

Southern Little Patuxent River Watershed Assessment

COMMUNITY MEETING NO. 2

December 3, 2015



Meeting Outline

- Welcome and Introductions
- Reasons for Study
- Watersheds 101
- Current Watershed Conditions
- Assessment Results
- Restoration Toolbox
- Countywide Implementation Strategy (CIS)
- Q&A – Information Stations



Why is the County doing a Watershed Assessment?

- 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 Year 1 (CIS)
- Total Maximum Daily Load (TMDL) “pollutant diet” for nutrients
- **Looking for cost-effective opportunities for environmental restoration (List of projects)**

Chesapeake Bay TMDL

- Chesapeake Bay TMDL Sectors:
 - Agriculture
 - Forest
 - Septic
 - Wastewater
 - **Urban Stormwater**
- NPDES Permit Year 1 - Restoration Plans 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

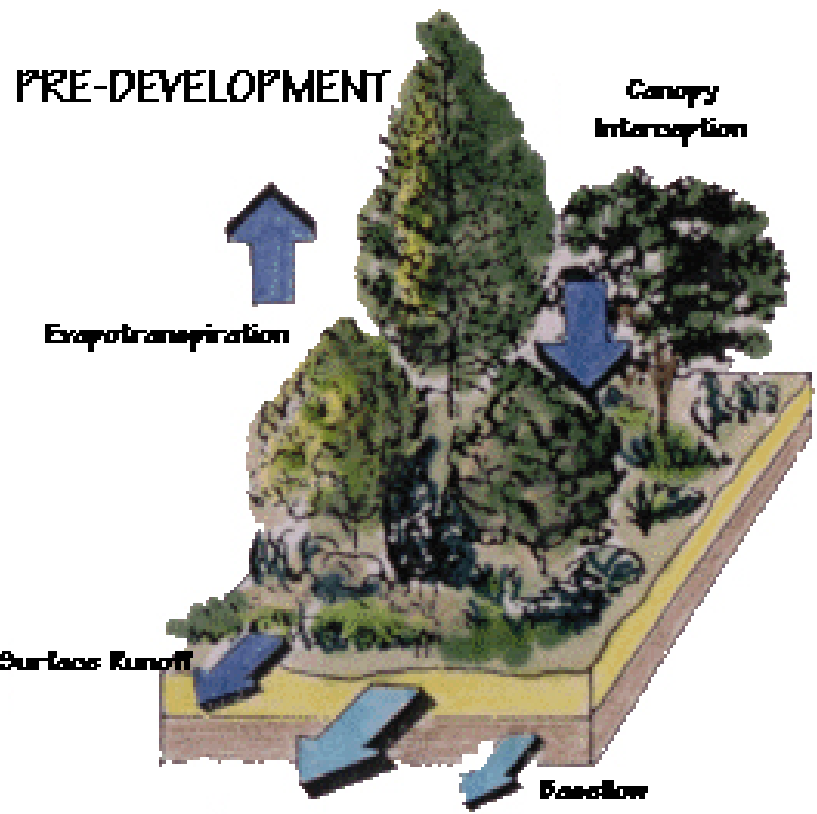
Watersheds

101

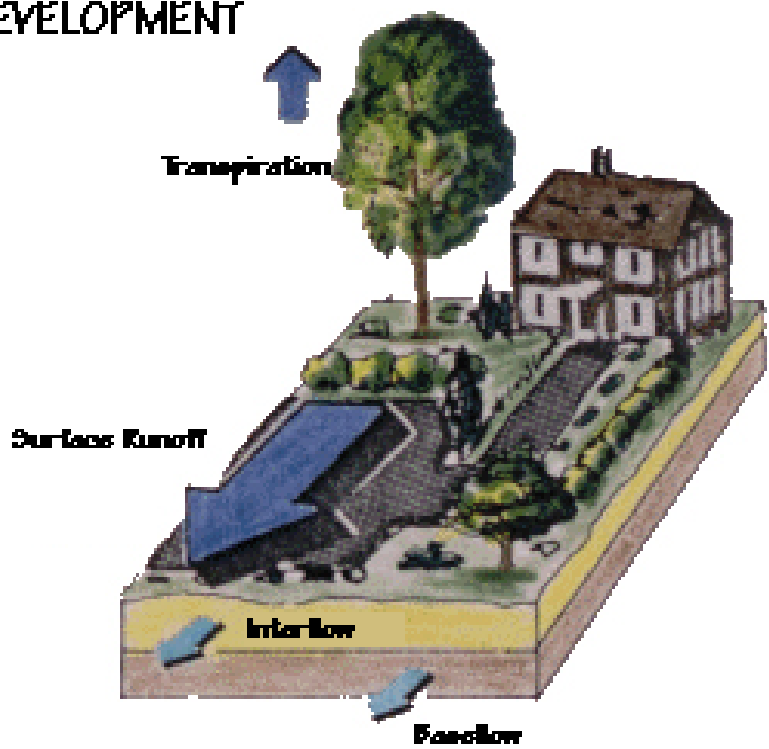


WATER BALANCE

PRE-DEVELOPMENT



POST-DEVELOPMENT



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.
- B. To a nearby stream without any treatment.
- C. To a stormwater management facility for pollutant removal and then to a nearby stream.
- D. B or C**



The Problem

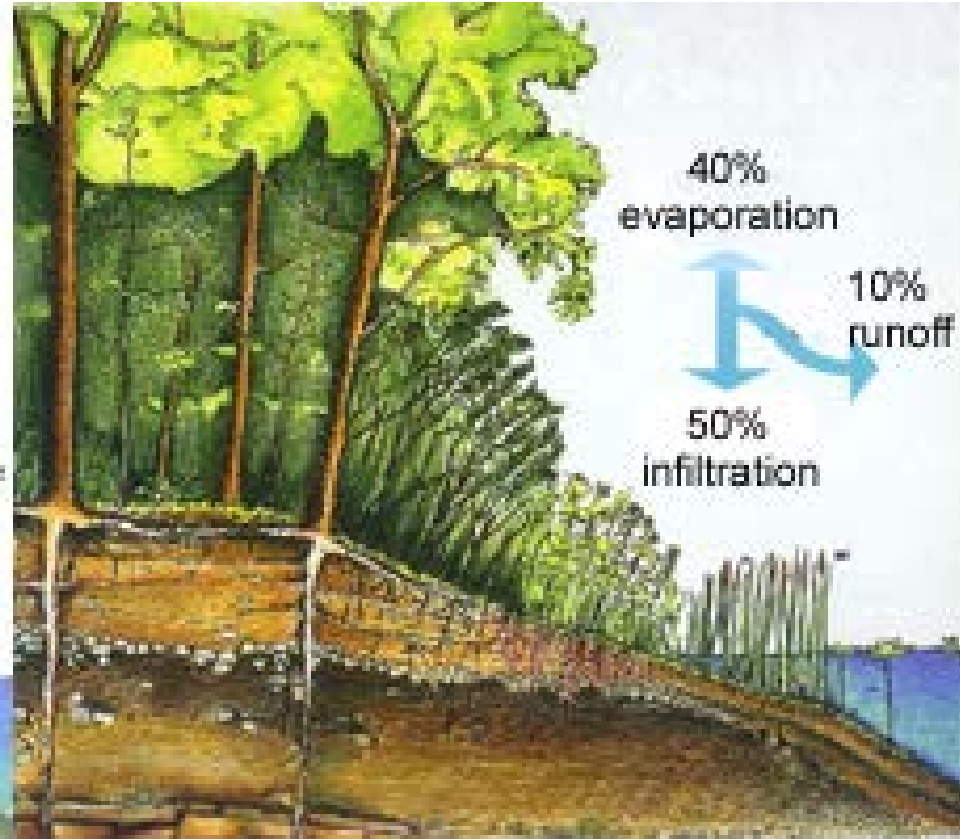
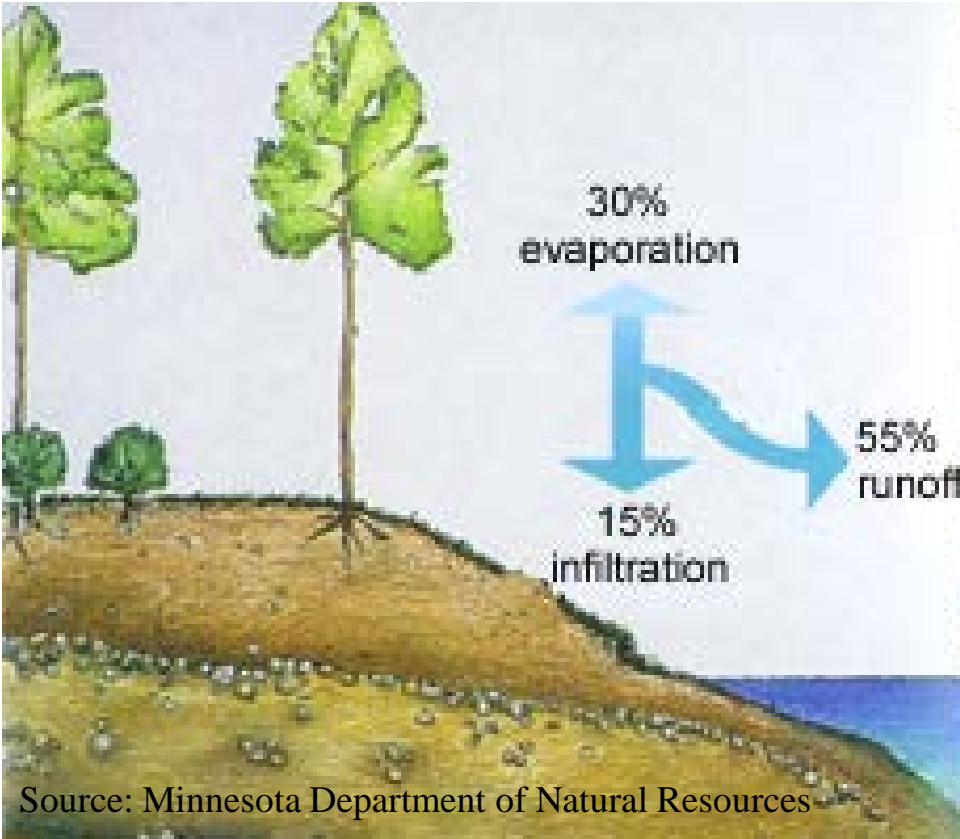




