Patuxent River Watershed Assessment

COMMUNITY MEETING NO. 2

January 23, 2017

clean H2OWARD

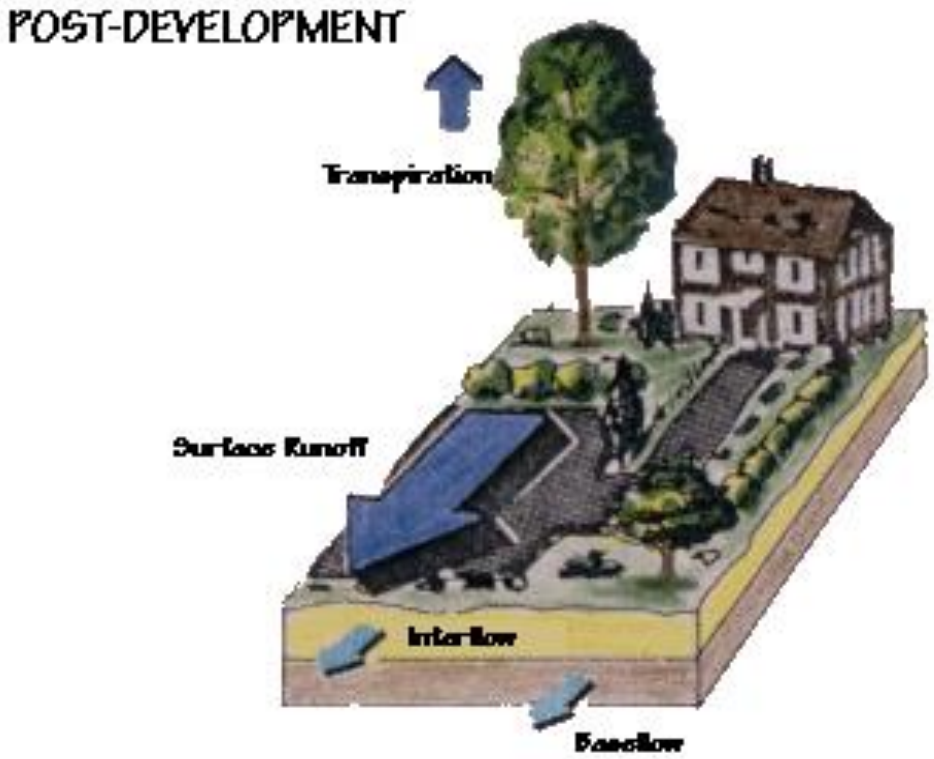
Howard County Stormwater Solutions

Meeting Outline

- Welcome and Introductions
- Watersheds 101
- Reasons for Study
- Countywide Implementation Strategy (CIS) – Part 1
- Watershed Study (Assessment Results, Concept Development, Pollutant Load Reductions)
- Restoration Toolbox
- Countywide Implementation Strategy (CIS) – Part 2
- Office of Community Sustainability
- Q&A

Watersheds
101

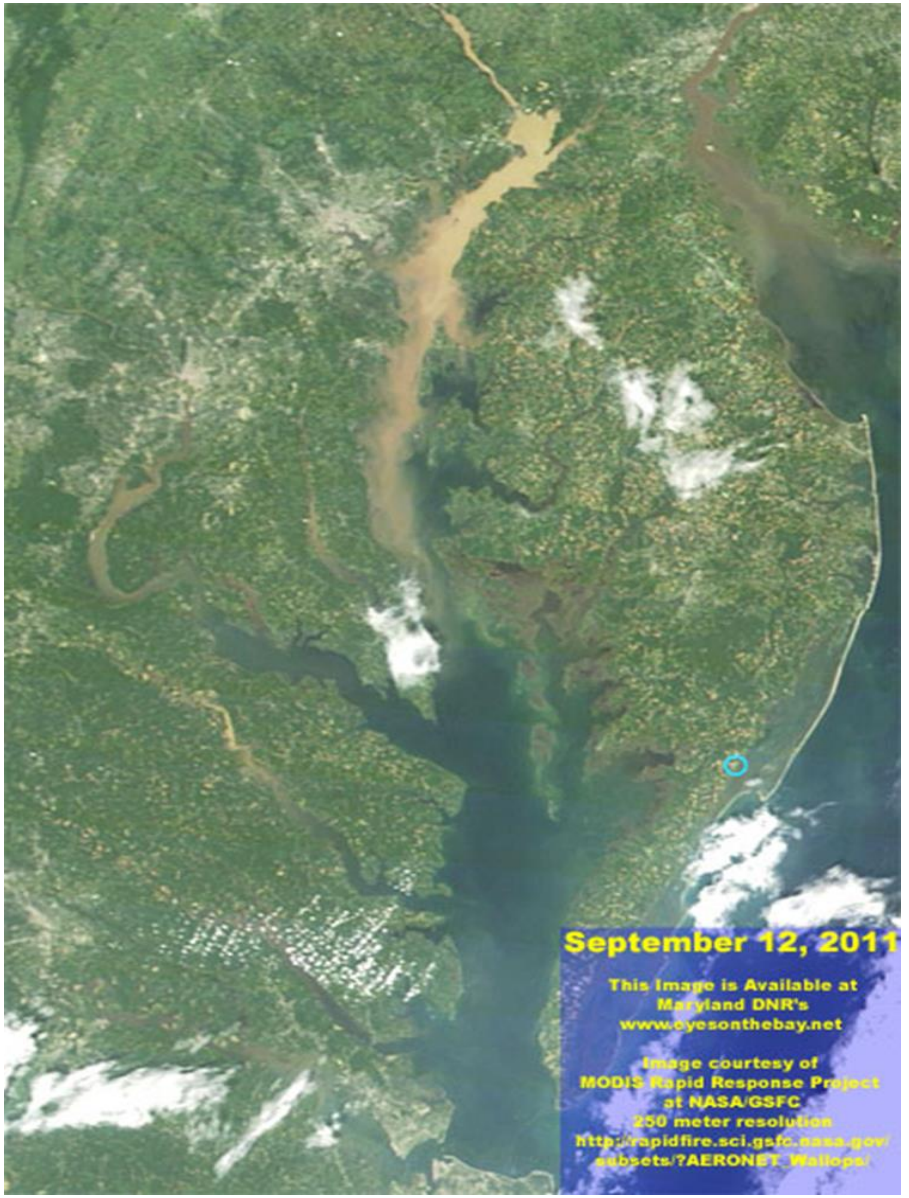
WATER BALANCE



Where does storm water go?

A. To a wastewater treatment plant so pollutants and trash can be removed before the water goes to a nearby stream. **False**
B. To a nearby stream without any treatment. **Possibly**
C. To a stormwater management facility for pollutant removal and then to a nearby stream. **Possibly**

The Problem


September 12, 2011
This Image is Available at
Maryland DNR's
www.eyesonthebay.net
Image courtesy of
MODIS Rapid Response Project
at NASA/GSFC
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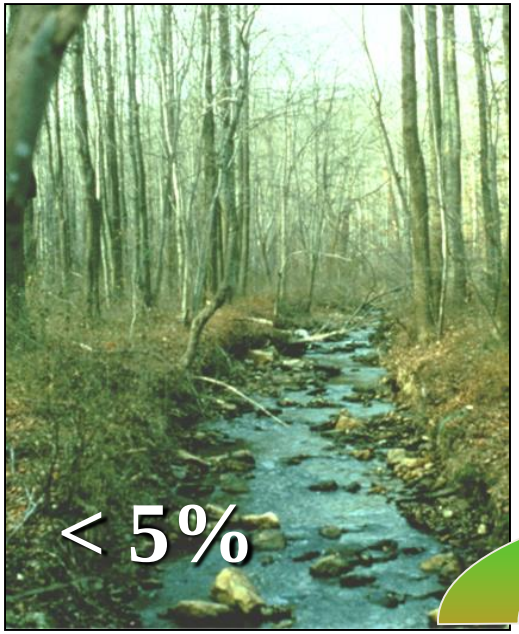
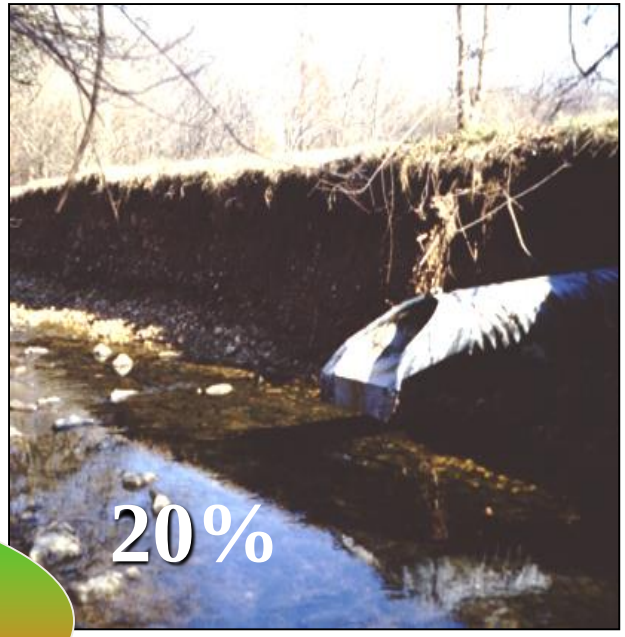
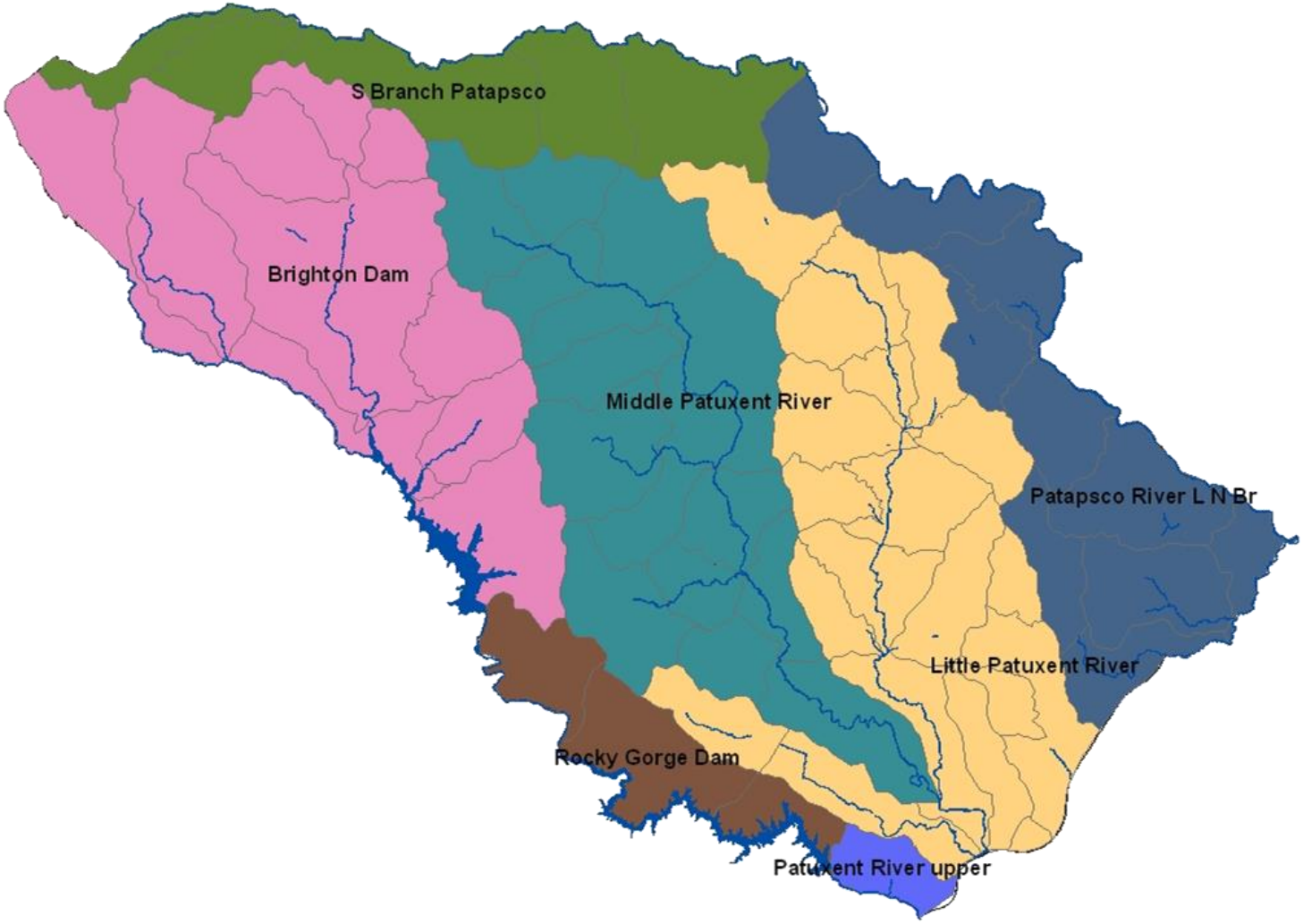




