

Watershed Stewards Academy Rainscaping Manual

WSA

Watershed Stewards Academy





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Introduction

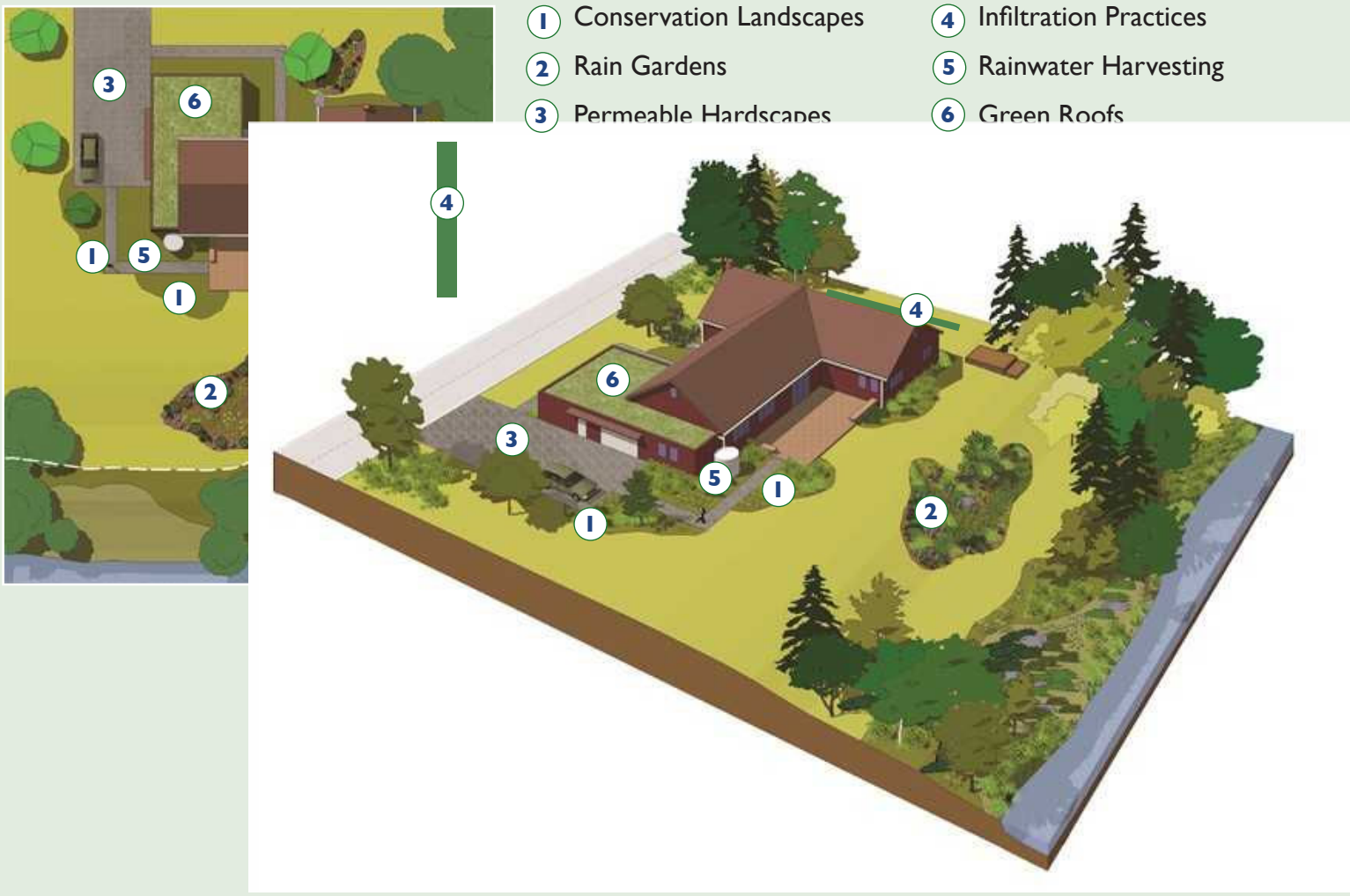


Figure I.1. *Stormwater Practices Included in the Manual*

1. Goals & Audience

The goal of this manual is to provide a resource to design, install, and maintain Conservation Landscaping and stormwater management practices suited primarily to residential and small commercial or institutional properties. These practices, when properly implemented, are attractive and functional landscape features that reduce, capture, absorb, and treat stormwater before it leaves a property.