Impervious Cover

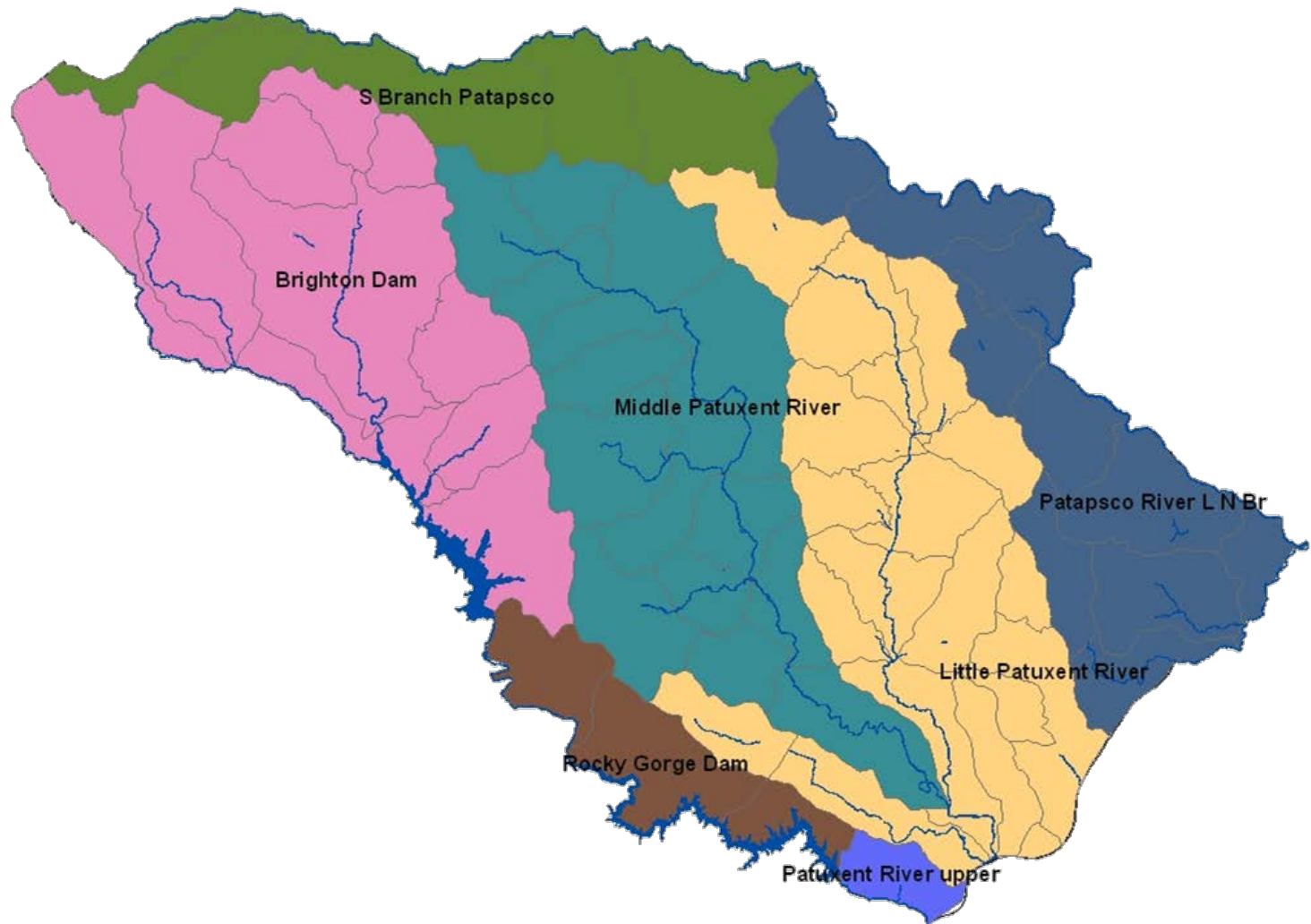


County = 13.6% Columbia ~ 15%-20%

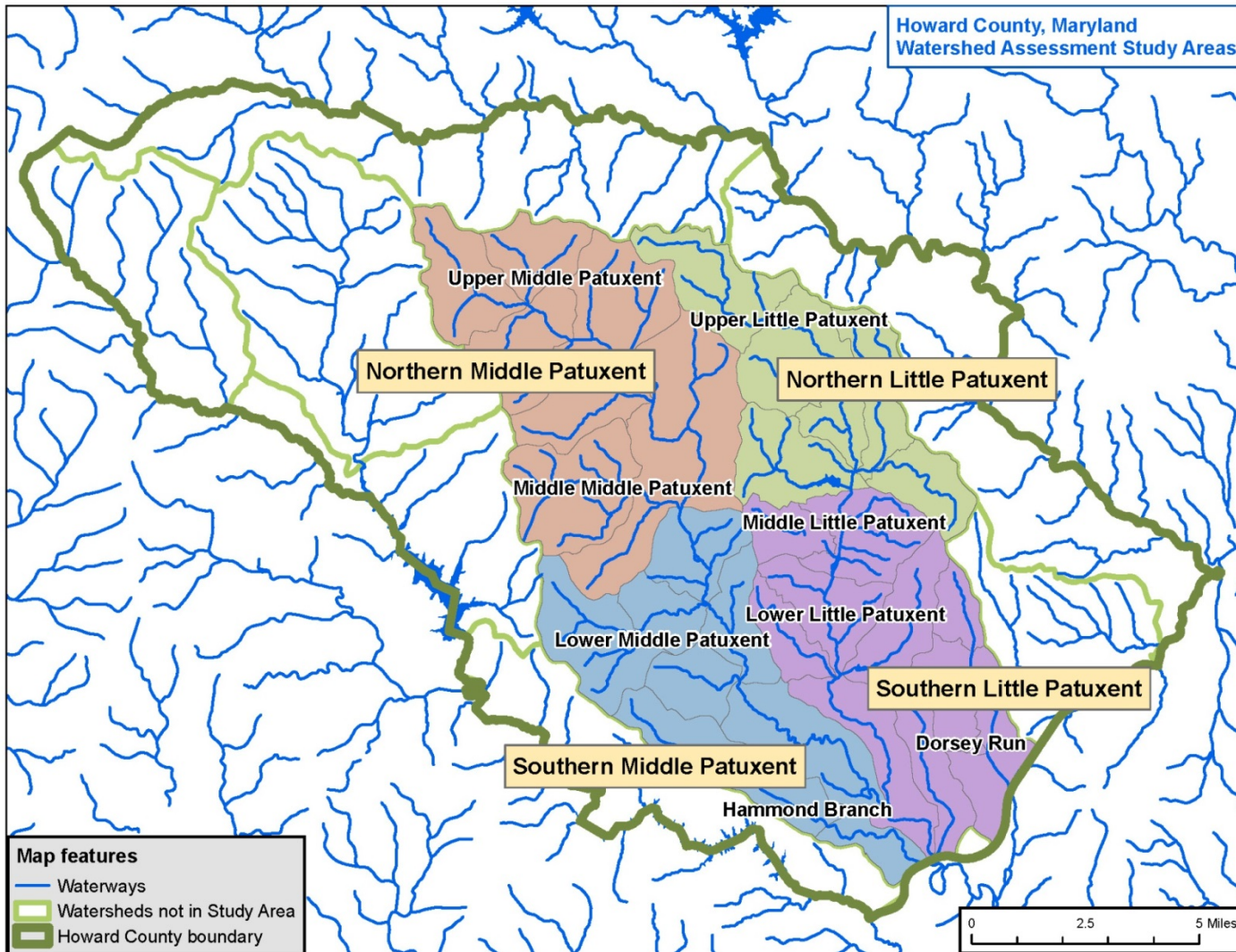


Water quickly runs off a shoreline cleared of natural vegetation, washing nutrients and pesticides into the water. A natural shoreline holds rainfall, which soaks into the soil; less water, soil and chemicals run into the lake or river. Shoreline and aquatic plants anchor shoreline areas, helping to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

