

Green Infrastructure Co-Benefits – The Relevance for Community Support of Stormwater & Smart Growth Goals

**Lower Hudson Coalition of Conservation Districts
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Overview

How are best practices for managing water related to health, sustainability, climate adaptation, greenhouse gas reduction, and resilience, and why should you care?

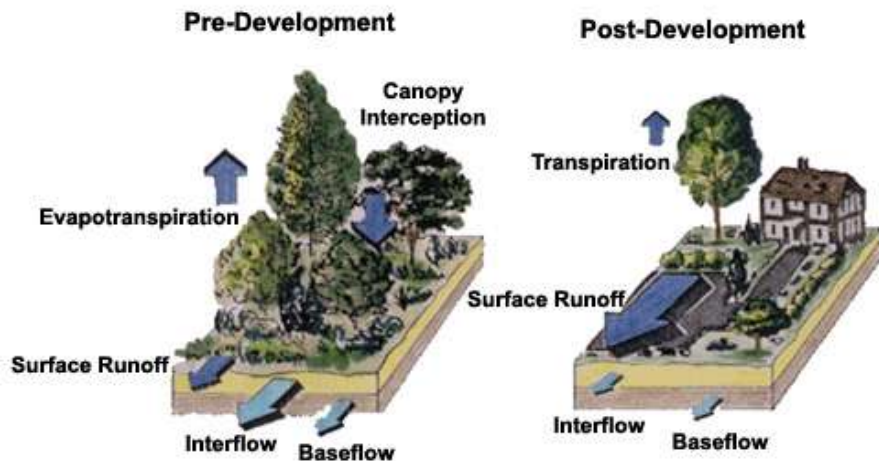


Photo courtesy of Marilyn Wyman, Cornell Cooperative Extension of Columbia and Greene Counties

Changes in watershed hydrology due to urbanization



Changes in Hydrology Due to Development Water Balance



Graphic above by Chris Cox, College of Agriculture and Life Sciences at Virginia Tech, from Federal Stream Corridor Restoration Handbook

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/full/national/water/manage/restoration/?cid=nrcs143_026903

Green infrastructure = site-scale practices for water rain gardens, bioretention, rainwater harvesting and reuse, pervious pavement, street trees, vegetated swales, riparian buffer protection and restoration, green roofs, green walls, downspout disconnection, stream daylighting and trees

Porous parking lot at
SUNY-New Paltz



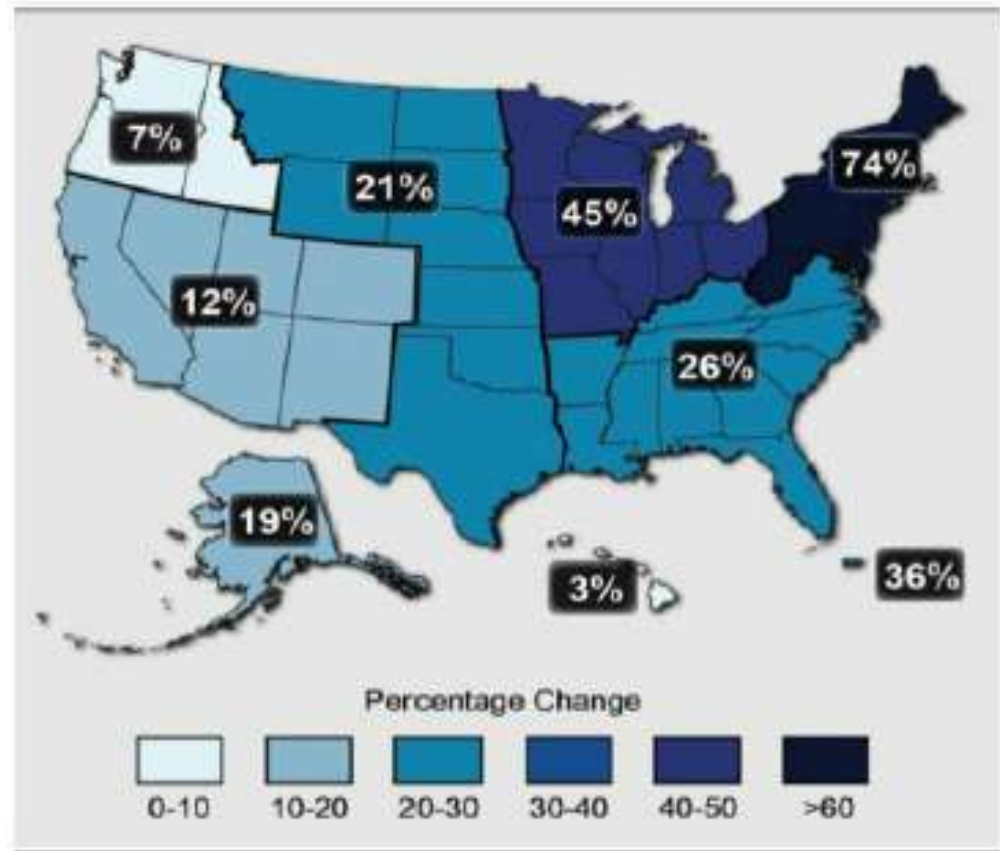
Rain garden at Black Rock Forest



Tree photo courtesy of Marilyn
Wyman, Cornell Cooperative
Extension of Columbia and Greene
Counties

