

i-Tree: Give it a Try Today

David V. Bloniarz, USDA Forest Service



Powerpoint and Resources

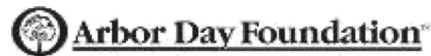
www.unri.org



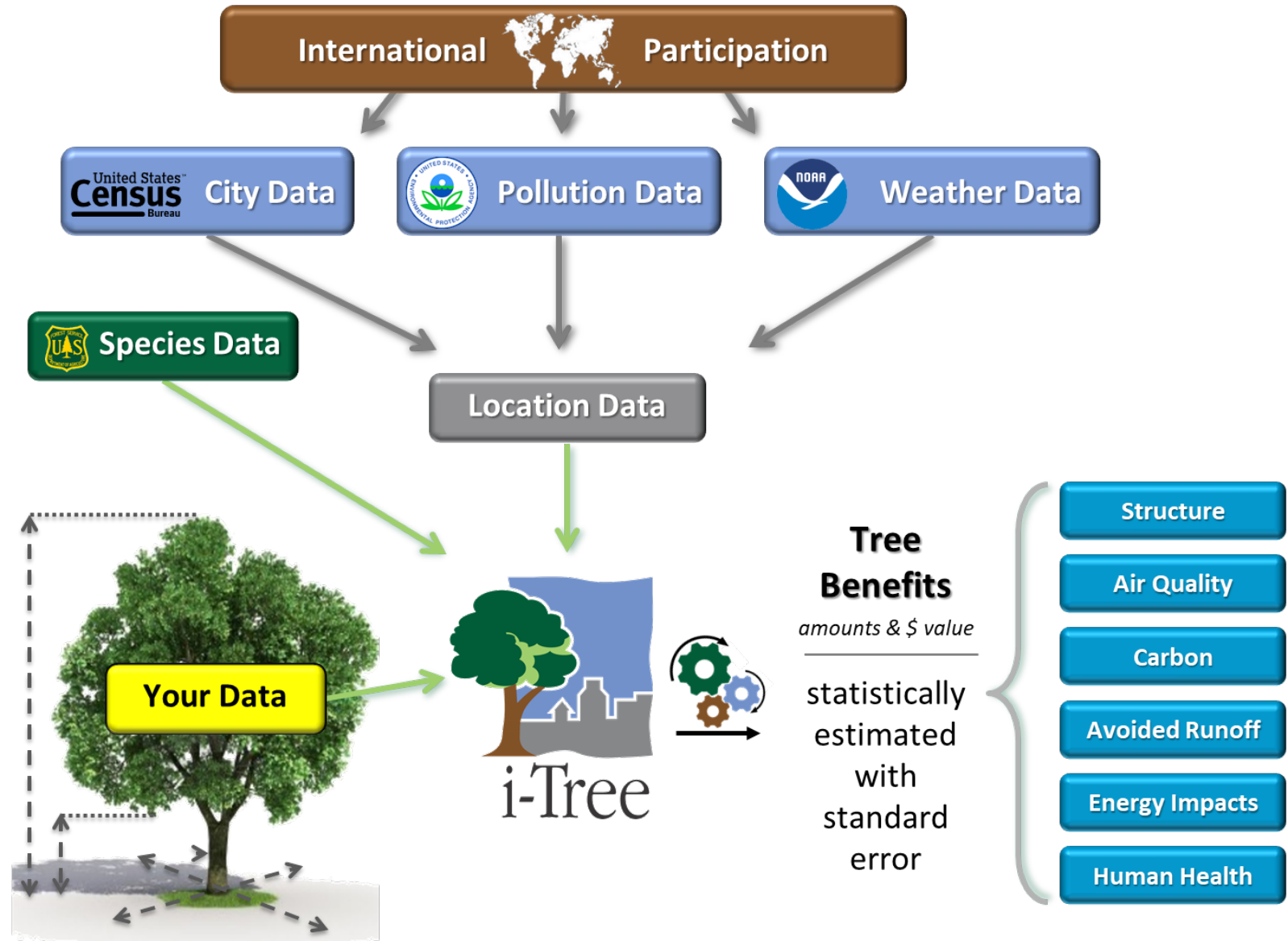
What is i-Tree?

“Putting US Forest Service science into the hands of users.”

- Benefits-based approach
- Based on peer-reviewed research
- A 15-year collaborative effort
- Technical Support
- www.itreetools.org



i-Tree Conceptual Model Schematic



Why i-Tree?

Opportunities for communities to...