Impervious Cover

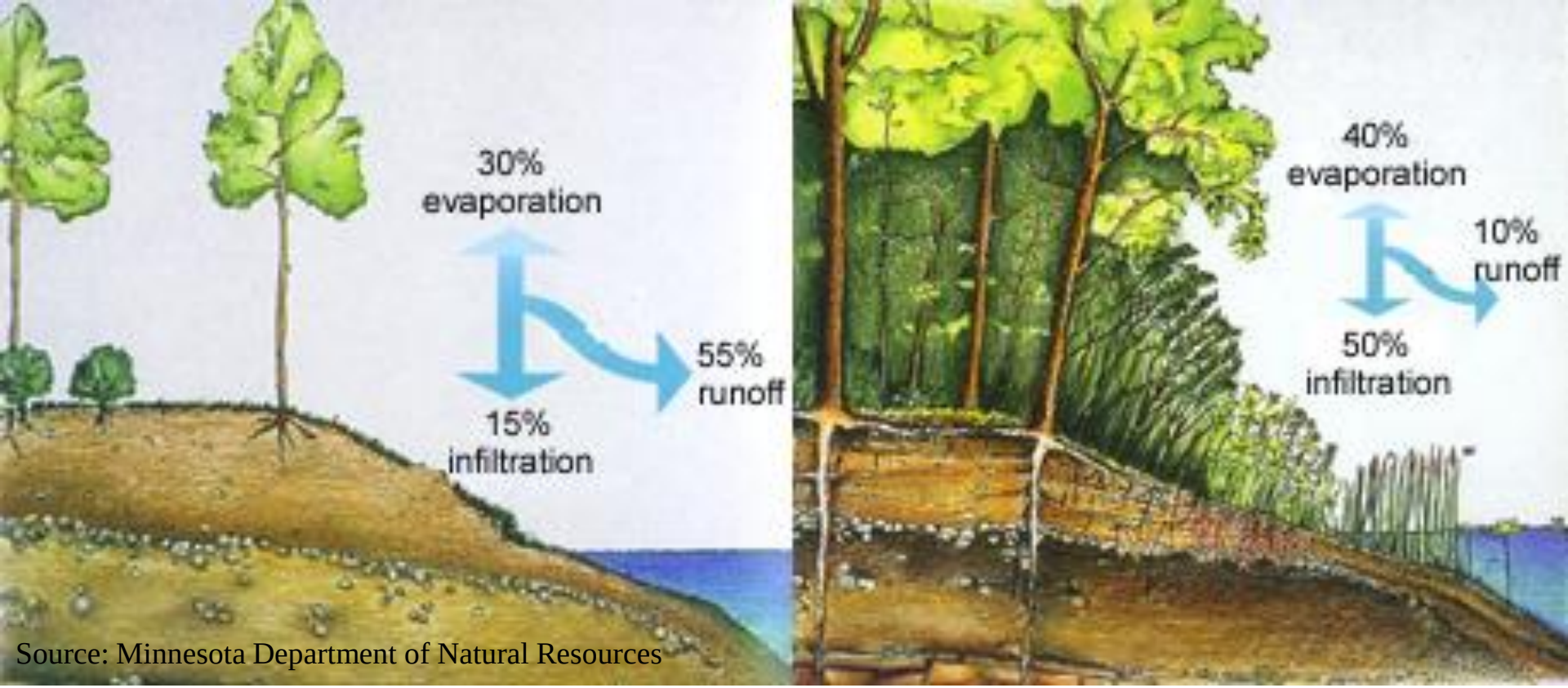
County = 12.7% Columbia ~ 15%-20%

County Watersheds



Impervious Area by Watershed

Watershed	Impervious	
	Acres	Percent
South Br. Patapsco	744	4.6
Triadelphia Reservoir (Brighton Dam)	1,830	5.0
Rocky Gorge Reservoir	585	7.3
Middle Patuxent	3,411	9.2
Patapsco - Lower North Br.	4,425	**18.3**
Little Patuxent	9,140	**24.0**
Patuxent – Upper	440	**25.5**



Source: Minnesota Department of Natural Resources

Water quickly runs off a shoreline cleared of natural vegetation, washing nutrients and pesticides into the water. A natural shoreline holds rainfall, which soaks into the soil; less water, soil and chemicals run into the lake or river. Shoreline and aquatic plants anchor shoreline areas, helping to protect them from erosion due to runoff and waves (Source:MN DNR)

Why is the County doing Watershed Planning?

- Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) permit
  - Permit requires treatment of **20%** of currently untreated impervious
  - Perform a comprehensive watershed assessment for the entire County within five year permit term
    - Little and Middle Patuxent Rivers in FY15 (Permit Year 1)
    - **Patapsco and Mainstem Patuxent Rivers in FY16 (Permit Year 2)**
  - Develop a Countywide restoration plan in Permit Year 1 (CIS)
- Total Maximum Daily Load (TMDL) "pollutant diet" for nutrients
- **Retrofitting water quality for older development**
- Looking for cost-effective opportunities for environmental restoration (List of projects)

Total Maximum Daily Load (TMDL)

- Chesapeake Bay TMDL Sectors:
  - Agriculture
  - Forest
  - Septic
  - **Urban Stormwater**
  - Wastewater
- NPDES Permit Year 1 - **Restoration Plan** for All Existing TMDL Waste Load Allocations (Bay and Local)
- All Sectors – Reduce Phosphorus (P) by ~30% and Nitrogen (N) by ~40% (approx. half of total reduction is urban stormwater)
- Bay TMDL - Meet 60% by 2017 and 100% by 2025
- Local TMDLs – County/MDE agree upon completion date

Countywide Implementation Strategy (CIS)

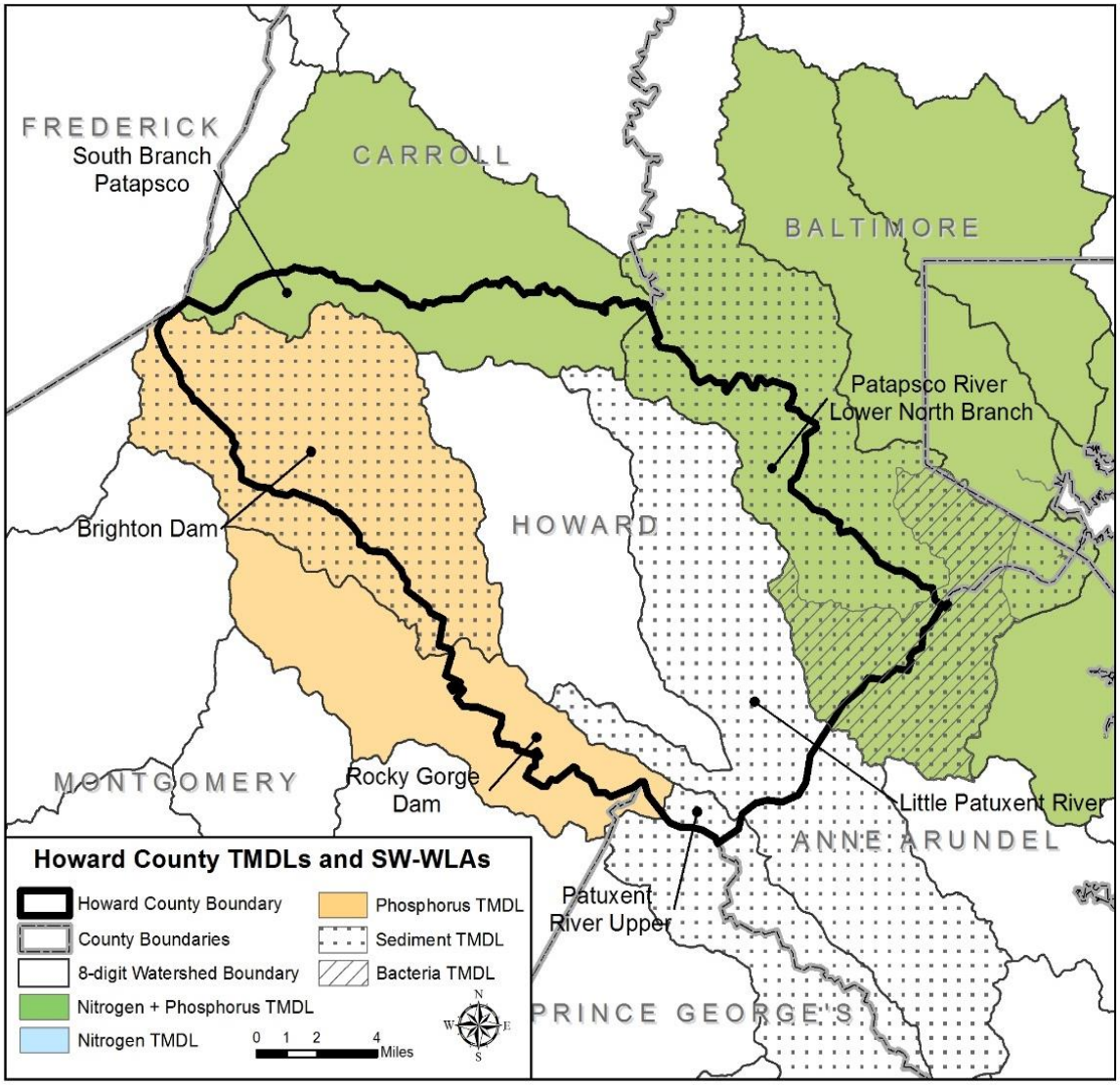
- County Restoration Plan
- Blue print for NPDES permit compliance, meeting TMDLs, and environmental improvements/protection
- Submitted to MDE December 17, 2015
- Review annually – currently finishing update for Patapsco/Patuxent study
- Consists of nine chapters

Countywide Implementation Strategy (CIS)

Chapter 1 – Background and Purpose

- NPDES MS4 Permit requirement
- **Chesapeake Bay TMDL and Local TMDLs**
- Middle Patuxent – no local TMDLs
- **Impervious baseline determination**
- Impervious area treatment – 20% of untreated
- Summary of previous studies

Howard County TMDL Watersheds



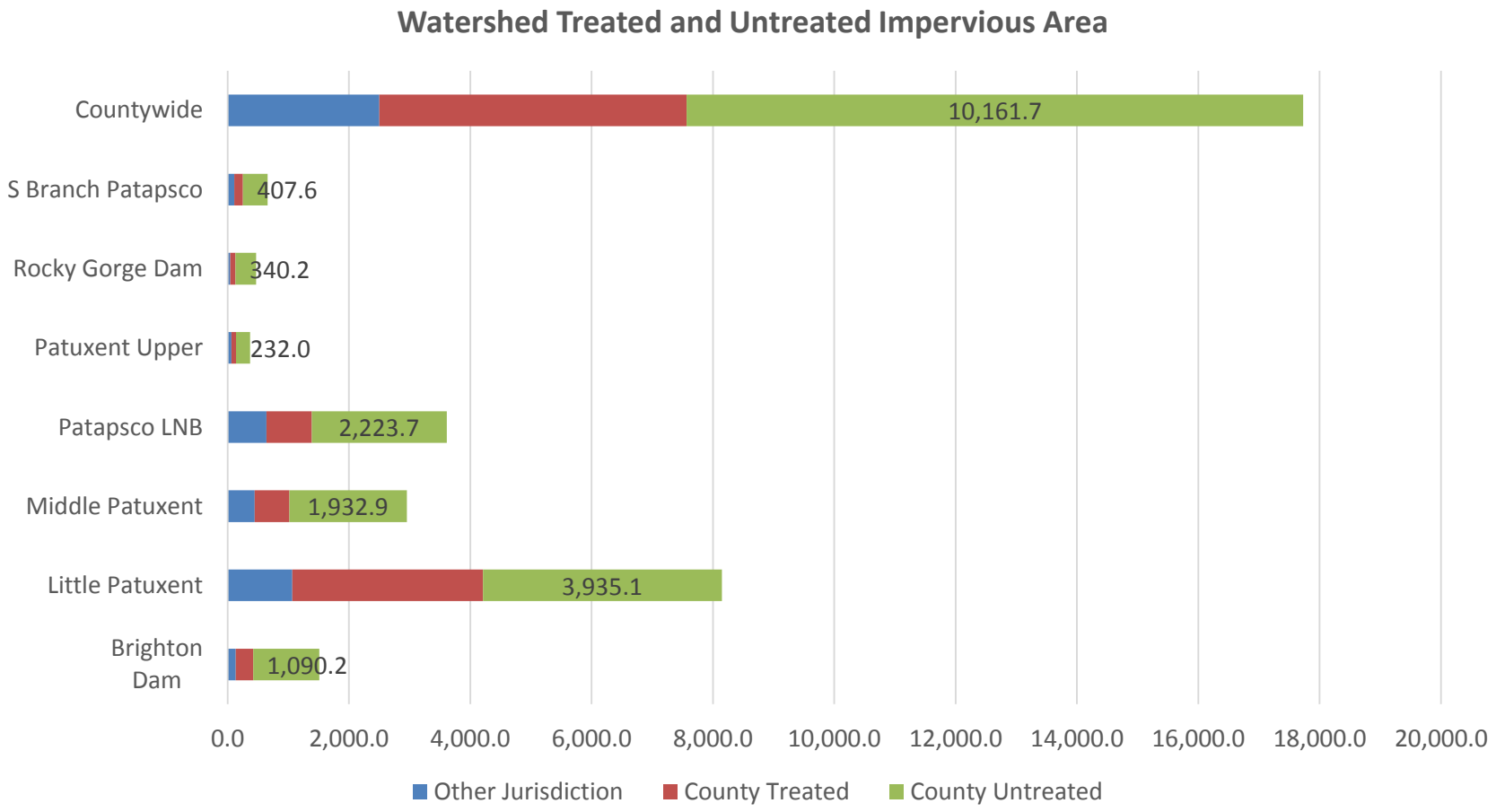
Countywide Implementation Strategy (CIS)

Howard County **Local** TMDLs:

