The Value of Stormwater Fees in Maryland

In 2012, Governor O'Malley signed into law House Bill 987, which requires the ten most populous jurisdictions in Maryland to establish a local stormwater protection and restoration program and implement a local stormwater fee to fund that program by July 1, 2013.

This fact sheet explains the purpose of a stormwater fee and benefits to Maryland communities, highlighting examples from successful programs around the country.

What is a stormwater fee?

Similar to a water or sewer fee, a stormwater fee is a recurring user fee charged to property owners by a stormwater utility for the service of managing the stormwater runoff and associated pollutants coming from their property. The fee is calculated based on the demands a property places on the drainage system and is administered separately from general tax fund, ensuring sustainable and adequate funding for these public services.

What is the history of stormwater fees?

Stormwater fees are by no means new. The first stormwater fee in the country was enacted in 1974 in Bellevue, Washington "to manage the storm and surface water system in Bellevue, to maintain a hydrologic balance, to prevent property damage, and to protect water quality; for the safety and enjoyment of citizens and the preservation and enhancement of wildlife habitat."[1]

Stormwater from impervious surfaces contributes to an increase in downstream flooding and erosion, and an increase in water pollution as runoff picks up contaminants such as sediment, nutrients, bacteria, oil and grease, trash, and metals.

The stormwater utilities established in the 1970s and 1980s tended to be focused primarily on flood control. The number of communities with stormwater fees grew slowly but steadily (Figure 1) until the 1990s, when they climbed sharply in response to

increasing water quality requirements under the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) permit program for municipal separate storm sewer systems (MS4s).[2] By 1996, there were an estimated 300 stormwater utilities nationwide,[3] and this number had doubled by 2007 after a flurry of implementation in the mid-2000s driven by the NPDES stormwater rules being extended to small MS4 communities.[4]

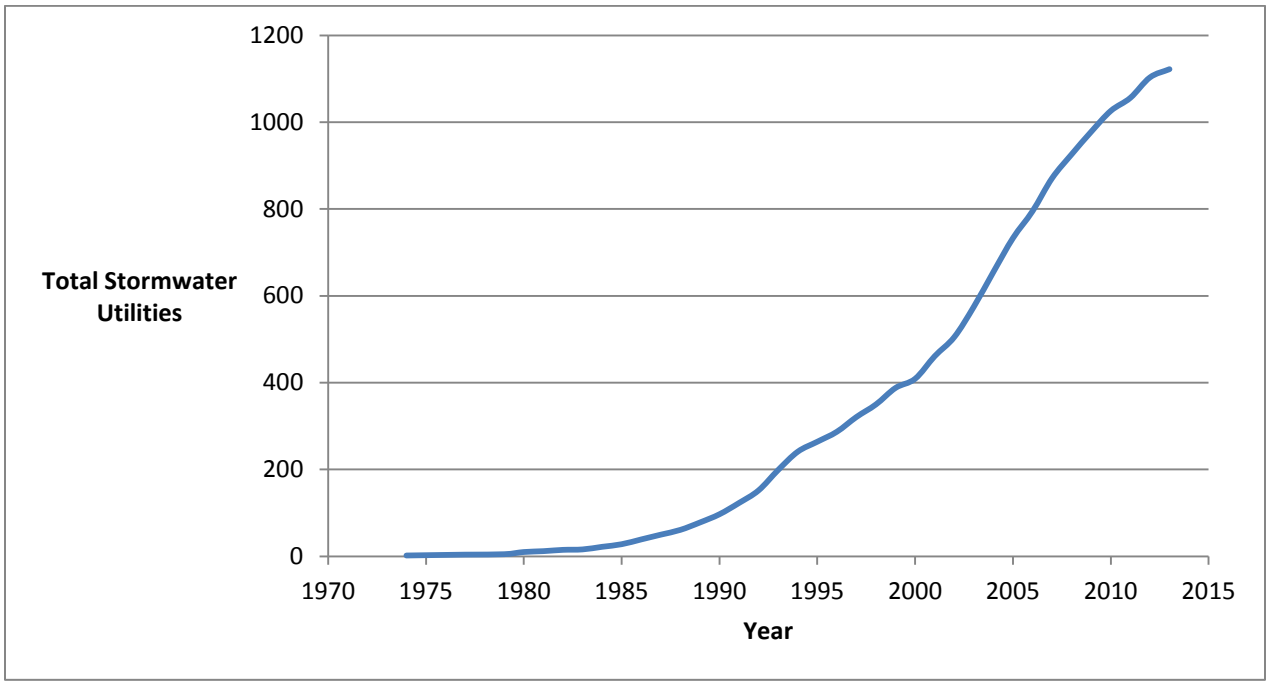


Figure 1. Rate of Growth of Stormwater Utilities in the U.S (data provided by Warren Campbell)

The State of Maryland has recognized the need to establish dedicated stormwater funding sources since the early 1990s. In 1992, the General Assembly enacted enabling legislation that allows localities to develop a stormwater fee system to finance stormwater programs. The first Maryland municipality to establish a stormwater fee was Takoma Park in 1996. Other communities followed suit, including Montgomery County, Rockville, Silver Spring, Annapolis, and the City of Frederick. The idea of a locally-based stormwater fee system continued to gain traction and was one of the key financing strategies recommended by the Chesapeake Bay Watershed Blue Ribbon Finance Panel to finance basinwide restoration plans.[5] These recommendations prompted several statewide attempts to require local governments to establish utilities, but none were successful until 2012. After the passage of House Bill 987, Anne Arundel County, Baltimore County, Baltimore City, Frederick County, Harford County, Howard County, Charles County and Prince George's County each established a stormwater fee.

