

Reinventing Urban Landscapes with Green Infrastructure

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and
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- Urban Landscapes



- Green Infrastructure

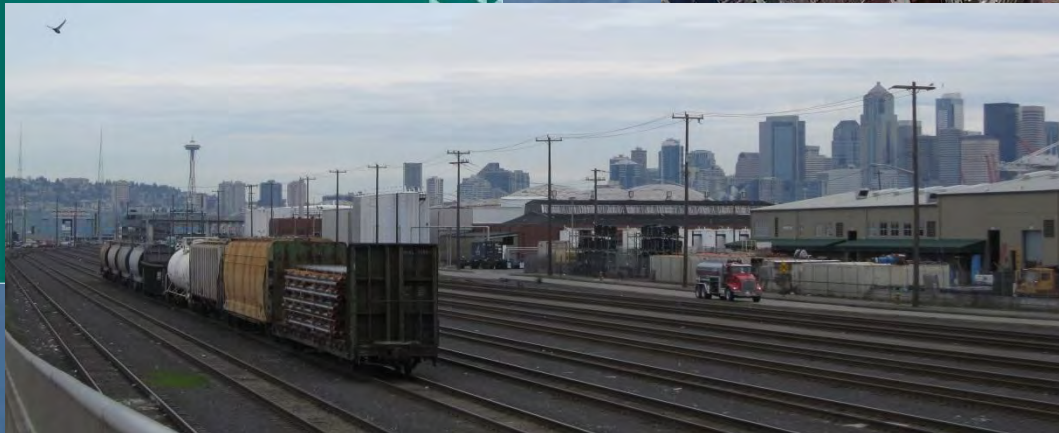




NEW DIRECTIONS
IN ARCHAEOLOGY

The Archaeology of Urban Landscapes

Explorations in Slumland



RURAL-----URBAN



- | | |
|------------------------------|---------------------|
| 1. MORE VEGETATION----- | MORE PAVEMENT |
| 2. MORE INFILTRATION----- | MORE RUNOFF |
| 3. MORE SHADE----- | MORE HEAT |
| 4. MORE WILDLIFE----- | MORE PEOPLE |
| 5. MORE OXYGEN----- | MORE CARBON DIOXIDE |
| 6. MORE QUIET----- | MORE NOISE |
| 7. MORE CALM----- | MORE STRESS |
| 8. MORE FOOD----- | MORE "DESERT" |
| 9. MORE "LAISSEZ FAIRE"----- | MORE MAINTENANCE |

WHAT IS GREEN INFRASTRUCTURE?

RHODE ISLAND STORMWATER DESIGN AND INSTALLATION STANDARDS MANUAL

AMENDED MARCH 2015



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL
MANAGEMENT AND**



COASTAL RESOURCES MANAGEMENT COUNCIL



There are really two definitions of green infrastructure.

One is “an inter-connected network of green open spaces that provide a range of ecosystem services — from clean air and water to wildlife habitat and carbon sinks”.

The other is a more limited one promoted by the EPA: small-scale green systems designed to be urban stormwater management infrastructure.

In either definition, green infrastructure is about bringing together natural and built environments and using the landscape as infrastructure.