The intended audience for this manual includes landscape contractors interested in implementing stormwater projects, but need more information and guidance on designing and building them. The content of the manual is geared to practices for residential or small-scale commercial or institutional properties, like houses of worship. However, the manual also points to other resources that apply to larger or more complex projects. These projects require additional technical expertise and/or the involvement of a licensed design professional (see **Section 6** of the Introduction and see the end of each individual chapter).





In the Chesapeake Bay watershed, one of the greatest threats to the health of the Bay and the local waterways comes from runoff from developed land, including streets, yards, driveways, rooftops, and other impervious, or hardened, surfaces and managed landscapes. These developed areas are characterized by hardened or compacted surfaces and less natural vegetation. This results in less rainwater soaking into the ground where it is naturally filtered before returning to our streams and rivers. When left untreated, such runoff can lead to increased flooding, erosion, and pollution of local creeks, streams, lakes, and the Chesapeake Bay.

In order to reduce stormwater runoff and protect and restore water quality and habitat, many local governments and watershed groups, such as Anne Arundel County and the Watershed Stewards Academy, are promoting the use of Conservation Landscaping and stormwater management practices on private properties. Small-scale practices that slow down, capture, treat, and infiltrate stormwater runoff can help combat the threats to local waterways and the Chesapeake Bay.

The emerging market for these types of practices has created a need for clear and consistent guidance on proper practice design, installation, and maintenance geared towards the landscape industry and residential, small-scale commercial and/or institutional projects. Implementation of these practices requires site-specific analyses and designs to fit the site and the client's needs and maintenance capabilities.

2. . Chapter Content

Each chapter focuses on a specific management practice. **Figure I.2** shows representative photos of each practice and the corresponding chapter number.

Each chapter also contains the following sections:

1. ***Project Complexity*** This will provide guidance to determine if the project complexity is within the scope of a contractor's abilities. Each chapter provides a table outlining if the project is SIMPLE, and thus can use the guidance in this manual, or MODERATE or COMPLEX, in which case additional professional services are likely needed from a licensed design professional and/or specialized contractor. Typically, this is the case for projects that require permits and stamped drawings from a licensed professional engineer or landscape architect, an erosion and sediment control plan, properly sized pipes and inflow and outflow features, and specialized equipment and training for installation and maintenance.
2. ***Location and Feasibility*** The practices covered in this manual require site-specific analyses of existing conditions. Considerations include soil and water table characteristics, buried and overhead utilities, surface water drainage patterns and topography, environmentally-sensitive areas to preserve, and existing native and invasive vegetation. All of these factors, as well as the client's needs, aesthetics, and landscape behavior, impact the location, suitability, feasibility, and long-term success of a practice. Each chapter describes the most important factors when choosing a location for the stormwater practice.
3. ***Design*** This section provides basic and typical design schematics and descriptions of the practice's main components. This includes simple calculations on how to estimate the size and footprint of the practice. All original landscape designs should be prepared in accordance with sustainable, conservation or ecological landscape design practices and principles.
4. ***Materials*** Standard materials needed to build each practice are listed in this section.
5. ***Construction*** This provides typical installation protocols with a step-by-step construction sequence.
6. ***Maintenance*** All landscapes and hardscapes require maintenance, whether they are designed for stormwater treatment or not. This section outlines common maintenance tasks and frequencies for each type of practice.
7. ***Resources and References*** Other literature and websites cited in the chapters are referenced in this section. Additional resources are listed for anyone interested in learning more about each specific stormwater practice.