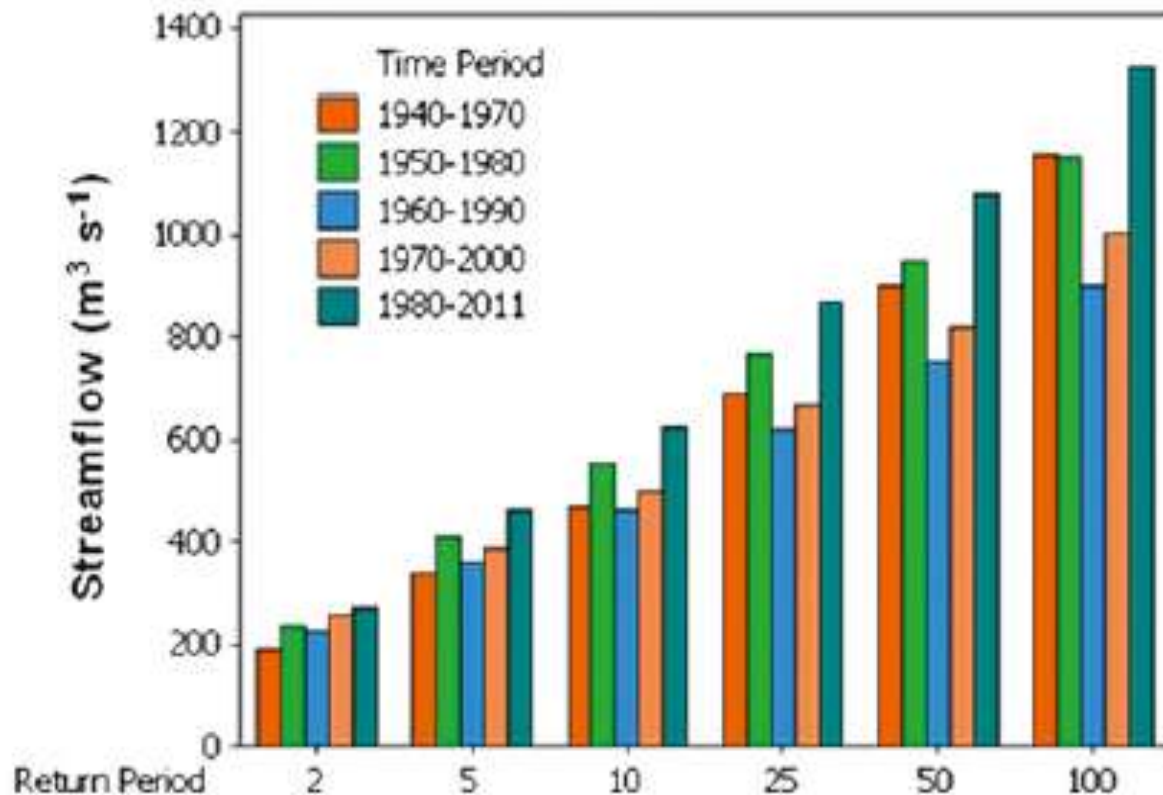
The frequency of larger storms has increased significantly in our lifetime, more so in Northeast than other parts of the U.S.

Graphic from *Reducing the Impact of Severe Flooding*, Cornell University Cooperative Extension Hudson Estuary Watershed Resiliency Project



Percentage Change in Very Heavy Precipitation throughout the United States—The map shows percent increases in the amount of precipitation falling in *very heavy precipitation* events (defined as the heaviest 1% of all daily events) from 1958 to 2011 for each region. The Northeast has seen a 74% increase in these events during this time period.

