GREEN INFRASTRUCTURE

Manage rainwater runoff near its source to emulate the area's pre-development hydrology, using green infrastructure practices that allow rainwater to percolate into the soil.

Green Infrastructure, also known as low impact development, light imprint, or environmentally sensitive design, is used to avoid or minimize the impact of rainwater runoff on the environment, especially upon wetlands and water bodies located downstream from development. New buildings, streets, and parking lots introduce impervious surfaces and modify the existing ground cover and vegetation, thereby accelerating runoff, increasing flooding, and intensifying the amount of pollutants and sediment that drain to water sources.

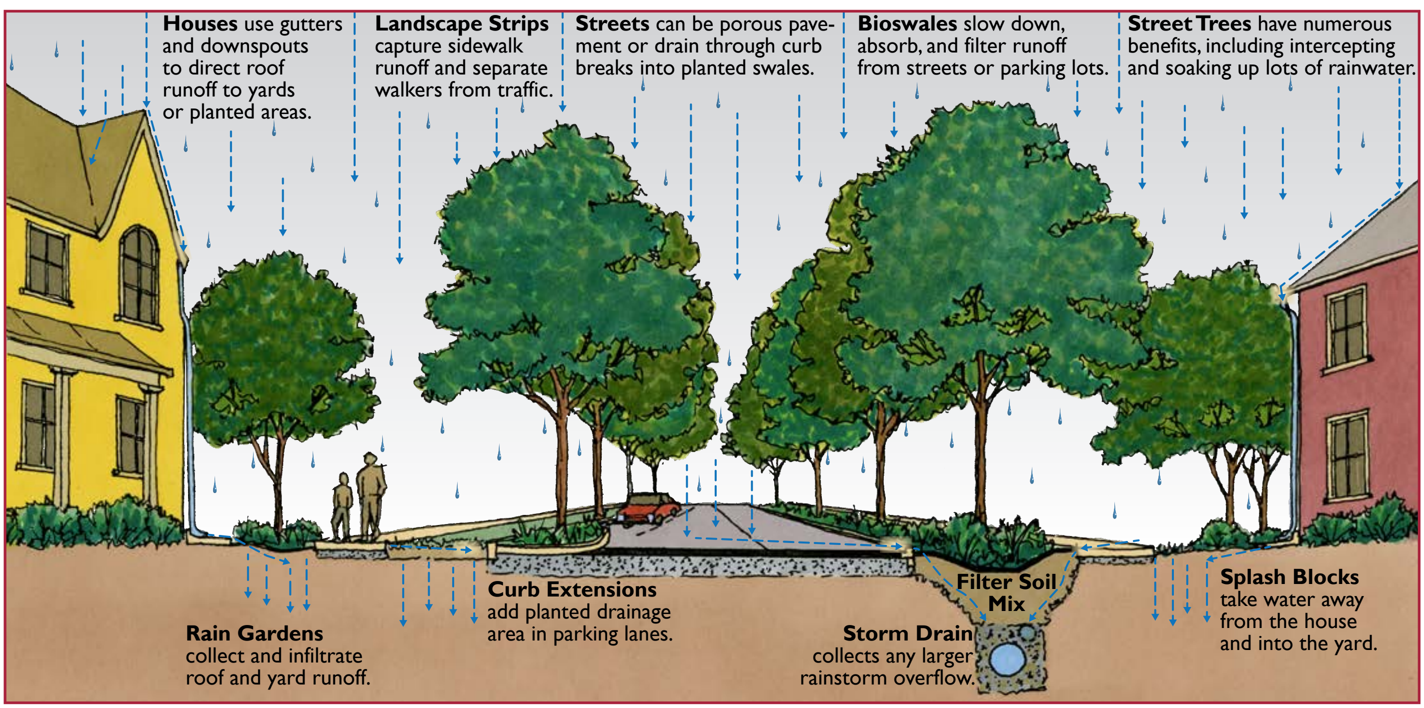
Bioretention swale at Marist College collects runoff from the parking lot, absorbs and filters rainwater, and includes an overflow grate for any flooding.

The conventional approach to handling increases in runoff is to use storm drains and pipes to convey the runoff to a detention pond or nearby waterbody. This not only modifies the natural water cycle of the land, it involves highly engineered solutions that are expensive to construct and maintain. A much better approach is to replenish the groundwater by retaining the hydrologic cycle as close to the natural pre-development state as possible.

