

*Managing Stormwater –
Natural Vegetation and Green Methodologies*

Guidance for Municipalities



DRAFT

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STORMWATER MANAGEMENT ORDINANCES & POLICIES

<i>LONG ISLAND PINE BARRENS – NY</i>	
<i>FREDERICK COUNTY, MD</i>	
<i>LAKE TRAVIS, TX</i>	
<i>CROTON-ON-HUDSON, NY</i>	
<i>RHODE ISLAND</i>	
<i>NAPA, CA</i>	



STORMWATER

Runoff from stormwater is defined by the U.S. EPA as “generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground. As the runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the runoff is discharged untreated.^{1”}

What is Stormwater Management?

Under natural conditions, stormwater is absorbed into the ground, where it is filtered and ultimately replenishes aquifers or flows into streams, rivers and estuaries.

In developed areas, however, impervious surfaces such as pavement and building roofs prevent precipitation from naturally soaking into the ground. Instead, the water runs rapidly into storm drains and drainage ditches. The resulting rush of stormwater discharge can cause infrastructure damage, downstream flooding, and stream bank erosion. In addition, the bacteria and other pollutants not filtered from stormwater can contaminate streams, rivers, and coastal waters.

Stormwater management addresses these concerns through a variety of techniques, including strategic site design, measures to control the sources of runoff, and thoughtful landscape planning. Managing stormwater has multiple benefits which include environmental, economic and human health. Benefits include:

- Reduced and Delayed Runoff Volumes –
- Enhanced Groundwater Recharge
- Pollutant Reductions into rivers, stream, tributaries and bays
- Reduced Sewer Overflow Events
- Increased Carbon Sequestration
- Urban Heat Island Mitigation and Reduced Energy Demands
- Improved Air Quality
- Additional Wildlife Habitat and Recreational Space.
- Improved Human Health



- Increased Land Values

Stormwater runoff is regulated under the National Pollutant Discharge Elimination System (NPDES), however most states implement the NPDES program as a state program – SPDES. The NPDES program covers the following activities: Municipal Separate Storm Sewer Systems, Construction Activities, and (Large) Industrial activities.² Stormwater runoff from these activities is considered point source pollution, or direct discharge.



Quick Checklist for Addressing Stormwater

Addressing stormwater runoff from direct discharge activities is only part of the solution. Protecting existing native vegetation and providing incentives to use vegetation to protect groundwater and surface water quality is a key part of successful stormwater management. In areas where groundwater recharge is important to the long-term health and sustainability of a community incentives to protect vegetation and recharge areas will ultimately result in money-saved for the municipality. The following is a quick checklist to help start assessing what measures can be taken to protect ground and surface water:

- Do you have zoning overlay districts specifically devoted to groundwater protection?
- Do you have written standards for handling storm water to incorporate with deed covenants and restrictions associated with zoning changes?
- Do your subdivision regulations allow for alternative design, storage and reuse of storm water on development parcels, on planned rights-of-way and within engineered structures, such as leaching basins, catch basins, recharge basins, perforated pipe?
- Do your site plan review requirements permit alternative stormwater design and rainscaping techniques such as temporary parking pavement waivers, roof and pavement drainage structures such as porous pavement, rain gardens, bio-retention basins, bio-swales, and green roofs?
- Do your codes contain incentives for the retention or re-establishment of existing native plantings and non-disturbance of natural recharge areas?
- Do your codes contain disincentives to discourage extensive fertilized vegetation, automatic irrigation, impervious surface and urban heat island effect and, conversely, to encourage drought-tolerant plants, no-mow meadowland, upgrade and renewal of natural process for site work?

Municipalities that have reassessed how they view stormwater – as a resource as opposed to a problem to be managed – have seen a variety of benefits. This guidance document will discuss solutions for municipalities as well as the benefits of implementation.

Managing Wet Weather with Green Infrastructure

Green infrastructure is an approach to wet weather management that is cost-effective, sustainable, and environmentally friendly. Green Infrastructure management approaches and technologies infiltrate, evapotranspire, capture and reuse stormwater to maintain or restore natural hydrologies.

At the largest scale, the preservation and restoration of natural landscape features (such as forests, floodplains and wetlands) are critical components of green stormwater infrastructure. By protecting these ecologically sensitive areas, communities can improve water quality while providing wildlife habitat and opportunities for outdoor recreation.

On a smaller scale, green infrastructure practices include rain gardens, porous pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting for non-potable uses such as toilet flushing and landscape irrigation.

