



New York State Water  
Resources Institute

# Green Infrastructure and Trees for Tribs Presentation to the Village of Cold Spring March 24, 2011

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New York State Department of Environmental Conservation  
In cooperation with Cornell University NYS Water Resources Institute

NYS Department of Environmental Conservation



# Presentation Outline

- Hudson River Estuary Program
- Stormwater and stormwater management
- Green Infrastructure
  - For planning
  - Specific practices and local examples
- Village of Cold Spring Comprehensive Plan
- Resources available



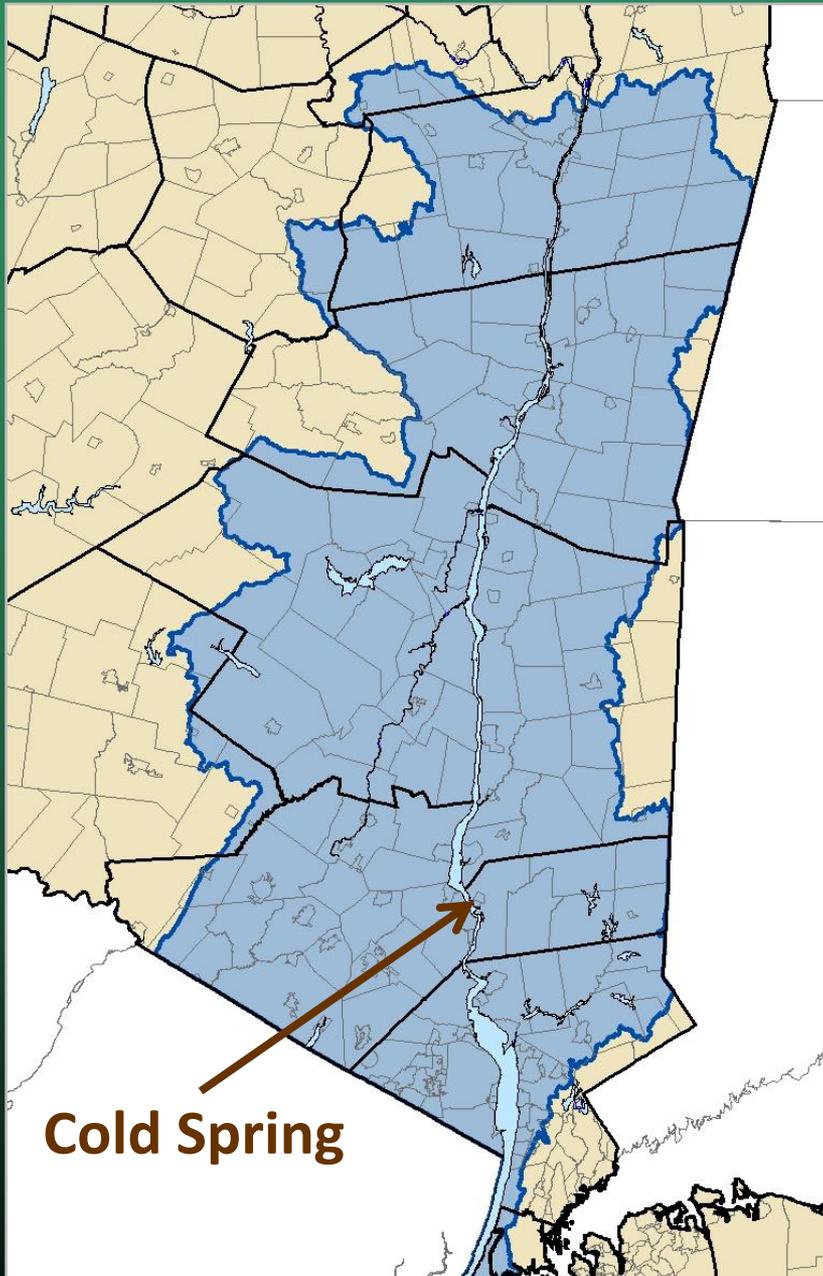
# Hudson River Estuary Program

## Core Mission

- Ensure *clean water*
- Protect and restore fish, wildlife, and their *habitats*
- Provide water recreation and river *access*
- Adapt to *climate change*
- Conserve world-famous *scenery*

