



**Correcting local polluted runoff problems with nature-based solutions in the Potomac River Watershed.**

*Source: National Geographic*



*Source: Laura Hegre*

A Guide to Local Government Policy Changes to Implement Environmental Site Design to the Maximum Extent Practicable: Maryland & Washington, D.C.



Fall 2014

## Acknowledgements



### Supporters:



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[www.potomac.org](http://www.potomac.org).

## Note from Hedrick Belin. *Potomac Conservancy President :*



If you want to see how a leader can make a difference when it comes to reducing pollution, you should visit Forest Heights, Maryland. Over the past few years, Mayor Jacqueline Goodall has installed a green roof, planted lots of trees and installed rain gardens on town property. One of her top priorities is to improve water quality and achieve zero runoff.

Notice the damage to your own neighborhood next time there is a torrential rainstorm. Residential roads erode, properties flood and pollution gushes into our neighborhood creeks. This polluted runoff is the biggest threat to the long-term health of our rivers and streams – often the source of our drinking water.

This pollution is caused by changes in land cover and increased acres of paved surfaces that repel the water, leading to larger volumes of runoff traveling at faster velocities.

The solution to these problems is deceptively simple – to build in a way where the ground absorbs the rain water where it falls as mother nature intended. But too often there are barriers in existing local codes and ordinances that prevent the instillation of more green filters and porous roads, sidewalks and driveways.

This report gives local decision makers in 9 Maryland counties and Washington, DC the information they need to remove these barriers to environmental site design. But it will take thoughtful and committed leaders, since everything we do on the land effects what happens with our water.

If Mayor Jacqueline Goodall can make a difference in her community, so can the leaders in the local Maryland jurisdictions and the District of Columbia. This report provides a critical roadmap showing the way to improving the health of our local rivers and streams.

A handwritten signature in black ink that reads "H Hedrick Belin". The signature is written in a cursive, flowing style.

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**ENVIRONMENTAL SITE DESIGN**  
**WHY IT WORKS:** Stream quality and watershed health decline when as little as 10% of a watershed is covered with impervious surfaces, including roofs, roads and driveways.

Homeowners can use **rain barrels** to catch water for irrigation or washing the car.

Shared driveways can **reduce maintenance costs.**

Conservation easements in rural areas can protect valuable pastimes, like hunting and fishing, which **help local economies.**

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# Executive Summary

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This report presents the results of a review of development regulations conducted by the Potomac Conservancy and the Center for Watershed Protection for jurisdictions in Maryland located within the Potomac River watershed and Washington, D.C. These jurisdictions include the District of Columbia (District) and nine counties; Allegany, Carroll, Charles, Frederick, Garrett, Montgomery, Prince George's, St. Mary's, and Washington. The purpose of the code review was to identify opportunities and barriers to implementing Environmental Site Design (ESD) practices on development and redevelopment sites.

The code review was conducted using two modified versions of the Codes and Ordinances Worksheet (Center, 1998); a revised COW for the counties and a redevelopment COW for the District. Each COW was completed with cooperation from the appropriate staff person at each jurisdiction's Codes and Ordinances were reviewed to identify the answer to each COW question and specific code sections were noted in the worksheet. COW questions were answered based on language in the code, even if the code differs from what actually occurs in practice. A draft COW was provided to each County contact for review and was finalized based on their input. A final memorandum was provided to each locality that summarized the jurisdictions COW results and identified specific recommendations for code revisions to enhance the use of ESD Design development methods.

The ten Potomac watershed jurisdictions for which the code review was conducted vary widely in terms of their level of urbanization, growth pressure, and staff capacity to handle site plan reviews. The jurisdictions were classified based on

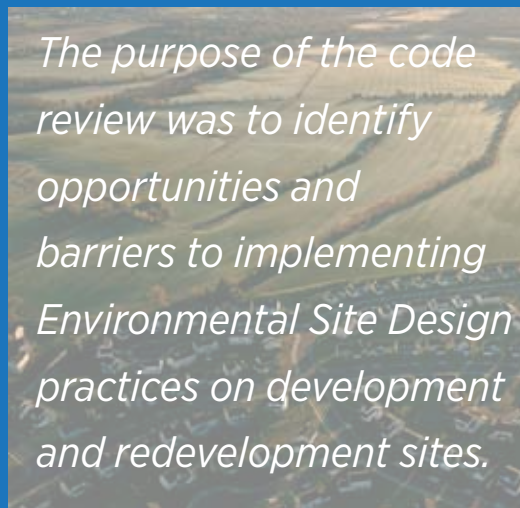
their level of urbanization and projected population growth so that the COW results for an individual county could be compared with other jurisdictions in the same category, and to identify goals and strategies that are most appropriate for jurisdictions falling within each category.

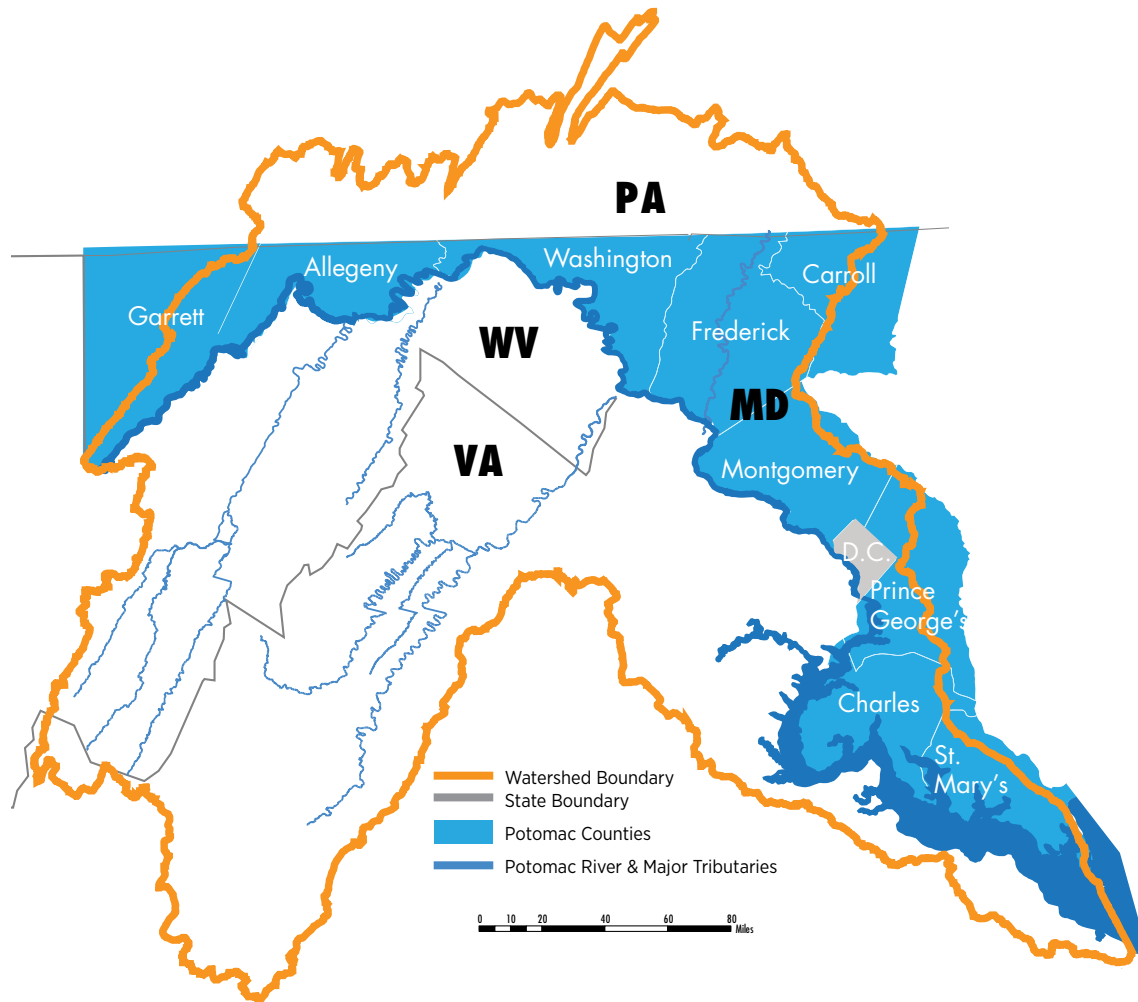
The report provides a summary of the COW results for each jurisdiction and general recommendations organized by category. A summary of each jurisdiction's COW results is provided that includes each jurisdiction's category, COW score, identified strengths and weaknesses of development codes and recommendations for code changes. For each

category, general recommendations are suggested based on current land use and anticipated water quality concerns related to growth pressure.

In general, the higher COW scores are seen for jurisdictions with high growth pressure (e.g., St. Mary's County, Charles County) and jurisdictions that are highly urban (District of Columbia, Montgomery County) and have likely experienced

high growth pressure in the past, because these jurisdictions have adopted and modified their growth policies and regulations in response to this pressure. Conversely, jurisdictions with low growth pressure or that are less urban have not yet had the need to address topics such as forest conservation, which often becomes a concern only with the threat of tangible impacts from imminent development. Many other factors affect decisions on local development codes including state and federal regulations, political climate and the willingness of the local staff and elected officials to be a champion for environmental protection.





## Introduction to the Report

This report presents the results of a review of development regulations conducted by the Potomac Conservancy and the Center for Watershed Protection for nine Maryland counties and the District of Columbia (the District) to identify opportunities and barriers to implementing Environmental Site Design (ESD) practices on development and redevelopment sites. ESD is an approach to land development that seeks to minimize the negative impacts of impervious cover on local waterways. Several regulatory mandates over the last seven years have identified widespread implementation of ESD as an important strategy to help protect and restore the Chesapeake Bay and its tributaries, including the Potomac River. Identifying and removing code barriers to ESD is an important first step towards implementation of this strategy.