Chapter 1. Conservation Landscapes

Conservation Landscaping is a broad term to describe landscapes that use locally-native plants, provide wildlife habitat, promote clean air and water, and utilize sustainable design principles. In the context of this manual, Conservation Landscapes describe a residential-scale practice that features landscape areas of native plants that provide more wildlife habitat and clean water value than the typical turf grass found in many American yards. Plants and healthy soils associated with these landscapes provide good ground cover, which slows down and filters pollution from stormwater runoff.

(Source: Montgomery Co. Department of Environmental Protection, RainScapes)

Chapter 2. Rain Gardens

Rain Gardens are shaped as shallow landscaped depressions that receive runoff from surrounding rooftops, driveways, or yard areas. Rain Gardens typically use a special sandy soil mixture that is particularly good at filtering runoff. Similar to Conservation Landscaping, native plants are the preferred plant material.





Chapter 3. Permeable Hardscapes

Permeable Hardscapes are commonly used alternatives to traditional impervious paving materials, such as concrete or asphalt. They allow water to seep into the ground by using permeable paver stones or similar materials and a gravel layer underneath. They are used for driveways, patios, walkways, or even parking lots.

(Source: North Carolina State University, Stormwater Engineering Group)

Chapter 4. Infiltration Trench or Dry Well

These practices are stone-filled trenches or pits that temporarily collect runoff, mostly from roof downspouts, and allow the water to percolate into the ground. Some variations have turf cover.





Chapter 5. Rainwater Harvesting

Rainwater Harvesting involves collecting roof runoff in a Rain Barrel or cistern, primarily for slowly releasing water into other practices for infiltration, such as Conservation Landscapes and Rain Gardens.

(Sources: Flickr Creative Commons)

Chapter 6. Green (or Vegetated) Roofs

Vegetated Roofs replace traditional roof materials with layers of special soil mixture, plants, drainage materials, and other components. The roof temporarily stores rainwater and allows it to gradually drain off.

(Source: Living Roofs, Inc.)



Figure I.2. *Practices Included in the Manual*





Table I.1 provides a relative comparison of each practice based on the following factors:

- ***Implementation Difficulty*** This describes the degree to which the practice requires specialized design, materials, installation expertise, and contractors. Practices with low difficulty can be implemented by most landscape contractors. Projects ranked medium and high may require the services of a design professional (e.g., engineer or landscape architect) and/or contractor with past experience and specialized capabilities.
- ***Typical Cost Range*** This range of construction costs is based on the area of the stormwater practice. For example, a 100 square foot Conservation Landscape would cost approximately $500 or more to have professionally installed by a contractor. These costs will vary significantly, depending on the contractor, practice size, materials used, and other factors. No general estimate will replace the value of a specific written estimate from an installer.
- ***Runoff Reduction Benefit*** This shows how well the practice reduces runoff volumes and, as a result, pollutant loads that may leave the property. The numbers in the table are based on research adopted by Virginia and other Chesapeake Bay states, and they relate to the drainage area for an individual practice.

Table I.1. Comparison of Practice Implementation Difficulty, Relative Cost, and Relative Stormwater Benefits

Practice	Implementation Difficulty	Typical Cost Range, Installed[1]	Potential Runoff Reduction Benefit[2]
Chapter 1 Conservation Landscapes	Low to Medium	$5-20 / square foot	25 - 50%[3]
Chapter 2 Rain Gardens	Medium	$8-25 / square foot	40-80%
Chapter 3 Permeable Hardscapes	Medium to High	$6-12 / square foot	45-75%
Chapter 4 Infiltration Trenches and Dry Wells	Medium	$18-22 / square foot	50-90%
Chapter 5 Rainwater Harvesting	Low to Medium (Potentially High for commercial or industrial)	$100-1,000 for residential scale $1,000 and up for commercial scale	Varies (up to 90)[4]
Chapter 6 Green (or Vegetated) Roofs	High	$20-35 / square foot	45-60%

1 Derived from: King, D., and P. Hagen. 2011. Costs of Stormwater Management Practices in Maryland Counties. Prepared for Maryland Department of the Environment by the University of Maryland Center for Environmental Services. Technical Report Series No. TS-626-11 of the University of Maryland Center for Environmental Science. Costs modified for Anne Arundel County, based on anecdotal data and scale considerations. Actual construction costs will vary depending on materials and contractual services.

