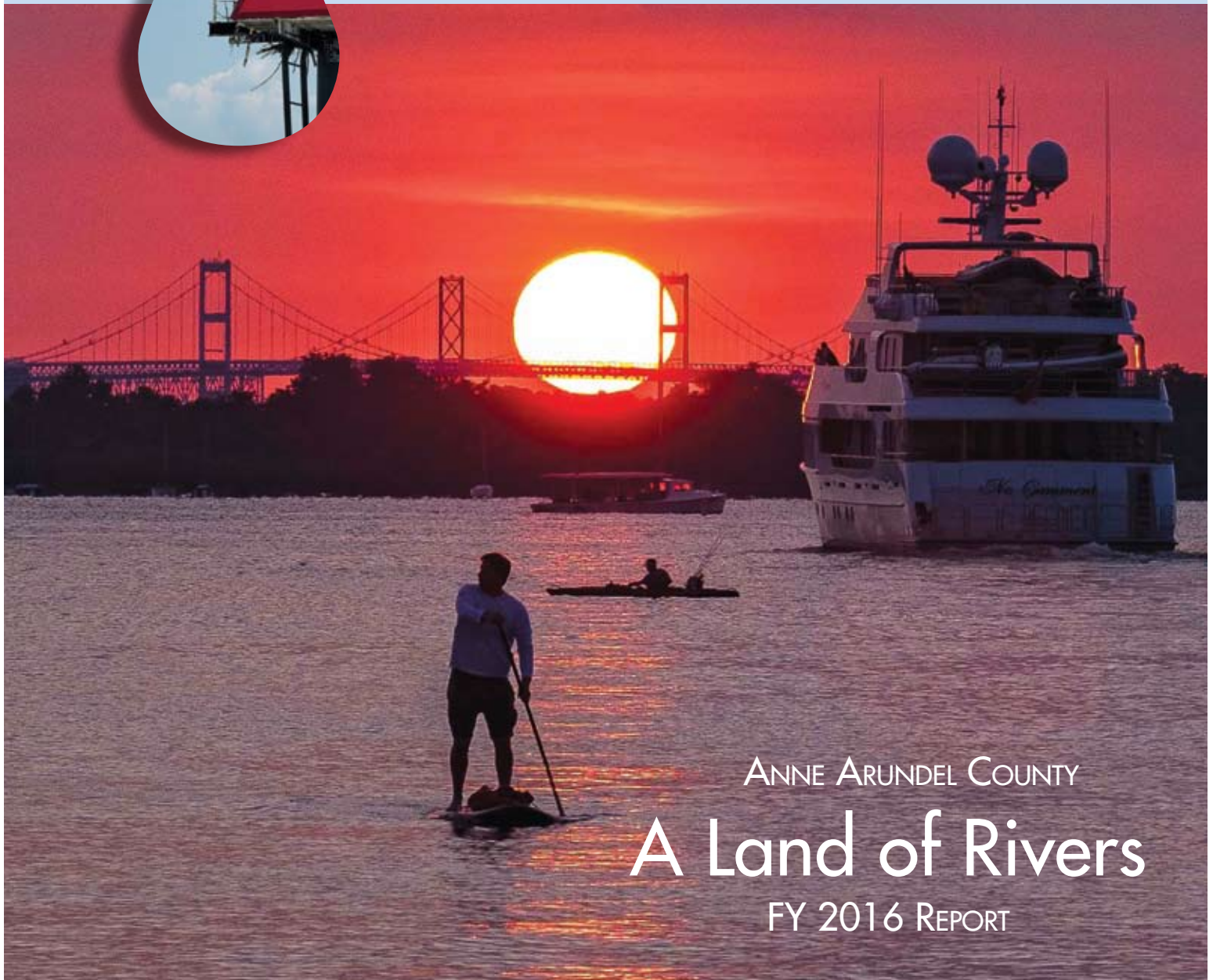




Anne Arundel County
WATERSHED
Protection & Restoration
P R O G R A M



ANNE ARUNDEL COUNTY
A Land of Rivers
FY 2016 REPORT



Anne Arundel County
Department of Public Works
AARIVERS.ORG



Dear Anne Arundel County Resident,

Our *2016 Anne Arundel County, A Land of Rivers* report summarizes the watershed protection and restoration actions initiated by the Anne Arundel County Department of Public Works and our partners during fiscal year 2016. In 2012, the County finalized its Watershed Implementation



Steven R. Schuh, County Executive

Plan (WIP) to provide targets for improving water quality and watershed health, and to protect and restore natural resources. The County reports annually on progress made towards these goals through innovative and collaborative projects.

As I have stated previously, my vision is for Anne Arundel County to be the best place to live, work, and start a business in the State of Maryland. In pursuit of that vision, we are working to implement our basic five-point plan for our citizens:

- Reduce taxes and fees to make it easier to live and to start a business here.
- Improve our system of public education by accelerating development of smaller neighborhood schools.
- Improve public safety by investing in our basic infrastructure and increase staffing in our public safety departments and offices.
- Reform County Government by making it more efficient and customer-friendly.
- And lastly, as communicated in this report, clean up our waterways. With more miles of shoreline than any other jurisdiction in the United States, we are the water people.

We have a responsibility to make sure that our waterways are clean and healthy for ourselves, our children, and our grandchildren.


Anne Arundel County's water resources - its streams, rivers, wetlands, and Chesapeake Bay - play an important role in the quality of life we enjoy. They provide us a sense of place, recreation, support tourism, and are used by industry. These waters, however, are vulnerable to pollution from a wide variety of human activities.

Many of our water pollution problems are due in large part to pollutants that are washed off the land by storms.

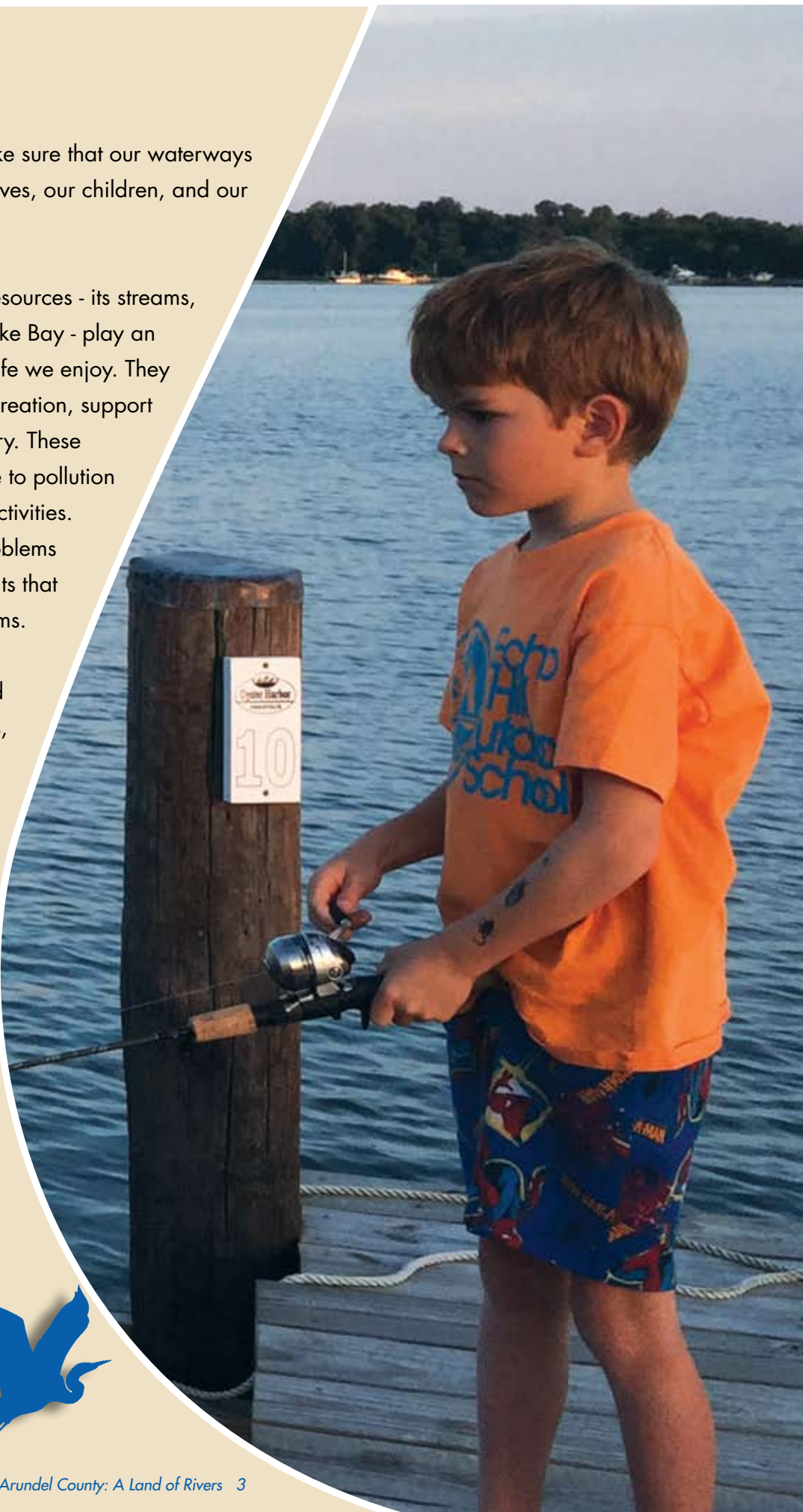
The quality of stormwater from public facilities, commercial and industrial businesses, residences, and agricultural lands is an increasing concern nationwide.

