What's Happening to the Water Cycle?

As we develop our land and increase the amount of paved surfaces and buildings (known as impervious cover), the water cycle is changed. Less rainfall and snowmelt sinks into the ground and more water flows rapidly over the land into our lakes, rivers and estuaries. Stormwater runoff can lead to increased flooding, erosion and pollution and decreased groundwater recharge during dry periods.

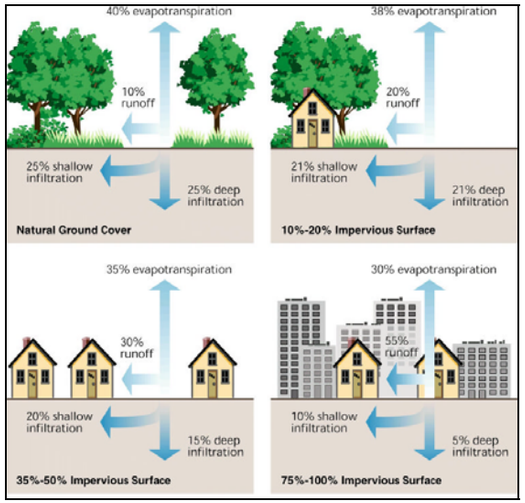


Photo: FISRWG

As impervious surfaces increase, the problems associated with stormwater quality also increase. Stormwater can contain pollutants such as sediment, nutrients, bacteria and chemicals that can threaten aquatic health, and contribute to the loss of water dependent recreational activities. Unmanaged stormwater is recognized nationally as the leading cause of water pollution today.

Conventional methods of land development collect and convey stormwater quickly into a series of drains and pipes that flow directly into the closest waterbody with little or no water quality treatment.

How can we help? Consider a Green Roof!

Low Impact Development (LID) techniques manage stormwater runoff by mimicking the natural movement of water in the environment. A great way to decrease the volume of stormwater runoff in your community is to consider **INSTALLING A GREEN ROOF**. Green roofs are designed to absorb precipitation with vegetation and soil, which then return the water to the air through evaporation and transpiration. They can improve water quality by filtering out harmful metals and sediments that carry pollutants to our rivers and streams. Green roofs can also help to reduce energy costs by providing insulation, thereby decreasing demand on heating and cooling systems.

The Aetna Building green roof in Hartford

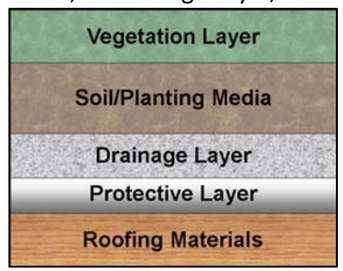
As a part of a larger stormwater management program, green roofs can help to:

- Reduce local flooding
- Reduce the need for sewer upgrades by reducing the amount of stormwater entering sanitary sewer lines
- Reduce heating and cooling costs
- Reduce greenhouse gas emissions
- Improve water quality
- Create wildlife habitat
- Provide "green" public spaces

Installing a green roof is a way to make your home environmentally friendly, while saving you money on your energy bills. Green roofs can be used for a variety of purposes including your own roof at home, bus shelters, and even dog houses!

Types of Green Roofs

Green roofs are specially designed systems that consist of layers of vegetation and growing media, a drainage layer, and a waterproofing membrane. The ability of a structure to support a green roof system should be evaluated by a qualified engineer prior to installation. There are two types of green roofs: extensive and intensive.



Extensive green roofs usually have a shallower soil depth, weigh less when saturated, and are available in pre-planted grid systems. This type of roof is a good choice for retrofit projects because it is lighter weight and can be installed on slopes of up to 30%. This type of green roof best supports small grasses, non-invasive wildflowers, sedums, and other low-profile succulents.

Pre-planted green roof grid

Intensive green roofs have deeper soil depths and weigh more. Due to the higher weight load, this type of roof may not be appropriate for retrofitting older buildings. Intensive green roofs are often accessible to the public, so they are best placed on flat roofs. Due to the deeper soil layer, plantings can include non-invasive larger grasses, ornamental perennials, shrubs, and trees.