Watershed	Impairment
Patapsco River - Lower North Branch	Sediment, Bacteria
Baltimore Harbor (S. Branch Patapsco+Patapsco LNB)	Nitrogen, Phosphorus
Patuxent River Upper	Sediment
Triadelphia Reservoir (Brighton Dam)	Sediment
Rocky Gorge Reservoir	Phosphorus
Little Patuxent River	Sediment

Impervious Area Baseline

- Countywide 10,161.7 untreated County impervious acres
- 20% Restoration Goal = 2,032.3 acres



Countywide Implementation Strategy (CIS)

Chapter 2 – Causes and Sources of Impairment

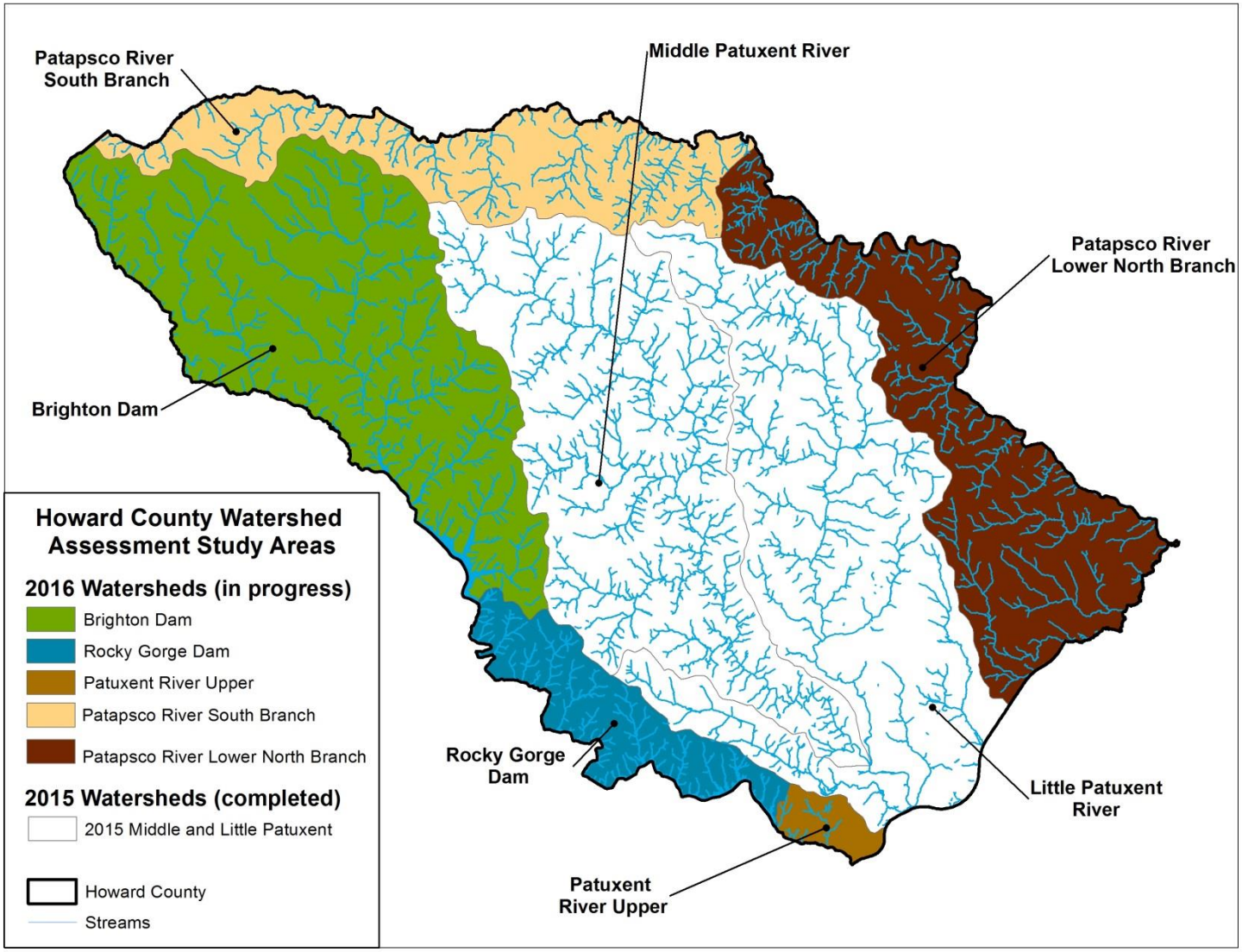
- Biological impairments
- Nutrients, sediment, bacteria
- Land use/Land cover
- Impervious areas
- Anticipated growth

Countywide Implementation Strategy (CIS)

Chapter 3 – Management Measures

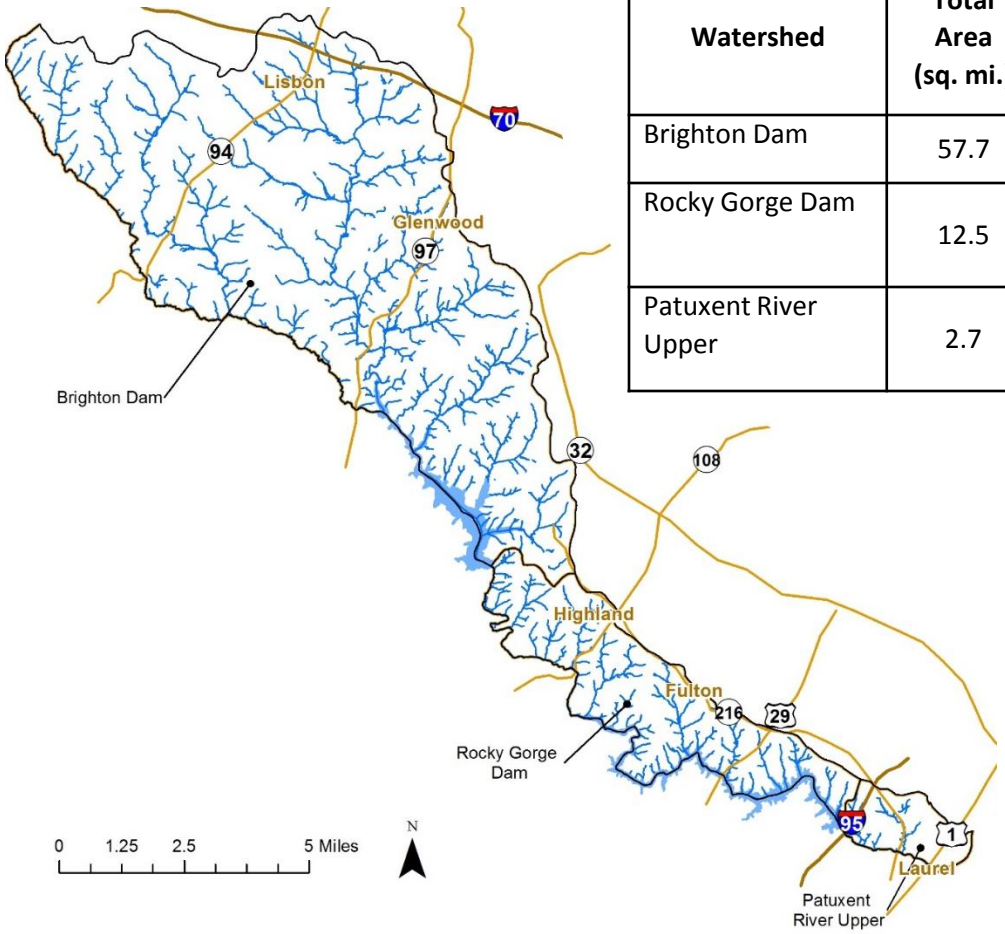
- **Watershed assessments**
- Summarizes Little/Middle Patuxent; updated now for Patapsco/Patuxent
- Modeling approach (MAST – **M**aryland **A**ssessment **S**cenario **T**ool & BayFAST)
- BMPs – types and efficiencies for pollutant removal

Patuxent/Patapsco Watershed Assessment



Watershed Characteristics

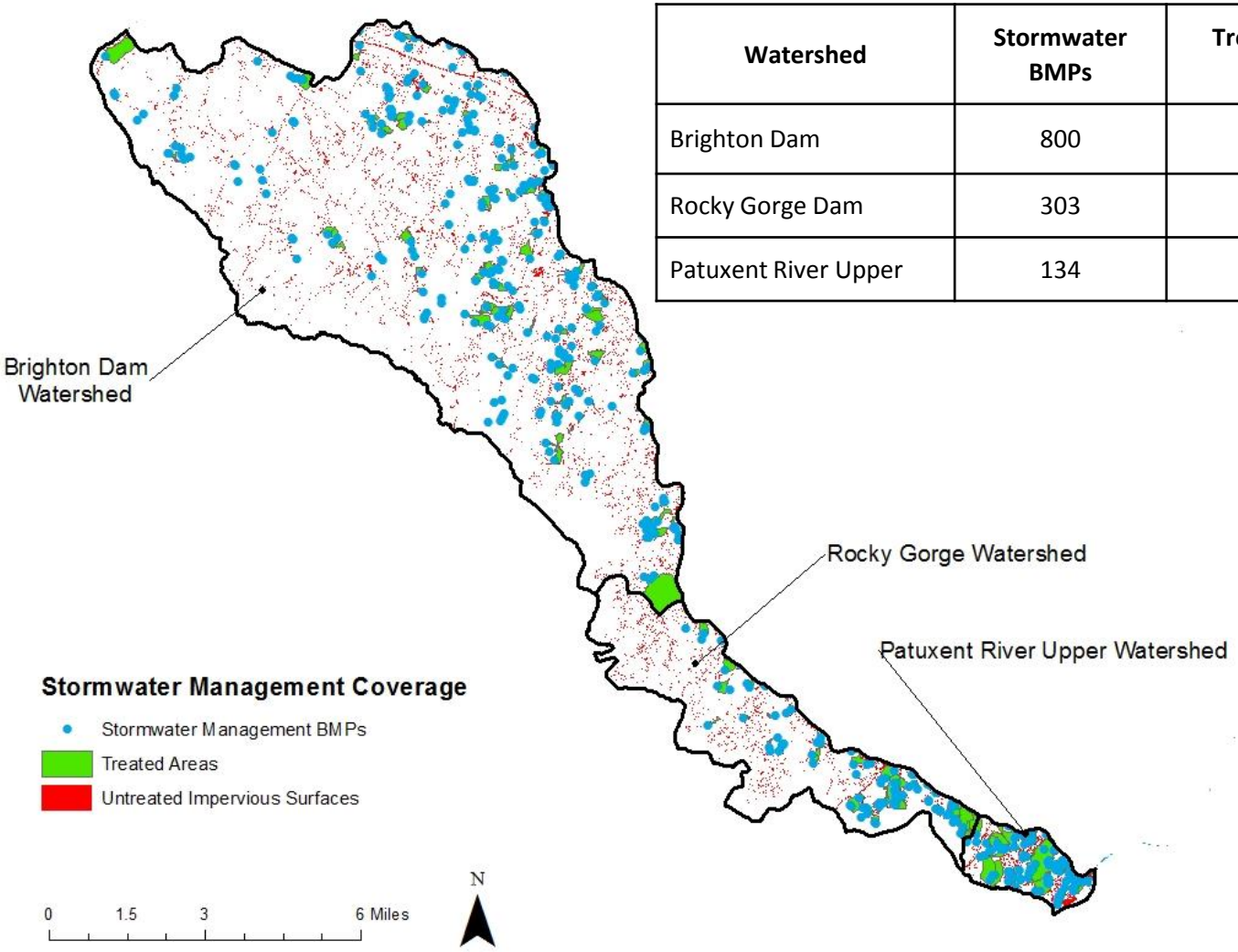
Patuxent River Watersheds



Watershed	Total Area (sq. mi.)	Impervious Area (sq. mi.)	Impervious Percent	Wooded Area (sq. mi.)	Wooded Percent
Brighton Dam	57.7	2.9	5.0	15.3	26.5
Rocky Gorge Dam	12.5	0.9	7.2	4.3	34.4
Patuxent River Upper	2.7	0.7	25.9	0.7	25.9

Stormwater BMPs

Watershed	Stormwater BMPs	Treated Area (acres)	Treated Area (sq. mi.)
Brighton Dam	800	390.0	0.6
Rocky Gorge Dam	303	108.5	0.2
Patuxent River Upper	134	86.1	0.1



Watershed Study – Phase 1

- Completed Fall 2016
  - Desktop Analysis
  - Handheld Tablet Setup and Programming
  - Consultant Field Calibration and Training
  - Field Assessment (Approx. 3 months)
  - Review and Compile Field Data
  - Late June 2016 - Community Meeting - #1
  - Prepare Site Ranking and Prioritization

Field Assessments and Results

Project Types Investigated

- Retrofit of Existing BMPs
- New BMPs
- Outfall Stabilization
- Stream Restoration
- Reforestation/Riparian Buffers