2 Runoff reduction values from the Virginia Stormwater BMP Clearinghouse. The range presented depends on the design of the individual practice, and the drainage area contributing runoff to it. http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html

3 The cost and runoff reduction value for Conservation Landscapes is variable, depending on an installation's size, depth, and whether it collects runoff from uphill areas (e.g., yards, driveways). The upper end of the runoff reduction range is based on the Virginia BMP Clearinghouse practice known as "Sheetflow to Vegetated Filter Strip," and assumes some treatment of uphill areas. For cost, the Conservation Landscape may not necessarily treat an uphill impervious area. In these cases, it would best to use the WSA Landscape Conservation Design Tool for a more accurate estimate.

4 The runoff reduction value for Rainwater Harvesting is dependent on the size of the rooftop area captured, size of the tank, and demand or drawdown of the water stored in the tank.



3. How Stormwater Practices Differ From Common Landscaping Practices

While the practices in this manual use standard landscaping materials, there are some key differences when compared to traditional landscapes or hardscapes. Stormwater practices differ in placement, materials, function, underlying structure, installation techniques, and maintenance. These differences are illustrated in **Figure I.3** and described below:

Designed to Collect and Store Runoff Rain Gardens, and some other stormwater practices are shaped and positioned as shallow depressions to collect runoff from roof downspouts, driveways, patios, and surrounding yard areas. In contrast, traditional landscape beds are usually raised or mounded up compared to the surrounding ground such that runoff flows around, rather than into, the beds. Conservation Landscaping is designed to filter and slow down stormwater, provide habitat, avoid the use of pesticides, herbicides, and fertilizers and, once established, reduce long term maintenance and irrigation needs. Permeable Hardscapes are designed to absorb or store stormwater rather than to shed it rapidly downstream. Site work often requires extra precautions and different construction techniques to avoid sedimentation or soil compaction during installation or maintenance.

Beneath the Surface Almost all stormwater practices contain underground layers of a special soil mix and/or gravel. These layers may not be present with traditional landscaping. The underground layers require additional excavation or digging. It is critical that the underlying soil is not compacted during installation. The materials used are often specified and often can't be substituted if the practice is going to qualify as a stormwater practice. The purpose of these layers is to temporarily store runoff within the pore spaces of the layers, slow it down, and let some or all of it percolate into the ground. Each chapter in this manual contains specific details about the underground layers specific to each practice.

Plants The prevailing wisdom for vegetated stormwater practices is to use, to the extent possible, native plants. As with any plant, make sure the plant is suited for the growing conditions at the site. Native plant communities combined with healthy soils attract local pollinators and wildlife, thrive in the local climate, reduce the need for fertilizers, pesticides, herbicides, and excess water, and simulate the runoff cleansing benefits of natural ecosystems. There are many cultivars of native plants available through nurseries, so it is best to consult with a Watershed Steward or knowledgeable local nursery about the native plants available.







Traditional	Stormwater
Designed to Collect & Store Runoff	
 Most landscape islands are raised up on curbs and water flows around them to enter the storm sewer.	 Rain Garden is in a slight depression where it collects and treats runoff from the parking lot.
 A typical paved driveway produces a lot of stormwater runoff.	 Driveway is constructed from permeable materials to let water soak in. *(Source: South River Federation)*
Beneath the Surface	
 Most landscaping has a few inches of mulch placed on top of the existing soil, which may be compacted. Compacted soil is not a very good sponge for absorbing runoff.	 Depending on the practice, the design uses underground layers of a special soil mix and/or gravel to absorb stormwater and let it percolate into the ground. *(Source: Alliance for the Chesapeake Bay)*
Plants	
 Most landscaping uses common, commercially-available plant stock, much of which is comprised of non-native species or cultivars.	 This Conservation Landscape replicates native plant communities from the surrounding landscape.