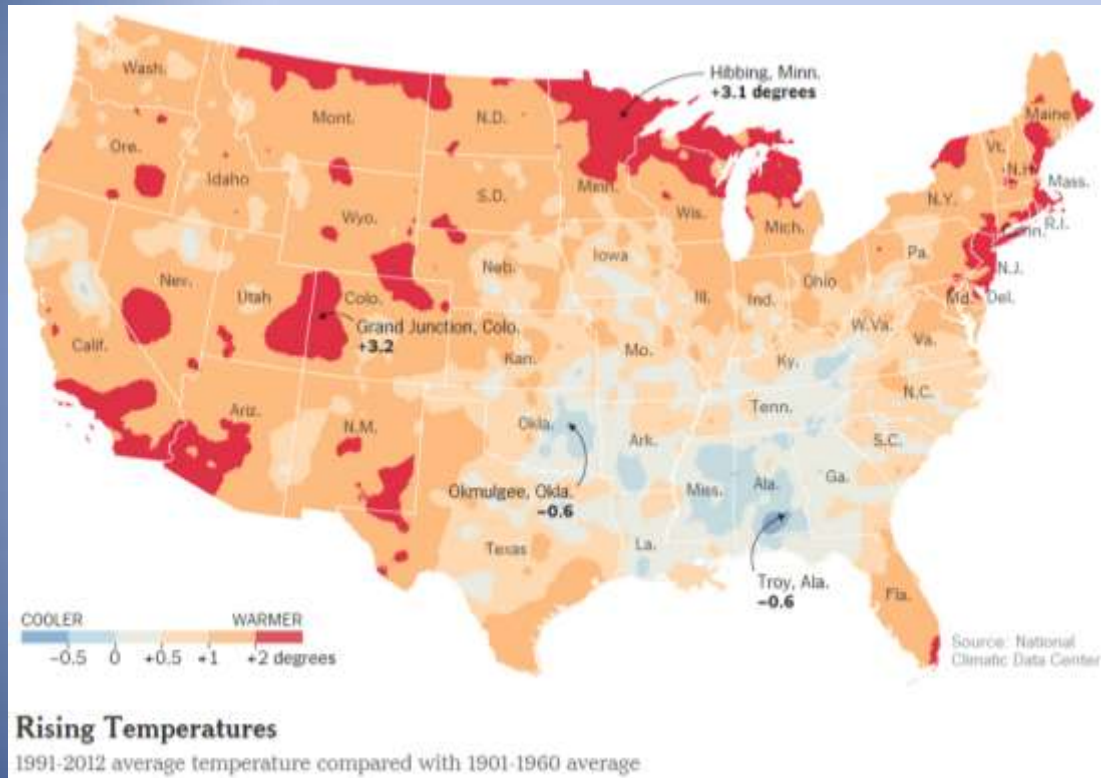
Source: Draft National Climate Assessment, Jan. 2013



In the Hudson Valley & Catskill Mountain region, the 10-year flood from the period 1960-1990 became the 5-year flood during 1980-2011, and the 25-year flood from 1960-1990 became the 10-year flood for 1980-2011

From Matonse, Adão H, Allan Frei, 2013: A Seasonal Shift in the Frequency of Extreme Hydrological Events in Southern New York State. *J. Climate*, 26, 9577-9593

U.S. National Climate Assessment issued May 6, 2014



John Holdren, Director, White House Office of Science and Technology Policy, speaking about the new report in NY City on May 7, 2014

U.S. Climate Has Already Changed, Study Finds, Citing Heat and Floods

By [JUSTIN GILLIS](#) MAY 6, 2014

http://www.nytimes.com/2014/05/07/science/earth/climate-change-report.html?_r=0



Mid-Hudson Regional Sustainability Plan, completed in May 2013 as part of NY State's Cleaner Greener Communities program including grants through NYS CFA process

How are best practices for managing water related to sustainability, climate mitigation, greenhouse gas reduction and resilience?

Decision: focus on trees

Trees are...

Widespread across the landscape

Important for energy efficiency,
management of the electric grid,
and carbon mitigation &
sequestration

“Charismatic megafauna”, i.e. big –
the largest base of existing green
infrastructure assets