Stormwater fees across the country

Today, 1,417 stormwater utilities have been documented in 39 states and the District of Columbia (Figure 2) and it is estimated that between 1,800-2,000 stormwater utilities exist nationwide.[6] Six states—Florida, Minnesota, Washington, Ohio, Texas, and Wisconsin—each now have more than 100 stormwater utilities.[7] Many types of communities charge stormwater fees. The population served by the respondents of a 2012 stormwater utility survey ranged from 86 (Village of Indian Creek, Fla.) to 4 million (City of Los Angeles), and the area served varies from 6 to 900 square miles.[8] All jurisdictions surveyed are regulated under the MS4 program; 84% had separate stormwater systems while 16% had a mix of separate and combined sewer systems.[9]

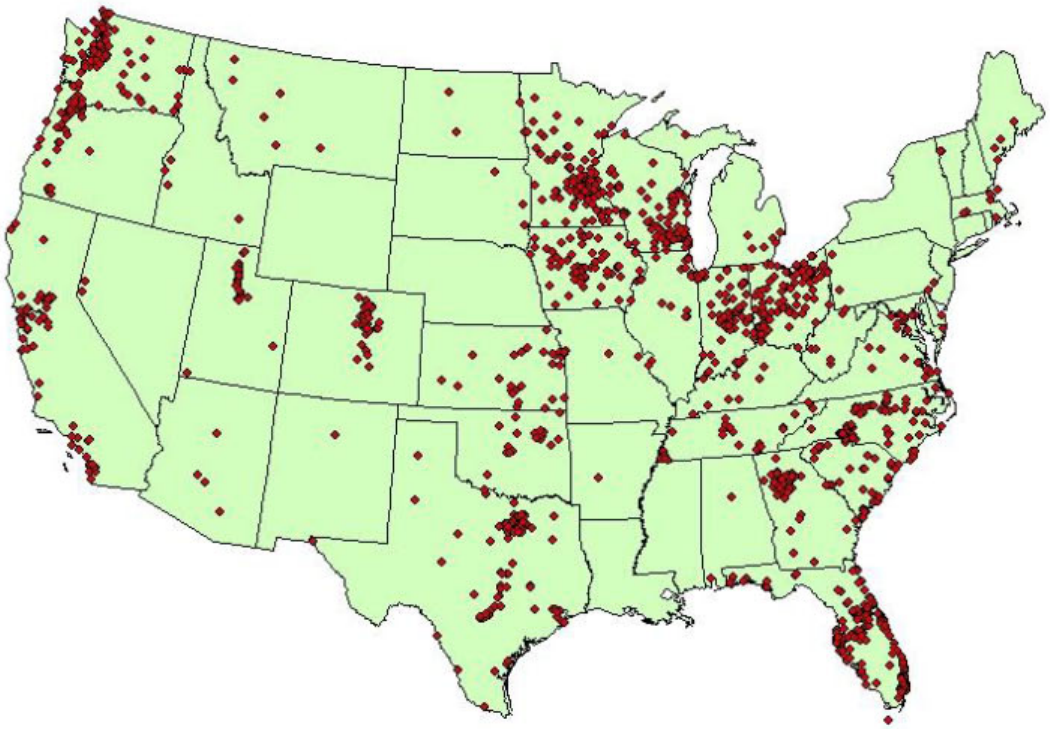


Figure 2. Stormwater Utilities in the U.S. (Source: Campbell, 2013)

Municipalities that do not charge a stormwater fee typically fund stormwater management through the general revenue. Under this system, some property owners may overpay for stormwater services, while others are being subsidized because the fee is based on property taxes as opposed to the actual stormwater runoff of a property (Figure 3). For example, a homeowner who builds an addition onto a house will pay higher property taxes than one who merely installs a patio of the same area, yet they would generate the same amount of runoff. For this reason, a stormwater fee is a more equitable approach to paying for stormwater services.

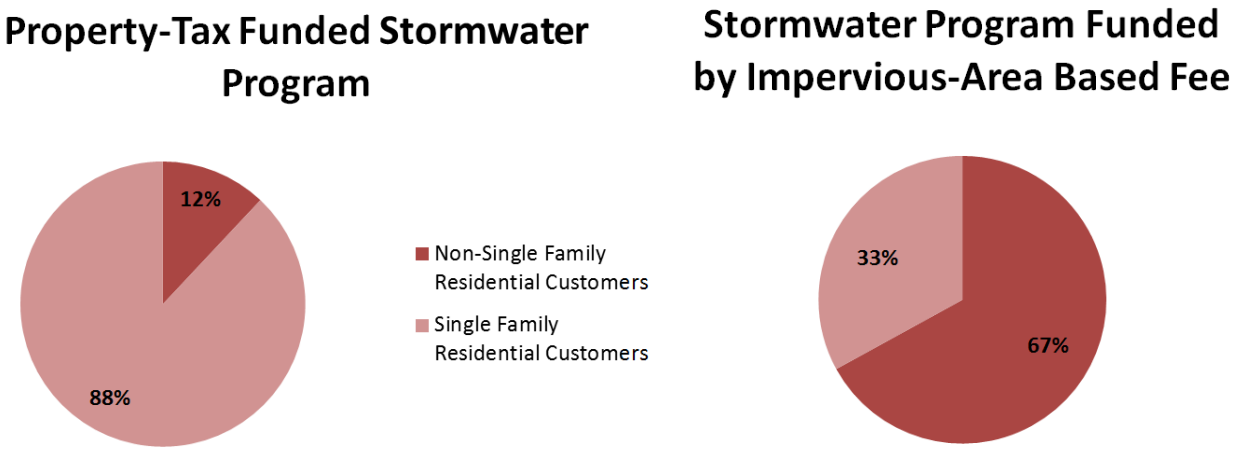


Figure 3. Distribution of stormwater management costs in Baltimore City based on property taxes (left) versus an impervious-area based stormwater fee (right). (Source: Baltimore City Department of Public Works, 2013)

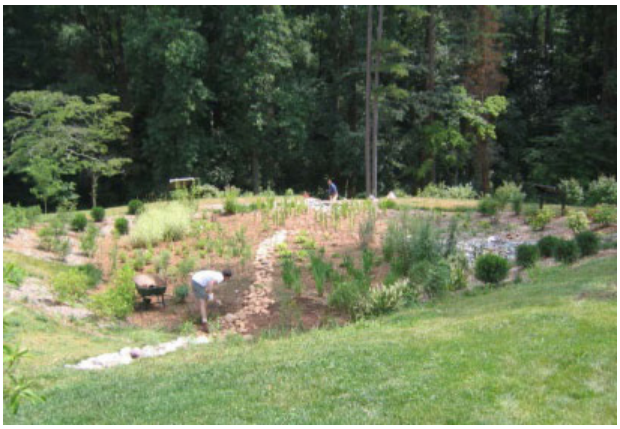
What are stormwater fees used for?

Stormwater fees are dedicated to the maintenance, design, construction, and administration of the storm sewer system. A storm sewer system is designed to drain excess runoff from paved streets, parking lots, sidewalks, and roofs and consists of an extensive network of inlets, pipes and outfalls. Many storm drainage systems were designed to drain the stormwater, untreated, into rivers or streams. The insertion of stormwater management practices into the landscape helps to restore water quality by reducing runoff and removing pollutants before they enter local waterways. All of these components of the stormwater system require regular operation and maintenance to function properly as well as periodic upgrades and repairs.