In fact, all of Anne Arundel County's waterways are considered "impaired" because of excessive levels of pollution, largely a result of untreated stormwater runoff. Minimizing polluted runoff will help to make our rivers and the Chesapeake Bay safer for swimming and recreation and Anne Arundel County is one of the leaders in making that vision a reality.

Sincerely,



Steven R. Schuh
County Executive





The Changing Landscape

Anne Arundel County is a land of rivers. With more than 533 miles of shoreline and 12 different major watersheds, everything that happens on Anne Arundel's landscape is just a short trip away from its waterways. From its colonial beginnings in the middle of the 17th century, to today, with a population of over 550,000 residents, the land has been used intensively and continuously, shifting from a largely forested landscape to one that was heavily agricultural and cleared, then to the blend of urban, suburban, and rural uses that we see today.

The current health of our local waterways is a product of more than 350 years of intensive land use and an insufficient recognition that the clearing of the landscape, much of which was accomplished by the mid-18th century, followed by increasingly intensive development over the course of the past 50 years, has left our rivers with a broken network of streams and creeks.

This transformation of the natural landscape, with the addition of impervious surfaces such as roof tops, roads, sidewalks, and driveways endures today as the County continues to grow. The addition of these impervious surfaces has led to the issue of stormwater runoff. Stormwater runoff is the rain or snowmelt that flows off these impervious surfaces and into a local storm drain or culvert. Most stormwater runoff ends up in nearby creeks, streams, rivers, and eventually the Chesapeake Bay without treatment.

Since runoff comes into contact with litter, gasoline, oils, brake pad dust from cars, pesticides, waste from pets and many other toxins along its journey, stormwater is a significant source of pollution to our waterways.

In addition, stream erosion is accelerated as stormwater runoff is swiftly routed through a network of pipes to nearby waterways. Erosion adds excess sediment to the water, which has devastating effects on stream ecosystems. In fact, all of Anne Arundel County's waterways are considered "impaired" because of excessive levels of contaminants and sediment, largely a result of untreated stormwater runoff.

Over the course of the past decade, the Anne Arundel County Department of Public Works (DPW) has invested considerable time and money in conducting watershed assessments of each of the County's river systems. These assessments have involved walking hundreds of miles of streams throughout the County, evaluating their biological and physical condition, and developing a restoration implementation plan to recover their health and arrest the continued flow of pollutants into our rivers.

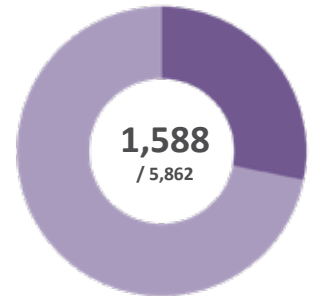


Regulatory Drivers



In 2010, with the implementation of the Chesapeake Bay Total Maximum Daily Load (TMDL) requirements by the US Environmental Protection Agency (EPA), and in 2014, with the issuance of a more aggressive National Pollutant Discharge Elimination Systems Municipal Separate Storm Sewer System (NPDES-MS4) Permit issued by the Maryland Department of the Environment, the regulatory demand to increase the pace of local restoration implementation has increased considerably.

WPRP MS4 Attainment Goals *(acres to date/projected acres)*



MS4 Permit
Progress Tracking

Through June 30, 2016

For latest progress, visit www.aarivers.org

The goal of the NPDES-MS4 permit is to control stormwater pollution, improve water quality, and work toward meeting water quality standards.

WPRP MS4 Attainment Goals tracks the restoration of twenty percent of Anne Arundel County's impervious surface area that has little or no stormwater management as required by our NPDES-MS4 permit. The impervious area restoration requirement is part of the strategy in Maryland's Watershed Implementation Plan (WIP) for meeting the Chesapeake Bay TMDL.

Anne Arundel County possesses the expertise, the plan, and the resources to accomplish our shared clean water goals. The Watershed Protection and Restoration Program (WPRP) has hundreds of projects programmed over the next several years to ensure that we succeed in our ambitious mission to restore the health of our local creeks and rivers.

The Restoration Plan

Anne Arundel County's Watershed Implementation Plan (WIP), approved in 2012, enumerated three primary strategies for achieving its required pollution reduction targets: 1) Upgrading, to the current limits of technology, the County's major wastewater treatment plants (WWTPs); 2) Reducing pollution from urban stormwater by providing treatment for currently untreated impervious areas within the County by 2019 and beyond, and; 3) Converting roughly half (~20,000) of the County's septic systems to more effective, nutrient-reducing wastewater treatment alternatives.

Almost 5 years into the implementation of the WIP, the County will have all of its WWTPs upgraded to the Enhanced Nutrient Removal (ENR) standard by early 2017. This action alone will be the single biggest step that Anne Arundel County has ever taken to reduce nutrient pollution to local waterways.

At the end of FY16, the County had achieved over 25% of the restoration requirements under its current MS4 permit, with the rest of the required work in the procurement, design, and construction pipeline. Additionally, the County's final watershed assessment – of the Middle Patuxent and Herring Bay – was initiated just before the end of fiscal 2016. The Department of Public Works and Anne Arundel County Health Department continue to work closely together to direct Bay Restoration Funds for septic conversions and septic-to-sewer connections, as revenues are available.

In 2017, it is anticipated that the Maryland Department of the Environment (MDE) will require the County to develop a Phase 3 WIP, further refining the County's plan to achieve the 2025 Chesapeake Bay TMDL goals, a process which the County has already begun.

There are approximately 41,000 septic systems in Anne Arundel County. Of these, several thousand are located within the "Critical Area," land within 1,000 feet of tidal waters. The typical septic system does not remove nitrogen, instead delivering about 23.2 pounds of nitrogen per year to the groundwater.

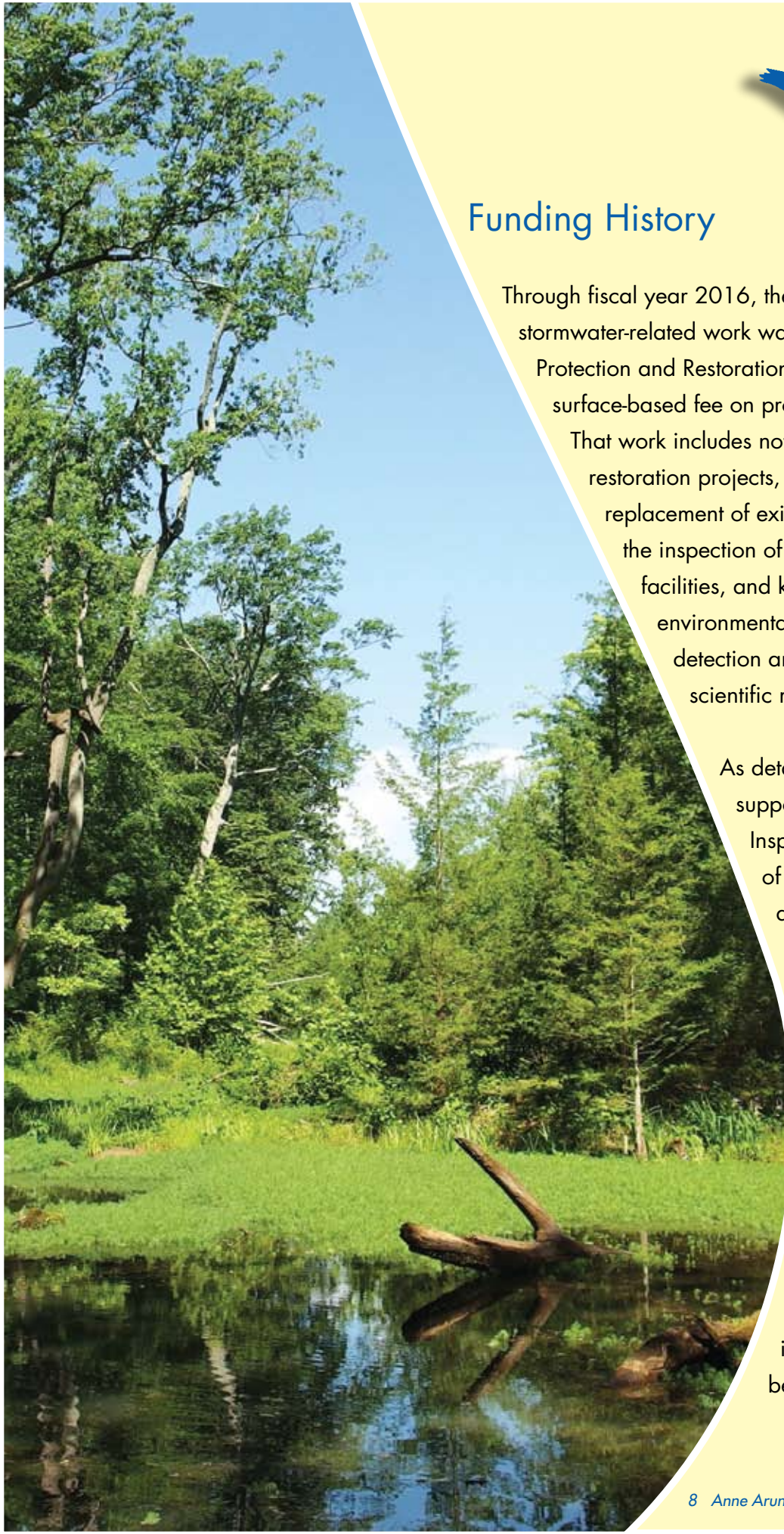
The Anne Arundel County Department of Health locally administers the Bay Restoration Fund (BRF). The BRF is a state-supported initiative that provides funding to replace conventional septic tanks with nitrogen-reducing technology. The units reduce the amount of harmful nutrients, such as nitrogen, that septic systems discharge into the Chesapeake Bay and its tributaries. An upgraded, nitrogen-removing septic system cuts a system's nitrogen load in half.