County Watersheds



Breakdown of Study Areas

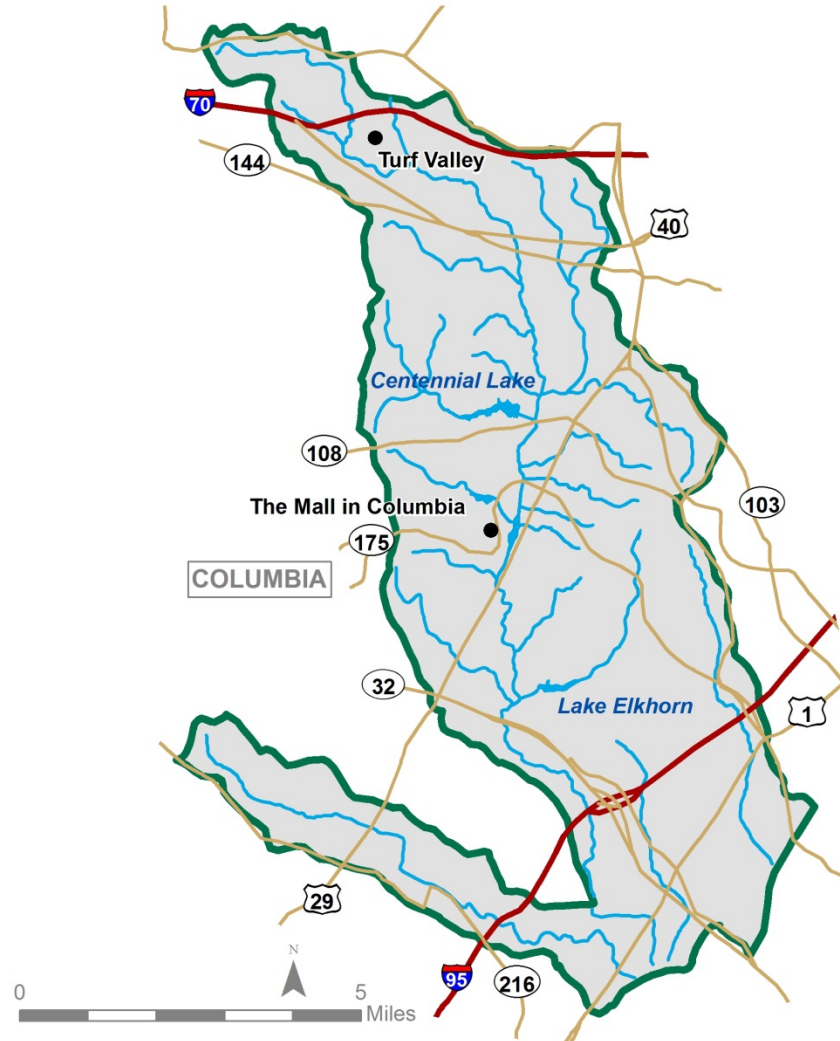


Watershed Characteristics

Little Patuxent River Watershed

Little Patuxent River

- 59 square miles
- 37,727 acres
- **9,688 impervious acres**
- 9,043 wooded acres
- 190 miles of streams
- **1,746 stormwater BMPs treating 47 acres of impervious area**



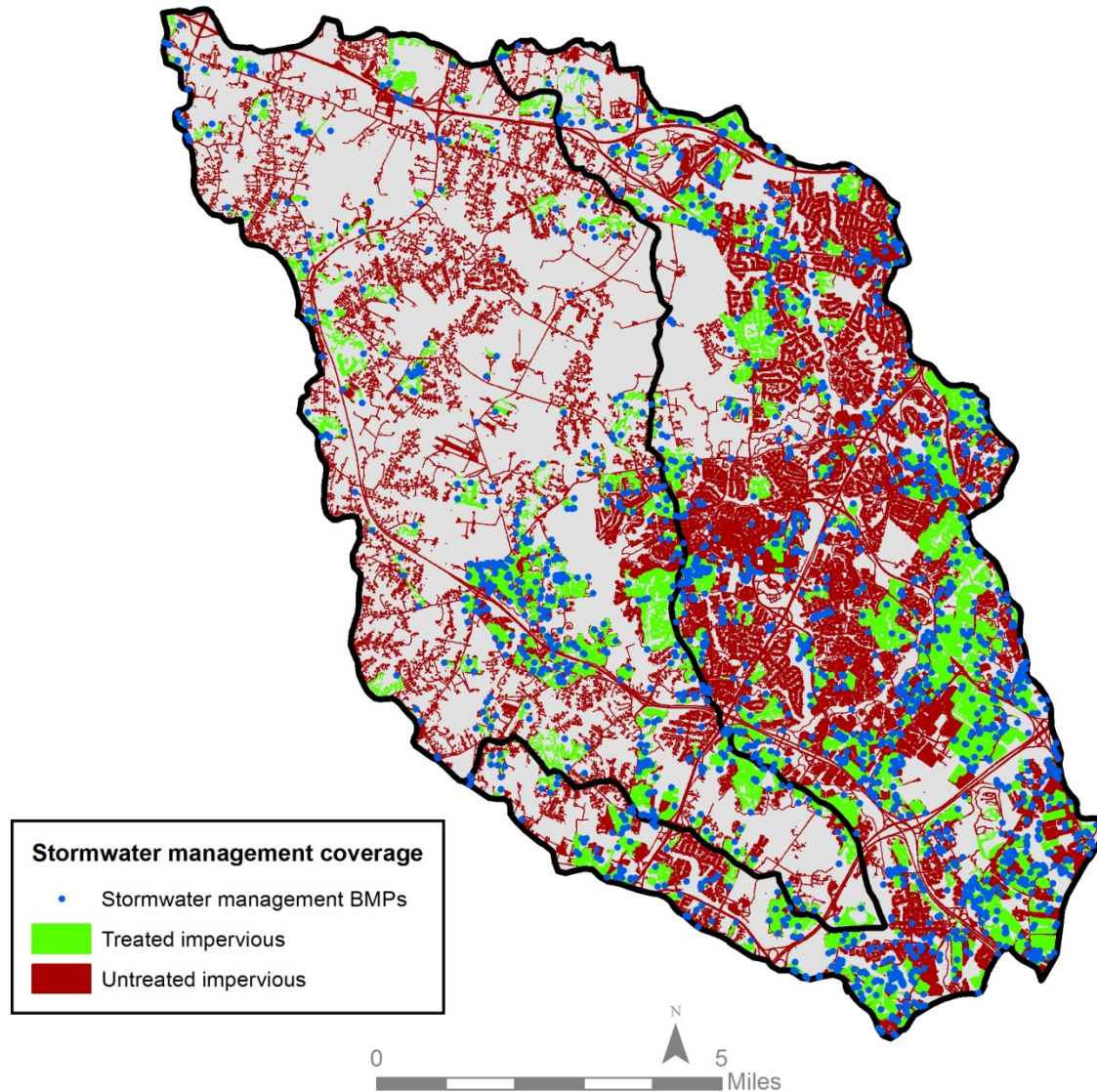
Middle Patuxent River Watershed

Middle Patuxent River

- 58 square miles
- 37,074 acres
- **3,675 impervious acres**
- 12,367 wooded acres
- 227 miles of streams
- **593 stormwater BMPs treating 40 acres of impervious area**



Stormwater BMPs



Watershed Study – Phase 1

- Completed mid-July 2015
 - Desktop Analysis
 - Handheld Tablet Setup and Programming
 - Consultant Field Calibration and Training
 - Field Assessment (Approx. 3 months)
 - Review and Compile Field Data
 - Late June 2015 - Community Meetings - #1
 - Prepare Site Ranking and Prioritization

Project Types Investigated

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

Field Assessments and Results

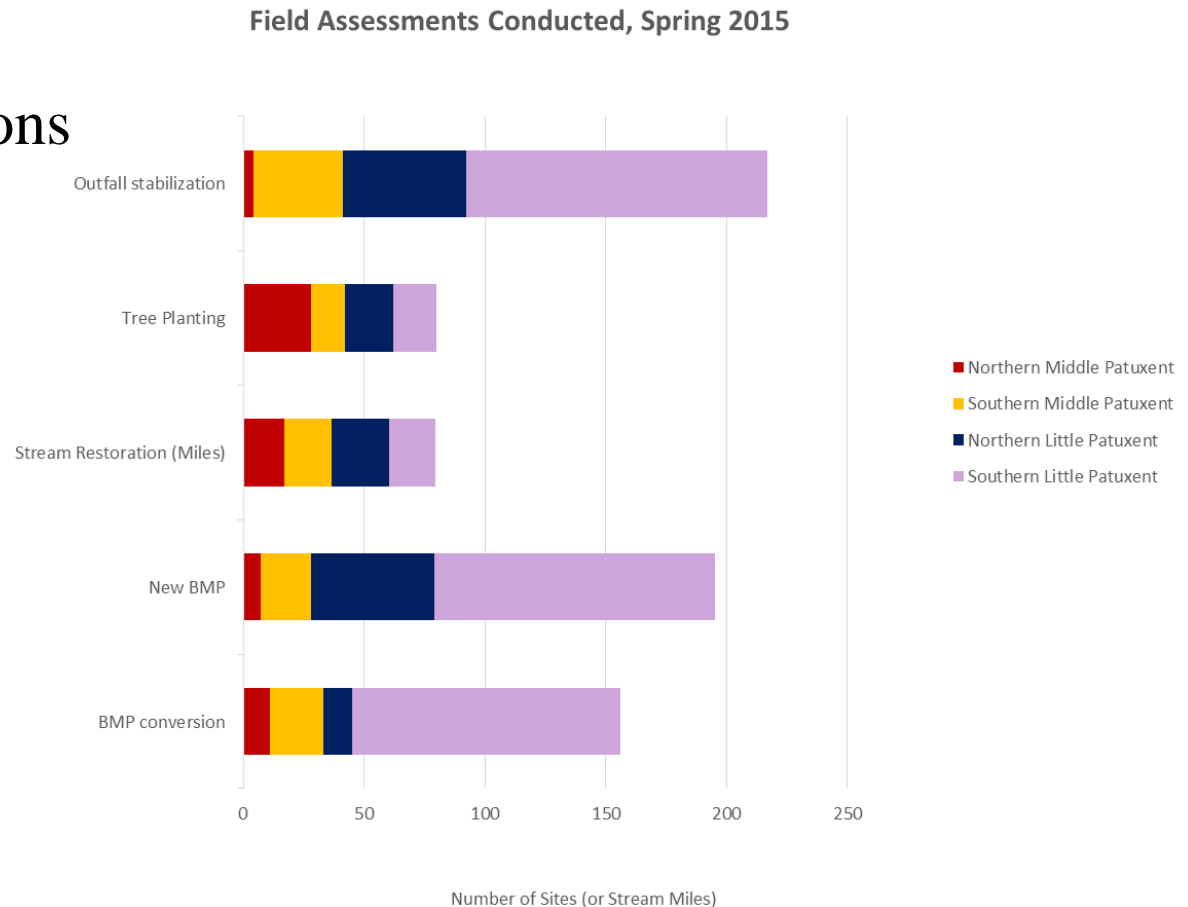
Field Assessment



Field Assessment Results – Total

Sites Assessed:

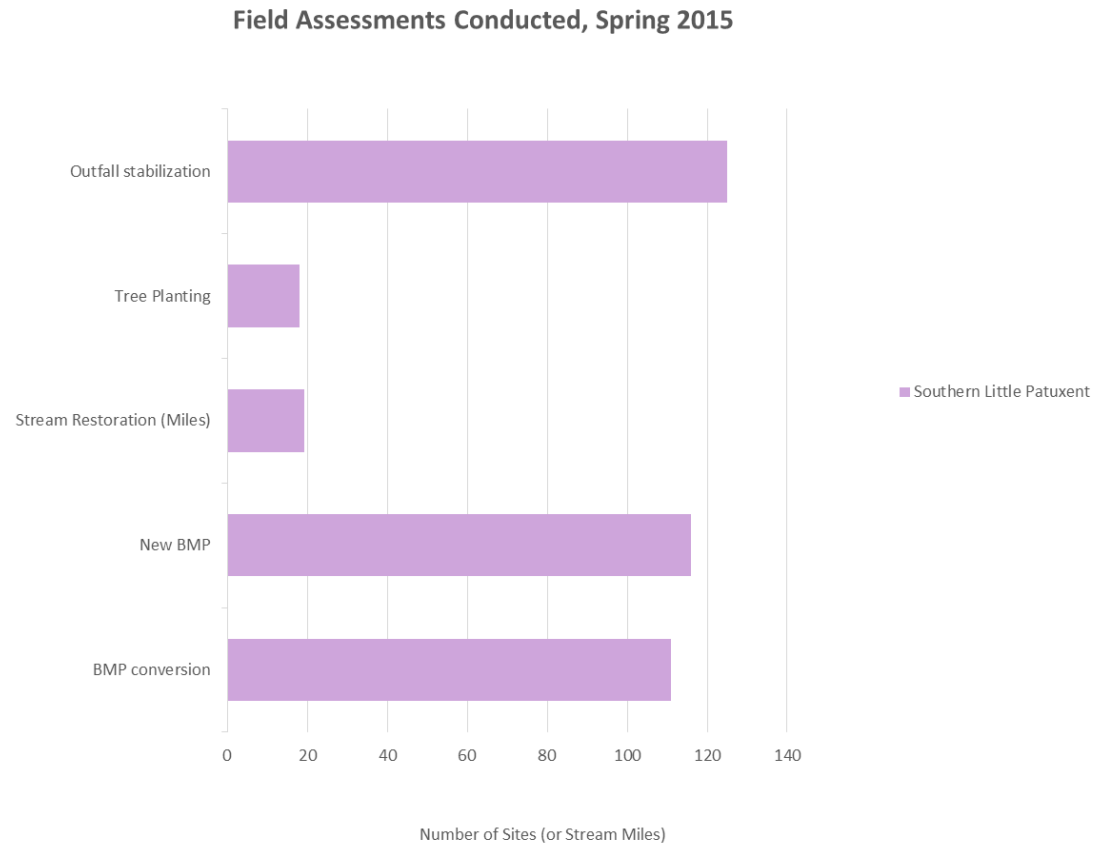
- 217 Outfall stabilizations
- 80 Tree planting sites
- 79.4 Stream miles
- 195 New BMP sites
- 156 BMP conversions



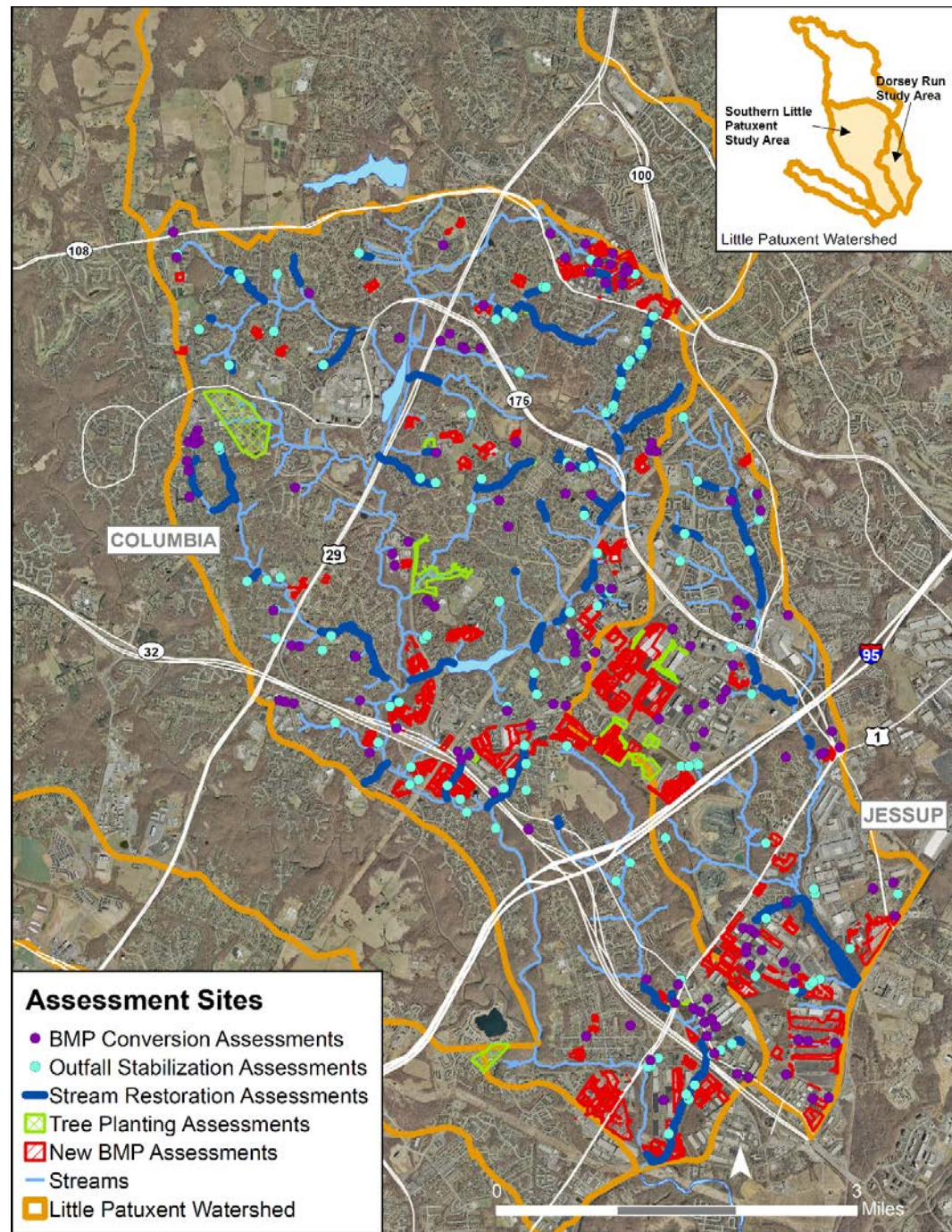
Field Assessment Results - SLP

Sites Assessed:

- 125 outfall stabilizations
- 18 tree planting sites
- 19.2 miles of stream
- 116 new BMP sites
- 111 BMP conversions



Field Assessment Sites – SLP



Watershed Study – Phase II

- Scheduled completion end of 2015
 - Perform Concept Level Designs (Including Cost Estimates)
 - Rank sites (\$/acre of impervious treated)
 - Input to restoration plan (CIS)
 - Generate Draft Watershed Report
 - **Community Meetings - #2**
 - Review and Comment Period
 - Report to MDE December 17, 2015

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

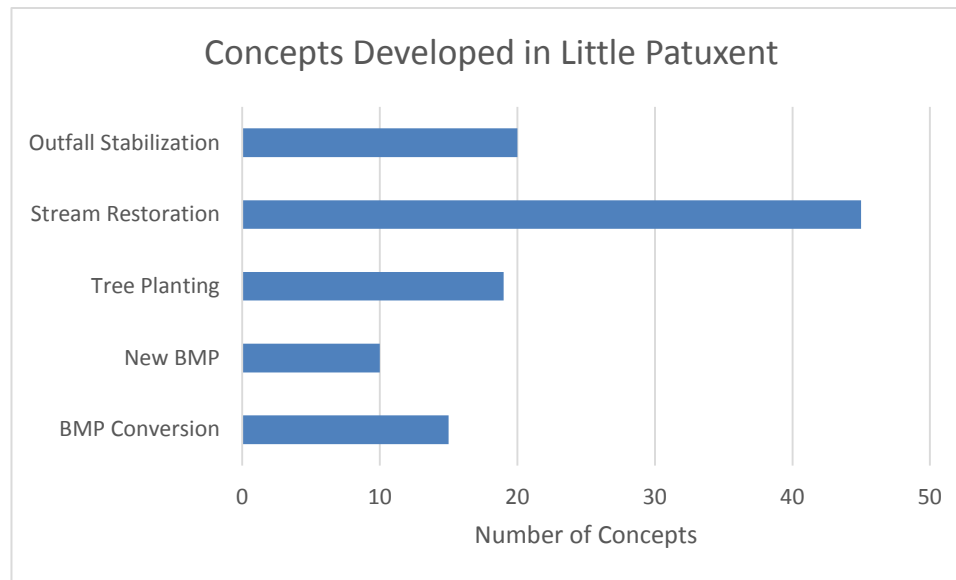
Site Ranking Factors

- 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.)