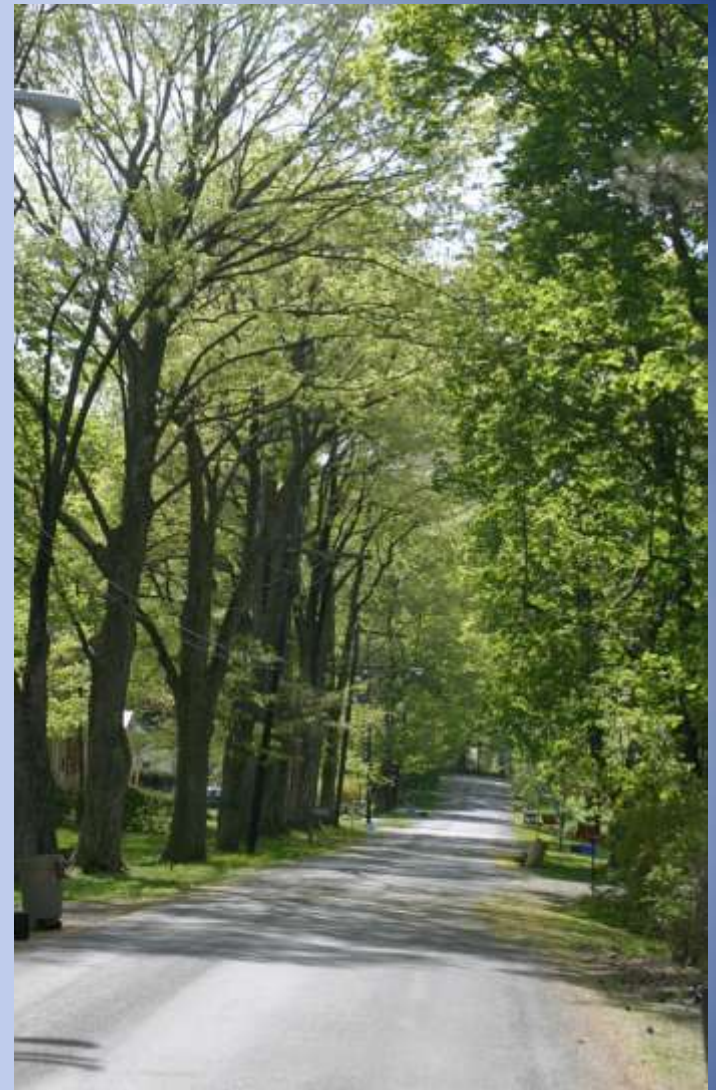
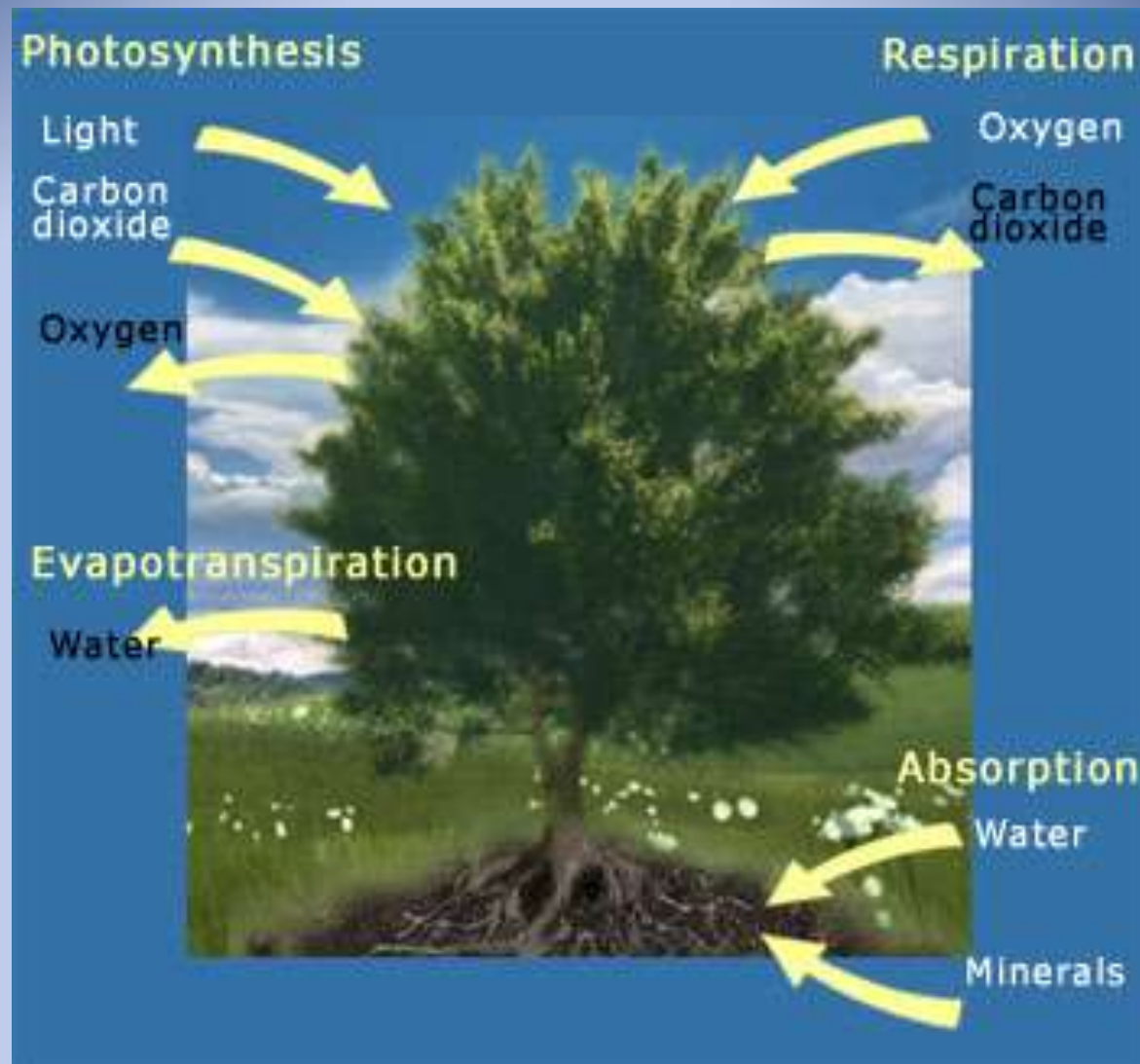