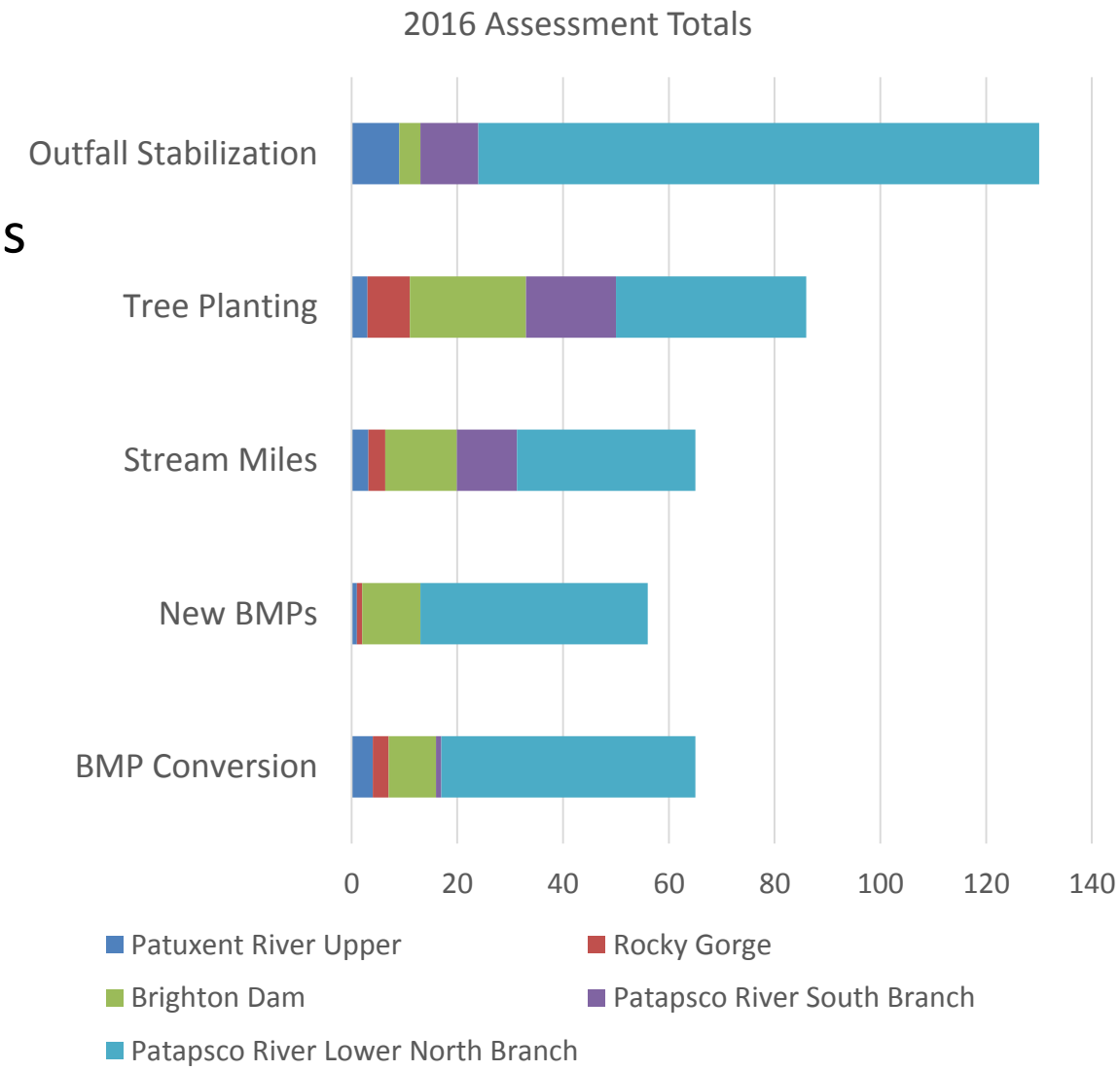
- Source Reduction?

Field Assessment

Assessment Results – Total

Sites Assessed:

- 130 Outfall stabilizations
- 86 Tree planting sites
- 65.0 Stream miles
- 56 New BMP sites
- 65 BMP conversions

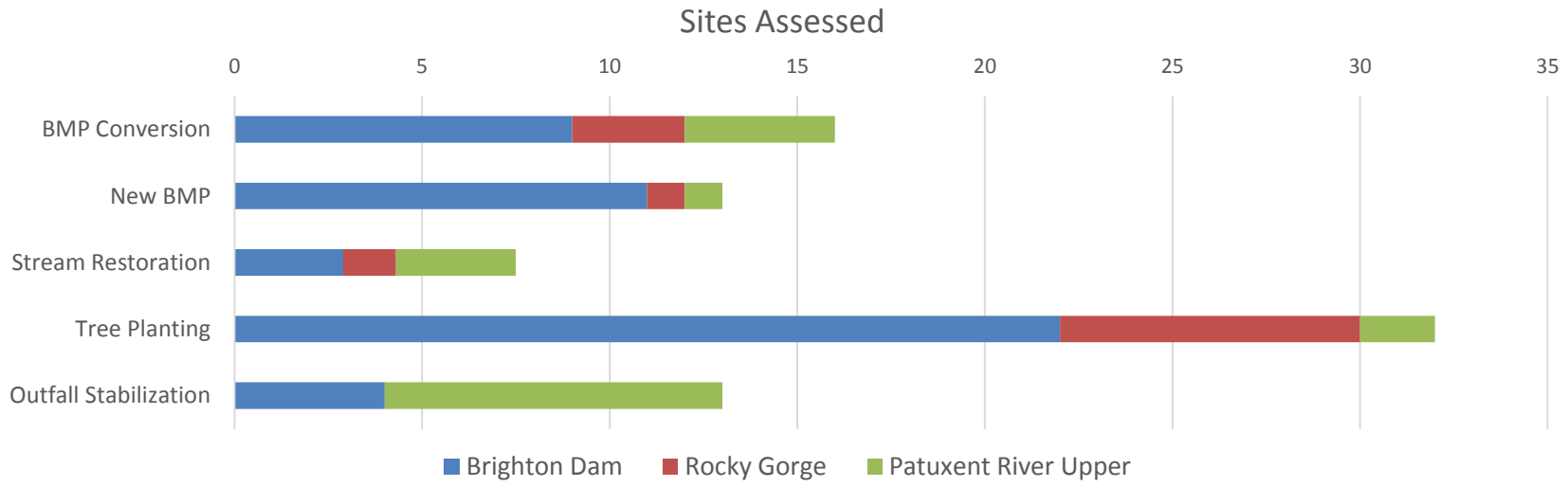


Assessment Sites – Patuxent Watersheds

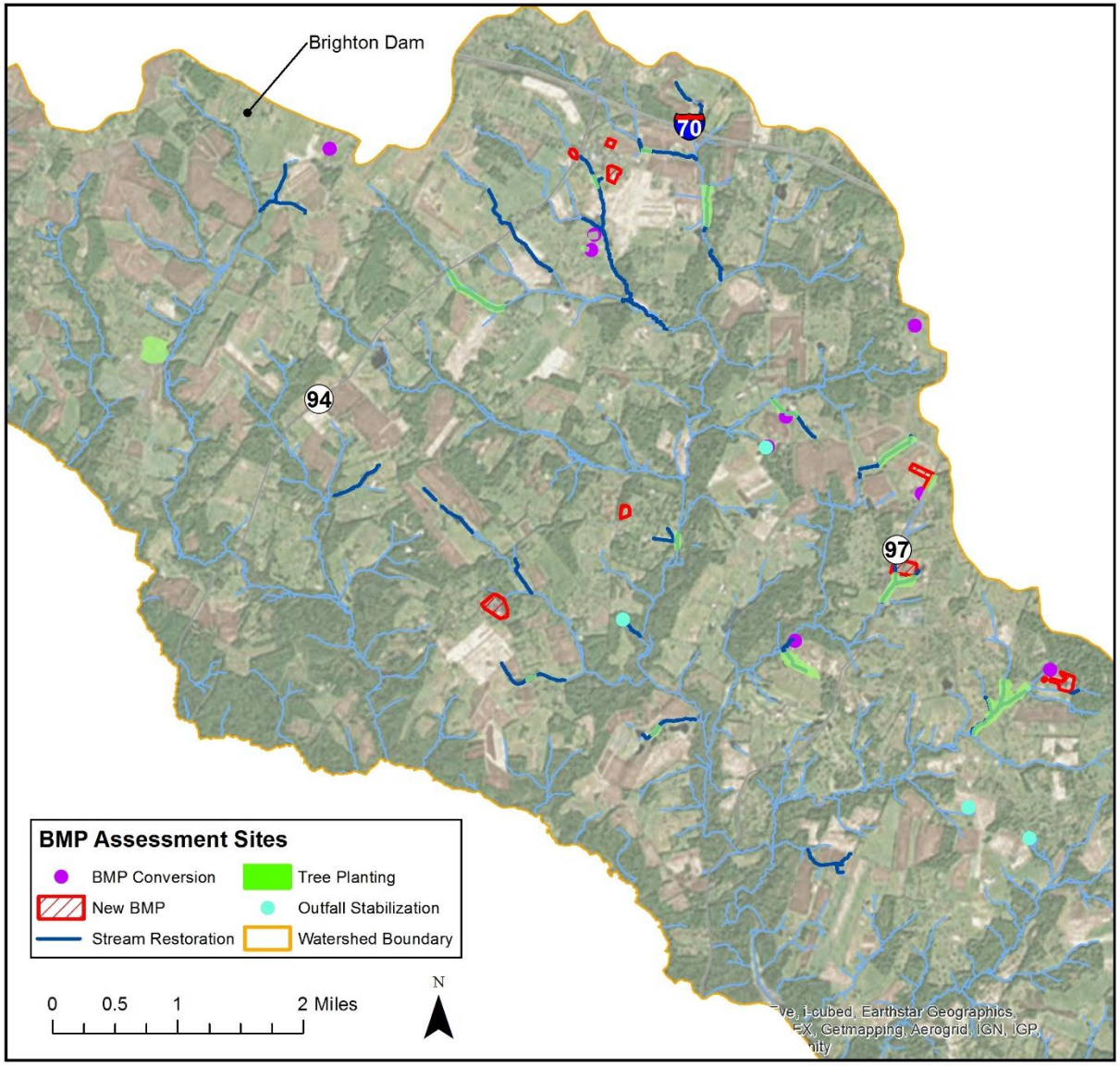
Numbers of Sites Assessed

Type	Unit	Brighton Dam	Rocky Gorge	Patuxent River Upper
BMP Conversion	Number of sites	9	3	4
New BMP	Number of sites	11	1	1
Stream Restoration	Stream miles	2.9	1.4	3.2
Tree Planting	Number of sites	22	8	2
Outfall Stabilization	Number of sites	4	0	9
Total Assessments		**44 sites** **2.9 stream miles**	**12 sites** **1.4 stream miles**	**16 sites** **3.2 stream miles**

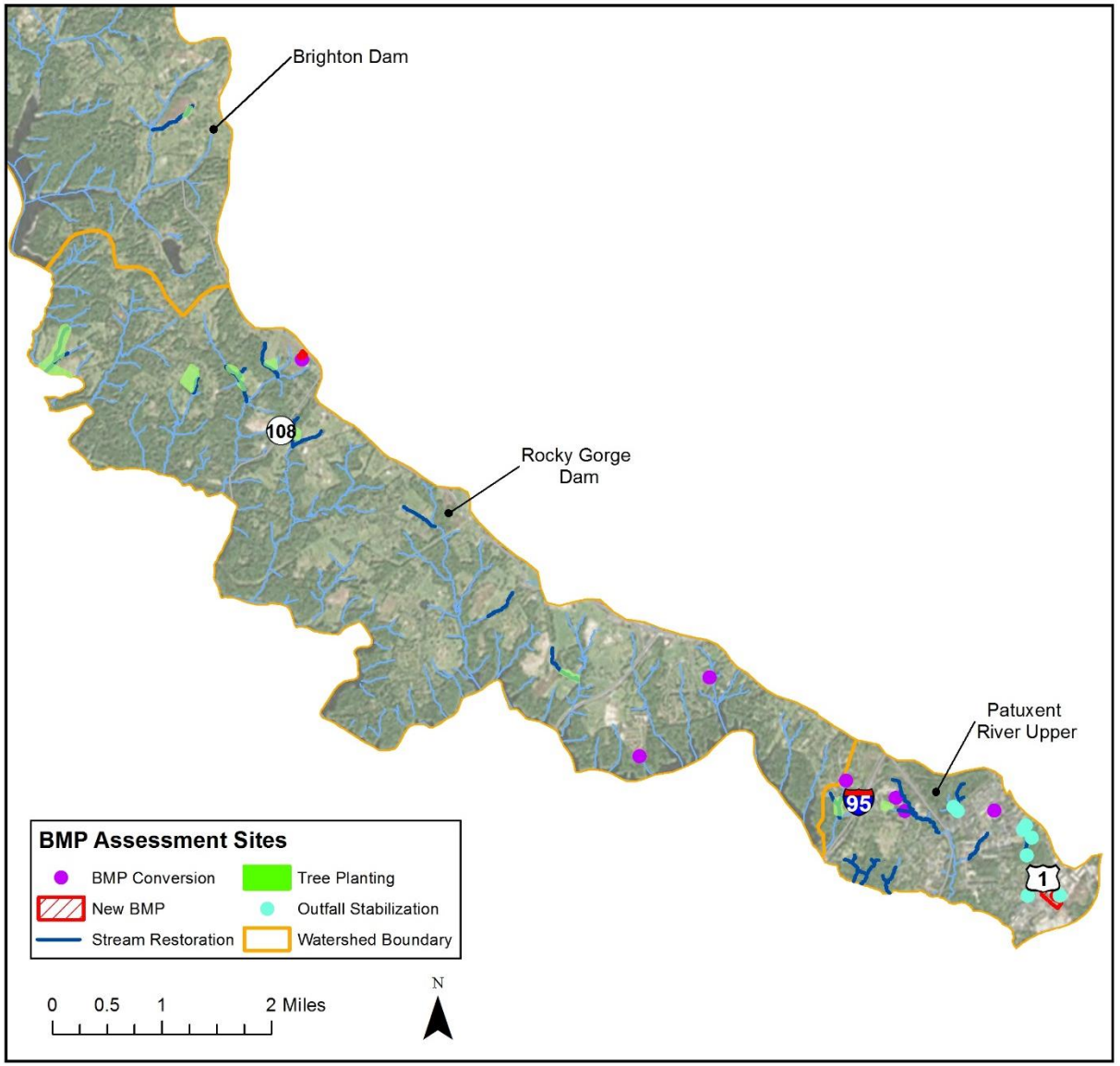
Note: includes Field and Desktop Assessments