Site Assessment – Scoring Results

Little Patuxent Watershed

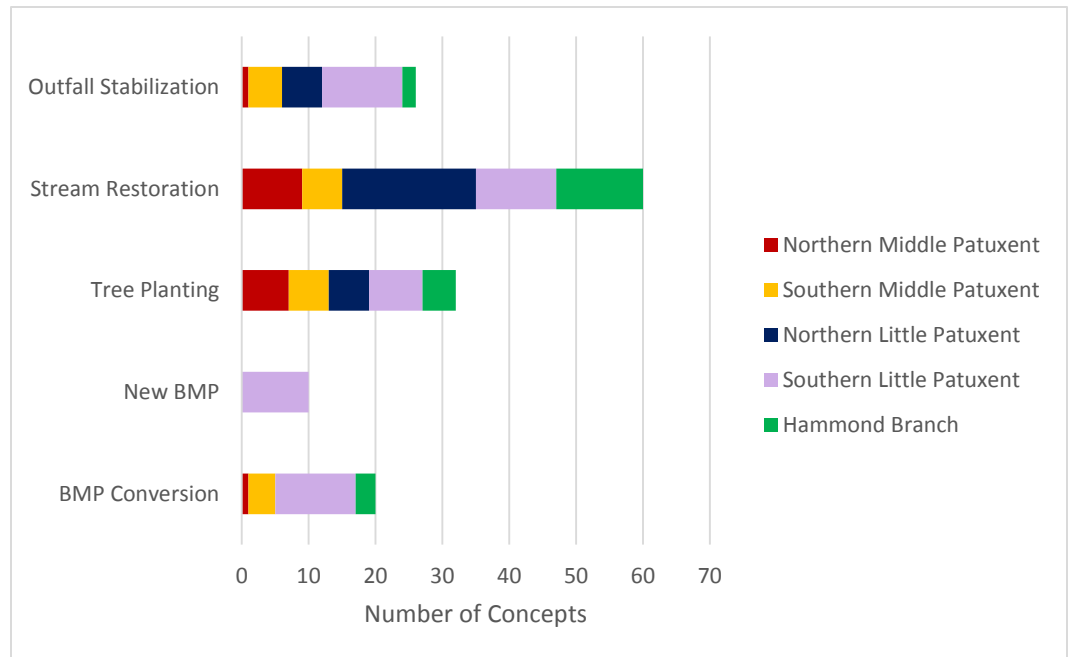
Type	Number of Concepts	Max Score	Min Score	Min Concept Score
BMP Conversion	15	31	11	26
New BMP	10	28	13	26
Tree Planting	19	32	22	26
Stream Restoration	45	31	17	27
Outfall Stabilization	20	28	16	26
Total	109	32	11	26



Concept Plans - Total

Concepts Prepared:

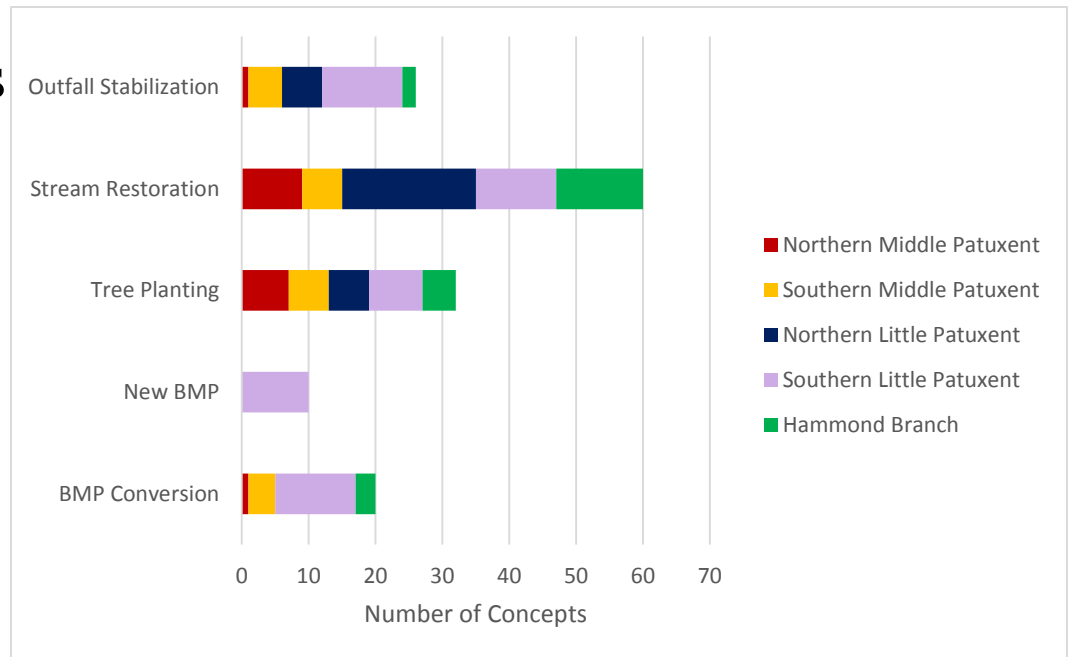
- 26 Outfall stabilizations
- 60 Stream restorations
- 32 Tree planting sites
- 10 New BMP sites
- 20 BMP conversions
- 148 Total



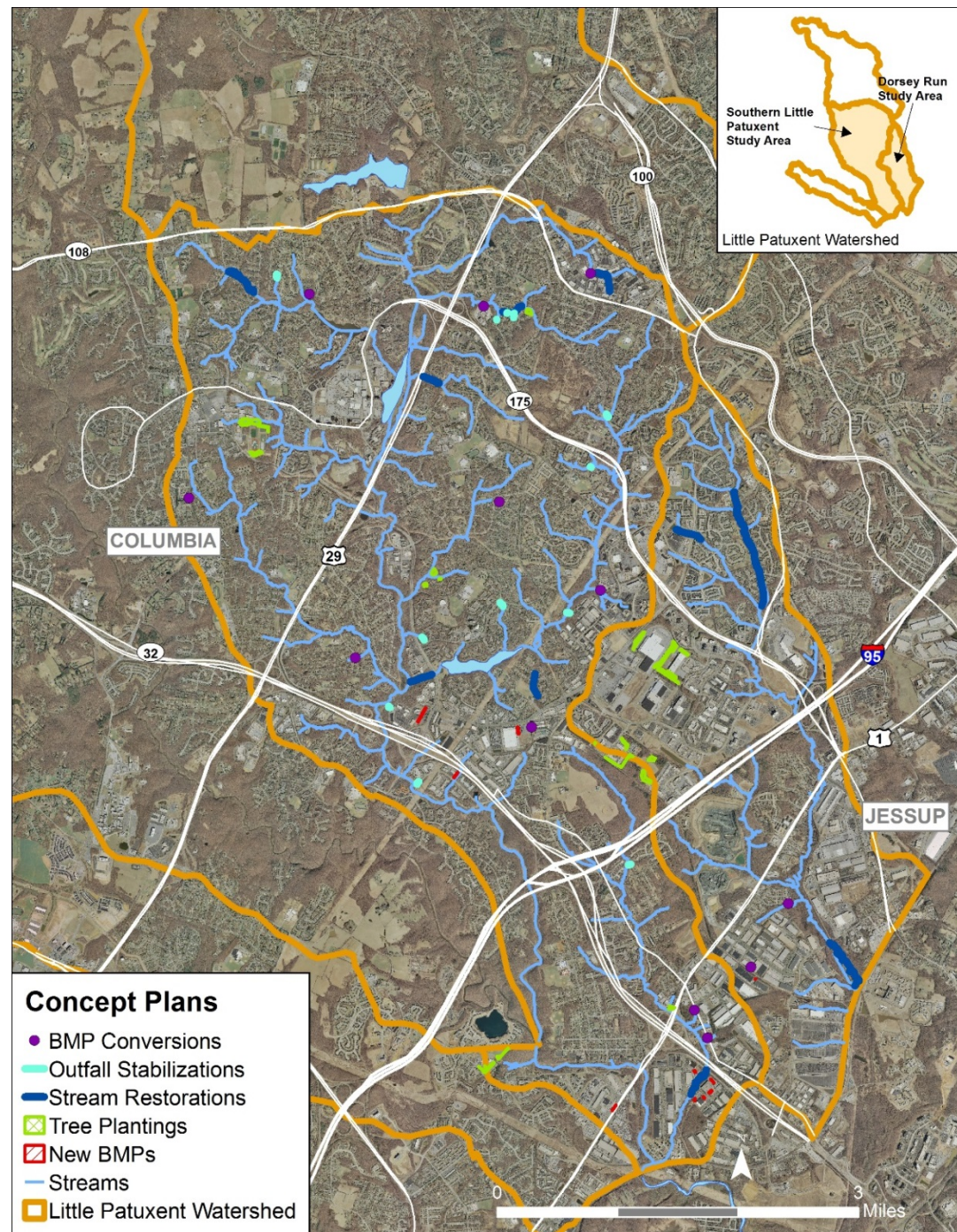
Concept Plans –SLP

Concepts Prepared:

- 12 Outfall stabilization
- 12 Stream restorations
- 8 Tree planting sites
- 10 New BMP sites
- 12 BMP conversion
- 54 Total



Concept Plan Sites – SLP



Concept Plan - Typical

Howard County Watershed Assessment Concept Plan: Stream Restoration

Site ID: SR-37

Contractor: Biohabitats

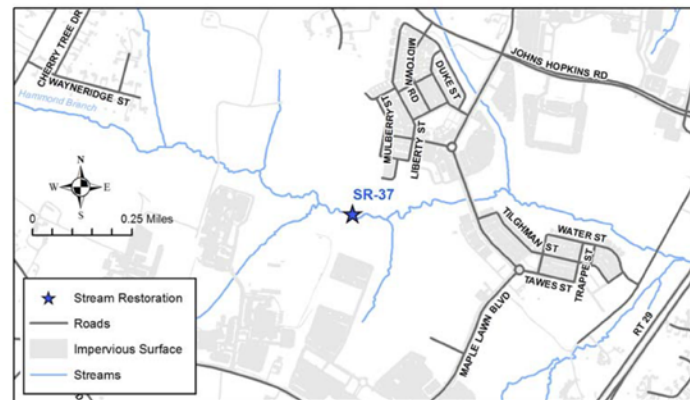
Site Name: Hammond Branch (d) - Reservoir High School

Watershed: Little Patuxent River

Ownership: Private- Commercial/Industrial
Multiple Owners

Existing Conditions:

This project site includes two stream assessment sites: SMP-SR-F336A and SMP-SR-F338A. SMP-SR-F338A is upstream of SMP-SR-F336A on Hammond Branch. A BGE ROW runs the length of the site, with very little overhead cover and shade. SMP-SR-F338A is located near Cedar Lane School and Lime Kiln Middle School, while SMP-SR-F336A is near Reservoir High School. The stream has moderate erosion occurring along both the left and right banks ranging from 3 to 5 ft. in bank height for most of the length. The upstream reach (SMP-SR-F338A) has a long section of eroding bank over 9 ft. in height, the right bank has very high eroding banks cutting into the hillslope near the school. The instream habitat within the existing channel scored in the marginal range overall. The epifaunal substrate upstream is poor with less than 20% stable habitat; however, as the stream moves downstream the epifaunal substrate becomes better and consists of 40-70% stable habitat favorable for epifaunal colonization with desirable habitat and some disturbed substrate not ready for colonization yet. Embeddedness throughout the stream is higher at the upstream end and continues to decrease as the stream moves downstream with an average of 25-50% of gravel, cobble, and boulder particles surrounded by fine sediment. The velocity/depth regime of the channel is suboptimal with three velocities present throughout the stream. Severe sediment deposition occurs within the upstream portion of the stream with 50% of the bottom affected and bar formations are occurring along the stream banks. As the stream moves downstream, only 30% of the bottom is affected by sediment deposition. The channel flow status is suboptimal throughout the stream with water filling on average 75% of the available channel and some riffle substrate exposed. Bank stability is moderately unstable on both the left and right side of the stream with 30-60% of the stream banks having some cover and increased erosion during floods. Vegetative protection along the left and right bank is marginal with an average of 70% of the stream bank surface covered. Shading along the existing channel is poor (10%).



