

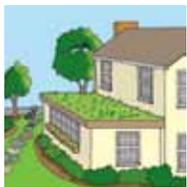


RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Green Roofs

Why should I install a green roof?



Typical rooftops are hard surfaces that cannot absorb rainwater, so they contribute

to stormwater runoff and increased pollution to streams. A green roof on a house or building allows rainwater to be absorbed by the plants and soil that are incorporated on the roof. This plant-based living roof reduces the amount of water leaving the property. This RainScapes technique reduces the environmental impact of a building roof, and usually provides energy savings and maintenance benefits.

Each green roof is unique and the type of benefits it provides will vary depending on the type of system installed. Studies have shown that 50 to 60 percent of annual rainfall at a site can be captured by green roofs, which significantly reduces runoff and harmful downstream ecological and environmental effects.



Green roof tray system - UMD Shady Grove campus

What is a green roof?

A green roof is a rooftop partially or completely covered with a specifically designed soil and vegetation system. Green roofs create living green spaces on top of buildings and structures that help to capture rainfall and reduce stormwater runoff. This captured water may be used by plants on the roof, released back to the atmosphere through evaporation, or it can be reused in other locations on the property.

Green roofs are a roof system that includes a waterproof membrane, filter fabric, drainage layer, root barrier, growing medium (soil), and plants. Green roofs may be constructed using modular units that contain all components listed above, or the components may be installed step-by-step directly on the building's roof deck.

The two main types of green roofs are extensive or intensive green roofs.

Extensive green roofs are typically lighter and thinner, which makes them more suitable to residential properties, while intensive roofs are thicker, heavier, and are designed to support trees and larger shrubs.



Green roof tray system

Extensive green roofs are designed to be lightweight and to maximize the performance and environmental benefits that a green roof can bring to a building. Extensive green roofs feature a layer of growing media that is 6-inches deep or less and are planted with drought-tolerant plants. Extensive systems require less maintenance and have simpler irrigation and drainage systems, if they have any at all. Existing roofs on porches, garages, sheds, and sunrooms are excellent candidates for extensive green roof retrofits.

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Green roof tray system

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Currently, only extensive green roofs constructed on existing buildings (retrofits), whether applied in an integrated approach (replacing the existing roof and applying the layered components directly onto the roof's surface) or in modular units (placed on top of the existing roof), are eligible for rebates under the RainScapes Rebate Program. Green roofs for new construction are not eligible for rebates at this time.

What are the benefits and incentives?

In a typical neighborhood, more than half of the impervious area is from rooftops.

Green roofs capture rainfall, and slow and reduce runoff. As stormwater filters through the soil and is taken in through plant root systems, pollutants are absorbed, reducing the volume of pollutants that enter nearby streams. Water (that is not used by the roof plants or released to the atmosphere) is filtered and can be directed to other RainScapes techniques such as dry wells or rain gardens, which provide additional treatment and infiltration. Excess water may also be directed to and stored in rain barrels or cisterns and used for irrigation of the roof itself or other landscaped areas in times of little rainfall. By doing things like this, the amount of runoff from your property is greatly reduced, which can help to protect your community's stormdrain system.

Green roofs provide building insulation, which often results in decreased heating and cooling costs. The soil and plants of a green roof protect the building's roof membrane from ultraviolet rays that break down conventional roofs. For this reason, green roofs have been shown to last up to twice as long as conventional roofs, reducing overall replacement and maintenance costs.

A green roof enables you to play a role in preserving the environment and conserving water resources. This practice may also increase your property value through increased visual appeal and lower energy bills.

The **RainScapes Rewards Rebate Program** offers a rebate for residential applications and commercial, multi-family, and institutional applications. To see the requirements and submit the RainScapes Rewards Rebate Application, please visit www.rainscapes.org



Shed green roof in shade



Green roof on addition



Steeper roof applications need a more engineered approach



Parts of a green roof

How to...

Assess Your Property

A qualified roofing contractor, who may be assisted by a landscape architect, is critical to the success of your system. A contractor who is experienced in green roof installations may assist with the selection of materials and placement of products, and help you assess your property. When considering installing a green roof you should evaluate the condition of your current roof and have a licensed professional evaluate its structural capacity. The amount of weight (load) your roof can sustain will determine the type of green roof product to select as well as whether you can cover the entire roof or only a portion of the roof. The load capacity of your roof will also determine the maximum soil depth your system can have. **The roof must be designed with a minimum of 4 inches of soil but no more than 6 inches, to qualify for the rebate.** You will also need to determine the slope and amount of drainage from your current roof. If your building has a flat roof, you will need an additional drainage layer and steeper roofs will require additional tools to hold soil in place. While it is possible to install a green roof on rooftops with slopes of up to 40 degrees, a 5 to 20 degree slope is optimal to ensure excess runoff can drain naturally.