Assessment Sites



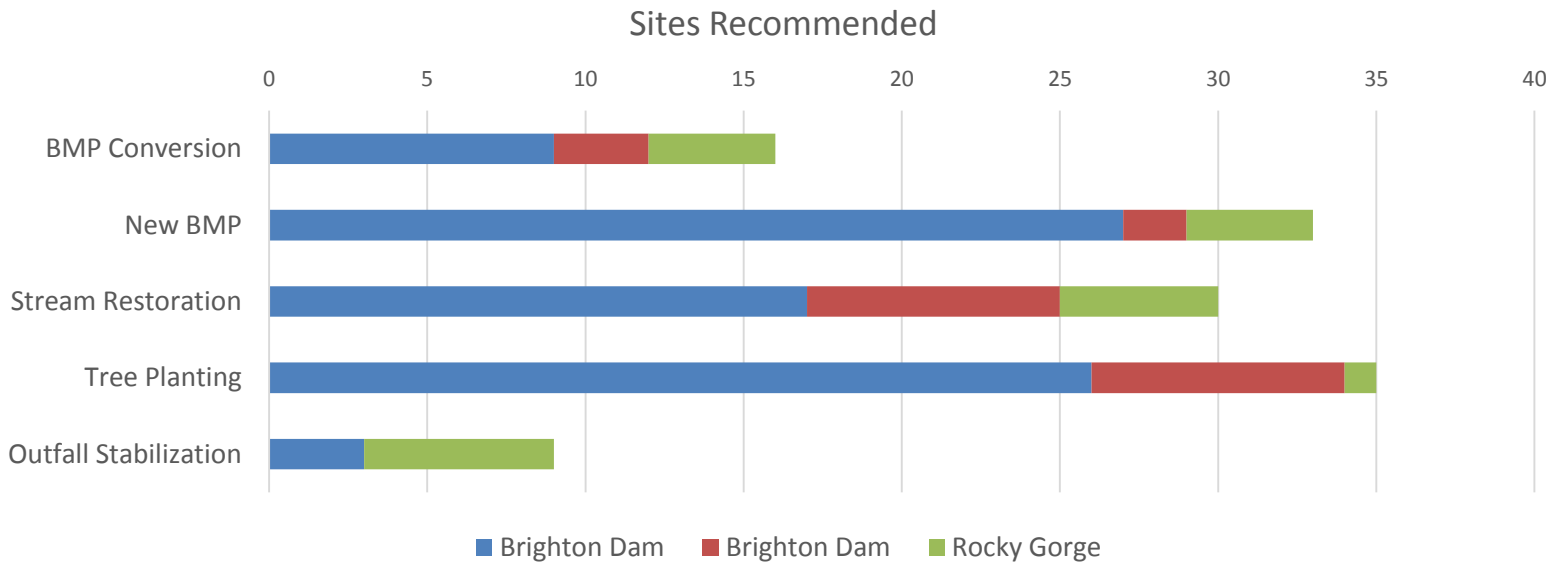
Assessment Sites



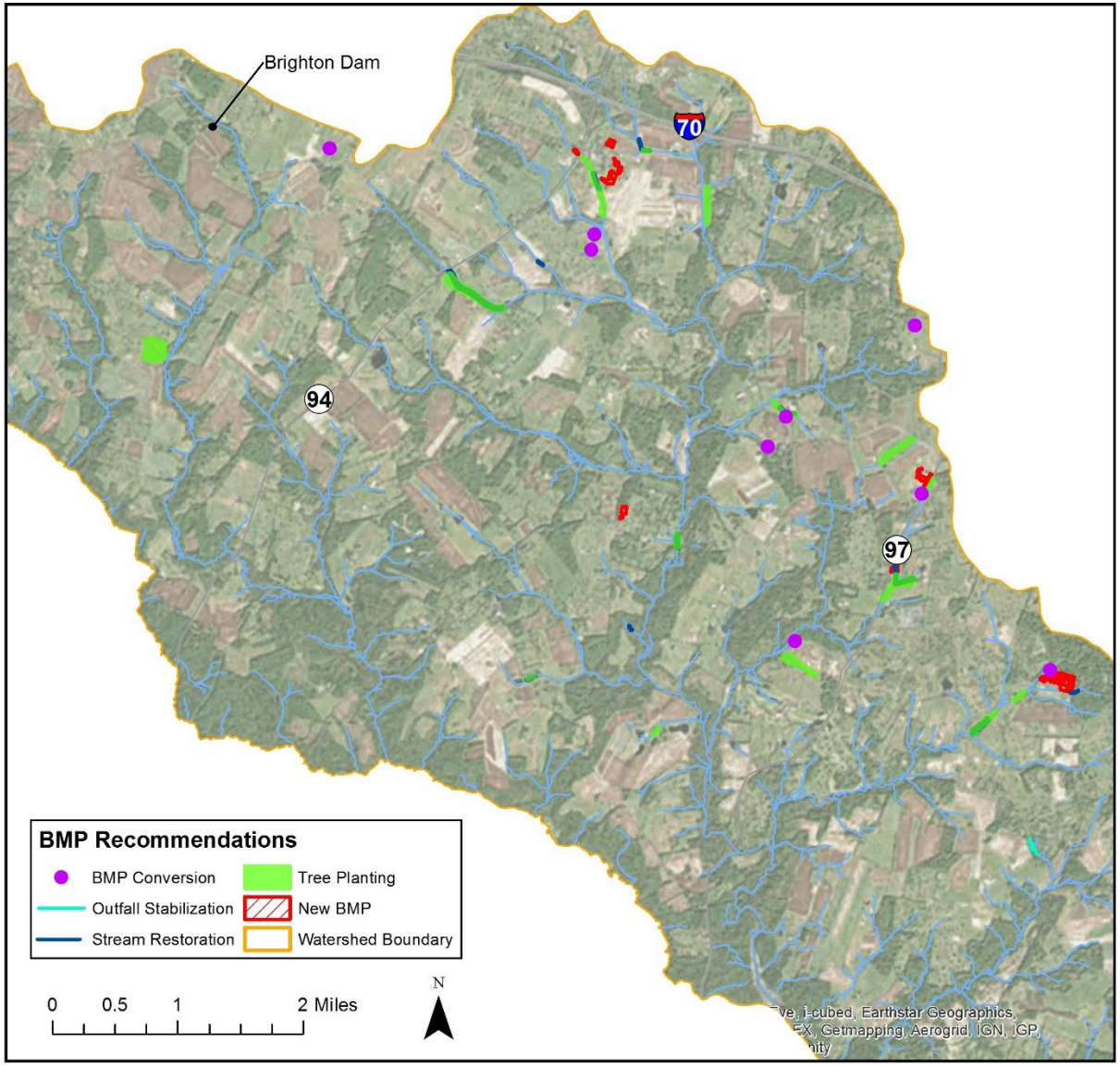
Assessment Recommendations

Number of Sites Recommended by Field Crews

Type	Brighton Dam	Rocky Gorge	Patuxent River Upper
BMP Conversion	9	3	4
New BMP	27	2	4
Stream Restoration	17	8	5
Tree Planting	26	8	1
Outfall Stabilization	3	0	6
Total Recommendations	**82**	**21**	**20**



Recommended Sites



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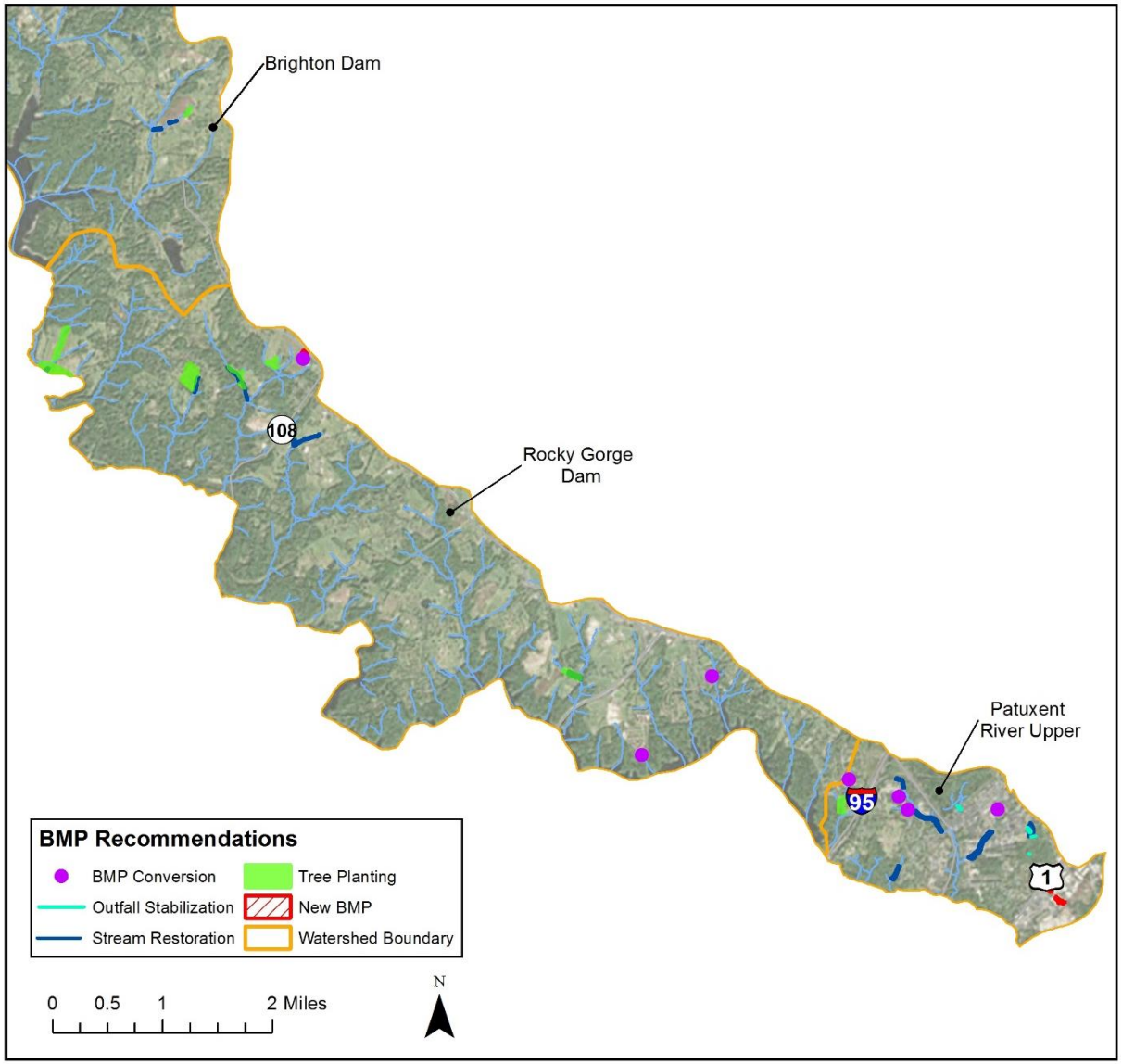


Watershed Study – Phase II

- Scheduled completion early 2017
  - Perform Concept Level Designs (Including Cost Estimates)
  - Rank sites ($/acre of impervious treated)
  - Input to restoration plan (CIS) update
  - Generate Draft Watershed Report
  - **Community Meeting - #2**
  - Review and Comment Period
  - Report to MDE - Early 2017

Site Ranking Factors

- Feasibility
  - Ease of access
  - Conflicts with infrastructure or other site constraints
  - Adverse impacts to nearby trees
  - Ownership – public vs. private
  - Pond/infrastructure already in need of repair
  - Field assessment – high potential for restoration/retrofit
  - Site preparation required before planting

- Biological uplift – additional benefits, such as augmenting existing green infrastructure or protecting wetlands
  - Within 500 feet of Green Infrastructure Network or High Quality (Tier II) waters
  - Planting is within 100 feet of wetlands

Site Ranking Factors

- Permit contribution – how project will help meet MS4 impervious treatment requirements and TMDL pollutant reduction goals
  - Acres of impervious treatment
  - Pollutant load reduction factor (Sum of % load reductions for TN, TP, and sediment)
  - Cost per acre of impervious treatment

- Programmatic benefit – value beyond primary functional purpose
  - Site has educational value and/or is visible for public demonstration
  - Site is near 2 or more other potential projects allowing for easier monitoring and demonstration of benefit