Howard County Watershed Assessment Concept Plan: Stream Restoration

Site ID: SR-37

Contractor: Biohabitats

Site Name: Hammond Branch (d) - Reservoir High School

Watershed: Little Patuxent River



Facing downstream, an average 4 ft. recently eroded bank.



Facing downstream, very high eroded banks cutting into the hillslope near the school.

Howard County Watershed Assessment Concept Plan: Stream Restoration

Site ID: SR-37

Contractor: Biohabitats

Site Name: Hammond Branch (d) - Reservoir High School

Watershed: Little Patuxent River

Constraints/Utilities:

Both site assessments are mainly within a BGE ROW and are in close proximity to multiple schools. There are electrical power lines overhead and transmission poles along the stream that can make the site hazardous during construction. A sewer line does cross the stream and runs along a small portion of the stream. Very minimal tree impacts are anticipated due to a lack of overhead cover.

Concept Description:

The objective for this project is to reduce bank erosion and improve instream habitat for aquatic organisms. To improve instream habitat, either the stream invert can be raised or a new floodplain can be graded to reduce bank erosion and promote floodplain reconnection. In addition, grading banks back to a stable angle and stabilizing them with native vegetation to hold soil in place will help reduce bank erosion. 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. The proposed channel restoration work would occur predominately on the existing channel alignment; however, some minor realignment may be necessary where the stream is cutting into the hillslope. Maximizing riparian buffer will increase the shading to reduce the stream temperature and provide needed litter inputs and woody debris. This channel restoration has the potential to reduce the sediment supply, improve habitat, provide opportunities for nutrient uptake, and serve as an outdoor learning laboratory for the surrounding schools. The site can be accessed from the BGE access road and/or the nearby school. There are seven other nearby project recommendations that should be concurrently implemented with this site including five stream restoration sites and two tree planting site. These nearby projects include: SR-33, SR-34, SR-35, SR-36, SR-38, SMP-TP-F405A, and SMP-TP-F406. The outfalls from the area being developed on the reach between here and SR-38 should be modified so that the flow passes to the stream through a channel, not sheet flow so as to limit future headcutting up to the outfall.

Nearby Opportunities:

SR-33, SR-34, SR-35, SR-36, SR-38, SMP-TP-F405A, SMP-TP-F406

Proposed Project Credit		Costs	
Length Restored (ft):	1,749	Estimated Design Cost:	\$300,000.00
Impervious Area Treated Credit (ac.):	17.5	Estimated Construction Cost:	\$787,500.00
Cost per Impervious Credit Acre:	\$75,686.11	30% Contingency:	\$236,250.00
		Estimated Total Cost:	\$1,323,750.00

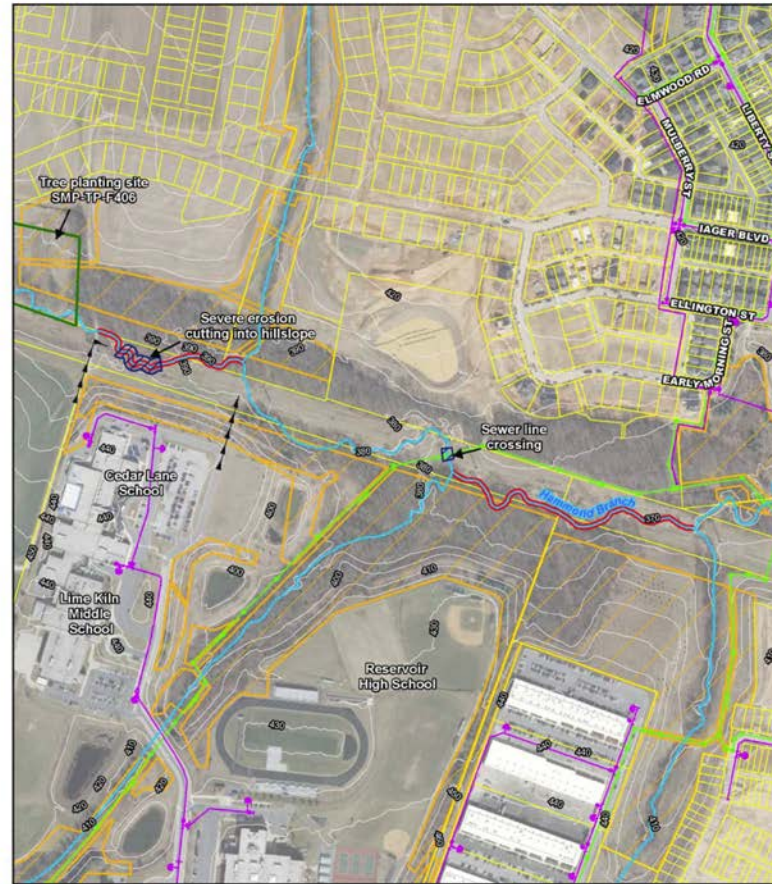
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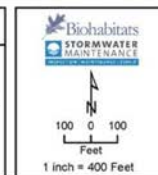
Contractor: Biohabitats

Watershed: Little Patuxent River



Plan-View Design Drawing

Stream Restoration - SR-37



Modeling Results

Number of Concepts

Number of Projects by Project Type and Watershed			
	Little Patuxent River	Middle Patuxent River	<i>Grand Total</i>
BMP Conversions	15	5	20
New BMPs	10	0	10
Outfall Stabilization	20	6	26
Stream Restorations	45	15	60
Tree Plantings	19	13	32
<i>Grand Total</i>	109	39	148

Impervious Acre Credit - Concepts

Total Impervious Credit Acres by Project Type and Watershed

	Little Patuxent River	Middle Patuxent River	<i>Grand Total</i>
BMP Conversion	81.78	19.37	101.15
New BMP	33.47	-	33.47
Outfall	49.84	22.29	72.13
Stream Restoration	868.91	337.58	1,206.49
Tree Planting	33.67	31.78	65.45
<i>Grand Total</i>	1,067.67	411.02	1,478.69

Nitrogen Reduction - Concepts

Target Reduction – Approx. 12%

Total Nitrogen Reduction (lbs/yr) by Project Type and Watershed					
	Little Patuxent River	% Reduction of Total Urban	Middle Patuxent River	% Reduction of Total Urban	<i>Grand Total</i>
BMP Conversion	516.8	0.18%	141.7	0.08%	658.5
New BMP	138.6	0.05%	-	0.00%	138.6
Outfall (SPSC only)	252.4	0.09%	77.7	0.04%	330.0
Stream Restoration	6,516.8	2.28%	2,532.0	1.39%	9,048.8
Tree Planting	570.2	0.20%	539.2	0.30%	1,109.5
<i>Grand Total</i>	<i>7,994.7</i>	<i>2.80%</i>	<i>3,290.6</i>	<i>1.81%</i>	<i>11,285.4</i>

Phosphorus Reduction - Concepts

Target Reduction – Approx. 20%

Total Phosphorus Reduction (lbs/yr) by Project Type and Watershed					
	Little Patuxent River	% Reduction of Total Urban	Middle Patuxent River	% Reduction of Total Urban	<i>Grand Total</i>
BMP Conversion	64.48	0.31%	10.64	0.11%	75.11
New BMP	35.56	0.17%	-	0.00%	35.56
Outfall (SPSC only)	37.25	0.18%	11.77	0.12%	49.02
Stream Restoration	5,908.52	28.62%	2,295.68	23.10%	8,204.20
Tree Planting	18.93	0.09%	17.90	0.18%	36.82
<i>Grand Total</i>	6,064.73	29.38%	2,335.99	23.50%	8,400.72

Sediment Reductions - Concepts

Sediment goal met if TP goal met

Sediment Reduction (lbs/yr) by Project Type and Watershed					
	Little Patuxent River	% Reduction of Total Urban	Middle Patuxent River	% Reduction of Total Urban	<i>Grand Total</i>
BMP Conversion	109,736	0.53%	45,050	0.34%	154,786
New BMP	47,395	0.23%	-	0.00%	47,395
Outfall (SPSC only)	39,961	0.19%	18,602	0.14%	58,563
Stream Restoration	3,899,623	18.81%	1,515,150	11.33%	5,414,773
Tree Planting	8,121	0.04%	6,072	0.05%	14,193
<i>Grand Total</i>	<i>4,104,836</i>	<i>19.80%</i>	<i>1,584,874</i>	<i>11.85%</i>	<i>5,689,710</i>

