-4.7K**	**-1.8M**

Assawoman Bay – Plan Approved 2020 | 319 Priority Watersheds

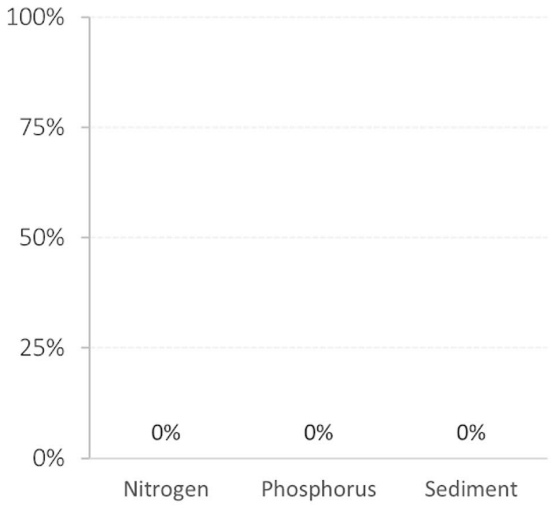


Watershed Profile

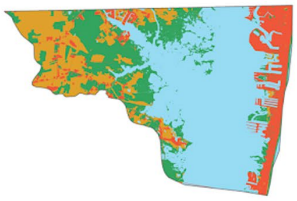
Assawoman Bay

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019



Total Acres | **6K**

Agriculture | **21%**

Developed | **34%**

Natural | **45%**

NPS Reduction Progress

Assawoman Bay will not have progress until two years after its start date, in SFY 2022.

Watershed Funding | SFY19 –SFY20

Millions of Dollars

319(h) Grant	**$0.0 M**
All Else	**$0.0 M**

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$0.0M	0.0K	0.0K	0.0M
All Else	$0.0M	0.0K	0.0K	0.0M
Total	**$0.0M**	**0.0K**	**0.0K**	**0.0M**

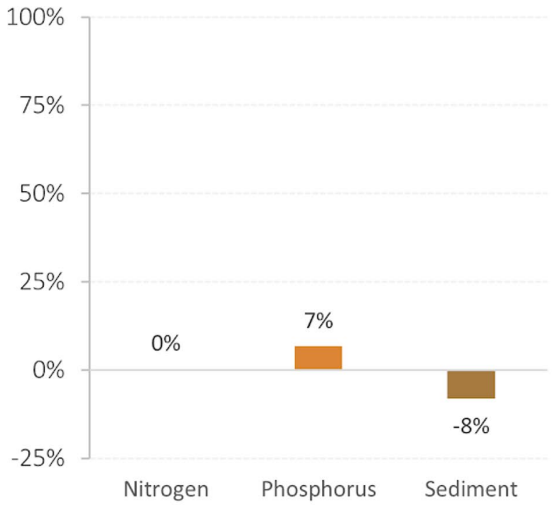
Back River: Tidal – Plan Approved 2010 | 319 Priority Watersheds

Watershed Profile

Back River: Tidal

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019

Total Acres | **16K**

Agriculture | **3%**

Developed | **65%**

Natural | **33%**

NPS Reduction Progress

From 2010 to 2019, Back River: Tidal is 0% towards its 15K lbs/yr nitrogen reduction goal, 7% towards its 2K lbs/yr phosphorous reduction goal, and -8% towards its 13.3 M lbs/yr sediment reduction goal.

Watershed Funding | SFY10 – SFY20

Millions of Dollars *

** Back River Tidal and Upper funding linked due to project overlap*

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$1.8M	0.3K	0.1K	0.4M
All Else	$18.8M	-0.2K	0.0K	-1.5M
Total	**$20.5M**	**0.1K**	**0.1K**	**-1.1M**

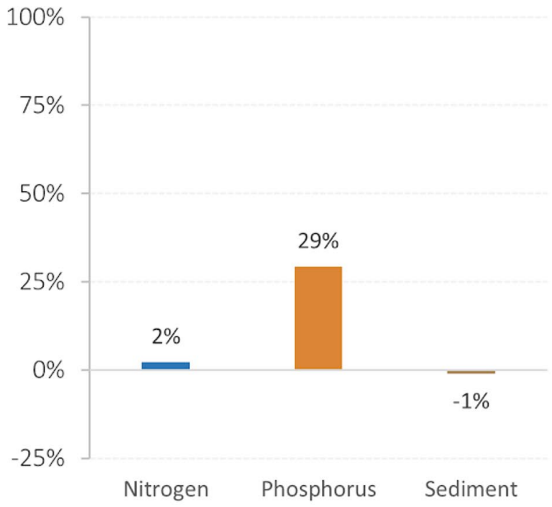
Back River: Upper – Plan Approved 2008 | 319 Priority Watersheds

Watershed Profile

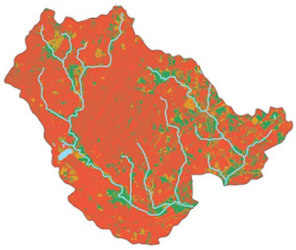
Back River: Upper

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019



Total Acres | **20K**

Agriculture | **0%**

Developed | **85%**

Natural | **15%**

NPS Reduction Progress

From 2008 to 2019, Back River: Upper is 2% towards its 24K lbs/yr nitrogen reduction goal, 29% towards its 3K lbs/yr phosphorous reduction goal, and -1% towards its 32.6 M lbs/yr sediment reduction goal.

Watershed Funding | SFY10 – SFY20

Millions of Dollars *

** Back River Tidal and Upper funding linked due to project overlap*

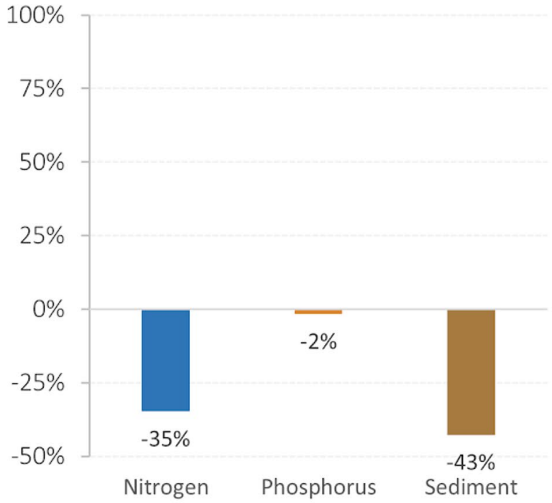
Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$1.8M	1.0K	0.3K	0.2M
All Else	$18.8M	-0.4K	0.5K	-0.5M
Total	**$20.5M**	**0.6K**	**0.8K**	**-0.3M**

Casselman River – Plan Approved 2011 | 319 Priority Watersheds

Percent Progress Towards Target*

Nitrogen, Phosphorus, Sediment



*Watershed plan is for pH – See Appendix B

Land Use | 2019

Total Acres | **59K**

Agriculture | **17%**

Developed | **9%**

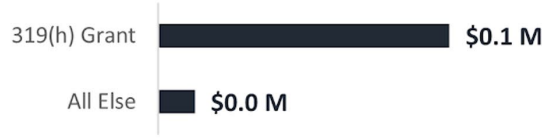
Natural | **74%**

NPS Reduction Progress

From 2011 to 2019, Casselman River is -35% towards its 39K lbs/yr nitrogen reduction goal, -2% towards its 6K lbs/yr phosphorous reduction goal, and -43% towards its 17.0 M lbs/yr sediment reduction goal.

Watershed Funding| SFY12 – SFY20

Millions of Dollars



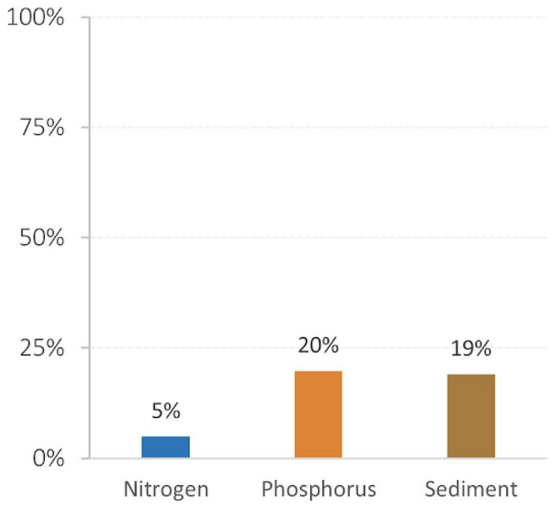
Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$0.1M	0.0K	0.0K	0.0M
All Else	$0.0M	-13.4K	-0.1K	-7.2M
Total	**$0.1M**	**-13.4K**	**-0.1K**	**-7.2M**

Choptank River: Upper – Plan Approved 2010 | 319 Priority Watersheds

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019

Total Acres | **154K**

Agriculture | **54%**

Developed | **11%**

Natural | **36%**

NPS Reduction Progress

From 2010 to 2019, Choptank River: Upper is 5% towards its 1.1M lbs/yr nitrogen reduction goal, 20% towards its 30K lbs/yr phosphorous reduction goal, and 19% towards its 23.6 M lbs/yr sediment reduction goal.

Watershed Funding | SFY11 – SFY20

Millions of Dollars

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$0.7M	1.1K	0.3K	1.1M
All Else	$0.7M	51.4K	5.6K	3.5M
Total	**$1.5M**	**52.5K**	**5.9K**	**4.5M**

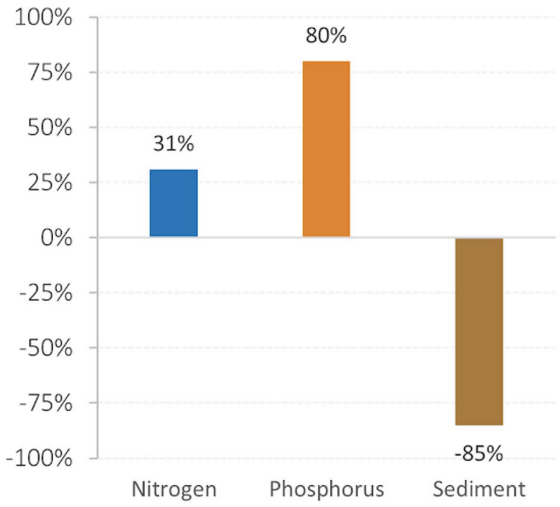
Corsica River – Plan Approved 2004 | 319 Priority Watersheds

Watershed Profile

Corsica River

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019

Total Acres | **23K**

Agriculture | **55%**

Developed | **12%**

Natural | **33%**

NPS Reduction Progress

From 2004 to 2019, Corsica River is 31% towards its 72K lbs/yr nitrogen reduction goal, 80% towards its 5K lbs/yr phosphorous reduction goal, and -85% towards its 1.4 M lbs/yr sediment reduction goal.

Watershed Funding | SFY05 – SFY20

Millions of Dollars

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$2.1M	4.9K	0.5K	1.5M
All Else	$1.7M	17.6K	3.6K	-2.7M
Total	**$3.8M**	**22.4K**	**4.1K**	**-1.2M**

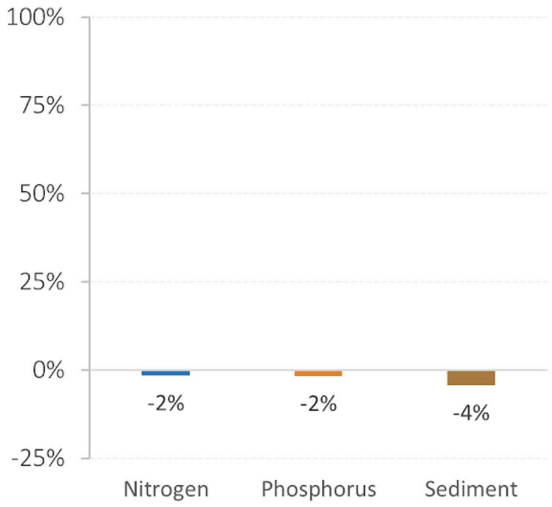
Gwynns Falls: Middle – Plan Approved 2014 | 319 Priority Watersheds

Watershed Profile

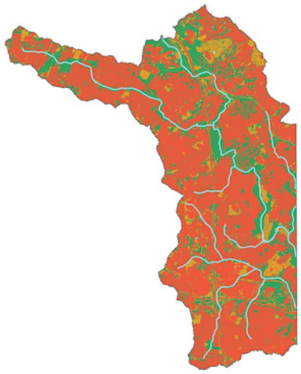
Gwynns Falls: Middle

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019



Total Acres | **31K**

Agriculture | **1%**

Developed | **77%**

Natural | **22%**

NPS Reduction Progress

From 2014 to 2019, Gwynns Falls: Middle is -2% towards its 89K lbs/yr nitrogen reduction goal, -2% towards its 12K lbs/yr phosphorous reduction goal, and -4% towards its 23.5 M lbs/yr sediment reduction goal.

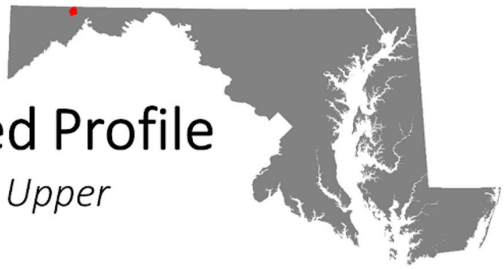
Watershed Funding | SFY13 – SFY20

Millions of Dollars

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$1.1M	3.9K	1.6K	3.2M
All Else	$3.3M	-5.3K	-1.8K	-4.2M
Total	**$4.3M**	**-1.4K**	**-0.2K**	**-1.0M**

Jennings Run: Upper – Plan Approved 2019 | 319 Priority Watersheds

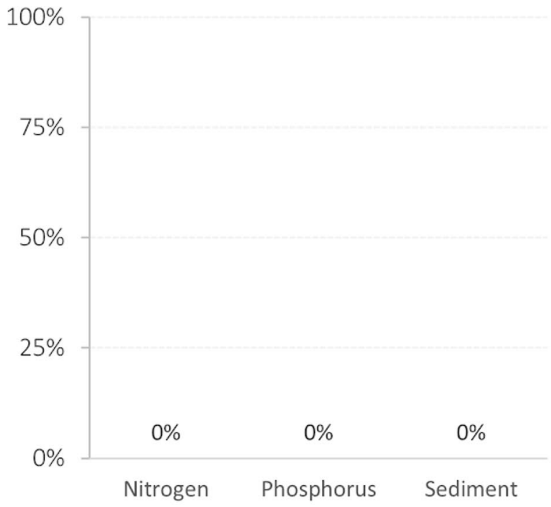


Watershed Profile

Jennings Run: Upper

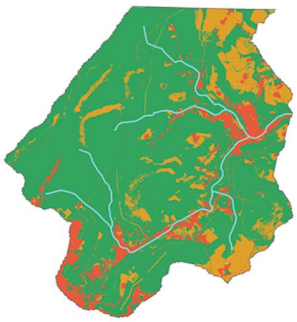
Percent Progress Towards Target*

Nitrogen, Phosphorus, Sediment



*Watershed plan is for pH – See Appendix B

Land Use | 2019



Total Acres | **19K**

Agriculture | **7%**

Developed | **12%**

Natural | **80%**

NPS Reduction Progress

Jennings Run: Upper will not have progress until two years after its start date, in SFY 2021.

Watershed Funding | SFY20

Millions of Dollars

319(h) Grant	**$0.0 M**
All Else	**$0.0 M**

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$0.0M	0.0K	0.0K	0.0M
All Else	$0.0M	0.0K	0.0K	0.0M
Total	**$0.0M**	**0.0K**	**0.0K**	**0.0M**

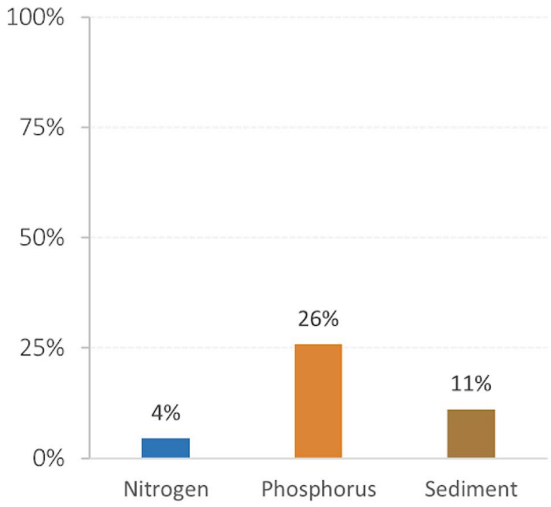
Jones Falls: Lower – Plan Approved 2008 | 319 Priority Watersheds

Watershed Profile

Jones Falls: Lower

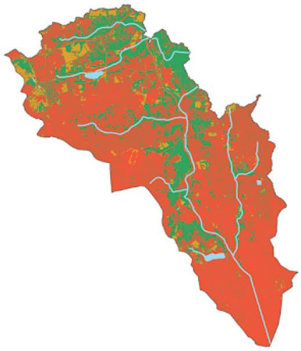
Percent Progress Towards Target*

Nitrogen, Phosphorus, Sediment



*Watershed plan includes bacteria – See Appendix B

Land Use | 2019



Total Acres | **37K**

Agriculture | **4%**

Developed | **67%**

Natural | **30%**

NPS Reduction Progress

From 2008 to 2019, Jones Falls: Lower is 4% towards its 103K lbs/yr nitrogen reduction goal, 26% towards its 8K lbs/yr phosphorous reduction goal, and 11% towards its 6.2 M lbs/yr sediment reduction goal.

Watershed Funding | SFY13 – SFY20

Millions of Dollars

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$0.5M	0.1K	0.1K	0.2M
All Else	$6.8M	4.5K	2.0K	0.5M
Total	**$7.3M**	**4.6K**	**2.1K**	**0.7M**

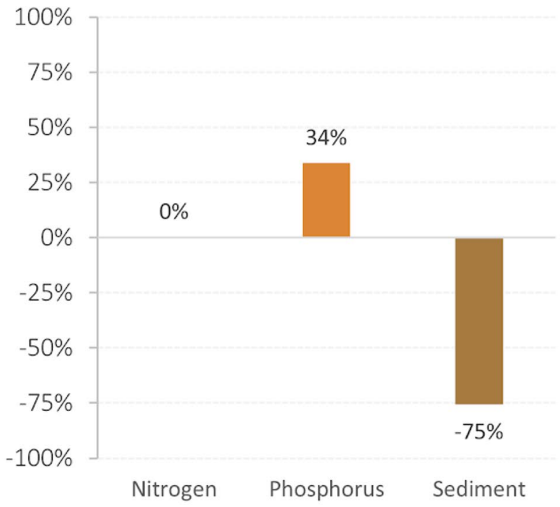
Monocacy River: Lower – Plan Approved 2008 | 319 Priority Watersheds

Watershed Profile

Monocacy River: Lower

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019

Total Acres | **195K**

Agriculture | **34%**

Developed | **26%**

Natural | **39%**

NPS Reduction Progress

From 2008 to 2019, Monocacy River: Lower is 0% towards its 283K lbs/yr nitrogen reduction goal, 34% towards its 30K lbs/yr phosphorous reduction goal, and -75% towards its 24.4 M lbs/yr sediment reduction goal.

Watershed Funding | SFY08 – SFY20

Millions of Dollars

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$1.1M	0.7K	0.2K	0.1M
All Else	$1.6M	-0.1K	9.9K	-18.5M
Total	**$2.8M**	**0.7K**	**10.1K**	**-18.4M**

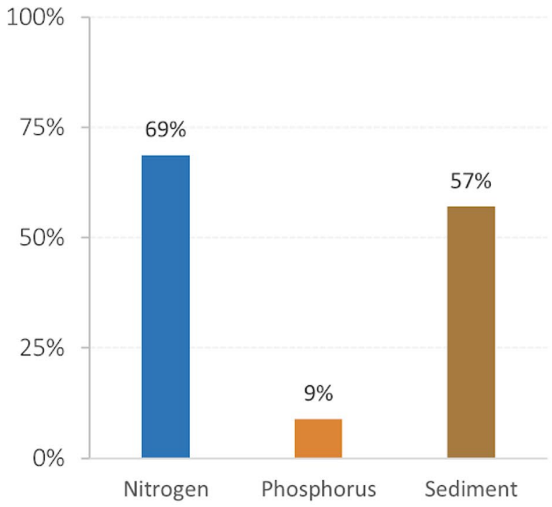
Sassafras River – Plan Approved 2009 | 319 Priority Watersheds

Watershed Profile

Sassafras River

Percent Progress Towards Target

Nitrogen, Phosphorus, Sediment



Land Use | 2019

Total Acres | **47K**

Agriculture | **58%**

Developed | **11%**

Natural | **31%**

NPS Reduction Progress

From 2009 to 2019, Sassafras River is 69% towards its 57K lbs/yr nitrogen reduction goal, 9% towards its 9K lbs/yr phosphorous reduction goal, and 57% towards its 3.8 M lbs/yr sediment reduction goal.