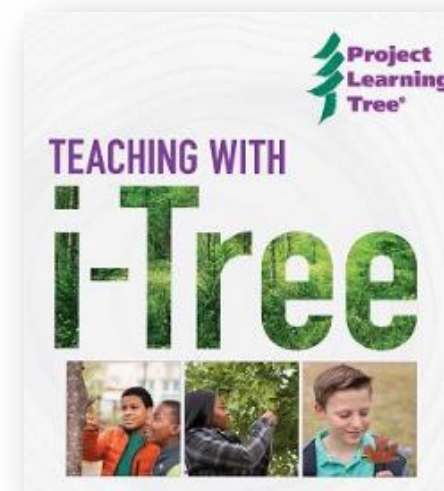
- Plan and manage urban forest resources more strategically to serve and protect citizens;
- Integrate urban forests in policies: sustainability, climate, resiliency, air quality, public health, stormwater, etc.;
- Support advocacy efforts with data;
- Improve preservation of trees and forests;
- Connect urban and rural forest importance.



Why i-Tree?

Opportunities for communities to...

- Economic opportunities:
attract & retain new businesses and residents;
- Promote green tourism and investment;
- Create green industry jobs;
- Sustainable development;
- Youth education & engagement;
- Develop new relationships & partnerships...



i-Tree's Vision

To improve forest and human health, and forest and city resiliency through easy-to-use technology that engages people globally in enhancing forest management.



Quantify Tree Benefits

with

Science!

Carbon dioxide storage and sequestration
Air pollution removal
Storm water reduction

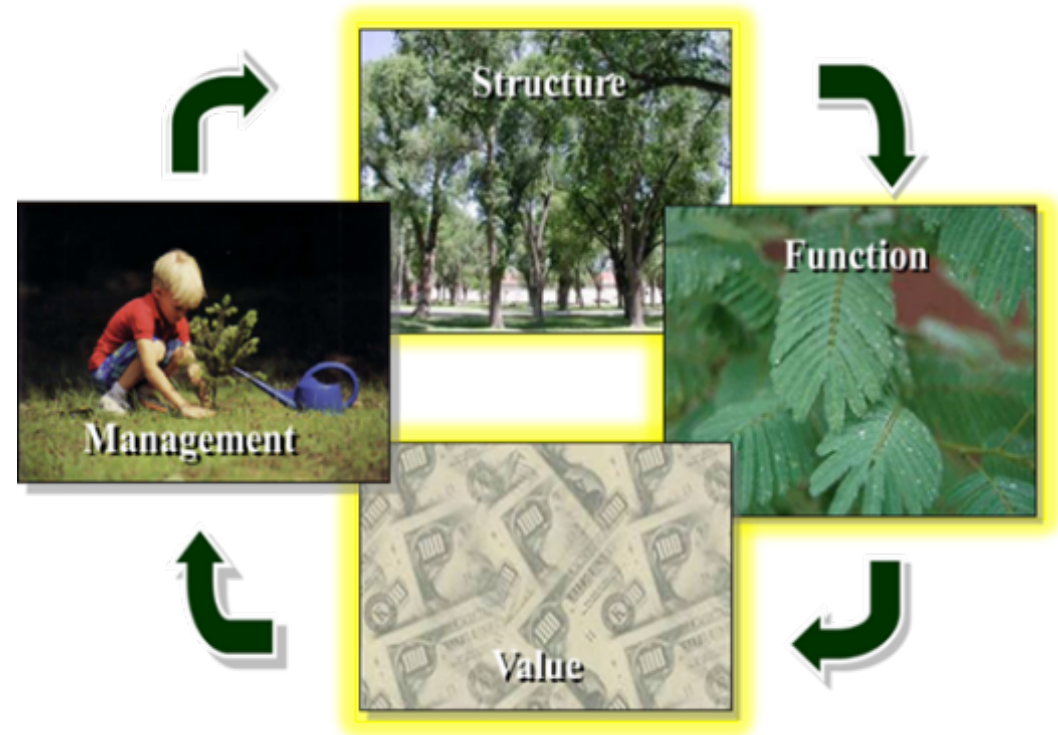
\$2.94 in benefits
for every \$1.00 spent

Benefit Summary for Pittsburgh's Street Trees

| + Benefits | Total (\$) |
|-----------------------|--------------------|
| Energy | \$1,205,133 |
| CO2 | \$35,424 |
| Air Quality | \$252,935 |
| Stormwater | \$334,601 |
| Aesthetic/Other | \$572,882 |
| Total Benefits | \$2,400,975 |



The only infrastructure
that increases in value
over time.



What are your urban forestry challenges and opportunities?

