Planting for the Future

Embracing Climate Change and the Unknown in Municipal Forestry

Emily Hamilton, Davey Resource Group
May 20th, 2014
Planting for the Future

• Climate change in the context of Urban Forestry (Context)
• What approach do we take? (Approach)
• What options are available? (Action Planning)
• What are other cities doing? (Networking)
• Available tools and resources (Tools & Resources)
Context

Climate Change Effects Impacting Trees

Trees Impacting the Effects of Climate Change
Context

Climate Change Effects Impacting Trees

Immediate Impacts Gradual Change
Context

Climate Change Effects Impacting Trees

Immediate Impacts

Gradual Change

Image courtesy ReGreen Springfield
Context

Climate Change Effects
Impacting Trees

Immediate Impacts
Gradual Change

Image courtesy ReGreen Springfield
Context

Climate Change Effects Impacting Trees

Immediate Impacts

Image courtesy ReGreen Springfield

Gradual Change

Billions to Eradicate

Emergency Funds
Context

Trees Impacting the Effects of Climate Change

“$$$$”
Context

Methods:
- Benefits and costs were quantified for typical large, medium, and small deciduous trees and a conifer
- The analysis assumed that trees were planted in a residential yard, public park, or street side with a 66-percent survival rate over 40 years
- Tree care costs were based on results from a survey of municipal and commercial arborists
- Benefits were calculated by using tree growth curves and numerical models that consider regional climate, building characteristics, air-pollutant concentrations, and prices

Benefits analyzed:
- Energy savings (electricity and natural gas)
- Air pollution reduction (carbon dioxide, nitrogen dioxide, sulfur dioxide, ozone, airborne particles, and volatile organic compounds)
- Runoff reduction (rainfall interception)
- Property values

Costs analyzed:
- Tree purchase and planting
- Pruning
- Irrigation
- Pest and disease prevention and control
- Removal and disposal
- Sidewalk repair
- Leaf litter cleanup
- Liability, legal aspects, and administration

Study conducted by: USDA, USFA, Pacific SW Research Station
$5,870

The Value of a Tree in the Northeast

A large tree in the Northeast will provide $5,870 in environmental and other benefits over its lifetime. That’s nearly a 440-percent return on investment!

Properly cared for, trees are valuable and growing assets worth nearly four and a half times the investment.

Trees produce benefits for us when we plant and nurture them in our urban environments. The Urban Ecosystems and Social Dynamics Program at the USDA Forest Service Pacific Southwest Research Station is assessing the ways that trees pay us back and their value to us.

Healthy trees mean:

Healthy people
Each year, 100 large, mature street trees
- Remove 24 tons of carbon dioxide (CO₂)
- Remove 261 pounds of other air pollutants
- Catch about 19,800 gallons of rainwater

Healthy communities
Tree-filled neighborhoods
- Report lower levels of domestic violence
- Are safer and more social
- Reduce stress of body and mind
- Decrease need for medication, and speed recovery times

Homeowner savings
One well placed large tree
- Provides average savings of $30 in home heating costs each year

Better business
In tree-lined commercial districts, shoppers report
- More frequent shopping
- Longer shopping trips
- Willingness to pay more for parking
- Willingness to spend 12 percent more for goods

Higher property values
Trees increase the resale value of houses
- Each large front yard tree adds 1 percent to the sales price of a house
- Large specimen trees can add 10 percent to property value

It pays to care for trees

Landscape trees provide benefits that far exceed the costs of planting and care over their lifetime.

Environmental and aesthetic benefits, such as energy savings, stormwater runoff reduction, cleaner air, and higher property values, are consistently many times greater than tree care costs.

The greatest benefits are higher property values and energy savings from heating and cooling.

