

TREE CANOPY STORMWATER IMPLEMENTATION & OUTREACH PROGRAM

MassDEP Project 14-07/319

Comprehensive Environmental Inc.



Overview

Purpose:

- ▣ Stimulate greater interest in integrating trees into stormwater management design

Tasks:

- ▣ Site Development Scenarios & Stormwater Benefits of Trees
- ▣ Implementation Tools
- ▣ Tree Selection, Planting, Maintenance
- ▣ Internet Toolbox



An irony of stormwater design:

We remove trees (and other vegetation) to create impervious surface...



...then we remove more trees to create facilities to treat stormwater to mitigate for the loss of tree cover!



(MassDOT)

Ecological Services of Trees

Our Challenge:

How to more carefully consider the ecological functions of trees, and integrate *Tree Canopy* into the design of projects and their stormwater management systems.

Ecological Services of Trees

Municipal Forest Resource Analysis: New York City
(Center for Urban Forest Research, 2007)

- ▣ Tree inventory & benefit analysis quantified:
 - Energy savings
 - CO₂ reduction
 - Air pollutant reduction
 - Property value increase
 - **Stormwater runoff reduction**



Source: CUFR 2007

Ecological Services of Trees

CUFR: Municipal Forest Resource Analysis - NYC

- ▣ Annually, trees provide \$121.9 million in ecological services for NYC.
 - \$209 per tree
 - \$5.60 in benefits for every \$1.00 for tree planting and care
- ▣ Trees provide \$35.6 million annual savings in treating stormwater, because of rainfall interception
 - Average reduction of 1432 gallons per tree per year

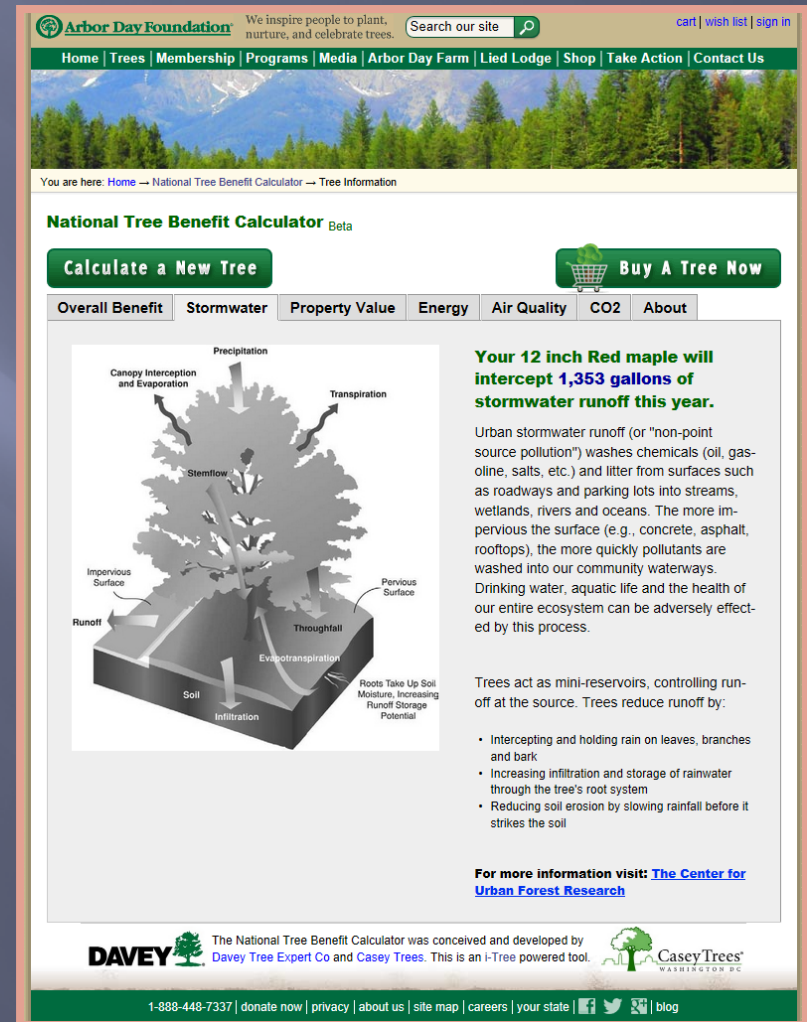
Task 1: Site Scenarios and Stormwater Benefits of Trees

In Central Massachusetts,
a 12-inch Red Maple...