Estimated Costs - Concepts

Total Cost by Project Type and Watershed			
	Little Patuxent River	Middle Patuxent River	<i>Grand Total</i>
BMP Conversion	\$ 4,607,177	\$ 1,768,062	\$ 6,375,239
New BMP	\$ 4,150,497	\$ -	\$ 4,150,497
Outfall	\$ 4,837,128	\$ 1,735,222	\$ 6,572,350
Stream Restoration	\$ 63,882,088	\$ 24,151,355	\$ 88,033,443
Tree Planting	\$ 3,874,096	\$ 3,614,000	\$ 7,488,096
<i>Grand Total</i>	\$ 81,350,985	\$ 31,268,639	\$ 112,619,625

Watershed Assessment Summary:

- Confirmed large number of restoration opportunities
- More need/potential projects in Little Patuxent than Middle Patuxent
- Streams – scored higher, more cost efficient, and plentiful
- Approx. 75% of projects on private property
- 148 projects will make a big dent in our permit requirements . . . and our checkbook

Watershed Study - Next Steps

- Master list for developing annual Capital Budget requests
- Help define total budget and manpower needs to meet permit conditions
- Input to CIS restoration plan
- Private property approach needed
- Public review and submittal to MDE
- Provide lessons learned for next watershed study – Patapsco River and Patuxent River

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)

Countywide Implementation Strategy (CIS) - Overview

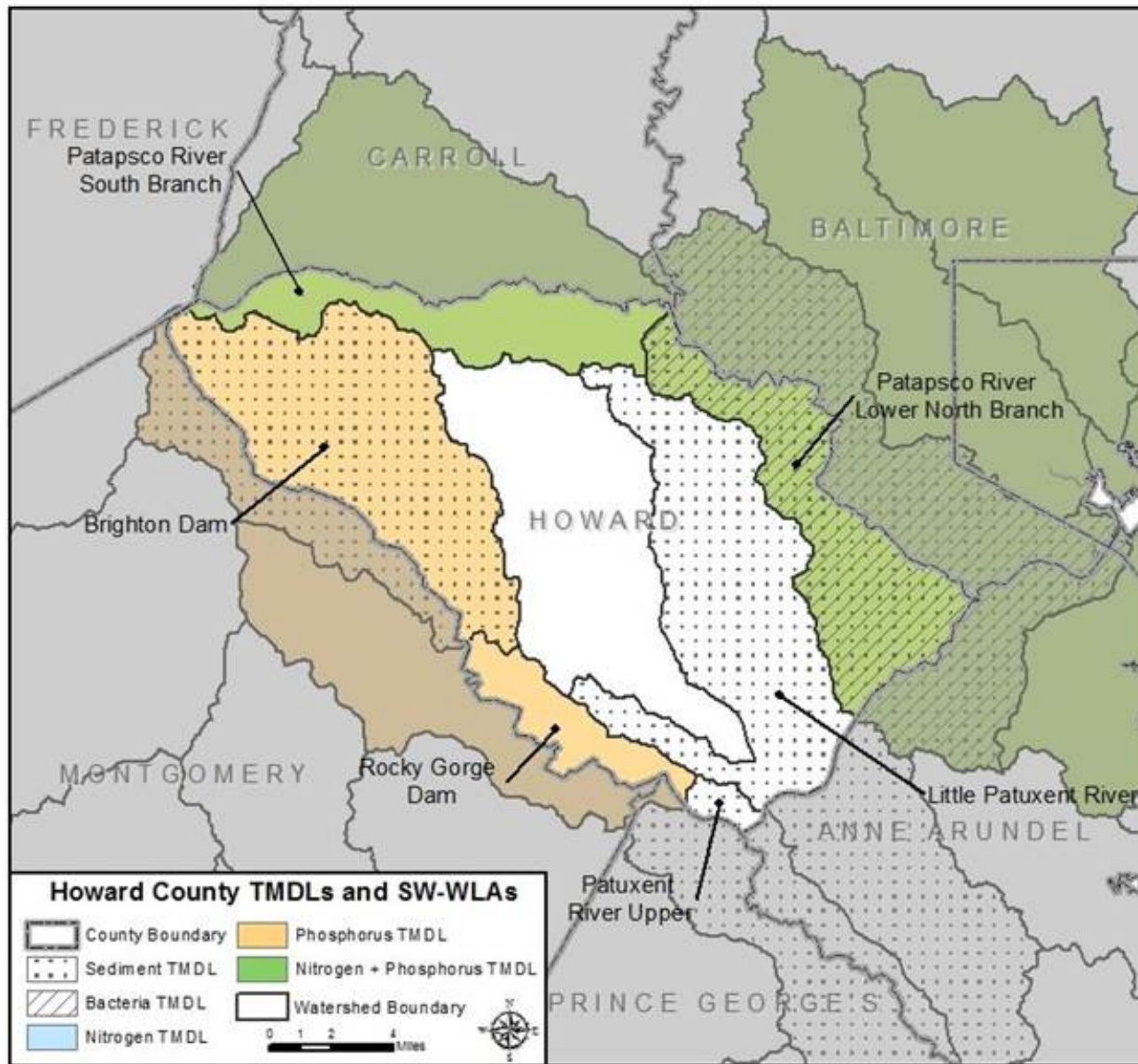
- It's our Restoration Plan
- Blue print for NPDES permit compliance, meeting TMDLs, and environmental improvements
- 30-day public review period
- Submittal to MDE December 17, 2015
- Review annually
- Consists of nine chapters

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

Patapsco - Lower North Branch

Baltimore Harbor

Little Patuxent

Patuxent – Upper

Triadelphia Reservoir
(Brighton Dam)

Rocky Gorge Reservoir

Impairment

Sediment, Bacteria

Nitrogen, Phosphorus

Sediment

Sediment

Sediment

Phosphorus

Impervious Area Baseline

	Brighton Dam	Little Patuxent River	Middle Patuxent River	Patapsco River L N Br	Patuxent River Upper	Rocky Gorge Dam	South Branch Patapsco	Countywide
Impervious Baseline and Target (Impervious Credit Acres)								
Total Impervious Area	1,830.1	9,139.7	3,410.9	4,424.8	439.7	584.8	744.3	20,574.5
County MS4 Impervious Area	1,691.1	8,124.7	2,990.6	3,854.5	381.0	530.9	629.9	18,202.8
Pre-1985 Stormwater BMPs	2.4	112.4	34.2	15.1	0.0	0.4	0.0	164.4
<i>New Development</i>	2.4	38.2	8.0	5.4	0.0	0.4	0.0	54.2
<i>Redevelopment</i>	0.0	74.3	26.2	9.7	0.0	0.0	0.0	110.2
<i>Restoration</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985 - 2002 Stormwater BMPs	50.7	743.1	222.9	465.8	67.0	20.6	7.6	1,577.6
<i>New Development</i>	18.6	520.8	179.6	386.5	66.2	19.6	6.2	1,197.5
<i>Redevelopment</i>	23.8	208.4	23.5	65.7	0.8	0.6	0.0	322.8
<i>Restoration</i>	8.3	13.8	19.8	13.6	0.0	0.4	1.3	57.3
2002 - 2013 Stormwater BMPs	230.0	1,613.3	572.7	909.6	72.7	79.5	56.6	3,534.2
<i>New Development</i>	87.8	1,080.9	332.8	703.8	71.7	66.0	13.0	2,356.0
<i>Redevelopment</i>	20.0	289.8	53.0	139.0	0.1	1.1	5.0	508.0
<i>Restoration before 7/1/2013</i>	122.1	242.5	186.9	66.8	1.0	12.3	38.6	670.2
Howard County Lakes	0.0	1,450.2	24.6	152.2	0.0	0.0	0.0	1,627.0
Rooftop Disconnect	55.7	163.5	64.7	44.7	5.5	12.9	20.7	367.5
Non-Rooftop Disconnect	176.2	147.8	168.5	88.6	7.8	42.7	75.7	707.3
Rain Barrels	0.1	0.5	0.1	0.2	0.0	0.0	0.0	0.9
Septic Upgrades	0.0	0.5	0.8	0.0	0.0	0.0	0.8	2.1
Impervious Baseline Treated	515.0	4,231.2	1,088.4	1,676.1	153.1	156.0	161.3	7,981.1
Impervious Baseline Untreated	1,176.1	3,893.5	1,902.2	2,178.3	227.9	374.9	468.6	10,221.6
20% Restoration Target	235.2	778.7	380.4	435.7	45.6	75.0	93.7	2,044.3

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)

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

Countywide Implementation Strategy (CIS)

Chapter 3 – Management Measures

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

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**

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/100mL/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	2005	2005	2000	2000
Calibrated Baseline Load	107,059	6,546	10,346,821	6,123,442	60,282	145,902	861	2,654
Target Percent Reduction	15.0%	15.0%	48.1%	10.0%	13.4%	11.4%	15.0%	15.0%
Calibrated Target Reduction	16,059	982	4,976,821	612,344	8,078	16,633	129	398
Calibrated TMDL WLA	91,000	5,564	5,370,000	5,511,098	52,204	129,269	732	2,256
2015 Progress Reductions								
Restoration Reductions (from baseline to 2015)	2,324	205	697,379	99,887	4,975	4,477	64	112
Planned Reductions								
Planned Reductions	14,020	5,184	4,325,445	2,841,452	5,862	45,244	137	410
<i>2016 Concepts (Pending)</i>	13,526	4,913	1,124,634	2,633,671	5,513	45,244	137	410
<i>FY16/17 Planned + 2015 Concepts</i>	494	271	3,200,810	207,781	349	0	0	0
Restoration Reduction Percent	13.1%	79.2%	41.8%	46.4%	9.7%	31.0%	15.9%	15.5%
Totals								
Reduction (Progress+Planned)	16,344	5,389	5,022,824	2,941,339	10,837	49,721	201	522
Reduction Percent (Progress + Planned)	15.3%	82.3%	48.5%	48.0%	18.0%	34.1%	23.3%	19.7%
Reduction Remaining for Treatment	-285	-4,407	-46,003	-2,328,995	-2,759	-33,088	-72	-124