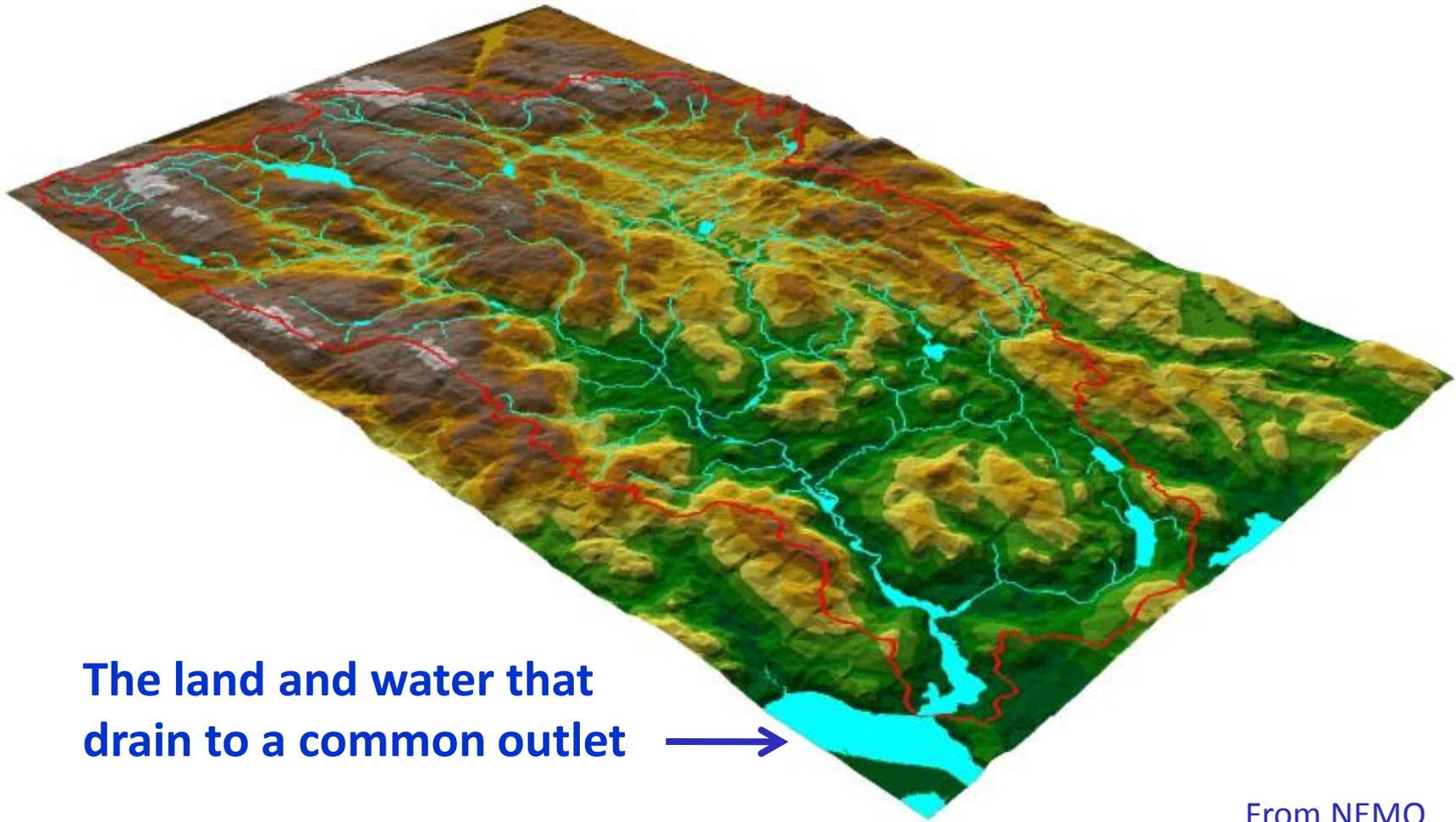


# Hudson River Estuary Watershed



**Cold Spring**

# Importance of Watershed-Thinking

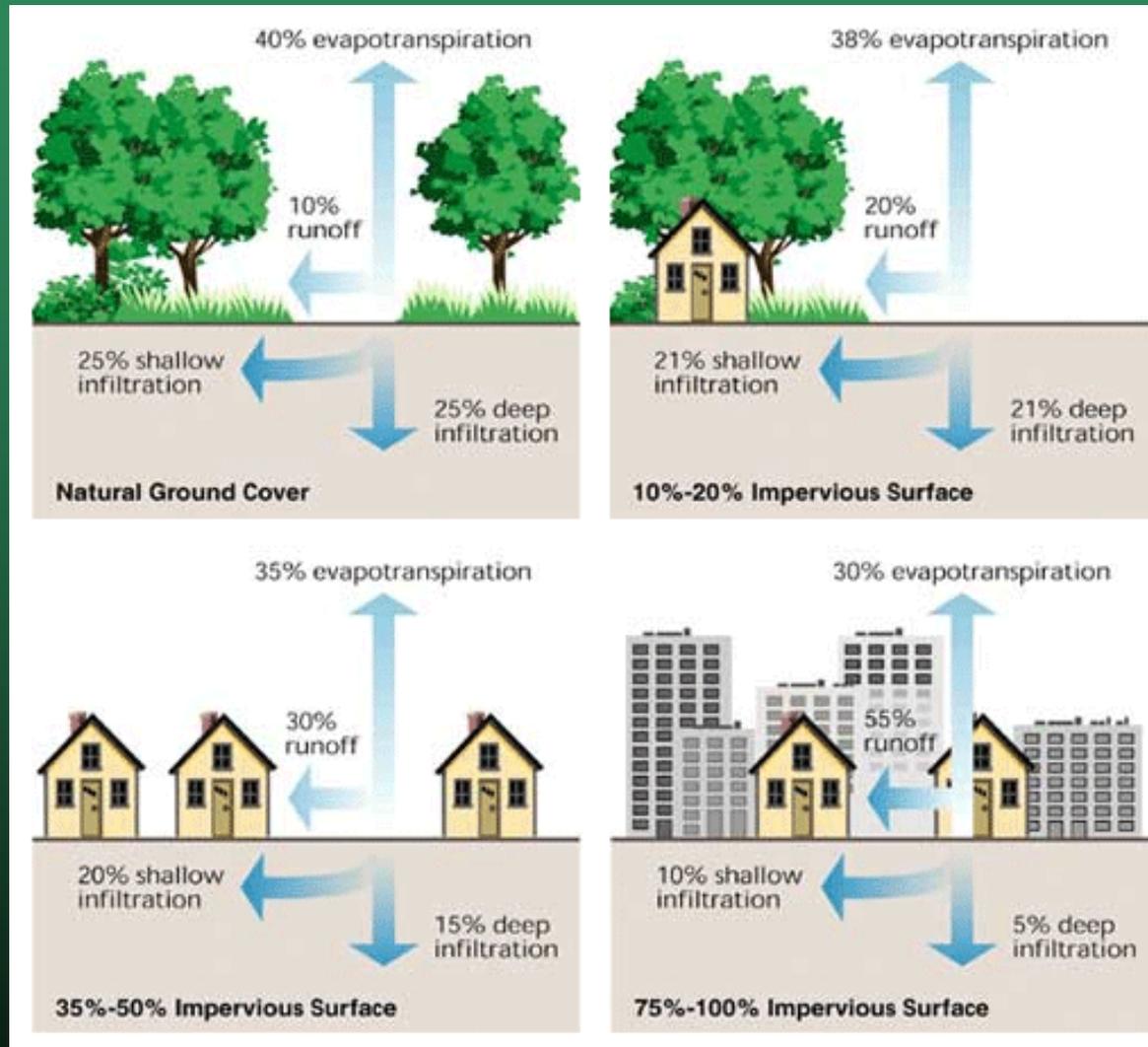


The land and water that drain to a common outlet



From NEMO

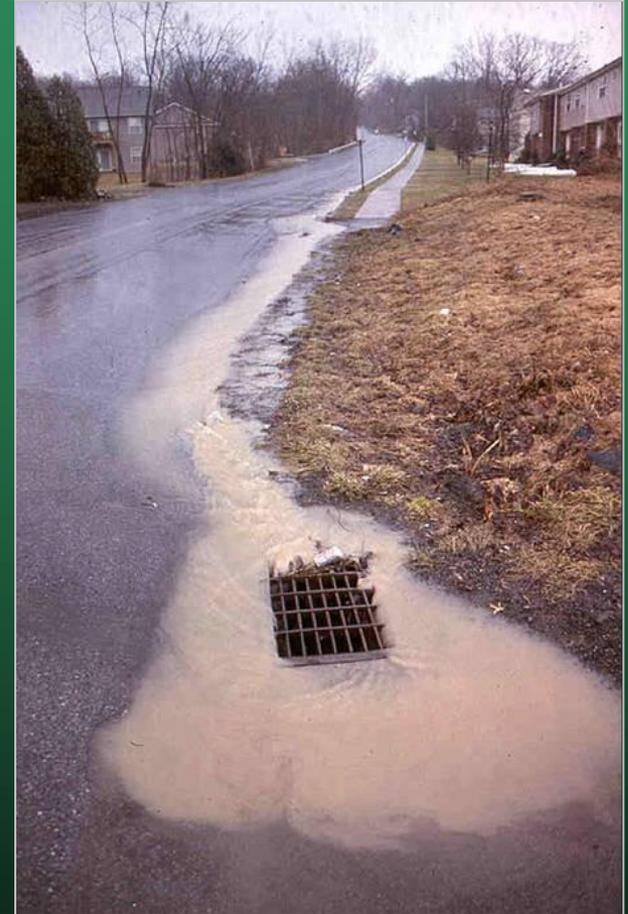