- ▣ Intercepts 1353 gallons of water per year;
- ▣ Equals 3.8 inches of runoff reduction over the area of the tree's canopy;
- ▣ Reduction in "effective rainfall" by 8 to 10% over the canopy area

National Tree Benefit Calculator

<https://www.arborday.org/calculator/index.cfm>



Arbor Day Foundation We inspire people to plant, nurture, and celebrate trees. Search our site cart | wish list | sign in

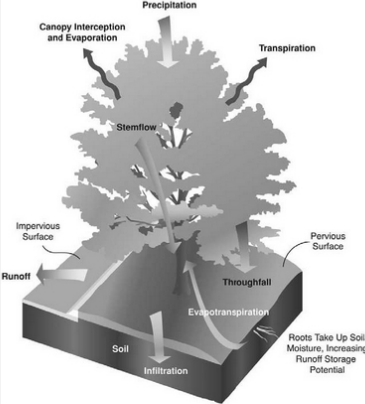
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You are here: Home → National Tree Benefit Calculator → Tree Information

National Tree Benefit Calculator Beta

Calculate a New Tree Buy A Tree Now

Overall Benefit Stormwater Property Value Energy Air Quality CO2 About



Your 12 inch Red Maple will intercept 1,353 gallons of stormwater runoff this year.

Urban stormwater runoff (or "non-point source pollution") washes chemicals (oil, gasoline, salts, etc.) and litter from surfaces such as roadways and parking lots into streams, wetlands, rivers and oceans. The more impervious the surface (e.g., concrete, asphalt, rooftops), the more quickly pollutants are washed into our community waterways. Drinking water, aquatic life and the health of our entire ecosystem can be adversely affected by this process.

Trees act as mini-reservoirs, controlling runoff at the source. Trees reduce runoff by:

- Intercepting and holding rain on leaves, branches and bark
- Increasing infiltration and storage of rainwater through the tree's root system
- Reducing soil erosion by slowing rainfall before it strikes the soil

For more information visit: [The Center for Urban Forest Research](#)

DAVEY The National Tree Benefit Calculator was conceived and developed by Davey Tree Expert Co and Casey Trees. This is an i-Tree powered tool. **Casey Trees** WASHINGTON DC

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Task 1: Site Scenarios and Stormwater Benefits of Trees

- ▣ Apply iTree Design to prototype scenarios:
 - Subdivision roads
 - Urban streets
 - Parking lots



(Alex92287 - Flickr.com)



(Using Trees to Reduce Stormwater Runoff -
Center for Watershed Protection/USDA Forest Service)

Task 1: Site Scenarios and Stormwater Benefits of Trees

- ▣ Estimate runoff reduction and associated TP reduction
 - Simple spreadsheet analysis based on representative tree species
 - MassDOT recommended plant list
 - iTree Tools selection guide – based on stormwater function
 - Does EEA Planting Program have recommended list?

Task 2: Implementation Tools

- ▣ Language for local bylaws to promote integration of trees for stormwater management
- ▣ Public planting and tree care program guidelines:
 - Does EEA already have resources for this component?
- ▣ Outreach brochure for private owners
 - Any EEA resources?