Bay TMDL Goals

	TN-EOS lbs/yr	TN-DEL lbs/yr	TP-EOS lbs/yr	TP-DEL lbs/yr	TSS-EOS lbs/yr	TSS-DEL lbs/yr
Baseline and Targets						
Calibrated 2010 Baseline Load	566,350	319,997	27,609	14,300	26,344,338	20,262,457
Target Percent Reduction	11.98%	12.00%	20.72%	19.74%	-	-
Calibrated Target Reduction	67,849	38,400	5,721	2,823	-	-
Calibrated Bay TMDL WLA	498,501	281,597	21,889	11,477	-	-
2015 Progress Reductions						
Restoration Reductions (from baseline to 2015)	4,950	2,115	1,353	893	843,467	808,062
Planned Reductions (2016 – 2025)						
Planned Reductions	32,333	20,956	18,048	11,338	12,759,062	11,695,030
<i>2016 Concepts (Pending)</i>	<i>18,314</i>	<i>10,589</i>	<i>8,962</i>	<i>4,723</i>	<i>6,475,206</i>	<i>5,060,663</i>
<i>FY16/17 Planned + 2015 Concepts</i>	<i>14,018</i>	<i>10,367</i>	<i>9,086</i>	<i>6,615</i>	<i>6,283,856</i>	<i>6,634,367</i>
Planned Reduction Percent	5.7%	6.5%	65.4%	79.3%	48.4%	57.7%
Total Reductions						
Reduction (Progress + Planned)	37,283	23,071	19,400	12,231	13,602,529	12,503,092
Reduction Percent (Progress + Planned)	6.6%	7.2%	70.3%	85.5%	51.6%	61.7%
Reduction Remaining for Treatment	30,566	15,328	-13,680	-9,408	-	-
Reduction Percent Remaining	5.4%	4.8%	-49.5%	-65.8%	-	-

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	1,691.1	8,124.7	2,990.6	3,854.5	381.0	530.9	629.9	18,202.8
Impervious Baseline Treated	515.0	4,231.2	1,088.4	1,676.1	153.1	156.0	161.3	7,981.1
Impervious Baseline Untreated	1,176.1	3,893.5	1,902.2	2,178.3	227.9	374.9	468.6	10,221.6
20% Restoration Target	235.2	778.7	380.4	435.7	45.6	75.0	93.7	2,044.3
2015 Progress Impervious Restoration (Impervious Credit Acres)								
2015 Total Progress Restoration	35.2	72.0	28.2	11.8	0.0	3.6	6.5	157.4
% Impervious Treated	3.0%	1.8%	1.5%	0.5%	0.0%	1.0%	1.4%	1.5%
Planned Impervious Restoration (2016-2019) (Impervious Credit Acres)								
Total Restoration BMPs	60.3	926.8	330.9	247.9	10.1	29.0	51.6	1,656.6
2016 Concepts (Pending)	60.3	106.2		201.1	10.1	20.1	51.6	449.5
FY16/FY17 Planned and 2015 Concepts		820.6	330.9	46.8		8.9		1,207.1
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	103.4	970.2	374.0	291.0	53.1	72.1	95.3	1,959.0
% Impervious Treated	8.8%	24.9%	19.7%	13.4%	23.3%	19.2%	20.3%	19.2%
Total Impervious Restoration to 2019 (Impervious Credit Acres)								
2015 Progress	35.2	72.0	28.2	11.8	0.0	3.6	6.5	157.4
2016-2019 Planned	103.4	970.2	374.0	291.0	53.1	72.1	95.3	1,959.0
Total Impervious Restoration	138.6	1,042.1	402.2	302.9	53.1	75.7	101.8	2,116.4
% Impervious Treated	11.8%	26.8%	21.1%	13.9%	23.3%	20.2%	21.7%	20.7%

Countywide Implementation Strategy (CIS)

Chapter 5 – Technical/Financial Assistance Needs

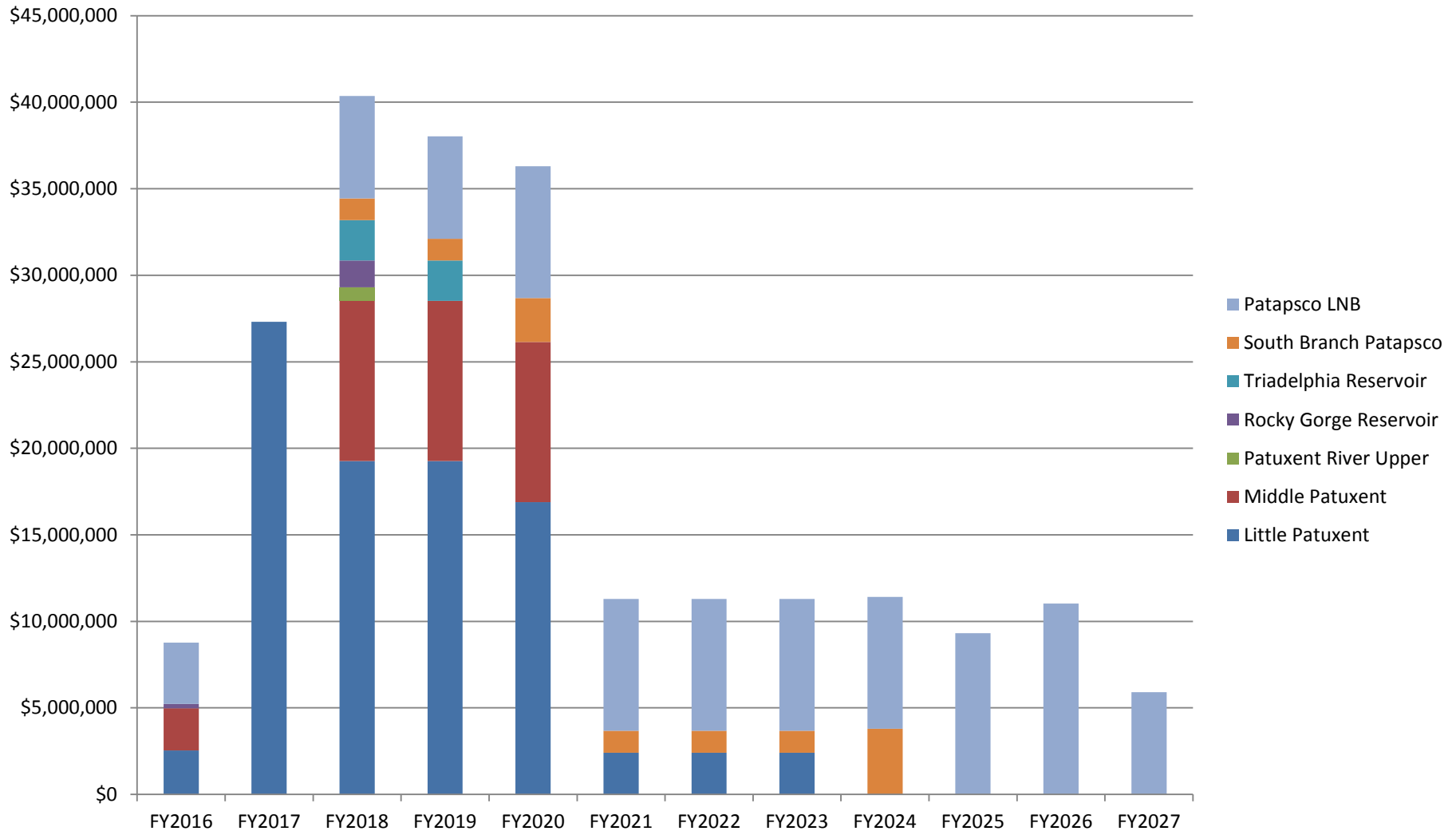
- Technical assistance
- **Implementation cost summary**
- Funding sources



Cost Summary Estimate

						Baltimore Harbor		Total
Fiscal Year	Little Patuxent	Middle Patuxent	Patuxent River Upper	Rocky Gorge Reservoir	Triadelphia Reservoir	South Branch Patapsco	Patapsco LNB	
2016	\$ 2,536,484	\$ 2,443,236		\$ 250,000			\$ 3,535,768	\$ 8,765,487
2017	\$ 27,305,179							\$ 27,305,179
2018	\$ 19,263,884	\$ 9,254,620	\$ 777,212	\$ 1,554,424	\$ 2,331,636	\$ 1,263,190	\$ 5,912,839	\$ 40,357,805
2019	\$ 19,263,884	\$ 9,254,620			\$ 2,331,636	\$ 1,263,190	\$ 5,912,839	\$ 38,026,169
2020	\$ 16,894,849	\$ 9,254,620				\$ 2,526,379	\$ 7,616,545	\$ 36,292,393
2021	\$ 2,413,550					\$ 1,263,190	\$ 7,616,545	\$ 11,293,285
2022	\$ 2,413,550					\$ 1,263,190	\$ 7,616,545	\$ 11,293,285
2023	\$ 2,413,550					\$ 1,263,190	\$ 7,616,545	\$ 11,293,285
2024						\$ 3,789,569	\$ 7,616,545	\$ 11,406,114
2025							\$ 9,320,252	\$ 9,320,252
2026							\$ 11,023,958	\$ 11,023,958
2027							\$ 5,912,839	\$ 5,912,839
Total	\$ 92,504,931	\$ 30,207,095	\$ 777,212	\$ 1,804,424	\$ 4,663,272	\$ 12,631,896	\$ 79,701,223	\$ 222,290,052

Cost Summary Estimate



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**

Countywide Implementation Strategy (CIS)

Chapter 7 – Implementation Schedule

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

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**

Countywide Implementation Strategy (CIS)

Chapter 9 – Monitoring

- Current monitoring – biological, chemical, physical (NPDES permit condition and voluntary)
- Stormwater Design Manual (NPDES permit condition)

Countywide Implementation Strategy (CIS)

In Summary:

- Comprehensive summary of County's current and proposed efforts for environmental restoration and permit compliance
- **Planning document** including possible schedule and anticipated costs

Want to learn more about stormwater?

Office of Community Sustainability

www.cleanwaterhoward.com



Stormwater Management Division Website

www.howardcountymd.gov/SWM.htm

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