In FY16 the Department of Health improved water quality through the Bay Restoration Fund grant program, which cost-shared 225 pretreatment units and two connections to public sewer. For more information on the grant program visit www.aahealth.org.

ANNE ARUNDEL COUNTY ENR UPGRADE SCHEDULE			
WRF	Investment	Status	Completion
Annapolis	\$20 million	Complete	June 2015
Broadneck	\$25 million	95% complete	January 2017
Broadwater	\$10 million	Complete	June 2015
Cox Creek Ph I Cox Creek Ph II	\$141 million*	Complete 93% complete	January 2017
Maryland City	\$10 million	Complete	December 2014
Patuxent	\$13 million	Complete	May 2014
Mayo**	\$29 million	50% complete	January 2017
TOTAL	\$249 million		

* Represents the largest capital project in County history.

** Plant to be decommissioned. New forcemain will pump wastewater to upgraded Annapolis WRF for treatment.



Funding History



Through fiscal year 2016, the entirety of the County's stormwater-related work was funded through the Watershed Protection and Restoration Fee (WPRF), an impervious surface-based fee on properties throughout the County. That work includes not only the County's clean water restoration projects, but also the maintenance and replacement of existing drainage infrastructure, the inspection of public and private stormwater facilities, and key programmatic efforts around environmental education, illicit discharge detection and elimination (IDDE), and the scientific monitoring of restoration projects.

As detailed in this report, the WPRF supports staff in the Department of Inspections and Permits, Department of Public Works Bureau of Highways, and the Department of Public Works Watershed Protection and Restoration Program working to protect and restore the County's waterways.

In July of 2016, the WPRP submitted a Financial Assurance Plan to MDE detailing the past, present, and anticipated expenditures required to satisfy its current MS4 permit. That plan is available at aarivers.org and will be updated every two years.



How is the Fee Calculated?

The Department of Public Works utilized Geographic Information Systems (GIS) technology along with parcel data collected from the Consolidated Property File and County Zoning Maps to estimate the imperviousness of residential properties in the various zoning districts. This information was used to determine a baseline Equivalent Residential Unit (ERU) of impervious surface of 2,940 sq. ft. An ERU is the base unit for calculating the annual charge for residential and non-residential properties. Currently the charge is \$85 per ERU, per year.

The fee structure varies between land use type and intensity as seen in the table below:

ANNUAL WATERSHED PROTECTION AND RESTORATION FEE RATES		
Zoning	Rate Calculation	FY16 Fee
R10, R15, R22	$\$85 \times .4$	\$34
R1, R2, R5	\$85	\$85
RA, RLD	$\$85 \times 2$	\$170
Non-Residential	Actual sf of impervious surface divided by 2,940 x \$85	Varies

To view the WPRF for your property visit www.AARivers.org.

Watershed Protection and Restoration Program – Carrying Out the Plan

The Watershed Protection and Restoration Program (WPRP) is located in the Bureau of Engineering of the Anne Arundel County Department of Public Works. The WPRP develops and delivers technical environmental assessment, restoration planning and implementation information and regulatory support to the Departments of Public Works, Inspections and Permits, Department of Health, and the Office of Planning and Zoning. This support enables these agencies to carry out their responsibilities for successfully managing delegated programs outlined in the County's NPDES-MS4 Permit, the State's Critical Area program, and the State Forest Conservation Act, as well as their responsibilities for land use decisions set forth in the County Code.

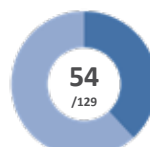
Implementation of the WPRP stormwater restoration strategy is focused on three key areas:

- **Stormwater Pond Retrofits** – Existing facilities, such as dry ponds, detention ponds, or infiltration basins that have failed will be rebuilt to optimize their pollution reduction capacity and provide an array of ecosystem benefits.
- **Stormwater Outfall Repairs** – Eroded or failing stormwater outfalls – locations where drainage systems discharge onto erosive soils – will be reconstructed into systems that can both safely convey high flows as well as provide water quality benefits and habitat.
- **Stream & Wetland Restoration** – Stream erosion is the largest contributor of sediment and phosphorus to our local rivers, and the County's strategy to re-hydrate valley bottoms through restoration will provide water quality, floodplain connection, and ecological benefits on a broad scale.

In addition to the work above, funds from the WPRP are used to address a \$30+ million backlog of stormwater infrastructure repairs and replacement, ensuring that the County's culverts and drainage infrastructure are functioning properly and are not a threat to public health and safety.

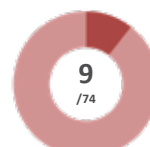
WPRP Restoration Project Goals (# of projects completed/anticipated)

Through June 30, 2016



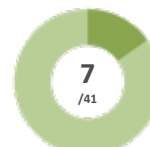
Stormwater Pond Retrofits

Existing facilities, such as dry ponds, detention ponds, or infiltration basins that have failed will be rebuilt to optimize their pollution reduction capacity and provide an array of ecosystem benefits.



Stormwater Outfall Repairs

Eroded or failing stormwater outfalls – locations where drainage systems discharge onto erosive soils – will be reconstructed into systems that can both safely convey high flows as well as provide water quality benefits and improved habitat.



Stream & Wetland Restoration

Stream erosion is the largest contributor of sediment and phosphorus to our local rivers, and our strategy to re-hydrate valley bottoms through restoration will provide water quality, floodplain connection, and ecological benefits on a broad scale.