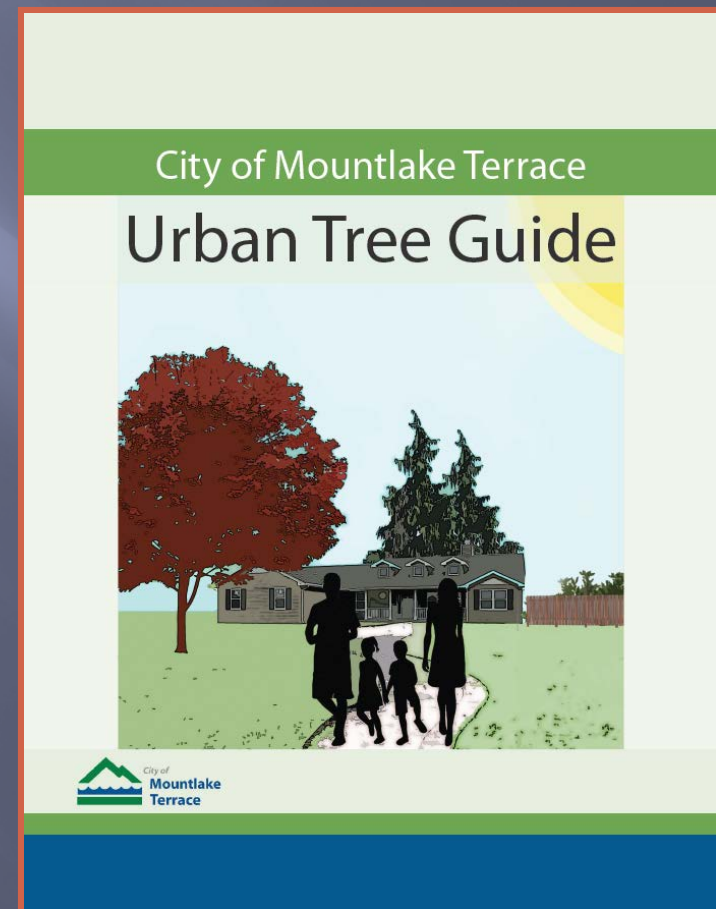
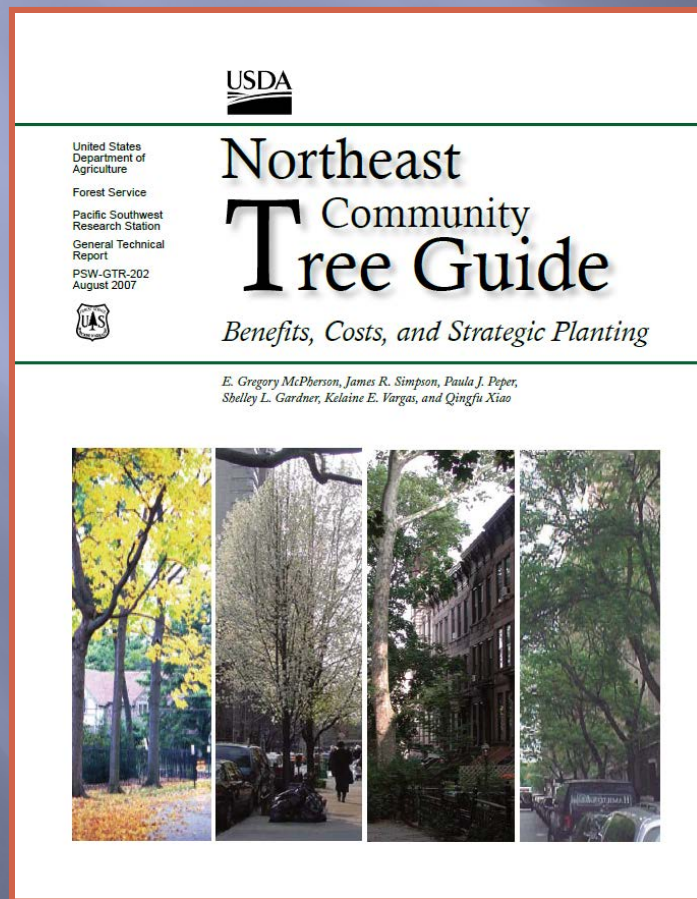
Task 2: Implementation Tools

Bylaw concepts:

- ▣ City of Philadelphia, PA stormwater program:
 - Water Quality Volume reduction for individual trees located close to pavement
 - Existing tree preservation (canopy within 20 feet)
 - New tree installation (canopy within 10 feet)
 - Must comply with specified standards
- ▣ Cities of Portland and Eugene, OR
- ▣ State of Pennsylvania – forested area credit

Task 2: Implementation Tools

Guidance for municipalities, private owners



Task 3: Selection/Planting/Maintenance

Will the tree destroy the pavement...



(MassDOT)

...or will the pavement
kill the tree ?



(Using Trees to Reduce Stormwater Runoff-
Center for Watershed Protection/USDA Forest Service)

Task 3: Selection/Planting/Maintenance



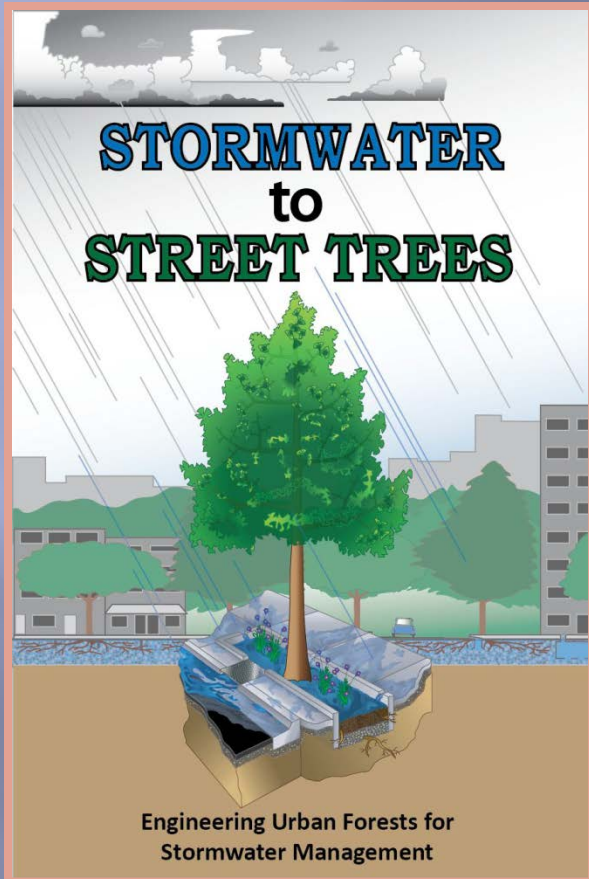
[http://www.na.fs.fed.us/pubs/uf/watershed1/
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Tree versus pavement...