Mark K. Morrison Landscape Architecture

Green roof with greenhouse and vegetable gardens at New York City school reduces runoff and provides students all-season, hands-on ecological education.

The New York State Stormwater Management Design Manual provides guidance on implementing and designing Green Infrastructure techniques. Under the New York State Stormwater Pollution Discharge Elimination System (SPDES), Green Infrastructure methods are required for new development that will disturb one acre or more of soil, but these best practices should be implemented for projects of any size and redevelopment projects.



Model green drainage strategies for a residential street.

Green Infrastructure Principles:

Conserve existing natural land. Reuse of sites and buildings in developed places saves farmland, woods, wetlands, and natural drainage systems.

Promote compact development. For example, building at an average of eight dwelling units per acre rather than one unit per acre consumes far less land, creates fewer roads and parking lots, and can reduce impervious surfaces in the watershed by 60% and overall runoff per dwelling by 74%.

Take advantage of existing site features. Existing trees, well-drained soils, and natural drainageways may be used to emulate the pre-development hydrology, fit development into the site, and reduce infrastructure costs.

Minimize impervious surfaces. Less impervious area means less runoff treatment, so avoid excessive paving, road widths and parking.

Absorb stormwater near the source. Provide the maximum level of on-site infiltration that is feasible, given the constraints in the area.

Green Infrastucture Techniques:

Green roofs absorb rainwater with lightweight soils and plantings or they can be used to grow food in urban areas.

Roof downspouts should be directed to rain barrels, cisterns, yards, or planted areas, not stormwater pipes or impervious driveways and roads.

Rain gardens are landscaped depressions that gather and infiltrate rainwater, usually planted with native, ornamental vegetation.

Bioswales are vegetated ditches along roads and parking lots, used for infiltration instead of conventional curbs and storm drain systems.

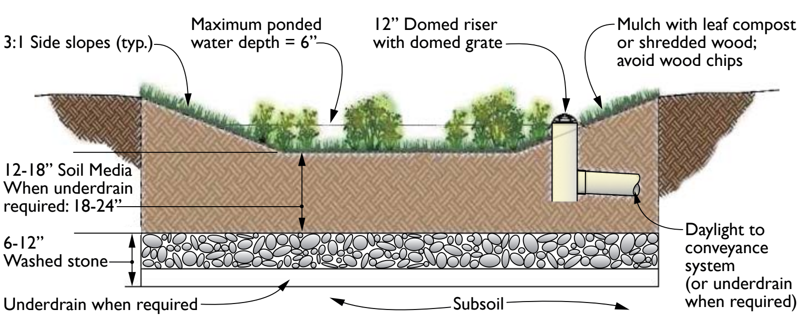
Stream daylighting replaces sub-surface pipes with an open stream to improve water quality, increase flood storage, and provide wildlife habitat.

Dry wells and infiltration chambers are underground storage structures, often used under parking lots on smaller or urban parcels.

Planting trees is an effective way to absorb rainfall. In urban areas they can be used in planters along sidewalks, roads and parking lots.

Planted curb extensions are landscaped areas extending into parking lanes to absorb road runoff, provide space for street trees, and slow traffic.

Permeable pavement, including porous concrete and asphalt, pavers, and open block systems, allow water to pass through into a gravel base below.



Rain garden profile, New York State Stormwater Management Design Manual, August 2010

Local Case Study: New York State Parks Taconic Region Headquarters in Staatsburg, Hyde Park

The park offices received the highest level of green building certification by incorporating a full range of energy and cost efficient features, such as low-flow water fixtures, geothermal heat pump system, solar panels, and model green infrastructure techniques.

Adaptive reuse of a vacant 1930s school building in the Hudson River National Historic Landmark District.

NYS Parks Taconic Region

Underground pipe converted back into a stream, pond, and native vegetation for natural drainage and riparian habitat.

Rain garden built into a planter box at the building entrance.

NYS Parks Taconic Region

Permeable pavement and brick pavers in the parking lot with reinforced grass overflow parking to the rear.

Sources:
Rutgers Cooperative Extension, *An Introduction to Green Infrastructure Practices*, Fact Sheet FS1197, December 2012
USEPA, *Using Smart Growth Techniques as Stormwater Best Management Practices*, December 2005