Photo from *Health and Incidence & Severity of Decay of Street Tree Maples in Four Upstate New York Cities*

http://www.dec.ny.gov/docs/lands_forests_pdf/streetmaples.pdf



Evapotranspiration (ET) = link between water and energy flows

ET, shading, buffering winter winds = energy efficiency benefits of trees

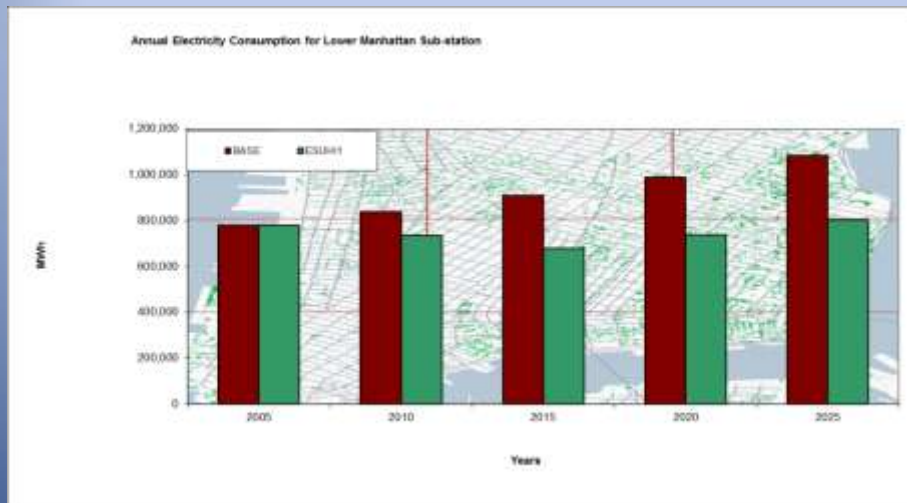
How much energy do trees save?

“Trees ... can cut cooling costs by 20 to 40 percent.” “Evergreens block wind. They can help you save 20 percent or more on heating costs.” (Con Edison email to customers in May 2014.)

In CA cities, \$500 million/year savings in wholesale electricity costs to utilities in 2001 (McPherson and Simpson 2003)

US Department of Energy: 15-50% reduction in air conditioning costs
(<http://energy.gov/articles/energy-saver-101-infographic-landscaping>)

Impacts of UHI Measures and Energy Star Technologies: >20% reduction in annual electricity consumption in urban NYC neighborhood (USEPA, citation below)



From *Urban Heat Island and Global Warming -- An Analysis of the Current State of Knowledge and Market Transformation Efforts in US Cities*. Patrick Kelly, EPA April 2007

Multiple benefits of green infrastructure

- Cooling streets, parking areas and buildings in urban areas by reducing *urban heat island* impacts
- Reduced energy use and public health benefits
- Contributes to aesthetic quality
- Reduced rates of certain crimes
- Safety improvements – less icing in parking areas (porous paving)
- Phytoncides boost human immune system, other health benefits *
- Mental and emotional health, including faster healing times after surgery
- Increased property values
- Air quality – impact of trees is complex and mixed
- Runoff reduction and water quality

* The Forest Rx, Gloria Van Duyne, NYS DEC, in Taking Root Summer 2013
See <http://www.dec.ny.gov/lands/90720.html>

Photo courtesy of Marilyn Wyman, Cornell Cooperative Extension of Columbia and Greene Counties



Challenges for tree planning and management

Storm risks

Real and perceived risks to buildings, etc. and precautionary cutting

Interference with power lines, utilities face competing interests

Need for training and technical assistance including public works/highway departments

Challenging urban environments with limited space and compacted soils



Trees washed downstream in Irene/Lee 2011 – Moodna Creek marsh, New Windsor NY

Work of Professor Dr. Nina Bassuk, Program Leader, Urban Horticulture Institute at Cornell University, and colleagues

