Assessment of the Benefits of Ecosystem Restoration with i-Tree Eco

Jason Henning, The Davey Institute and US Forest Service Philadelphia Urban Field Station
Talk Outline

- What is i-Tree?
- What does i-Tree Eco do?
- Example Applications
- Questions & Answers
i-Tree...

“Putting USFS Urban Forest science into the hands of users”

- Credible, USDA FS peer-reviewed tools
- Public domain software
- Accessible
- Continuously improved

www.itreetools.org
Benefit Based Approach

- Strategic Management & Advocacy
- Comprehensive Value
- Ecosystem Services
- Structure

i-Tree Tools
i-Tree Suite of Software

www.itreetools.org
Assessing Urban Tree Populations

i-Tree Eco assesses:

- Structure
- Function
  - Energy
  - Air pollution
  - Carbon
  - Avoided runoff
- Value ($)
- Management needs
  - Pest risk
  - Tree health
  - Exotic/invasive spp.
How does i-Tree Eco work?

1. Design Project
   - Determine what benefits you want to estimate
     - Standard metrics
     - Optional metrics
   - Define area of interest

2. Define Inventory Method
   - Sample plots (recommend 200, 1/10th acre for urban areas)
   - Complete inventory (for small areas)

3. Collect Field Data
   - Web-enabled mobile device, PDA, or paper data sheets
   - Measure variables
     - DBH, height, crown base, crown width, crown light exposure, condition...

Submit data for processing
Example restoration applications

1. Establish baseline comparisons
   - Using i-Tree Eco to predict the benefits associated with existing tree populations

2. Estimate benefits of urban proposals
   - Examine the benefits associated with projects in urban areas
1. Establish baseline comparisons

Monitor natural areas in Three Rivers Park District

• 27,000 acres of parks and trails
• Assess current structure of the forest resource
• Estimate benefits associated with resource

Use a plot based i-Tree Eco project
1. Establish baseline comparisons

Summary of forest structure

- Species distribution
- Diameter distribution
- Species origin
- Species importance
- Species diversity
- Tree condition
- Leaf area
- Biomass
- Etc.
- Summary by species
- Summary by land cover types

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Percent Population</th>
<th>Percent Leaf Area</th>
<th>Importance Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar maple</td>
<td>27.9</td>
<td>31.7</td>
<td>59.6</td>
</tr>
<tr>
<td>Eastern hophombeam</td>
<td>17.4</td>
<td>9.4</td>
<td>26.8</td>
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<tr>
<td>American elm</td>
<td>10</td>
<td>7.9</td>
<td>17.9</td>
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<tr>
<td>Northern red oak</td>
<td>5</td>
<td>12</td>
<td>17</td>
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<tr>
<td>American basswood</td>
<td>6.4</td>
<td>10</td>
<td>16.4</td>
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<tr>
<td>Green ash</td>
<td>6.4</td>
<td>6.9</td>
<td>13.4</td>
</tr>
<tr>
<td>European buckthorn</td>
<td>9.2</td>
<td>3.2</td>
<td>12.4</td>
</tr>
<tr>
<td>Boxelder</td>
<td>4.7</td>
<td>4.4</td>
<td>9.1</td>
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<tr>
<td>Bur oak</td>
<td>1.3</td>
<td>4.1</td>
<td>5.4</td>
</tr>
<tr>
<td>White oak</td>
<td>1.1</td>
<td>3.3</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Table 1. Most important species in Three Rivers Parks District
1. Establish baseline comparisons

Summary of forest benefits

- Air pollution removal
- By species
- Monthly
- Hourly
- Carbon sequestration
- Carbon storage
- Oxygen production
- Avoided run-off
- VOC production
- $ value of ecosystem services
- Etc.

<table>
<thead>
<tr>
<th>Species</th>
<th>Oxygen (tons)</th>
<th>Net Carbon Sequestration (tons/yr)</th>
<th>Number of trees</th>
<th>Leaf Area (square miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar maple</td>
<td>12,793.07</td>
<td>4,797.40</td>
<td>1,085,515.00</td>
<td>31.97</td>
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<tr>
<td>Northern red oak</td>
<td>7,220.84</td>
<td>2,707.82</td>
<td>194,573.00</td>
<td>12.06</td>
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<tr>
<td>Green ash</td>
<td>2,210.09</td>
<td>828.78</td>
<td>250,897.00</td>
<td>6.99</td>
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<tr>
<td>Boxelder</td>
<td>2,183.78</td>
<td>818.92</td>
<td>184,333.00</td>
<td>4.42</td>
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<tr>
<td>Bur oak</td>
<td>2,063.97</td>
<td>773.99</td>
<td>51,204.00</td>
<td>4.16</td>
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<tr>
<td>Eastern hophornbeam</td>
<td>1,848.86</td>
<td>693.32</td>
<td>675,887.00</td>
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<td>American basswood</td>
<td>1,642.27</td>
<td>615.85</td>
<td>250,897.00</td>
<td>10.06</td>
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<td>European buckthorn</td>
<td>1,559.84</td>
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<tr>
<td>Bigtooth aspen</td>
<td>1,199.37</td>
<td>449.77</td>
<td>66,565.00</td>
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<td>American elm</td>
<td>1,069.42</td>
<td>401.03</td>
<td>389,147.00</td>
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<td>612.65</td>
<td>229.74</td>
<td>40,963.00</td>
<td>3.37</td>
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<tr>
<td>Black ash</td>
<td>531.55</td>
<td>199.33</td>
<td>35,842.00</td>
<td>1.96</td>
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<td>Black cherry</td>
<td>366.11</td>
<td>137.29</td>
<td>92,166.00</td>
<td>0.51</td>
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<td>Bitternut hickory</td>
<td>361.91</td>
<td>135.72</td>
<td>40,963.00</td>
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<td>Slippery elm</td>
<td>255.24</td>
<td>95.71</td>
<td>56,324.00</td>
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<td>Northern hackberry</td>
<td>227.22</td>
<td>85.21</td>
<td>30,722.00</td>
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<td>Button bush</td>
<td>114.7</td>
<td>43.01</td>
<td>5,120.00</td>
<td>0.42</td>
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<tr>
<td>Quaking aspen</td>
<td>87.3</td>
<td>32.74</td>
<td>15,361.00</td>
<td>0.07</td>
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<td>Siberian elm</td>
<td>53.44</td>
<td>20.04</td>
<td>10,241.00</td>
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<td>Common chokecherry</td>
<td>31.66</td>
<td>11.87</td>
<td>5,120.00</td>
<td>0.02</td>
</tr>
</tbody>
</table>
2. Benefits of Urban Projects

Phoenix park in Camden, NJ

- Restore riverside marsh
- Provide access to waterfront
- Involves planting 56 trees
2. Benefits of Urban projects

Method:
- Create a list of mature trees of desired species (e.g. DBH 10-20 inches)
- Predict possible tree characteristics (i.e. crown parameters)
- Import the data to i-Tree Eco and predict benefits.

Results:
- Structural/replacement value of $90,000
- Storing 10 tons of carbon
- Sequestering an additional 1,200 lbs of C/yr
- Filtering 45 lbs of pollution from air each year
- EPA estimated value of $620/yr
- Preventing 5,500 gallons of rainfall from becoming runoff each year
Summary: What can i-Tree do for you?

- Provide estimates of the value of restoration
- Evaluate different restoration scenarios
- Monitor restoration projects and estimate changes in benefits
- Provide documentation to support restoration proposals and projects

...No, seriously, What can i-Tree do for you?
Thank You

Questions

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