# The Problem with Impervious Surfaces



National Research Council, "Stormwater Management in the United States" (2008)

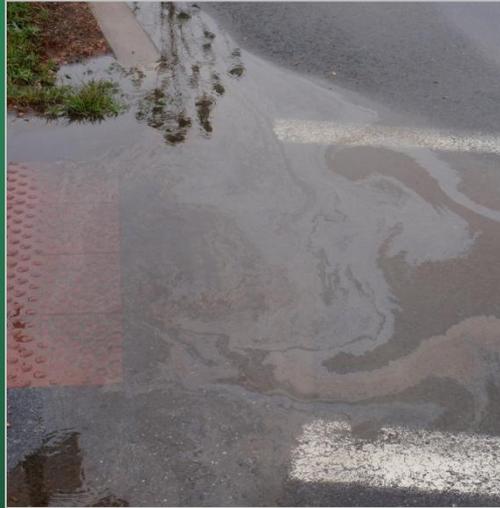
# Stormwater Management

- Traditional stormwater management (impervious surface to storm drain to waterbody)
- Most stream impairments are due to nonpoint source pollution and stormwater runoff (NYSDEC)
- Both water *quality* and water *quantity* problems



# Pollution

- Sediment
- Nutrients
- Heavy metals
- Road salt
- Bacteria
- Pesticides
- Oil and grease
- Trash



