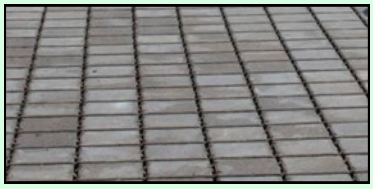
Green Innovation Grant Program
Green Infrastructure Practices

Permeable Pavement

Permeable Pavement is designed to convey rainfall through the pavement surface into an underlying reservoir where it can infiltrate, thereby reducing stormwater runoff from a site. Given appropriate soil and subsurface conditions, permeable pavements can be used in any type of development, for example: roads, parking lots, sidewalks, basketball and tennis courts, playgrounds, and plaza surfaces. Permeable pavement includes pervious asphalt and concrete and pervious pavers such as reinforced turf, interlocking modules, and pavers.

Porous Asphalt



Porous Pavers

Grass Pavers

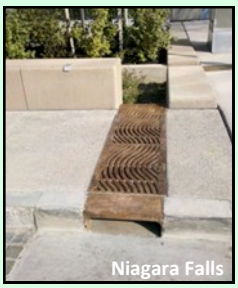
Bioretention

Town of Amherst Bioswale

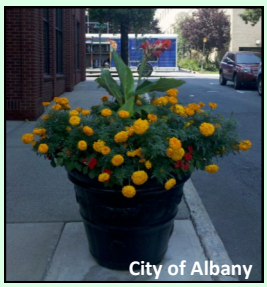
Rain Garden

Bioretention systems are shallow vegetated depressions often referred to by a variety of names such as bioinfiltration areas, biofilters, rain gardens, bioswales, or recharge gardens. They are very effective at removing pollutants and reducing stormwater runoff. These systems are designed to collect water in the depression where it ponds on the surface. This water is then used by the vegetation in evapotranspiration and infiltrated into the soil. Larger volume systems may be designed to include stone or sand beds for storage underneath the soil to provide additional capacity.

Properly designed bioretention practices mimic natural ecosystems through species diversity, density, and distribution of vegetation. The use of native species results in a system that is resistant to insects, disease, pollution, and climatic stresses.



Infiltration Planters



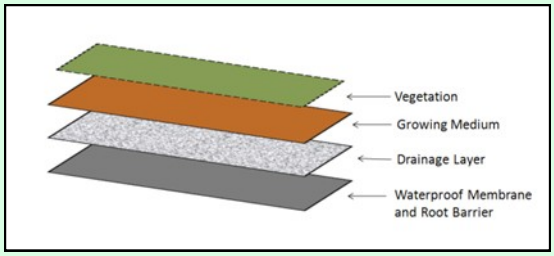
Container Planters

Stormwater Planters are a type of bioretention. These specialized planters are designed to manage stormwater through filtration, infiltration, and evapotranspiration. There are three main types of stormwater planters: container planters, infiltration planters, and flow-through planters. All three types of planters include three common elements: planter “box” material, growing media, and vegetation.

Green Roofs and Green Walls

Green Roofs consist of vegetation, growing media, and drainage layers installed on top of a roof. Green roofs reduce stormwater runoff and attenuate peak flows through absorption and evapotranspiration by the vegetation - water evaporates off the plant and soil surface and in larger storms, a portion runs off after being detained on the roof. In addition to stormwater benefits, green roofs have been shown to extend the service life of the roof membrane by two to three times by protecting it from mechanical damage, shielding it from UV radiation, and reducing extreme temperature fluctuations. Research has shown that green roofs reduce energy costs by acting as a heat sink and providing evaporative cooling of the air above the roof surface as part of the evapotranspiration process. They have also been shown to reduce the urban heat island effect and filter dust particles and other pollutants from the air.

Steele Memorial Library in Elmira, NY



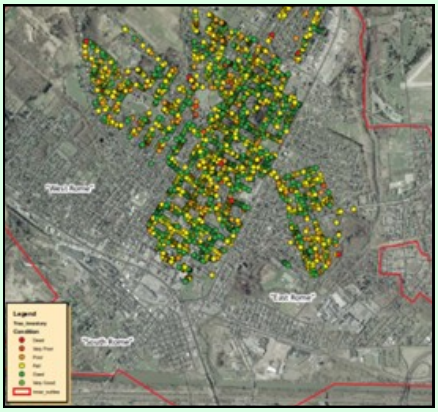
Simple Schematic of a Green Roof

There are two types of green roofs: extensive and intensive. Extensive green roofs are thinner, lighter, less expensive, and generally require low maintenance. Intensive green roofs often have pedestrian access and are characterized by a deeper soil layer with greater weight, higher capital cost, increased plant diversity, and more maintenance requirements.

Green Walls are typically vertical systems which consist of a container to hold growing media and vegetation. Vegetation can be rooted in the ground, in modular containers, in growing blocks, or in growing mats located at various heights along the face of the structure. Green walls provide air quality, stormwater benefits, and can help to reduce energy usage.

Stormwater Street Trees/Urban Forestry Programs

The City of Utica Street Trees


City of Rome's Tree Inventory

Stormwater Trees and Urban Forests can provide water quality benefits in addition to numerous other benefits including: reduced energy usage by shading buildings in the summer to reduce thermal loads and blocking winter winds, providing wildlife habitat, sequestering carbon dioxide and other greenhouse gases, intercepting and absorbing pollutants through their leaves and branches, increasing property values and revenues, reducing crime, engaging residents in creating safer neighborhoods, improving walkability of communities, traffic calming, and promoting smart growth.

Key elements of an Urban Forestry Program include a detailed inventory and map of existing and proposed trees. This enables a community to best manage and maintain their urban forest. The inventory and map usually include detailed data on each tree with respect to species, site, condition, and management needs. This baseline data helps to ensure the success of the program by determining the location and species for planting and managing an effective maintenance program to ensure tree health.