Watershed Funding| SFY12 – SFY20

Millions of Dollars

Total Funding Sources and NPS Reductions | *Nitrogen, Phosphorus, Sediment*

Funding Source	Funds	Nitrogen | lbs/yr	Phosphorus | lbs/yr	Sediment | lbs/yr
319(h) Grant	$0.4M	4.2K	0.3K	0.2M
All Else	$4.6M	35.2K	0.6K	2.0M
Total	**$5.0M**	**39.4K**	**0.8K**	**2.2M**

Appendix A | Financial Information

319(h) Grant Funding

Maryland tracks annual 319(h) Grant federal vs state contributions since 1990 (Table A - 1). However, tracking Priority Watershed progress did not begin until the first watershed plan for Corsica River was approved in 2004.

Table A - 1: *319(h) Grant funding by State Fiscal Year*

State Fiscal Year	319(h) Grant	Non-Federal Match	Total State and Federal Funds
1990 - 2003	$24,876,369	$16,584,247	$41,460,616
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
2013	$1,990,999	$1,327,333	$3,318,332
2014	$2,119,118	$1,412,745	$3,531,863
2015	$2,084,277	$1,389,518	$3,473,795
2016	$2,109,728	$1,406,485	$3,516,213
2017	$2,236,500	$1,491,000	$3,727,500
2018	$2,129,000	$1,419,333	$3,548,333
2019	$2,129,000	$1,419,335	$3,548,335
2020	$2,241,500	$1,494,334	$3,735,834
Post 2004 Totals	**$40,768,007**	**$27,178,673**	**$67,946,680**

Maintenance of Effort (MOE) vs Federal 319(h) Grant Funds

Maryland contributes more State funds to NPS pollution reduction on an annual basis compared to what it receives through 319(h) Grant funding (Figure A - 1). In SFY 2020, Maryland's NPS pollution control expenditures totaled over $177 million which is about 22 times more than EPA's required minimum of $8.4 million in Maintenance of Effort spending. Much of the increase this year came from new projects funded through the Water Quality State Revolving Loan Fund.

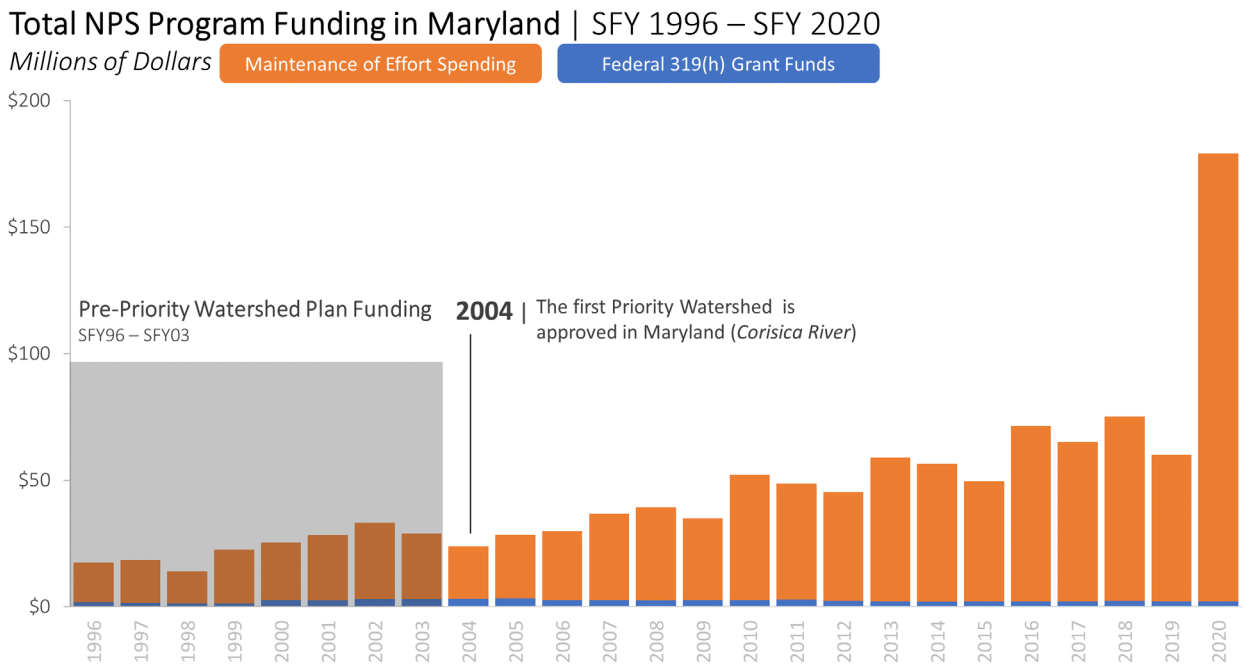


Figure A - 1: *Maryland's Maintenance of Effort funds (MOE) vs. Federal 319(h) Grant dollars received*

Table A - 2: *MOE vs Federal 319(h) Grant dollars received by State Fiscal Year (Millions of Dollars)*

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
319(h) Federal Spending	$3.1	$3.4	$2.7	$2.7	$2.6	$2.7	$2.6	$2.9	$2.3	$2.1	$2.0	$2.1	$2.1	$2.1	$2.2	$2.1	$2.2
MOE	$20.8	$25.1	$27.1	$34.2	$36.7	$32.4	$49.4	$45.8	$43.1	$56.7	$54.5	$47.5	$69.4	$63.0	$73.0	$57.9	$177.0

Chesapeake and Atlantic Costal Bays Trust Fund

Since its inception in SFY 2009, the Chesapeake and Atlantic Costal Bays Trust Fund (Trust Fund) has contributed $406 million to Maryland NPS programs and pollution reduction practices (Figure A - 2). The Trust Fund is a major source of funding for NPS programs and pollution reduction practices within the State and has contributed over three times the total lifetime funding as the 319(h) Grant, including state match.

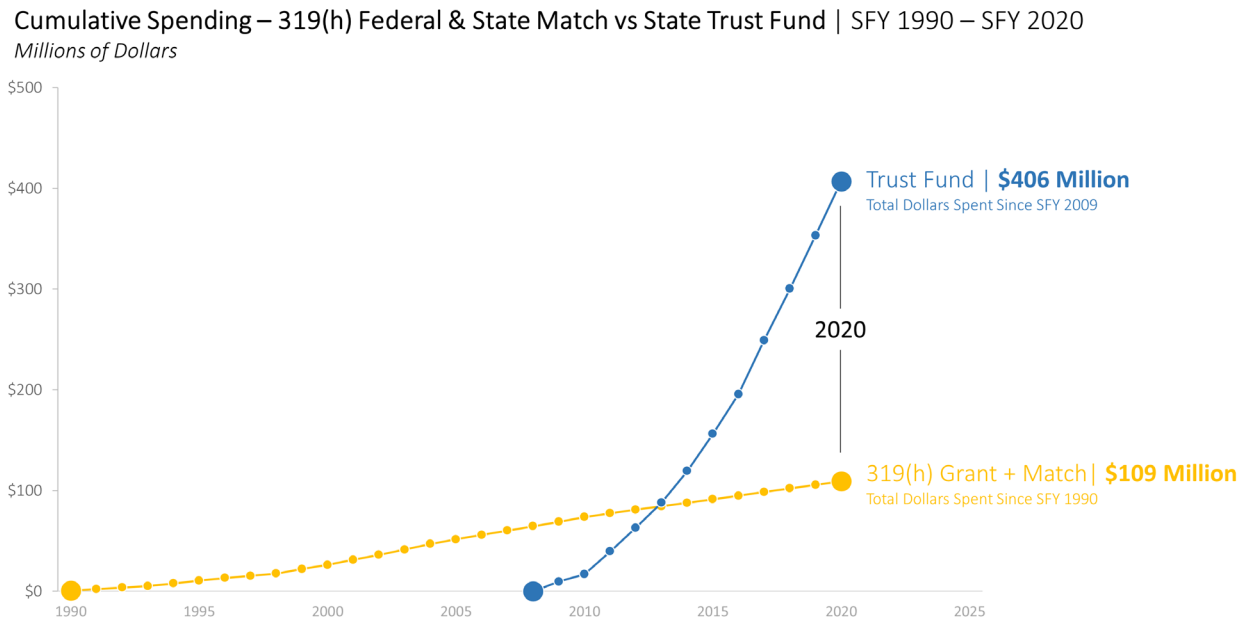


Figure A - 2: *Cumulative spending for 319(h) Grant (including State Match) and Trust Fund*

Initially, the Trust Fund was roughly twice the size of the total 319(h) Grant funding. Yet, since about SFY 2017, the Trust Fund has increased substantially with the latest years funding being about fifteen times greater than the same years 319(h) Grant dollars (Table A - 3).

Table A - 3: *319(h) Grant dollars vs Trust Fund spending by State Fiscal Year (Millions of Dollars)*

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
319(h) Grant + State Match	$4.29	$4.77	$3.81	$3.49	$3.32	$3.53	$3.47	$3.52	$3.73	$3.55	$3.55	$3.74
Trust Fund	$9.60	$7.30	$22.64	$23.58	$24.80	$31.50	$36.80	$39.40	$53.47	$51.31	$52.93	$53.63

Spending Breakdown by Priority Watershed

Maryland spends significantly more state dollars in its priority watersheds than federal dollars from the 319(h) Grant (Table A - 4). As of SFY 2020, Maryland has spent $38.6 million on in the ground projects in priority watersheds. Comparatively, the 319(h) Grant, not including state match, has accounted for $10.4 million in project spending.

Table A - 4: *Spending by Priority Watershed by funding source*

Priority Watershed	Plan Start Date	Chesapeake and Atlantic Bays Trust Fund	State Revolving Fund	Total Non-319 Funds	319(h) Grant	Total Funds
Antietam Creek	2012	$736,786	$424,600	$1,161,386	$2,583,023	$3,744,409
Assawoman Bay	2020	-	-	-	-	-
Back River: Tidal	2010	$6,031,605	$12,724,100	$18,755,705	$1,755,348	$20,511,053
Back River: Upper	2008					
Casselman River	2011	$6,440	$0	$6,440	$83,619	$90,059
Choptank River: Upper	2010	$740,425	$0	$740,425	$720,346	$1,460,771
Corsica River	2004	$1,659,485	$0	$1,659,485	$2,137,406	$3,796,891
Gwynns Falls: Middle	2014	$3,248,000	$0	$3,248,000	$1,063,940	$4,311,940
Jennings Run: Upper	2019	-	-	-	-	-
Jones Falls: Lower	2008	$6,730,213	$100,664	$6,830,877	$462,309	$7,293,186
Monocacy River: Lower	2008	$1,638,143	$0	$1,638,143	$1,143,305	$2,781,448
Sassafras River	2009	$4,584,724	$0	$4,584,724	$425,748	$5,010,472
Watershed Totals		**$25,375,822**	**$13,249,364**	**$38,625,186**	**$10,375,044**	**$49,000,230**

Appendix B | NPS Load Tracking

Nutrient and Sediment Tracking

Maryland tracks nutrient and sediment reductions for 319 Priority Watersheds using the Chesapeake Assessment Scenario Tool (CAST). In the following tables (*B - 1 to B - 3*), *Reduction Source Document* refers to how the *Percent Reduction Required* (PRR) was determined. All loads are reported as Edge of Stream: the nutrient and sediment entering directly into local waterbodies from the adjoining land.

The percent reduction for *Watershed Plan* was taken from the approved watershed plan. If no such number was given, PRR was calculated as the percent reduction of the watershed's Plan Start Date (PSD) NPS load necessary to achieve the watershed's TMDL for nitrogen, phosphorus, or sediment. If no TMDL was available, or the TMDL was exceeded, PRR was calculated as the percent reduction required of the watershed's PSD NPS load to achieve the watershed's Phase III WIP nutrient or sediment goals.

Baseline loads were extracted directly from CAST and represent the load during a watershed's PSD. Target loads were calculated as *((1 – PRR) * Baseline Loads)*. Current Loads represent 2019 Progress loads in CAST for each watershed.

319 Reductions come from the individual project calculations provided to MDE in the watershed work plans; Appendix D contains the source documentation for these reductions. Non-319 Reductions are calculated as *((PSD - Current Loads) - 319 Reductions)*.

Table B - 1: *Nitrogen tracking (Edge of Stream loads – Pounds / Year)*

Priority Watershed	Plan Start Date	Reduction Source Document	Percent Reduction Required	Baseline Loads	Target Loads	Current Loads (2019)	319 Reductions	Non-319 Reductions	Total Reductions	Target Reductions	Percent Progress
Antietam Creek	2012	Phase III WIP	10%	1,319,242	1,192,629	1,326,307	1,337	-8,402	-7,065	126,613	-6%
Assawoman Bay	2020	-	-	-	-	-	-	-	-	-	-
Back River: Tidal	2010	Watershed Plan	15%	99,130	84,261	99,082	280	-232	48	14,870	0%
Back River: Upper	2008	Watershed Plan	15%	162,869	138,439	162,315	975	-421	554	24,430	2%
Casselman River	2011	Phase III WIP	11%	349,681	311,118	363,070	0	-13,389	-13,389	38,563	-35%
Choptank River: Upper	2010	Watershed Plan	39%	2,723,478	1,661,321	2,671,025	1,048	51,405	52,453	1,062,156	5%
Corsica River	2004	Local TMDL	22%	324,679	252,431	302,235	4,873	17,571	22,444	72,248	31%
Gwynns Falls: Middle	2014	Watershed Plan	29%	308,514	219,045	309,883	3,925	-5,294	-1,369	89,469	-2%
Jennings Run: Upper	2019	Phase III WIP	2%	83,979	82,259	83,979	0	0	0	1,720	0%
Jones Falls: Lower	2008	Watershed Plan	22%	459,856	356,849	455,237	90	4,529	4,619	103,008	4%
Monocacy River: Lower	2008	Phase III WIP	8%	3,356,264	3,073,151	3,355,617	726	-79	647	283,113	0%
Sassafras River	2009	Watershed Plan	9%	629,276	572,012	589,915	4,204	35,157	39,361	57,264	69%
Watershed Totals *(Nitrogen)*			**19%**	**9,816,968**	**7,943,514**	**9,718,664**	**17,458**	**80,845**	**98,303**	**1,873,454**	**5%**

Table B - 2: *Phosphorus tracking (Edge of Stream loads – Pounds / Year)*

Priority Watershed	Plan Start Date	Reduction Source Document	Percent Reduction Required	Baseline Loads	Target Loads	Current Loads (2019)	319 Reductions	Non-319 Reductions	Total Reductions	Target Reductions	Percent Progress
Antietam Creek	2012	Local TMDL	7%	72,427	67,231	77,121	529	(5,223)	(4,694)	5,196	-90%
Assawoman Bay	2020	-	-	-	-	-	-	-	-	-	-
Back River: Tidal	2010	Watershed Plan	15%	13,304	11,309	13,170	94	40	134	1,996	7%
Back River: Upper	2008	Watershed Plan	15%	18,284	15,541	17,480	328	476	804	2,743	29%
Casselman River	2011	Phase III WIP	23%	27,709	21,382	27,810	0	(100)	(100)	6,327	-2%
Choptank River: Upper	2010	Watershed Plan	28%	106,500	76,680	100,588	308	5,605	5,913	29,820	20%
Corsica River	2004	Phase III WIP	35%	14,447	9,353	10,365	458	3,624	4,082	5,094	80%
Gwynns Falls: Middle	2014	Watershed Plan	45%	26,821	14,725	27,024	1,554	(1,757)	(203)	12,096	-2%
Jennings Run: Upper	2019	Phase III WIP	13%	4,808	4,198	4,808	0	0	0	610	0%
Jones Falls: Lower	2008	Watershed Plan	30%	27,966	19,716	25,837	91	2,038	2,129	8,250	26%
Monocacy River: Lower	2008	Phase III WIP	26%	114,254	84,463	104,193	169	9,892	10,061	29,791	34%
Sassafras River	2009	Watershed Plan	34%	27,862	18,417	27,021	254	587	841	9,445	9%
Watershed Totals *(Phosphorus)*			**25%**	**454,383**	**343,014**	**435,417**	**3,785**	**15,181**	**18,966**	**111,369**	**17%**

Table B - 3: *Sediment tracking (Edge of Stream loads – Pounds / Year)*

Priority Watershed	Plan Start Date	Reduction Source Document	Percent Reduction Required	Baseline Loads	Target Loads	Current Loads (2019)	319 Reductions	Non-319 Reductions	Total Reductions	Target Reductions	Percent Progress
Antietam Creek	2012	Watershed Plan	52%	137,562,959	66,281,690	139,400,460	10,374,000	(12,211,501)	(1,837,501)	71,281,268	-3%
Assawoman Bay	2020	-	-	-	-	-	-	-	-	-	-
Back River: Tidal	2010	Local TMDL	68%	19,490,972	6,237,111	20,555,279	428,000	(1,492,308)	(1,064,308)	13,253,861	-8%
Back River: Upper	2008	Local TMDL	68%	47,994,451	15,358,224	48,313,493	203,000	(522,042)	(319,042)	32,636,227	-1%
Casselman River	2011	Phase III WIP	18%	93,835,841	76,877,570	101,074,510	0	(7,238,669)	(7,238,669)	16,958,271	-43%
Choptank River: Upper	2010	Phase III WIP	31%	76,132,325	52,500,449	71,621,229	1,061,000	3,450,096	4,511,096	23,631,876	19%
Corsica River	2004	Phase III WIP	12%	11,026,744	9,658,555	12,193,549	1,520,000	(2,686,806)	(1,166,806)	1,368,189	-85%
Gwynns Falls: Middle	2014	Local TMDL	37%	63,591,505	40,062,648	64,603,596	3,156,000	(4,168,091)	(1,012,091)	23,528,857	-4%
Jennings Run: Upper	2019	Phase III WIP	-2%	18,865,565	19,184,930	18,865,565	0	0	0	(319,365)	0%
Jones Falls: Lower	2008	Watershed Plan	8%	76,178,610	69,931,964	75,484,950	173,000	520,660	693,660	6,246,646	11%
Monocacy River: Lower	2008	Phase III WIP	9%	270,862,476	246,503,526	289,232,530	75,000	(18,445,054)	(18,370,054)	24,358,949	-75%
Sassafras River	2009	Watershed Plan	15%	25,829,495	22,006,729	23,648,692	187,000	1,993,802	2,180,802	3,822,765	57%
Watershed Totals *(Sediment)*			**26%**	**841,370,942**	**624,603,397**	**864,993,854**	**17,177,000**	**(40,799,912)**	**(23,622,912)**	**216,767,544**	**-11%**

Other NPS Pollution – Bacteria

MDE does not currently have a system for tracking bacteria reductions within priority watersheds. Bacteria concentrations and loads tend to be highly variable and difficult to track, particularly when assessing the effectiveness of restoration. The State will continue to evaluate new tools, technologies, and monitoring designs to track progress towards applicable bacteria TMDLs in the future. This largely applies to the Antietam Creek priority watershed plan, which addresses the Bacteria TMDL for the watershed.

Other NPS Pollution – pH Impairments

The Casselman River and Upper Jennings Run priority watershed plans were developed to address the low pH impairment listings due to acid mine drainage. Rather than directly tracking pH, Maryland tracks pH remediation by evaluating how many streams within these watersheds have been successfully delisted for a pH impairment (Table B - 4)., based on pre and post BMP implementation monitoring. Currently, four water quality segments within the Casselman River watershed have been delisted for pH.

Table B - 4: *Casselman River sub-watersheds delisted for pH impairments*

Casselman River | pH Delistings			
River Name	**HUC-12 Watershed**	**Impairment**	**Listing Category**
Alexander Run	050202040032	pH, Low	2 – Meets water quality criteria for the specified pollutant
Big Laurel Run	050202040033	pH, Low	2 – Meets water quality criteria for the specified pollutant
Spiker Run	050202040034	pH, Low	2 – Meets water quality criteria for the specified pollutant
Tarkiln Run	050202040032	pH, Low	2 – Meets water quality criteria for the specified pollutant

Tracking Historical Projects

This report only tracks projects that were funded after the watershed plan approval date. However, many of the priority watersheds received funding and completed projects before any watershed plan was approved.