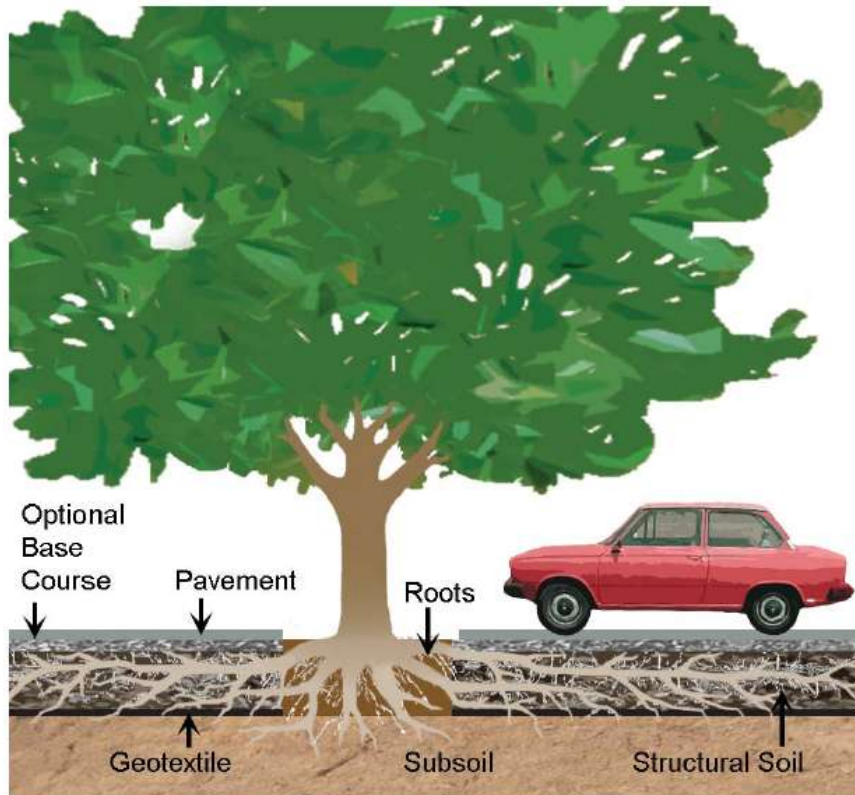


Figure 2. This system both serves as a parking lot and as a stormwater management facility. In addition to this double use of space, the structural soils also provide vastly greater soil volumes for tree root growth than traditional parking lot construction. Note: Gravel base course is optional, since the structural soil is designed to be as strong as a base.

Figure by Sarah Dickinson.

The focus of Bassuk's work includes optimizing health and benefits of street trees using CU-Structural Soil™ (also known as CU-Soil™), including combining CU-Soil™ with porous paving

Giving trees room to grow in urban environments



Soil volume effects on tree growth potential. Honeylocusts in Syracuse, NY – trees on the right are in tree pits with limited volume, while those on left are in tree pits and adjacent to a larger green area with more room for root growth.

Photo courtesy of Nina Bassuk, Cornell University Urban Horticulture Institute.



Monitoring root growth with ground-penetrating radar

Photo courtesy of Nina Bassuk, Cornell University Urban Horticulture Institute.

NYS 2100 COMMISSION

Recommendations to Improve
the Strength and Resilience of
the Empire State's Infrastructure



April 2014 – NY State Department of Public Service staff report kicks off major reform initiative for electric grid resilience, efficiency, and carbon reduction