The project area is specifically focused on those Maryland counties within the Potomac River watershed, and the District, which also has great influence on the Potomac River. This report follows on the heels of a similar project completed by the Potomac Conservancy, James River Association, and Friends of the Rappahannock in 2012 that analyzed development codes in all of Virginia's non-tidal counties (FOR et al, 2012). Ten of the Virginia counties assessed as part of that project drain in-part or entirely to the Potomac Watershed. Therefore, through the combination of the 2012 report and this report, development codes in 76% of Maryland and Virginia counties in the Potomac watershed have now been reviewed. The remaining six counties in Virginia are tidal communities that will receive assistance from the VA DCR to review their development codes.

# Polluted runoff is the ONLY growing source

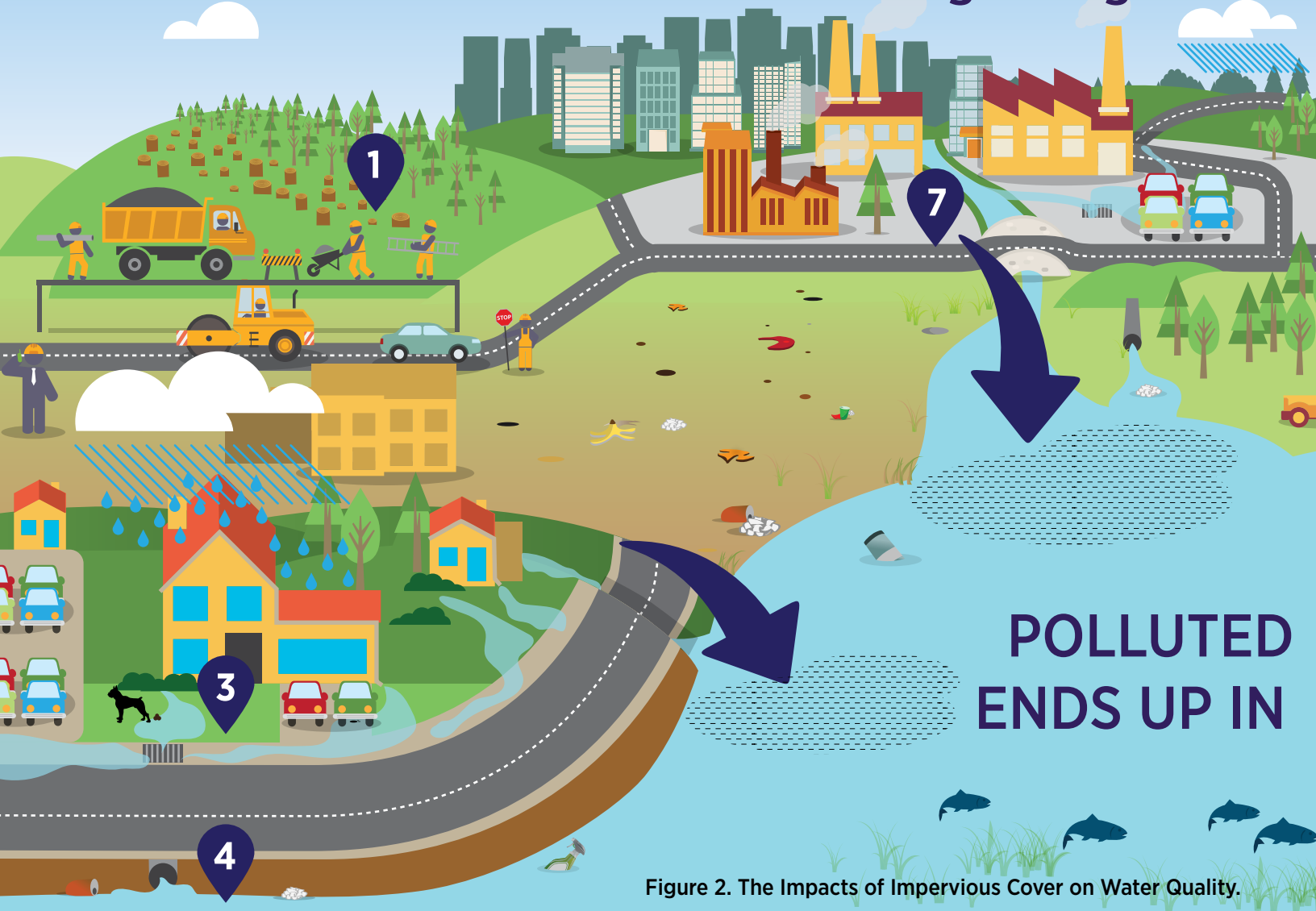


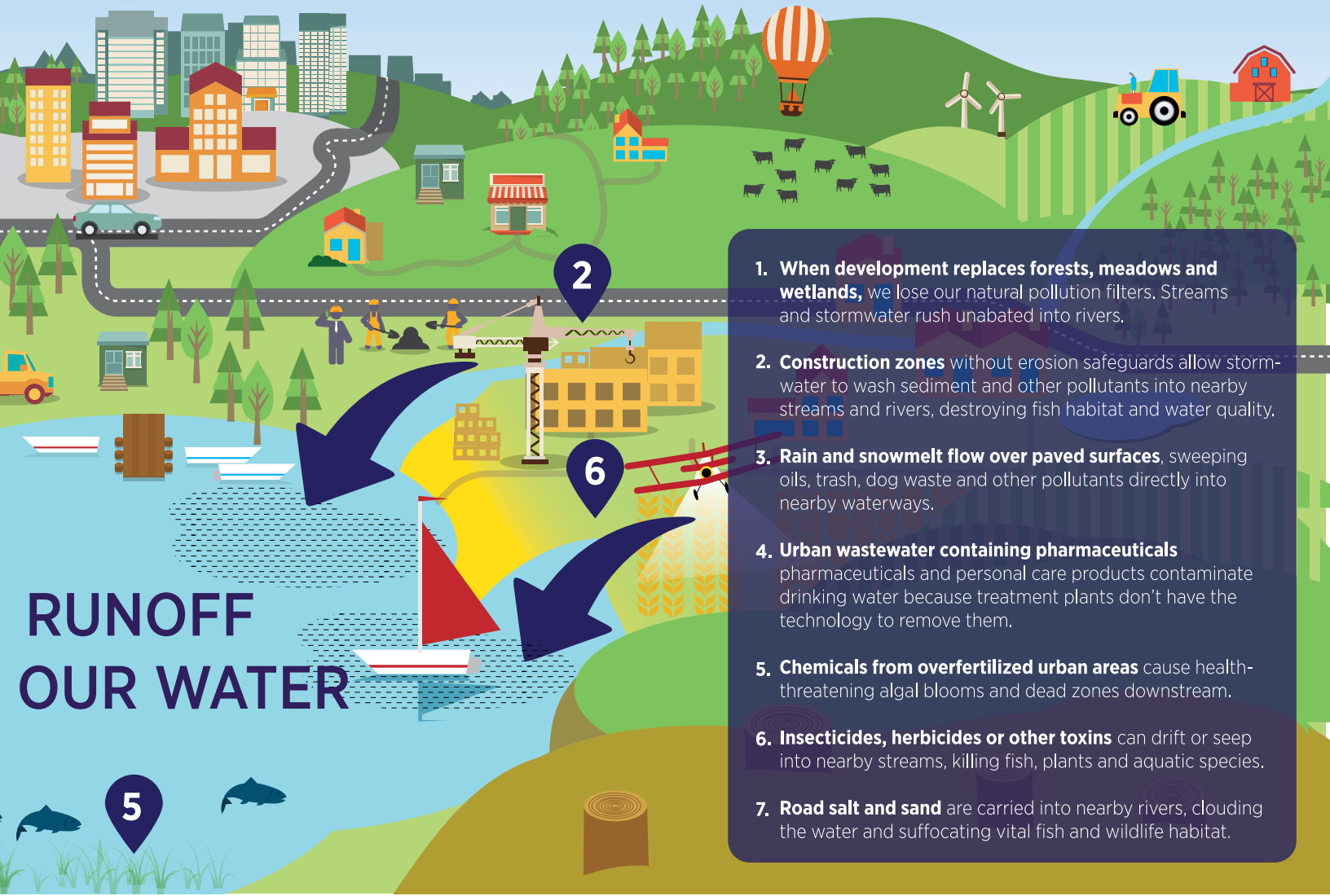
Figure 2. The Impacts of Impervious Cover on Water Quality.



## Impacts of Land Development on the Potomac River Watershed

Land development practices transform subwatersheds in ways that can have negative effects on local streams. As land is developed, forests, farms, and wetlands are cleared and replaced by rooftops, parking lots, and other forms of impervious cover. If the construction process is not managed appropriately, tons of sediment can erode from development sites and be transported to nearby stream systems. After construction, impervious cover blocks the infiltration of rain and snowmelt into the ground and generates increased stormwater runoff. Receiving streams must adjust to the high volumes of stormwater flowing rapidly over the landscape. Combined with pollutant sources, such as sediment and excess nutrients, the increased stormwater runoff from impervious cover causes a continuous, but variable decline in most stream health indicators, including: changes to stream hydrology, physical

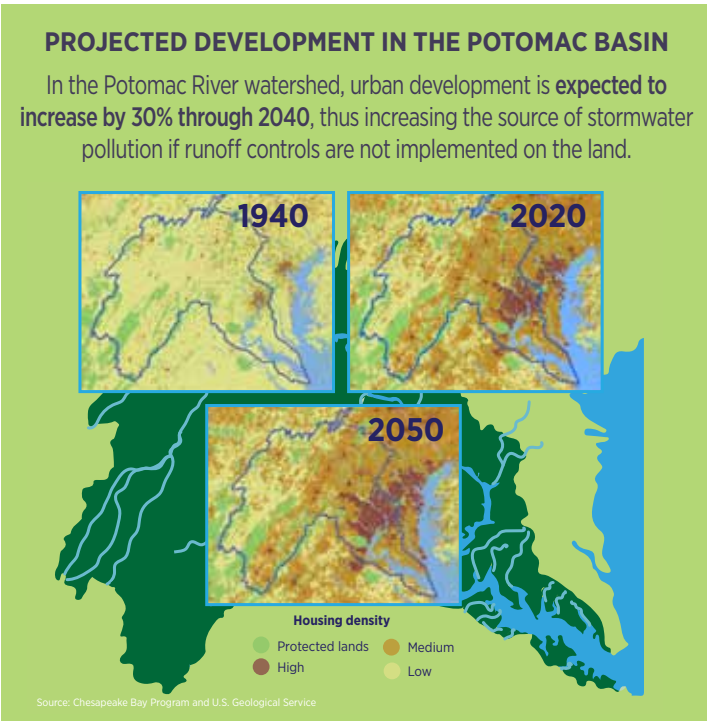
# of pollution in the Potomac River Watershed