Under Maryland's House Bill 987, stormwater fee revenue must be deposited into the local watershed protection and restoration fund and may not revert or be transferred to a local general fund. The stormwater fees are intended to be used only to support additional (not existing or ongoing) efforts for specified stormwater management activities.[10] This means they will primarily be used for implementation of stormwater management practices as opposed to infrastructure repair or administration of the local stormwater program.

Maryland municipalities regulated under Phase I of the MS4 program are required to install stormwater management practices to treat 20% of their currently untreated impervious surfaces. According to the Maryland Department of the Environment, only 8.7% of untreated impervious cover has been restored in the Phase I MS4 communities since the beginning of the MS4 permit program over 20 years ago.[11] The 20% requirement is equivalent to restoring 31,300 acres of impervious cover by 2017, with additional impervious cover treatment requirements likely needed to meet the Chesapeake Bay total maximum daily load (TMDL) by 2025.

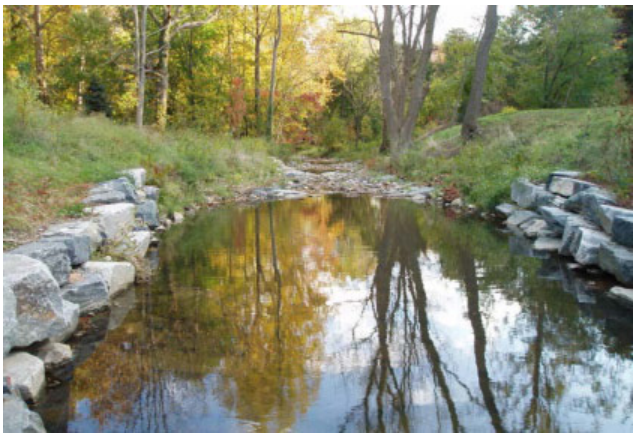
Some examples of projects funded by stormwater fees in Maryland are shown below.



Howard County plans to install bioretention practices like this one that will treat more than 2,000 acres of land in the county (Source: Center for Watershed Protection)

Baltimore County plans to reforest 50 acres of streamside land such as this to help achieve their nutrient and sediment reductions (Source: Chesapeake Bay Program)

In Prince George's County, infiltration practices, such as this planter, will be installed to treat more than 5,400 acres of land (Source: Radcliffe Dacanay).



Charles County's restoration plan includes construction of up to 54,543 feet of stream restoration projects like this one (Source: Center for Watershed Protection)

Anne Arundel County has identified 455 stormwater ponds that are slated to be retrofitted to provide water quality treatment, such as in this photo (Source: Center for Watershed Protection)

Montgomery County's restoration plan focuses heavily on installing stormwater retrofits, such as this permeable pavement, on existing developed land (Source: Chesapeake Bay Program)

What are the benefits of a stormwater fee?

In Maryland, jurisdictions are responsible for reducing stormwater runoff pollution by implementing practices and programs that reduce runoff and remove contaminants. Municipalities regulated under Phase I of the MS4 program must install stormwater management practices to treat 20% of their currently untreated impervious surfaces within the next five year permit term, and are also responsible for specific reductions in nutrients and sediment from stormwater to meet the Chesapeake Bay TMDL or "pollution diet" as well as other local TMDLs for pollutants such as bacteria and trash A stormwater fee enables jurisdictions to meet these responsibilities by creating a dedicated revenue stream. The estimated local government cost to meet the Bay TMDL for stormwater alone by 2025 is $5.9 billion[12] Many local governments are already behind schedule and communities without stormwater fees will need to rely heavily on the general fund to pay for these improvements.

Everyone benefits from the clean water found in our rivers and streams that is supported by local stormwater management programs. The benefits associated with clean water also translate into monetary and social benefits such as healthier communities and reduced public monies spent on

emergencies related to flooding and other water damage. A properly funded and managed stormwater utility can mean more parks and open space, less flooding, reductions in trash and litter, and increased property values. A more desirable community improves the local economy.

Stormwater managers across the country are beginning to recognize these economic and social benefits of stormwater management practices. Cities such as Seattle, Milwaukee, and Philadelphia are taking an approach that focuses on sustainability and multiple benefits and have identified millions of dollars in annual benefits that would have been unrealized had they chosen to continue to invest in only traditional gray infrastructure.[13] Table 1 summarizes the numerous environmental economic and social benefits of "green infrastructure," or stormwater management practices that use processes that are found in natural vegetated systems to reduce and treat stormwater runoff. Because many of these practices increase tree canopy and vegetation, they are associated with numerous quality of life benefits.

Table 1. Benefits of Green Infrastructure

Benefit	Practice				
	Green Roof	Tree Planting	Bioretention/ Infiltration	Permeable Pavement	Water Harvesting
Reduces water treatment needs	●	●	●	●	●
Improves water quality	●	●	●	●	●
Reduces grey infrastructure needs	●	●	●	●	●
Reduces flooding	●	●	●	●	●
Increases available water supply			○		
Increases groundwater recharge		○	○	○	○
Reduces salt use				●	
Reduces energy use	●	●		○	○
Improves air quality	●	●	●	●	○
Reduces atmospheric CO_2	●	●	●	●	○
Reduces urban heat island	●	●	●	●	
Improves aesthetics	●	●	●		
Increases recreational opportunity	○	●	●		
Reduces noise pollution	●	●	○	●	
Improves community cohesion	○	●	○		
Urban agriculture	○	○			
Improves habitat	●	●	●		

Compiled from CNT (2011); ●= Yes, ○ = Maybe

The massive investment in stormwater management in Maryland and across the Chesapeake Bay region expected over the next few years has the potential to contribute significantly to local economies and their associated businesses and industries. Every dollar invested in stormwater management and restoration activities will directly support jobs in a variety of industries and businesses (e.g., engineering, landscaping, manufacturing and distribution, construction), and this direct spending influences industry purchases as they respond to new demands (e.g., new purchase of machinery, supplies, plant stock) and spending from households that are stimulated by resulting income and employment changes.[14] In addition, these economic impacts on employment and associated population levels can affect

government expenditures by changing demand for public services–these are referred to as fiscal impacts.

