

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



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# 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](http://www.itreetools.org)



The screenshot shows the i-Tree website homepage. At the top, there's a navigation bar with the i-Tree logo, the tagline "Tools for Assessing and Managing Community Forests", a "Get the Tools" button with a CD icon, a Google Custom Search box, and a USDA logo. Below the navigation bar is a large banner image of a city skyline at night with a river and a bridge. Under the banner is a horizontal menu with buttons for Home, About, Applications, Utilities, Resources, Support, and News. The main content area is divided into three columns. The left column features a "Community Trees: A Living Investment" section with a DVD cover image and a "Featured i-Tree Project: Fox Valley, WI Metro Area" section with a tree diagram showing various metrics. The middle column has a "What is i-Tree?" section with a detailed paragraph about the software suite, followed by a paragraph about the initial release in August 2006, and a paragraph about the public domain status. The right column has a "What's New?" section with several news items, including "PA Joint Legislative Air and Water Pollution Control and Conservation Committee Environ. Synopsis Dec 2012", "Wisconsin DNR study shows Fox Valley area trees provide \$5m per year in benefits", "i-Tree and Air Pollution in Desoto County, Mississippi Urban Forestry South - Leaves of Change", "A Guide to Assessing Urban Forests", "Virginia Street Tree Assessment Project: An application of i-Tree Streets", and "Green Benefits in Victoria (UK) Business Improvement". At the bottom of the middle column is a "Follow i-Tree on Twitter" link with a Twitter icon.





# Benefit Based Approach



# i-Tree Suite of Software



[www.itreetools.org](http://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.

### I. Tree Characteristics of the Urban Forest

The urban forest of Washington DC has an estimated 2,043,000 trees with a tree cover of 29.6 percent. Trees that have diameters less than 6-inches constitute 56.7 percent of the population. The three most common species are American beech (14.60 percent), Red maple (6.43 percent), and Boxelder (6.17 percent).

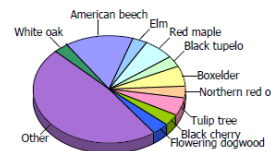


Figure 1. Tree species composition in Washington DC

Among the land use categories, the highest tree densities occur in Forest followed by Ag./Water/Wetland and Developed, open. The overall tree density in Washington DC is 128 trees / hectare (see Appendix III for comparable values from other cities).

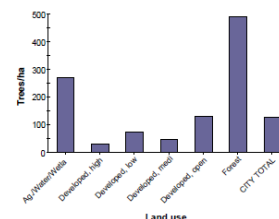
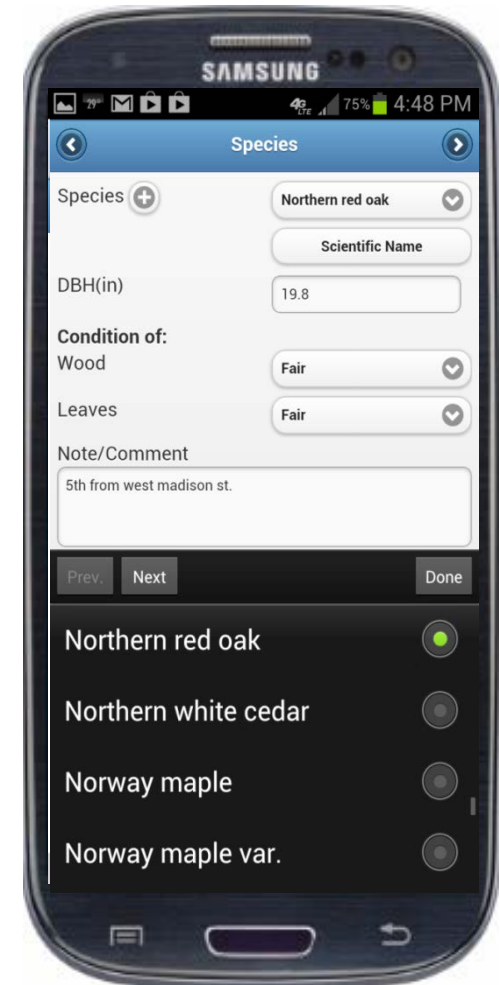


Figure 2. Number of trees/ha in Washington DC by land use





# 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, 1/10<sup>th</sup> 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