Site Ranking Factors

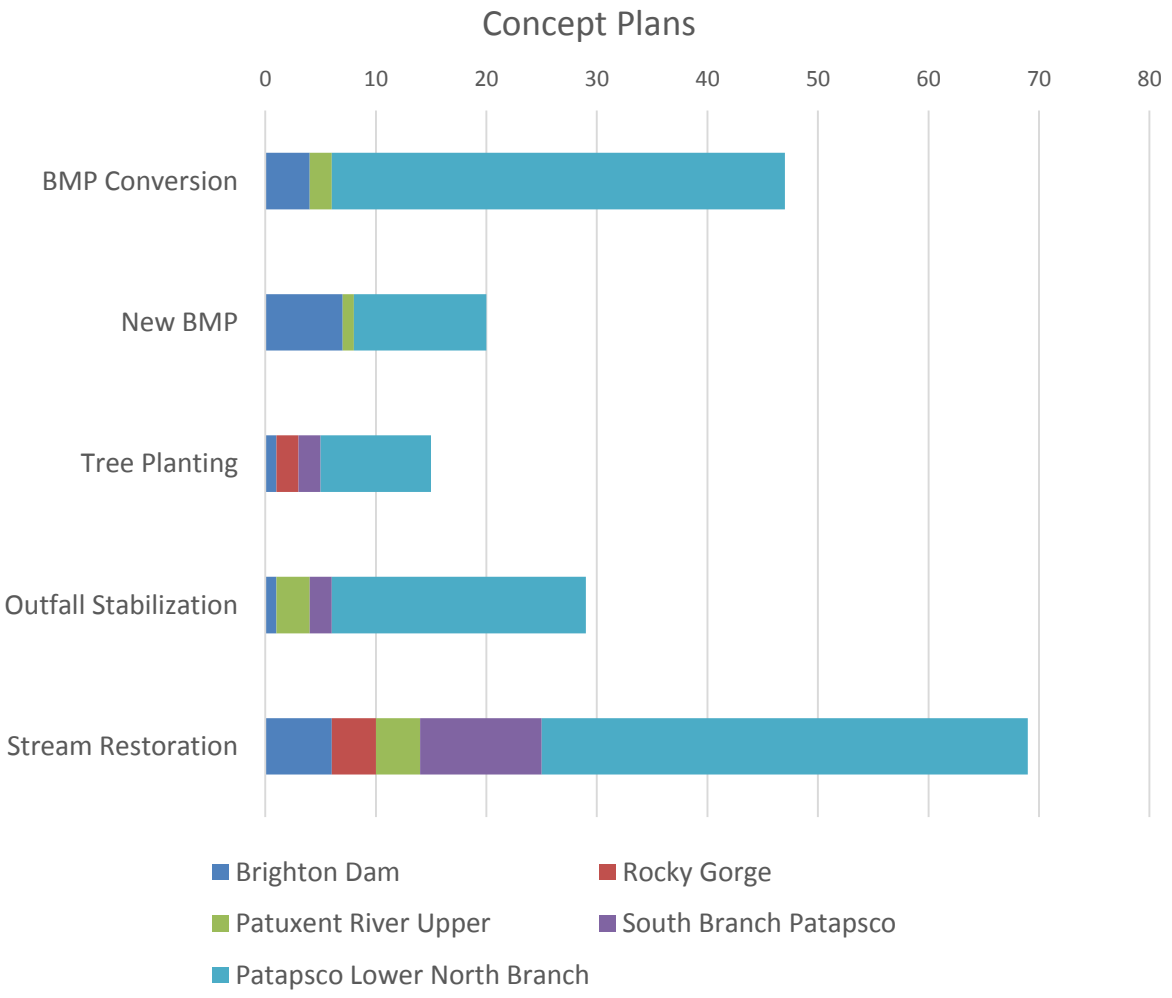
- Erosion factor (stream and outfall stabilization projects)
  - Length and severity of erosion

- Stream condition factors (stream projects)
  - Average Bank Erosion Hazard Index score
  - Habitat Assessment score
  - Number of other problems along reach (exposed pipes, pipe outfalls, unusual conditions, etc.)

Concept Plans - Total

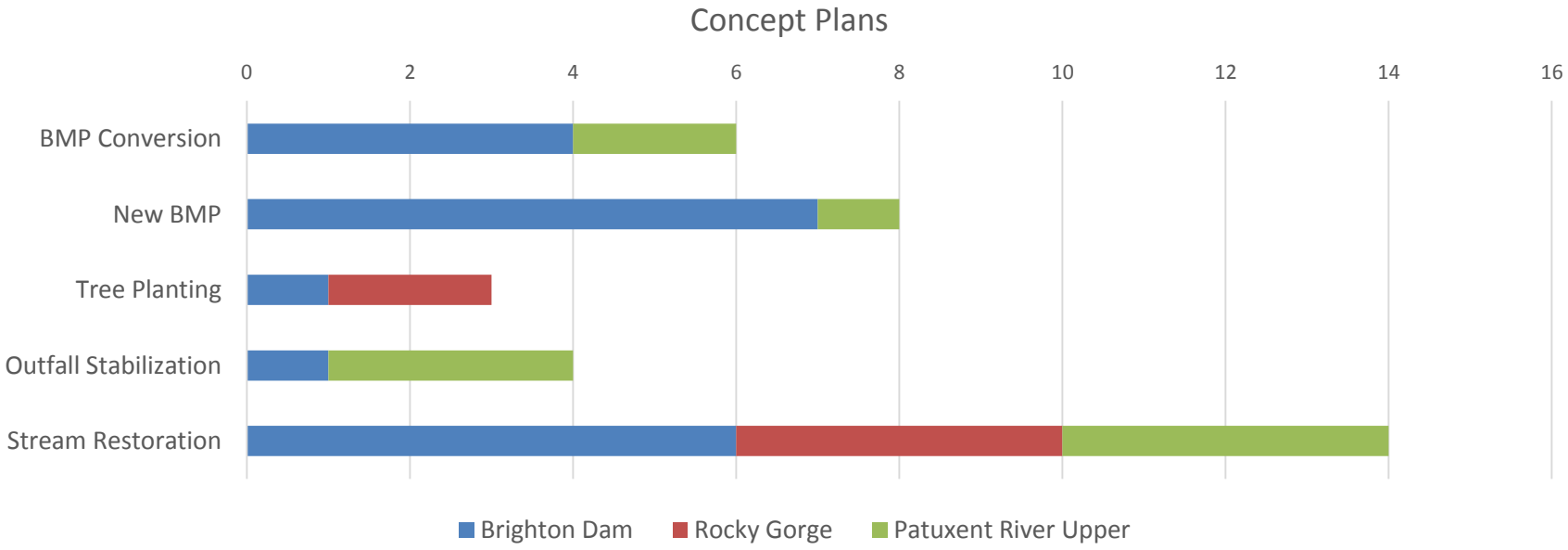
Concepts Prepared:

- 47 BMP conversions
- 20 New BMP sites
- 15 Tree planting sites
- 29 Outfall stabilizations
- 69 Stream restorations
- <u>180 Total</u>

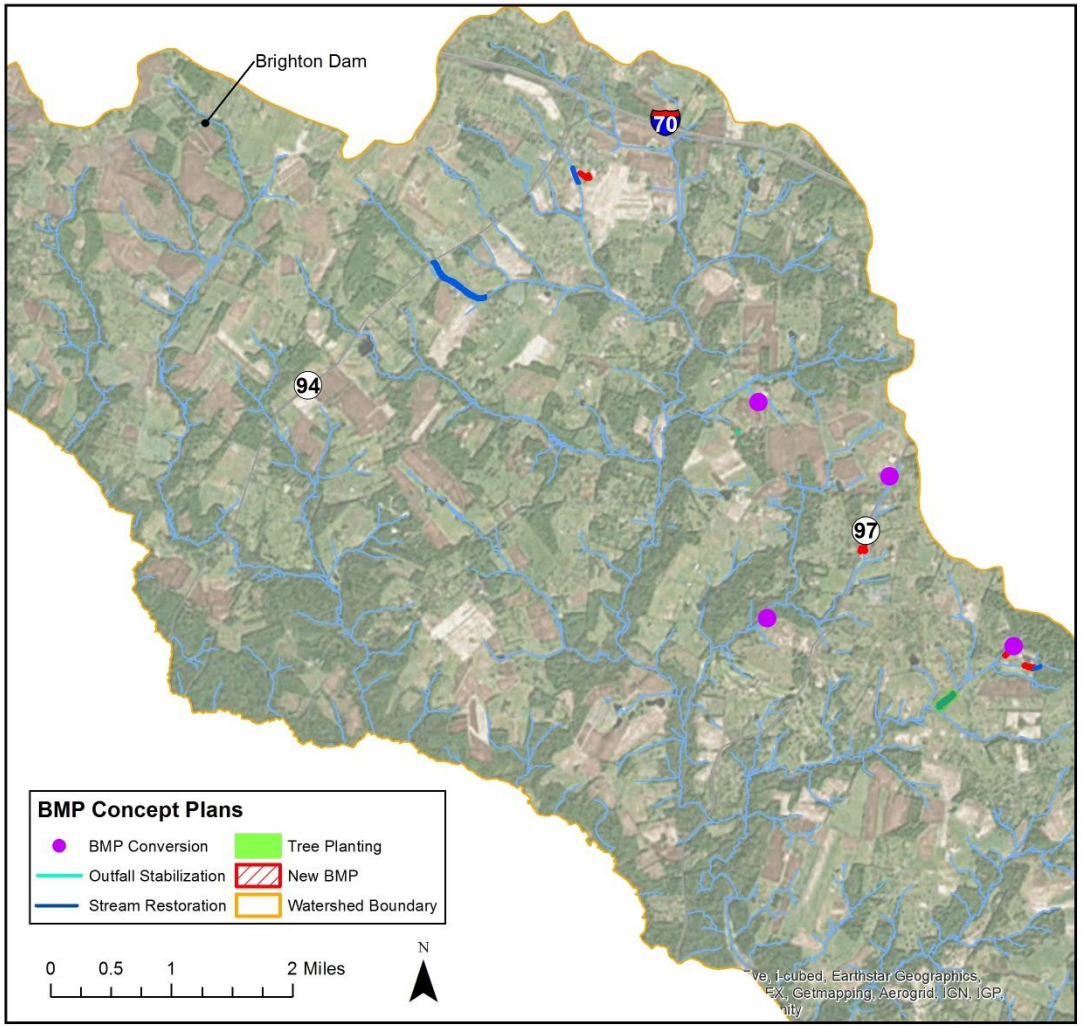


Concept Plans – Patuxent Watersheds

Project Type	Number of Concept Plans Developed		
	Brighton Dam	Rocky Gorge Dam	Patuxent River Upper
BMP Conversion	4		2
New BMP	7		1
Tree Planting	1	2	
Outfall Stabilization	1		3
Stream Restoration	6	4	4
Total	**19**	**6**	**10**



Concept Plan Sites



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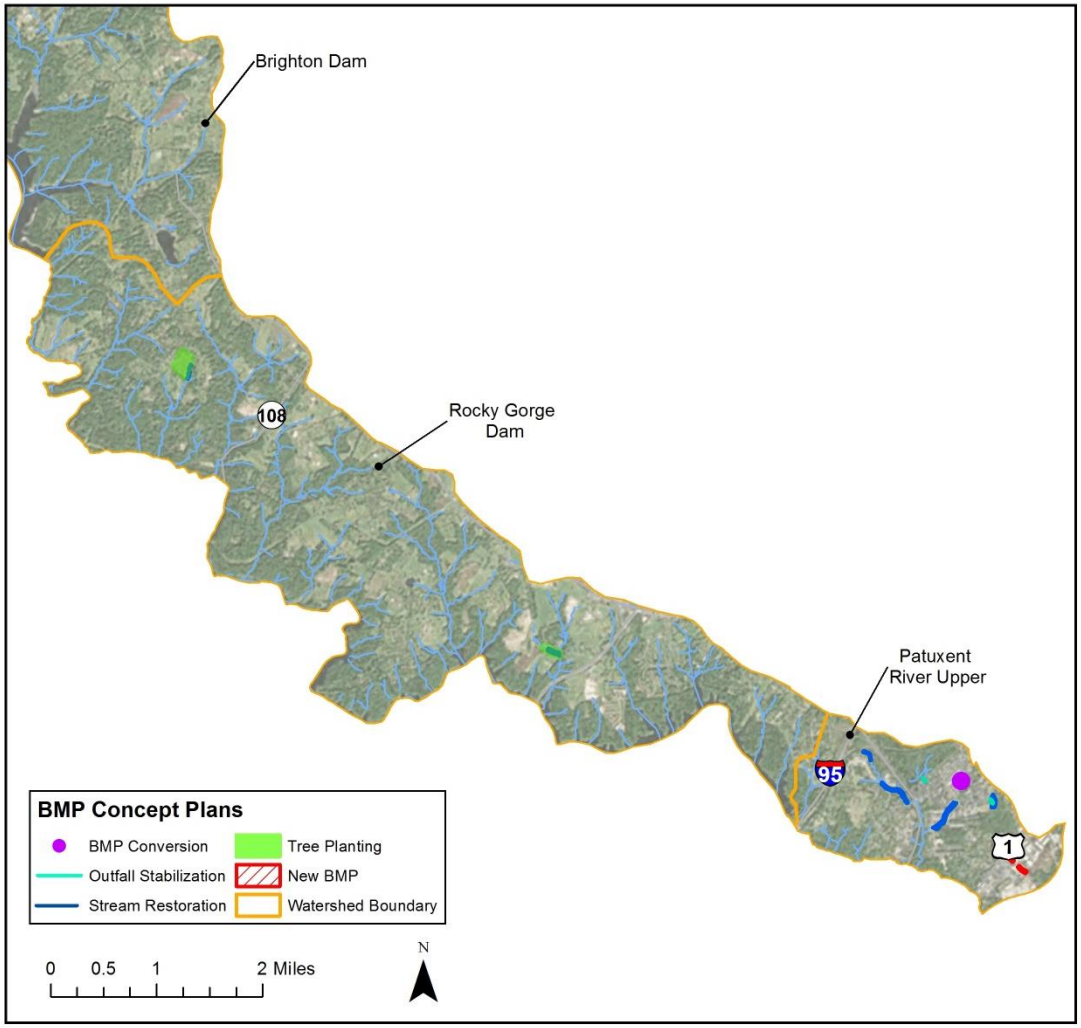