One large public tree, 40 years after planting, averaged:

<table>
<thead>
<tr>
<th>Annual benefits</th>
<th>$147</th>
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<td>Annual costs</td>
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<td>Annual net benefit</td>
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Over 40 years, 100 large public trees total:

<table>
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<tr>
<th>Benefits</th>
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<td>Costs</td>
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<td>40-year net benefit</td>
<td>$453,280</td>
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- Remove 24 tons of carbon dioxide (CO₂)
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Healthy communities
- Tree-filled neighborhoods
  - Report lower levels of domestic violence
  - Are safer and more sociable
  - Reduce stress of body and mind
  - Decrease need for medication, and speed recovery times

Homeowner savings
- One well-placed large tree
  - Provides average savings of $39 in home heating costs each year

Better business
- In tree-lined commercial districts, shoppers report
  - More frequent shopping
  - Longer shopping trips
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Higher property values
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One large public tree, 40 years after planting, averaged:

- Annual benefits: $147
- Annual costs: $34
- Annual net benefit: $113

Over 40 years, 100 large public trees total:

- Benefits: $587,360
- Costs: $134,280
- 40-year net benefit: $453,080
Approach

- **Resistance**
  - Fight to keep things the same

- **Resilience**
  - Accept temporary change with the goal of returning to a previous condition

- **Adaptation**
  - Respond to new conditions by accommodating change
Elm – Lined Street.
Image courtesy Ferrebeeker on wordpress.com
Approach

Sweetgum

White Oak

Amur Corktree

Black Tupelo

American Hophornbeam

American Hornbeam
Approach

Sweetgum

White Oak

Amur Corktree

Black Tupelo

American Hophornbeam

American Hornbeam

Right tree, right place ... Right purpose!
Performance Based Planting
Acer saccharum

Species adaptability:
Positive traits
• Shade tolerance (tolerant)
• Environmental habitat specificity (not specific)

Negative traits
• none

Gleditsia triacanthos

Species adaptability:
Positive traits
• None

Negative traits
• Shade tolerance (intolerant)

Right tree, right place ... Right purpose!

Action Planning

Basic Elements of Urban Forestry Management Planning

Know what you have, know your potential. Get the support!

- Tree inventory
- Urban Tree Canopy Assessment
- Maintenance & Budget plan

- Political Structure
- Staffing and Resources
- Networking

- Funding
Action Planning

Tree Inventory - species, condition, risk, etc.
Pruning/Removal, Planting, Pest/Disease Control, etc.
### Estimated Costs for the Town of Easton’s Five-Year Tree Maintenance Program

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**Maintenance and Budget Plan**
Urban Tree Canopy (UTC) Assessment

Action Planning

Land Cover Classification
- Tree Canopy
- Buildings
- Roads
- Other Impervious
- Grass/Low-Lying Vegetation
- Bare Soils
- Open Water

Hardscape Proximity
Canopy Proximity
Soil Permeability
Floodplains
Slope
Population Density
Road Density
Urban Heat Island

Urban Tree Canopy (UTC) Assessment
Urban Tree Canopy (UTC) Assessment

Action Planning

Canopy Percent vs Median Income

Median Income
- Less Than $10,000
- $10,001 - $20,000
- $20,001 - $30,000
- $30,001 - $40,000
- Greater Than $40,000

R² = 0.2359

Population
Action Planning

Urban Tree Canopy (UTC) Assessment

Urban Heat Island Threat
- Very Low
- Low
- Moderate
- High
- Very High

Environmental Need
- Very Low
- Low
- Moderate
- High
- Very High
Action Planning

- Governing Documents
  - Tree Ordinance
  - Set-back Planting Policy
  - Public Tree Master Plan
- Governing bodies
  - Tree Board/Committee
  - Law Enforcement
- Permanent Staff vs. Volunteers, Non-Profit/NGO/Friends-of Organizations
  - What can they bring to the table? How are they best utilized?
  - Who is certified? What jobs require certification?
  - Knowledge of income, materials and resources available vs. needed

Effective Political Framework
Action Planning

Know your Nurseries!

Keep Up with Grant Opportunities!