The EPA provides an educational and comprehensive report on this at http://www.epa.gov/npdes/pubs/gi_action_strategy.pdf



METHODS TO INCREASE STORMWATER RECHARGE

The following are a sampling of methods municipalities can use to increase stormwater recharge on residential, commercial, municipal, and other properties. These are common references in green infrastructure and stormwater best management practice guidance documents.

ZONING OVERLAY DISTRICTS³ – Overlay districts can be used to establish protection areas for specific uses, such as aquifer recharge.^{4,5}

BIO-RETENTION BASIN – An area designed to accept and retain storm water, to slow or block either its discharge to surface water or its recharge to groundwater, to lessen erosion, allow for filtering of sediments, plant root uptake of nutrients, and biological control the water. It may be equipped with various overflows or high water level bypasses to transport amounts of water exceeding its holding capacity.

BIO-SWALE – A linear area designed to capture, slow and distribute flowing water so that plants can absorb the water. These vegetated areas may be supplemented by under drains, overflows or other engineering devices to cope with unusual storm events.



DROUGHT-TOLERANT PLANT – Any of a variety of plants (including some considered weeds) that have a capacity to thrive with minimal available water or are able to store water for use during extended dry periods.

GREEN ROOF – A building roof that is engineered to be covered with low-maintenance growing plants that: Insulate in winter, cool the building in summer,

reduce solar absorption, reduce precipitation run-off from roof surfaces, improve interior Heating, Ventilating and Air Conditioning (HVAC) efficiency. Sometimes green roofs are used to mitigate Urban Heat Island Effect.

NATIVE PLANT – a plant, not introduced from outside the geographical area, that is genetically suited to thrive with no maintenance, in the undisturbed or original soils to which it is accustomed, with the natural levels of precipitation and temperature range historically found in the area.

NO-MOW MEADOW – an area planted with a variety of geographically appropriate grasses or wildflower mixtures such that it is only mowed once at the end of the growing season and generally is capable of reseeding or over-seeding itself. It can be designed to attract various birds, butterflies or other wildlife.

POROUS OR PERMEABLE PAVEMENT – a hard surface with load bearing capacity engineered to allow for the passage of water through it. The surface may be comprised of paving blocks with open corners, lattices or edges or asphalt/concrete mixes without “fines”. Porous asphalt or concrete is usually not recommended for highway use and is usually underlain by carefully engineered layers of crushed rock, fabric filter cloth, piping or drains. If not properly maintained, it can be subject to failure by clogging of the pores.



RAINSCAPING – A generalized term for how all the various techniques to deal with precipitation on both hard (pervious and impervious) surfaces, and natural or soft surfaces can be used together on a site, to capture and use rainwater as a resource.

RAIN GARDEN – see “Bio-Swale”, also outfitted with attractive ornamental plants and flowers, to pleasantly highlight landscape features, focal points or high-visibility on site.

EXAMPLES OF STORMWATER MANAGEMENT ORDINANCES & POLICIES

All ordinances are hyperlinked within the text. Full links are footnoted at the end of each section.

- **TOWN OF EAST HAMPTON, NY**
The Town of East Hampton established a [Harbor Overlay District](#) to maintain or improve surface water quality. The district is also intended to maintain or improve wildlife habitat in these areas and to maintain or restore these waterways as closely as possible to their natural condition.⁶
- **FREDERICK COUNTY, MD**
Frederick County's Forest Conservation [ordinance](#) recognizes why forestation is beneficial to human health and the environment and focuses on preservation.⁷
- **LOWER COLORADO RIVER AUTHORITY – TX**
The Lake Travis Nonpoint Source Pollution Control [Ordinance](#) is aimed at reducing nonpoint source pollution in the Lake Travis area (a watershed near Austin, TX). The Lake Travis watershed is a sub-watershed of the Lower Colorado River.⁸
- **CROTON-ON-HUDSON, NY**
Croton-on-Hudson's Wetlands and Watercourses [ordinance](#) protects wetlands and other natural stormwater management areas in order to prevent water contamination. Croton-on-Hudson uses this ordinance to establish a Water Control Commission.⁹
- **RHODE ISLAND**
Rhode Island's [ordinance](#) is focused on vegetated coastal zone buffers. Rhode Island also seeks to protect ecologically sensitive areas and prevent contaminated runoff from non-point source pollution.^{10, 11}
- **NAPA, CA**
Napa's Riparian Habitat [ordinance](#) is focused on protecting native vegetation and restoring native vegetation. Napa's ordinance also takes additional measures to prevent streambank hardening which is detrimental to habitat and accelerates erosion.¹²

New York Case Studies on Green Infrastructure

SYRACUSE, NY

Onondaga County has begun a comprehensive, multi-faceted campaign entitled, “Save the Rain” www.savetherain.us. Its purpose is to generate awareness and increase public participation (both residential and commercial) to reduce polluted runoff into Onondaga Lake and its tributaries. Educational billboards are posted around lake communities and a grants program was established to help defray costs of property improvements (i.e. repaving a parking lot) that can pay for the difference between conventional asphalt and permeable pavers). Additionally, a team of on-the-ground green infrastructure installers directly interact with communities in target “sewersheds” to implement several projects, i.e.: increasing rain gardens, rain barrels, use of porous pavement, green roofs, cisterns and vegetative swales.