# Erosion



Center for Watershed Protection



# Flooding



Rt. 32, Rosendale



Bethlehem, NY



# Combined Sewer Overflows



Poughkeepsie, NY



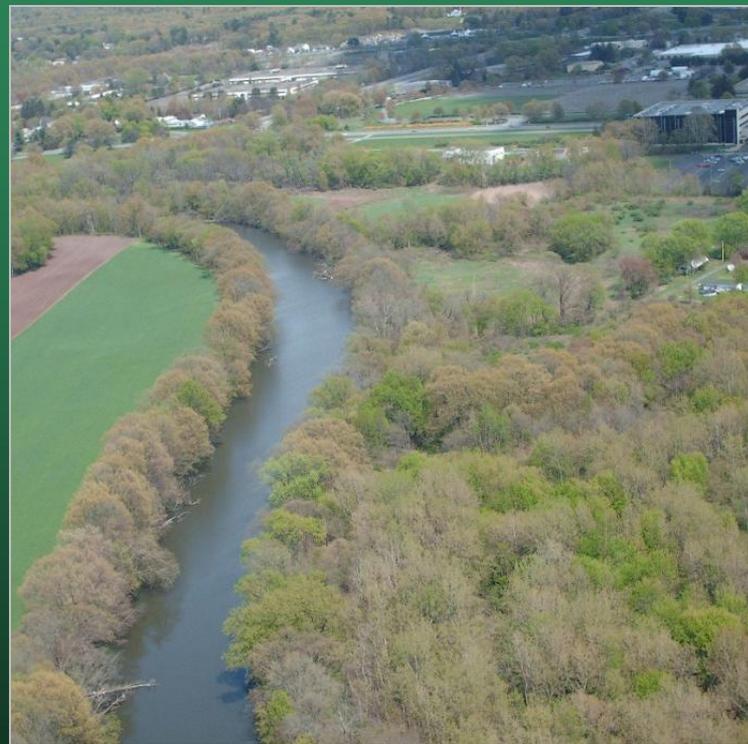
# Green Infrastructure

- The network of naturally occurring and engineered systems in the environment, generally vegetated, that provide ecosystem services
- Manage stormwater runoff while maintaining or restoring natural hydrology
  - allow stormwater to *infiltrate* and be used by plants
- Green vs. gray infrastructure



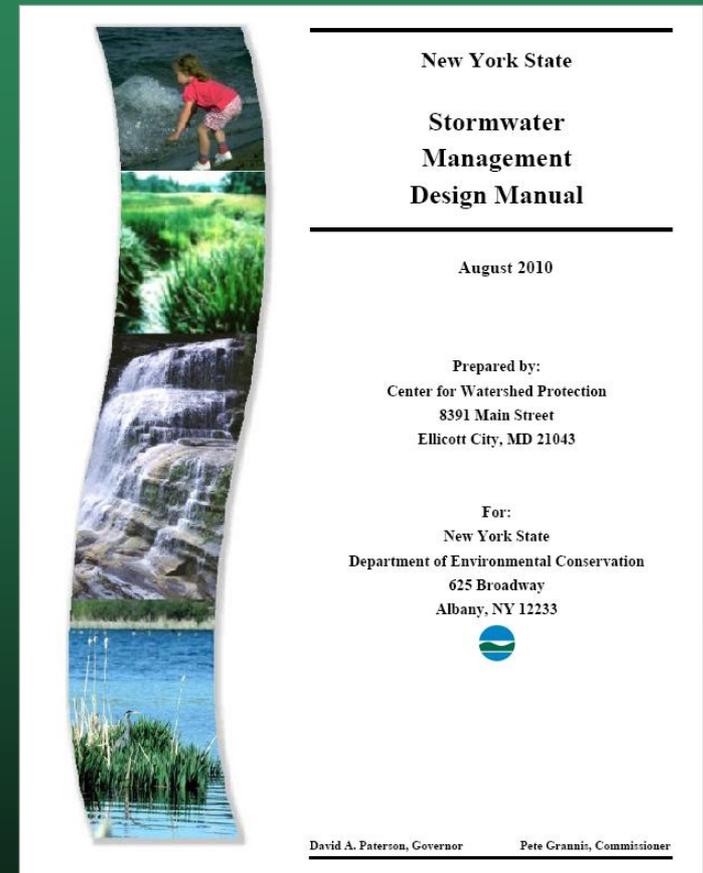
# Green Infrastructure

- Applies to both regional and local scales
- Number of benefits
  - Water quality/quantity
  - Native plants for wildlife
  - Aesthetics
- Includes projects defined as “better site design” or “low impact development”



# Green Infrastructure Requirements

- August 2010 - Updated New York State Stormwater Management Design Manual
- **New** development required to incorporate green infrastructure
- Chapter 5 – Green Infrastructure



# Chapter 5 – Green Infrastructure

## 1. Planning

A. Preserving natural areas → Avoid stormwater

B. Reducing impervious surface cover → Reduce stormwater

2. Green infrastructure practices → Manage stormwater



# 1A: Preserving or Restoring Natural Areas

- Preserving undisturbed areas
- Preserving buffers
- Reducing clearing and grading
- Locating development in less sensitive areas
- Open space design
- Soil restoration



# 1B: Reducing Impervious Surfaces

- Roadways
- Sidewalks
- Driveways
- Cul-de-sacs
- Building footprints
- Parking lots



# Green Infrastructure Practices

- Site- and neighborhood-specific practices that allow stormwater to infiltrate on-site
- Includes natural features and engineered practices