Antietam Creek Washington Co.	Duration	Unit	Measure	LBS Reduced Nitrogen	 Phosphorus	 Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	27,510.00	31,793.03	-	-
Rate Nitrogen	annual	Acres	4,007.00	1,556.44	-	-
Placement Nitrogen	annual	Acres	884.64	724.18	-	-
Timing Nitrogen	annual	Acres	591.98	487.21	-	-
Core Phosphorus	annual	Acres	27,510.06	-	1,851.70	-
Rate Phosphorus	annual	Acres	2,150.85	-	55.53	-
Placement Phosphorus	annual	Acres	548.26	-	6.93	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				34,560.85	1,914.17	-
Tillage Management						
Conservation	annual	Acres	4,360.98	9,286.27	922.87	3,618,761.57
Continuous High Residue	annual	Acres	14,536.58	43,332.96	3,841.73	23,242,324.80
Low Residue	annual	Acres	-	-	-	-
TOTAL				52,619.23	4,764.60	26,861,086.37
Cover Crop						
Traditional	annual	Acres	3,518.24	16,148.92	34.09	164,436.99
Commodity	annual	Acres	3,951.68	7,012.20	-	-
TOTAL				23,161.12	34.09	164,436.99
Pasture Management						
Alternative Watering	cumulative	Acres	1,668.97	863.49	162.82	2,235.23
Prescribed Grazing	cumulative	Acres	955.15	934.71	279.56	3,880.01
Horse Pasture Management	cumulative	Acres	0.03	-	2.11	0.16
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	37.69	10,616.52	663.78	470,347.04
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	23.26	1,859.93	403.26	289,672.78
TOTAL				14,274.65	1,511.54	766,135.23
Forest Buffers	cumulative	Acres in Buffers	-	-	-	-
Wetland Restoration	cumulative	Acres	2.12	64.45	1.27	4,194.44
Wetland Creation	cumulative	Acres	-	-	-	-
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	-	-	-	-
Grass Buffers	cumulative	Acres in Buffers	128.17	3,985.66	22.64	308,627.19
Tree Planting	cumulative	Acres	-	-	-	-
Alternative Crops	cumulative	Acres	-	-	-	-
Soil and Water Conservation Plan	cumulative	Acres	-	-	-	-
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	-	-	-	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	8,500.13	577.24	368.06	1,192,028.02
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				4,627.36	391.97	1,504,849.65
Agricultural Drainage Management				-	-	-
Denitrifying Ditch Bioreactors	cumulative	Acres	99.94	426.34	-	-
Saturated Buffer	cumulative	Acres	99.94	5,227.70	(1.75)	200,398.37
Sorbing Materials in Ag Ditches	cumulative	Acres	99.94	-	16.40	-
Water Control Structures	cumulative	Acres	99.94	439.35	-	-
TOTAL				6,093.38	14.65	200,398.37
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	59.52	8,822.33	380.41	162,172.99
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	45.58	8.32	13.35	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				8,830.65	393.77	162,172.99
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	-	-	-	-
Storm Water Treatment Performance Standard	cumulative	Acres Treated	-	-	-	-
Wet Ponds & Wetlands	cumulative	Acres Treated	-	-	-	-
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	-	-	-	-
Extended Dry Ponds	cumulative	Acres Treated	4,320.23	7,749.88	713.01	3,391,658.88
Infiltration Practices	cumulative	Acres Treated	-	-	-	-
Filtering Practices	cumulative	Acres Treated	256.12	918.55	126.48	268,091.73
BioRetention	cumulative	Acres Treated	-	-	-	-
BioSwale	cumulative	Acres Treated	35.25	221.18	21.75	36,893.43
Permeable Pavement	cumulative	Acres Treated	-	-	-	-
Vegetated Open Channel	cumulative	Acres Treated	36.64	90.33	8.30	28,762.92
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	-	-	-	-
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				8,979.94	869.54	3,725,406.96
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	0.01	0.06	-	26.17
Urban Forest Buffers	cumulative	Acres in Buffers	-	-	-	-
Urban Tree Planting	cumulative	Acres	-	-	-	-
Urban Forest Planting	cumulative	Acres	174.66	1,159.42	159.12	110,407.59
Urban Nutrient Management	annual	Acres	-	-	-	-
Urban Stream Restoration	cumulative	Feet	6,595.43	447.90	285.58	924,919.56
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	-	-	-	-
Septic Connections	cumulative	No. Systems	2.03	25.31	-	-
Septic Denitrification	cumulative	No. Systems	-	-	-	-
Septic Pumping	annual	No. Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				1,632.69	444.71	1,035,353.32
Antietam Creek Watershed Load Reduction Summary				154,779.88	10,339.03	34,419,839.89

Corsica River Quenn Anne's Co.	Duration	Unit	Measure	LBS Reduced Nitrogen	 Phosphorus	 Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	10,048.19	18,863.36	-	-
Rate Nitrogen	annual	Acres	3,560.05	2,090.49	-	-
Placement Nitrogen	annual	Acres	1,943.00	2,816.53	-	-
Timing Nitrogen	annual	Acres	466.76	580.40	-	-
Core Phosphorus	annual	Acres	10,048.19	-	2,100.27	-
Rate Phosphorus	annual	Acres	420.07	-	28.59	-
Placement Phosphorus	annual	Acres	1,659.37	-	55.69	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				24,350.78	2,184.56	-
Tillage Management						
Conservation	annual	Acres	2,045.48	1,777.34	330.12	336,236.55
Continuous High Residue	annual	Acres	6,818.25	17,773.34	1,536.49	2,159,566.21
Low Residue	annual	Acres	-	-	-	-
TOTAL				19,550.67	1,866.61	2,495,802.76
Cover Crop						
Traditional	annual	Acres	4,978.65	23,994.88	23.51	5,875.30
Commodity	annual	Acres	1,336.62	2,710.89	-	-
TOTAL				26,705.76	23.51	5,875.30
Pasture Management						
Alternative Watering	cumulative	Acres	21.21	9.48	2.23	3.35
Prescribed Grazing	cumulative	Acres	25.65	20.91	9.44	10.12
Horse Pasture Management	cumulative	Acres	5.85	-	1.85	3.08
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	0.94	49.64	15.40	8,771.58
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	0.95	48.44	15.17	8,863.56
TOTAL				128.47	44.10	17,651.68
Forest Buffers	cumulative	Acres in Buffers	52.32	3,776.73	58.17	43,423.70
Wetland Restoration	cumulative	Acres	99.44	4,456.62	119.32	68,317.95
Wetland Creation	cumulative	Acres	34.95	900.88	28.30	14,996.27
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	117.44	2,208.07	5.89	46,521.72
Grass Buffers	cumulative	Acres in Buffers	517.72	28,856.35	321.41	429,141.87
Tree Planting	cumulative	Acres	10.12	224.19	6.33	3,962.96
Alternative Crops	cumulative	Acres	3.14	66.30	0.36	1,246.79
Soil and Water Conservation Plan	cumulative	Acres	6,412.75	9,868.20	501.22	560,561.50
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	1,848.94	3,733.35	171.90	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	-	-	-	-
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				54,090.68	1,212.90	1,168,172.76
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	122.66	534.43	-	-
Saturated Buffer	cumulative	Acres	122.66	7,866.11	16.27	49,581.89
Sorbing Materials in Ag Ditches	cumulative	Acres	122.66	-	27.91	-
Water Control Structures	cumulative	Acres	122.66	794.39	-	-
TOTAL				9,194.93	44.18	49,581.89
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	2.10	387.71	34.46	561.34
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	0.10	0.25	0.01	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				387.97	34.47	561.34
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	-	-	-	-
Storm Water Treatment Performance Standard	cumulative	Acres Treated	87.59	262.21	44.35	18,066.40
Wet Ponds & Wetlands	cumulative	Acres Treated	448.40	789.35	201.41	77,647.02
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	6.56	2.90	0.65	189.32
Extended Dry Ponds	cumulative	Acres Treated	-	-	-	-
Infiltration Practices	cumulative	Acres Treated	1.47	10.68	1.25	403.03
Filtering Practices	cumulative	Acres Treated	1.41	4.97	0.85	325.54
BioRetention	cumulative	Acres Treated	23.17	119.01	15.82	5,015.29
BioSwale	cumulative	Acres Treated	1.40	8.63	1.05	323.24
Permeable Pavement	cumulative	Acres Treated	2.04	8.38	1.02	412.13
Vegetated Open Channel	cumulative	Acres Treated	-	-	-	-
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	-	-	-	-
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				1,206.13	266.39	102,381.98
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	-	-	-	-
Urban Forest Buffers	cumulative	Acres in Buffers	0.31	2.65	0.48	86.06
Urban Tree Planting	cumulative	Acres	0.46	0.46	0.08	42.20
Urban Forest Planting	cumulative	Acres	0.47	3.07	0.51	73.85
Urban Nutrient Management	annual	Acres	1,836.40	1,143.25	81.17	-
Urban Stream Restoration	cumulative	Feet	294.81	18.89	16.39	27,607.99
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	-	-	-	-
Septic Connections	cumulative	Number of Systems	-	-	-	-
Septic Denitrification	cumulative	Number of Systems	42.91	225.91	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				1,394.23	98.62	27,810.11
Corsica River Watershed Load Reduction Summary				137,009.62	5,775.34	3,867,837.81

Lower Jones Falls Baltimore City & Baltimore Co.	Duration	Unit	Measure	LBS Reduced Nitrogen	 Phosphorus	 Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	-	-	-	-
Rate Nitrogen	annual	Acres	-	-	-	-
Placement Nitrogen	annual	Acres	-	-	-	-
Timing Nitrogen	annual	Acres	-	-	-	-
Core Phosphorus	annual	Acres	-	-	-	-
Rate Phosphorus	annual	Acres	-	-	-	-
Placement Phosphorus	annual	Acres	-	-	-	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				-	-	-
Tillage Management						
Conservation	annual	Acres	-	-	-	-
Continuous High Residue	annual	Acres	-	-	-	-
Low Residue	annual	Acres	-	-	-	-
TOTAL				-	-	-
Cover Crop						
Traditional	annual	Acres	-	-	-	-
Commodity	annual	Acres	-	-	-	-
TOTAL				-	-	-
Pasture Management						
Alternative Watering	cumulative	Acres	-	-	-	-
Prescribed Grazing	cumulative	Acres	-	-	-	-
Horse Pasture Management	cumulative	Acres	-	-	-	-
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	-	-	-	-
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	-	-	-	-
TOTAL				-	-	-
Forest Buffers	cumulative	Acres in Buffers	-	-	-	-
Wetland Restoration	cumulative	Acres	-	-	-	-
Wetland Creation	cumulative	Acres	-	-	-	-
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	-	-	-	-
Grass Buffers	cumulative	Acres in Buffers	-	-	-	-
Tree Planting	cumulative	Acres	-	-	-	-
Alternative Crops	cumulative	Acres	-	-	-	-
Soil and Water Conservation Plan	cumulative	Acres	-	-	-	-
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	-	-	-	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	-	-	-	-
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				-	-	-
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	-	-	-	-
Saturated Buffer	cumulative	Acres	-	-	-	-
Sorbing Materials in Ag Ditches	cumulative	Acres	-	-	-	-
Water Control Structures	cumulative	Acres	-	-	-	-
TOTAL				-	-	-
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	-	-	-	-
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	-	-	-	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				-	-	-
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	-	-	-	-
Storm Water Treatment Performance Standard	cumulative	Acres Treated	-	-	-	-
Wet Ponds & Wetlands	cumulative	Acres Treated	-	-	-	-
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	101.37	36.78	6.92	10,444.46
Extended Dry Ponds	cumulative	Acres Treated	-	-	-	-
Infiltration Practices	cumulative	Acres Treated	-	-	-	-
Filtering Practices	cumulative	Acres Treated	1.05	3.05	0.43	865.49
BioRetention	cumulative	Acres Treated	0.12	0.51	0.06	92.73
BioSwale	cumulative	Acres Treated	-	-	-	-
Permeable Pavement	cumulative	Acres Treated	-	-	-	-
Vegetated Open Channel	cumulative	Acres Treated	-	-	-	-
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	-	-	-	-
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				40.34	7.41	11,402.68
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	0.07	0.26	(0.01)	90.18
Urban Forest Buffers	cumulative	Acres in Buffers	-	-	-	-
Urban Tree Planting	cumulative	Acres	1.98	0.21	0.04	31.83
Urban Forest Planting	cumulative	Acres	211.98	968.02	169.82	69,069.23
Urban Nutrient Management	annual	Acres	3,881.10	574.20	31.37	-
Urban Stream Restoration	cumulative	Feet	-	-	-	-
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	-	-	-	-
Septic Connections	cumulative	Number of Systems	-	-	-	-
Septic Denitrification	cumulative	Number of Systems	0.00	0.00	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				1,542.69	201.21	69,191.24
Lower Jones Falls Watershed Load Reduction Summary				1,583.03	208.62	80,593.92

MD-02140302 - Lower Monocacy Permit Approval 2008/Fredneck Co.	Duration	Unit	Measure	LBS Reduced Nitrogen	Phosphorus	Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	19,400.55	26,099.56	-	-
Rate Nitrogen	annual	Acres	2,866.31	1,317.35	-	-
Placement Nitrogen	annual	Acres	287.59	270.09	-	-
Timing Nitrogen	annual	Acres	240.23	237.56	-	-
Core Phosphorus	annual	Acres	19,400.55	-	1,601.13	-
Rate Phosphorus	annual	Acres	451.16	-	16.90	-
Placement Phosphorus	annual	Acres	266.73	-	4.85	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				27,924.56	1,622.88	-
Tillage Management						
Conservation	annual	Acres	2,751.28	7,429.04	576.72	1,896,324.84
Continuous High Residue	annual	Acres	9,170.94	34,664.69	2,485.60	12,179,654.13
Low Residue	annual	Acres	-	-	-	-
TOTAL				42,093.73	3,062.32	14,075,978.97
Cover Crop						
Traditional	annual	Acres	5,479.38	29,847.49	41.56	95,083.51
Commodity	annual	Acres	2,420.16	6,019.83	-	-
TOTAL				35,867.32	41.56	95,083.51
Pasture Management						
Alternative Watering	cumulative	Acres	1,331.59	676.25	101.25	1,265.70
Prescribed Grazing	cumulative	Acres	251.13	274.85	56.61	727.02
Horse Pasture Management	cumulative	Acres	33.46	-	6.27	128.58
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	10.71	636.26	166.16	105,438.67
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	13.77	786.93	207.12	135,568.82
TOTAL				2,374.29	537.41	243,128.80
Forest Buffers	cumulative	Acres in Buffers	468.04	28,865.99	359.34	1,091,947.20
Wetland Restoration	cumulative	Acres	0.00	0.00	0.00	0.03
Wetland Creation	cumulative	Acres	-	-	-	-
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	588.03	10,108.59	28.23	697,693.19
Grass Buffers	cumulative	Acres in Buffers	86.23	4,151.75	25.28	204,810.80
Tree Planting	cumulative	Acres	40.25	796.35	16.71	42,192.98
Alternative Crops	cumulative	Acres	-	-	-	-
Soil and Water Conservation Plan	cumulative	Acres	15,625.07	-	2,840.48	-
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	1,520.27	3,147.06	163.70	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	102.52	5.70	4.44	13,236.85
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				47,075.45	3,438.18	2,049,881.05
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	148.01	800.73	-	-
Saturated Buffer	cumulative	Acres	148.01	10,133.83	14.11	248,123.72
Sorbing Materials in Ag Ditches	cumulative	Acres	148.01	-	26.91	-
Water Control Structures	cumulative	Acres	148.01	874.62	-	-
TOTAL				11,809.18	41.02	248,123.72
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	36.36	3,099.47	86.18	102,234.83
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	190.77	96.64	83.88	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				3,196.11	170.06	102,234.83
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	592.47	2,140.63	143.25	367,358.17
Storm Water Treatment Performance Standard	cumulative	Acres Treated	2,149.88	4,542.58	408.65	1,241,929.69
Wet Ponds & Wetlands	cumulative	Acres Treated	2,455.24	5,396.86	720.59	1,817,524.09
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	807.12	443.69	52.78	99,580.51
Extended Dry Ponds	cumulative	Acres Treated	2,096.60	4,608.54	274.19	1,552,036.74
Infiltration Practices	cumulative	Acres Treated	262.25	2,377.82	145.36	307,385.06
Filtering Practices	cumulative	Acres Treated	51.04	224.40	19.99	50,381.58
BioRetention	cumulative	Acres Treated	11.96	76.70	5.33	11,071.38
BioSwale	cumulative	Acres Treated	8.51	65.44	4.16	8,395.55
Permeable Pavement	cumulative	Acres Treated	1.25	6.42	0.41	1,081.47
Vegetated Open Channel	cumulative	Acres Treated	-	-	-	-
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	-	-	-	-
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				19,883.08	1,774.70	5,456,744.25
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	0.92	5.75	(0.13)	1,861.00
Urban Forest Buffers	cumulative	Acres in Buffers	15.63	161.86	15.57	16,310.44
Urban Tree Planting	cumulative	Acres	34.99	36.84	3.60	-
Urban Forest Planting	cumulative	Acres	189.86	1,503.47	132.25	102,174.05
Urban Nutrient Management	annual	Acres	14,679.96	12,078.23	500.59	-
Urban Stream Restoration	cumulative	Feet	2,326.21	129.41	100.68	300,353.66
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	-	-	-	-
Septic Connections	cumulative	Number of Systems	0.00	0.00	-	-
Septic Denitrification	cumulative	Number of Systems	187.82	1,268.10	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				15,183.66	752.56	420,699.16
Lower Monocacy River Watershed Load Reduction Summary				205,407.37	11,440.69	22,691,874.29

Middle Gywnns Falls Baltimore City & Baltimore Co.	Duration	Unit	Measure	LBS Reduced Nitrogen	 Phosphorus	 Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	150.63	163.81	-	-
Rate Nitrogen	annual	Acres	81.85	27.40	-	-
Placement Nitrogen	annual	Acres	31.47	22.28	-	-
Timing Nitrogen	annual	Acres	5.02	3.36	-	-
Core Phosphorus	annual	Acres	150.63	-	7.87	-
Rate Phosphorus	annual	Acres	2.71	-	0.07	-
Placement Phosphorus	annual	Acres	17.80	-	0.23	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				216.85	8.18	-
Tillage Management						
Conservation	annual	Acres	19.41	32.35	3.81	5,122.75
Continuous High Residue	annual	Acres	64.69	152.73	15.66	32,902.20
Low Residue	annual	Acres	-	-	-	-
TOTAL				185.08	19.47	38,024.95
Cover Crop						
Traditional	annual	Acres	43.73	164.01	0.11	114.81
Commodity	annual	Acres	9.53	14.66	-	-
TOTAL				178.67	0.11	114.81
Pasture Management						
Alternative Watering	cumulative	Acres	20.16	5.83	0.13	6.47
Prescribed Grazing	cumulative	Acres	5.02	3.16	0.13	4.78
Horse Pasture Management	cumulative	Acres	5.46	-	0.14	6.95
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	-	-	-	-
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	-	-	-	-
TOTAL				8.99	0.40	18.20
Forest Buffers	cumulative	Acres in Buffers	468.04	21,052.06	248.32	472,803.43
Wetland Restoration	cumulative	Acres	0.00	0.00	0.00	0.01
Wetland Creation	cumulative	Acres	-	-	-	-
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	588.03	6,749.51	145.07	285,160.38
Grass Buffers	cumulative	Acres in Buffers	86.23	2,998.76	31.70	88,690.09
Tree Planting	cumulative	Acres	40.25	518.23	9.52	17,031.14
Alternative Crops	cumulative	Acres	-	-	-	-
Soil and Water Conservation Plan	cumulative	Acres	15,625.07	13,000.84	505.63	1,409,965.62
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	1,520.27	1,914.43	94.10	-
Capture & Reuse	cumulative	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Acres	15,625.07	823.13	679.22	1,092,688.71
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				47,056.97	1,713.57	3,366,339.37
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	0.20	0.68	-	-
Saturated Buffer	cumulative	Acres	0.20	8.62	0.04	128.87
Sorbing Materials in Ag Ditches	cumulative	Acres	0.20	-	0.02	-
Water Control Structures	cumulative	Acres	0.20	0.76	-	-
TOTAL				10.06	0.06	128.87
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	36.36	224.20	17.70	20,715.35
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	0.55	0.60	0.03	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				224.81	17.73	20,715.35
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	-	-	-	-
Storm Water Treatment Performance Standard	cumulative	Acres Treated	-	-	-	-
Wet Ponds & Wetlands	cumulative	Acres Treated	13.22	19.44	4.31	9,302.52
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	1,097.12	402.39	78.87	128,619.05
Extended Dry Ponds	cumulative	Acres Treated	1,619.76	2,381.08	232.87	1,139,351.21
Infiltration Practices	cumulative	Acres Treated	14.28	86.63	8.78	15,906.12
Filtering Practices	cumulative	Acres Treated	39.03	114.75	16.95	36,607.07
BioRetention	cumulative	Acres Treated	23.77	101.94	11.76	20,898.25
BioSwale	cumulative	Acres Treated	1.37	7.06	0.75	1,287.55
Permeable Pavement	cumulative	Acres Treated	0.55	1.89	0.20	452.22
Vegetated Open Channel	cumulative	Acres Treated	0.07	0.13	0.01	46.28
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	0.41	0.37	0.04	74.80
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				3,115.69	354.54	1,352,545.08
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	3.99	15.15	(0.85)	5,519.98
Urban Forest Buffers	cumulative	Acres in Buffers	8.59	51.06	10.25	7,313.97
Urban Tree Planting	cumulative	Acres	11.28	-	-	-
Urban Forest Planting	cumulative	Acres	433.49	1,885.95	375.70	152,202.21
Urban Nutrient Management	annual	Acres	11,190.87	-	-	-
Urban Stream Restoration	cumulative	Feet	988.43	62.77	55.40	146,528.16
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	2.72	0.24	0.17	446.73
Septic Connections	cumulative	Number of Systems	74.97	519.70	-	-
Septic Denitrification	cumulative	Number of Systems	23.57	107.98	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				2,642.84	440.67	312,011.05
Middle Gwynns Falls Watershed Load Reduction Summary				53,639.96	2,554.73	5,089,897.66