Executive Summary


Pioneer Valley Planning Commission

Pioneer Valley Climate Action and Clean Energy Plan

*Moving toward a carbon neutral future.
Adapting to create resilient communities.*

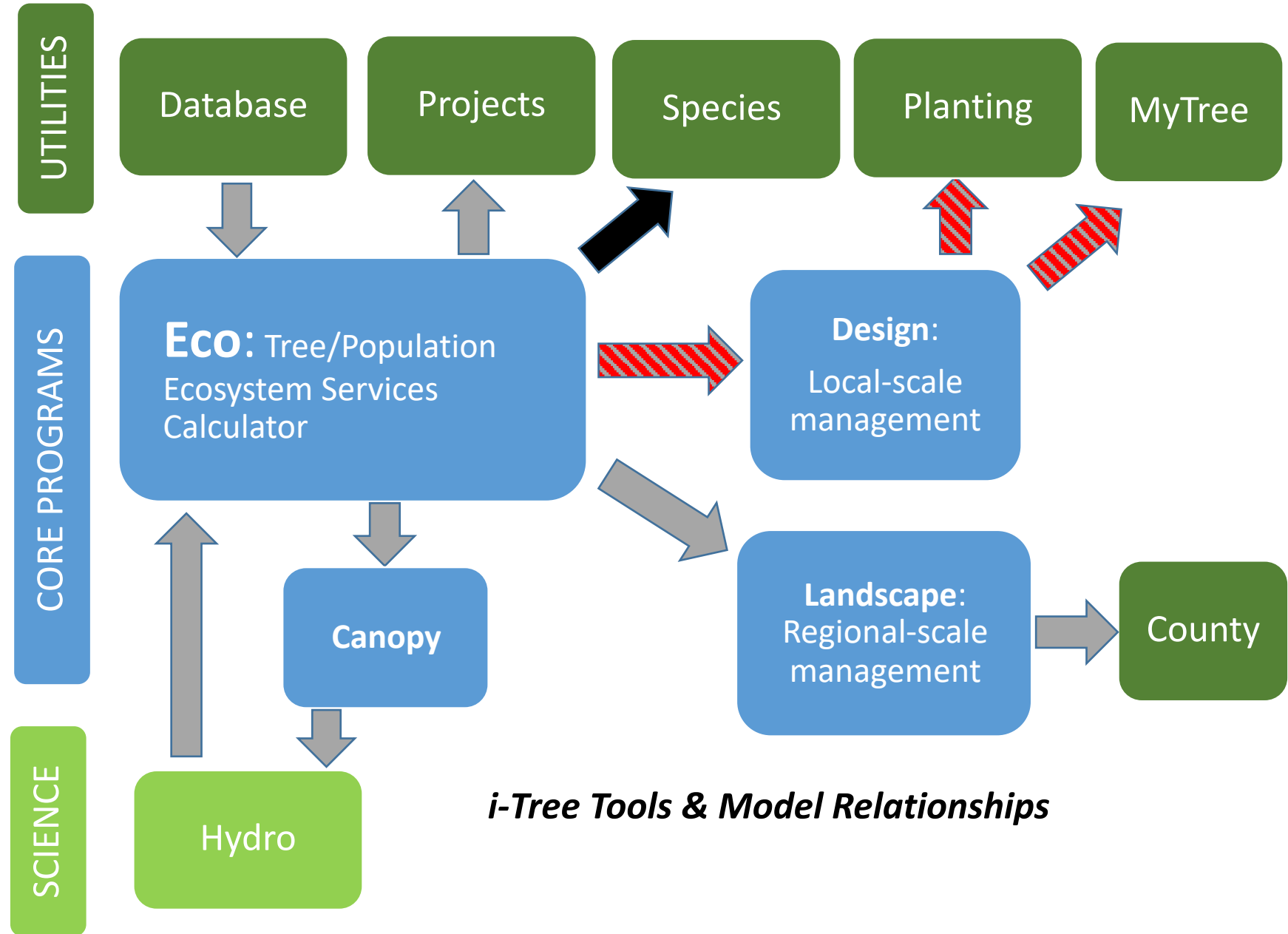
Produced by the Pioneer Valley Planning Commission with the support of the U.S. Department of Housing and Urban Development Sustainable Communities Initiative Regional Planning Grant Program.