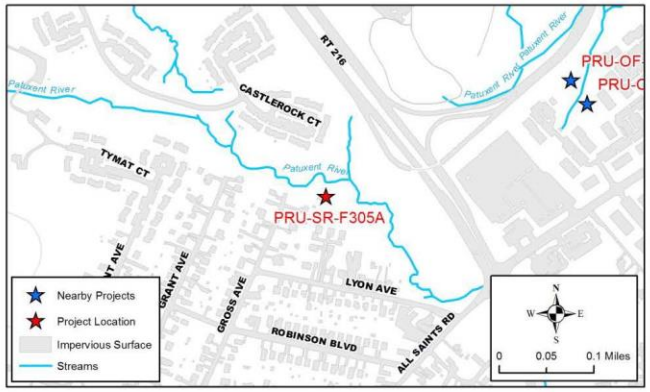
Howard County Watershed Assessment Concept Plan: Stream Restoration

Site ID: PRU-SR-F305A
Site Name: Lyon Avenue - A
Contractor: Biohabitats
Watershed: Patuxent River Upper

Ownership: County Owned
Multiple Owners

Existing Conditions:

The site is located within Howard County property and is classified as Howard County Open Space in Laurel, MD. The stream is located within a medium density residential area; however, the riparian zone is forested with Maryland 216 adjacent to the left and residential homes adjacent to the right (while looking downstream). The existing mainstem channel has persistent erosion throughout its extent, with alternating stream bank erosion between the left and right banks; however, the severity varies depending on location. The assessed stream has a small tributary that joins it about half way throughout its extents. This tributary is a pipe outfall channel from Maryland 216 and it was not assessed; however, the tributary was observed at its confluence with the assessed stream and was later revisited during the concept phase. The tributary is a 360 ft. long incised channel currently disconnected with its floodplain and exhibits an eroded bank height between 4 ft. and 5 ft. along both the left and right bank. Upstream of this tributary, alternating left and right bank erosion occurs at an average eroded bank height between 2 ft. and 3 ft.; however, this erosion is spotty and is healing over throughout the upstream extents. A sewer line crossing is also observed directly upstream of the tributary. The sewer line is not exposed, but the sewer line protection has been shifted and could possibly expose the pipe over time. Directly downstream of this tributary, the mainstem exhibits some of the worst erosion throughout the stream channel. The mainstem is widening and is disconnected from its floodplain directly downstream of the tributary for approximately 125 lf. at an average height of 5 ft. along the left bank. The mainstem then enters tight meanders creating high eroded banks. Downstream of these tight meanders, the mainstem bank erosion becomes less severe, with more spotty areas of erosion that are in the process of healing. The most downstream limits of the mainstem become very sinuous and steep with bank erosion shifting from the left and right banks with the average eroded bank heights between 2 ft. and 3 ft. Moderate sediment deposition throughout the channel is evident based on recent bank failure which is creating alternating bars along the toe of the banks. Riparian vegetative zone for both the upstream and downstream limits of the stream are optimal, with human activities (homes and roads) being more of an impact in the upstream limits. Shading along the existing channel is optimal (80%).



Howard County Watershed Assessment Concept Plan: Stream Restoration

Site ID: PRU-SR-F305A
Site Name: Lyon Avenue - A
Contractor: Biohabitats
Watershed: Patuxent River Upper

Photo facing downstream assessing the left bank and depicts a typical stream bank within the downstream limits of the assessed stream.

Photo facing upstream assessing the right bank and depicts a typical stream bank within the upstream limits of the assessed stream.

Howard County Watershed Assessment Concept Plan: Stream Restoration

Site ID: PRU-SR-F305A
Site Name: Lyon Avenue - A
Contractor: Biohabitats
Watershed: Patuxent River Upper

Constraints/Utilities:

Access to the stream poses an issue due to steep side slopes and surrounding private properties, but the site can be accessed from the sewer line easements along Old Scaggsville Road or Gross Ave. A water line crosses the stream at the upstream limits of the stream, while a sewer line runs adjacent to the stream and crosses the stream at several locations. Moderate impact to trees and wetlands could be an issue during construction due to the close proximity of these natural resources to the stream itself. The tributary is located with a forest conservation easement.

Concept Description:

The objective for this project is to reduce bank erosion and improve instream habitat for aquatic organisms. This project proposes the restoration of 1,650 lf. of stream channel which encompasses 1,290 lf. of the mainstem and 360 lf. of a tributary/outfall channel that was added during the concept reconnaissance. Because the tributary is currently entrenched with 4 ft. to 5 ft. eroding banks, the channel should be reconnected to its floodplain through stream restoration as well as safely convey into the mainstem to prevent further downstream erosion. Upstream of the tributary is a sewer crossing that is not currently exposed, but the existing sewer protection needs to be stabilized. This area also provides a logical tie-in point for the proposed restoration. Directly downstream of the sewer crossing and the tributary is a section of stream that is currently overwide and needs to be restored. Opportunities for the restoration of this reach include: 1.) raising the invert of the stream to provide better access to the existing broad floodplain, or 2.) create a nested channel with a shallow hyporheic bench within the over-widened channel while grading back the eroded banks to a stable angle, which will better align the channel cross section within the urban channel's flow regime. Moving downstream from this overwide section, the mainstem alignment should be realigned to reduce bank erosion occurring along the tight bends. Minor bank stabilization throughout the downstream limits of the mainstem and possible grade control structures could increase stability of the mainstem. Adding woody debris, cobble riffles, pools, and other nature-like habitat structures will reinforce the stream bed and banks, improve the flow diversity and structural complexity of the stream bed, and uplift the instream habitat throughout the mainstem. The proposed channel restoration work would occur predominately on the existing channel alignment; however, some minor realignment may be necessary at the tight meander bends at the downstream limits of the mainstem. This channel restoration has the potential to reduce sediment supply, improve habitat and provide opportunities for nutrient uptake.

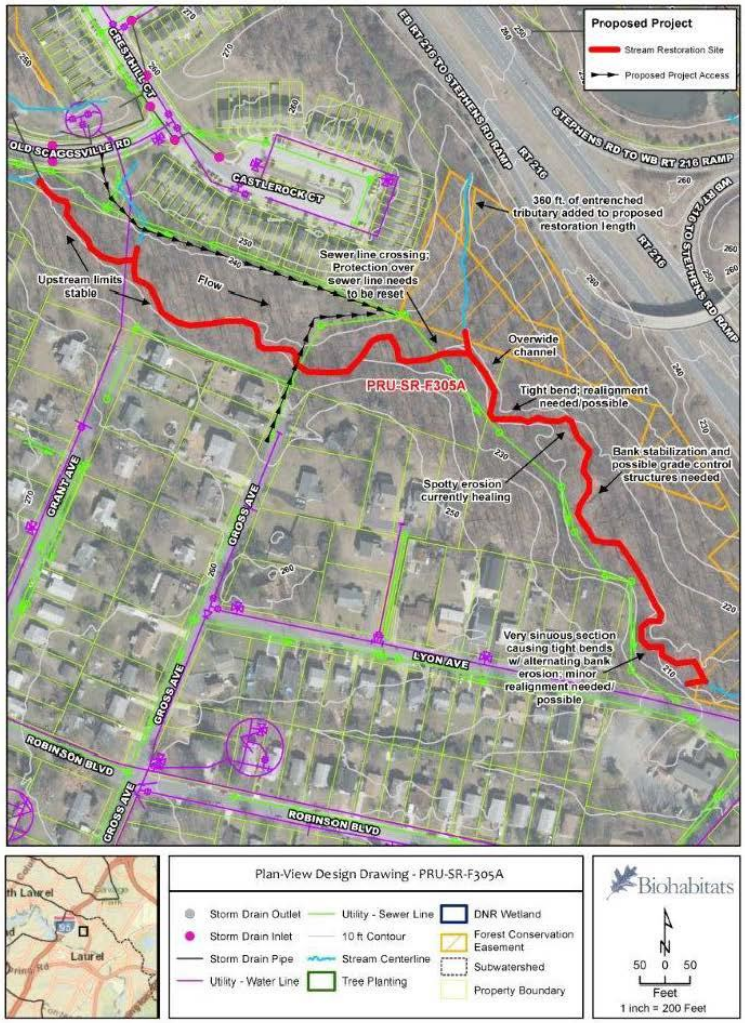
Nearby Opportunities:

None recommended

Proposed Project Credit		Costs	
Length Restored (ft):	1,650	Estimated Design Cost:	$300,000
Impervious Area Treated Credit (ac.):	16.5	Estimated Construction Cost:	$742,500
Cost per Impervious Credit Acre:	$82,136	30% Contingency:	$312,750
		Estimated Total Cost:	$1,355,250

Howard County Watershed Assessment Concept Plan: Stream Restoration

Site ID: PRU-SR-F305A
Site Name: Lyon Avenue - A
Contractor: Biohabitats
Watershed: Patuxent River Upper



Project Results – Patuxent Summary

	Number of Projects/ Concepts	Impervious Credit	TMDL Estimated Load Reductions		
			TN-EOS lbs	TP-EOS lbs	TSS-EOS lbs
Brighton Dam	19	84	1,055	425	290,387
BMP Conversion	4	20	491	36	31,228
New BMP	7	3	39	4	2,992
Stream Restoration	6	56	417	378	250,425
Tree Planting	1	1	24	1	379
Outfall Stabilization - SPSC	1	3	84	6	5,363
Patuxent River Upper	10	70	572	354	231,215
BMP Conversion	2	14	140	16	8,630
New BMP	1	2	25	3	1,337
Stream Restoration	4	49	364	330	218,250
Outfall Stabilization - SPSC	3	6	43	5	2,998
Rocky Gorge Dam	6	46	411	274	182,811
Stream Restoration	4	40	298	270	178,830
Tree Planting	2	7	113	4	3,981
Total	**35**	**200**	**2,038**	**1,053**	**704,413**

Project Results – Patuxent Summary

Based on doing ALL 35 concept projects in the Patuxent Watershed:

Impervious Restoration

- 200 restored acres possible with implementation of all identified projects
- Represents 10% of the projects needed to meet the impervious restoration goal (2,032 acres) or 1% of the 20% restoration target

Pollutant Load Reductions

- Patuxent River Upper – Potential sediment reduction of 231,215 lbs of represents 50 times the remaining reduction required (4,708 lbs)
- Rocky Gorge – Potential phosphorus reduction of 274 lbs represents 6 times the remaining reduction required (45 lbs)
- Brighton Dam – Potential phosphorus reduction of 425 lbs represents 1.8 times the remaining reduction required (232 lbs)

Estimated Costs – Patuxent Concepts

	Brighton Dam		Rocky Gorge Dam		Patuxent River Upper		Total	
	Number of Projects	Cost	Number of Projects	Cost	Number of Projects	Cost	Number of Projects	Cost
BMP Conversion	4	$2,444,662	0	$0	2	$1,414,563	6	$ 3,859,225
New BMP	7	$1,870,083	0	$0	1	$413,543	8	$ 2,283,626
Stream Restoration	6	$5,400,005	4	$4,408,677	4	$4,137,250	14	$ 13,945,932
Tree Planting	1	$162,760	2	$741,520	0	$0	3	$ 904,280
Outfall Stabilization - SPSC	1	$413,400	0	$0	3	$1,671,800	4	$ 2,085,200
Total	19	$10,290,909	6	$5,150,197	10	$7,637,156	**35**	**$23,078,263**

Watershed Assessment Summary:

- Identified restoration opportunities
- More need/potential projects in Patapsco than Patuxent
- Streams – scored higher, more cost efficient, and plentiful
- Approx. 60% of projects on private property
- 180 projects will make a dent in our permit requirements . . . and our checkbook

Watershed Study - Next Steps

- Master list for developing annual Capital Budget requests (included with Little Patuxent, Middle Patuxent, and new citizen generated projects)
- Help define total budget and manpower needs to meet permit conditions
- Valuable input to CIS restoration plan
- Factor in private property projects
- Public review and submittal to MDE

Can’t wait for restoration projects . . .

Restoration Toolbox

Bioretention

Pond Retrofit Project

Pond Retrofit Project

Outfall Stabilization

Stream Restoration

Riparian Buffer Enhancement

Alternative BMPs

Can we get credit from MDE?