Riparian Buffers, Floodplains and / or Wetlands

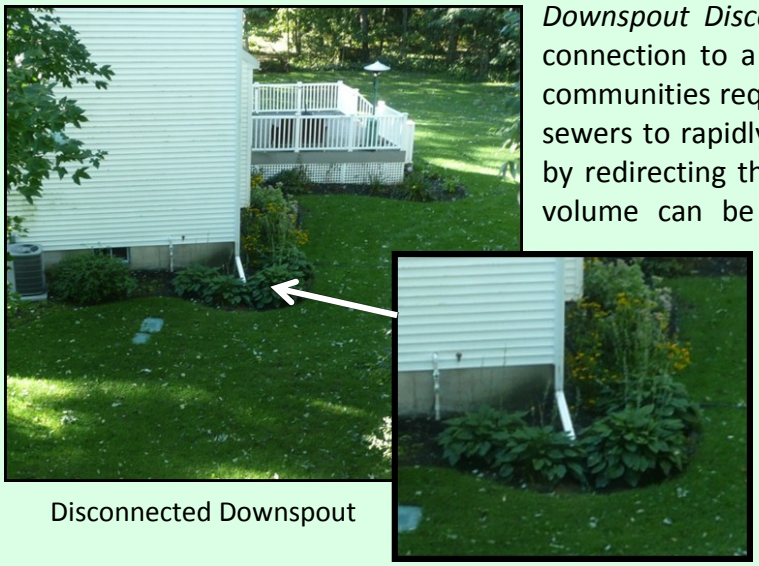
Riparian Buffers are vegetated or undisturbed natural areas which help to protect a waterbody from pollutants by absorbing or infiltrating runoff before it enters the waterbody. These riparian zones reduce sediment, nitrogen, phosphorous, pesticides, and other pollutants by intercepting them and soaking the water and associated pollutants into the ground. Healthy riparian buffers provide habitat, stabilize channels and banks, improve water quality, provide stream shade and temperature control, and improve aesthetics.

Wetland Creation in Tioga County

Floodplain Restoration re-establishes the natural water right-of-ways that provide temporary storage for large flood events, keeping people and structures out of harm's way and preserving riparian ecosystems and habitats. Over time, people have filled-in and built on floodplains, thereby reducing nature's ability to cope with large rain events. Restoring these floodplains enables them to provide safe storage in large events, reduce volume through infiltration and evaporation, and filter sediment and nutrients from the water before it reaches or re-enters the larger waterbody. Floodplain restoration may include the rehabilitation of riparian buffers.

Constructed Wetlands are shallow marsh systems planted with emergent vegetation that are designed to treat stormwater runoff. They are extremely effective for pollutant removal. They can also mitigate peak rates and reduce runoff volume. Constructed wetlands are often categorized in four groups: shallow wetlands, extended detention shallow wetlands, pocket wetlands, and pond/wetlands. Shallow wetlands are large and primarily accomplish water quality improvements. The extended detention shallow wetland is similar to the shallow wetlands but it uses extended detention to accomplish both water quality and peak rate control. Pocket wetlands serve a smaller drainage area (usually between 5 and 10 acres). Finally, pond/wetland systems are a combination of a wet pond and a constructed wetland. All of the constructed wetlands have considerable aesthetic and wildlife benefits and are a good option for retrofitting existing detention basins.

Downspout Disconnection



Disconnected Downspout

Downspout Disconnection is the removal of roof runoff from a direct connection to a combined or storm sewer system. Historically, many communities required that roofs direct stormwater conveyance to storm sewers to rapidly convey the water away from the structure. However, by redirecting the rain to a designated vegetated pervious area, runoff volume can be greatly reduced and water quality benefits can be achieved. When disconnecting a downspout, the runoff is directed to a vegetated and pervious area where plant and soil can filter and infiltrate the water. It is important to make sure the practice is sized according to the drainage volume.

Stream Daylighting—restoring natural stream morphology

Stream Daylighting is the unearthing of natural streams from artificial pipes and culverts to restore a natural stream morphology that is capable of accommodating a range of hydrologic conditions while also providing biological integrity. Stream daylighting restores habitat, promotes infiltration, helps reduce pollutant loads, and can provide better runoff attenuation because it increases the storage size of the natural system. The historic enclosure of rivers and streams often took place in urbanized areas to accommodate development. Stream daylighting re-establishes stream banks where culverts once existed. This often requires updating of existing grey stormwater infrastructure. When the operation is complete, what was once a linear pipe of heavily polluted water can become a meandering stream with dramatic improvements to both aesthetics and water quality. Stream daylighting is not only an important water quality practice, but it is also a powerful economic development and community revitalization tool.

City of Yonkers Sawmill River Project

Stormwater Harvesting and Reuse — rain barrels, cisterns, and reuse

Residential Rain Barrel in Utica, NY

Rain Barrels are storage tanks that collect rain from rooftops typically utilized in residential settings. *Cisterns* are large-scale storage tanks used in commercial and industrial settings. Rain barrels and cisterns store stormwater runoff to irrigate lawns and landscaping, or the water can be filtered and used for non-potable activities such as car washing or filling swimming pools. Rain barrels and cisterns may be constructed of any water-retaining material; their size varies from hundreds of gallons for residential uses, to tens of thousands of gallons for commercial and/or industrial uses. The storage systems may be located either above or below ground and may be constructed of on-site material or pre-manufactured.

For more information about the Green Innovation Grant Program, or to learn more about the variety of programs offered by EFC, please visit www.efc.ny.gov.

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