Healing Our Rivers

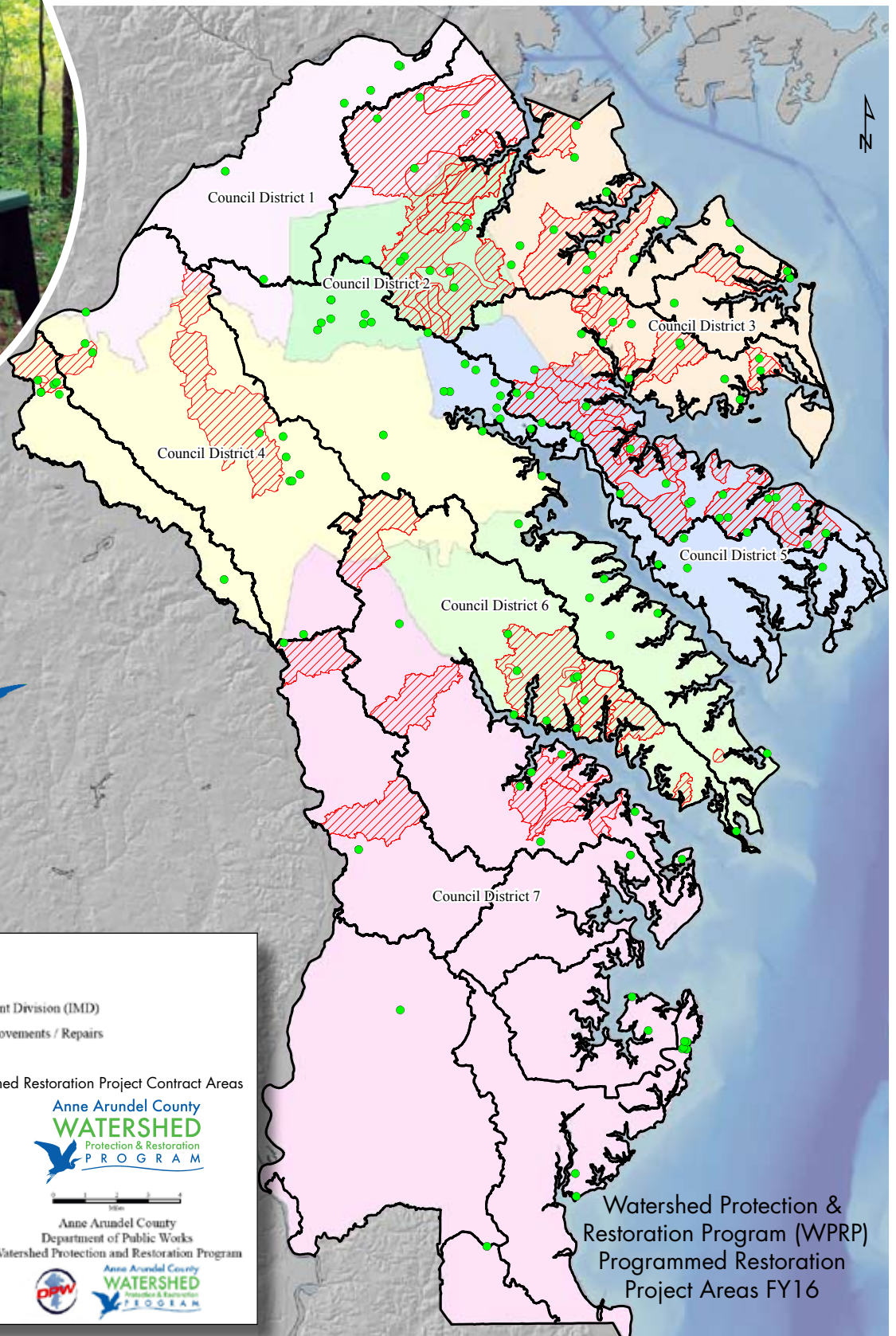
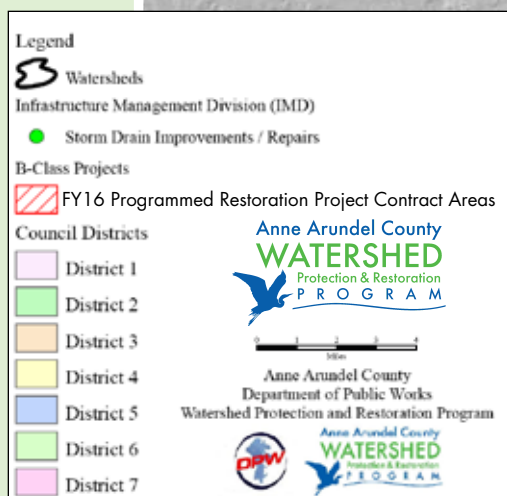
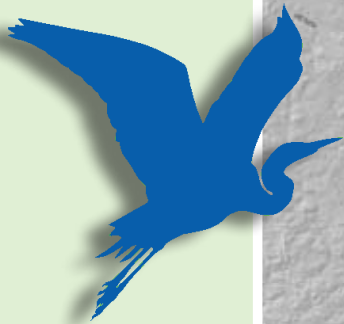
The health of Anne Arundel County's waterways is tied to the health of its watersheds. While the health of the Chesapeake Bay itself is integrally tied to inputs from the region's largest waterways, such as the Susquehanna and Potomac Rivers, the health of our rivers and creeks has been demonstrated to be largely driven by activities – both past and present – in our own watersheds. Nutrient discharges from our wastewater treatment plants and septic systems, and sediment and nutrient runoff from our businesses and homes are the drivers of our local impairments. Our restoration work, paired with that being required of the other bay jurisdictions, can ensure that our creeks and rivers, as well as the Chesapeake, are put on the path to recovery.

Summary of Watershed Restoration Projects

WATERSHED IMPLEMENTATION PLAN (WIP) PROJECTS FUNDED IN FY16	
Bodkin Creek Watershed	\$43,700
Little Patuxent Watershed	\$5,376,000
Magothy River Watershed	\$22,460,500
Patapsco River (Non-Tidal) Watershed	\$510,000
Patapsco River (Tidal) Watershed	\$24,643,000
Upper Patuxent Watershed	\$1,263,500
Severn River Watershed	\$90,000
South River Watershed	\$14,898,800
TOTAL	\$69,285,500

Note: Watershed Implementation Plan (WIP) project costs include: Stream Restoration, Stormwater Management Pond Retrofits, and Storm Drain Outfall Enhancements. The funding identified in the above table represents only that portion of the project costs that were funded in the FY16 Capital Budget. Watershed assessments for Little Patuxent, West/ Rhode River Herring Bay and Middle Patuxent are scheduled for completion by 2017.

Watershed Protection & Restoration Program Projects Budgeted in FY 2016



Stream & Wetland Restoration Program

Purpose & Function

Anne Arundel County's Stream & Wetland Restoration Program is a watershed-based approach to restoring degraded stream systems to improve stream morphology, ecological function, water quality, along with aquatic and riparian habitat to ensure the resilience of the County's environment for its citizens. The Stream & Wetland Restoration Program is at the core of Anne Arundel County's program to meet federal and state mandated pollutant load reductions (TMDLs) and impervious surface management (NPDES MS4) requirements.

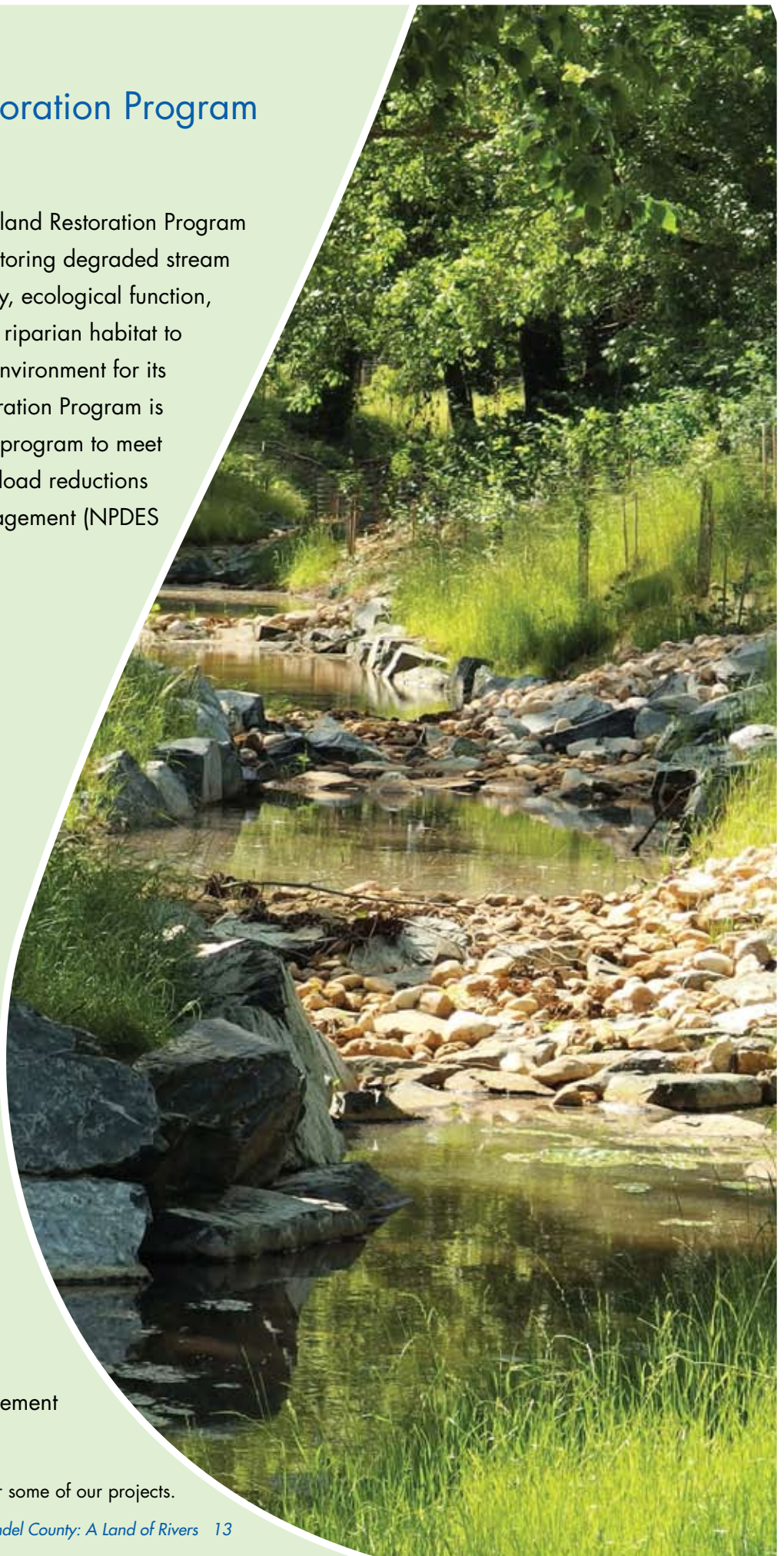
Stream Restoration Project Tasks

- Assessment and Evaluation
- Prioritization and Project Selection
- Design
- Community Input
- Federal, State and Local Permits
- Private/Public Property Access Approval
- Construction
- As-Built Approval
- Adaptive Management

Monitoring

Pre- and post- construction monitoring is often integral to restoration projects and is, many times, required by Federal and State permitting agencies. Collecting data on the performance and function of restoration projects provides decision makers with information that assists managers in making informed management decisions.