March / 2014



i-Tree Tool Selection Framework

- *My objectives?*
- *Tool advantages, limitations, and options?*
- *Available resources?*
- *Technical capacity or skillset?*
- *Timeline?*
- *Audience?*
- *What does success look like for me?*



i-Tree Tools & Model Relationships

www.itreetool.org Resources



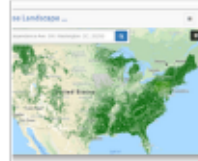
i-Tree is a combination of science and free tools that:
Quantifies the benefits and values of trees around the world.

Aids in tree and forest management and **advocacy**.

Shows potential **risks** to tree and forest health.

Is based on **peer-reviewed**, USDA Forest Service Research.

i-Tree Tools



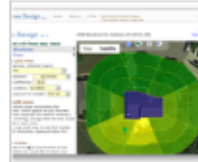
i-Tree Landscape

Rapidly assess human and forest population information; threats to help prioritize areas for tree planting; protection.



i-Tree Canopy

Easily estimate tree canopy and benefits using aerial photographs.



i-Tree Design

Parcel level analysis of current and future tree benefits.



i-Tree Eco

Flagship tool that quantifies the structure of, threats to, and benefits and values provided by forest populations globally.



More tools...

See all the i-Tree tools, past and present, listed here.



Which Tool Should I Use?

Keys to Using i-Tree Effectively

- Understand tool advantages, limitations, and options available.
- Define your objectives.
- Can i-Tree can be used to help you achieve desired outcomes?
- Evaluate your available resources (*time, equipment, money, technical capacity, potential collaborators*) to plan, manage and complete a project.
- Consider pilot projects that can be used to learn, show potential, and justify scaling up projects.
- Connect data and results to things that matter to people.



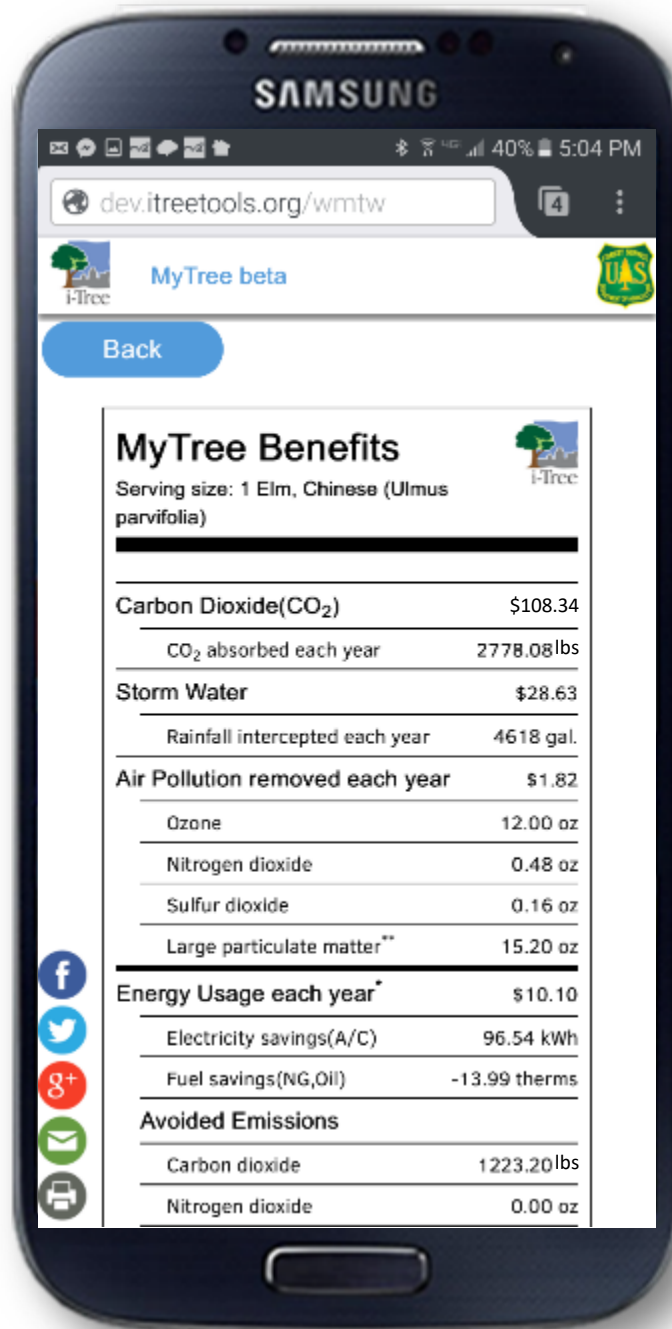
MyTree





i-Tree™

MyTree



i-Tree on the go...
for individual or multiple trees!