1. **When development replaces forests, meadows and wetlands**, we lose our natural pollution filters. Streams and stormwater rush unabated into rivers.
2. **Construction zones** without erosion safeguards allow stormwater to wash sediment and other pollutants into nearby streams and rivers, destroying fish habitat and water quality.
3. **Rain and snowmelt flow over paved surfaces**, sweeping oils, trash, dog waste and other pollutants directly into nearby waterways.
4. **Urban wastewater containing pharmaceuticals** pharmaceuticals and personal care products contaminate drinking water because treatment plants don't have the technology to remove them.
5. **Chemicals from overfertilized urban areas** cause health-threatening algal blooms and dead zones downstream.
6. **Insecticides, herbicides or other toxins** can drift or seep into nearby streams, killing fish, plants and aquatic species.
7. **Road salt and sand** are carried into nearby rivers, clouding the water and suffocating vital fish and wildlife habitat.

alteration of the stream corridor, stream habitat degradation, declining water quality, and loss of aquatic diversity. Research indicates that when impervious cover reaches around 10 percent, streams show clear signs of impacted health (Schueler et al. 2009) (Figure 2).

The amount of developed land has doubled in the Potomac Watershed since 1970, with related losses in forest and agricultural land. The most rapidly urbanizing areas include the Monocacy and Lower Potomac subwatersheds, particularly the City of Frederick, MD; Prince William, VA; and Charles County, MD. In the last three decades, many areas of the watershed have more than doubled in population. Based on the 2010 census, the population is approximately 6.1 million, with nearly three-quarters residing in the Washington metropolitan area (ICPRB, 2013). The Potomac River is an important resource to this region as it supplies almost 90% of the drinking water to the District Metropolitan area.



## Environmental Site Design as a Solution

Local development rules collectively shape how development happens and its impact on the land. Communities often find that their existing development rules conflict with the goal of sustainable development by requiring excessive impervious cover in the form of wide streets, expansive parking lots, and large-lot subdivisions. In addition, the economic incentives for developers to conserve natural areas are generally few and far between.

One solution to reduce the impact from land development is Environmental Site Design (ESD) also known as Better Site Design (BSD). ESD is based on a set of principles that seek to accomplish three goals at every development site: to reduce the amount of impervious cover, to increase natural lands set aside for conservation, and to use pervious areas for more effective stormwater management. In 1998, the Center for Watershed Protection's identified a set of 22 model development principles for ESD. The 22 model development principles were created through a consensus based process that involved professionals from multiple disciplines including land developers, planners and local environmental organizations. ESD works to reduce the surface area of parking lots and other impervious areas, and to use that space to incorporate functional landscaping and better stormwater treatment within the site. This reduces the impact on local waterways, and can result in savings in reduced infrastructure costs and improved quality of life for residents.



*Rain gardens and bioretention in the public right-of-way. Source: US EPA*



*Replace lawns with native vegetation and rain gardens to better control runoff. Source: US EPA*



*Vegetated bioswales along busy roadsides can capture polluted runoff from impervious surfaces. Source: US EPA*



*Permeable pavers are a river-friendly substitute to concrete and asphalt. Removing curbs and directed flow into rain gardens captures stormwater. Source: US EPA*



# ENVIRONMENTAL SITE DESIGN:

Making the case for green infrastructure in the Potomac River Watershed

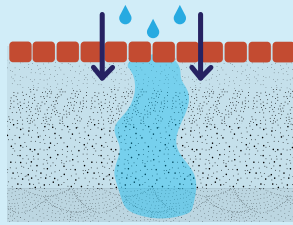
## WHAT ARE SOME

## OF THE KEY FEATURES OF ENVIRONMENTAL SITE DESIGN?

### 1. Permeable pavements

Spaced pavers allows water to filter

The pavers sit on a base of increasingly large-diameter stones that help remove water from surface while filtering it.



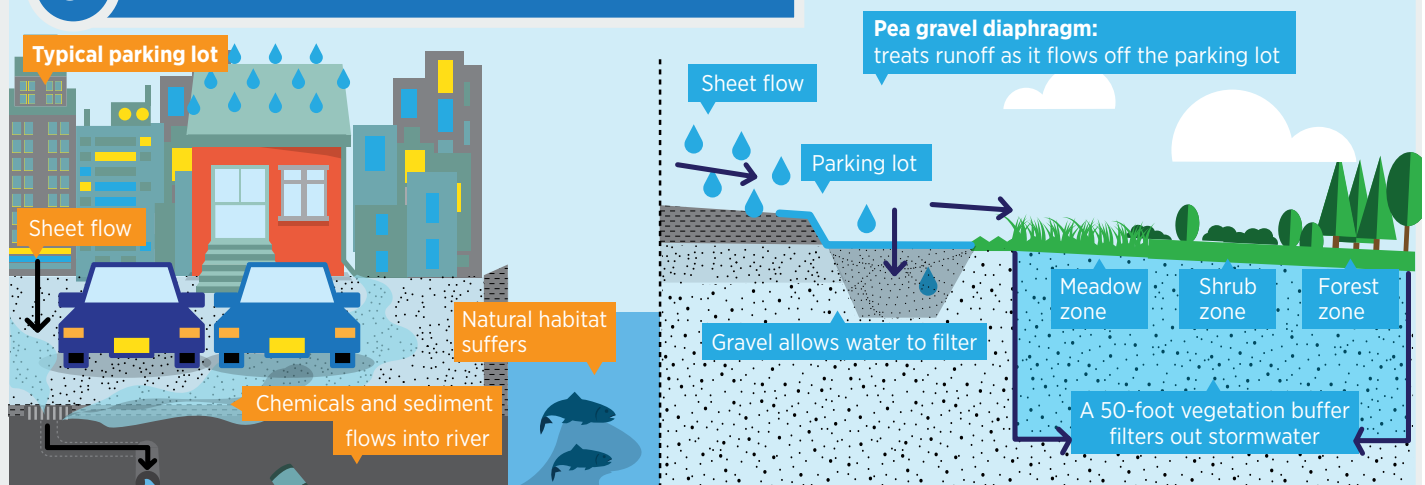
There are alternatives to sheets of parking lot asphalt that collect rainwater and funnel it into stormwater drains. Permeable pavements, like **porous asphalt**, **pervious concrete** and **permeable paver stones** allow stormwater to **seep through the surface and infiltrate** the surrounding soils, providing water quality and groundwater recharge benefits.

Bed of stones provides the final filtration before the water reaches the native soil.

### 2. Landscaping methods around the home



### 3. Landscaping around commercial projects



## Reasons why these jurisdictions should adopt and implement these recommendations:

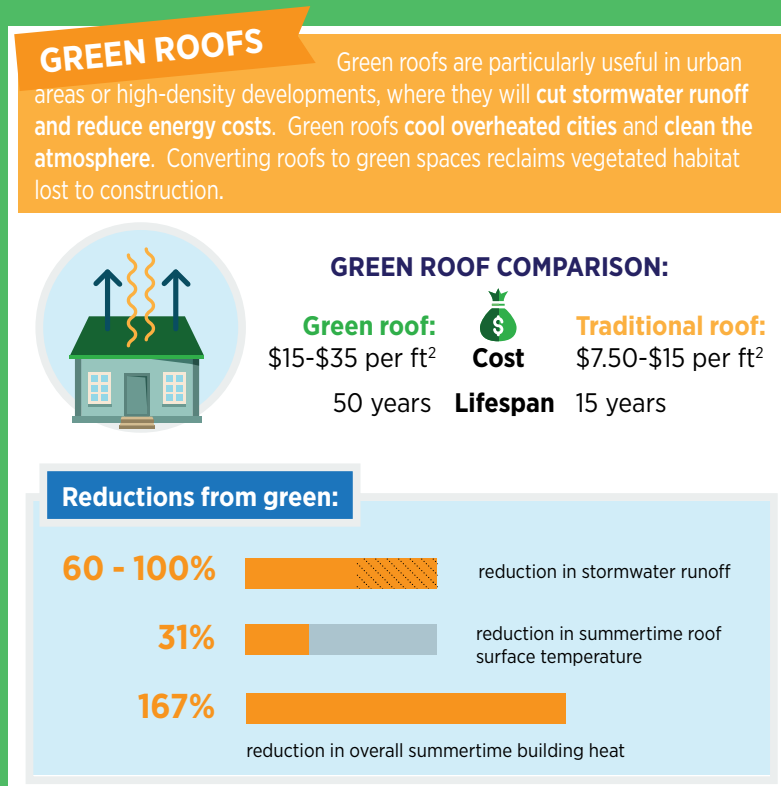
On April 24, 2007, Governor Martin O'Malley signed the "Stormwater Management Act of 2007" (Act), which became effective on October 1, 2007. ESD is a key component of the stormwater requirements set forth by the Act. ESD is a comprehensive design strategy for maintaining predevelopment runoff characteristics and protecting natural resources. It relies on integrating site design, natural hydrology, and smaller scale stormwater management controls to capture and treat runoff. ESD utilizes many processes to manage stormwater and mimic natural hydrology, minimizing the impact of land development on water resources. The Act requires that ESD, through the use of nonstructural and other best management practices be implemented to the maximum extent practicable (MEP). The Act defines ESD to the MEP as designing stormwater management systems so that all reasonable opportunities for using ESD planning techniques and treatment practices are exhausted and, only where absolutely necessary, a structural BMP is implemented. Prior to the Act, ESD was only encouraged through a series of credits found in Maryland's Stormwater Design Manual.