Visit www.aarivers.org for monitoring data for some of our projects.





STREAM RESTORATION PROJECTS FUNDED IN FY16

Project #	Watershed	Community	Council District	# of Stream Segments	Stream Length (Linear Feet)
B552000	Magothy	Pasadena	3	2	1,430
B552100	Magothy	Severna Park	5	3	3,761
B552300	Magothy	Cape St. Claire	5	3	2,434
B553500	Patapsco Tidal	Glen Burnie	1	16	13,123
B553700	Patapsco Tidal	Glen Burnie	1, 2	17	12,389
B553900	Patapsco Tidal	Glen Burnie	2	5	4,195
B554300	Patapsco Tidal	Glen Burnie	2	6	4,298
B554400	Patapsco Tidal	Glen Burnie	2	7	5,426
			TOTAL	59	47,056

NOTE: Stream restoration project costs are programmed in the CIP budget over multiple years.

Stormwater Management Pond Retrofit/ Conversion and Storm Drain Outfall Enhancement Program

Purpose & Function

Anne Arundel County's Stormwater Management (SWM) Pond Retrofit/Conversion and Storm Drain Outfall Enhancement Program utilizes a watershed-based approach to reducing pollutant loads from upland sources and managing stormwater from impervious surfaces within Anne Arundel County. The SWM Pond Retrofit/Conversion and Storm Drain Outfall Enhancement projects along with the Stream & Wetland Restoration projects make up Anne Arundel County's Stormwater Tier One Watershed Implementation Strategy (WIP). The County's WIP was structured to meet Federal and State mandated pollutant load reductions required to achieve the Chesapeake Bay TMDL, including those local TMDLs established for Anne Arundel County's waterways, and impervious surface management (NPDES MS4) requirements.

Pond Retrofit/Conversion & Outfall Enhancement Project Tasks

- Assessment and Evaluation
- Prioritization and Project Selection
- Design
- Community Input
- Federal, State and Local Permits
- Private/Public Property Access Approval
- Construction
- As-Built Approval
- Adaptive Management

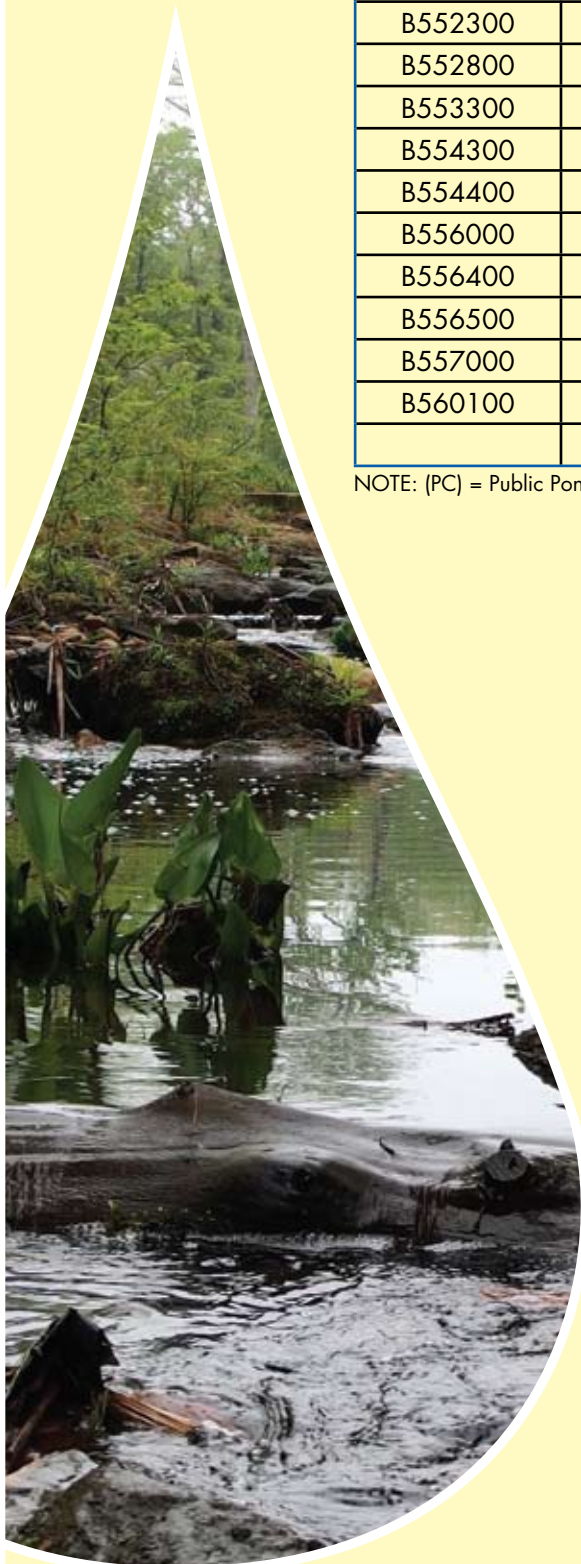




SWM POND RETROFIT/CONVERSION PROJECTS FUNDED IN FY16

Project #	Watershed	Council District	# of Private Ponds
B552000	Magothy	3	1± (PC)
B552100	Magothy	5	1± (PP)
B552300	Magothy	5	1± (PC), 2± (PP)
B552800	Magothy	3, 5	10± (PP)
B553300	Patapsco Tidal	1, 2, 3	26± (PP)
B554300	Patapsco Tidal	2	2± (PC), 1± (PP)
B554400	Patapsco Tidal	2	1± (PC)
B556000	Bodkin	3	1± (PP)
B556400	Upper Patuxent	4, 7	5± (PP)
B556500	Upper Patuxent	4, 7	1± (PC)
B557000	Little Patuxent	1, 4, 7	16± (PP)
B560100	South	4, 6, 7	23± (PP)
	TOTAL		91

NOTE: (PC) = Public Ponds (PP) = Private Ponds

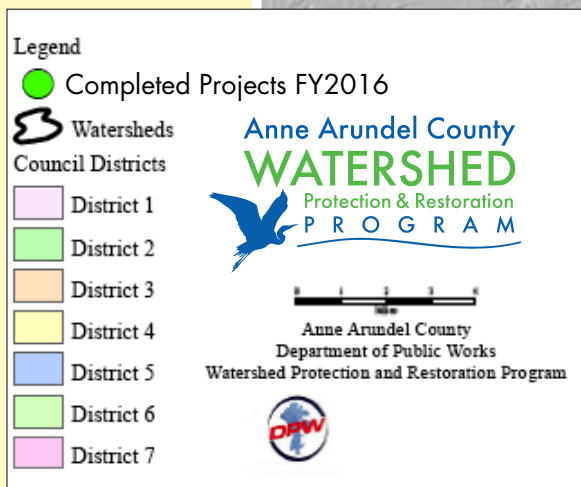


STORM DRAIN OUTFALL ENHANCEMENT PROJECTS FUNDED IN FY16

Project #	Watershed	Council District	# of Outfalls
B552000	Magothy	3	8±
B552100	Magothy	5	8±
B552300	Magothy	5	8±
B552500	Magothy	5	19±
B552600	Magothy	3, 5	105±
B552700	Magothy	3	29±
B553100	Magothy	3, 5	54±
B553500	Patapsco Tidal	1	9±
B553600	Patapsco Tidal	1, 2	14±
B553700	Patapsco Tidal	1, 2	34±
B553800	Patapsco Tidal	1, 2	15±
B553900	Patapsco Tidal	2	19±
B554300	Patapsco Tidal	2	7±
B554400	Patapsco Tidal	2	8±
B554600	Patapsco Tidal	2	12±
B551000	Patapsco Tidal	3	116±
B555200	Patapsco Tidal	3	43±
B555400	Patapsco Non-Tidal	1	50±
B556700	Little Patuxent	4	14±
B559000	Severn	6	49±
B559500	South	6	17±
B559900	South	7	7±
B560300	South	4, 6, 7	41±
	TOTAL		686

WPRP Restoration Projects Completed in FY16

The following projects were constructed to meet multiple objectives including: water quality enhancement, infrastructure protection, improved flood attenuation, improved fish habitat, and improved riparian functions.



Outfalls Completed: 4

Notable Project: Cinnamon Lane Outfall Repair

Ponds Completed: 31

Notable Project: Hospital Drive Pond Retrofits

Stream Restorations Completed: 3

Notable Project: Dividing Creek Stream Restoration

Infrastructure Management Division (IMD) Stormwater Management



The Infrastructure Management Division is responsible for managing the inventory, inspection, and development of the County's Stormwater Infrastructure Capital Program. This program aims to repair and/or replace aging, damaged storm drain systems and culverts throughout the County, as well as any associated design and permitting requirements. These projects are normally identified and transferred to the IMD by the Road Operations Division and are scheduled in a worst-first priority order.

Funds from the Watershed Protection and Restoration Program are used to address stormwater infrastructure repairs and replacements, ensuring that the County's culverts and drainage infrastructure are functioning properly and are not a threat to public health and safety.