# Rain Gardens

- Manage and treat small volumes of stormwater, filter runoff through soil and vegetation within a shallow depression



Rockland County Park, Clarkstown



SUNY Orange, Middletown



# Bioretention

- Larger than rain gardens and may be designed with an underdrain to connect to the storm drain system



Beacon Institute for Rivers and Estuaries, Beacon



Vassar College, Poughkeepsie



# Vegetated Swales

- Natural drainage paths or vegetated channels used to transport water above ground



Subdivision, Pawling



Village Hall, Greenwood Lake



# Greef Roofs

- Layers of soil and vegetation on rooftops that capture runoff



Rensselaer County Master Gardeners  
shed, Wynantskill



Beacon Institute for Rivers and  
Estuaries, Beacon



# Porous Pavement

- Pervious types of pavements allow stormwater to infiltrate through the surface



Village Hall,  
Greenwood Lake



Garrison Institute, Garrison



Stewart Airport, New  
Windsor



# Rain Barrels or Cisterns

- Capture and store water to use for watering plants and other non-contact uses



Private home, Millerton



Vassar College, Poughkeepsie



# Stream Buffer Restoration

- A healthy vegetated buffer helps improve stream health and water quality by filtering and slowing polluted runoff, with many other benefits.



SUNY Orange, Middletown



Greenvale Park, Poughkeepsie



# Other Green Infrastructure Practices

- Tree planting/tree pit
- Disconnection of rooftop runoff
- Stormwater planters
- Stream daylighting



NYS Parks, Recreation & Historic  
Preservation, Staatsburg



Ardsey, Westchester

# Benefits of Green Infrastructure

- Stormwater management (quality and quantity)
- Groundwater recharge
- Reduced potential for combined sewer overflows
- Cooling effect in urban areas – energy savings
- Wildlife habitat
- Improve air quality
- Improve human health
- Increase land values
- Beautify neighborhoods



# Implementing Green Infrastructure

- Homeowners, businesses, neighborhoods, regional planners, and
- **Municipalities**
  - Planning
  - Codes/ordinances can encourage, incentivize, or require
  - Demonstration sites



SUNY Orange, Middletown



# Implementing Green Infrastructure in Cold Spring

Already thinking about green infrastructure approaches through comprehensive plan

## Village of Cold Spring Draft Comprehensive Plan

January 27, 2011



### Special Board Members:

Michael J. Armstrong, chair  
Anne E. Impellizzeri, vice chair  
Marie Eagle, secretary  
Cathryn Fadden, treasurer  
Kagen L. Doyle  
Mirshill Mermell  
Anthony Phillips  
Michael D. Reisman  
Catharine J. Squace

### Village Board Members:

Seth Gallagher, Mayor  
Bruce D. Campbell, Trustee  
J. Ralph Falloon, Trustee  
Charles Hustis, III, Trustee  
Aizinhos Serradas, Trustee

*The Village of Cold Spring received financial assistance for this work from the Hudson River Valley Greenway and from the New York State Department of State Division of Coastal Resources with funds provided under Title 11 of the Environmental Protection Fund.*



# Cold Spring Comprehensive Plan

## Planning for Green Infrastructure

- 3.1.8. Build on the *open space inventory* and consider measures to preserve open space (conservation easements and incentive zoning)
- 3.1.12. Consider *floodplain protection measures* and ensure that residents are informed of changes in the FEMA insurance floodplain map
- 3.1.13. Clarify ownership of *lands adjacent to Back and Foundry Brooks*
- 3.1.14. Consider enacting established methods for maintaining Back Brook's and Foundry Brook's forested *riparian corridor*. Consider establishing buffer zones and using the DEC's Trees for Tribs program
- 3.3.1. *Map the existing stormwater management system*
- 3.3.2. Prepare a *plan for stormwater management*
- 3.3.5. Complete and implement *plans for correcting drainage problems*



# Cold Spring Comprehensive Plan

## Planning – Codes and Ordinances

- 3.1.7. Consider establishing and implementing local **wetlands protection measures**
- 3.2.4. Amend Village Zoning Law and Subdivision regulations to **require submission of a resource analysis map** for the site and surrounding area prior to the sketch plan phase to assist applicants and the Planning Board to design a subdivision or site plan around a site's natural features
- 3.3.3. Develop and implement a **local storm water law** with particular emphasis on the use of Low Impact Development (LID) techniques