Implementation of the Act's requirements occurs at the state and local level. The State of Maryland establishes technical requirements and provides a model ordinance, and county governments are required to adopt an ordinance that meets these regulatory requirements. A municipality may either adopt its own local ordinance or rely on the county program. In each case, the MDE must review and approve the local stormwater management ordinances (MDE, 2010a).

An additional driver for ESD in Maryland is the National Pollutant Discharge Elimination System (NPDES) permits for municipal separate storm sewer systems (MS4s). MS4 permits in Maryland require that the regulated jurisdiction identify means of implementing ESD to the MEP. Specifically, they are required to modify codes and ordinances to eliminate any impediments to implementing ESD. They also contain requirements for providing "treatment" of 20% of the jurisdiction's untreated impervious surfaces. Treatment will primarily be accomplished through the installation

of stormwater management practices in the developed landscape as retrofits. Many of the practices approved by MDE for this purpose qualify as ESD practices. Since many of the same code conflicts that prevent the use of ESD during development can also act as obstacles to implementation of ESD retrofits, a review of local codes to identify barriers can also help to facilitate implementation of the MS4 requirements.

Additional requirements in the MS4 permits in Maryland and the District include meeting specific pollutant load reductions to meet the Chesapeake Bay Total Maximum Daily Load (TMDL). The Chesapeake Bay TMDL is a comprehensive federal "pollution diet" that sets limits on the amount of nitrogen, phosphorus, and sediment that can enter the Bay and its tidal rivers to meet water quality goals. To comply with the TMDL, bay jurisdictions must not only reduce existing pollution loads, but also maintain reduced pollution loads as population growth and new development occurs. Therefore, as part of the bay jurisdictions Watershed Implementation Plans (WIPs), EPA required each jurisdiction to include a method to account for future growth in pollution loads. Therefore, all new development within the Maryland jurisdictions and Washington DC would benefit from the use of ESD to help offset pollutant loads from future development.



# Project Approach

## The Assessment Tool: Codes and Ordinance Worksheet

Communities can evaluate their local codes and ordinances against ESD principles (referred to in the COW as BSD) using the Code and Ordinance Worksheet (COW). The COW allows for an in-depth review of the standards, ordinances, and codes (i.e., the development rules) that shape how development occurs in a jurisdiction. It asks specific questions to elicit basic information about how development actually happens in the jurisdiction, and can be thought of as an “audit” of the existing codes and ordinances. The COW provides a systematic comparison of local development rules against a set of 22 model development principles.

Institutional frameworks, regulatory structures and incentive programs are included in this review. Points are assigned based on how well the current development rules agree with the site planning benchmarks derived from the model development principles (CWP, 1998). With COW results in-hand, communities can focus discussion on specific local regulations in need of improvement.

It is important to note that the COW scores represent a snapshot in time, as most jurisdictions review and update their regulations on a regular schedule. Several of these jurisdictions are currently in the process of code revisions that are not reflected in the study results, but could have an impact on water quality in the future. For example, the District is revising parking standards and creating a wetland protection ordinance, Montgomery and Prince George’s counties are revising their zoning ordinances and the Waterbody Buffer requirements are being revised in Frederick County.

## Classification of Jurisdictions

The ten Potomac watershed jurisdictions for which the code review was conducted vary widely in terms of their level of urbanization, growth pressure, and staff capacity to handle site plan reviews. The jurisdictions were classified based on their level of urbanization and projected population growth so that the COW results for an individual county could be compared with other jurisdictions in the same category, and to identify goals and strategies that are most appropriate for communities falling within each category. The indicators and data used for the classification are described below.

**Growth Pressure:** Population change was used as an indicator of growth pressure. Population from the 2010

Census was compared with projected 2025 population from the Maryland Department of Planning and the District Department of Planning to determine the percentage of projected change over a 15-year time period. Growth pressure was then ranked as follows for the counties and the District.

% Population Change 2010-2025	Ranking
<5	Low
5-20	Moderate
>20	High

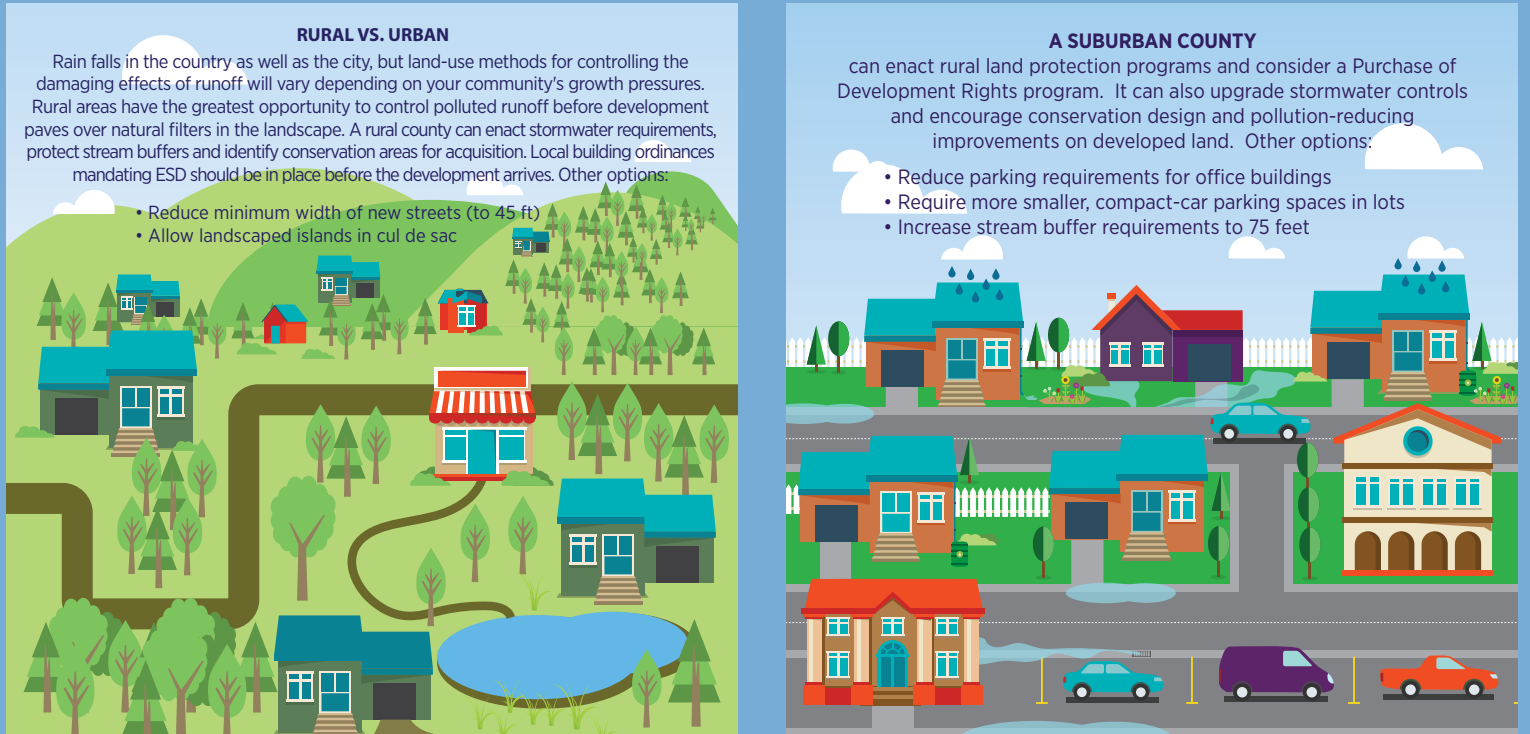
**Level of Urbanization:** Land use / land cover (LULC) data was used as an indicator of urbanization, including Maryland Department of Planning 2010 LULC for the Maryland counties and 2006 National Land Cover Data (NLCD) for the District. The categories of land use in the LULC and NLCD that were considered urban for this analysis are included in the table below.

Land Use Categories Considered Urban	
MD Department of Planning 2010 LULC	2006 NLCD
Low, Medium, and High Density Residential	Developed, Open Space
Commercial	Developed, Low Intensity
Industrial	Developed, Medium Intensity
Institutional	Developed, High Intensity
Open Urban Land	Transportation
Large Lot Subdivision (Agriculture)	
Large Lot Subdivision (Forest)	

Urbanization was then ranked as follows for the counties and the District:

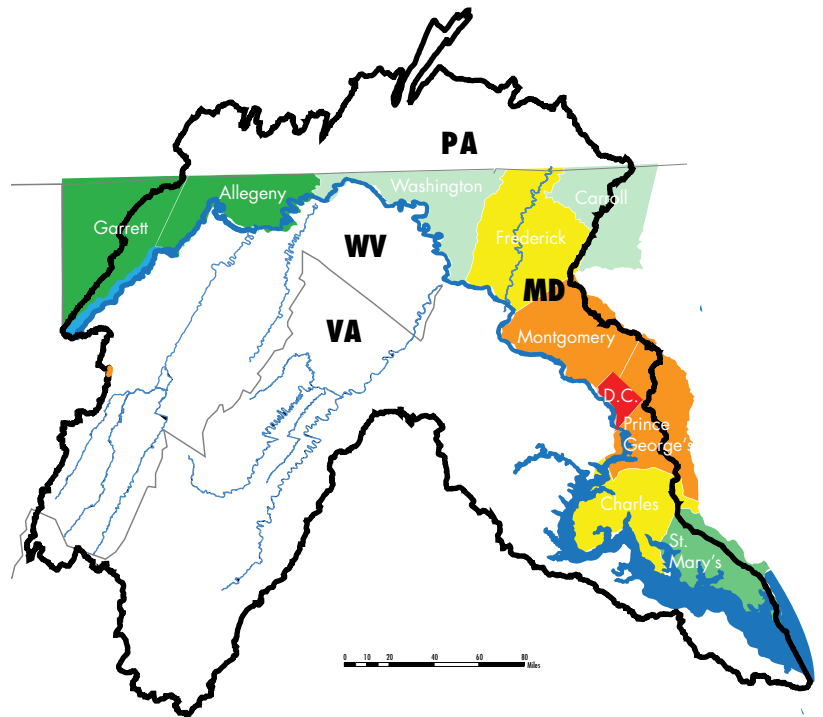
% Urban	Ranking
<15	Rural
15-40	Suburban
40-75	Urban
>75	Ultra-Urban

**Figure 3. Classification of Maryland Jurisdictions in the Potomac River Watershed and Washington, D.C.**



After each county and the District were ranked according to growth pressure and level of urbanization, they were assigned one of the following categories:

- **Built-Out With Moderate Growth:** Fully developed with a moderate amount of growth pressure for redevelopment.
- **Urban Moderate Growth:** Significant amount of existing development combined with moderate growth pressure.
- **Suburban Highly Vulnerable:** Moderate level of existing development and high growth pressure.
- **Suburban Vulnerable:** Moderate level of existing development and a moderate level of growth pressure.
- **Rural Highly Vulnerable:** Limited existing development and moderate to high growth pressure.
- **Rural Low Growth:** Limited existing development with low growth pressure.