The estimated economic and fiscal impacts of spending on stormwater management practice construction (Table 2) and operation and maintenance (Table 3) were evaluated by the University of Maryland Environmental Finance Center for two Maryland jurisdictions.[15] This study shows that the economic impact of stormwater investments in Maryland communities has the potential to be significant, in addition to resulting in cleaner environments and more livable communities.

Table 2. Estimated Impacts Per $100 Million Invested in Stormwater BMP Construction

Jurisdiction	Economic Impact	Jobs Supported	Fiscal Impacts	
			Federal	State and Local
Anne Arundel County	$220.2 million	776	$8.9 million	$4.6 million
Baltimore City	$145.0 million	344	$5.0 million	$3.9 million

Source: UMD EFC (2012)

Table 3. Estimated Impacts Per $10 Million Invested in Stormwater O&M

Jurisdiction	Annual Economic Impact	Jobs Supported	Fiscal Impacts	
			Federal	State and Local
Anne Arundel County	$33.6 million	118	$1.6 million	$0.8 million
Baltimore City	$22.9 million	75	$0.9 million	$0.6 million

Source: UMD EFC (2012)

How are stormwater fees calculated?

Stormwater utilities generally determine their user fees based on the total amount of revenue needed to fund the stormwater program, which is then allocated to individual properties based on impervious cover, property size, runoff volume generated, or some other metric that approximates the share of stormwater management services related to the property. The fee may be a flat rate, graduated based on the amount of impervious surface on each property, or based on another method of calculation.

In Maryland, each of the 10 jurisdictions subject to House Bill 987 have developed preliminary estimates of the level of resources needed to comply with the MS4 permits and Chesapeake Bay TMDL requirements. The jurisdictions' forecasted costs include operating and maintenance costs, capital costs, and debt service associated with the issuance of any bonds to support the capital component of the local stormwater program. The total estimated stormwater program costs vary across the jurisdictions, and are best compared by taking into account the extent of untreated impervious cover, which is quite variable across the jurisdictions. Table 4 presents the average annual cost per untreated impervious acre for each jurisdiction. The differences in the municipalities' fee per acre of untreated impervious surface is reflective of the cost of the strategies used to address the jurisdiction's impervious surfaces, as well as other geographic and economic factors.[16] For example, Prince George's County's cost per impervious acre is more than double that of Baltimore County because their Watershed Implementation Plan strategies focus heavily on structural stormwater practices such as bioretention, filtering and infiltration practices, compared to Baltimore County's focus on reforestation, stream restoration and street sweeping.[17]

Table 4. Average Annual Cost Per Acre of Untreated Impervious Surface			
Jurisdiction	**Acres of Untreated Impervious Surface**	**Projected Stormwater Costs Annualized**	**Average Annual Cost Per Acre**
Anne Arundel County	14,887	$80,540,000	$5,410
Baltimore County	23,373	$45,700,000	$1,955
Baltimore City	28,983	$33,400,000	$1,152
Carroll County	6,449	$6,813,873	$1,057
Charles County	2,607	$9,488,120	$3,639
Frederick County	6,725	$22,400,000	$3,331
Harford County	8,308	$18,000,000	$2,167
Howard County	11,453	$42,000,000	$3,667
Montgomery County	21,458	$66,580,942	$3,103
Prince George's County	22,020	$89,800,000	$4,078

Source: MD Dept of Legislative Services (2013)

The actual stormwater fees instituted to finance restoration vary in part due to the differences in the total projected program costs, but also because the jurisdictions were given flexibility in determining how much of the stormwater program to support using other sources of funding (such as the general fund, plastic bag charges, bond proceeds or environmental services fees; see Figure 4), whether to charge now for future projected costs or gradually phase in the fees over time, the actual fee structure, and the role of bond revenues. For these reasons, the total program cost is the important figure to use when comparing costs across jurisdictions. For example, Howard County's fee per-acre equivalent for non-residential properties is more than three times that of Prince George's County; however, stormwater fee revenues are expected to fund more than half the total cost of the stormwater program in Howard County, while bond revenues will play a significant funding role in Prince George's County program.

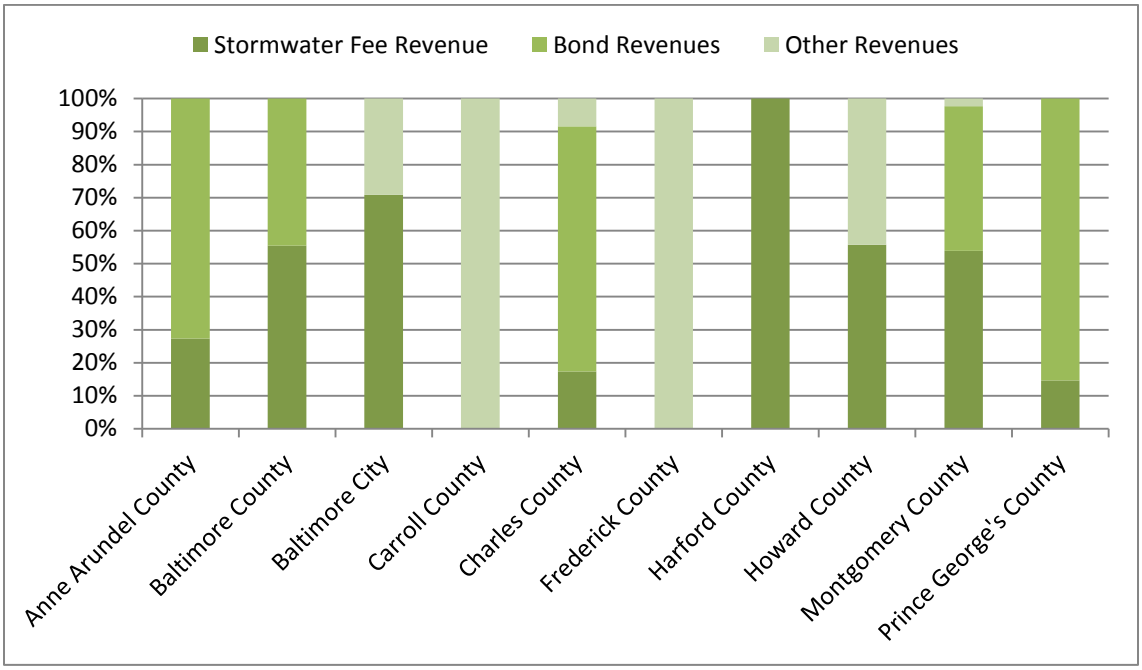


Figure 4. Sources of Funding for Maryland Stormwater Programs (Source: MD Dept of Legislative Services 2013)

In a 2012 survey of stormwater utilities, only 31 percent of respondents indicate that funding is adequate for meeting most stormwater program needs. Ten percent of respondents indicated that funding was not sufficient to meet even the "most urgent" needs. Similarly, the Maryland Department of Legislative Services found that several of the 10 jurisdictions still appear to have a long term funding shortfall for their stormwater program, even with the newly established stormwater fee.[18] To meet the restoration goals, additional funding may need to be secured.