# Cold Spring Comprehensive Plan

## Green Infrastructure Practices

- 3.3.4. **Encourage pervious surfaces** for all new commercial, multiple automobile parking areas and explore converting impervious parking areas to surfaces that are pervious
- 3.3.6. Address **flooding and erosion issues** of Back Brook especially in the Garden / Church Street and Spring Brook areas, and **enhance landscaping** of its banks
- 3.3.7. Encourage use of **rain barrels** (covered for safety and health reasons), planting of street trees and rain gardens, and a **reduction of impervious surfaces** throughout the Village to reduce stormwater runoff and sewer inflow and infiltration



# Cold Spring Comprehensive Plan

## Preventing Nonpoint Source Pollution

- 3.3.8. Regulate the use of *pesticides* in the Village
- 3.3.9. Explore ways to *prevent pollutants* from entering Foundry Cove via the Chestnut Street / Benedict Road / Marion Avenue storm water collection system storm water discharge pipe at the Foundry site



# Going Further: Resources from the Estuary Program

- Review local codes and ordinances
- Visit Green Infrastructure Examples site
- Restore buffers/Trees for Tribs
- Learn more/written resources



# Review Local Codes and Ordinances

- Codes and Ordinances Worksheet for New York State
- Town of Wappinger and Town of Clinton case studies

<http://www.dec.ny.gov/lands/42053.html>

**Town of Wappinger**  
Recommended Model Development Principles  
for Conservation of Natural Resources  
in the Hudson River Estuary Watershed  
*Consensus of the Local Site Planning Roundtable*



A partnership among:  
Town of Wappinger, Dutchess County, New York  
Dutchess County Environmental Management Council  
Wappinger Creek Watershed Intermunicipal Council  
NYSDEC Hudson River Estuary Program  
Center for Watershed Protection, Maryland



June 2006



# Green Infrastructure Examples in the Hudson Valley

<http://www.dec.ny.gov/lands/58930.html>



DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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## Vassar College Rain Garden

### Description

This rain garden is an example of green infrastructure in an institutional setting. The runoff from the maintenance building is directed to the rain garden where is infiltrated into the ground.

### Site Location

- **Site Address:** Hooker Ave. Poughkeepsie, NY 12601
- **Town:** Poughkeepsie
- **County:** Dutchess
- **Land Use of Site:** College Campus
- **Can Site be visited?:** Check with College
- **Location on Site:** North of first building on the right after entering the athletic complex from Hooker Avenue

### Practice Information Details

- **Intent of Design:** Treat parking lot runoff through infiltration and biological uptake.
- **Stormwater Management Capacity:** 152 Cubic Feet
- **Year of Installation:** 2007
- **Plant Material Used:** Unknown
- **Annual Operational and Maintenance:** Weeding and replacement of any dead vegetation.
- **Required Zoning Change or Special Permit:** None



Page Applies To:



Hudson River

**Related Links:**

- [Better Site Design Program for the Hudson River Estuary](#)
- [NYSDEC Construction Stormwater Toolbox](#)
- [NYSDEC Stormwater Public Review Documents](#)

**Offsite Links:**

- [Low Impact Development Center](#)
- [Beacon Institute for Rivers and Estuaries](#)
- [NEMO National Low Impact Development Atlas](#)

**PDF Help:**

# Participate in Trees for Tribs



**TREES FOR TRIBS**

**Hudson Estuary**

<http://www.dec.ny.gov/lands/43668.html>



# Written Resources

- New York State Stormwater Design Manual (updated August 2010)

<http://www.dec.ny.gov/chemical/29072.html>

- EPA – Managing Wet Weather with Green Infrastructure

[http://cfpub.epa.gov/npdes/home.cfm?program\\_id=298](http://cfpub.epa.gov/npdes/home.cfm?program_id=298)

- Hudson Valley Region Green Infrastructure Planning

<http://www.hudsonvalleyregionalcouncil.com/GIRpg2.html>





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<http://www.dec.ny.gov/lands/43668.html>

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