The results from the jurisdiction classification are shown in Figure 3 and Table 1 along with the regulatory status.

### AN URBAN COUNTY

can incentivize redevelopment practices that correct stormwater runoff problems, integrate stormwater management rules into park and road projects, inspect and monitor stormwater management efforts.

- Encourage parking structures
- Encourage cluster development
- Reduce driveway widths to 9 feet and allow two-track and shared driveways



### A HIGHLY URBAN COUNTY

can reduce impervious surfaces with redevelopment, set an example by installing green roofs on municipal buildings, provide incentives for redevelopment and green infrastructure development. Other options:

- Reduce parking lot stall lengths from 19 to 18 feet
- Increase stream buffer from 25 to 75 feet.
- Require that buffers have native vegetation
- Require long-term protection of remaining natural areas









**Table 1. Summary of Classification of Maryland Jurisdictions in the Potomac River Watershed and the District of Columbia.**

Jurisdiction	Growth Pressure Ranking	Urbanization Ranking	Category	MS4 Regulatory Status
Allegany County	Low	Rural	Rural Low Growth	Unregulated
Carroll County	Moderate	Suburban	Suburban Vulnerable	Phase I
Charles County	High	Suburban	Suburban Highly Vulnerable	Phase I
District of Columbia	Moderate	Ultra Urban	Built Out w/ Moderate Growth	Phase I
Frederick County	High	Suburban	Suburban Highly Vulnerable	Phase I
Garrett County	Low	Rural	Rural Low Growth	Unregulated
Montgomery County	Moderate	Urban	Urban Moderate Growth	Phase I
Prince George's County	Moderate	Urban	Urban Moderate Growth	Phase I
St. Mary's County	High	Rural	Rural Highly Vulnerable	soon to be Phase II
Washington County	Moderate	Suburban	Suburban Vulnerable	Phase II

# Results

A rural county with high development pressure may want to focus on protecting existing natural resources through the use of conservation easements and land acquisition, while a more urban county that is developing rapidly might focus their efforts on improving environmental protection during site development through ESD, plan review, inspection and enforcement procedures, and construction- phase and post-construction best management practices.

## General Recommendations by Category

Jurisdiction and COW Score	General Recommendations
 <p><b>Rural Low Growth</b> Allegany (40%) Garrett (65%)</p>	<ul style="list-style-type: none"> <li>Identify conservation areas; consider Purchase of Development Rights (PDR) program, conservation easements and land acquisition to protect these areas</li> <li>Enhance existing protections of sensitive resource areas, such as stream buffers</li> <li>Consider strengthening stormwater requirements including erosion and sediment control (ESC) measures to minimize impacts when development does occur</li> </ul>
 <p><b>Rural Highly Vulnerable</b> St. Mary's (74%)</p>	<ul style="list-style-type: none"> <li>Identify conservation areas; consider Purchase of Development Rights (PDR) program, conservation easements and land acquisition to protect these areas</li> <li>Enhance existing protections of sensitive resource areas, such as stream buffers</li> <li>Consider strengthening stormwater requirements including erosion and sediment control (ESC) measures to minimize impacts when development does occur</li> </ul>
 <p><b>Suburban Vulnerable</b> Carroll (56%) Washington (49%)</p>	<ul style="list-style-type: none"> <li>Implement rural land protection programs</li> <li>Encourage the use of conservation design</li> <li>Upgrade stormwater controls; improve inspection and maintenance program</li> <li>Enhance stream buffer protection</li> <li>Identify conservation areas; consider Purchase of Development Rights (PDR) program</li> </ul>
 <p><b>Suburban Highly Vulnerable</b> Charles (75%) Frederick (68%)</p>	<ul style="list-style-type: none"> <li>Use Smart Growth principles to designate development &amp; protection zones; implement rural, agricultural, and conservation area zoning protections</li> <li>Encourage the use of conservation design</li> <li>Upgrade stormwater controls; improve inspection and maintenance program</li> <li>Encourage pollution-reducing behaviors and practices on developed land</li> <li>Identify conservation areas; consider Purchase of Development Rights (PDR) program</li> </ul>
 <p><b>Urban Moderate Growth</b> Montgomery (73%) Prince George's (67%)</p>	<ul style="list-style-type: none"> <li>Provide redevelopment incentives</li> <li>Allow for stormwater management to be integrated into parking lots and roadways</li> <li>Implement and enforce Erosion and Sediment Control</li> <li>Provide innovative stormwater management that includes inspection and enforcement</li> </ul>
 <p><b>Built Out w/ Moderate Growth</b> (District of Columbia 78%)</p>	<ul style="list-style-type: none"> <li>Provide redevelopment incentives</li> <li>Reduce impervious surfaces with redevelopment</li> <li>Focus on source control of pollution</li> <li>Enhance protection of remaining natural resources for water quality improvement</li> </ul>

In general, the higher COW scores are seen for jurisdictions with high growth pressure (e.g., St. Mary's County, Charles County) and jurisdictions that are highly urban (District of Columbia, Montgomery County) and have likely experienced high growth pressure in the past, because these jurisdictions have adopted and modified their growth policies and regulations in response to this pressure. Conversely, jurisdictions with low growth pressure or that are less urban have not had the need to address topics such as forest conservation, which often becomes a concern only with the threat of tangible impacts from imminent development. Many other factors affect decisions on local development codes including state and federal regulations, political climate and the willingness of the local staff and elected officials to be a champion for environmental protection.



*Studies have found average increases of up to 37% in residential property values associated with the presence of more vegetation.*

# Allegany County

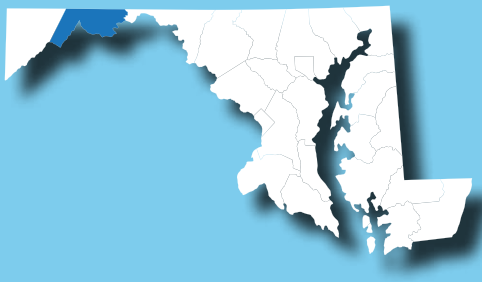


Rural Low Growth

Score: 40%

Urban Land: 13%

Projected Population Change  
(2010-2025): 2%



**Allegany County** is located in western Maryland in the Alleghany Mountains on the border with West Virginia and Pennsylvania. There are five incorporated towns and two cities (Cumberland and Frostburg) within Allegany County, plus many un-incorporated places. The city of Cumberland is the county seat. It is a rural county of 430 square miles that are mostly forested. According to the 2010 Census, Allegany County had a population of 75,087.

## Strengths

Street pavement widths, single family home parking ratio, rear and side setback depth and lot width, buffer area (although only 25-50 feet wide) for streams, wetlands, and 100-year floodplain, no requirement for curb and gutter, use of vegetated open channels, permeable pavement for parking lots, driveways, etc., recorded stormwater management maintenance agreement.

## Weaknesses

Driveway width, shared and two-track driveways and parking, queuing streets, utilities under the pavement, right-of-way widths, turnaround alternatives

and landscaped islands in cul-de-sacs, compact car parking spaces, parking ratios and dimensions, landscaping/trees and stormwater practices in parking lots, cluster development, buffer width, irregular lot shapes, allowable uses in stream buffers and enforcement mechanisms, preservation of trees and other natural vegetation, TDR/PDR or other conservation incentives.

## Recommendations

1. Allow parking lanes to also serve as traffic lanes (i.e., queuing streets).
2. Reduce the minimum right-of-way for residential streets to 45 ft or less.
3. Allow utilities to be placed under the paved section of road right-of-way.
4. Allow alternative turnarounds such as "hammerheads."
5. Allow the use of landscaped islands within cul-de-sacs, for stormwater management practices.
6. Reduce parking ratio for office buildings to 3 spaces or less per 1,000 sq. ft. of gross floor area.
7. Reduce parking ratio for shopping centers to the equivalent of 4.5 spaces or less per 1,000 sq. ft. of gross floor area.
8. Allow shared parking arrangements and provide a model shared parking agreement.
9. Reduce parking space dimensions to 9ft x 18ft.
10. Require at least 30% of spaces in commercial parking lots have smaller dimensions for compact cars.
11. Require a minimum percentage of parking lots to be landscaped and allow stormwater practices.
12. Allow a by-right cluster design option for development to help conserve natural areas.
13. Allow irregular lot shapes such as flag lots and pie-shaped lots.
14. Reduce minimum front setbacks for ½-acre residential lots to 20 ft or less.
15. Reduce minimum driveway width to 9 ft or less and allow two-track design.
16. Allow shared driveways in residential areas.
17. Increase the minimum stream buffer width to 75 ft or more and define allowable uses in the buffer areas.
18. Require or encourage the preservation of trees and other natural vegetation at development sites.
19. Give developers incentives and flexibility to achieve conservation goals.
20. Create a Transfer of Development Rights and/or Purchase of Development Rights program.