How can property owners reduce their stormwater fee?

Each Maryland jurisdiction that has established a stormwater remediation fee has implemented or intends to implement a stormwater credit program. Stormwater credits are ongoing reductions to a property's calculated stormwater fees that are given to properties that either reduce demand on the stormwater system and/ or reduce the utility's cost of service through functional stormwater management practices and best management practices. So, for example, single family residential property owners in Baltimore City who install a rain garden, plant trees on their property, or participate in a community stream cleanup or pavement removal project can receive a credit towards their stormwater fee.

In addition to credits, several Maryland jurisdictions have established rebate programs to incentivize the installation of stormwater practices by property owners. Anne Arundel, Charles, Howard, and Prince George's counties have authorized the establishment of a rebate program to help defray some of the costs of implementing BMPs. Montgomery County has a preexisting rebate program to assist in the construction of BMPs, including special rebates for those in designated target neighborhoods.[19]

Two success stories of how stormwater utility fees have been used to improve local communities are profiled on the following pages for Portland, Oregon and Philadelphia, Pennsylvania.

Case Study: Portland, Oregon

The City of Portland, Oregon created its stormwater utility and fee in 1977 to pay for programs and facilities to address urban drainage and flood control problems. In 1983, the Bureau of Environmental Services (BES) was created to protect the City's clean rivers through water quality protection, watershed planning, wastewater collection and treatment, sewer installation, and stormwater management. From 1977-1992, the stormwater fees collected by BES paid for traditional engineering strategies to collect and safely convey runoff to city sewers and stream/rivers. In the 1990s, the City turned to a more sustainable stormwater management program driven by a better understanding of the negative impacts of stormwater runoff and by new regulatory requirements, including combined sewer overflow reduction, the MS4 permit, TMDLs, federal listing of salmon and steelhead trout as endangered species under the Endangered Species Act and the listing of Portland Harbor as a superfund cleanup site.

Today, Portland's stormwater utility works together with the sanitary sewer utility to operate and maintain 2,300 mile of sanitary, stormwater and combined sewers, 8,600 stormwater sumps in public rights of way, 123 miles of stormwater drainage ditches and 750 detention and pollution reduction facilities serving an estimated population of 550,000. Portland's dual approach to address CSOs by increasing storage capacity of the sewer pipes (aka the gray infrastructure) and reducing stormwater inputs to the sewer system by implementing lot- level green infrastructure strategies has saved the City millions by simultaneously addressing these multiple objectives. The City's stormwater utility includes numerous credit and incentive programs to encourage property owners to install green infrastructure practices on their properties in exchange for a fee reduction. Between these incentive programs and the City's Capital Improvement Project programs, the City's green infrastructure has been greatly expanded, improving the environment and supporting jobs.

- **Downspout Disconnection**
  Since 1994, the Downspout Disconnection program has reached 56,000 properties and disconnected 1.5 billion gallons of runoff from the combined sewer system.

- **Controlling Invasive Plants**
  Over 7,400 acres have been treated for invasive plants. This includes new area managed and follow up land management through two programs that are part of the city's comprehensive approach to invasive species management. The invasive species programs also supported the Youth Conservation Crew, which provides employment opportunities for a diverse population of youth ages 14-18 who help clear ivy from city parks.

Figure 5. Downspouts at the BES lab disconnected from the combined sewer system and directed into infiltration swales next to the Willamette River (Printed with permission ©2013 Environmental Services, City of Portland, OR)

- **Constructing Green Streets**
  A green street facility is a small rain garden that collects stormwater runoff from streets to keep stormwater out of the sewer system and local streams. Green street facilities increase urban green space, improve air quality, replenish groundwater, and reduce air temperature. In the City of Portland, 867 new green street facilities have been constructed under the City's various programs. While some of the work is done by City staff, a bulk of it is bid out to contractors. Jeanie Braun of Braun Construction says "We have seen a lot more work in this area in recent years." Braun alone has had four such projects in the past year, one a $300,000 contract with the City. Under the Green Street Stewardship Program, businesses and individuals helping to care for green streets and beautify their neighborhoods, while BES continues to monitor facility performance and improve designs to reduce maintenance costs.

Figure 6. The SW 12th Avenue Green Street at SW 12th and Montgomery on the Portland State University campus utilizes a series of landscaped stormwater planters designed to capture and infiltrate approximately 8,000 square feet of street runoff. This innovative streetscape project effectively manages street runoff while still maintaining strong pedestrian circulation and on-street parking. Built in summer 2005, this street retrofit project demonstrates how both new and existing streets in downtown or highly urbanized areas can be designed to provide direct environmental benefits and be aesthetically integrated into the urban streetscape. This green street project is effective and functional, and it also successfully integrates landscaped stormwater planters into the urban fabric (Printed with permission ©2013 Environmental Services, City of Portland, OR)

.

Figure 7. Part of the Holman Pocket Park and Green Street Bike Boulevard Project, two green streets in the ROW adjacent to the park accept runoff from the street (Printed with permission ©2013 Environmental Services, City of Portland, OR)

- **Planting Yard and Street Trees**
  Over 32,200 new street and yard trees have been planted. These trees will capture more than 18 million gallons of stormwater each year when they are mature. Environmental Services' Urban Canopy Program, in partnership with Friends of Trees and other contractors, uses innovative outreach and planting models to get more trees planted in low-canopy, underserved neighborhoods and communities. Canvassers have visited over 190,000 Portland properties to map available planting spaces and talk to residents about tree planting. Community volunteers with Friends of Trees have contributed nearly $2 million worth of volunteer hours in this effort.

- **Acquiring and Protecting Open Spaces**
  Environmental Services and partners have purchased 406 acres of natural areas in the city to help protect natural stormwater management functions and clean water sources.