INFRASTRUCTURE MAINTENANCE DIVISION PROJECTS BUDGETED IN FY16	
Culvert & Closed Storm Drain Repair	\$4,766,600
Emergency Storm Drain	\$600,000
TOTAL	\$5,366,600

2016 Infrastructure Management Division WPRP Capital Projects

2016 INFRASTRUCTURE MANAGEMENT DIVISION WPRP CAPITAL PROJECTS			
COUNCIL DISTRICT	ROAD NAME	DESCRIPTION	CAPITAL FUNDING
1	Bishop Ave	Extension of the storm drain system	\$60,000
1	Booker Ave	Inlet structure rehab	\$8,000
1	Broadway Ave	Grade new open channel swales	\$22,000
1	Brockbridge Road	Pipe replacement and regrade swale	\$12,000
1	Carriage Drive	Installed internal clamp and repaired inlet	\$10,000
1	Madora Road	External pipe coupling to seal pipe joints	\$9,000
1	Parkway Drive	Repaired inlets	\$17,000
1	Sunnyfield Lane	Inlet structure rehab	\$33,000
1	Tulip Oak Ct	Rehab of exsiting storm drain pipe	\$2,000
1	Woodland Rd	Storm drain repair and structure rehab	\$46,000
2	Edgerly Rd	Storm drain structure rehab	\$8,000
2	Elizabeth Rd	Inlet structure rehab	\$28,000
2	Glenwood Dr	Removal/replacement of exsiting failing storm drain pipe system	\$10,000
2	Hospital Dr	Installation of internal pipe clamps	\$38,000
2	Millrace	Inlet structure rehab	\$4,000
2	N Jerome Pkwy @ Bliss	New storm drain extension	\$53,000
2	Pasture Brook Rd	Installation of internal clamps	\$14,000



2016 INFRASTRUCTURE MANAGEMENT DIVISION WPRP CAPITAL PROJECTS

COUNCIL DISTRICT	ROAD NAME	DESCRIPTION	CAPITAL FUNDING
2	Perthshire Path	Inlet structure and storm drain pipe repair	\$12,000
2	Ridgely Rd at Marshall Rd	Storm drain repair and structure rehab	\$15,000
2	Rosewood Rd	Installation of new pipe, manhole junction boxes, new inlet, etc.	\$81,000
2	Silo Rd	Installation of internal clamps	\$22,000
2	Tall Pines Ct	Storm drain repair and structure rehab	\$12,000
2	WB&A Blvd	Installed internal clamps	\$15,000
2	WB&A@Burns Crossing Rd	Pipe repair	\$22,000
2	WB&A@Delmount Rd	Installed new pipes, headwalls, and replaced rip-rap	\$29,000
2	Whitebark Ln	Repaired inlet	\$8,000
3	210th St	Install of a new storm drain inlet and pipe	\$13,000
3	Appletree Rd	New storm drain extension	\$12,000
3	Argyle	Replacment of existing culvert and headwalls	\$8,000
3	Bar Harbor Rd	Structure Rehab	\$4,000
3	Bar Harbor Rd	Installation of internal pipe clams to seal connecting pipe joints	\$28,000
3	Braid Hills Dr.	Inlet structure rehab and pipe clamps to seal connecting pipe joints	\$20,000
3	Bush Ave	Installation of internal pipe clamps to seal connecting pipe joints	\$11,000
3	Carvel Beach Rd	Temp repair of storm drain	\$2,000
3	Carvel Beach Rd	Removal and replacement of deteriorated SD pipe, SD extension	\$61,000
3	Cheverly Land	Removal and replacement of existing failing storm drain pipe system	\$18,000
3	Country Life Rd	Remove deteriorated concrete swale, replaced with SPSC conveyance	\$81,000
3	Dubblin Dr	Storm drain pipe lining	\$26,000
3	Edgewater Dr	Installation of new storm drain	\$12,000
3	Falcon Dr	Inlet structure rehab #1	\$4,000
3	Fallon Dr	Inlet structure rehab #2	\$6,000
3	Grace Ave	Storm drain extension	\$45,000
3	Locust Dr	Storm drain outfall rehab	\$45,000
3	Luke Dr	Installation of a new infiltration trench to drain exsiting pavement sump	\$51,000
3	North @ Bay St	Removal and replacement of existing failing storm drain pipe	\$53,000
3	Puffin Ct	Existing storm drain outfall restoration	\$12,000
3	Riverside	Storm drain outfall rehab	\$15,000
3	Rock Hill	Inlet structure rehab	\$5,000
3	Saint Lauren Ct	Culvert pipe rehab	\$13,000
3	Seaborne Dr	Storm drain outfall rehab	\$41,000
3	Shellcove Rd	Structure rehab and point repair of storm drain	\$5,000
3	Southwest Rd	Removal and replacement of existing deteriorated storm drain pipe	\$37,000
3	Sun Glo	Provide overflow piping for existing infiltration facility	\$8,000
3	Swan Creek Dr	Inlet structure rehab to address erosion	\$17,000
3	Tennessee Ave	Removal and replacement of deteriorated storm drain pipe	\$9,000
3	Turf Valley Dr	Storm drain repair and structure rehab	\$22,000
3	Weston Woods	Storm drain repair and structure rehab	\$10,000
3	Windjamer	Storm drain pipe lining to seal leaking pipe joints	\$15,000

2016 INFRASTRUCTURE MANAGEMENT DIVISION WPRP CAPITAL PROJECTS

COUNCIL DISTRICT	ROAD NAME	PROJECT SCOPE OF WORK	CAPITAL FUNDING
4	Brockbridge Rd @ Ellen St	Repaired/replaced corrugated metal pipe sections, installed bands	\$75,000
4	Brockbridge Rd @ Ellen St	Sliplined pipe culvert	\$80,000
4	Brockbridge Rd @ Urbana	Installed grout bags to stablize headwall, new rip-rap	\$12,000
4	Cecil Ave	Repaired/rehab inlet	\$18,000
4	Eachann Ln	Sinkhole repairs, headwall repair, pipe seals	\$13,000
4	Fall Ridge Way	Sinkhole repairs	\$9,000
4	Henryton South	Structures repaired	\$4,000
4	Lyndhurst St	Internal pipe seals and asphalt repair	\$12,000
4	Meyers Station Rd	Installed pipe and rip rap	\$64,000
4	Misthaven Ln	Repaireed pipe joints	\$18,000
4	Oak Run Rd	Installed band and asphalt patch	\$5,000
4	Rita Dr	Inlet and pipe repair	\$3,000
4	S. Riverside Dr	Installed ducttile, reinforced plastic pipes, repaired inlets, junction box	\$73,000
4	Snowflake Dr	Installed internal bands	\$9,000
4	Vacation Dr	Installed internal fiberglass patch, backfilled sinkhole	\$6,000
4	Wye Mills South	Installed cmps and rip-rap stabilized outfall	\$152,000
5	Arundel Ave	Outfall rehab	\$16,000
5	Avondale Circle	Extension of existing storm drain system	\$57,000
5	Bay Green Dr	Pipe and inlet repair	\$20,000
5	Bay Green Dr @ Baydale Dr	Inlet repair (steel plate)	\$10,000
5	Benfield at Twekesbury Ln	Inlet structure rehab	\$10,000
5	Chautatgua Rd	Storm drain repairs	\$5,000
5	Cougar Ct	Outfall rehab	\$24,000
5	Edgeway	Removed concrete pipe, installed rip-rap plunge pool, regraded swale	\$48,000
5	Evergreen Rd	Storm drain extension	\$32,000
5	Finnegan Dr	Deep pavement patch over previously repaired storm drain	\$4,000
5	Governor Stone Pkwy	Installation of internal pipe clamps to seal connecting pipe joints	\$13,000
5	Grinstead Rd	Structure rehab and point repair of storm drain	\$13,000
5	Hatton Dr	Point repair of existing storm drain pipe	\$8,000
5	Holly Ridge Rd	Rehabilitation of existing storm drain system	\$99,000
5	Keeling Ct	Repaired one inlet	\$4,000
5	Kevins Dr	Repaired one inlet	\$3,000
5	Kimwood Rd	Repaired one inlet	\$3,000
5	Lakeland Rd	Inlet structure rehab	\$4,000
5	Lighthouse Landing Rd	Installed internal bands, backfilled sinkhole	\$14,000
5	Little Current Dr	Repaired inlet and curb/gutter	\$3,000
5	Liveoak Dr	Inlet structure rehab	\$9,000
5	Long Meadow Way	Stabilized w/ topsoil, rip-rap and curlex	\$13,000
5	Mariner Dr	Installed CMPs, inlets and grates, rip-rap	\$82,000
5	Marnel Rd	Point repair of existing storm drain pipe	\$23,000
5	Mermain Dr	Internal pipe seals, parged manhole, asphalt patch	\$9,000