RI Stormwater Regulations

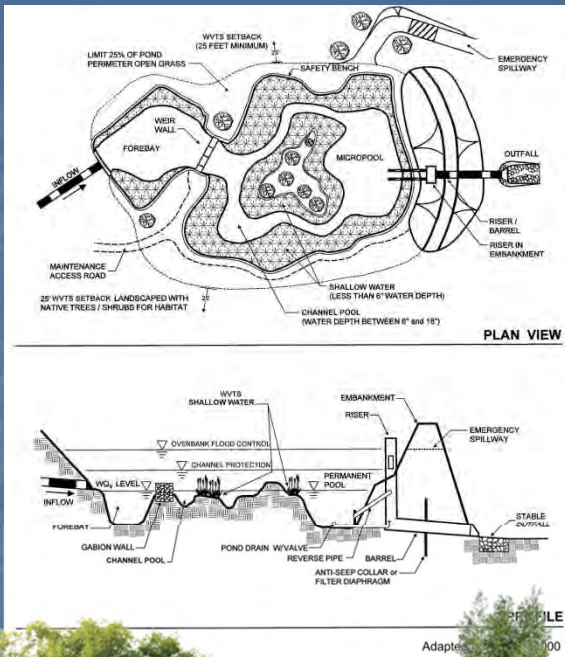
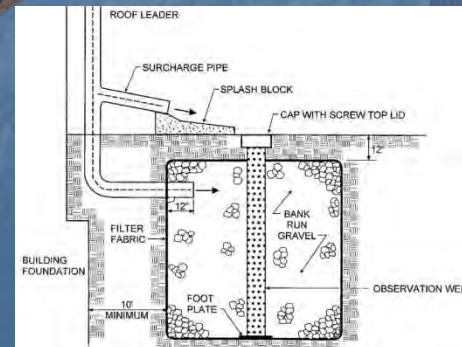
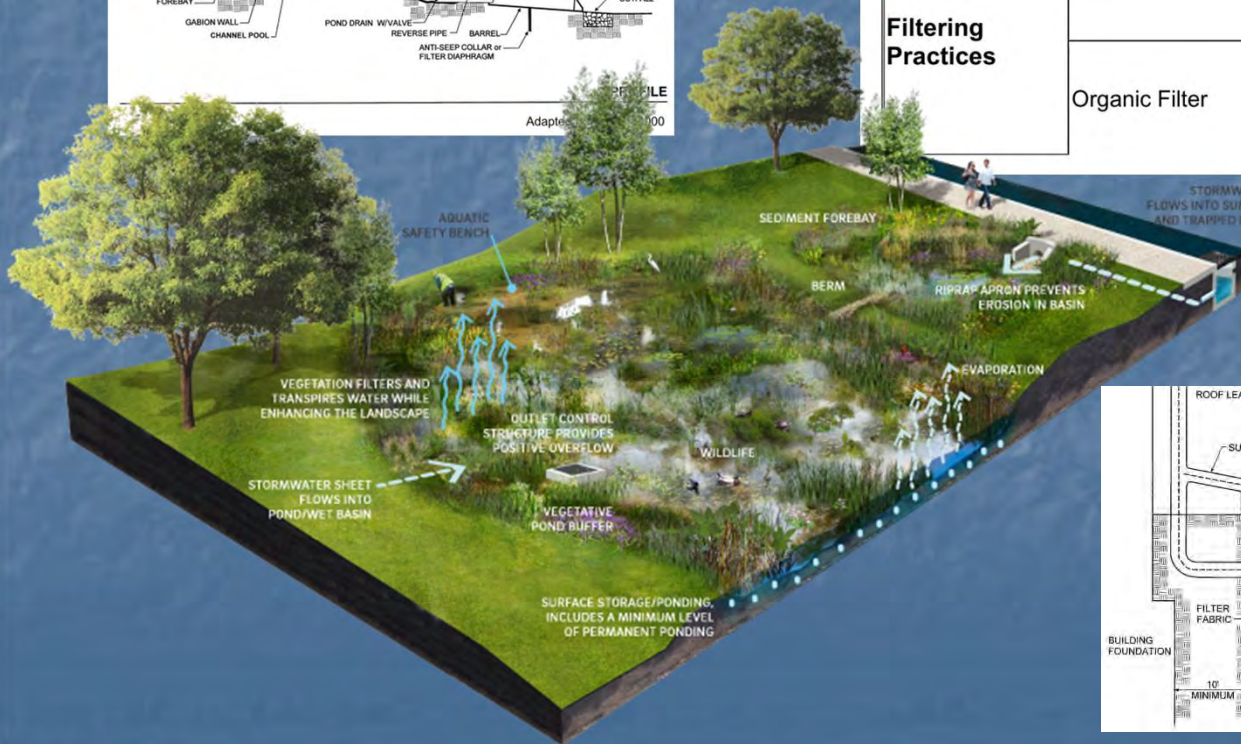
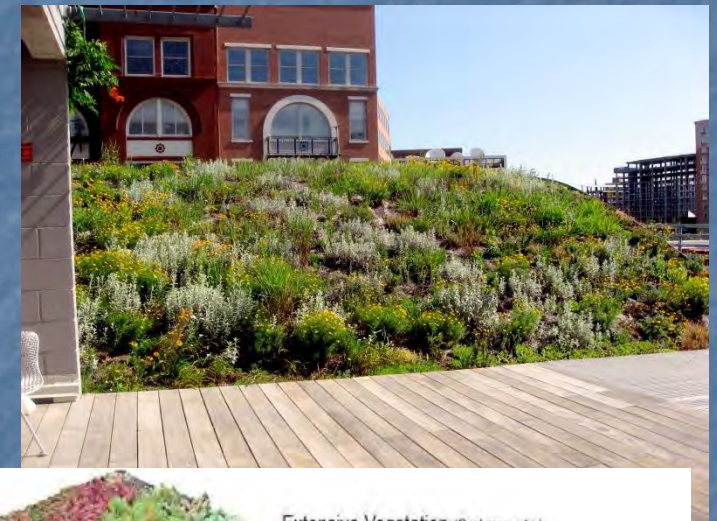
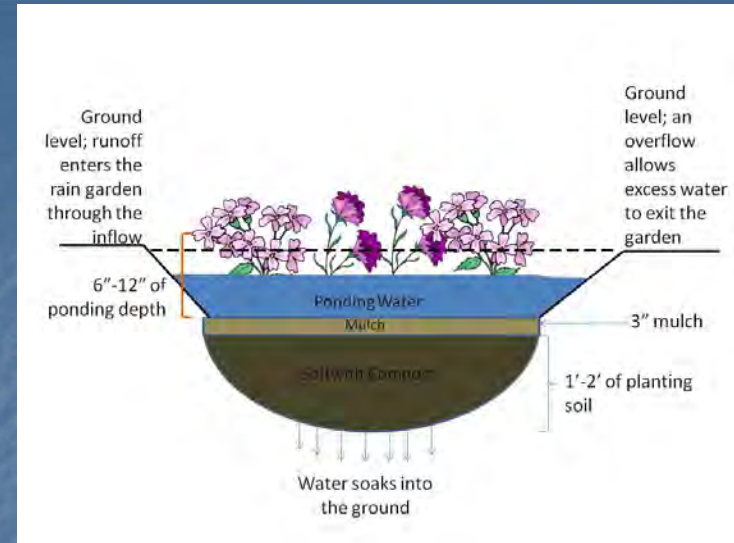