If a green roof is feasible, assess the amount of sun and wind exposure your green roof is likely to experience. Green roofs are most successful with full or partial sunlight. Your plant selections will depend on these factors, as well as the amount of rainfall the roof is to receive and the soil depth your roof can support. It is also important to consider maintenance and accessibility of the system, and the amount of maintenance required for the plants you select. **To receive a rebate you will also need to ensure that your green roof area is at least 300 square feet or one-quarter of the roof area (whichever is smaller). The green roof must also replace an existing roof area rather than expand the original roof footprint.** For more information, please see the rebate application at rainscapes.org.

How to... Design and Plan

While a qualified green roofing contractor will help with determining the design of your green roof, you may also need to involve a landscape architect for assistance with the landscape design and plant selection. Plant selection should be based on climate, type and depth of growing medium, loading capacity of your roof, height

and slope of roof, maintenance, and presence or absence of an irrigation system. Your contractor will determine your maximum capacity, but the most consistent storage for extensive green roofs occurs in those with soil depths of approximately 4 inches. A runoff calculation report must be prepared by the certified green roof designer/

contractor to prove that the green roof will capture the required runoff. A statement on the structural analysis will also be provided by the contractor.

Can I do this project myself?

Green roofs are not recommended as a do-it-yourself project. To be eligible for the RainScapes Rebate, a certified green roof contractor must install your green roof.

What should I ask a potential contractor?

- What experience do you have installing green roofs (modular units or integrated systems)?
- Are you certified with any nationally recognized organizations?
- Are you a licensed roofing contractor, architect, landscape architect, or engineer who can perform a structural load analysis to determine the feasibility of installing a green roof on my existing roof?
- Can you provide a runoff calculation report for this roof?
- Can you supply references from previous clients?
- Do you intend to use subcontractors?
- Are you insured and bonded in Maryland?
- Do you have a portfolio of completed projects?
- What design do you envision for my green roof?
 - » What types of plants do you typically use?

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- » Who installs the drainage systems for your green roof design?
- What is included in your services?
- How long do you expect the project to take?
- Do you offer a guarantee for your work?
- Are you available to perform ongoing maintenance of the green roof if needed?
- How much will your services cost?

Build/Implement

Installation of a green roof requires a qualified roofing contractor with experience in green roof installation to install the non-living components. Whether it is a modular interlocking grid system or an integrated system in which components are installed directly on the roof surface, a green roof consists of several layers. From top to bottom a typical green roof consists of a vegetation layer, growing medium (soil), soil retention barrier, roof barrier, drainage layer, filter fabric, and waterproof membrane. The separation layer protects the membrane from root penetration, and the membrane itself protects the roof from leaks. The contractor must certify that a licensed professional has performed a structural load analysis for the green roof, and this documentation must be submitted with your RainScapes application. Any extensive green roof that requires a modification to the roof's structure must undergo a building permit review

through the [Montgomery County Department of Permitting Services](#).

This is separate from the RainScapes application and must be done prior to rebate processing.

Costs

Costs for green roofs will vary widely depending on the application selected, the size of the area to be planted, and the planting materials. Costs for extensive green roofs vary from \$10 to \$30 per square foot depending on the type of system, structural support, and plantings. Initial costs for green roofs are generally higher than traditional roofs, and retrofits may make projects more costly due to load limitations, but long-term savings can offset these costs.

Maintenance

Green roofs are designed to withstand harsh conditions and most require little maintenance. They may need to be irrigated during initial seasons until plants are established and during extreme drought periods. Although, plant selection can help reduce the amount of irrigation required. If irrigation is necessary, sprinkler systems or membranes that store rainwater can be installed. The water passing through the system can be captured through other RainScapes techniques and used for irrigation as mentioned above. Pesticides should not be used. The roof should be monitored closely to make sure vegetation remains healthy and that weeds are controlled.

Different applications

Extensive green roofs may be installed as integrated systems that are applied directly on the roof's surface in layers, or they may be installed in modular units. Each type has benefits and limitations, and your contractor can help you choose the type that is right for your application.

For more information

Green Roofs for Healthy Cities

www.greenroofs.org

GreenSave Calculator (long-term costs and benefits of green roofs compared to traditional roofs)

http://www.greenroofs.org/index.php?option=com_content&task=view&id=626&Itemid=116

Ecoroof recommended plant list

<http://www.portlandonline.com/shared/cfm/image.cfm?id=55831>

“Green Your Garage: Volume 1” <http://roofbloom.org/roofbloom-vol1-082007.pdf>

Modular Green Roofs
www.greengridroofs.com



Green roof plants