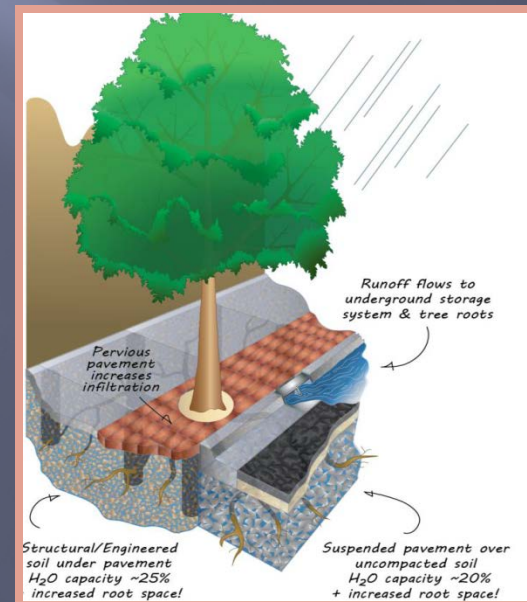


Source: McPherson & McDonagh, 2012

Tree versus pavement...



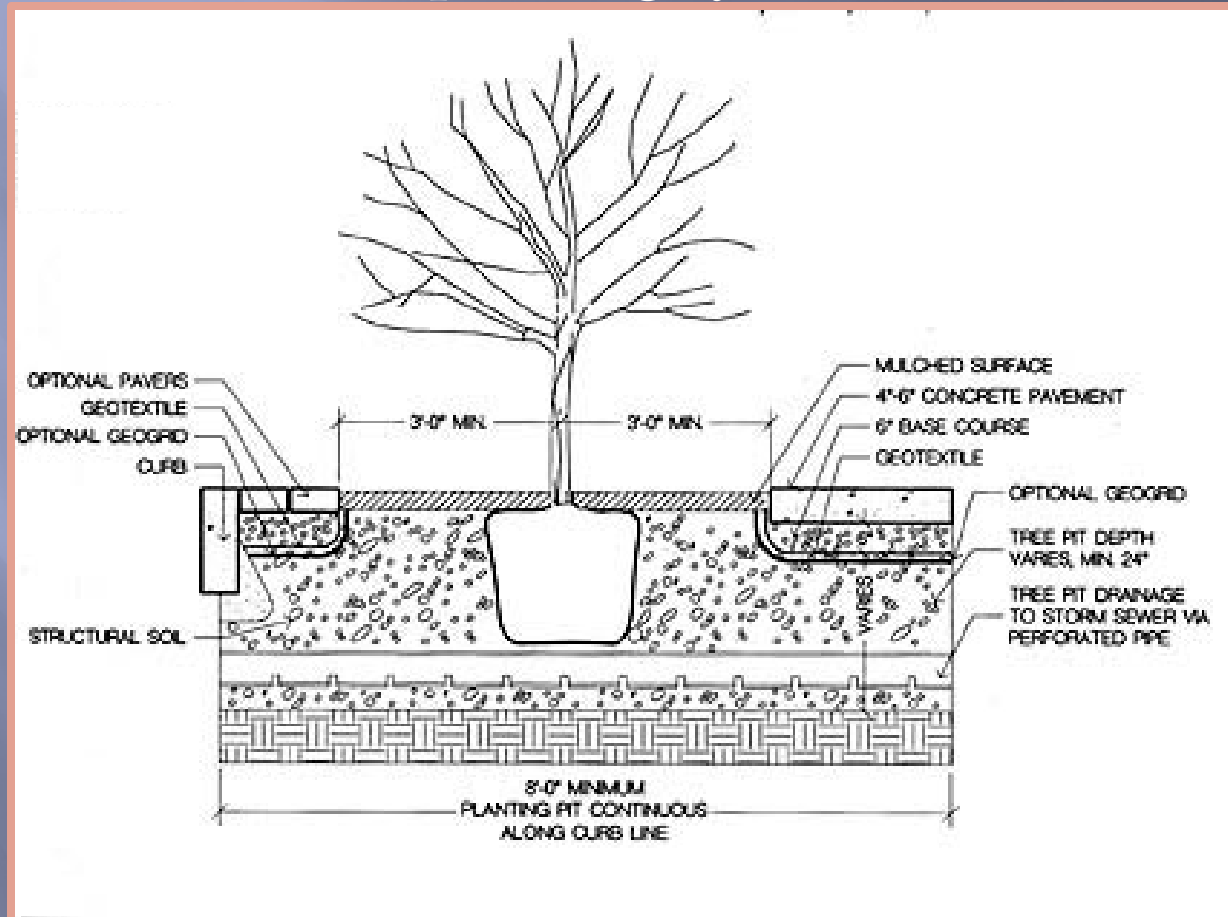
- ❑ Suspended pavement
- ❑ Structural cells
- ❑ Structural soil
- ❑ Stormwater tree pits
- ❑ Permeable pavement