# Carroll County

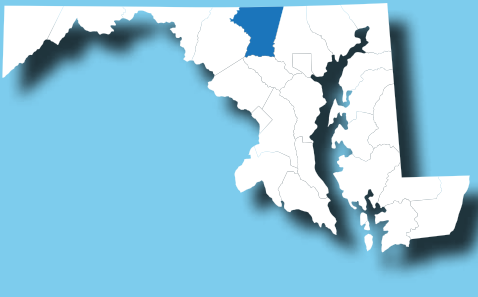


**Suburban Vulnerable**

**Score: 56%**

**Urban Land: 29%**

**Projected Population Change  
(2010-2025): 15%**



**Carroll County** is located in northern Maryland within an hour's drive of Baltimore and Washington, DC. The County is bordered to the North by the Mason-Dixon line and is characterized by rolling terrain. The County contains the cities of Westminster and Taneytown, 6 towns plus 27 unincorporated areas. The recent high growth rate has resulted in a mixed landscape of urban, suburban and rural land, although agriculture is a large part of the economy. The County's population of 167,134 qualifies it as a medium Phase I MS4 municipality, making it subject to the NPDES stormwater rule. It should be noted that while Carroll County was contacted as part of this project, the County declined to participate in the project and as such does not endorse the review or results.

## Strengths

ESD practices are promoted to treat road, rooftop and parking lot runoff; cluster design is encouraged; minimum standards for alternative T shaped turnaround, parking space dimensions, shared driveways, and residential driveway width generally reduce impervious cover; effective requirements for stream buffers, clearing and grading, tree conservation and land conservation.

## Weaknesses

Minimum standards for street width and road rights-of-way, lot setbacks and frontages, parking ratios for professional office buildings, and disincentive of the use of shared parking lots may result in creation of more impervious cover than is necessary; codes do not provide for effective management of open space.

## Recommendations

1. Reduce minimum pavement width for residential areas with curb and gutter to 22 ft.
2. Reduce minimum right-of-way width for residential streets to 45ft.
3. Reduce parking ratios for office buildings to 3 spaces per 1,000 sq. ft. of gross floor area.
4. Promote the use of shared parking arrangements and include a sample shared parking agreement in the Carroll County Development Review Manual.
5. Require at least 30% of spaces at larger commercial parking lots to have smaller dimensions for compact cars.
6. For half-acre lots, reduce minimum front setbacks to 20 ft., rear setbacks to 25 ft., side setbacks to 8 ft., and frontage to 80 ft.
7. In cluster developments, enforce management of open space, define uses, and consolidate into larger units.
8. Increase stream buffer width to 75 ft., maintain with native vegetation, and include education mechanisms.
9. Require verification of State and Federal stream and wetland permit approval prior to issuance of a grading permit.

# Charles County

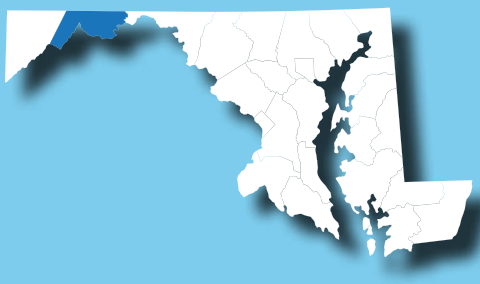


**Suburban Highly Vulnerable**

**Score: 75%**

**Urban Land: 17.5%**

**Projected Population Change  
(2010-2025): 30%**



**Charles County** is located in southern Maryland and is part of the Washington Metropolitan Area. There are three incorporated towns, Indian Head, La Plata, and Port Tobacco Village, within Charles County, plus many unincorporated places. The town of La Plata is the county seat. It is a suburban county of 643 square miles, which includes area of water. According to the 2010 Census, Charles County had a population of 146,551.

## Strengths

Narrower street pavement and right-of-way widths, smaller cul-de-sacs, smaller parking ratios and parking space dimensions, narrower driveways, shared driveways and parking lots, and narrower minimum sidewalk width, use of permeable paving materials for parking lots and driveways, stormwater treatment practices in landscaped areas and setbacks of parking lots and yards, recorded stormwater maintenance agreements, cluster development, stream and wetland buffers, reduced lot dimensions/setbacks/frontage, floodplain protection, tree protection requirements, and a Transfer of Development Rights option.

## Weaknesses

Allowing hammerhead turnarounds, use of curb-and-gutter on many new residential streets, high parking ratios for office buildings and shopping centers, greater submittal requirements for open space/cluster developments than for conventional development, greater front setback for small residential lots, queuing streets, street layouts, reduced parking ratios with shared parking, allow compact car parking spaces, incentives for parking garages versus surface parking, alternatives to sidewalks (e.g., trails), two-track driveway design, open space not required to be consolidated in cluster design, allowable and unallowable uses for open space no defined, and Purchase of Development Rights program.

## Recommendations:

1. Allow parking lanes to also serve as traffic lanes (i.e., queuing streets).
2. Allow alternative turnarounds such as “hammerheads.”
3. Consider reducing requirement for curb-and-gutter to only those streets where it is absolutely necessary.
4. Reduce parking ratio for office buildings to 3 spaces or less per 1,000 sq. ft. of gross floor area.
5. Reduce parking ratio for shopping centers to the equivalent of 4.5 spaces or less per 1,000 sq. ft. of gross floor area.
6. Reduce overall parking ratio requirements when shared parking arrangements are employed and have sample agreement document on file for applicants to use.
7. Require at least 30% of spaces in commercial parking lots to have smaller dimensions for compact cars.
8. Require the same level of detail and review for site plans for cluster developments as for conventional developments.
9. Reduce minimum front setbacks for ½-acre residential lots to 20 feet or less.
10. Allow alternatives to impervious sidewalks.
11. Allow two-track driveway design.
12. In cluster developments, require open space to be consolidated and managed in natural condition and outline allowable uses.
13. Create a Purchase of Development Rights program.

# District of Columbia



**Ultra Urban**

**Score: 75%**

**Urban Land: 82%**

**Projected Population Change  
(2010-2025): 15%**



**The District of Columbia** (the District) is the Nation's Capital located along the Potomac River. The District is highly urban with an estimated population in 2012 of over half a million people rising to a million people during the weekdays with commuters coming into the District for work. Approximately 19% of the District's area is national parkland containing the National Mall and Memorial Parks, C&O Canal National Historic Park, Rock Creek Park and other parklands. The District is governed by a mayor and council; however Congress has authority over this government and can overturn local laws. The District's large population qualifies it as a Phase I MS4 municipality, making it subject to the NPDES stormwater rule. In addition, the District has a Long Term Control Plan to manage the combined sewer overflows (CSOs).

## Strengths

ESD practices are promoted to treat road, rooftop and parking lot runoff; effective requirements for stream buffers, tree conservation and protection, water conservation and pollution prevention.

## Weaknesses

Minimum parking stall length, encourage use of shared parking, stream buffer width, stream buffer maintenance, allowable uses and education, and long term protection and management of natural area remnants.

## Recommendations

1. Reduce minimum parking lot stall length from 19 feet to 18 feet.
2. Set parking requirements as maximum or median rather than minimum.
3. Encourage the use of shared parking between land uses, provide a model shared parking agreement and allow for reduced parking ratios when shared parking is used.
4. Increase the minimum stream buffer width from 25 feet to 75 feet.
5. In the stream buffer ordinance, require that part of the stream buffer be maintained with native vegetation, outline allowable uses and provide education mechanisms for landowners e.g., posting signs to inform residents of the buffer.
6. Require long-term protection and management of natural area remnants.

Note: Washington, DC has updated and strengthened some of its codes and ordinances like parking standards that remove barriers to Environmental Site Design. As such, its score is predicted to have increased since its COW assessment in March, 2014.

# Frederick County

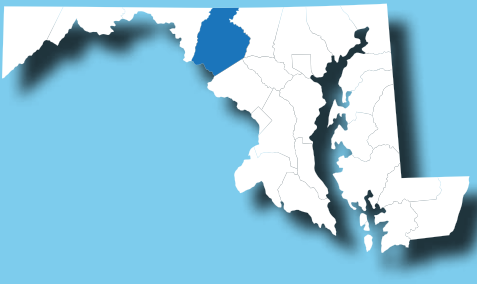


**Suburban Highly Vulnerable**

**Score: 68%**

**Urban Land: 24%**

**Projected Population Change  
(2010-2025): 23%**



Preface: Since assessed in January 2014, many changes to Frederick County's codes and ordinances have been made by local government. We anticipate that these changes will result in the decrease in Frederick County's COW Score and render greater barriers to the use of Environmental Site Design. Potomac Conservancy will conduct an updated analysis of the county's local codes and ordinances in 2015.

**Frederick County** is located in northern Maryland within an hour's drive of Baltimore and Washington, DC. The western portion of the County is mountainous and the eastern portion has more rolling terrain. The County contains the City of Frederick and 11 other incorporated cities, towns, or villages plus 20 unincorporated areas. The recent high growth rate has resulted in a mixed landscape of urban, suburban and rural land, although agriculture is a large part of the economy and the County has successfully preserved almost 40,000 acres of farmland through its various conservation programs. The County's population of 233,385 qualifies it as a medium Phase I MS4 municipality, making it subject to the NPDES stormwater rule.

## Strengths

ESD practices are promoted to treat road, rooftop and parking lot runoff; cluster design is encouraged; minimum standards for roads, cul-de-sacs and parking lots generally reduce impervious cover; effective requirements for stream buffers, clearing and grading, tree conservation and land conservation.

## Weaknesses

Minimum standards for road rights-of-way, lot setbacks and frontages, parking ratios and driveways may result in creation of more impervious cover than is necessary; codes do not provide for effective management of open space that is set aside as part of cluster development.