REFORMING THE ENERGY VISION

NYS DEPARTMENT OF PUBLIC SERVICE
STAFF REPORT AND PROPOSAL

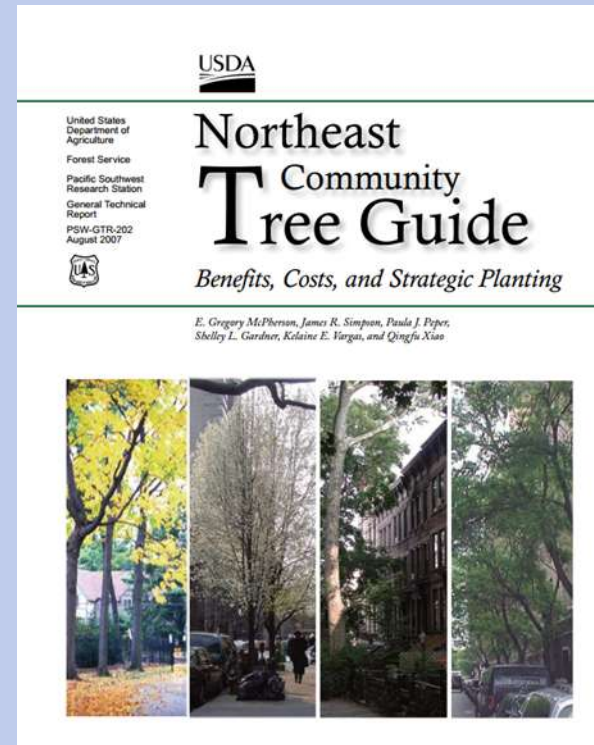
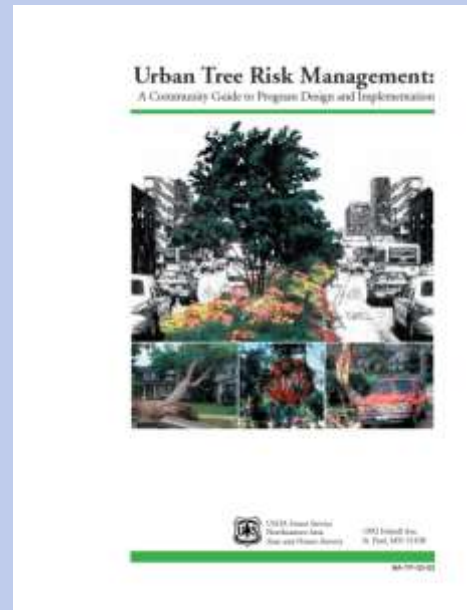
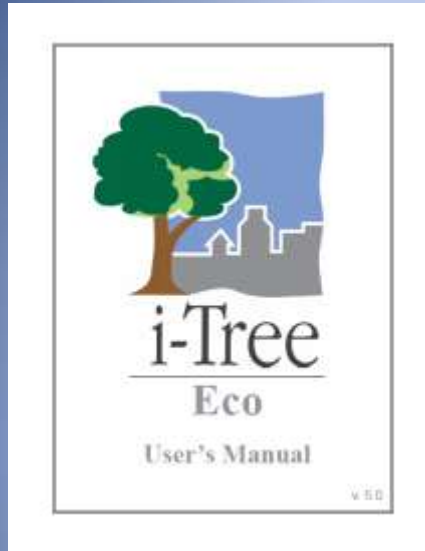
CASE 14-M-0101
4/24/2014

Report from NYS 2100 Moreland Commission established after Superstorm Sandy in 2012 – **“Promote and expand urban forests... to combat stormwater runoff and urban heat”** (p. 131)



Challenge and opportunity: integrate trees with other energy & climate priorities including solar energy
Home in Warwick NY, designed by Rick Alfandre, Alfandre Architecture

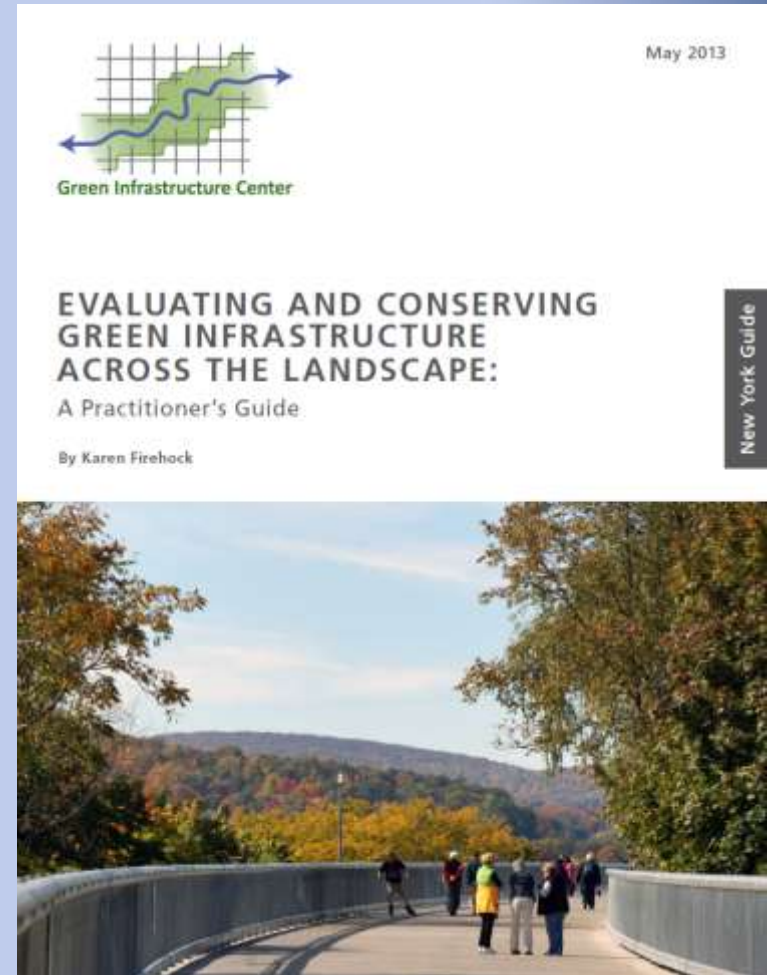
Tree assessment, valuation & risk management resources