Sassafras River Cecil & Kent Co.	Duration	Unit	Measure	LBS Reduced Nitrogen	 Phosphorus	 Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	19,391.44	24,316.29	-	-
Rate Nitrogen	annual	Acres	6,462.91	2,935.84	-	-
Placement Nitrogen	annual	Acres	1,273.39	1,265.64	-	-
Timing Nitrogen	annual	Acres	1,021.60	1,009.97	-	-
Core Phosphorus	annual	Acres	19,391.44	-	2,602.07	-
Rate Phosphorus	annual	Acres	539.54	-	28.65	-
Placement Phosphorus	annual	Acres	1,108.53	-	29.08	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				29,527.75	2,659.80	-
Tillage Management						
Conservation	annual	Acres	4,464.88	4,430.58	775.97	1,277,481.83
Continuous High Residue	annual	Acres	14,882.94	36,674.30	3,513.48	8,204,982.21
Low Residue	annual	Acres	-	-	-	-
TOTAL				41,104.88	4,289.45	9,482,464.04
Cover Crop						
Traditional	annual	Acres	11,229.88	49,827.92	92.12	38,847.96
Commodity	annual	Acres	3,114.16	6,230.44	-	-
TOTAL				56,058.36	92.12	38,847.96
Pasture Management						
Alternative Watering	cumulative	Acres	144.00	67.81	19.99	73.54
Prescribed Grazing	cumulative	Acres	99.42	86.39	40.41	158.16
Horse Pasture Management	cumulative	Acres	3.29	-	1.10	6.90
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	1.50	146.86	39.32	20,956.49
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	3.38	193.20	49.99	29,484.09
TOTAL				494.25	150.81	50,679.18
Forest Buffers	cumulative	Acres in Buffers	118.14	7,344.81	115.24	155,504.16
Wetland Restoration	cumulative	Acres	43.56	1,850.85	49.73	50,003.53
Wetland Creation	cumulative	Acres	25.36	549.55	16.88	16,592.10
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	684.87	10,739.16	44.59	428,082.84
Grass Buffers	cumulative	Acres in Buffers	372.45	17,818.87	150.79	490,160.31
Tree Planting	cumulative	Acres	47.13	872.84	23.11	28,051.59
Alternative Crops	cumulative	Acres	5.23	99.86	(0.36)	3,507.82
Soil and Water Conservation Plan	cumulative	Acres	20,785.72	26,648.16	1,503.92	2,752,460.92
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	4,330.80	7,438.71	406.53	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	186.11	12.28	10.19	20,045.66
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				73,375.09	2,320.62	3,944,408.93
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	525.83	2,108.98	-	-
Saturated Buffer	cumulative	Acres	525.83	27,615.35	12.97	433,512.93
Sorbing Materials in Ag Ditches	cumulative	Acres	525.83	-	114.30	-
Water Control Structures	cumulative	Acres	525.83	2,908.73	-	-
TOTAL				32,633.07	127.27	433,512.93
Animal Waste Management Systems	cumulative	Animal Units	6,511.46	9,709.29	1,203.07	-
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	20.01	2,592.55	276.34	31,696.66
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	2,902.85	(905.18)	1,148.10	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				11,396.66	2,627.51	31,696.66
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	0.64	3.14	0.44	296.74
Storm Water Treatment Performance Standard	cumulative	Acres Treated	67.55	193.34	36.92	29,201.34
Wet Ponds & Wetlands	cumulative	Acres Treated	0.15	0.25	0.07	56.01
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	2.14	0.91	0.23	133.17
Extended Dry Ponds	cumulative	Acres Treated	-	-	-	-
Infiltration Practices	cumulative	Acres Treated	2.17	15.20	1.95	1,282.86
Filtering Practices	cumulative	Acres Treated	-	-	-	-
BioRetention	cumulative	Acres Treated	0.11	0.55	0.08	51.34
BioSwale	cumulative	Acres Treated	-	-	-	-
Permeable Pavement	cumulative	Acres Treated	-	-	-	-
Vegetated Open Channel	cumulative	Acres Treated	-	-	-	-
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	-	-	-	-
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				213.39	39.69	253.08
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	-	-	-	-
Urban Forest Buffers	cumulative	Acres in Buffers	0.55	4.54	0.90	315.80
Urban Tree Planting	cumulative	Acres	0.60	0.56	0.11	16.92
Urban Forest Planting	cumulative	Acres	0.37	2.34	0.42	116.43
Urban Nutrient Management	annual	Acres	3,645.54	2,291.04	181.79	-
Urban Stream Restoration	cumulative	Feet	-	-	-	-
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	0.15	0.01	0.01	25.27
Septic Connections	cumulative	Number of Systems	0.66	6.05	-	-
Septic Denitrification	cumulative	Number of Systems	118.45	702.14	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				3,006.69	183.23	474.43
Sassafras River Watershed Load Reduction Summary				247,810.13	12,490.50	13,982,337.20

Tidal Back River				LBS Reduced		
Permit Approval 2010/Baltimore City	Duration	Unit	Measure	Nitrogen	Phosphorus	Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	207.44	225.59	-	-
Rate Nitrogen	annual	Acres	75.51	25.28	-	-
Placement Nitrogen	annual	Acres	29.03	20.55	-	-
Timing Nitrogen	annual	Acres	4.63	3.10	-	-
Core Phosphorus	annual	Acres	207.44	-	10.84	-
Rate Phosphorus	annual	Acres	2.50	-	0.07	-
Placement Phosphorus	annual	Acres	16.42	-	0.22	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				274.52	11.13	-
Tillage Management						
Conservation	annual	Acres	43.34	72.26	8.51	11,442.39
Continuous High Residue	annual	Acres	144.48	341.15	34.97	73,491.82
Low Residue	annual	Acres	-	-	-	-
TOTAL				413.41	43.49	84,934.22
Cover Crop						
Traditional	annual	Acres	47.19	176.97	0.12	123.88
Commodity	annual	Acres	29.46	45.32	-	-
TOTAL				222.30	0.12	123.88
Pasture Management						
Alternative Watering	cumulative	Acres	14.63	4.23	0.09	4.70
Prescribed Grazing	cumulative	Acres	3.64	2.29	0.09	3.46
Horse Pasture Management	cumulative	Acres	3.96	-	0.10	5.04
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	0.01	0.11	0.03	6.08
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	0.18	2.88	0.88	179.83
TOTAL				9.51	1.20	199.11
Forest Buffers	cumulative	Acres in Buffers	1.29	58.11	0.69	1,305.07
Wetland Restoration	cumulative	Acres	0.23	6.23	0.12	176.35
Wetland Creation	cumulative	Acres	0.02	0.35	0.01	10.75
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	2.85	32.77	0.70	1,384.36
Grass Buffers	cumulative	Acres in Buffers	2.14	74.53	0.79	2,204.31
Tree Planting	cumulative	Acres	0.19	2.43	0.04	79.83
Alternative Crops	cumulative	Acres	-	-	-	-
Soil and Water Conservation Plan	cumulative	Acres	169.88	141.34	5.50	15,329.10
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	4.78	6.02	0.30	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	378.33	19.93	16.45	26,457.09
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				341.71	24.59	46,946.87
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	0.07	0.24	-	-
Saturated Buffer	cumulative	Acres	0.07	3.02	0.02	45.10
Sorbing Materials in Ag Ditches	cumulative	Acres	0.07	-	0.01	-
Water Control Structures	cumulative	Acres	0.07	0.27	-	-
TOTAL				3.52	0.02	45.10
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	0.31	1.90	0.15	175.24
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	0.28	0.31	0.01	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				2.20	0.16	175.24
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	64.78	161.62	16.01	20,925.57
Storm Water Treatment Performance Standard	cumulative	Acres Treated	676.31	985.17	131.34	203,644.65
Wet Ponds & Wetlands	cumulative	Acres Treated	0.27	0.39	0.07	114.96
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	48.59	17.18	2.91	3,396.39
Extended Dry Ponds	cumulative	Acres Treated	342.55	484.41	41.07	143,664.05
Infiltration Practices	cumulative	Acres Treated	1.26	7.37	0.65	839.29
Filtering Practices	cumulative	Acres Treated	0.06	0.17	0.02	34.32
BioRetention	cumulative	Acres Treated	2.84	11.72	1.17	1,489.25
BioSwale	cumulative	Acres Treated	3.14	15.55	1.42	1,756.61
Permeable Pavement	cumulative	Acres Treated	-	-	-	-
Vegetated Open Channel	cumulative	Acres Treated	-	-	-	-
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	0.05	0.04	0.00	5.12
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				1,683.63	194.67	375,870.21
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	2.52	9.24	-	2,819.15
Urban Forest Buffers	cumulative	Acres in Buffers	1.23	8.19	1.12	654.48
Urban Tree Planting	cumulative	Acres	4.13	1.43	0.27	221.22
Urban Forest Planting	cumulative	Acres	68.71	348.38	44.53	18,334.49
Urban Nutrient Management	annual	Acres	4,723.27	2,329.33	127.24	-
Urban Stream Restoration	cumulative	Feet	750.78	39.55	32.64	52,503.63
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	0.04	0.00	0.00	6.03
Septic Connections	cumulative	Number of Systems	53.50	348.73	-	-
Septic Denitrification	cumulative	Number of Systems	3.96	16.70	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				3,101.55	205.80	74,539.00
Tidal Back River Watershed Load Reduction Summary				6,052.35	481.18	582,833.63

Upper Back River Baltimore City	Duration	Unit	Measure	LBS Reduced Nitrogen	Phosphorus	Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	10.07	-	-	-
Rate Nitrogen	annual	Acres	3.96	-	-	-
Placement Nitrogen	annual	Acres	1.52	-	-	-
Timing Nitrogen	annual	Acres	0.24	-	-	-
Core Phosphorus	annual	Acres	10.07	-	-	-
Rate Phosphorus	annual	Acres	0.13	-	-	-
Placement Phosphorus	annual	Acres	0.86	-	-	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				-	-	-
Tillage Management						
Conservation	annual	Acres	1.39	-	-	-
Continuous High Residue	annual	Acres	4.64	-	-	-
Low Residue	annual	Acres	-	-	-	-
TOTAL				-	-	-
Cover Crop						
Traditional	annual	Acres	2.21	-	-	-
Commodity	annual	Acres	0.76	-	-	-
TOTAL				-	-	-
Pasture Management						
Alternative Watering	cumulative	Acres	0.87	-	-	-
Prescribed Grazing	cumulative	Acres	0.22	-	-	-
Horse Pasture Management	cumulative	Acres	0.23	-	-	-
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	-	-	-	-
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	-	-	-	-
TOTAL				-	-	-
Forest Buffers	cumulative	Acres in Buffers	0.07	-	-	-
Wetland Restoration	cumulative	Acres	0.01	-	-	-
Wetland Creation	cumulative	Acres	0.00	-	-	-
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	0.14	-	-	-
Grass Buffers	cumulative	Acres in Buffers	0.11	-	-	-
Tree Planting	cumulative	Acres	0.03	-	0.00	1.14
Alternative Crops	cumulative	Acres	-	-	-	-
Soil and Water Conservation Plan	cumulative	Acres	9.20	-	-	-
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	0.24	-	-	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	448.80	28.50	25.16	66,531.05
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				28.50	25.16	66,532.19
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	0.01	-	-	-
Saturated Buffer	cumulative	Acres	0.01	-	-	-
Sorbing Materials in Ag Ditches	cumulative	Acres	0.01	5.45	0.45	32.19
Water Control Structures	cumulative	Acres	0.01	-	-	
TOTAL				5.45	0.45	32.19
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	0.02	-	-	-
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	-	-	-	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				-	-	-
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	-	-	-	-
Storm Water Treatment Performance Standard	cumulative	Acres Treated	-	-	-	-
Wet Ponds & Wetlands	cumulative	Acres Treated	79.58	116.99	25.92	55,977.88
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	45.41	16.66	3.26	5,323.95
Extended Dry Ponds	cumulative	Acres Treated	44.46	65.35	6.39	31,272.17
Infiltration Practices	cumulative	Acres Treated	0.16	0.96	0.10	177.03
Filtering Practices	cumulative	Acres Treated	0.22	0.66	0.10	210.50
BioRetention	cumulative	Acres Treated	6.18	26.51	3.06	5,434.50
BioSwale	cumulative	Acres Treated	0.17	0.88	0.09	161.00
Permeable Pavement	cumulative	Acres Treated	0.00	0.00	0.00	0.30
Vegetated Open Channel	cumulative	Acres Treated	0.00	0.00	0.00	1.20
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	0.01	0.01	0.00	2.74
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				228.03	38.92	98,561.24
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	0.13	0.50	(0.03)	181.33
Urban Forest Buffers	cumulative	Acres in Buffers	2.15	12.77	2.56	1,828.91
Urban Tree Planting	cumulative	Acres	3.46	-	-	-
Urban Forest Planting	cumulative	Acres	174.34	758.50	151.10	61,212.94
Urban Nutrient Management	annual	Acres	8,146.14	-	-	-
Urban Stream Restoration	cumulative	Feet	20.53	1.30	1.15	3,043.78
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	13.94	1.20	0.85	2,285.66
Septic Connections	cumulative	Number of Systems	3.06	21.19	-	-
Septic Denitrification	cumulative	Number of Systems	2.22	10.15	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				805.62	155.64	68,552.62
Upper Back River Watershed Load Reduction Summary				1,067.59	220.17	233,678.24

Upper Choptank River Talbot, Caroline, & Queen Anne's Co.	Duration	Unit	Measure	LBS Reduced Nitrogen	Phosphorus	Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	36,190.92	95,337.34	124.05	-
Rate Nitrogen	annual	Acres	10,655.61	8,686.87	-	-
Placement Nitrogen	annual	Acres	3,838.08	7,885.15	-	-
Timing Nitrogen	annual	Acres	5,660.51	9,817.81	-	-
Core Phosphorus	annual	Acres	36,190.92	-	9,032.20	-
Rate Phosphorus	annual	Acres	3,265.76	-	420.92	-
Placement Phosphorus	annual	Acres	1,900.60	-	119.10	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				121,727.17	9,696.27	-
Tillage Management						
Conservation	annual	Acres	10,167.26	11,438.68	2,623.62	1,524,426.41
Continuous High Residue	annual	Acres	33,890.89	114,386.50	12,676.71	9,791,042.34
Low Residue	annual	Acres	-	-	-	-
TOTAL				125,825.18	15,300.33	11,315,468.76
Cover Crop						
Traditional	annual	Acres	13,269.68	82,822.55	153.85	22,582.43
Commodity	annual	Acres	7,157.82	18,139.37	-	-
TOTAL				100,961.92	153.85	22,582.43
Pasture Management						
Alternative Watering	cumulative	Acres	26.57	13.84	3.94	31.59
Prescribed Grazing	cumulative	Acres	62.77	58.25	26.56	277.75
Horse Pasture Management	cumulative	Acres	9.43	-	3.37	68.04
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	0.07	3.58	1.14	478.22
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	1.85	90.27	28.65	14,451.09
TOTAL				165.94	63.66	15,306.68
Forest Buffers	cumulative	Acres in Buffers	81.65	6,898.64	174.52	62,183.64
Wetland Restoration	cumulative	Acres	338.12	18,256.39	714.25	199,552.33
Wetland Creation	cumulative	Acres	5.18	172.68	8.02	2,009.48
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	172.55	4,472.52	55.95	59,858.95
Grass Buffers	cumulative	Acres in Buffers	1,104.83	72,471.27	1,478.02	834,362.94
Tree Planting	cumulative	Acres	100.13	2,874.39	119.84	35,450.82
Alternative Crops	cumulative	Acres	0.20	5.49	0.07	71.26
Soil and Water Conservation Plan	cumulative	Acres	30,237.04	59,306.41	4,438.77	2,375,955.76
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	273.85	749.99	48.16	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	1,092.17	67.45	57.86	62,462.86
Non Urban Shoreline Management	cumulative	Feet	0.01	0.00	0.00	1.64
TOTAL				165,275.23	7,095.46	3,631,909.68
Agricultural Drainage Management	cumulative	Acres	651.65			
Denitrifying Ditch Bioreactors	cumulative	Acres	162.91	919.16	-	-
Saturated Buffer	cumulative	Acres	162.91	13,483.71	63.01	59,399.13
Sorbing Materials in Ag Ditches	cumulative	Acres	162.91	-	69.94	-
Water Control Structures	cumulative	Acres	162.91	1,349.76	-	-
TOTAL				15,752.64	132.95	59,399.13
Animal Waste Management Systems	cumulative	Animal Units	165,715.00	126,743.90	6,478.61	-
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	8.17	1,899.27	97.02	459.35
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	141.76	173.39	64.29	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	739.15	347.24	0.45	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				129,163.81	6,640.37	459.35
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	-	-	-	-
Storm Water Treatment Performance Standard	cumulative	Acres Treated	2.77	9.61	1.02	333.28
Wet Ponds & Wetlands	cumulative	Acres Treated	0.08	0.18	0.03	8.98
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	0.00	0.00	0.00	0.00
Extended Dry Ponds	cumulative	Acres Treated	-	-	-	-
Infiltration Practices	cumulative	Acres Treated	0.00	0.01	0.00	0.11
Filtering Practices	cumulative	Acres Treated	-	-	-	-
BioRetention	cumulative	Acres Treated	-	-	-	-
BioSwale	cumulative	Acres Treated	0.00	0.01	0.00	0.10
Permeable Pavement	cumulative	Acres Treated	-	-	-	-
Vegetated Open Channel	cumulative	Acres Treated	-	-	-	-
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	-	-	-	-
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				9.81	1.05	342.47
Erosion and Sediment Control	annual	Acres		-	-	-
Impervious Surface Reduction	cumulative	Acres	-	-	-	-
Urban Forest Buffers	cumulative	Acres in Buffers	-	-	-	-
Urban Tree Planting	cumulative	Acres	-	-	-	-
Urban Forest Planting	cumulative	Acres	-	-	-	-
Urban Nutrient Management	annual	Acres	7,917.43	6,657.91	337.60	-
Urban Stream Restoration	cumulative	Feet	-	-	-	-
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	0.13	0.01	0.01	21.32
Septic Connections	cumulative	Number of Systems	-	-	-	-
Septic Denitrification	cumulative	Number of Systems	175.86	1,113.65	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres		-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				7,771.57	337.61	21.32
Upper Choptank River Watershed Load Reduction Summary				666,653.27	39,421.55	15,045,489.83