## Recommendations

1. Reduce minimum right-of-way width for residential streets to 45ft.
2. Reduce parking ratios for office buildings to 3 spaces per 1,000 sq. ft. of gross floor area.
3. Provide model shared parking agreements.
4. Require at least 30% of spaces at larger commercial parking lots to have smaller dimensions for compact cars.
5. For half-acre lots, reduce minimum front setbacks to 20 feet, rear setbacks to 25 feet, and side setbacks to 8 feet.
6. Reduce driveway width to 9 feet and provide standards for two-track driveways.
7. Require open space in cluster developments to be consolidated into larger units.
8. Require a minimum percentage of open space in cluster developments to be managed in a natural condition, and define allowable and unallowable uses.
9. Include requirements for associations that can effectively manage open space and specify that open space can be managed by a third party using land trusts or conservation easements.
10. Include education and enforcement mechanisms for stream buffers.
11. Incorporate forest conservation more explicitly into local conservation incentive programs.
12. Require verification of State and Federal stream and wetland permit approval prior to issuance of a grading permit.

# Garrett County

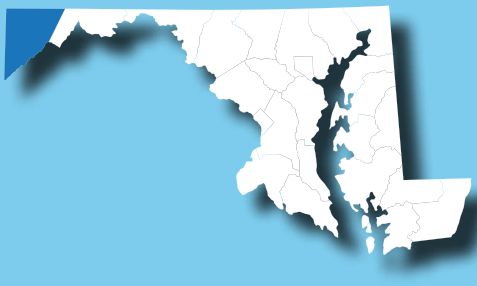


**Rural Low Growth**

**Score: 65%**

**Urban Land: 9%**

**Projected Population Change  
(2010-2025): 4%**



**Garrett County** is Maryland's westernmost County, located in the Allegheny Mountains on the border with West Virginia and Pennsylvania. It is a rural county of 656 square miles that are mostly forested. The town of Oakland is the county seat and Deep Creek Lake is the primary attraction of tourism and new development in the area. According to the 2010 Census, Garrett County had a population of 30,097. There are eight incorporated towns within Garrett County, plus many un-incorporated places.

## Strengths

Street widths (in low-density developments), cul-de-sac turnarounds, the single family home parking ratio, parking space dimensions, use of ESD practices along roadsides (vegetated open channels), within parking lots, and codes effectively address stormwater outfall discharges.

## Weaknesses

Queuing streets, efficient street layouts to reduce length, requirement for compact car parking spaces and landscaping/trees in commercial lots, mini-

imum commercial parking ratios and driveway widths, use of two-track driveway design, small minimum stream buffer width, maintaining stream buffers with native vegetation, flexibility for meeting conservation requirements, plan submittal and review requirements for cluster developments, Transfer of Purchase of Development Rights programs, and setbacks between septic fields and streams.

## Recommendations

1. Allow parking lanes to also serve as traffic lanes (i.e., queuing streets).
2. Reduce the minimum right-of-way for residential streets to 45 ft or less.
3. Reduce parking ratio for office buildings to 3 spaces or less per 1,000 sq. ft. of gross floor area.
4. Reduce parking ratio for shopping centers to the equivalent of 4.5 spaces or less per 1,000 sq. ft. of gross floor area.
5. Develop a model shared parking/joint use agreement.
6. Require at least 30% of spaces in commercial parking lots to have smaller dimensions for compact cars.
7. Allow stormwater practices within lot setbacks and landscaped areas.
8. Reduce the minimum requirements for side setbacks for a half-acre lot to 8 ft or less.
9. Reduce minimum driveway width to 9 ft or less and allow two-track design.
10. Make the Single Family Cluster Option a by-right form of development.
11. Increase the minimum stream buffer width to 75 ft or more.
12. Require vegetated buffers around wetlands, steep slopes and the 100-year floodplain.
13. Give developers flexibility to achieve conservation goals.
14. Create a Transfer of Development Rights and/or Purchase of Development Rights program

# Montgomery County

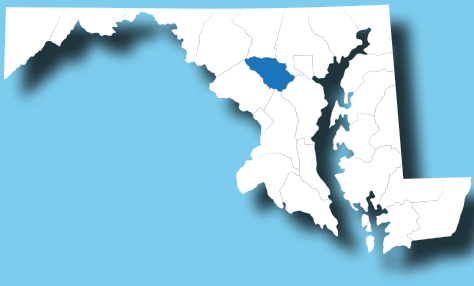


## Urban Moderate Growth

**Score: 76%**

**Urban Land: 49%**

**Projected Population Change  
(2010-2025): 14%**



**Montgomery County** is located in Maryland, just north of Washington, DC and is located entirely within the rolling terrain of the Piedmont. This populous County contains 18 incorporated municipalities, 4 special tax districts and 38 unincorporated places and is one of the most affluent counties in the nation. Most of the urban development is concentrated in the central and southeastern sections, while the west and north regions are still fairly rural in nature. The County's population of 971,777 qualifies it as a large Phase I MS4 municipality, making it subject to the NPDES stormwater rule.

## Strengths

ESD practices are promoted to treat road, rooftop and parking lot runoff; minimum standards for roads, rights-of-way, cul-de-sacs and parking ratios generally reduce impervious cover; effective requirements for protection and maintenance of stream buffers, clearing and grading, tree conservation and land conservation.

## Weaknesses

Minimum standards for lot setbacks and frontages, driveways, parking lots and sidewalks may result in creation of more impervious cover than is necessary; codes do not provide for effective management of open space in a natural condition and extra review requirements may discourage use of cluster design.

## Recommendations

1. Allow cul-de-sac islands to be used for stormwater treatment and tree planting
2. Reduce parking ratios for shopping centers outside a Parking Lot District to 4.5 spaces per 1,000 sq. ft. of gross floor area.
3. Set maximum parking ratios for lots outside a Parking Lot District.
4. Provide model shared parking agreements.
5. Require at least 20% of spaces at larger commercial parking lots to have smaller dimensions for compact cars.
6. Provide incentives for structured parking.
7. Streamline requirements for cluster design to remove potential barriers to its use.
8. For half-acre lots, reduce minimum front setbacks to 20 feet, rear setbacks to 25 feet, and side setbacks to 8 feet.
9. Reduce driveway width to 9 feet and provide standards for two-track and shared driveways.
10. Require a minimum percentage of open space to be managed in a natural condition.
11. Include requirements for associations that can effectively manage open space.
12. Include education mechanisms to inform residents of stream buffers.
13. Require verification of State and Federal stream and wetland permit approval prior to issuance of a grading permit.

Note: Montgomery County's COW assessment was completed in December, 2013. In January 2013, the county adopted a comprehensively updated zoning code that is expected to increase its score. However, most recommendations were not adopted and improvements can still be made.

# Prince George's County

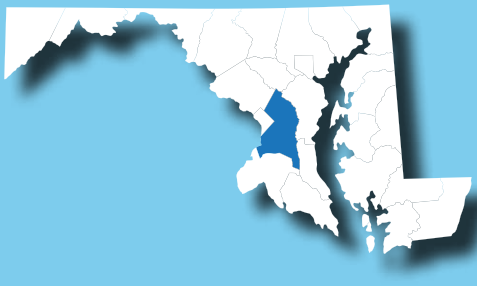


## Urban Moderate Growth

**Score: 67%**

**Urban Land: 46%**

**Projected Population  
Change (2010-2025): 6.7%**



**Prince George's County** is an urban County, located to the west of the District of Columbia along the Capital Beltway. It is a rural county of 656 square miles that are mostly forested. The Town of Upper Marlboro is the county seat and there are fifteen stations of the Washington Metro subway system within the county. According to the 2010 Census, Prince George's County had a population of 863,420. There are ten incorporated cities and seventeen towns within Prince George's County.

## Strengths

Use of ESD practices along roadsides (vegetated open channels, street widths, cul-de-sac radii, parking ratios within parking lots, protection and maintenance of stream buffers, limited clearing and grading during development, tree conservation and land conservation, and a by-right form of cluster development.

## Weaknesses

Plan submittal and review requirements for cluster developments, use of shared driveways, placing utilities under the paved section of the right-of-way, minimum lot setbacks and driveway widths, minimum right-of-way widths, queuing streets, the use of a landscape island in a cul-de-sac, model shared parking agreement, management of open space in a natural condition and defining the allowable uses for open space.

## Recommendations

1. Reduce the minimum right of way width for a residential street to less than 45 ft.
2. Reduce the minimum frontage distance for a half-acre lot to 80 ft.
3. Reduce the use of curb and gutter and encourage the use of vegetated swales.
4. Reduce driveway width to 9 ft. or less.
5. Allow for the placement of utilities under the paved section of the right of way.
6. Reduce parking ratios for professional office buildings to 3 spaces per 1,000 sq. ft. of GFA.
7. Reduce the minimum parking stall width to 9 ft. and length to 18 ft.
8. Reduce the minimum front setbacks for half-acre lots to 20 ft. or less.
9. Expand the stream buffer ordinance to the entire County.
10. For roads in more densely developed or commercial parts of the County, allow parking lanes to also serve as traffic lanes (i.e., queuing streets).
11. In cluster developments require a minimum percentage of open space to be managed in a natural condition and define allowable uses.
12. When cul-de-sac radius is greater than the minimum standard, allow for the use of landscape islands.
13. Provide model parking agreements to facilitate the use of shared parking.
14. Make the submittal requirements for open space design and conventional development the same.
15. Allow/promote alternative pedestrian networks that are permeable.
16. Provide standards for two-track driveway design.
17. Expand the use of shared driveways outside of the Chesapeake Bay Critical Area or M-X-C zone.

Note: Prince George's County has made many progressive updates to its codes and ordinances since March of 2014. These updates removed Barriers to Environmental Site Design and is anticipated to augment the county's COW score.