i-Tree Eco

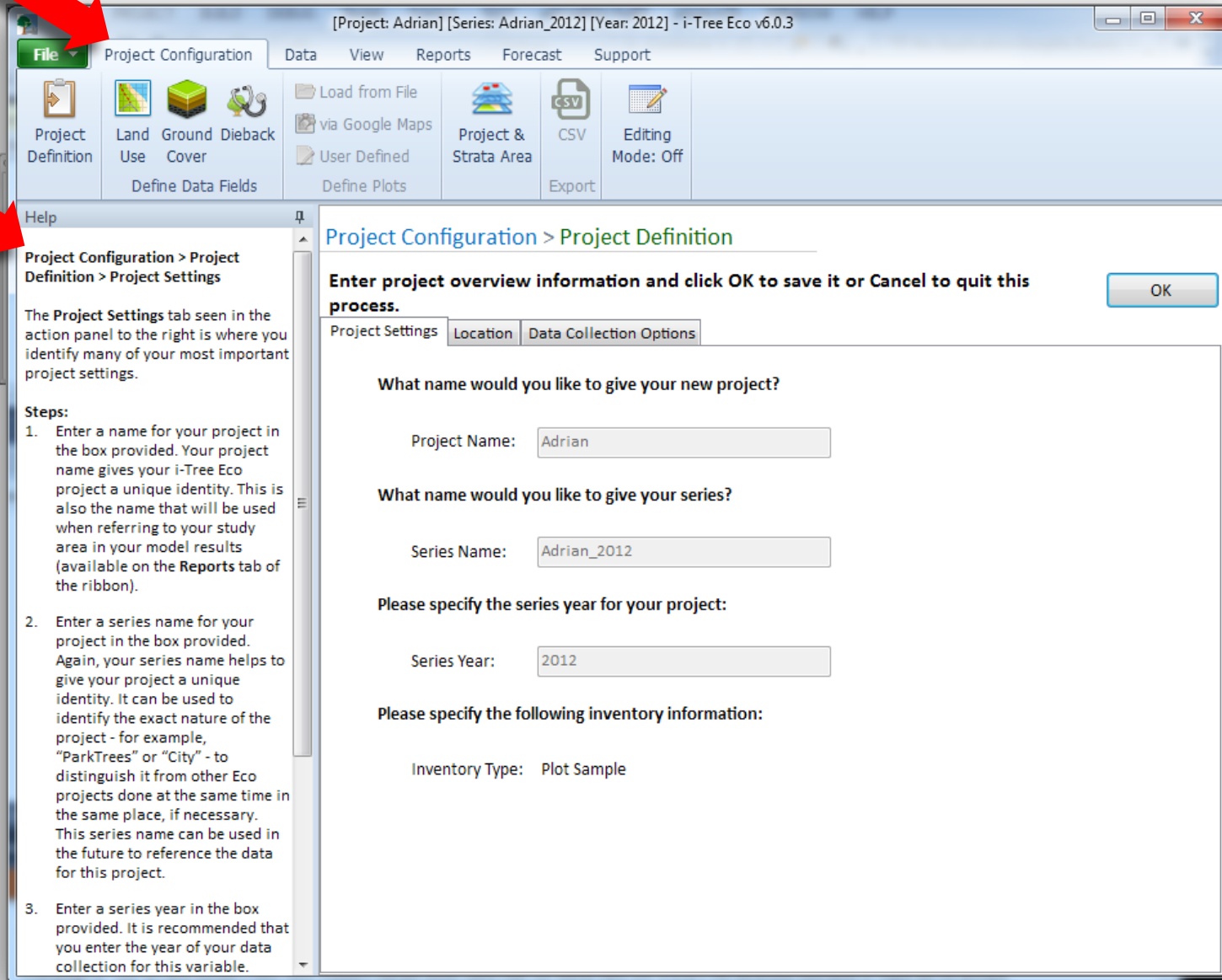


i-Tree Eco v6

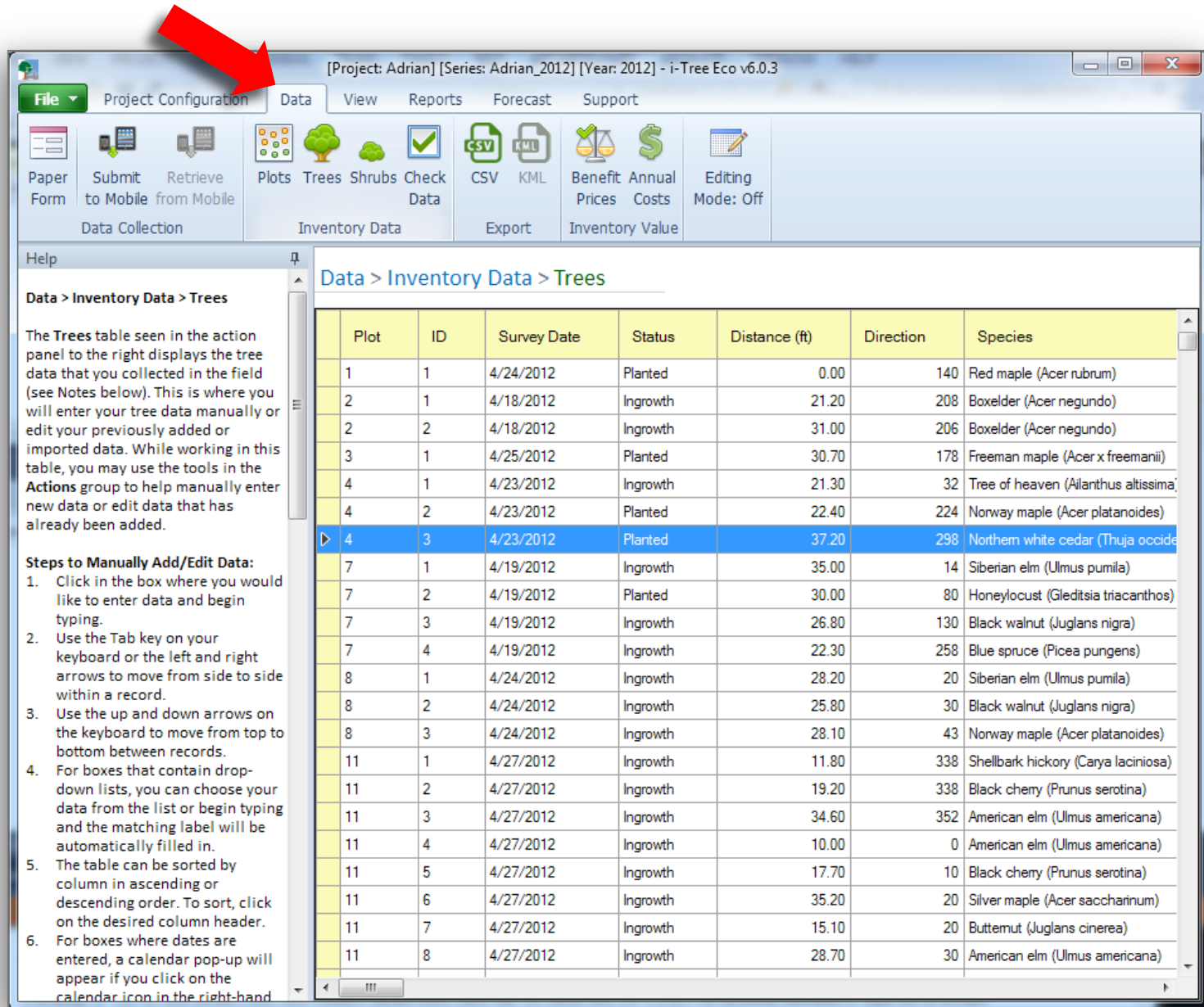
Flagship tool with best estimates for Composition and Benefits.

- User interface & Help text
- Reporting
- Tree inventory import
- Mobile data collector
- Help text

Plot Sampling & Complete Inventories



i-Tree Eco v6



[Project: Adrian] [Series: Adrian_2012] [Year: 2012] - i-Tree Eco v6.0.3

File Project Configuration **Data** View Reports Forecast Support

Paper Form Submit to Mobile Retrieve from Mobile Plots Trees Shrubs Check Data CSV KML Benefit Annual Prices Costs Editing Mode: Off

Help

Data > Inventory Data > Trees

The Trees table seen in the action panel to the right displays the tree data that you collected in the field (see Notes below). This is where you will enter your tree data manually or edit your previously added or imported data. While working in this table, you may use the tools in the Actions group to help manually enter new data or edit data that has already been added.