Upper Jennings Run Allegany County	Duration	Unit	Measure	LBS Reduced Nitrogen	Phosphorus	Sediment
Agriculture Practices						
Nutrient Management						
Core Nitrogen	annual	Acres	873.83	224.49	-	-
Rate Nitrogen	annual	Acres	105.59	21.15	-	-
Placement Nitrogen	annual	Acres	17.06	3.59	-	-
Timing Nitrogen	annual	Acres	2.57	1.01	-	-
Core Phosphorus	annual	Acres	873.83	-	12.80	-
Rate Phosphorus	annual	Acres	6.21	-	0.11	-
Placement Phosphorus	annual	Acres	12.34	-	0.10	-
Timing Phosphorus	annual	Acres	-	-	-	-
TOTAL				250.24	13.01	-
Tillage Management						
Conservation	annual	Acres	36.93	68.93	12.40	68,875.00
Continuous High Residue	annual	Acres	123.09	322.31	54.54	442,371.36
Low Residue	annual	Acres	-	-	-	-
TOTAL				391.24	66.94	511,246.36
Cover Crop						
Traditional	annual	Acres	34.33	108.44	0.72	2,255.58
Commodity	annual	Acres	1.24	1.55	-	-
TOTAL				110.00	0.72	2,255.58
Pasture Management						
Alternative Watering	cumulative	Acres	271.53	96.59	3.79	526.50
Prescribed Grazing	cumulative	Acres	68.42	53.45	2.86	405.65
Horse Pasture Management	cumulative	Acres	2.86	-	0.10	22.58
Forest Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	6.11	181.00	50.99	30,602.02
Grass Buffers on Fenced Pasture Corridor	cumulative	Acres in Buffers	3.82	375.72	110.81	67,125.98
TOTAL				706.76	168.54	98,682.72
Forest Buffers	cumulative	Acres in Buffers	73.23	2,125.39	39.38	190,544.03
Wetland Restoration	cumulative	Acres	0.19	2.69	0.07	258.97
Wetland Creation	cumulative	Acres	-	-	-	-
Wetland Enhancement and Rehabilitation	cumulative	Acres	-	-	-	-
Land Retirement	cumulative	Acres	73.04	458.57	4.01	95,251.10
Grass Buffers	cumulative	Acres in Buffers	2.99	67.85	0.48	8,302.25
Tree Planting	cumulative	Acres	30.23	246.12	5.49	26,613.80
Alternative Crops	cumulative	Acres	-	-	-	-
Soil and Water Conservation Plan	cumulative	Acres	1,201.01	510.77	33.89	210,445.96
Crop Irrigation Management	cumulative	Acres	-	-	-	-
Manure Incorporation	annual	Acres	-	-	-	-
Capture & Reuse	annual	Acres	-	-	-	-
Non Urban Stream Restoration	cumulative	Feet	242.16	13.79	8.34	21,433.89
Non Urban Shoreline Management	cumulative	Feet	-	-	-	-
TOTAL				3,425.18	91.65	552,850.00
Agricultural Drainage Management						
Denitrifying Ditch Bioreactors	cumulative	Acres	3.17	11.88	-	-
Saturated Buffer	cumulative	Acres	3.17	118.75	1.46	14,777.55
Sorbing Materials in Ag Ditches	cumulative	Acres	3.17	-	0.35	-
Water Control Structures	cumulative	Acres	3.17	8.57	-	-
TOTAL				139.20	1.80	14,777.55
Animal Waste Management Systems						
Broiler Mortality Freezers	annual	Dry Tons (Carcasses)	-	-	-	-
Barnyard Runoff Control & Loafing Lot Management	cumulative	Acres	1.13	3.16	-	669.56
Ag Stormwater Management	cumulative	Acres Treated	-	-	-	-
Manure Transport	annual	Dry Tons	-	-	-	-
Dairy Precision Feeding	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Litter Amendments)	annual	Animal Units	-	-	-	-
Ammonia Emission Reductions (Biofilters)	cumulative	Animal Units	-	-	-	-
Ammonia Emission Reductions (Lagoon Covers)	cumulative	Animal Units	-	-	-	-
TOTAL				3.16	-	669.56
Urban/Suburban Practices						
Stormwater Management						
Runoff Reduction Performance Standard	cumulative	Acres Treated	-	-	-	-
Storm Water Treatment Performance Standard	cumulative	Acres Treated	6.36	19.53	1.73	11,216.13
Wet Ponds & Wetlands	cumulative	Acres Treated	-	-	-	-
Floating Treatment Wetlands	cumulative	Acres Treated (Wet Pond)	-	-	-	-
Dry Ponds	cumulative	Acres Treated	254.51	953.54	-	-
Extended Dry Ponds	cumulative	Acres Treated	2.90	5.29	0.31	4,365.59
Infiltration Practices	cumulative	Acres Treated	4.71	35.46	2.14	11,219.28
Filtering Practices	cumulative	Acres Treated	0.47	1.71	0.15	941.29
BioRetention	cumulative	Acres Treated	19.19	102.24	7.02	36,106.84
BioSwale	cumulative	Acres Treated	8.61	55.03	3.46	17,281.67
Permeable Pavement	cumulative	Acres Treated	0.12	0.51	0.03	210.15
Vegetated Open Channel	cumulative	Acres Treated	-	-	-	-
Urban Filter Strips	cumulative	Acres Treated	-	-	-	-
Grey Infrastructure (IDDE)	annual	Acres Treated	-	-	-	-
Impervious Disconnection	cumulative	Acres Treated	-	-	-	-
Conservation Landscaping Practices	cumulative	Acres Treated	-	-	-	-
TOTAL				1,173.32	14.85	81,340.94
Erosion and Sediment Control	annual	Acres	-	-	-	-
Impervious Surface Reduction	cumulative	Acres	1.20	5.53	-	4,041.10
Urban Forest Buffers	cumulative	Acres in Buffers	37.22	336.56	33.55	82,790.22
Urban Tree Planting	cumulative	Acres	23.51	17.29	1.86	9,959.06
Urban Forest Planting	cumulative	Acres	-	-	-	-
Urban Nutrient Management	annual	Acres	2,310.12	1,514.14	58.24	-
Urban Stream Restoration	cumulative	Feet	310.00	17.65	10.67	27,438.51
Storm Drain Cleanout	annual	Lbs of Sediment	-	-	-	-
Street Sweeping	annual	Acres	-	-	-	-
Urban Shoreline Management	cumulative	Feet	-	-	-	-
Septic Connections	cumulative	Number of Systems	2.39	15.58	-	-
Septic Denitrification	cumulative	Number of Systems	7.01	29.53	-	-
Septic Pumping	annual	Number of Systems	-	-	-	-
Resource Practices						
Forest Harvesting Practices	annual	Acres	-	-	-	-
Dirt&Gravel Road E&S	cumulative	Feet	-	-	-	-
Non-Tidal Algal Flow-way	annual	Acres	-	-	-	-
Tidal Algal Flow-way	annual	Acres	-	-	-	-
TOTAL				1,936.29	104.32	124,228.90
Upper Jennings Run Watershed Load Reduction Summary				8,135.38	461.84	1,386,051.62

Appendix C | Milestones and BMP Goals

Priority Milestones for the Phase III Chesapeake Bay WIP

	Milestone	Agency	Steps to Achieve MS Goals	Deliverable
Agriculture	**Agricultural Drainage Management**	MDA	1) Add drainage management BMPs to MACS Program 2) Collaborate with Conservation Partners to identify opportunities for implementation. 3) Provide appropriate training for drainage management BMP design & installation.	**4,156 acres managed under Agricultural Drainage Management**
	Pasture and Grazing Management	MDA	1) Identify opportunities for additional stream exclusion fencing 2) Working with NRCS, MDA will conduct grazing management training for field staff 3) Re-engage the Horse Outreach Workgroup to provide technical assistance to equine operations 4) Collaborate with conservation partners in securing additional funding to support pasture/grazing operations management.	**292 Total Acres under Horse Pasture Management** **3,232 Total Acres under Prescribed Grazing**
	Increase Conservation Practice Adoption on Leased Land	MDA	1) Work with conservation partners regarding outreach/education to non-operating landowners 2) Explore options to incentivize conservation participation with non-operation landowners 3) Work with conservation partners to evaluate/combine existing stewardship recognition programs (Certainty, FSCAP, CSP etc)	**# of Landowners reached**

	Increased Technical Assistance	MDA, MDDNR	1) MDA has worked with the Governor's office to propose a reallocation of funding from the Chesapeake and Atlantic Coastal Bays Trust Fund to support up to 53 State positions within Maryland that will provide direct technical assistance to farmers and boost the State's BMP verification program to support the WIP. While the funding reallocation was approved, the timeline for hiring is currently being evaluated given the anticipated fiscal impact from COVID-19. 2) In agreements between the Resource Conservation Program and Soil Conservation Districts, funding distribution has been aligned with demonstrated progress towards WIP goals at the local level.	**# of Positions Created**
Natural Filters	**Oyster Reef Restoration**	DNR	1) Complete restoration in Little Choptank River (2020) 2) Complete an initial planting in the Tred Avon River (2021) 3) Complete the final planting in Harris Creek (2020) 4) Complete the final restoration blueprints and begin restoration activities for St. Mary's and Manokin restorations 5) Continue monitoring and sampling to ensure successful metrics as defined by the Chesapeake Bay Agreement	**177.2 Acres of restored oyster reefs** **Completed Blueprints for St. Mary's and Manokin restoration sites**
	Forest Market Strategy	DNR	1) Promote local forest product markets, which include value-added products and woody biomass used for local generation of thermal energy and electricity. 2) Fund silviculture needed for forest health and to attract private investment that preserves existing forest and expands forests.	**Completed Maryland Economic Adjustment Strategy that supports sustainable forestry**

	Incentivise Forest Conservation in Developed Sector	MDE	Include forest conservation measures within the updated Accounting Guidance for the fifth generation Phase I MS4 permits	**Increased implementation of these practices documented in the annual reports**
Stormwater	**Finalize the next generation Phase I MS4 permits**	MDE	1) Issue final determinations for the next generation Phase I MS4 permits for five large and five medium jurisdictions 2) Issue tentative determination for the State Highway Administration's Phase I MS4 permit 3) Issue accounting guidance for the fifth-generation permit 4) Additional impervious acre retrofit requirement of approximately 2 percent per permit year, in aggregate, from the dates when the permits are issued	**Large permits issued and enforced** **Issue Accounting Guidance** **Medium permits issued and enforced**
	Atmospheric Deposition	MDE	Investigate opportunities to receive model credit for NOx emissions reductions strategies identified in Maryland's Phase III WIP	**Initiate process for crediting non-VW-settlement NOx reductions within bay accounting framework**

	Milestone	Agency	Steps to Achieve MS Goals	Deliverable
Agriculture	**Traditional Cover Crop Implementation**	MDA	1) Continue to work with the agricultural community to ensure strong participation in the Maryland Cover Crop Program. 2) Continue to evaluate and refine program policies in consideration of environmental and economic factors. 3) Develop a Soil Health Program that will also help promote the benefits of cover crops in row crop production.	**470,000 acres of traditional cover crop**
	Soil Conservation and Water Quality Planning	MDA	1) Continue to work with USDA-NRCS and local Soil Conservation Districts in SCWQP development 2) Work with the Conservation Partnership to identify and address Technical Assistance gaps.	**1,000,000 acres managed under a Conservation Plan**
	Tillage Management	MDA	1) Through the Soil Health Program, highlight the co-benefits provided by long-term utilization of tillage management practices.	**Work towards 248,000 acres of conservation tillage annually** **643,000 acres of high residue tillage annually**
	Animal Waste Management Systems	MDA	1) Continue to work with USDA-NRCS and local Soil Conservation Districts to identify and address resource concerns in the area of animal waste management. 2) Continued funding of storage facilities through MACS and EQIP.	**Poultry - 100% AU** **Dairy - 90% AU** **Livestock - 50% AU**

	Grass & Riparian Buffers	MDA	1) Incentivize implementation of grass buffers through enrollment in the Conservation Reserve Enhancement Program. 2) Collaborate with Conservation Partners to identify implementation opportunities in conjunction with other practices.	**Additional 605 acres a year**
	Nutrient Management Core Nitrogen	MDA	1) Continue to work with the agricultural community to ensure fertilizers, manure, and other nutrient sources are applied in an effective and environmentally sound manner. 2) Continue to provide education and training regarding proper nutrient application in adherence with a nutrient management plan and all current regulations.	**70% compliance rate**
	Pocomoke and Wicomico River Basins	MDA	Data from 2014 to 2016 showed the Pocomoke and Wicomico Rivers as having some of the highest levels of summer dissolved oxygen open water criteria exceedances in Maryland. EPA's evaluation of Maryland's Phase III WIP recommended that the state, "target implementation in the most impaired segments." Wicomico, Worcester, and Somerset counties, where the Pocomoke and Wicomico river basins are located, have collectively committed to: 1) Working within the Soil Conservation District partnership to address natural resource concerns and provide direct technical assistance, planning an additional 1,800 acres a year. 2) An additional 1,800 acres treated through agricultural drainage management practices by 2021. 3) Continuing to manage 100% of their poultry waste through animal waste management practices, as well as a 10% increase of	**Regionally** **109,404 acres managed under a conservation plan** **An additional 1,800 acres treated through Ag Drainage Management Practices** **Animal Waste Management Systems:**

			the amount of livestock waste managed by 2021.	**Poultry - 100% AU** **Livestock - 50% AU**
	Phosphorus Management Tool	MDA	1) Continue to fund and support the Manure Transport Program which provides financial assistance to farmers for transportation of manure to a producer or alternative use facility where it can be utilized in accordance with a Nutrient Management Plan. 2) Continue to work with Delmarva Land to Litter Collaborative and other partners, identifying solutions to the challenge of managing litter in order to achieve our water quality goals. 3) Continue to work within Soil Conservation Districts to identify and address resource concerns in the area of animal waste management as well as provide continued funding of storage facilities through MACS and EQIP, as highlighted in our Animal Waste Management System milestones.	**Manure Transport Funding Support** **Animal Waste Management System Milestones**
	New CAFO Permit	MDE	1) Renew general CAFO permit by December 1, 2020. 2) Prioritize the registry of the remaining 19 CAFOs that were missed in the 2017under 2019 general permit. 3) Begin the renewal of facilities under the 2014 permit into the 2020 permit.	**New Permit Issuance** **Registration of remaining 19 CAFOs not under 2014 permit** **# of CAFOs under new permit**

Natural Filters	**Expand existing tree planting programs**	DNR, MDE	1) Work in 5 counties to increase the number of contracts on residential properties in the Lawn to Woodland program. 2) Providing economic incentives through the "Marylanders Plant Trees" program which encourages citizens to plant individual trees on residential properties. 3) Incentivize tree planting and forest buffers through updated Accounting Guidance for fifth-generation MS4 permits 4) Continuing with the Healthy Forests, Healthy Waters initiative, prioritize riparian buffer plantings through decision criteria scoring	**Maintain contract numbers in Lawn to Woodland program** **Maintain number of vouchers provided in Marylanders Plant Trees program** **300 acres planted via Healthy Forests, Healthy Waters**
	Maryland Stream ReLeaf	DNR	1) Establish partnerships to identify focus areas and complementary programs that expand forest buffers 2) Identify riparian forest buffer priority projects in the Lower Susquehanna watershed (Cecil and Harford Counties)	**2 meetings per year to coordinate the partnership** **Develop riparian forest buffer restoration and conservation strategies for the program**
	Incorporate Conservation Plus	DNR, MDP	For the first time, land conservation activities will count toward our Bay goals. This is due to the fact that the Chesapeake Bay Program (CBP) now considers land conservation a best management practice (BMP) similar to cover crops, septic system upgrades, wetlands restoration, and oyster aquaculture. Maryland is recognized as a leader in land conservation and, in order to take advantage of this new opportunity, will:	**Sustained levels of state funding for Program Open Space, Rural Legacy, and Maryland Agricultural Land Preservation Foundation.**

			1) sustain funding for state land conservation and preservation programs to support the expected 2019-2025 forecast. Maryland will continue to support the Maryland Agricultural Land Preservation Foundation, Rural Legacy Program, and Program Open Space State-side. 2) Work with state agencies and local governments to apply state and local land conservation programs as appropriate to reduce the modelled impacts to the bay of future growth, maximize bay health restoration opportunities, and mitigate the impacts of climate change to our natural and built infrastructures.	**Refined targeting of Maryland's land conservation programs to address impacts from modelled future growth and climate change**
On-Site Disposal Systems	**Septic Upgrades to BAT**	MDE	1) Continue to use the Bay Restoration Fund to upgrade septic systems to Best Available Technology (BAT) within the Critical Area	**Fund 1800 BAT upgrades in the critical area**
	Regulations Amendment	MDE	Amend regulations to include loading rate decreases when Best Available Technology (BAT) or Membrane Bioreactor (MBR) technology is utilized for systems that discharge <5,000 gallons per day.	**Regulation Amendment**
	Bermed Infiltration Pond Removal	MDE	1) Identify priority systems 2) Remove discharge permit and connect to Wastewater facilities There are 8 large facilities and approximately 40 small facilities	**Work on 8 large facilities as priority**

Stormwater	**Stormwater Goals**	MDE	1) Before the next Phase I permit can be issued, permittees are required to perform a "Maximum Extent Practicable" (MEP) analysis of their programs to determine the BMP implementation level that they could reasonably achieve with available and future funding levels.	**MEP analyses for all Phase I MS4 permittees**
	Implementation of SW goals	MDE	1) In the next Phase 1 MS4 permits, establish a requirement that milestones for implementation will be included in the jurisdictions' annual reports. 2) Review all Phase I MS4 Annual Reports, any new MEP analyses, and fiscal analyses on an annual basis for ensuring MS4 permit compliance	**Collection of milestones from Annual Reports** **Annual Report and FAP Review for all jurisdictions in 2021**
	Urban Nutrient Management	MDA	1) Continue to support and expand the management of nutrient applications on urban land	**285,000 acres managed under urban NM - Commercial Applicator** **466,000 acres managed under urban NM - DIY Applicator**
	Industrial Stormwater Compliance	MDE	1) Continue to work with industrial sites to bring unpermitted sites into compliance 2) Focus on areas with requests for residual designation	**Report on number of sites brought into compliance**

	Phase II MS4 Permit Compliance	MDE	1) The most recent Phase II MS4 permit was issued on October 31, 2018. 2) MDE continues to provide extensive outreach and assistance with Phase II permittees so they understand permit conditions and obligations. 3) Currently there are a total of 89 municipal, State, and federal permittees throughout Maryland which are submitting annual reports which MDE will review. 4) In year one, MDE will assist with development of their permit baselines that will be used to drive implementation for the next permit iteration. 5) Years 2 through 5 will be used to develop their BMP implementation plans to meet the third generation permit conditions.	**# of annual reports completed and reviewed by MDE** **Preliminary BMP Implementation goals**

Appendix D | Priority Watershed Details

This appendix provides details for projects funding by the 319(h) Grant (*pages D - 2 to D - 6*). Table D - 1 (*Table 3 in the main report*) provides a summary of the 319 Priority Watershed status.

For details on total spending by priority watershed, see Appendix A; for details on total NPS reduction by watershed, see Appendix B. All projects are complete unless specified otherwise. Projects generally take two years to complete from the initial funding date.

Table D - 1: *Summary of Maryland's 319 Priority Watersheds*

Priority Watershed	**Plan Start Date**	**Funding** *(Total)* State | 319 | Total	**Reductions** (lbs/yr) TN | TP | TSS
Antietam Creek	2012	$ 1.2M | $ 3.1M | $ 4.2M	-7.1K | -4.7K | -1.8M
Assawoman Bay	2020	$ 56K | $ 0.4 | $ 0.4	0.7K | 0.01K | 25K
Back River-Tidal	2010	$18.8M | $ 1.8M | $20.5M	0.0K | 0.1K | -1.1M
Back River-Upper	2008	$ 0.0M | $ 0.0M | $ 0.0M	0.6K | 0.8K | -0.3M
Casselman River	2011	$ 0.0M | $ 0.1M | $ 0.1M	-13.4K | -0.1K | -7.2M
Choptank-Upper	2010	$ 0.7M | $ 0.8M | $ 1.5M	52.5K | 5.9K | 4.5M
Corsica River	2004	$ 1.7M | $ 2.1M | $ 3.8M	22.4K | 4.1K | -1.2M
Gwynns Falls-Middle	2014	$ 3.2M | $ 1.1M | $ 4.3M	-1.4K | -0.2K | -1.0M
Jennings Run	2019	$ 0.0M | $ 0.0M | $ 0.0M	0.0K | 0.0K | 0.0M
Jones Falls-Lower	2008	$ 6.8M | $ 0.5M | $ 7.3M	4.6K | 2.1K | 0.7M
Monocacy River-Lower	2008	$ 1.6M | $ 1.1M | $ 2.8M	0.6K | 10.1K | -18.4M
Sassafras River	2009	$ 4.6M | $ 0.4M | $ 5.0M	39.4K | 0.8K | 2.2M
Watershed Totals		**$38.6M | $10.4M | $49.0M**	**98.3K | 19.0K | -23.6M**

Project Details | 319(h) Grant Funded Projects

The following tables (*D - 2 to D - 13)* provide detailed project information for different 319(h) Grant funded projects occurring between the watershed plan approval date and SFY 2020 Estimated load reductions come from the approved watershed plans.