Table 3-6 Acceptable BMPs for Water Quality Treatment

Group	Practice	Description
Wet Vegetated Treatment Systems (WVTS)	Shallow WVTS	A surface wet stormwater basin that provides water quality treatment primarily in a shallow vegetated permanent pool.
	Gravel WVTS	A wet stormwater basin that provides water quality treatment primarily in a wet gravel bed with emergent vegetation.
Infiltration	Infiltration Trenches/Chambers/ Dry Wells	An infiltration practice that stores the water quality volume in the void spaces of a trench or open chamber filled with or embedded in clean gravel before it is infiltrated into underlying soils. ¹
	Infiltration Basin	An infiltration practice that stores the water quality volume in a shallow surface depression before it is infiltrated into the underlying soils. ¹
	Permeable Paving	A practice that stores the water quality volume in the void spaces of a clean sand or gravel base before it is infiltrated into the underlying soils. ¹
Filtering Practices	Sand Filter	A filtering practice that treats stormwater by settling out larger particles in a sediment chamber, and then filtering stormwater through a surface or underground sand matrix.
	Organic Filter	A filtering practice that uses an organic medium such as compost in the filter, or incorporates organic material in addition to sand (e.g., peat/sand mixture).





Group	Practice	Description
	Bioretention	A shallow depression that treats stormwater as it flows through a soil matrix, and is returned to the storm drain system, or infiltrated into underlying soils or substratum.
Green Roofs	Extensive	Rooftop vegetated with low, drought-tolerant plant species and a shallow planting media designed for performance. Not typically designed for public access.
	Intensive	Rooftop vegetated with trees and shrubs with a deeper planting soil and walkways, typically designed for both performance and public access.
Open Channels	Dry Swale	An open vegetated channel or depression explicitly designed to detain and promote filtration of stormwater runoff into an underlying fabricated soil matrix.
	Wet Swale	An open vegetated channel or depression designed to retain water or intercept groundwater for water quality treatment.

**Green Infrastructure Approaches Can Reduce Flooding Damage and Costs,
Role of Green Infrastructure and Flood Control Management**



Noise?
Temp?
Stress?
Oxygen?
Wildlife?
Fun?