Figure I.3. *Key Differences Between Traditional Landscaping and Stormwater Practices*





4. Cost-Share Eligibility

Many local governments, regional watershed associations, and other entities provide some type of incentive (e.g. technical assistance, stormwater fee "credit" or a cost-share) for homeowners, small businesses, and houses of worship to implement these practices. Often localities that fund their stormwater management programs through a stormwater utility fee offer a reduction in the fee assessed to a property or credit, when a property owner implements an on-site stormwater project. Other programs may provide up-front cost-share assistance or rebates to the property owner to offset design, material, and construction costs.

Check with the local stormwater department to ascertain whether cost-share assistance or a utility fee credit is available. The Chesapeake Stormwater Network has a list of organizations that offer financial, technical, or other assistance. Go to: *http://chesapeakestormwater.net/be-bay-friendly/directory-residential-bmp-programs/.*

Another good resource for Anne Arundel County Rain Gardens and the local approval process can be found here: *http://www.aacounty.org/DPW/Highways/RainGarden.cfm*

5. Chesapeake Bay Clean-Up Goals

Most of the practices in this manual -- if designed, installed, and maintained properly -- can be counted towards the local Chesapeake Bay pollutant reduction targets. These are required through water quality permits, stormwater management programs and/or Watershed Implementation Plans (WIP). Check with the local government stormwater program to determine which practices have local incentives. Special protocol or construction techniques are may be required and there may be specific reporting guidelines.

Counting Your Practice All the practices described in this manual reduce pollutants to local waterways and the Chesapeake Bay. Anne Arundel County, and other jurisdictions, can count these practices in their overall plan to reduce pollutants from the community. The *Stormwater Management and Restoration Tracker (SMART) Tool* was developed by University of Maryland Extension as an online portal for private property owners in Maryland and Virginia to report a wide variety of types of stormwater management practices that are built on their property.

Once the user enters the relevant details, the tool computes the estimated average annual nitrogen and phosphorus pollution load reduction that will be achieved by the practice over its lifetime. The SMART Tool continues to evolve; visit *http://www.extension.umd.edu/watershed/smart-tool* to find the latest version of the tool and to see a complete list of the types of stormwater practices that can be submitted.

Local jurisdictions may have their own means of tracking projects. For Anne Arundel County, visit *http://www.aarivers.org*

6. Resources for More Complex Projects

As stated earlier, the practices and methodologies outlined in this manual are primarily suitable for residential and small commercial or institutional properties. Landscape professionals using this manual may be confronted with larger or more complex projects that require additional design, installation, and/or maintenance expertise, equipment, or permits to comply with local or state regulations. This is particularly true for projects that must undergo a plan review process, require erosion and sediment control plans, and/or must adhere to local or state stormwater standards. The beginning of each chapter in this manual provides some guidance for the user to assess the technical complexity of a given project and the need for additional expertise and resources, such as a local or state stormwater management design manual.





For more detailed specifications, the following are offered as good sources the Chesapeake Bay watershed:

- Anne Arundel County, Design Manual and Standard Specifications and Details for Construction (Chapter VI) & Stormwater Management Practices & Procedures Manual:
  http://www.aacounty.org/DPW/Engineering/DesignManual.cfm

- Department of Environment, Maryland Stormwater Design Manual, Volumes I and II:
  http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Pages/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.aspx

- Virginia Department of Environmental Quality, Virginia Stormwater BMP Clearinghouse (NOTE: not applicable from a regulatory standpoint in Maryland, but contains some updated stormwater practice specifications as a general reference):
  http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html

Other resources specific to small-scale homeowner stormwater practice implementation in the Chesapeake Bay watershed include:

- Chesapeake Stormwater Network, Homeowner Guide For a More Bay-Friendly Property:
  http://chesapeakestormwater.net/2013/04/homeowner-bmp-guide/

- RiverWise manual & website
  http://stormwater.allianceforthebay.org

- Montgomery County, MD Rainscapes: *http://www.montgomerycountymd.gov/dep/water/rainscapes.html*

- Low Impact Design Center: *http://www.lid-stormwater.net/index.html*

- Anne Arundel County Watershed Protection and Restoration Program:
  http://www.aarivers.org