Steps to Manually Add/Edit Data:

1. Click in the box where you would like to enter data and begin typing.
2. Use the Tab key on your keyboard or the left and right arrows to move from side to side within a record.
3. Use the up and down arrows on the keyboard to move from top to bottom between records.
4. For boxes that contain drop-down lists, you can choose your data from the list or begin typing and the matching label will be automatically filled in.
5. The table can be sorted by column in ascending or descending order. To sort, click on the desired column header.
6. For boxes where dates are entered, a calendar pop-up will appear if you click on the calendar icon in the right-hand

| Plot | ID | Survey Date | Status | Distance (ft) | Direction | Species |
|------|----|-------------|----------|---------------|-----------|--|
| 1 | 1 | 4/24/2012 | Planted | 0.00 | 140 | Red maple (<i>Acer rubrum</i>) |
| 2 | 1 | 4/18/2012 | Ingrowth | 21.20 | 208 | Boxelder (<i>Acer negundo</i>) |
| 2 | 2 | 4/18/2012 | Ingrowth | 31.00 | 206 | Boxelder (<i>Acer negundo</i>) |
| 3 | 1 | 4/25/2012 | Planted | 30.70 | 178 | Freeman maple (<i>Acer x freemanii</i>) |
| 4 | 1 | 4/23/2012 | Ingrowth | 21.30 | 32 | Tree of heaven (<i>Ailanthus altissima</i>) |
| 4 | 2 | 4/23/2012 | Planted | 22.40 | 224 | Norway maple (<i>Acer platanoides</i>) |
| 4 | 3 | 4/23/2012 | Planted | 37.20 | 298 | Northern white cedar (<i>Thuja occidentalis</i>) |
| 7 | 1 | 4/19/2012 | Ingrowth | 35.00 | 14 | Siberian elm (<i>Ulmus pumila</i>) |
| 7 | 2 | 4/19/2012 | Planted | 30.00 | 80 | Honeylocust (<i>Gleditsia triacanthos</i>) |
| 7 | 3 | 4/19/2012 | Ingrowth | 26.80 | 130 | Black walnut (<i>Juglans nigra</i>) |
| 7 | 4 | 4/19/2012 | Ingrowth | 22.30 | 258 | Blue spruce (<i>Picea pungens</i>) |
| 8 | 1 | 4/24/2012 | Ingrowth | 28.20 | 20 | Siberian elm (<i>Ulmus pumila</i>) |
| 8 | 2 | 4/24/2012 | Ingrowth | 25.80 | 30 | Black walnut (<i>Juglans nigra</i>) |
| 8 | 3 | 4/24/2012 | Ingrowth | 28.10 | 43 | Norway maple (<i>Acer platanoides</i>) |
| 11 | 1 | 4/27/2012 | Ingrowth | 11.80 | 338 | Shellbark hickory (<i>Carya laciniosa</i>) |
| 11 | 2 | 4/27/2012 | Ingrowth | 19.20 | 338 | Black cherry (<i>Prunus serotina</i>) |
| 11 | 3 | 4/27/2012 | Ingrowth | 34.60 | 352 | American elm (<i>Ulmus americana</i>) |
| 11 | 4 | 4/27/2012 | Ingrowth | 10.00 | 0 | American elm (<i>Ulmus americana</i>) |
| 11 | 5 | 4/27/2012 | Ingrowth | 17.70 | 10 | Black cherry (<i>Prunus serotina</i>) |
| 11 | 6 | 4/27/2012 | Ingrowth | 35.20 | 20 | Silver maple (<i>Acer saccharinum</i>) |
| 11 | 7 | 4/27/2012 | Ingrowth | 15.10 | 20 | Butternut (<i>Juglans cinerea</i>) |
| 11 | 8 | 4/27/2012 | Ingrowth | 28.70 | 30 | American elm (<i>Ulmus americana</i>) |

Flagship tool with best estimates for Composition and Benefits.

- User interface & Help Text
- Reporting
- Tree inventory import
- Mobile data collector
- Help text

Plot Sampling & Complete Inventories.

i-Tree Eco v6

The screenshot displays the i-Tree Eco v6.0.3 software interface. The main window is titled "i-Tree Eco - Adrian Plot Based Sample Project" and shows a "Result View" with a table of "Total Estimates for Trees in Adrian by Species". A red arrow points to the title bar. Below the table, a bar chart titled "Carbon Storage in Adrian by Land Use" is visible. A watermark "Eco version 5.0" is overlaid on the image.