2016 INFRASTRUCTURE MANAGEMENT DIVISION WPRP CAPITAL PROJECTS

COUNCIL DISTRICT	ROAD NAME	DESCRIPTION	CAPITAL FUNDING
5	Oak Tree Lane	Repaired inlet, added band, patched joints	\$15,000
5	Preserve Dr	Rehab and lined RCP	\$166,000
5	Retford Dr	Storm drain point repair	\$13,000
5	Ridgeway Dr	Repair Failing Storm Drain System	\$12,000
5	Saint Ives	Culvert pipe rehab	\$14,000
5	Seaward Dr	Inlet structure rehab	\$3,000
5	Sheffield Rd	Inlet / manhole structure rehab	\$7,000
5	Stinchcomb Dr	Installed internal clamps, sealed lift holes and repaired two inlets	\$26,000
5	Sunwood Terr	Replaced inlet	\$11,000
5	Tam Glade	Storm drain outfall and conveyance channel rehab	\$60,000
5	White Tail Deer Rd	Sinkholes over pipe	\$11,000
6	Cape St John Rd	Installed new pipe and rip-rap for swale	\$61,000
6	Crownsville Rd	Installed new pipe and rip-rap for swale	\$23,000
6	Gordon Cove Dr	Sinkholes over pipe	\$7,000
6	Lindamoor Dr	Installed new plastic pipe and rip-rap	\$8,000
6	Oak Grove Rd	Installed new pipe, interceptor, inlets, and pipe repair	\$62,000
6	Riva Rd	Repaired inlets, manholes and replaced curbstone	\$144,000
6	Riva Rd	Installed retaining wall	\$141,000
6	Saltworks Ct	Installed grout bags to stabilize hillside	\$114,000
6	Sara Dr	Installed reinforced plastic pipe and rip-rap	\$25,000
6	Scenic Hills Way	Repaired curbstone	\$5,000
6	Scotts Crossing Way	Sinkholes over pipe	\$2,000
7	Aspen Ct	Installed internal clamps, underdrain, and topsoil	\$47,000
7	Bay View Ave	Installed new ducttile pipe and end walls	\$8,000
7	Bay View Ave	Installed new ducttile pipe and concrete driveway	\$8,000
7	Bay View Ave	Regraded drainage ditch, installed new pipes	\$11,000
7	Chesapeake Ave	Installed new pipe and inlet w/ vane grate	\$9,000
7	Defense Hwy	Repaired inside manhole structure, replaced manhole frame/lid, asphalt patch	\$9,000
7	Drum Point Rd	Installed new pipe, repaired inlets, new vane grates	\$91,000
7	Griner Ln	Rehab ditch	\$7,000
7	Irvin Ave	Storm drain system replacement/upgrade	\$185,000
7	Jewell Rd	Installed internal joint seal, and repaired inlet	\$6,000
7	Monarch @ Ladybug Way	Repaired structure, asphalt patch	\$8,000
7	Mount Tabor Rd	Repaired pipe/inlet	\$20,000
7	Oak Ave	Regraded drainage ditch, installed new pipe	\$14,000
7	Parke Dr	Installed new pipe, inlets, and manhole structures	\$106,000
7	Pine Ave @ Parke Dr	Installed new pipe and inlets w/ vane grates	\$25,000
7	Pine St	Installed new pipe, headwall, and rip-rap	\$14,000
7	Rolling Rd	Installed new pipe and paved	\$17,000
7	Selby Heights	Rehab inlet	\$12,000
7	Southdown Rd	Replaced concrete swale	\$7,000
7	Tarrytown Ave	Repaired inlets w/ vane grates	\$17,000
7	Virginia Ave	Replaced ducttile pipe, repaired inlets and installed new grates	\$95,000





IMD Milestones

The Infrastructure Management Division is responsible for managing the inventory, inspection, and maintenance of 855 stormwater management facilities that are collectively referred to as Best Management Practices (BMPs). In addition, IMD works alongside the Roads Operations Division to sweep County roads to remove loose materials, litter and other debris that are unsightly, hazardous, or could cause possible drainage obstructions.

IMD 2016 MILESTONES

Action	Result
BMP's Inspected	591
Miles of Street Sweeping	204
Tons of Litter Collected (Street Sweeping)	472
Storm Drains and Culvert Projects	258

Watershed Projection and Restoration Fund Revenue and Expense Report

Maryland Environment Code Ann §4-202.1 (2013) requires that a county make a report publicly available, beginning on July 1, 2014, and every two years thereafter. This requirement was amended in FY15 to require annual reporting of operating expenditures. The following report is being issued in addition to these requirements, and includes revenues and expenses for FY16, the third year of implementation for the Watershed Protection and Restoration Fund in Anne Arundel County, Maryland. This report includes expenses incurred beginning July 1, 2015 through June 30, 2016.

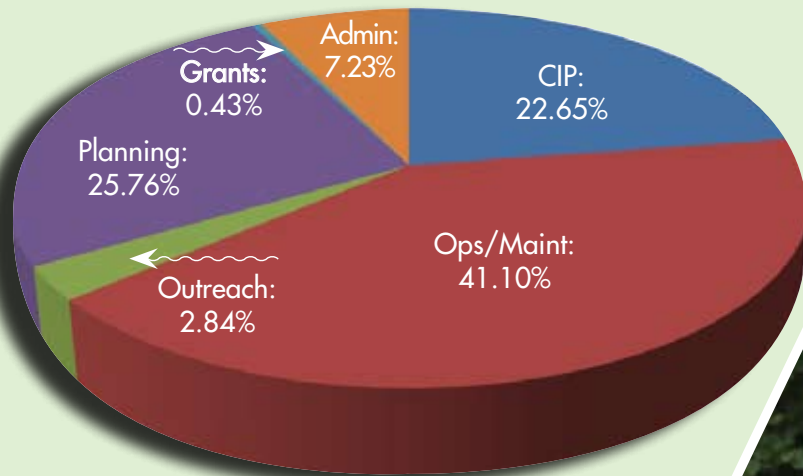
WPRP FY16 Operating Expenses

Expenses Posted as of July 10, 2016

Revenues

The Stormwater Fee was first billed on property taxes on July 1, 2013. There were 212,980 properties in Anne Arundel County that were subject to the fee. For FY16, Anne

FY16 Operating Expenditures



Arundel County has received \$21,058,000 in revenues as of June 30, 2016. In addition to the Stormwater Fees, the county has received \$642,000 to fund watershed protection and restoration projects from other sources.

Expenditures

Operating expenditures for FY16 totaled \$15,027,000. Of these expenditures, \$6,176,000 was spent on operations and maintenance activities for the county's stormwater infrastructure. An additional \$3,871,000 was spent for planning for future improvements to these systems. The fund balance of \$6,673,000 will be used to pay debt payments associated with the capital improvement projects required to update the aging infrastructure and to construction of best management practices for locations that do not meet current requirements.





Surface Water Monitoring Program

The Surface Water Monitoring Program is responsible for evaluating the in-stream water quality of the County's non-tidal streams and rivers for purposes of developing a long-term water quality characterization. The program monitors the health and water quality of the County's streams and rivers in a variety of ways and for a variety of reasons, including:

Biological Health – How healthy are County waterways? What's the best way to measure their health? Biological assessments are a highly effective approach to understanding the overall health and quality of streams. The primary goals of the program have been to assess the status of the County's biological stream resources and to establish a baseline for comparing future assessments, to track the status and trends of biological stream resources, and to relate them to specific programmatic activities.


The aquatic insect communities that live in streams are very useful for indicating changes in overall stream health. Insects are somewhat stationary and integrate a whole season of water quality impacts in a way that a single water sample or short series of water samples simply cannot do. Changes in biological communities from their known and well-studied natural condition can indicate impairment in stream health.

From 2003 to 2013, the County completed two sampling rounds in each of the County's twelve major river basins and developed a baseline of existing conditions. The program design was updated in 2016 to better characterize status and trends within the County's river basins and, through the addition of fish sampling, will provide a more well-rounded assessment of non-tidal stream health. The start of a third round of sampling, implementing this updated program, is planned for early 2017.

Monitoring for Restoration Success – To determine if a stream restoration project is meeting its objectives, before and after monitoring are performed. Water quality, biological, and stream channel stability measurements are performed both before and after restoration activities, ensuring that funds are spent in effectively and efficiently. Currently, detailed monitoring to characterize pre-restoration conditions is on-going in the Cowhide Branch and Furnace Branch watersheds. In Furnace Branch, for example, the County is collecting storm water samples and has sampled the aquatic insect population before restoration work begins to establish the pre-restoration condition. Post-restoration monitoring work will then be compared to the pre-restoration condition to determine how effective the project is at enhancing ecological conditions once completed. Similar characterization work is underway in Cowhide Branch where, in conjunction with a stream restoration project, a large dam is being removed to restore the free movement of fish within the watershed. Physical stability assessments and fish population sampling have been performed in the reaches upstream of the project area so that the actual level of fish habitat restoration can be determined during the post-restoration monitoring period.