- **Replacing Culverts**
  BES and its partners are on track to remove or replace all nine culverts that block fish passage and create water quality problems in Crystal Springs Creek by 2015. In addition to this work in Crystal Springs, eight other culverts in the city have been removed or replaced to improve fish passage, water quality and hydrology.

- **Private Property Retrofits**
  The Private Property Retrofit Program works closely with targeted property owners to plan, design and install rain garden, ecoroofs, and/or other stormwater facilities.

Before

After

Before

After

Figure 8. The City recently partnered the Western Seminary at SE 55th and Hawthorne to manage stormwater from a total of 25,700 ft^2 of roof and paved area. This project used two infiltration planters and 3 tiered infiltration basins to reduce stormwater flows entering the local sewer by an average of 570,000 gallons of runoff annually. These facilities were constructed by Ted's Excavating and Braun Construction (Printed with permission ©2013 Environmental Services, City of Portland, OR)

Figure 9. In 2002, BES began planning for a project to protect residents from sewer backups on SE Pine Street adjacent to Mt. Tabor Middle School. The project included a rain garden, a vegetated swale, six smaller infiltration planters, and three drywells. BES also constructed a stormwater curb extension and sump adjacent to the school at SE 57th and Pine Street. The facilities together manage runoff from approximately two acres of roof, playground, parking lot, and street surface. The photo shows the site of the rain garden prior to construction. The parking lot swale was constructed between the rows of parking stalls in the foreground (Printed with permission ©2013 Environmental Services, City of Portland, OR)

.

Figure 10. The Mt. Tabor Middle School rain garden in January 2007. The trench drain in the foreground delivers runoff from the asphalt play area (Printed with permission ©2013 Environmental Services, City of Portland, OR)

Figure 11. View of rain garden in 2013 (Printed with permission ©2013 Environmental Services, City of Portland, OR)

- **Natural Area Revegetation**
  The Watershed Revegetation Program works with public and private property owners to restore native vegetation on more than 4,100 acres since 2008. This includes planting over 500,000 new native tree and shrub seedlings and following up to make sure the new plants and trees are well established.

Figure 12. The Headwaters at Tryon Creek serves as a demonstration in sustainable stormwater management, green development practices, wildlife habitat restoration and water conservation. The daylighted tributary stream of Tryon Creek originally ran through a pipe under the site is approximately 450 linear feet, connects an upstream, forested wetland to a downstream rain garden, is planted with native trees, shrubs, and grasses that restore lost riparian and wetland habitat, and has a 5 foot (1.5 meter) deep gravel lens below the stream bed that helps direct flow below the surface for groundwater recharge (Printed with permission ©2013 Environmental Services, City of Portland, OR)

.

- **Building Ecoroofs**
  More than 500 ecoroofs covering 38 acres of rooftop have been completed since 2008. Combined, these roofs manage 38 million gallons of stormwater before it reaches the sewer system. Many of these projects were constructed despite the economic downturn in the early years of Grey to Green with assistance from the city's Ecoroof Incentive program. More development projects are pairing

ecoroofs with photovoltaic panels, or adding habitat features, to maximize benefits on Portland's rooftops. Portland's ecoroof industry has grown considerably since the program began (Box 1).

Figure 13. Ecoroofs at Portland's south waterfront neighborhood (Printed with permission ©2013 Environmental Services, City of Portland, OR)

These green infrastructure projects are paid for by Portland residents via sanitary and stormwater utility fees. Already, a combination of infrastructure improvements and private property stormwater management initiatives has virtually eliminated CSOs to the Columbia Slough, which discharges into the Willamette River, and has eliminated or controlled eight Willamette River CSO outfalls. Upon completion, the number of CSO events is expected to shrink to an average of four every winter and one every third summer.

In addition to the water quality benefits, green infrastructure has improved Portland in more intangible ways. For example, numerous industries are influenced by an increased demand for green infrastructure practices, from plant, stone and dirt suppliers, to engineers, landscape contractors and landscape architects.

Case Study: Philadelphia, PA

Since 1968, the City of Philadelphia began billing property owners for stormwater collection and treatment. Until recently, the rate structure for stormwater fees was based on each property's water usage (an in turn, sewage use), as measured by the size of the water meter on each parcel. There was not a strong connection between the stormwater fee rate and the amount of runoff generated by each parcel. This eventually led to complaints that the stormwater billing system was not equitable: properties with low water usage and high impervious cover were essentially under-paying relative to their contribution of runoff, while parcels with high water usage and little impervious cover were seen to be over-paying. In response, the City's Philadelphia Water Department established a Citizens Advisory Council in 1994 to help resolve perceived deficiencies in the stormwater management billing structure. Over the next decade the City would gradually move toward a fee structure based on impervious cover.

The City is now phasing in a new parcel-based stormwater fee structure, initiated on July 1, 2010. Over four years, the stormwater fee for all properties (residential and non-residential) will completely switch from being charged based on water meter readings to a fee based on impervious cover on each parcel. The Water Department does not define the utility fee as a new or additional charge, but as an alternate and more equitable method for calculating the rate. The new method is based on the amount of stormwater runoff generated by the property and therefore varies by the size and impervious cover of each lot. In addition, a credit system is in place that reduces the stormwater rate for property owners who implement best management practices to reduce runoff.

Activities Supported by Stormwater Utility

The utility currently brings in approximately $120 million of revenue a year, but this will increase over time with inflation and higher costs. The stormwater utility revenues pay for stormwater operation and maintenance, City-built stormwater retrofits, and cost-share funds for implementing stormwater practices on non-City properties (see description of SMIP, below). Most of the City's public works projects are funded through bonds, so a large portion of the stormwater fee revenues pays the debt service on large public infrastructure projects.

The City has developed a long-term control plan for its combined sewer system that relies heavily on green infrastructure for managing stormwater. As such, the City has reduced capital investments in underground stormwater detention structures and other "grey infrastructure," and directed more funds to plant-based and infiltration-based "green infrastructure" to reduce and treat stormwater runoff. In its *Green City, Clean Waters* plan signed in 2011, the City aims to convert 9,500 impervious areas to "green acres" over 25 years. To date, the Philadelphia Water Department has used stormwater utility funds to develop hundreds of green infrastructure practices throughout the city. The following have been completed or are in the design process:

- 191 Stormwater Tree Trenches
- 20 Stormwater Planters
- 21 Stormwater Bumpouts
- 61 Rain Gardens
- 5 Stormwater Basins
- 72 Infiltration/Storage Trenches
- 34 Porous Paving Projects
- 16 Swales
- 2 Stormwater Wetlands
- 1 Cistern or Rain Barrel
- 33 Downspout Planters (not shown in map)
- 12 Other Projects

Figure 14: Stormwater trench at Columbus Square.