In addition to environmental and community benefits, green infrastructure projects in Onondaga County also avoid the higher costs of building regional treatment facilities, separating sewers, and the operation and maintenance associated with gray water treatment infrastructure. Two projects currently underway to provide financial resources for implementation are the Green Improvement Fund, which provides grants for green infrastructure in targeted areas and the Rain Barrel Program, which provides free rain barrels in targeted areas.

LINDENHURST, NY

The Lindenhurst Library is home to Long Island’s first permeable pavement parking lots. The parking lot is designed with permeable paving stones, set in-between gravel, which sits atop 4 layers of different sized gravel. The water is able to infiltrate through the pavement and then the various layers of gravel. This water would otherwise run-off as polluted stormwater into the Great South Bay. The parking lot also has bio-swales surrounding the perimeter with drought resistant plants that help to capture rain water to recharge it into the aquifer. Lindenhurst is prone to flooding and many areas surrounding the parking lot become flooded after heavy rains, with the exception of the parking lot. The project was built using \$200,000 in stimulus funds, which covered 90% of the construction and engineering costs. To compliment the project, solar power is used to light the parking lot at night.

HICKSVILLE, NY

The Hicksville Water District worked with the company VeriGreen to install permeable pavement at one of their nitrate treatment facilities. The project area is approximately 400-500 square feet, located 3ft below grade. The water district originally wanted to use basic cement, but then would have had to set up leeching pools or pumps because of the high probability of flooding. Instead they went with permeable pavers. The pavers are



set on top a layer of sand allowing rainwater to seep back into the ground. The project was complete in the beginning of 2010. To date there has been no problems with flooding.

Other municipal case studies highlighting communities adopting green infrastructure for managing stormwater can be found at the EPA website;

<http://cfpub.epa.gov/npdes/greeninfrastructure/gicasestudies.cfm#Municipal>

Footnotes:

¹ US EPA Stormwater Program - http://cfpub.epa.gov/npdes/home.cfm?program_id=6

² Ibid.

³ Groundwater Overlay District Model Ordinance from The Stormwater Managers Resource Center –

http://www.stormwatercenter.net/Model%20Ordinances/Source_Water_Protection/Model%20Groundwater%20Ordinance.htm

⁴ Basic Aquifer Overlay Zoning Ordinance from Stratham, NH -

http://www.stormwatercenter.net/Model%20Ordinances/Source_Water_Protection/Aquifer%20District%20Ordinance.htm

⁵ Salt Lake City, UT Ordinance Creating Recharge & Protection Zones -

http://www.stormwatercenter.net/Model%20Ordinances/Source_Water_Protection/Groundwater%20Source%20Protection%20Overlay%20District%20.htm

⁶ Town of East Hampton Harbor Overlay District – <http://www.generalcode.com/webcode2.html> (Select New York; Town of East Hampton; Section 255, Title 3, Subsections 70, 71, 73, 75, 79)

⁷ Frederick County, MD Forest Resource Ordinance -

http://www.stormwatercenter.net/Model%20Ordinances/misc__forest_conservation.htm

⁸ Lake Travis Nonpoint Source Pollution Control Ordinance -

http://www.stormwatercenter.net/Model%20Ordinances/misc__lake_travis.htm

⁹ Croton-on-Hudson's Wetlands & Watercourses Ordinance -

http://www.stormwatercenter.net/Model%20Ordinances/misc__wetlands.htm

¹⁰ Rhode Island Coastal Zone Program - <http://www.epa.gov/nps/ordinance/documents/A2b-RhodeIsland.pdf>

¹¹ EPA Model Ordinance on Stream Buffers - <http://www.epa.gov/nps/ordinance/mol1.htm>

¹² Napa, CA Riparian Habitat Ordinance - [http://www.epa.gov/nps/ordinance/documents/a2c-
napa.pdf](http://www.epa.gov/nps/ordinance/documents/a2c-napa.pdf)