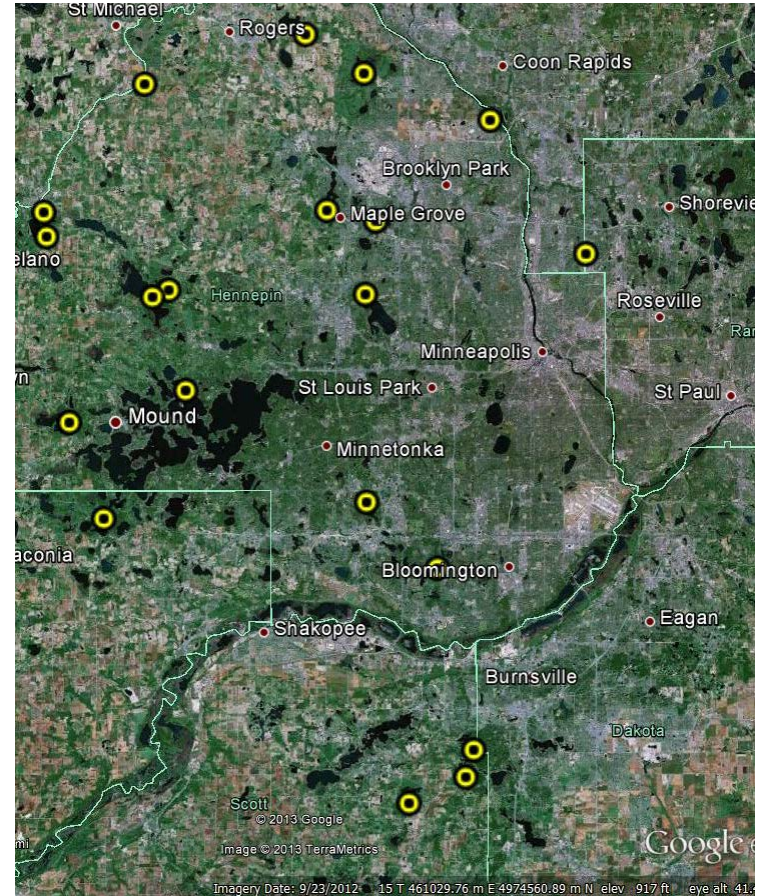
# 1. Establish baseline comparisons



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

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

**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.

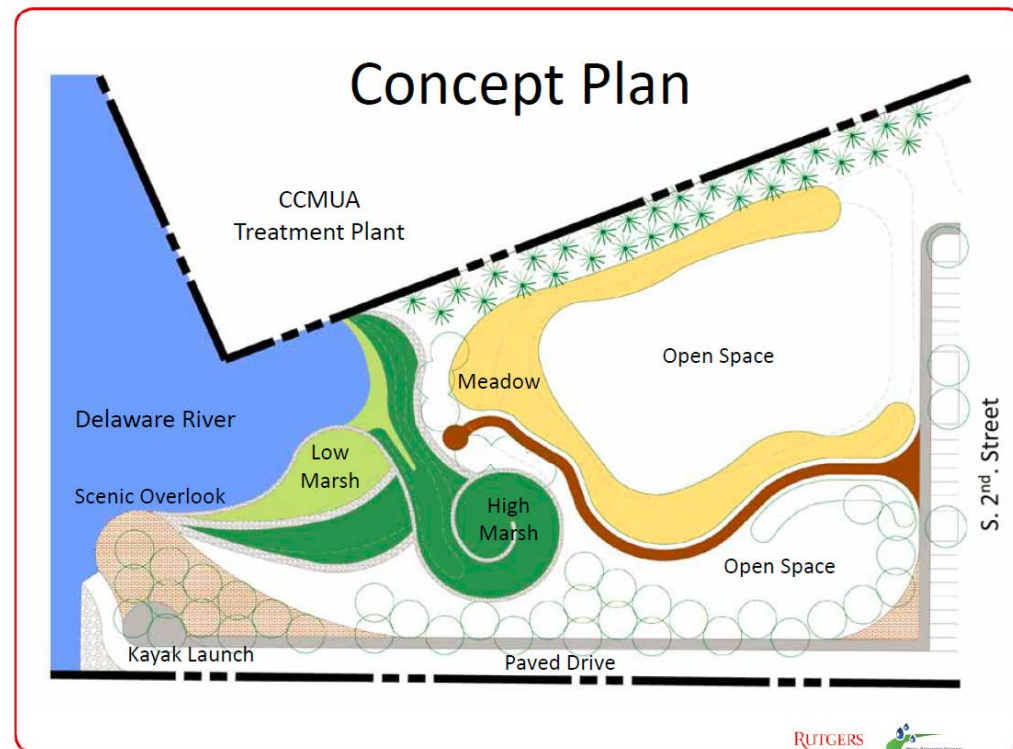
<i>Species</i>	<i>Oxygen (tons)</i>	<i>Net Carbon Sequestration (tons/yr)</i>	<i>Number of trees</i>	<i>Leaf Area (square miles)</i>
Sugar maple	12,793.07	4,797.40	1,085,515.00	31.97
Northern red oak	7,220.84	2,707.82	194,573.00	12.06
Green ash	2,210.09	828.78	250,897.00	6.99
Boxelder	2,183.78	818.92	184,333.00	4.42
Bur oak	2,063.97	773.99	51,204.00	4.16
Eastern hophornbeam	1,848.86	693.32	675,887.00	9.51
American basswood	1,642.27	615.85	250,897.00	10.06
European buckthorn	1,559.84	584.94	358,425.00	3.19
Bigtooth aspen	1,199.37	449.77	66,565.00	2.18
American elm	1,069.42	401.03	389,147.00	7.95
White oak	612.65	229.74	40,963.00	3.37
Black ash	531.55	199.33	35,842.00	1.96
Black cherry	366.11	137.29	92,166.00	0.51
Bitternut hickory	361.91	135.72	40,963.00	0.6
Slippery elm	255.24	95.71	56,324.00	0.67
Northern hackberry	227.22	85.21	30,722.00	0.43
Button bush	114.7	43.01	5,120.00	0.42
Quaking aspen	87.3	32.74	15,361.00	0.07
Siberian elm	53.44	20.04	10,241.00	0.13
Common chokecherry	31.66	11.87	5,120.00	0.02



## 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***

Visit [www.itreetools.org](http://www.itreetools.org)

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