Table D - 2: *Antietam Creek 319(h) Grant funded projects*

Antietam Creek | Watershed Plan Approved 2012							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Shank/Anderson Project Phase 2 of 3	2012	319 FFY11	$64,266	28	3	7,134	166
Devils Backbone Park Stream Restoration	2012	319 FFY11	$267,964	300	102	465	0
Kiwanis Park Stream Stabilization Phase 2	2013	319 FFY12	$46,000	34	10	36	0
Greensburg Rd Little Antietam Creek Restoration	2013	319 FFY12	$240,000	110	37	171	0
Barr Property Stream Restoration Ph1	2014	319 FFY13	$148,930	24	5	6	0
Kiwanis Park Stream Stabilization Phase 1	2015	319 FFY14	$124,998	34	10	34	0
Devils Backbone Park Stream Restoration	2015	319 FFY14	$390,000	300	102	465	0
Barr Property Stream Restoration Ph2	2016	319 FFY15	$139,257	24	5	6	0
Shank/Anderson Project Phase 3 of 3	2016	319 FFY15	$448,365	158	57	1,590	0
WCSCD Winders Ph2 of 3	2017	319 FFY16	$39,480	0	0	0	0
Little Grove Creek Stream Restoration	2019	319 FFY18	$221,178	71	65	42	0
Winders Property Phase 2 of 3	2019	319 FFY18	$52,585	126	17	2	105
Antietam-Beaver Creek Clagett Property	2020	319 FFY19	$400,000	128	116	423	0
Antietam Creek Mayo Property	2020	319 FFY20	$488,286	132	119	437	0
Watershed Totals			**$3,071,309**	**1,469**	**648**	**10,811**	**271**

Table D - 3: *Assawoman Bay 319(h) Grant funded projects*

Assawoman Bay | Watershed Plan Approved 2020							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (lbs/yr)	**Bacteria** (Billion/yr)
Grey's Creek Project	2020	319 FFY20	$106,000	38	15	20	
Back Creek Project	2020	319 FFY20	$250,000	612	36	25,000	
Watershed Totals			**$356,000**	**650**	**51**	**25,020**	**-**

Table D - 4: *Back River: Tidal 319(h) Grant funded projects*

Back River: Tidal | Watershed Plan Approved 2010							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Shank/Anderson Project Phase 2 of 3	2011	319 FFY10	$556,443	280	94	428	0
Watershed Totals			**$556,443**	**280**	**94**	**428**	**0**

Table D - 5: *Back River: Upper 319(h) Grant funded projects*

Back River: Upper | Watershed Plan Approved 2008							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Redhouse Run/St. Patricks stream restoration	2008	319 FFY07	$418,500	609	32	11	0
Upper Back River Stormwater conversions	2009	319 FFY08	$422,373	52	12	4	0
Herring Run/Overlook Park stream restoration & buffer planting	2015	319 FFY14	$358,032	314	284	188	0
Watershed Totals			**$1,198,905**	**975**	**328**	**203**	**0**

Table D - 6: *Casselman River 319(h) Grant funded projects*

Casselman River | Watershed Plan Approved 2012							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
AMD pH Remediation GIS Tool	2012	319 FFY11	$83,619	0	0	0	0
Watershed Totals			**$83,619**	**0**	**0**	**0**	**0**

Table D - 7: *Choptank River: Upper 319(h) Grant funded projects*

Choptank River: Upper | Watershed Plan Approved 2010							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
DPW Stormwater Retrofits	2011	319 FFY10	$46,440	11	8	2	0
U. Choptank Watershed Restoration	2013	319 FFY12	$140,001	8	1	0	0
Volunteer Fire Comp. SWM upgrades	2013	319 FFY12	$37,834	1	0	0	0
U. Choptank Watershed Restoration	2014	319 FFY13	$140,001	16	3	0	0
Dept. Emergency Services Porous Parking	2015	319 FFY14	$137,770	5	0	94	0
Lockerman School SWM Retrofit	2018	318 FFY17	$100,000	0	1	0	0
Morton Farm Bio-Retention/Swale	2018	318 FFY17	$88,220	598	33	23	0
North County Park Design	2020	319 FFY20	$80,080	409	262	942	0
Watershed Totals			**$770,346**	**1,048**	**308**	**1,061**	**0**

Table D - 8: *Corsica River 319(h) Grant funded projects*

Corsica River | Watershed Plan Approved 2004							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Agricultural Technical Assistance	2005	319 FFY04	$32,380	0	0	0	0
Watershed Restoration	2006	319 FFY05	$232,666	0	0	0	0
Agricultural Technical Assistance	2006	319 FFY05	$145,554	767	79	0	0
Watershed Restoration	2007	319 FFY06	$241,975	62	6	0	0
Agricultural Technical Assistance	2007	319 FFY06	$14,273	2,413	233	0	0
Corsica and Beyond	2007	319 FFY06	$124,281	0	0	0	0
Agricultural Technical Assistance	2008	319 FFY07	$48,472	286	10	1,510	0
Agricultural Technical Assistance	2009	319 FFY08	$50,780	46	3	0	0
Bioretention Swale	2009	319 FFY08	$50,000	0	0	1	0
Watershed Restoration	2010	319 FFY09	$270,427	5	1	1	0
Agricultural Technical Assistance	2010	319 FFY09	$58,539	149	10	0	0
Agricultural Technical Assistance	2011	319 FFY10	$61,590	887	84	0	0
Watershed Restoration	2012	319 FFY11	$298,998	58	5	2	0
Agricultural Technical Assistance	2012	319 FFY11	$69,546	127	17	0	0
Board of Education Bioretention	2012	319 FFY11	$93,198	5	0	0	0
Watershed Restoration	2013	319 FFY12	$115,002	7	1	0	0
Agricultural Technical Assistance	2013	319 FFY12	$67,512	0	0	0	0
Board of Ed. Phase 2: Kramer Center	2013	319 FFY12	$114,276	61	8	6	0
Agricultural Technical Assistance	2014	319 FFY13	$47,937	0	1	0	0
Watershed Totals			**$2,137,406**	**4,873**	**458**	**1,520**	**0**

Table D - 9: *Gwynns Falls: Middle 319(h) Grant funded projects*

Gwynns Falls: Middle | Watershed Plan Approved 2014							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Scotts Level Marriottsville Road Stream Restoration	2017	319 FFY16	$613,940	2,127	728	1,386	0
Scotts Level Upper Scotts Level Park Stream Restoration	2019	319 FFY18	$450,000	1,798	826	1,770	0
Watershed Totals			**$1,063,940**	**3,925**	**1,554**	**3,156**	**0**

Table D - 10: *Jennings Run: Upper 319(h) Grant funded projects*

Jennings Run: Upper | Watershed Plan Approved 2019							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
No 319(h) Projects as of SFY 2020							
Watershed Totals			-	-	-	-	-

Table D - 11: *Jones Falls: Lower 319(h) Grant funded projects*

Jones Falls: Lower | Watershed Plan Approved 2008							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Roland Run Stream Restoration	2020	319 FFY19	$462,309	90	91	173	0
Watershed Totals			**$462,309**	**90**	**91**	**173**	**0**

Table D - 12: *Monocacy River: Lower 319(h) Grant funded projects*

Monocacy River: Lower | Watershed Plan Approved 2008							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Urban Wetlands, Bennett Creek Pilot	2008	319 FFY07	$223,364	101	19	3	0
Urban Wetlands, Bennett Creek Pilot	2009	319 FFY08	$234,545	150	31	6	0
Green Infrastructure	2011	319 FFY10	$318,396	351	34	8	0
Neighborhood Green Infrastructure	2014	319 FFY13	$97,000	30	0	2	0
Rock Creek Stream Restoration	2018	319 FFY17	$270,000	94	85	56	0
Watershed Totals			**$1,143,305**	**726**	**169**	**75**	**0**

Table D - 13: *Sassafras River 319(h) Grant funded projects*

Sassafras River | Watershed Plan Approved 2009							
Project	**State Fiscal Year**	**Grant Funding Source**	**319(h) Grant**	**Nitrogen** (lbs/yr)	**Phosphorus** (lbs/yr)	**Sediment** (Thousand lbs/yr)	**Bacteria** (Billion/yr)
Galena Elementary School stormwater wetland	2013	319 FFY12	$15,000	1	0	0	0
Phipps Treatment Wetlands & sediment traps	2014	319 FFY13	$50,000	99	20	5	0
Harbor View / Colchester Farms	2018	319 FFY17	$216,234	2,220	136	111	0
Starkey Farm Watershed Restoration	2018	319 FFY17	$144,514	1,884	98	71	0
Watershed Totals			**$425,748**	**4,204**	**254**	**187**	**0**

Appendix E | Priority Watershed Monitoring

Targeted Watershed Project

Project Period: 07/01/19 - 09/30/20

EXECUTIVE SUMMARY

The Targeted Watershed Program (TWP) was originally conceived to demonstrate how focusing resources into comprehensive watershed restoration projects could improve water quality and habitat for living resources. As part of the project, monitoring activities were designed to establish baseline conditions within watersheds to ultimately evaluate the effectiveness of best management practices (BMPs) implemented as a result of watershed plans that addressed Total Maximum Daily Load (TMDL) and Chesapeake Bay restoration goals.

The challenge for the program and many others like it nationwide, such as the Rural Clean Water Program and the National Nonpoint Source Monitoring Program, has been determining how to augment status and trends monitoring data and make it applicable to management decisions required to address TMDL and watershed restoration goals. The Targeted Watershed Program has addressed these concerns based on the belief that more specific information about watershed conditions is necessary to effectively target restoration efforts and ultimately quantify the effect of these practices as progress towards restoring designated use.

The concept of assessing conditions and evaluating the impact of restoration (i.e. watershed plans that address TMDL goals) has been embraced statewide. Based on the lessons we have learned in nineteen years of monitoring and assessments, we have developed a suite of watershed assessment components that we provide as services to the local jurisdiction that are developing watershed plans and addressing TMDL goals in Maryland's priority watersheds. Included in the list of assessment components are physical habitat assessments, water quality assessments, and biological assessments (Benthic-BIBI & Fish-FIBI). We are also providing as a service the evaluation of restoration activities designed to address TMDL goals. This service will assist the Targeted Watershed Program with evaluation of efforts to de-list impaired waterways. The delisting of impaired waterways is a primary NPS program goal contained within EPA's strategic plan.

The goal of the Targeted Watershed Program is to continue to demonstrate how focusing resources into comprehensive watershed restoration projects can improve water quality and habitat for living resources as progress towards achieving TMDL goals and subsequent delisting**.** The project achieves this by continuing to provide evaluation services for TMDL related implementation activities, supporting the development, implementation, and evaluation of watershed plans in Maryland's priority watersheds that address TMDL goals.

The Targeted Watershed Program is currently focusing efforts in three regions throughout Maryland. In the Eastern Shore region, there is a large ongoing long term monitoring project tracking progress towards meeting TMDL goals in the Corsica River Watershed. This watershed has been designated a National Non-point Source Monitoring Program project. It has also been identified as one of Maryland's Section 319 Nonpoint Source Program Success Stories for documenting the reduction of nutrient trends in two of the three non-tidal streams flowing into the Corsica River.

In Central Maryland, the Targeted Watershed Program is continuing nutrient synoptic monitoring that complement regional coarse scale TMDL monitoring. The monitoring results are used to identify opportunities for fine scale implementation activities. Several BMP specific effectiveness-monitoring projects are also continuing in watersheds with EPA approved watershed restoration plans. The program continues to provide technical support to counties grappling with incorporating TMDL goals into their comprehensive plans.

In the Western Maryland region, pre and post BMP implementation monitoring is being conducted to address acid mine drainage (AMD) remediation in the Jennings Run Watershed.

INTRODUCTION

Targeted Watershed Program Background

The Targeted Watershed Program was originally conceived to demonstrate how focusing resources into comprehensive watershed restoration projects could improve water quality and habitat for living resources. As part of the program, monitoring activities were designed to establish baseline conditions within watersheds in order to ultimately evaluate the effectiveness of best management practices (BMPs). Monitoring associated with the Targeted Watershed Program initially focused on defining the status and trends in water quality and living resources within each watershed.

The challenge for the program and many others like it nationwide, such as the Rural Clean Water Program and the National Nonpoint Source Monitoring Program, has been determining how to augment status and trends monitoring data and make it applicable to management decisions. The Targeted Watershed Program began to address these concerns in 1992 based on the belief that more specific information about watershed conditions was necessary to effectively target restoration efforts and ultimately quantify the effect of these practices.

With the idea of collecting more specific information about watershed conditions, the watershed

wide "synoptic" monitoring tool has been developed to identify stream nutrient and contaminant "hot spots'' and associated smaller drainage areas. In using the "synoptic" technique as a screening tool, monitoring resources and BMP implementation can be more focused and efficient in addressing nonpoint contamination issues.

The Corsica River Targeted Watershed Project was originally a "Pilot Program" that was developed to test management strategies and activities designed to restore the Corsica River, a tributary to the Chester River and Chesapeake Bay in Queen Anne's County, to the designated uses of fishable, swimmable, and shellfish harvest waters. The goal of the Corsica River Monitoring Project is to demonstrate the success of management strategies and implementation activities throughout the watershed in meeting the nutrient and sediment total maximum daily loads (TMDLs) and remove this watershed from the federally impaired waters 303(d) list.

In addition, the Targeted Watershed Program is continuing to develop regional nutrient synoptic monitoring that complement regional coarse scale TMDL follow-up monitoring. The monitoring results have been used to identify opportunities for fine scale implementation activities. Several BMP specific effectiveness-monitoring projects are also continuing in watersheds with EPA approved watershed restoration plans. The program continues to provide technical support to counties grappling with incorporating TMDL goals into their comprehensive plans.

Another area of focus is low pH associated with acid mine drainage (AMD) in the Jennings Run watershed in Western Maryland. Monitoring has been conducted to assess the effectiveness of various types of AMD BMP implementation. The goal is to show improvement in both water quality and benthic fauna in the hopes of removing these impaired AMD affected streams from the 303(d) list.

GOALS AND OBJECTIVES

Outstanding Management Need: To demonstrate observable water quality improvements in response to implementation actions. Given the lessons learned, it is unclear whether this can be accomplished in a reproducible manner at a watershed scale under the current voluntary management framework.

In addition to this broad management need, this project supports implementation targeting, pollution source assessments, and project-scale evaluation of implementation.

Goal: The goal of this project continues to be demonstration of focusing resources into comprehensive restoration projects to improve water quality and habitat for living resources. The emphasis continues to be on restoring impaired water bodies with TMDLs and the support of local efforts to address TMDL implementation goals.

Objectives:

Field Evaluation Services: Continue to provide assessment services to assist in identifying water quality, living resource and habitat problems, identify pollutant source areas, and prioritize potential restoration sites. Assess effectiveness of restoration activities and efficiencies of BMPs being implemented to address impairments of watersheds on the 303d list of impaired waters. Support development of assessment and implementation in targeted watersheds and associated watershed planning.

Strategic Evaluation: In coordination with EPA and other interested parties, continue to evaluate the viability of the targeted watershed concept to generate "success stories" in terms of observable improvement in water quality criteria (physical, chemical, and biological). This includes the continuous review of results documented by this project, development of monitoring design methods to quantify expected outcomes as a function of anticipated levels of implementation, the re-evaluation of the scale at which future Targeted Watershed Projects should be conducted to guarantee observable results, and the systematic evaluation of potential future monitoring initiatives involving other stakeholders (EPA, State agencies, others).

Corsica Monitoring: Continue to provide long term evaluation services in the Corsica River watershed to help document progress toward achieving TMDL goals.

Objective 1: **Quality Assurance Project Plan (QAPP).**

Activity	Milestones	Timeline	Responsible Party	Deliverables / Outputs
Draft or revise current QAPP that meets EPA requirements	Submit a draft QAPP to EPA.	7/1/19	MDE	Quarterly Report: Provide a copy of the draft QAPP Final Report: 1) If no changes are made to the draft QAPP prior to the end of the project, in the Final Report include a copy of the draft QAPP as originally submitted to EPA. 2) If EPA comments lead to changes in the draft QAPP, in the Final Report include a copy of the revised QAPP.

Objective #2*: Continue to provide assessment services that assist in identifying water quality, living resource and habitat problems, identify pollutant source areas, and prioritize potential restoration sites. Assess effectiveness of restoration activities and efficiencies of best management practices (BMPs) being implemented to address impairments of watersheds on the 303d list of impaired waters.*

Responsible Party: MDE	*Timeframe*: July 1, 2019 to June 30, 2020	
Watershed	**Milestones**	**Deliverables / Outputs**
Watersheds with TMDLs	○ Synoptic surveys in non-tidal watersheds with TMDLs. Primarily collect whole and filtered water samples for total and dissolved nutrients, (if warranted – also collect: chlorides, sulfates, bacteria and/or other constituents). In addition, collect in-situ water quality parameters and stream discharge at up to 200 sites twice per year (400 samples annually).	○ Quarterly activity report detailing number of samples collected, lab analytical results, and other activities. Annual activity report as above with data interpretation. Final report to include maps of delineated subwatersheds.
	ACCOMPLISHMENTS	
	○ Synoptic surveys: ○ *Catoctin Watershed:* ▪ *Fall 2019 – and Antietam Spring 2020.* ○ *Synoptic "Hot Spot" monitoring for pre-implementation*	Quarterly activity report detailing number of samples collected lab analytical results, and other activities. Annual activity report as above with data interpretation.
Watershed	**Milestones**	**Deliverables / Outputs**
Jennings Run in Western Maryland (pH TMDL)	*Jennings Run*: Collect monthly surface water samples for closed pH, ANC, conductivity, alkalinity, chloride, sulfate, and metals at 16 sites (*The goal of the study is to have both pre and post implementation data for each site. Phase I , pre implementation sites are currently*	Quarterly status report detailing number of samples collected, and other activities.

	being collected. Implementation is projected within the year 2021, at which time Phase II post implementation will begin.).	Annual activity report (final report) as above.
	ACCOMPLISHMENTS	
		Quarterly status report detailing number of samples collected, and other activities. Annual activity report (final report) as above.

METHODS

Watersheds with TMDLs

Synoptic Sampling

Synoptic water chemistry samples were collected in early spring and early fall in the watersheds of interest. Synoptic sampling is conducted under "base flow" conditions. Therefore, sampling is delayed for a minimum of 24 hours after rainfall events totaling more than ¼ inches. Grab samples of whole water were collected just below the water surface at mid-stream and filtered using a Whatman 934/AH filter. The samples were stored on ice and frozen on the day of collection. Filtered samples were analyzed by the Chesapeake Biological Laboratory (CBL) for dissolved inorganic nitrogen (NO23) and dissolved inorganic phosphorus (PO_4). All analyses were conducted in accordance with U.S. Environmental Protection Agency (EPA) protocols. Stream discharge measurements were taken at the time of all water chemistry samples. Water temperature, dissolved oxygen, pH, and conductivity were measured in the field with a YSI at selected sites at the time of water collection. Where sites are nested in a watershed, the mapped concentration data for the downstream site is shown only for the area between the sites. The downstream sites therefore illustrate the cumulative impact from all upstream activities.

Jennings Run in Western Maryland (pH TMDL)

Evaluate Acid Mine Drainage BMP Implementation

Acid mine drainage (AMD) has been found to negatively impact stream segments within the Jennings Run watershed in Western Maryland.

Jennings Run Watershed: In order to address the low pH associated with AMD in the Jennings Run watershed, best management practices (BMPs – leach beds, and sand dumps) will be installed at Phase II sites in 2021 within the impaired segments of Jennings Run and its tributaries listed on the 303(d) list. Pre-Implementation water quality samples are currently being collected once per month in these stream segments since 2018. Post-implementation monitoring will be initiated in Fall / Winter of 2021 to assess and fine-tune water quality downstream of BMP implementation.

The analysis at Jennings Run watershed will include Acid Neutralization Capacity (ANC), closed pH, alkalinity, conductivity, iron, manganese, aluminum, calcium, magnesium, chloride and sulfate. Appalachian Laboratory (AL) will perform all specified analysis in accordance with standard protocols [US EPA 1987, Handbook of methods for acid deposition studies: Laboratory analyses for surface water chemistry for the United States National Acid Precipitation Assessment Program (EPA 600/4-87/026), APHA Standard Methods, and US EPA 1999, Methods and Guidance for Analysis of Water (EPA 821-C-99-004)].

In addition, biological community evaluations will be conducted in the Jennings Run watershed, both pre and post implementation, to help better assess stream health and quality. All field sampling will be performed under guidance established by the MBSS. The Maryland Biological Stream Survey Sampling Manual, February 2000, will serve as the authority. MBSS methods include qualitative sampling of best

available habitats incorporating approximately 20 square feet of substrate within each 75 meter designated station. All samples will be collected from riffle areas, as practical, because this is typically the most productive habitat in stream ecosystems. A 600-micron mesh D-net will be used to trap organisms dislodged from the sample area. The composited sample is condensed in the field with a standard .5-micron sieve bucket, placed in a sample jar with appropriate field label, and preserved with alcohol. Each sample is then sub-sampled to approximately 100 individual macroinvertebrates in the laboratory using a random-grid picking/sorting process. Most organisms are identified to genus, if possible, using stereoscopes. Chironomidae are slide-mounted and identified using compound microscopes. Habitat conditions will be assessed using standard MBSS methodology. In-situ water quality parameters will be recorded at each station with a multi-parameter field instrument.

RESULTS

Watersheds with TMDLs

Synoptic Sampling

In this reporting period, one synoptic survey was completed in the Catoctin Watershed and one was completed in Antietam Watershed. Sample collection details are in Table 1. Station locations are mapped in Figure 1 and 2. Site locations for each sample collected and their corresponding GPS coordinates for this watershed is provided in Appendix A, Table 6.