Green infrastructure at the landscape scale

Landscape-scale green infrastructure includes protection of forests, open space, river corridors and connected floodplains and wetlands, and agricultural land

NY Guide includes case study of Ulster County
Green Infrastructure Center Inc.
www.gicinc.org



Philadelphia Green Infrastructure Plan

Triple Bottom Line benefits

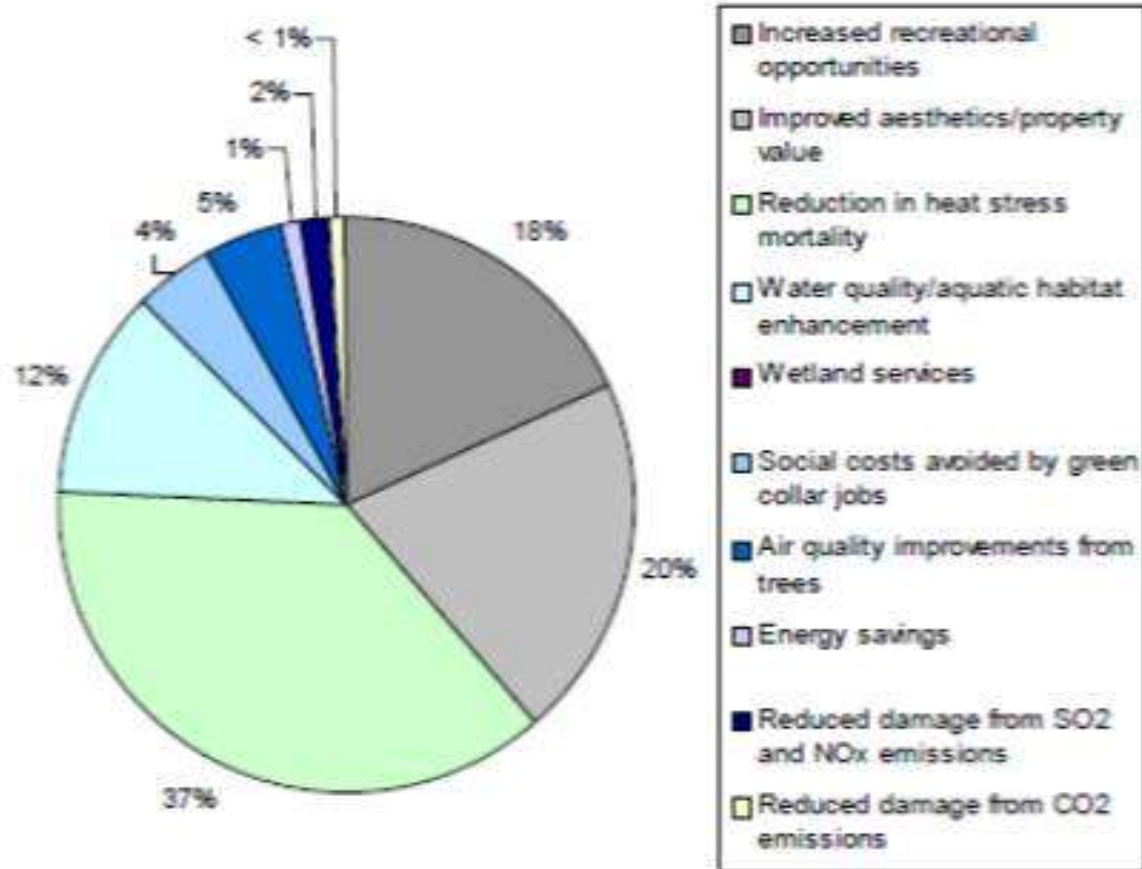


Figure 5.2. Shares of City-wide present value benefits of key CSO options: Cumulative through 2049.

Conclusions to date

- Abundant evidence and guidance material is available on many co-benefits of green infrastructure for human health, urban revitalization, energy efficiency (trees), reduction of peak load on the electric grid, urban heat island mitigation, some aspects of air quality (complex and mixed), and others
- In mid-Hudson region of NY, many of these topics and opportunities are not receiving as much attention as they should
- Post Irene/Lee and Sandy, and with other recent trends, major state and local initiatives are addressing relevant items but in mixed ways (e.g., plant more trees vs. cut more trees)
- Key sectors including health care, public health, community development, parks and recreation, insurance/finance, and energy and grid planning are areas with major potential for increased education, training, demonstration projects, etc.

How are best practices for managing water related to health, sustainability, climate adaptation, greenhouse gas reduction, and resilience?

For more information on regional water and green infrastructure initiatives:

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<http://hudsonvalleyregionalcouncil.org/>

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