Green roof in New Haven

Benefits of Green Roofs

The EPA recommends green roofs as a way to help control nonpoint source pollution from stormwater runoff. A properly installed green roof will also extend the life expectancy of the underlying roofing materials by protecting them from heat, harmful UV rays, and weather events. Green roofs also lower energy costs by providing thermal insulation, which helps to keep buildings cooler in the summer and warmer in the winter. They also help to reduce the heat island effect that occurs in cities during the summer months. Additional benefits of green roofs include aesthetic enhancement, habitat for wildlife, and reduction of interior noise levels.

Gant Plaza green roof at UConn -Storrs

Residential Options for Green Roofs

Green roofs are a great option for several residential projects including:

- Apartment Buildings
- Patios and other paved open spaces
- Garages
- Sheds
- Houses
- Dog houses

The Hollander Foundation Building green roof in Hartford

By minimizing the amount of impervious cover on your property through the use of a green roof, you can personally make a difference in the health of Connecticut's rivers, lakes, streams, and estuaries!

Common Questions About Green Roofs

Do green roofs work in the winter?

Green roofs function like any other garden during the winter months. Because they are planted with hardy plants, which are adapted to harsh conditions, green roofs overwinter well and regenerate in the spring. In very cold environments, a thicker soil base can be installed to prevent freezing and a layer of snow on the green roof can actually protect the plants.

Do green roofs leak?

Properly installed green roofs do not leak any more often than traditional roofs. In fact, green roofs can protect the roofing materials below by shielding harmful UV rays and protecting them from adverse weather events. However, it is important that green roofs have a suitable drainage path for excess water that is not absorbed during larger storms. All green roofs should be designed to move excess water away from the building. This water can then be directed to rain gardens or cisterns.

How do you maintain green roofs?

Green roofs have similar maintenance requirements to traditional gardens. Depending on plant selection and weather, a green roof may need to be watered and fertilized for the first 1-2 years. After the plants are established, minimal maintenance is required - weeding and pruning in the spring. Plus, because green roofs are planted with hardy sedums and succulents, they tend to be drought resistant.

How much do green roofs cost?

The costs of green roofs can range from $12 per square foot to $100 per square foot, depending on the type of green roof, size of the project, and plant selection. The initial costs may be higher than a traditional roof but this is often offset by savings in energy use for cooling in the summer and heating in the winter and reduced stormwater infrastructure costs.

Want to Know More? Click to Explore!

Resources in Connecticut:

Connecticut DEEP's Watershed Management Program:
www.ct.gov/dep/watershed

CT DEEP's *2004 Connecticut Stormwater Quality Manual*:
www.ct.gov/dep/cwp/view.asp?a=2721&q=325704&depNav_GID=1654

UCONN's Nonpoint Source Education for Municipal Officials (NEMO*) Planning for Stormwater* web site:
http://nemo.uconn.edu/tools/stormwater/green_roof.htm

A listing of Low Impact Development projects in Connecticut, including green roofs:
http://clear.uconn.edu/tools/lid/index.htm

EPA Resources

The EPA's Green Roof/ Urban Heat Island Web Site:
http://www.epa.gov/hiri/mitigation/greenroofs.htm

The EPA's Green Infrastructure Web Site – Green Roofs:
http://cfpub.epa.gov/npdes/greeninfrastructure/technology.cfm#greenroofs

Urban Green Roof Initiatives

Green Roofs for Healthy Cities Web Site:
http://www.greenroofs.org/

City of Chicago Green Roof Web Site:
http://www.artic.edu/webspaces/greeninitiatives/greenroofs/main.htm

Benefits of Green Roofs

An economic analysis of green roofs:
http://www.erb.umich.edu/News-and-Events/colloquium_papers/Clarketal.pdf

Water Quality and Quantity Monitoring Results:
http://ddoe.dc.gov/ddoe/frames.asp?doc=/ddoe/lib/ddoe/2009.05.04_Green_Roof_Monitoring.pdf

LID Urban Design Tools – Green Roofs
http://www.lid-stormwater.net/greenroofs_benefits.htm

Additional Town Information:

Including contacts and local resources

Fifth Brochure of the LID Series

For more information contact Connecticut DEEP's Watershed Management Program:

(860) 424-3020

http://www.ct.gov/dep/watershed

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Rainfall as a Resource

A Resident's Guide to Green Roofs in Connecticut

This green roof on the Hollander Foundation building is a part of a mixed-use, affordable residence housing project and was the first green roof installed in Hartford. Photo: CT DEEP

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