Table 1. Watershed Planning Nutrient Synoptic Survey Samples Collected:

07/01/19 – 06/30/20

Catoctin Watershed, Fall 2018	**80**
Antietam Watershed, Spring 2020	**59**
Totals =	**139**

Figure 1: Catoctin Synoptic Sampling Stations

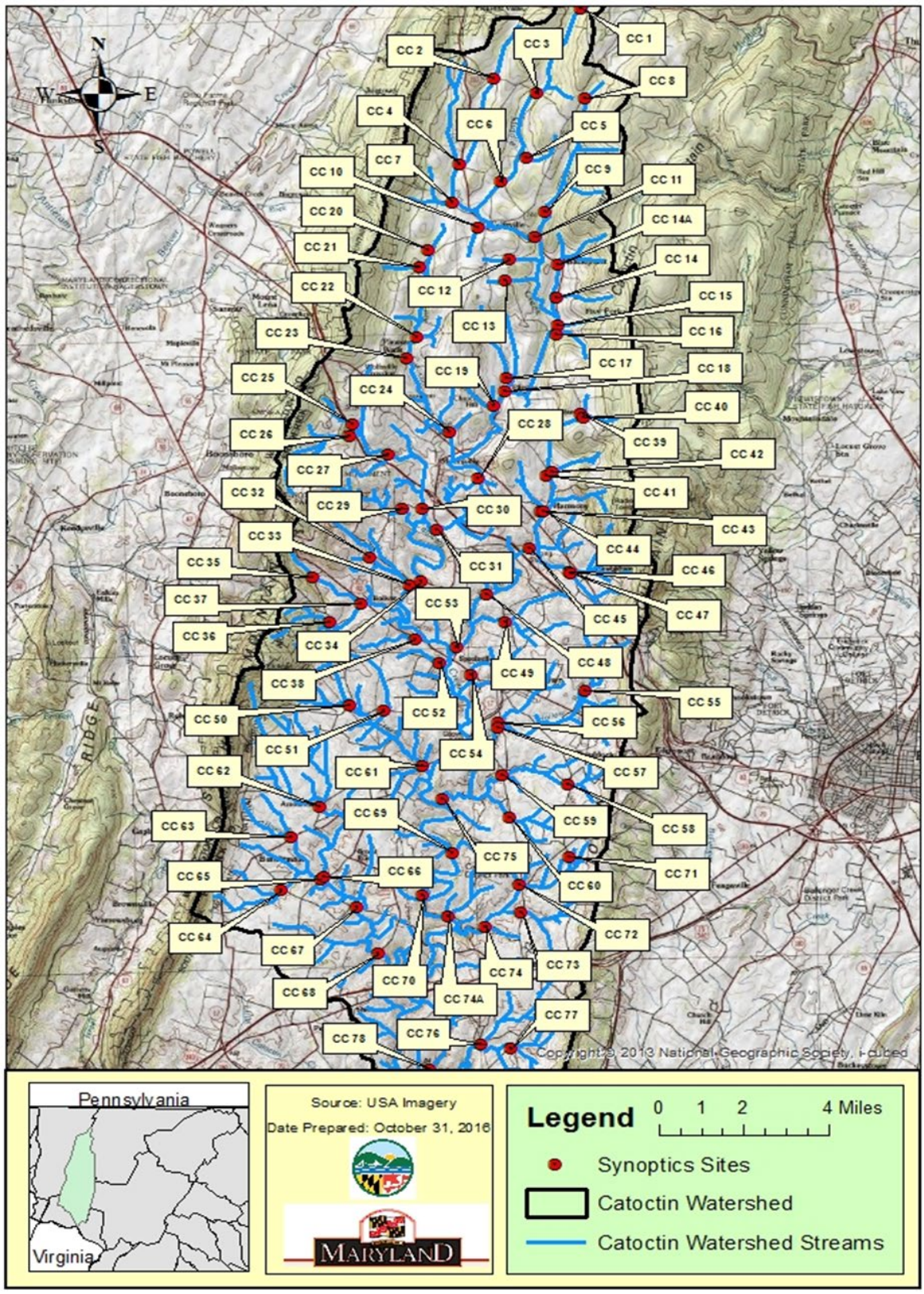


Figure 2. Antietam Synoptic Stations

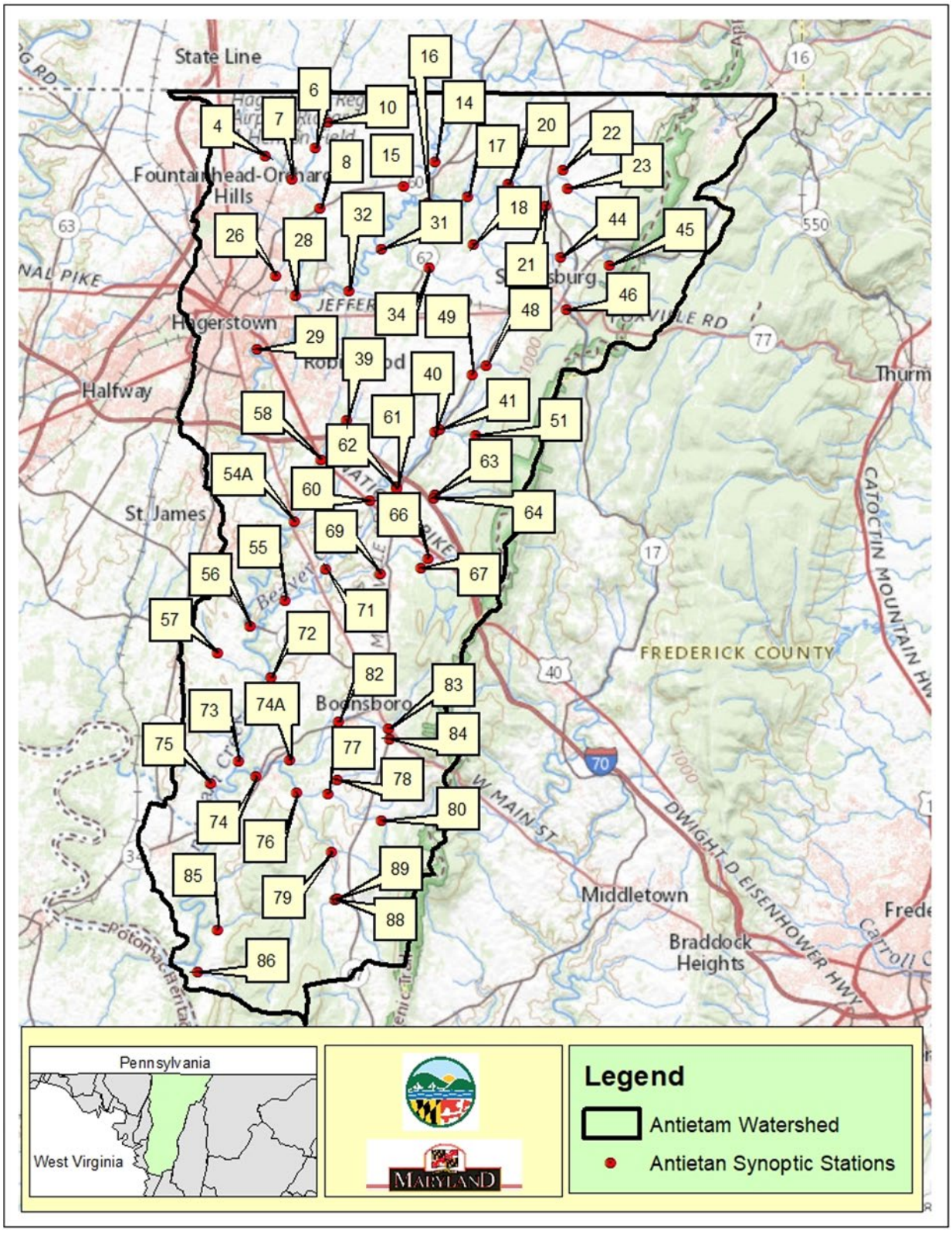
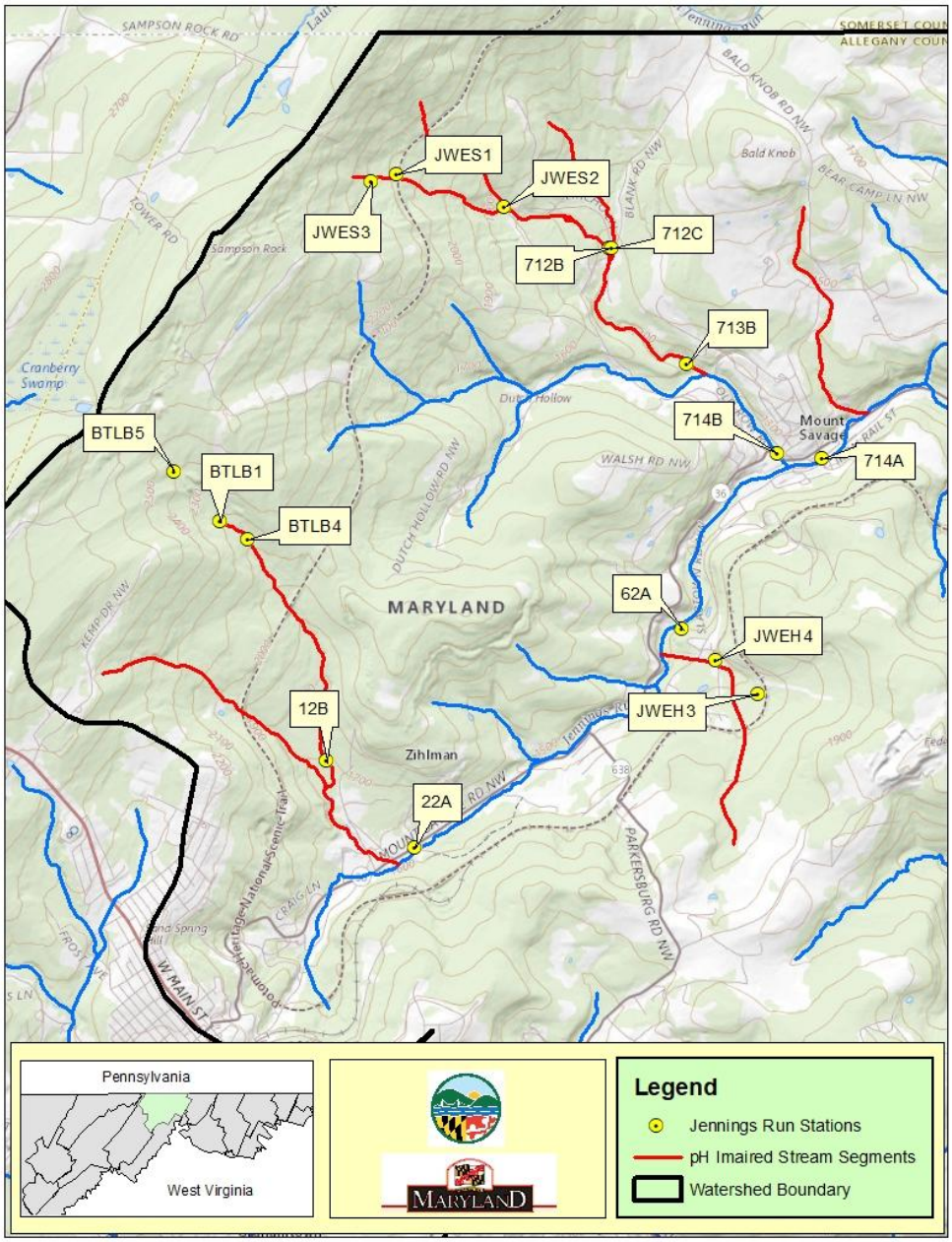


Figure 3: Jennings Run Watershed Phase I Stations



DISCUSSION

Synoptic Sampling

Supporting activities in watersheds with approved implementation plans is a protection and restoration goal. As noted, two nutrient synoptic survey areas have been completed in conjunction with TMDL watershed plan development and implementation monitoring. These synoptic surveys provide a finer resolution than the TMDL follow-up monitoring and can be used to help focus targeted TMDL BMP implementation in first and second order stream reaches. The data from these nutrient synoptic surveys have been disseminated to the associated counties and state agencies. It will be used to help determine watershed scale BMP implementation effectiveness and target areas that may respond to further BMP implementation. Data generated by this work will assist the department with follow-up monitoring in watersheds where TMDLs have been written and approved.

Jennings Run in Western Maryland (pH TMDL)

Evaluate Acid Mine Drainage BMP Implementation

Jennings Run Watershed

In order to address the low pH associated with AMD in the Jennings Run watershed, best management practices (BMPs – leach beds, and sand dumps) are slated to be installed in the fall / winter of 2021 in the headwaters of the impaired streams listed on the State of Maryland's 303(d) list based on the MDE Bureau of Mines plans. Pre-Implementation water quality samples are currently being collected once per month in these stream segments since 2018.

Objective #3: *Corsica River Watershed Implementation Monitoring*

a. Long-Term Monitoring of Three Non-Tidal Tributaries
b. Synoptic Surveys

The Corsica River Targeted Watershed Project is a Governor's Initiative and has been named an EPA National Nonpoint Source Monitoring Project. The Targeted Watershed Project is committed to evaluating this watershed throughout the course of this initiative. It aims to determine effectiveness of the Corsica River Watershed Management Plan in making progress towards satisfying the TMDL and removing the watershed from the list of impaired waters. Experience gained in this watershed will be transferable to many other watersheds across the state.

3a: Long-Term Monitoring of Three Non-Tidal Tributaries

Responsible Party: MDE		*Timeframe*: July 1, 2019 to June 30, 2020
Watershed	**Milestones**	**Deliverables / Outputs**
Corsica River (Queen Anne's Co.) *TMDL - Nutrient and sediment*	*Long-Term Monitoring of Three Non-Tidal Tributaries* ○ Collect weekly grab (whole and filtered) and flow weighted composite samples for total and dissolved nutrient analysis at three Corsica non-tidal tributary sites. Collect weekly grab (whole and filtered) for total and dissolved nutrient analysis at one control site.	○ Quarterly Status and Final Reports list the number of samples collected, lab analytical results, and other activities.
	ACCOMPLISHMENTS	
	○ Collected 211 weekly grab and 134 flow weighted composite samples for total and dissolved nutrient and sediment analysis at three Corsica non-tidal tributary sites and one control site.	○ Quarterly Status Reports list the number of samples collected, lab analytical results, and other activities ○ Annual activity report as above with data interpretation when appropriate

3b: Synoptic Surveys in the Corsica River Watershed

Responsible Party: MDE		*Timeframe*: July 1, 2018 to June 30, 2019
Watershed	**Milestones**	**Deliverables / Outputs**
Corsica River	*Synoptic Surveys in the Corsica River Watershed*	○ Quarterly Status and Final Reports list the number of samples collected, lab

(Queen Anne's Co.) *TMDL - Nutrient and sediment*	○ Conduct semi-annual nutrient synoptic surveys at up to 40 sites (80 samples). ○ Conduct "focused" monitoring of identified "hot spots"	analytical results, and other activities.
	ACCOMPLISHMENTS	
	○ Collected 59 Corsica synoptic samples. ○ 37 Focused HotSpot synoptic samples	○ Quarterly Status Reports list the number of samples collected, lab analytical results, and other activities ○ Annual activity report as above with data interpretation when appropriate

METHODS

3a: Long-Term Monitoring of Three Non-Tidal Tributaries

Base flow and flow weighted composite samples are collected using ISCO, Inc. automated samplers and flow meters installed at 3 of the 4 sites. A rating curve specific to each stream that equates stream height to stream volume has been programmed into the ISCO flow meters at each site. The ISCO Flow meter reads the stream height and calculates the estimated instantaneous volume. After a specified volume has passed the site the sampler will be initiated to sample a small volume of water. Samples are composited over the course of a week during base flow. Composite samples are preserved in the sampler using sulfuric acid. Once collected, samples are iced and refrigerated on the day of collection. The University of Maryland, Horn Point Laboratory (HPL) analyzes the samples for Total Nitrogen and Total Phosphorus (TN/TP).

3b: Synoptic Surveys in the Corsica River Watershed

Synoptic nutrient samples are collected at approximately forty sites previously identified during the 2003 WRAS nutrient synoptic survey throughout the Corsica watershed. Sampling is conducted during a period of high ground water recharge in the spring and during a period of minimal groundwater recharge in the fall. Sampling is delayed for 24 hours if there is more than a ¼ inch of rain in the previous 24 hours. Surface water grab samples are collected just below the water surface at mid-stream at all sites. Whole samples are analyzed for total nitrogen/total phosphorus (TN/TP). Filtered samples were analyzed for dissolved NO23, PO4, CL, and S04 by CBL in fall of 2015. In the spring of 2016, the filtered samples were only analyzed for NO23 and

PO4. All synoptic samples are stored on ice and frozen on the day of collection. Water temperature, dissolved oxygen, pH, and conductivity were measured in the field with a YSI at all sites at the time of water sampling. Discharge measurements are also taken at each site using a Marsh McBirney Model 2000D flow meter. The velocity measurements are taken in ten to fifteen intervals across a transect on a straight reach, as free as possible of in-channel obstructions.

RESULTS

3a: Long-Term Monitoring of Three Non-Tidal Tributaries

Weekly water quality samples (grab and composite) were collected from three main Corsica tributary outlets (Old Mill Stream Branch (OMS), Gravel Branch (GVL), and Three Bridges Branch (TBB) and one adjoining control site (Jarman Branch, (JB) – (*only grab samples collected at Jarman Branch*) as shown in Figure 6. Tables 2 and 3 detail the number of samples collected for the weekly grab and composite non-tidal. Figures 7 and 8 where the data is graphed, shows a small steady reduction in Nitrogen and Phosphorous for the weekly grab samples and the composite samples show a small steady reduction in Nitrogen. This is last year's results. Due to Covid-19 the labs were shut down from March 2020 until earky July 2020. They are working diligently to get the results to us as soon as possible.

Table 2. Corsica Watershed Weekly Grab Samples Collected: 07/01/19 – 06/30/20

Station	Whole	Filtered
Old Mill Stream	53	53
Gravel Branch	52	52
Three Bridges Branch	53	53
Jarman Branch	53	53
Totals	**211**	**211**

Table 3. Corsica Watershed Weekly Composite Samples Collected: 07/01/19 – 06/30/20

Station	Composite
Old Mill Stream Branch	36
Gravel Branch	48
Three Bridges Branch	50
Totals	**134**

Figure 6. Corsica and Jarman Branch Watersheds

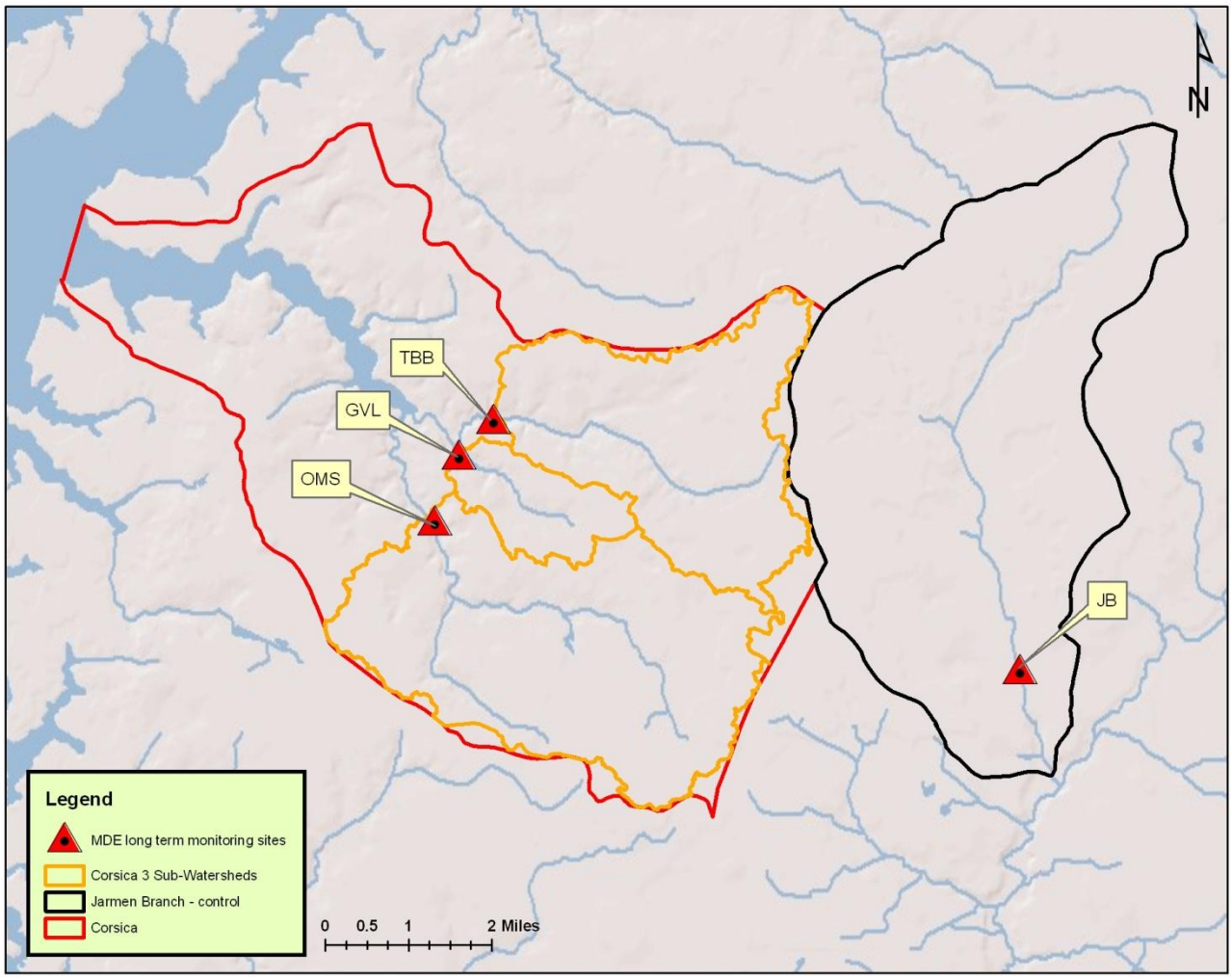
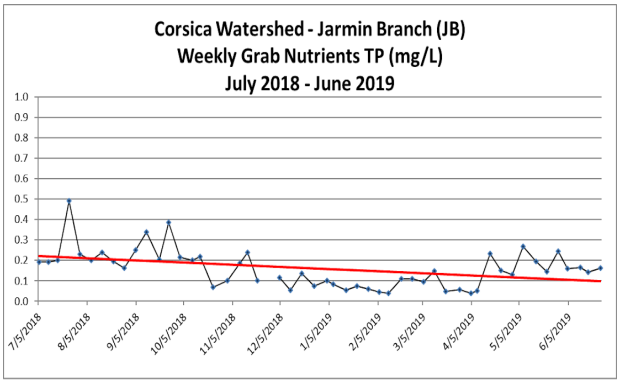
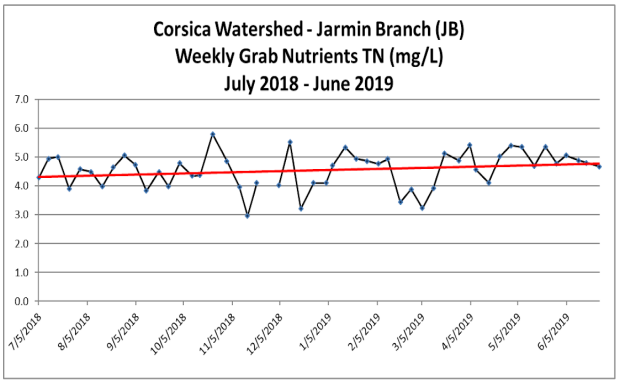
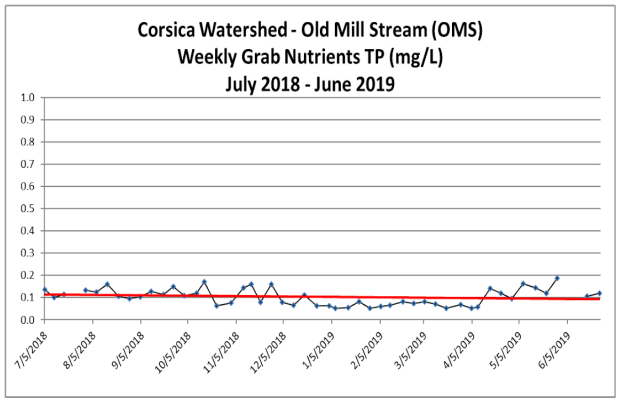
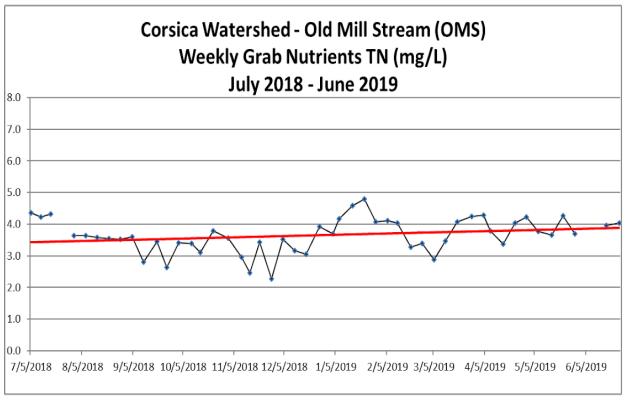