Post your Progress!

Chelsea, MA

Holyoke, MA

Fall River, MA

Energy and Environmental Affairs
“Community trees leverage the social, economic, and environmental value of cities, with forestry and related industries providing employment for over 1.6 million people and contributing $231.5 billion to US economy.”
i-Tree Design v6.0*

i-Tree Design allows anyone to make a simple estimation of the benefits provided by individual trees. With inputs of location, species, tree size, and condition, users will receive an understanding of tree benefits related to greenhouse gas mitigation, air quality improvements, and stormwater interception. With the additional step of drawing a building footprint – and virtually “planting” or placing a tree – tree effects on building energy use can be evaluated.

Tree benefits are estimated for (a) the current year, (b) a user-specified forecast year sometime in the future, (c) the projected total benefits across that future timespan, and (d) the total benefits provided to date (based on estimated tree age). Multiple trees and buildings can be added to compare benefits or to provide a full accounting of a property’s trees.

This tool is intended as a simple and accessible starting point for understanding the value of individual trees or a small population of trees to a community. For more detailed information on urban and community forest assessments, please explore more of the i-Tree website. To learn more about the i-Tree Design model, click here.

*The current version of i-Tree Design (v6.0) includes expanded performance and updated benefit estimates. Users wishing to access the previous version (v5) should click here. i-Tree Design v5 will continue to be available through June 2014.

www.itreetools.org/design.php
i-Tree Design v6.0

Get started with these easy steps:
1. Draw Structures
2. Place Trees
3. Estimate Benefits

Describe your tree:
- Tree species:
  - Ash, White
- Tree diameter: 15 Inches
- or circumference: 47.1
- Tree condition: Good
- Tree exposure to sunlight: Full sun

Tree benefit zones:
- The colored zones surrounding the structure, which appear as you describe your tree, illustrate the relative monetary value of energy savings that the tree would provide in each zone.
- Hover over each zone to see that energy benefit information displayed below the map.

To place a tree:
- Drag this icon to the location on the map where you would like to place your tree.
- Repeat to place additional trees.
- Hover over any tree you have placed on the map to display its benefits.

Model the tree(s) future crown growth over time:
- Model Crown Growth

40 Avon Street, Keene, NH 03431, USA

Less desirable | More desirable
Preferred planting zones to maximize tree benefits are shown around the structure.
Preferred planting zones to maximize tree benefits are shown around the structure.
This 15-inch diameter white ash will provide overall benefits of $39 in the current year.

While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees' specific geography, climate, and interactions with humans and infrastructure are highly variable and make precise calculations that much more difficult. Given these complexities, the results presented here should be considered initial approximations to better understand the environmental and economic value associated with trees and their placement.

Benefits of trees do not account for the costs associated with trees' long-term care and maintenance.

If this tree is cared for and grows, it will provide $43 worth of annual benefit in 10 years. See 'Future Year (2024)' tab at left for details.
Available Tools and Resources

Links:

- i-Tree tools: [www.itreetools.org](http://www.itreetools.org)
- USFS Tree Atlas: [http://www.nrs.fs.fed.us/atlas/tree](http://www.nrs.fs.fed.us/atlas/tree)
- US Drought Monitor: [http://droughtmonitor.unl.edu](http://droughtmonitor.unl.edu)
- National Tree Benefits Calculator: [www.treebenefits.com/calculator](http://www.treebenefits.com/calculator)
- US Conference of Mayors: [www.usmayors.org](http://www.usmayors.org)
- Urban Natural Resources Institute: [www.unri.org](http://www.unri.org)
- Arbor Day Foundation: [www.arborday.org](http://www.arborday.org)
- City of Surrey, BC Climate Adaptation Strategy: [http://www.surrey.ca/files/Climate_Adaptation_Strategy_-_FINAL.pdf](http://www.surrey.ca/files/Climate_Adaptation_Strategy_-_FINAL.pdf)

Thank you!

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