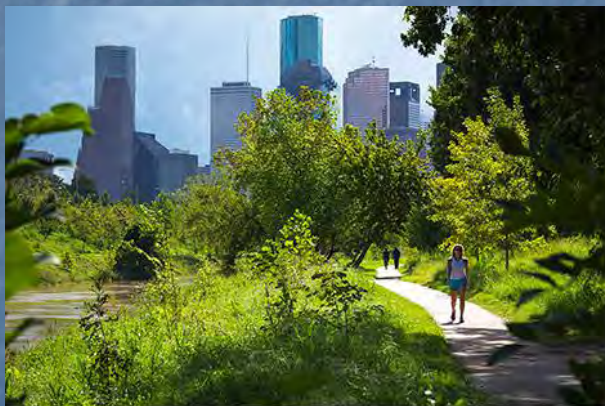
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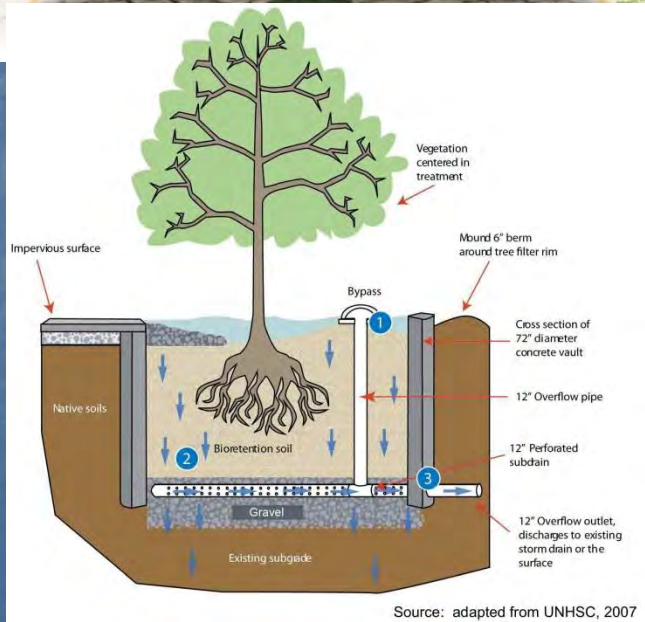
Green Infrastructure Solutions Reduce Energy Costs

Green Roofs and Green Jobs

Green roofs can also provide economic benefits to communities beyond stormwater management and energy savings. Wide-scale design, construction, and operation of green roofs can result in increased employment opportunities, which can in turn reduce urban unemployment or underemployment. Covering even 1 percent of large buildings in America's medium-to large-sized cities with vegetated roofs could create over 190,000 jobs and provide billions in revenue to suppliers and manufacturers that produce or distribute green-roof related materials. A \$10 billion investment in water efficiency projects would produce a total economic output of \$25-28 billion and create 150,000 to 220,000 jobs. Through collaborative job training and placement programs, these new jobs could further stimulate the local economy. For example, the New York non-profit Sustainable South Bronx provides training for green infrastructure jobs in landscaping, green roof installation and brownfield remediation. The organization reports that prior to training, nearly all students were on public assistance and half had prison records and afterwards 85% of graduates hold well-paying, steady jobs.



Noise?
Temp?
Stress?
Oxygen?
Wildlife?
Vegetation?
Food?



Source: adapted from UNHSC, 2007



ASPECTS/CHARACTERISTICS OF THE URBAN WILD (these are the main aspects, and they occur at all scales)

WATER

flash floods
voluntary tributaries
rapids
stormwater
topography
erosion



channelization



rivers + streams



Fall Line

FLORA

spontaneous
gardens
natives
invasives
street trees



opportunistic



patch



corridor



matrix

FAUNA

in # and physical size
insects
keystone species



insects



reptiles



birds



mammals...