Stormwater Monitoring – As part of County compliance with Federal and State clean water regulations, WPRP performs stormwater monitoring at two stations in the Church Creek (South River) watershed. These are long term monitoring stations that are used to understand the impacts of redevelopment activity and watershed restoration on stream water quality. Using computer-controlled sampling equipment, storms are sampled 12 times per year and occasional low flow samples are collected manually. A variety of pollutants are measured, including nutrients like nitrogen and phosphorus and heavy metals like copper and zinc. The amount of water flowing past the stations is measured continuously. Using this flow information along with the measured amount of pollutants in the water, a total amount of a particular pollutant—known as its load—can be determined. Monitoring changes in these pollutant loads help us understand if County efforts to improve stream water quality are successful or if more work needs to be done in the upstream developed areas to reduce these loads to desirable levels.






Illicit Discharge Detection and Elimination Program

During this past year, this program identified over 50 potential sources of illicit discharges to the County's storm drain system. To investigate these complaints, the WPRP collaborates with other County agencies having the legal authority to eliminate an illicit discharge or a potential upland source of pollutants (e.g., litter and trash). For example, the WPRP collaborates with the Anne Arundel Health Department to ensure that dumpsters and waste grease/oil containers are properly maintained and routinely emptied such that litter and food waste from food service facilities does not enter the storm drain system.

In the course of the storm drain outfall field screening for illicit discharges, the field teams also inspect the storm drain outfalls and the visible storm drain pipes. Should an infrastructure problem be identified (e.g., collapsing pipe, sedimentation within the pipe), the WPRP communicates those findings to the County's Bureau of Highways' Infrastructure Management Division who will initiate any needed repairs to ensure the integrity of that system. Additionally, the identification of trash, or dumpsites within the County right-of-way is communicated to the Bureau of Highways Road Operations staff who quickly respond to remove the materials before they can be washed into the storm drain system.

During outfall field screening process, dry weather flow might be seen flowing from a storm drain outfall. Typically, storm drains should only carry storm water flow which occurs during and for a very short time after a rain storm. If there is flow when there hasn't been any rain, it could be a potential illicit discharge. During this past year, the WPRP identified



the following types of potential illicit discharges detected through investigation of dry weather flows:

- Fleet car washing discharged to the storm drain;
- Loading dock wash water discharging to the storm drain;
- Chlorinated swimming pool water discharged to the storm drain;
- Gray water connections (e.g., washing machine discharge) to the storm drain.

When potential illicit discharges are discovered, the WPRP collaborates with the County's Department of Inspection & Permits to track down the source of that discharge. This Department maintains enforcement authority to investigate and eliminate any proven illicit discharge to the County's storm drain system. In the event of a dumping, a spill, or an illegal connection, they will correct the situation or refer the matter to MDE for correction.

To report a potential illicit discharge or other environmental violation contact the Anne Arundel County Environmental Hotline at 410-222-7777.



Watershed Partnerships

Successful conservation and preservation of Anne Arundel County's watersheds takes teamwork. To that end, in 2014 the Anne Arundel County Department of Public Works, in partnership with the Chesapeake Bay Trust, announced the [Anne Arundel County Watershed Restoration Grant Program](#), a community grant program to support watershed restoration activities throughout the County in order to improve water quality in local streams and rivers.

The grant program was created to engage local nonprofit organizations, landowners, and communities in efforts to restore the County's waterways; to provide resources to these groups to enable them to implement greening and water quality projects; and to assist Anne Arundel County's efforts to meet the requirements of its state and federal stormwater pollution permit and local waterway cleanup plan. This program encourages on-the-ground restoration activities that reduce stormwater flow and pollutants and engage Anne Arundel County residents in these activities.

On the adjoining page is a list of organizations that were awarded funding from Anne Arundel County for water quality restoration projects in 2016.

More information about the grant program can be found at www.CBTrust.org.



ORGANIZATIONS AWARDED FUNDING FOR WATER QUALITY RESTORATION PROJECTS IN 2016

ORGANIZATION	PROJECT DESCRIPTION	FUNDING AMOUNT	MATCH AMOUNT	IMPERVIOUS ACRES TREATED
South River Federation	St. Anne's School of Annapolis Rain Garden	\$15,000	\$80,255	.037
Alliance for the Chesapeake Bay, Inc.	RiverWise Congregations/Empowering Believers	\$43,080	\$42,595	0.96
South River Federation	Broad Creek – Health Department Stream Restoration	\$100,000	\$566,751	11.3
Chesapeake Rivers Association	Coventry Court Dry Challel RSC – Category 2	\$102,390	\$0	1.49
South River Federation	TriState Marine Stormwater Retrofit System	\$164,010	\$201,000	14.45
South River Federation	Killarney House & Neighbors Beards Creek Community BMPs	\$198,950	\$236,800	5
Chesapeake Rivers Association	Winchester on the Severn Dry Channel RSC	\$299,953	\$3,500	3.13
TOTAL		\$923,383	\$1,130,901	35.37



Arlington Echo Outdoor Education Center – Chesapeake Connections

The Arlington Echo Outdoor Education Center is operated by the Office of Environmental Literacy and Outdoor Education Program of Anne Arundel County Public Schools. Arlington Echo Outdoor Education Center offers Anne Arundel County students year-round opportunities to experience the natural environment. The Outdoor Education programs at Arlington Echo use environmental and outdoor learning to enhance, extend and enrich classroom curriculum. Arlington Echo hosts fourth grade elementary students on day and overnight trips, but also hosts middle, and high school groups.

Chesapeake Connections is the Outdoor Education outreach program of Arlington Echo which connects classroom instruction with a series of relevant hands-on experiences that lead to environmental stewardship. The staff at Arlington Echo Outdoor Education Center provide support and expertise to complete yearlong environmental service-learning projects as part of Chesapeake Connections with many Anne Arundel middle and elementary schools. The service-learning projects are incorporated into each school's curricula and involve using community areas or school grounds for environmental restoration activities. The program works to restore and/or create bogs, gardens, and runoff areas on school grounds or in the community to treat stormwater pollution. These projects meet growing environmental needs in our area and help protect the Chesapeake Bay.

The WPRP has partnered with the Chesapeake Connections program to provide hands-on experiences for Anne Arundel County students through the planting of native trees and other vegetation at several restoration projects. In 2016 over 2,200 Anne Arundel County Public School Student participated in planting events at 8 newly restored water quality project sites around the County. Below is a listing of those opportunities that occurred during 2016:

- [Buttonwood Trail Outfall Repair](#) – 300 6th grade students from Marley Middle School
- [Music Lane Pond Retrofits](#) – 200 6th grade students from Corkran Middle School AND 100 STEM students from Lindale Middle School
- [Finnegan Drive Pond Retrofit](#) – 70 students from Severna Park Middle School Green Club
- [Dividing Creek Stream Restoration Phase I](#) – 450 6th grade students from Severna Park Middle School
- [Dividing Creek Stream Restoration Phase II](#) – 330 6th grade students from Crofton Middle School AND 10 students from Broadneck High School.
- [Picture Spring Branch Outfall Repair](#) – 340 6th grade students from Old Mill Middle South
- [Cinnamon Lane Outfall Repair](#) – 100 STEM students from Central Middle School
- [Hospital Drive Pond Retrofit](#) – 320 6th grade students from MacArthur Middle School

Anne Arundel County Watershed Stewards Academy (WSA)

The Anne Arundel County Watershed Stewards Academy was created in 2009 out of a partnership between Arlington Echo Outdoor Education Center and the Anne Arundel County Department of Public Works to build capacity within communities to reduce pollutants entering our waterways via stormwater runoff. The Watershed Protection and Restoration Program continues to provide critical support in connecting Stewards and communities with watershed studies, planning, and restoration efforts.

WSA trains citizens in Anne Arundel County to help neighbors reduce pollution in our local streams, creeks, and rivers. WSA's hands-on training course gives Stewards the tools to bring change to their communities, by turning knowledge and good intentions into action. Stewards work with communities to install projects such as rain gardens or conservation landscapes that capture polluted runoff. Collectively, these community and individual actions add up to better health for our local waterways and the Chesapeake Bay.

2015 WSA Successes

(Reported on a Calendar Year Basis)

CERTIFIED over **160** Master Watershed Stewards since 2009

REMOVED over **350,000** square feet of invasive vegetation

PLANTED over **12,700** native plants and trees

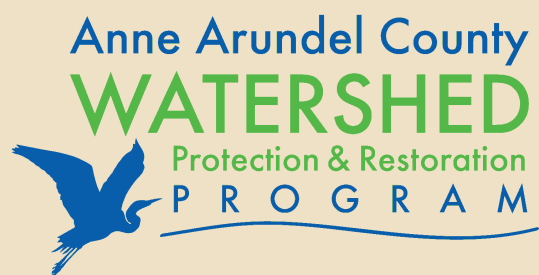
INSTALLED **350** rainscaping projects covering **201,600** square feet or over 3.5 football fields

CONNECTED **130** rain barrels & cisterns

ENGAGED over **14,000** people in Anne Arundel County through community presentations and rainscaping events.

For more information about WSA visit www.aawsa.org.





Bureau of Engineering, Department of Public Works
2662 Riva Road, Annapolis, MD 21401
410-222-4240 AARivers.org



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