Figure 15: Infiltration trench at Clark Park.

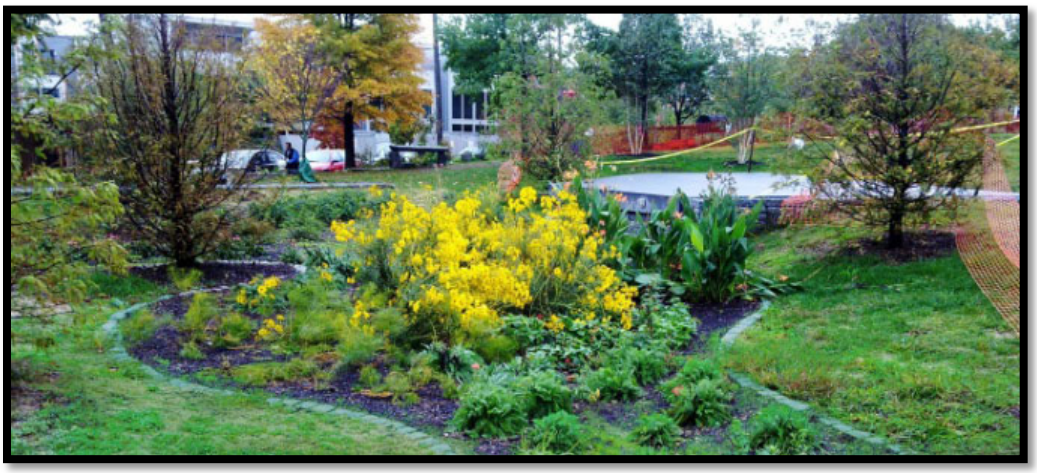


Figure 16: Rain Garden in Liberty Lands in Northern Liberties.

Figure 17: Porous pavement on Percy Street.
(Photos courtesy of: Philadelphia Water Department)

Leveraging Private Funds

To help meet its ambitious goal, Philadelphia recently established the *Stormwater Management Incentives Program* (SMIP) which offers financial assistance for private property owners or non-residential parcels to build rain gardens, vegetated infiltration basins, porous asphalt, green roofs, and other stormwater retrofits. As mentioned above, the SMIP program is funded through the City's stormwater utility fee. In its first year, 2012, the SMIP awarded eight grants totaling $3.2 million, to create 64 new green acres. In 2013, grants were awarded for 17 projects that will create 77 green acres for a total of $4.7 million. A "greened acre" is an acre of impervious area that has some type of stormwater system to manage the first 1" of rainfall, which the Philadelphia Water Department estimates can prevent 85 to 90 percent of that stormwater runoff from entering the overloaded combined sewer system.

The following SMIP-sponsored retrofits have been completed to date:

1. **Greene Street Friends School**, 5500-06 Germantown Ave
   Grant amount: $91,080
   Greened acres: 0.7
   Practices: rain garden + pavement removal

2. **Cardone Industries**, 5400 Whitaker Ave
   Grant amount: $3,361,441
   Greened acres: 52
   Practices: vegetated detention basins + underground infiltration basins
   Design/Construction/Maintenance Firm: Infrastructure Solution Services

Figure 18: One of the vegetated detention basins built at Cardone Industries with the help of SMIP funds *(Photo courtesy of: Philadelphia Water Department)*

.

The Stormwater Management Incentives Program leverages private spending on stormwater management by providing cost-share dollars. The combination of a stormwater utility fee and a way to

get a discount on one's fee (through the credit system and SMIP) creates multiple incentives for Philadelphia property owners to implement stormwater practices. This motivating factor and ability to leverage private funds did not exist prior to 2010 when the City raised its stormwater revenues based on water meter readings. The *impervious-based fee + credit + cost-share money* formula is crucial for Philadelphia to be able to get enough stormwater management practices in the ground to meet its stormwater management and water quality needs.

A 2012 analysis of options by the Natural Resources Defense Council to fund stormwater retrofitting concluded that a financing system that could leverage private funds is very promising. The report claims that "Philadelphia's transition to a parcel-based fee, coupled with the opportunity for near-100 percent fee reduction, makes that city one of the most attractive jurisdictions for structuring third-party financed stormwater retrofits on private property. Philadelphia alone represents a potential market for private investment on the order of $376 million while hundreds of other cities nationwide are facing similar stormwater challenges and seeking cost-effective solutions."

Other Benefits

In putting together its Long Term Control Plan Update, Philadelphia conducted a triple-bottom-line analysis to understand the economic, environmental, and social benefits of the *Green City, Clean Waters* plan goals. The city estimated that if 50% of the stormwater runoff from the City's impervious area was managed by green infrastructure, it would accrue billions of dollars-worth of public benefits over a 40-year period. Among other benefits, this includes:

- Additional recreational use of the city's waterways ($520 million in present value);
- Reduction of premature deaths and asthma attacks caused by air pollution and excessive heat ($1.1 billion);
- Increased property values in greened neighborhoods ($1.1 billion);
- Ecosystem values of restored or created wetlands ($1.6 million);
- Poverty reduction from the creation of local green jobs ($125 million); and
- Energy savings from the shading, cooling, and insulating effects of vegetation ($34 million).

This triple-bottom-line study also estimated that if 50% of the stormwater runoff from the City's impervious area was managed by green infrastructure, the construction, operation, and maintenance of that infrastructure would support approximately 380 jobs per year. The study projects that a large portion of these jobs would be available for workers with no prior experience and who may currently be unemployed.

Conclusions

During its 45 years of experience in raising funds for stormwater management and treatment, the City of Philadelphia has experimented with a variety of rate structures. It is telling that *now*, for reasons of equity and to achieve ambitious stormwater management goals, it has chosen to use an impervious-based stormwater utility fee structure. This is the way the City has decided will work best for not only being able to provide the necessary level of service in stormwater management for its citizens, but for also motivating those same citizens to reduce stormwater runoff on their own properties.

References and Resources

Baltimore City Department of Public Works. 2013. *Stormwater Utility Presentation*. http://cleanwaterbaltimore.org/flyers/Stormwater%20Fee%20Forum%20Presentation.pdf

Braun, J. December 31, 2013. Email communication.