Countywide Implementation Strategy (CIS) - Continued

Countywide Implementation Strategy (CIS)

Chapter 4 – Load Reductions/Impervious Treated

- Summaries based on Actual Implementation and Planned Implementation
- Bay TMDL and Local TMDLs
- By BMP types and subwatershed
- **Compare results to goals**

20% Impervious Acre Goal

Planned Projects - Countywide

- A selected suite of projects to meet the goal of 2,032 acres in 2019 (FY2017 to end of 2019)
- Total Cost of $50 million
- Per NPDES Permit - Meeting 20% impervious acre goal => Bay TMDL requirements are met

Number of BMPs (FY2017-2019)	**Brighton Dam**	**Little Patuxent**	**Middle Patuxent**	**Patapsco LNB**	**Patuxent Upper**	**Rocky Gorge Dam**	**S Branch Patapsco**	**Countywide**
Number of Restoration BMPs	1	34	10	26	1	0	0	72
FY17 Credit Year		*8*	*4*	*7*				*19*
FY18 Credit Year	*1*	*7*	*5*	*9*				*22*
FY19 Credit Year		*19*	*1*	*10*	*1*			*31*
Cost (FY2017-2019)								
Total Cost	$1,850,000	$27,168,234	$4,893,016	$15,149,167	$611,000		$0	$0 $49,671,417
FY17 Credit Year		*$6,503,600*	*$1,046,202*	*$2,817,959*				*$10,367,761*
FY18 Credit Year	*$1,850,000*	*$5,555,112*	*$2,075,806*	*$6,389,764*				*$15,870,682*
FY19 Credit Year		*$15,109,522*	*$1,771,008*	*$5,941,444*	*$611,000*			*$23,432,974*

20% Impervious Acre Goal

	Brighton Dam	Little Patuxent River	Middle Patuxent River	Patapsco River L N Br	Patuxent River upper	Rocky Gorge Dam	S Branch Patapsco	Countywide
Impervious Baseline and Target (Impervious Credit Acres)								
County MS4 Impervious Area	**1,378.5**	**7,080.1**	**2,506.9**	**2,971.4**	**311.0**	**426.2**	**552.2**	**15,226.4**
Impervious Baseline Treated	**288.3**	**3,145.0**	**574.0**	**747.8**	**79.0**	**86.0**	**144.6**	**5,064.7**
Impervious Baseline Untreated	**1,090.2**	**3,935.1**	**1,932.9**	**2,223.7**	**232.0**	**340.2**	**407.6**	**10,161.7**
20% Restoration Target	**218.0**	**787.0**	**386.6**	**444.7**	**46.4**	**68.0**	**81.5**	**2,032.3**
FY2016 Progress Impervious Restoration (Impervious Credit Acres)								
FY2016 Total Progress Restoration	**101.7**	**508.3**	**235.6**	**133.0**	**7.1**	**22.5**	**19.5**	**1,027.7**
% Impervious Treated	**9.3%**	**12.9%**	**12.2%**	**6.0%**	**3.1%**	**6.6%**	**4.8%**	**10.1%**
Planned Impervious Restoration (FY2017 – End of 2019) (Impervious Credit Acres)								
Total Restoration BMPs	64.0	379.0	73.7	194.7	6.0	0.0	0.0	717.5
FY17 Credit Year		*58.0*	*20.5*	*43.3*				*121.8*
FY18 Credit Year	*64.0*	*44.6*	*33.2*	*96.0*				*237.8*
FY19 Credit Year		*276.4*	*20.0*	*55.4*	*6.0*			*357.8*
Rain Barrels	0.04	0.30	0.09	0.13	0.01	0.02	0.61	1.2
Septic Pump-outs	38.6	38.6	38.6	38.6	38.6	38.6	38.6	270.0
Septic Upgrades	4.5	4.5	4.5	4.5	4.5	4.5	4.5	31.2
Total Planned Impervious Restoration	**107.1**	**422.3**	**116.8**	**237.9**	**49.0**	**43.0**	**43.6**	**1,019.9**
% Impervious Treated	**9.8%**	**10.7%**	**6.0%**	**10.7%**	**21.1%**	**12.7%**	**10.7%**	**10.0%**
Total Impervious Restoration to 2019 (Impervious Credit Acres)								
FY2016 Progress	**101.7**	**508.3**	**235.6**	**133.0**	**7.1**	**22.5**	**19.5**	**1,027.7**
FY2017-2019 Planned	**107.1**	**422.3**	**116.8**	**237.9**	**49.0**	**43.0**	**43.6**	**1,019.9**
Total Impervious Restoration	**208.8**	**930.6**	**352.5**	**370.8**	**56.2**	**65.6**	**63.1**	**2,047.6**
% Impervious Treated	**19.2%**	**23.6%**	**18.2%**	**16.7%**	**24.2%**	**19.3%**	**15.5%**	**20.2%**

Local TMDL Goals

	Baltimore Harbor		Little Patuxent	Patapsco R LN Branch		Patuxent R Upper	Rocky Gorge Reservoir	Triadelphia Reservoir (Brighton Dam)
	TN-EOS lbs/yr	TP-EOS lbs/yr	TSS-EOS lbs/yr	TSS-EOS lbs/yr	Bacteria MPN/100 mL/yr	TSS-EOS lbs/yr	TP-EOS lbs/yr	TP-EOS lbs/yr
Baseline Loads and Target Reductions								
TMDL Baseline Year	1995	1995	2005	2005	2003	2005	2000	2000
Calibrated Baseline Load	107,059	6,546	10,346,821	6,123,442	21,826	145,902	861	2,654
Target Percent Reduction	**15.0%**	**15.0%**	**48.1%**	**10.0%**	**75.0%**	**11.4%**	**15.0%**	**15.0%**
Calibrated Target Reduction	16,059	982	4,976,821	612,344	16,370	16,633	129	398
Calibrated TMDL WLA	91,000	5,564	5,370,000	5,511,098	5,457	129,269	732	2,256

Local TMDL Goals

Planned Projects

- Additional projects build on the impervious restoration progress to meet local TMDL goals
- FY2017 to end of 2019

Number of Planned BMPs	Baltimore Harbor	Little Patuxent	Middle Patuxent	Patapsco R LN Branch	Patuxent R Upper	Rocky Gorge Reservoir	Triadelphia Reservoir	Total*
Planned Projects	**181**	**58**	**10**	**159**	**1**	**2**	**1**	**253**
FY17 Credit Year	7	8	4	7				19
FY18 Credit Year	9	7	5	9			1	22
FY19 Credit Year	10	19	1	10	1			31
2015 Concepts - Inventory		24						24
2016 Concepts - Inventory	139			124		2		141
Additional Required Projects	16			9				16
Planned Costs	**$137,533,214**	**$44,330,000**	**$4,893,016**	**$114,832,701**	**$611,000**	**$1,287,549**	**$1,850,000**	**$190,504,778**
FY17 Credit Year	$2,817,959	$6,503,600	$1,046,202	$2,817,959				$10,367,761
FY18 Credit Year	$6,389,764	$5,555,112	$2,075,806	$6,389,764			$1,850,000	$15,870,682
FY19 Credit Year	$5,941,444	$15,109,522	$1,771,008	$5,941,444	$611,000			$23,432,974
2015 Concepts - Inventory		$17,161,766						$17,161,766
2016 Concepts - Inventory	$105,911,931			$90,466,826		$1,287,549		$107,199,480
Additional Required Projects	$16,472,116			$9,216,708				$16,472,116

*Patapsco R LNB is located within Baltimore Harbor watershed; therefore, projects/costs in Patapsco R LNB are part of the Baltimore Harbor numbers

Local TMDL Goals Met

	Baltimore Harbor		Little Patuxent	Patapsco R LN Branch		Patuxent R Upper	Rocky Gorge Reservoir	Triadelphia Reservoir (Brighton Dam)
	TN-EOS lbs/yr	TP-EOS lbs/yr	TSS-EOS lbs/yr	TSS-EOS lbs/yr	Bacteria MPN/100 mL/yr	TSS-EOS lbs/yr	TP-EOS lbs/yr	TP-EOS lbs/yr
Baseline Loads and Target Reductions								
Target Percent Reduction	15.0%	15.0%	48.1%	10.0%	75.0%	11.4%	15.0%	15.0%
FY2016 Progress Reductions								
Restoration Reductions	3,112	517	3,235,928	223,739	22	11,924	84	166
Restoration BMPs	*2,335*	*206*	*3,055,184*	*139,920*	*22*	*4,526*	*28*	*103*
Street Sweeping	*778*	*311*	*180,744*	*83,818*	*0*	*7,398*	*56*	*63*
Restoration Reduction Percent	2.9%	7.9%	31.3%	3.7%	0.1%	8.2%	9.8%	6.2%
Planned Reductions								
Planned Reductions	13,015	8,135	2,211,506	4,784,877	19,638	27,000	69	435
FY17 Credit Year	*307*	*187*	*133,952*	*138,778*	-	-	-	-
FY18 Credit Year	*718*	*584*	*140,076*	*397,253*	-	-	-	*435*
FY19 Credit Year	*585*	*290*	*1,149,331*	*230,023*	*31*	*27,000*	-	-
2015 Concepts - Inventory	-	-	*788,147*	-	-	-	-	-
2016 Concepts - Inventory	*9,805*	*6,027*	-	*3,606,051*	*2,864*		*69*	
Additional Placeholder Projects	*1,601*	*1,047*	-	*412,772*	*373*	-	-	-
Pet Waste					*16,370*			
Restoration Reduction %	12.2%	124.3%	21.4%	78.1%	90.0%	18.5%	8.0%	16.4%
Totals								
Reduction (Progress+Planned)	16,128	8,652	5,447,434	5,008,616	19,660	38,924	152	601
Reduction Percent (Progress + Planned)	15.1%	132.2%	52.6%	81.8%	90.1%	26.7%	17.7%	22.6%

Countywide Implementation Strategy (CIS)

Chapter 5 – Technical/Financial Assistance Needs

- Technical assistance
- **Implementation cost summary**
- Funding sources

Cost Summary **Estimate**

Cost - Design and Construction Combined

Watershed	Little Patuxent	Middle Patuxent	Patuxent River Upper	Rocky Gorge Reservoir	Triadelphia Reservoir	Baltimore Harbor		Total
						South Branch Patapsco	Patapsco LNB*	
Local TMDL Target Year	2025	NA	2019	2019	2020	2029		
FY2017 to FY2019 Near Term Planning Shown as Fiscal Year Budget Costs								
FY2017	$3,690,663	$2,221,004			$850,000		$4,225,629	$10,987,296
FY2018	$8,295,336	$1,800,000	$260,000	$376,200	$1,000,000		$5,974,230	$17,705,766
FY2019	$10,934,027		$351,000	$931,158			$3,690,948	$15,907,132
FY2020 to FY2027 Out Years Planning Shown as Credit Year Costs**								
FY2020	$4,298,529					$2,369,220	$11,056,360	$17,724,109
FY2021	$4,298,529					$2,369,220	$11,056,360	$17,724,109
FY2022	$4,298,529					$2,369,220	$12,635,840	$19,303,589
FY2023	$4,298,529					$2,369,220	$12,635,840	$19,303,589
FY2024						$2,369,220	$14,215,320	$16,584,539
FY2025						$2,369,220	$14,215,320	$16,584,539
FY2026						$1,579,480	$15,005,059	$16,584,539
FY2027						$1,579,480	$14,215,320	$15,794,799
FY2028								
FY2029								
Total	$40,114,143	$4,021,004	$611,000	$1,307,358	$1,850,000	$17,374,279	$118,926,223	$184,204,007

*Patapsco Lower North Branch sediment local TMDL target year also 2029

** Out Years include the full cost of the completed project, actual FY budget allocations will be adjusted as needed

Countywide Implementation Strategy (CIS)

Chapter 6 – Public Participation/Education

- Lists current environmental outreach
- This meeting is part of Public Outreach
- **30-day public review/comment period**

Chapter 7 – Implementation Schedule

- Lists various milestones
- **Provides possible schedule for attaining goals**

Project Schedule Summary

Number of Projects - by Credit Year*

Watershed	Little Patuxent	Middle Patuxent	Patuxent River Upper	Rocky Gorge Reservoir	Triadelphia Reservoir	Baltimore Harbor		Total
						South Branch Patapsco	Patapsco LNB**	
Local TMDL Target Year	2025	NA	2019	2019	2020	2029		
FY2017	8	4					7	19
FY2018	7	5			1		9	22
FY2019	19	1	1	2			10	33
FY2020	6					3	14	23
FY2021	6					3	14	23
FY2022	6					3	16	25
FY2023	6					3	16	25
FY2024						3	18	21
FY2025						3	18	21
FY2026						2	19	21
FY2027						2	18	20
FY2028								
FY2029								
Total	58	10	1	2	1	22	159	253

* All projects listed by credit year, i.e. the year the project is complete
** Patapsco Lower North Branch sediment local TMDL target year also 2029

Goals met?

Based on all projections and assumptions in CIS:

- 20% impervious acres – MS4 permit condition met by end of 2019
- Local TMDLs – known TMDLs met by 2027 (some earlier)
- Bay TMDL (Urban Stormwater Sector)
  - By the numbers: TP, TSS met; TN partially met by 2025
  - By MS4 permit – all met if achieve 20% impervious treatment goal

Countywide Implementation Strategy (CIS)

Chapter 8 – Load Reduction Evaluation Criteria

- 2-year interim milestone reporting (State)
- Annual NPDES reporting
- Triennial BMP inspections
- **Regular evaluation and adaptive management**

Chapter 9 – Monitoring

- Current monitoring – biological, chemical, physical
- Stormwater Design Manual

In Summary:

- CIS is a comprehensive summary of County's current and proposed efforts for environmental restoration and permit compliance
- **Planning document** including possible schedule and anticipated costs
- Detailed watershed assessments complete for entire County

Want to learn more about stormwater?

Office of Community Sustainability

www.cleanwaterhoward.com

SWM Division Website

www.howardcountymd.gov/SWM.htm

- Meeting #1 and #2 Powerpoints
- Watershed Assessment Reports
- CIS Report

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Howard County Stormwater Solutions