# St. Mary's County



**Rural Highly Vulnerable**

**Score: 74%**

**Urban Land: 13%**

**Projected Population Change  
(2010-2025): 31%**



**Saint Mary's County** is located in southern Maryland within an hour's drive of Baltimore and Washington, DC. The County is located on the St. Mary's Peninsula and is bordered by the Potomac River, the Patuxent River, the Wicomico River, and the Chesapeake Bay. The County contains one municipality, the Town of Leonardtown which is the county seat and 32 unincorporated areas. In addition, the County has two military bases; Naval Air Station Patuxent River and Naval Air Systems Command. The recent high growth rate has resulted in a mixed landscape of urban, suburban and rural land, although agriculture and the military bases are a large part of the economy. The County's population of 105,151 qualifies them to be a Phase II MS4 municipality with a pending permit. The MS4 permit makes the County subject to the NPDES stormwater rule.

## Strengths

ESD practices are promoted to treat road, rooftop and parking lot runoff; cluster design is encouraged; preserving natural lands, open space, and

reducing impervious cover is encouraged; minimum standards for roads and parking lots generally reduce impervious cover; effective requirements for clearing and grading, tree conservation and land conservation.

## Weaknesses

Minimum standards for road rights-of-way, parking ratios, parking lots, and driveways may result in creation of more impervious cover than is necessary; residential lot setbacks, buffer enforcement/education mechanisms, and model ordinances could be improved.

## Recommendations

1. Reduce the minimum pavement width for low density residential streets from 20ft. to 18ft.
2. Reduce minimum right-of-way width for residential streets to less than 45ft.
3. Reduce parking ratios for office buildings to 3 spaces per 1,000 sq. ft. of gross floor area.
4. Provide model shared parking agreements.
5. Require at least 30% of spaces at larger commercial parking lots to have smaller dimensions for compact cars.
6. Reduce the minimum front setbacks for a half-acre lot to 20 ft or less.
7. Reduce the minimum requirements for side setbacks for a half-acre lot to 8 ft or less.
8. Promote sidewalks that slope and drain to front yards.
9. Allow shared driveways in residential development.
10. Require open space areas to be consolidated into larger units.
11. In the stream buffer ordinance specify enforcement and education mechanisms.



# Washington County

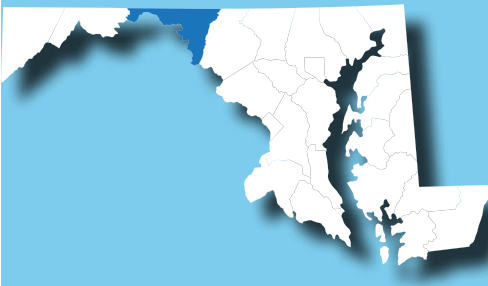


## Suburban Vulnerable

**Score: 49%**

**Urban Land: 23%**

**Projected Population Change  
(2010-2025): 17%**



**Washington County** is located in northern Maryland within an hour's drive of Baltimore and Washington, DC. The County is located in the Appalachian Mountains and is part of the Great Appalachian Valley. The County contains the City of Hagerstown and 8 other incorporated cities, towns, or villages plus 47 unincorporated areas. In addition, the County has 3 national parks, 7 state parks, 14 county parks, and additional city and town parks. The recent high growth rate has resulted in a mixed landscape of urban, suburban and rural land, although agriculture and tourism are a large part of the economy. The County's population of 147,430 qualifies it as a Phase II MS4 municipality, making it subject to the NPDES stormwater rule.

## Strengths

ESD practices are promoted to treat road, rooftop and parking lot runoff; cluster design is encouraged; preserving natural lands, open space, and reducing impervious cover is encouraged; effective requirements for clearing and grading, tree conservation and land conservation.

## Weaknesses

Minimum standards for road rights-of-way, lot setbacks and frontages, parking lots and driveways may result in creation of more impervious cover than is necessary; codes do not provide for effective management of open space; codes can provide stronger stream buffer management.

## Recommendations

1. Reduce the minimum pavement width for low density residential streets from 34 ft. to 22 ft.
2. For roads in more densely developed or commercial parts of the, allow parking lanes to also serve as traffic lanes (i.e., queuing streets).
3. Reduce minimum right-of-way width for residential streets from 50 ft. to 45 ft.
4. Allow landscaped islands within cul-de-sacs and alternative turnarounds.
5. Reduce parking ratios for office buildings to 3 spaces per 1,000 sq. ft. of gross floor area
6. Reduce parking ratio for shopping centers to 4.5 spaces or less per 1,000 sq. ft. of gross floor area.
7. Require at least 30% of spaces at larger commercial parking lots to have smaller dimensions for compact cars.
8. Allow shared parking and provide a model shared parking agreement.
9. Decrease the minimum parking stall length from 20 ft. to 18 ft.
10. Reduce the minimum front setbacks for a half-acre lot to 20 ft. or less, rear setbacks to 25 ft. or less; side setbacks to 8 ft. or less; and frontage to 80 ft. or less.
11. Allow sidewalks on one side of residential streets.
12. Allow shared driveways in residential development.

# Implementation

The primary goals of ESD are to maintain pre-development runoff characteristics and protect natural resources, which are accomplished by reducing impervious surfaces, conserving natural resources, and maximizing the use of stormwater practices that infiltrate, store or otherwise reduce runoff on-site. This report summarizes the results of a review of the development regulations for the nine Maryland counties located within the Potomac River Watershed and the District of Columbia and identifies recommended code changes that would remove barriers to and encourage greater use of ESD at new development and redevelopment sites. Because these same code barriers can limit the use of stormwater retrofits on existing developed sites, this review can also prepare the jurisdictions for implementation of the stormwater retrofits identified in its draft Phase I and II WIP and MS4 permits.

## Increased use of ESD in the jurisdictions would:

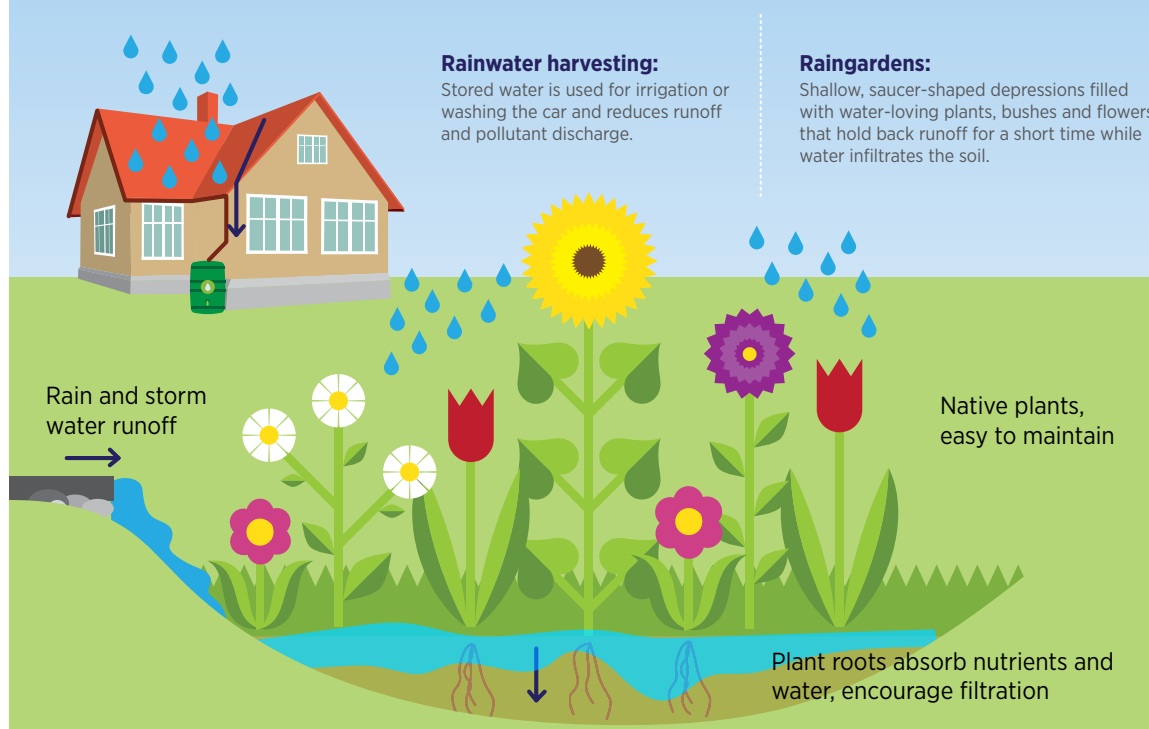
- address the Maryland Stormwater Management Act's requirement to implement ESD to the maximum extent practicable;
- allow for the use of on-site stormwater retrofit practices to reduce individual property owner's stormwater fee;
- help to ensure that any new development does not result in an increase in nutrient pollution, as is required by Maryland's Watershed Implementation Plan (WIP) to meet the Chesapeake Bay TMDL;
- help the County implement the goals identified in its draft Phase II WIP;
- reduce costs to developers, as many ESD practices are less costly than conventional ones (e.g., reducing impervious cover lowers clearing, grading and paving costs), and developers who increase nutrient pollution may need to offset these loads by purchasing pollution credits;
- provide a host of other local benefits, including shade, filtering of air pollutants, recreational amenities, wildlife habitat and more.

The Center for Watershed Protection's Better Site Design Manual (CWP, 1998) is also a useful resource for moving forward with code changes. For more information on jurisdiction-specific reviews and report findings, please visit [www.potomac.org/ESDscorecard](http://www.potomac.org/ESDscorecard).



*Photo Credit: Darren S Higgins*

## EASY AND COST-EFFECTIVE WAYS FOR HOMEOWNERS TO USE ENVIRONMENTAL SITE DESIGN ON THEIR PROPERTIES



There are always ways for private residents to make a difference for local waterways on their properties. Check out your local Department of Environment's website to find cost-share incentives that will help you improve the health of your watershed.

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*Founded in 1993, Potomac Conservancy is a member-supported nonprofit that works to ensure the Potomac River boasts clean water, healthy lands and vibrant communities. The Conservancy fights for improved water quality through conservation and advocacy, and empowers local landowners, volunteers, activists, partners and donors to lead the charge for clean streams and safe drinking water sources.*

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