SOCIAL ACTIVITIES

programmed
unprogrammed
flash mobs
cruising
Botanic Gardens



private



semi-public



public



INFRA-STRUCTURE

topography
culverted streams
green infrastructure
historic



sidewalk



lot



block



neighborhood



city



region

SCALE

smaller, less visible

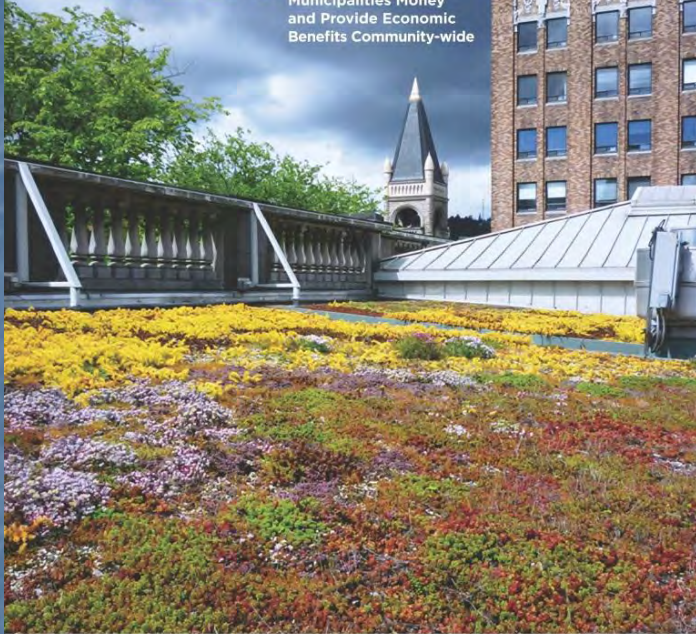
larger, more visible, assumed

Explore Rhode Island's Blueways and Greenways



BANKING ON GREEN:

A Look at How Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-wide



A Joint Report by American Rivers, the Water Environment Federation, the American Society of Landscape Architects and ECOnorthwest

April 2012

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by the
Landscape Architecture Foundation

The [Landscape Performance Series](http://www.landscapeperformance.org) is the online set of resources to help designers, agencies, and advocates evaluate performance, show value and make the case for sustainable landscape solutions.

www.landscapeperformance.org

AMERICAN SOCIETY OF
LANDSCAPE ARCHITECTS

Green Infrastructure & Stormwater Management CASE STUDY

The Steel Yard

Location: Providence, RI
Client: The Steel Yard - Ms. Drake Patten, Executive Director
Design Firm(s): The Klopfer Martin Design Group
Landscape architect/Project contact: Kaki Martin, ASLA
Email: kaki@klopfmartin.com
ASLA Chapter: Boston



Photo: by Annali Kiers, courtesy of the Steel Yard.

Project Specifications

Project Description: The Steel Yard's cleanup is a showcase for regenerative design in a tough environment. Within industrial Providence, our project is a public intervention that upends commonly held notions of blighted neighborhoods and shows the potential for real, actively engaged—not simply 'adaptive'—re-use. The Steel Yard's landscape for learning embodies the non-profit's mission through innovative (and necessarily inexpensive) brownfield remediation, stormwater filtration/reduction, purposeful design and placemaking.

asla.org/stormwater

ASLA
www.asla.org

Green Infrastructure Solutions Reduce Energy Costs

Keeping Cool with Green Roofs in Washington, DC

In 2006, the American Society of Landscape Architects replaced the existing roof on its headquarters in Washington, D.C., with a green roof designed by Michael Van Valkenburgh Associates. The green roof offers a myriad of environmental benefits including providing improved air quality and preventing stormwater runoff from entering the area's already taxed combined sewer system. The ASLA green roof retains about 80 percent of annual rainfall and significantly reduces the amount of nitrogen entering the watershed. Further, the green roof provides an extra layer of insulation for the building, reducing building energy use by as much as 10 percent during the winter months and temperatures on the roof itself measure 59 degrees cooler than a conventional black roof in the neighborhood.



American Society of Landscape Architects

www.asla.org





www.landscapeperformance.org

Watch Factory, Phase 1 & 2 Waltham, MA

Landscape Performance Benefits Environmental

- Reduces the rate of peak runoff discharge to the Charles River by 8.4 cfs or 9% for the 25 year, 24-hour storm event. The Charles River is a diverse ecosystem, home to 28 known fish species.
- Improves the quality of runoff discharged into the Charles River by decreasing nitrate loading by 30-50%, phosphate loading by 30-40%, and increasing dissolved oxygen by 60%, according to water quality sampling data.
- Reduces total suspended solids and metals by an estimated 90% and non-point contributors such as oils and grease by an estimated 67% by using vegetated rain gardens to manage roof and sheet flow runoff.
- Decreases summertime ambient air temperature in the Prospect Street Parking area by 13°F through the preservation of established shade trees.

Social

- Provides adequate opportunities for recreation and exercise along the waterfront for 78% of tenants surveyed.
- Demonstrated stormwater management as a unique benefit for 69% of tenants surveyed and piqued the interest of 93%, who indicated that they would be willing to learn more about the stormwater management system.

QUESTIONS?



www.riasla.org

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