Using urban forests to increase community resiliency to climate change

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Talk Outline

• Urban forests are valuable
• Urban forests are vulnerable
• WeatherWise Checklists: Strategies for Urban Forests
They are the most valuable forest type in NE
They provide key benefits (ecosystem services)

<table>
<thead>
<tr>
<th>Amenity</th>
<th>Air Pollution Control</th>
<th>Cooling</th>
<th>Water Quality</th>
<th>Other Cultural</th>
<th>Vegetation</th>
<th>Recreation</th>
<th>Soil Erosion Control</th>
<th>Water Supply</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>500</td>
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<td>5000</td>
</tr>
</tbody>
</table>

The chart above illustrates the annual value ($) per year for various ecosystem services. The services include amenities, cooling, air pollution control, wildlife habitat, water quality, other cultural, vegetation, recreation, soil erosion control, water supply, and total.
Climate change will affect our urban communities

• Stormwater overflows
• Drought
• Extreme heat
• More air pollution
• Road surface damage
# Urban Forests and Trees

<table>
<thead>
<tr>
<th>Increase temperatures</th>
<th>More tree pests and pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased winter temperatures</td>
<td>More winter kill (freezing and thawing)</td>
</tr>
</tbody>
</table>
| Summer drought | - Aggravated by urban soil compaction & impermeable surfaces  
                  - Urban foliage more attractive to pests and pathogens |
| Increased winter precipitation | Damage due to increased snow and ice loading |
| More frequent extreme weather | - Uproot trees  
                                  - Waterlogging impacts to tree roots |

**Very likely** that urban forests will be affected. Timing and magnitude of change uncertain.
Forests and Trees

<table>
<thead>
<tr>
<th>Type</th>
<th>Low: widespread decline and loss.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High: Loss everywhere and greatest in southern areas</td>
</tr>
<tr>
<td>Spruce - fir forests</td>
<td></td>
</tr>
<tr>
<td>Northern hardwood</td>
<td>Low: Some increased forest productivity.</td>
</tr>
<tr>
<td></td>
<td>High: Reduced area across region.</td>
</tr>
<tr>
<td>Hemlock</td>
<td>Hemlock woolly adelgid results in widespread loss.</td>
</tr>
<tr>
<td>Oak and pine</td>
<td>Widespread expansion, especially of pine</td>
</tr>
<tr>
<td>Swamp</td>
<td>Localized but widespread decline or loss due to drought and SLR</td>
</tr>
</tbody>
</table>

Very likely that forests will change. Timing and magnitude of change uncertain.
...and will make it harder to maintain urban forests

- Heat stress
- Drought
- Flooding
- Severe storms (wind, ice storms, uprooting)
- Air pollution
- Insect pests
- Exotic species
Urban Forests can reduce climate change impacts

• Moderate storm damage/impacts
• Moderate temperatures (e.g., for homes, heat island effect)
• Reduce peak water flows & flooding
• Absorb air pollution
• Keep sediment out water bodies
• Maintain community attractiveness
How do we adapt?

Focus on
- Urban Forest Plan
- Land Use Planning
- Ordinances
Four parts: WeatherWise Checklists

- Awareness: Get prepared
- Plan: Have a plan
- Do: Select appropriate strategies and Best Management Practices (BMPs)
- Check: Monitor progress
Get prepared

• General knowledge about climate change
• Community specific knowledge about potential threats
Checklist for Urban Forest Plan

- Goals and objectives
- Location information
- Protection and maintenance activities
- Neighborhood area descriptions and inventory
## Forest Plan – i-Tree Suite

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canopy</strong></td>
<td>Tree canopy cover, area of cover types, and key benefits in Google Earth.</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td>Tree benefits and ideal planting zones in Google Earth.</td>
</tr>
<tr>
<td><strong>Eco</strong></td>
<td>Uses your inventory data to quantify forest structure and key benefits.</td>
</tr>
<tr>
<td><strong>Vue</strong></td>
<td>Estimates cover types and some forest benefits urban, community, and private forests.</td>
</tr>
</tbody>
</table>
Checklist for Land Use Plans

• Vision
  – Future role of urban and community forest

• Future land use plan
  – Highlight value of urban and community forest for resiliency
  – Highlight vulnerable forest area

• Action Plan – Natural resources
  – Key attributes (highlight urban and community forests)
  – Planning considerations (climate change opportunities/threats)
  – General actions and their “actors” (what/who)

• Appendices
  – Public Facilities and Services Inventory - Highlight key urban and community forest resources and services (arborist, etc.)
  – Natural resources inventory – Highlight key climate-related vulnerabilities of urban and community forests
  – Optional - Climate Change Action Plan – mitigation & adaptation
Do: List of strategies & BMPs for urban forest plans

- Tree Management and Health
- Local Climate Regulation
- Air Quality and Green House Gas Sequestration
- Wildlife
- Water Quality
- Amenity Value and Recreation
Strategy #1: Increase urban tree cover

- BMP: Provide homeowner incentives for planting and maintaining yard trees.
  - Worcester Tree Initiative
  - Chicago
  - Toronto

http://www.treeworcester.org
Tree Management and Health

Strategy #2 Maintain species, structural & age class diversity

• BMP: Diversify species mix to reduce risk of catastrophic loss of urban trees.
Strategy #3: Maintain & increase species that are resilient to climate change

- BMP: Plant tree species favored by warming weather
  - Red maple
  - Sweetgum

- BMP: Reduce dominance of vulnerable species
  - Ash spp.
  - Eastern hemlock
Tree Management and Health

Strategy #5: Use tree and shrub species native to the region and/or eastern North America.

• BMP: Plant native trees and shrubs when possible

• BMP: Track existing and emerging threats of invasive species

Buckthorn

Japanese Barberry
Other strategies

• Local Climate Regulation
• Air Quality and Greenhouse Gas Sequestration
• Wildlife
• Water Quality
• Amenity Value and Recreation

Most adaptation BMPs are practices that manage general risk not just climate change
Urban ordinances can focus on:

• Reducing tree loss
  – Mandatory replacement of trees lost
  – Reduction of trees lost during construction

• Expanding tree cover
  – Planting areas with impervious surfaces
  – Planting unused grassed areas
  – Planting with new construction (energy use)

• Maintaining highway and buffer cover
  – Control exotics
  – Plant trees (air pollution)

• Maintaining native species
  – Restrict planting of exotic species on municipal land
Do: Checklist for land use

Community forest ordinances can focus on:

• Reducing forest loss
  – Incentive zoning
  – Conservation subdivisions
  – Cluster developments
  – Shore land zoning
  – Easements on public forests
  – Creation of a community forest system

• Maintaining native species
  – Establish a tree board or forestry commission
  – Education of landowners
Monitoring: Checklist for urban forest plans

• **Forest Plan:** Monitor urban forests for
  – Tree mortality
  – Pest and disease infestations
  – Tree canopy cover (neighborhoods, high-intensity areas)

• **Forest Plan:** Monitor forests for:
  – Flooding (including sea level rise) impacts
  – Habitat decline/loss
  – Pest and disease infestations
  – Exotic species
  – General changes in fire risk

• **Land use plan:** Monitor forests for:
  – Flooding
  – Forest cover loss (overall, watersheds, riparian areas)
  – General changes in fire risk
Three points (summary)

- Urban forests are key assets
- Urban forests are at risk to climate change
- Use local strategies to make urban forests more resilient, enhance their benefits, and make communities more resilient
Acknowledgements

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