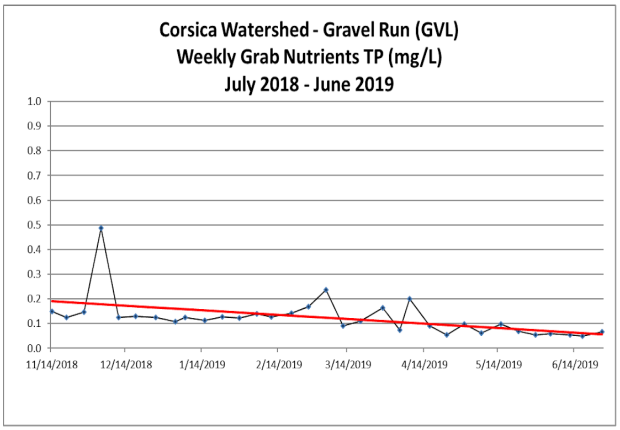
Figure 7. Weekly Grab Nutrients

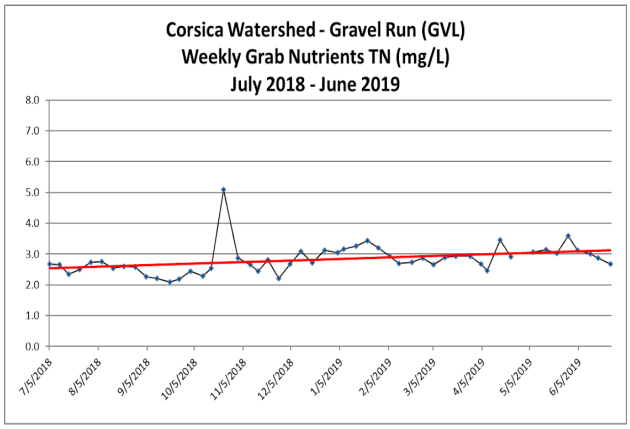


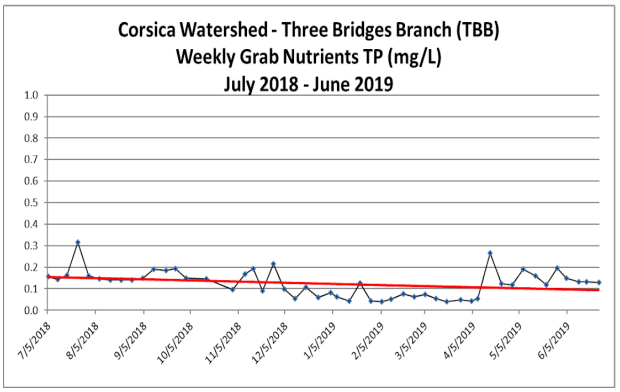












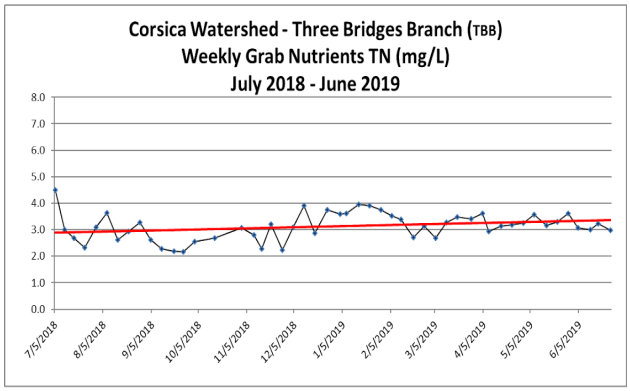
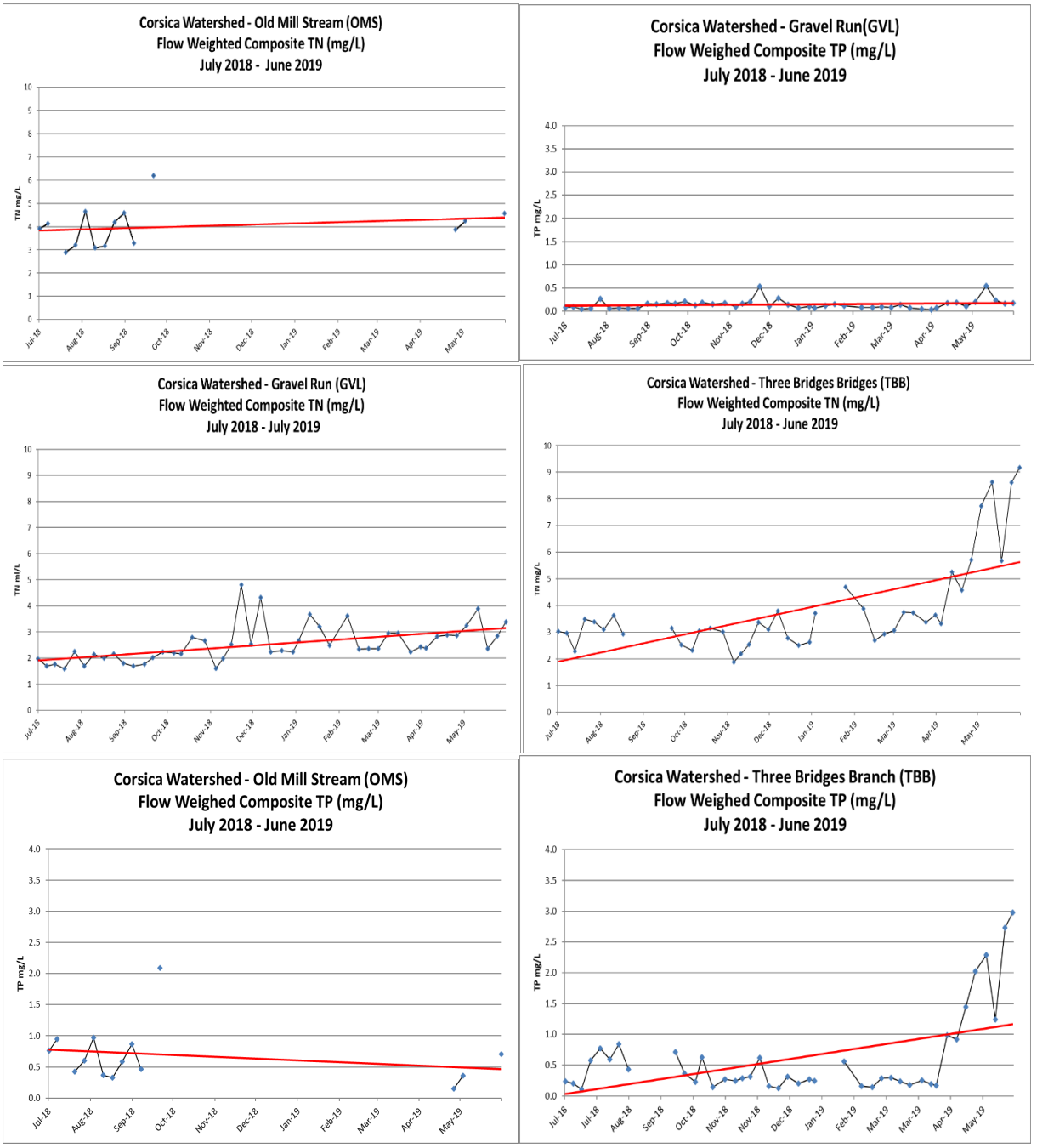


Figure 8. Weekly Composite Nutrients



3b: Synoptic Surveys in the Corsica River Watershed

Corsica watershed semi-annual (Fall 2019 and Spring 2020) nutrient synoptic surveys were completed. Table 4 details the number of samples collected. The stations are mapped in Figure 9. Station details can be found in the Appendix, Table 5.

Table 4. Corsica Nutrient Synoptic Survey Samples Collected: 07/01/19 – 06/30/20

Date	Whole	Filtered
FALL 2019	31	31
SPRING 2020	29	29
Synoptic Totals	**60**	**60**
HOT SPOT	37	37
Synoptic & Hot Spot Totals	**97**	**97**

Figure 9. Corsica Synoptic Stations

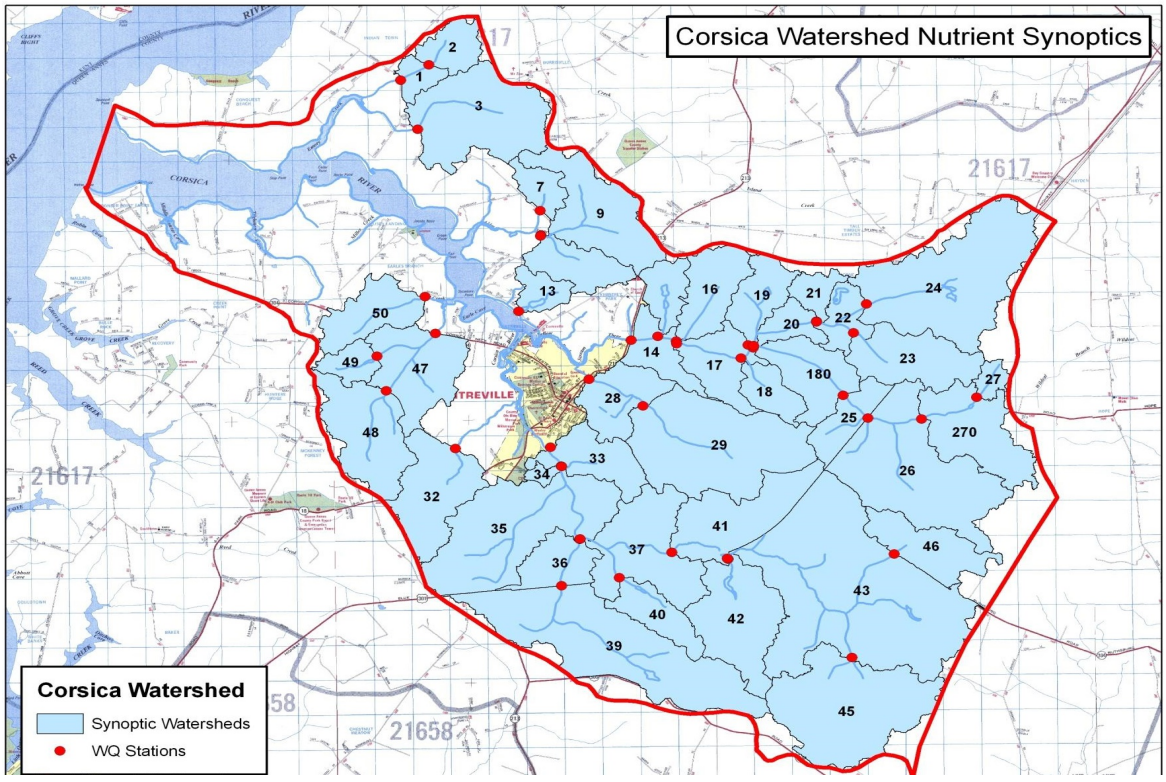
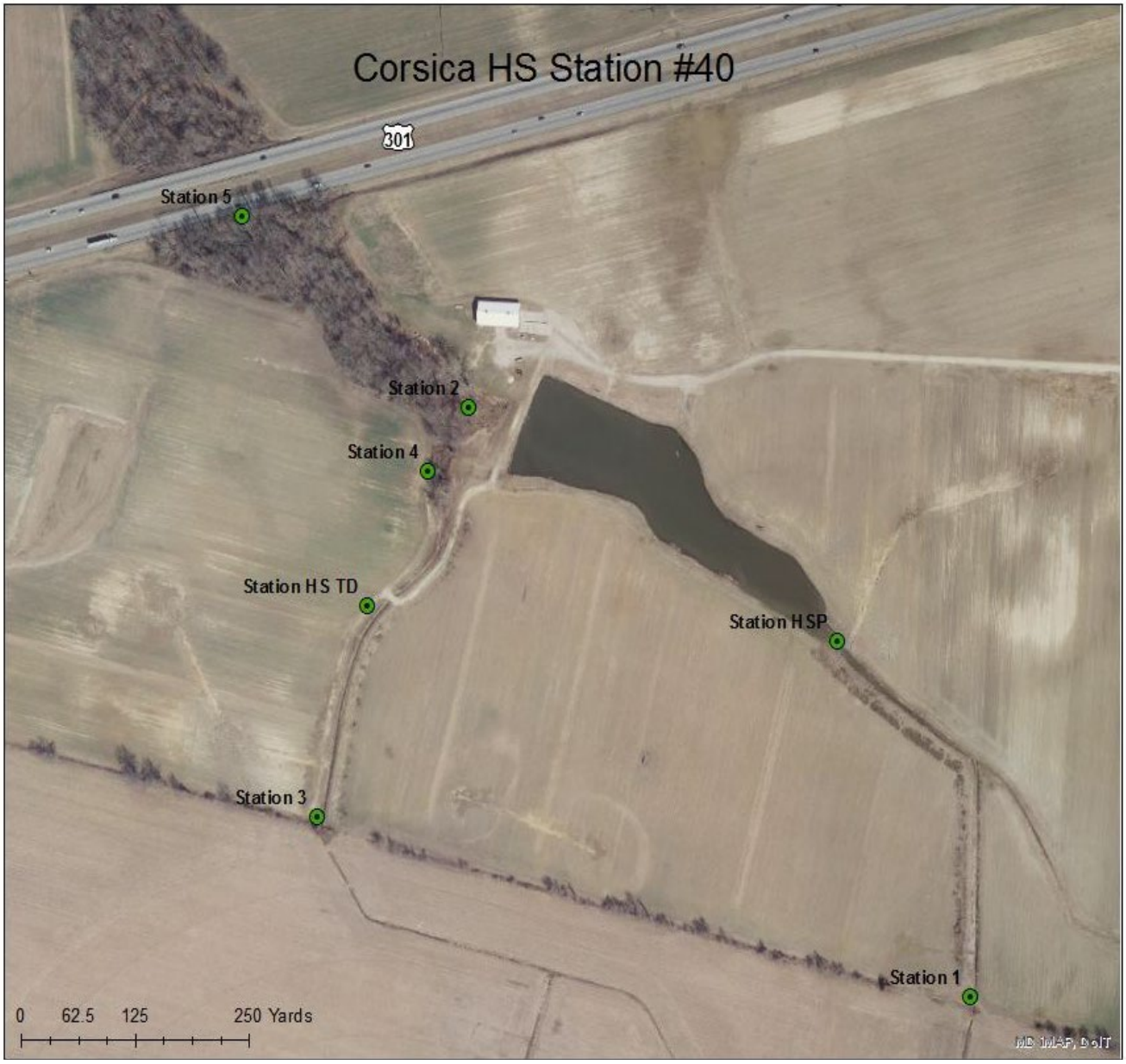


Figure 10: Hot Spot Stations



DISCUSSION

3a: Long-Term Monitoring of Three Non-Tidal Tributaries

BMP implementation efforts in the Corsica River Watershed have increased substantially over the last twelve years. Cover crop planting has increased as a result of regulation changes removing the cap on how many acres farmers are able to plant. A focused effort by the local Soil Conservation District made the one-on-one connections with farmers needed for a successful cover crop program. Rain garden and rain barrel installations have significantly increased but leveled off due to lack of funding. Stormwater retrofit projects in the city of Centreville and Queen Anne's County have increased substantially reducing pollution, as well as, sedimentation and the flash rain runoff component caused by storms. Sixteen septic system nutrient reducing retro-fit systems have been installed throughout the watershed. Having substantial effort put into BMP implementation and associated water quality monitoring to document the effects reductions in nutrients are beginning to be observed.

Dr. Jean Spooner from North Carolina State University has shown that in two (TBB and GVL) of the three Corsica River non-tidal headwater tributaries, there have been observed, statistically significant, reductions in both nitrogen and phosphorus over the last eight years. These two headwater tributary watersheds are the smallest of the three. It has been suggested that since these two watersheds are smaller, groundwater transport lag time would be shorter and thus nutrient reductions may be observed in the streams in less time. It is very difficult to specifically relate this reduction in nutrients to BMP implementation but, empirical data suggests that this could be the case. We had a Statistician do the data analysis for 2012 through 2017. The report can be found at: https://www.potomacriver.org/publications/updating-the-statistical-analysis-of-non-tidal-nutrient-monitoring-data-in-the-corsica-river-watershed/

Through continued monitoring, it is the scope of this long-term project to document, through water quality monitoring and BMP tracking, the cumulative effects of BMP implementation in reducing nutrients in the Corsica River watershed and assessing the status of the established TMDL.

3b: Synoptic Surveys in the Corsica River Watershed

The nutrient synoptic surveys completed during the fall and spring in the Corsica watershed help highlight some seasonal differences in nutrient concentrations in surface water. Some of the variables include cropping and cover crop history, concentrations of septic systems, and groundwater lag time. Using geographic information system (GIS) technologies, nutrient synoptic "hot spot" maps were developed that help focus BMP implementation efforts (Figure 10). There are a few reach-sized watersheds that have shown consistently elevated nitrogen levels that would be considered nutrient "hot spots". This information has been provided to Queen Anne's County, the Soil Conservation District, DNR, MDA, and MDE for targeting BMP implementation.

The landowner of one of the synoptic "hot spots" in the Corsica Watershed that has had consistently high levels of nitrogen (Average = 10 mg/L) has agreed to allow more focused water quality monitoring on the farm. Upon more focused on-site monitoring, it was established that the elevated nitrogen is coming from adjacent farms and field drain tiles on the property. This project has provided a platform for across-the-board cooperation with MDE, Maryland Dept. of Agriculture, Soil Conservation District, and the private sector farmer. As a result of our monitoring efforts, the farmer has installed a water control structure on the stream with the tile drains to retain the effluent and allow biological treatment to help reduce the nitrogen concentrations. This is part of the next phase of the synoptic process which is to use the synoptic tool to focus BMP implementation on "hot spots" to address elevated levels of nutrients.

Due to their longevity, these efforts will continue to be a testing ground for assessment, targeting, implementation, and evaluation methods. The lessons learned from the Targeted Watershed Projects will continue to be relevant to watershed management and be applicable to the WRAS and TMDL implementation activities.

All data from this project will be entered into AWQMS once it is received from the labs. Covid-19 closed the labs in March 2020 and they did not reopen until early July 2020. This has delayed the analysis process.