http://www.davey.com/media/183712/Stormwater_to_Street_Trees.pdf

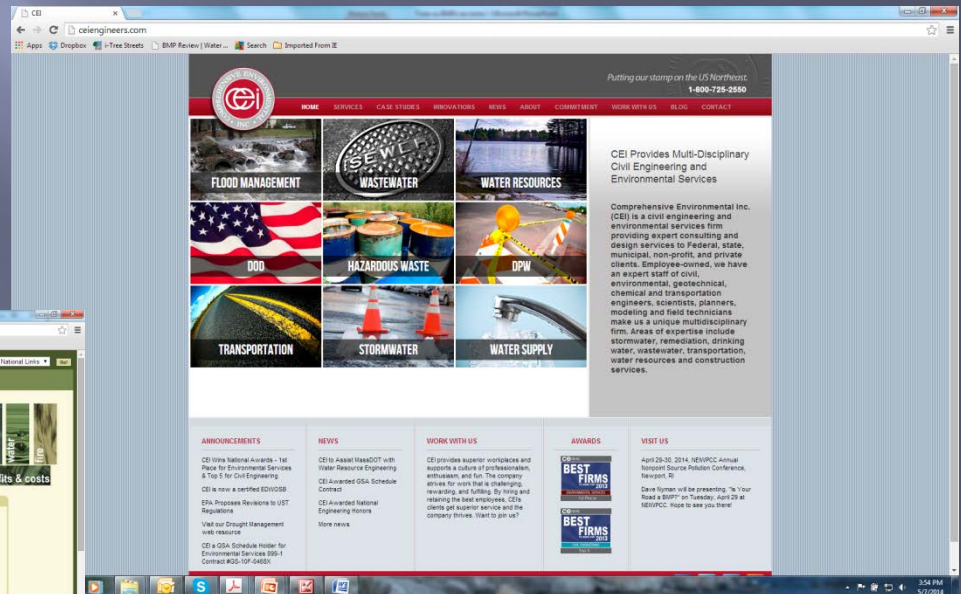
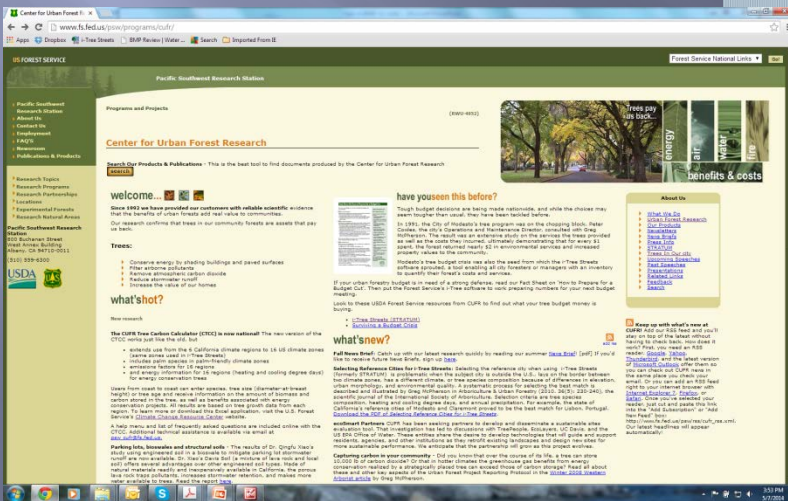
Tree versus pavement...

Structural soil planting system



Task 4: Internet Tool Box

- ▣ Links to deliverables produced in Tasks 1-3
- ▣ Links to other internet resources; e.g.:
 - ▣ Center for Urban Forest Research
 - ▣ EEA Program?
- ▣ CEI website = host





Questions?