Campbell, C. W. 2013. *Western Kentucky University 2013 Stormwater Utility Survey*. Western Kentucky University, Bowling Green, 51 pp.

Center for Neighborhood Technology (CNT) and American Rivers. 2011. *The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits*. Center for Neighborhood Technology. Chicago, IL.

Chomowicz, A. December 31, 2013. Email communication.

Environmental Finance Center (EFC). 2013. *Stormwater Financing Economic Impact Assessment: Anne Arundel County, MD, Baltimore, MD, and Lynchburg, VA*. University of Maryland.

Garrison, N. and K. Hobbs. 2011. *Rooftops to Rivers II: green strategies for controlling stormwater and combined sewer overflows*. Natural Resources Defense Council. Washington, DC.

Maryland Department of Legislative Services. 2013. *Stormwater Remediation Fees in Maryland; Local Implementation of House Bill 987 of 2012*. Office of Policy Analysis. Annapolis, MD.

Natural Resources Defense Council (NRDC). 2012. *Financing Stormwater Retrofits in Philadelphia and Beyond*.

Philadelphia Water Department (PWD). 2009. *Philadelphia Combined Sewer Overflow Long Term Control Plan Update*. Philadelphia Water Department (PWD). Philadelphia, PA.

Philadelphia Water Department (PWD). 2009. *Philadelphia Combined Sewer Overflow Long Term Control Plan Update: Supplemental Documentation Volume 2, Triple Bottom Line Analysis*. Philadelphia Water Department (PWD). Philadelphia, PA.

Philadelphia Water Department Stormwater Billing website: http://www.phila.gov/water/Stormwater_Billing.html

Philadelphia Water Department Map of Green Stormwater Infrastructure Project Map: http://www.phillywatersheds.org/BigGreenMap

Philadelphia Water Department SMIP website: http://www.phillywatersheds.org/what_were_doing/SMIP_Grant

Portland Bureau of Environmental Services website: http://www.portlandoregon.gov/bes/article/321331

Portland Bureau of Environmental Services. 2008. *Cost Benefit Evaluation of Ecoroofs*. Portland BES. Portland, OR.

U.S. Environmental Protection Agency (EPA). 2013. *Case Studies Analyzing the Economic Benefits of Low Impact Development and Green Infrastructure Programs.* EPA-841-R-13-004. EPA Office of Wetlands, Oceans and Watersheds. Washington, DC.

van der Voo, L. 2011. Ecoroofs: industry grows, costs come down. *Sustainable Business Oregon* March 3, 2011. http://sustainablebusinessoregon.com/articles/2011/03/ecoroofs-industry-grows-costs-come.html?page=all

Vizzini, D. and A. Nelson. 2011. Municipal Stormwater Management The New Normal. *The Water Report* Issue 84. EnviroTech Publications.

[1] http://www.werf.org/liveablecommunities/studies_bell_wa.htm
[2] Campbell, C. Warren. 2007. *Western Kentucky University 2007 Stormwater Utility Survey*, Western Kentucky University, Bowling Green, 51 pp.
[3] Natural Resources Defense Council, 1999. *Stormwater Strategies. Community Responses to Runoff Pollution*.
[4] Campbell, C. Warren. 2007. *Western Kentucky University 2007 Stormwater Utility Survey*, Western Kentucky University, Bowling Green, 51 pp.
[5] Chesapeake Bay Watershed Blue Ribbon Finance Panel. 2004. *Saving a National Treasure: Financing the Cleanup of the Chesapeake Bay*. A report to the Chesapeake Executive Council from the Chesapeake Bay Watershed Blue Ribbon Finance Panel.
[6] Campbell, C. Warren. 2013. *Western Kentucky University 2013 Stormwater Utility Survey*, Western Kentucky University, Bowling Green, 51 pp.
[7] Ibid.
[8] Black and Veatch. 2012. *2012 Stormwater Utility Survey*. Overland Park, KS.
[9] Ibid.
[10] Maryland Department of Legislative Services. 2013. *Stormwater Remediation Fees in Maryland; Local Implementation of House Bill 987 of 2012*. Office of Policy Analysis. Annapolis, MD.
[11] Unpublished data compiled by Maryland Department of the Environment from MS4 Annual Reports
[12] Maryland Department of Legislative Services. 2013. *Stormwater Remediation Fees in Maryland; Local Implementation of House Bill 987 of 2012*. Office of Policy Analysis. Annapolis, MD.
[13] EPA. 2013. *Case Studies Analyzing the Economic Benefits of Low Impact Development and Green Infrastructure Programs*. EPA-841-R-13-004. EPA. Washington ,DC.
[14] Environmental Finance Center (EFC). 2013. *Stormwater Financing Economic Impact Assessment: Anne Arundel County, MD, Baltimore, MD, and Lynchburg, VA.* University of Maryland.
[15] Ibid.
[16] Maryland Department of Legislative Services. 2013. *Stormwater Remediation Fees in Maryland; Local Implementation of House Bill 987 of 2012.* Office of Policy Analysis. Annapolis, MD.
[17] Gardina, V.J. 2012. *Baltimore County Phase II Watershed Implementation Plan.* Baltimore County Department of Environmental Protection and Sustainability. Prince George's County Department of Environmental Protection. 2012. *Revised Draft. Prince George's County, Maryland Phase II Watershed Implementation Plan. For inclusion in the Maryland final Phase II Watershed Implementation Plan*.
[18] Maryland Department of Legislative Services. 2013. S*tormwater Remediation Fees in Maryland; Local Implementation of House Bill 987 of 2012*. Office of Policy Analysis. Annapolis, MD.
[19] Ibid.

Publication Information
This fact sheet was developed by the Center for Watershed Protection
Publication date: January 2014
Funding provided by the Keith Campbell Foundation

About the Center for Watershed Protection

The Center for Watershed Protection, Inc. is a 501(c)(3) non-profit organization dedicated to fostering responsible land and water management through applied research, direct assistance to communities, award-winning training, and access to a network of experienced professionals. The Center was founded in 1992 and is headquartered in Ellicott City, Maryland. As national experts in stormwater and watersheds, our strength lies in translating science into practice and policy, and providing leadership across disciplines and professions. To learn more about the Center's commitment to protect and restore our streams, rivers, lakes, wetlands and bays, go to www.cwp.org.

CENTER FOR WATERSHED PROTECTION
8390 Main Street, 2nd Floor
Ellicott City, MD 21043