| Species | Number of Trees | Carbon Pool | Gross Equivalency | Net Equivalency | Leaf Area (m ²) | Leaf Biomass (mt) | Value (\$) |
|------------------|-----------------|-------------|-------------------|-----------------|-----------------------------|-------------------|------------|
| Balsam poplar | 20,312 | 11,207.0 | 5,226.4 | 5,481.4 | 227.6 | 71.7 | 140.0 |
| Common ash | 20,948 | 4,624.1 | 1,406.1 | 1,794.1 | 49.1 | 16.9 | 16.9 |
| Green ash | 17,947 | 10,010.0 | 3,706.7 | 3,927.7 | 113.2 | 4.0 | 107.0 |
| Red maple | 17,127 | 3,242.0 | 1,627.4 | 1,614.7 | 74.2 | 24.3 | 66.4 |
| Red pine | 17,120 | 3,769.4 | 1,468.4 | 1,664.4 | 74.0 | 27.0 | 61.2 |
| White pine | 12,789 | 4,755.1 | 1,252.1 | 1,255.1 | 22.4 | 22.2 | 22.4 |
| Scotch larch | 10,000 | 3,400.0 | 440.7 | 240.2 | 22.8 | 10.9 | 7.0 |
| White spruce | 9,995 | 4,514.4 | 1,379.3 | 1,362.3 | 89.0 | 30.4 | 74.5 |
| Red spruce | 9,886 | 2,452.2 | 1,340.2 | 1,339.2 | 45.4 | 12.0 | 39.1 |
| White oak | 9,284 | 1,807.7 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| Black oak | 7,984 | 4,851.1 | 1,001.1 | 1,001.1 | 1.7 | 1.0 | 10.6 |
| Northern redwood | 7,417 | 3,487.4 | 1,151.1 | 1,151.1 | 15.1 | 24.2 | 16.4 |
| White oak | 7,221 | 3,271.1 | 1,001.1 | 1,001.1 | 11.9 | 100.1 | 8.7 |
| Black oak | 7,118 | 4,487.8 | 1,101.1 | 1,101.1 | 1.7 | 1.0 | 10.6 |
| Red maple | 6,823 | 3,882.0 | 1,091.9 | 1,091.9 | 42.7 | 10.1 | 41.7 |
| White oak | 6,420 | 3,242.0 | 1,301.1 | 1,301.1 | 43.4 | 10.4 | 42.2 |
| Black oak | 6,148 | 3,824.1 | 1,114.2 | 1,114.2 | 4.0 | 16.9 | 16.9 |
| Red maple | 5,427 | 3,202.0 | 1,001.1 | 1,001.1 | 21.9 | 10.1 | 41.7 |
| White oak | 4,888 | 3,101.1 | 1,114.2 | 1,114.2 | 8.7 | 10.1 | 41.7 |
| Black oak | 4,715 | 3,487.4 | 1,151.1 | 1,151.1 | 8.4 | 16.4 | 16.4 |
| White oak | 4,621 | 3,781.1 | 1,421.1 | 1,421.1 | 14.2 | 24.2 | 16.4 |
| Black oak | 4,420 | 3,201.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| Red maple | 3,888 | 1,871.1 | 1,001.1 | 1,001.1 | 11.9 | 100.1 | 8.7 |
| White oak | 3,214 | 3,242.0 | 1,401.1 | 1,401.1 | 11.9 | 100.1 | 8.7 |
| Black oak | 3,124 | 1,711.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| White oak | 1,947 | 1,947.0 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| Black oak | 1,812 | 3,101.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| White oak | 1,747 | 1,891.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| Black oak | 1,421 | 3,201.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| White oak | 1,351 | 1,114.2 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| Black oak | 1,242 | 3,201.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| White oak | 1,101 | 1,101.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| Black oak | 1,001 | 1,101.1 | 1,114.2 | 1,114.2 | 11.9 | 100.1 | 8.7 |
| White oak | 948 | 948.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| Black oak | 848 | 848.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| White oak | 827 | 827.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| Black oak | 827 | 827.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| White oak | 427 | 427.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| Black oak | 411 | 411.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| White oak | 388 | 388.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| Black oak | 388 | 388.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| White oak | 388 | 388.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |
| Black oak | 388 | 388.0 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 |

Flagship tool with best estimates for Composition and Benefits.

- User interface & Help text
- Reporting
- Tree inventory import
- Mobile data collector
- Basic mapping

Plot Sampling & Complete Inventories.

i-Tree Eco v6

Flagship tool with best estimates for Composition and Benefits.

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Plot Sampling & Complete Inventories.

Select an inventory column below and then define how to import it into Eco. Repeat for EACH column BEFORE clicking Next.

| Site | SPP | DBH | Trunks | Cond | Cavity | WeakFork |
|------|------------------|-----|--------|------|--------------------------|--------------------------|
| 105 | Acer platanoides | 10 | 1 | Poor | <input type="checkbox"/> | <input type="checkbox"/> |

Review the results of your processed data.

Total records processed: 520
Total records skipped: 37
Total records to import: 483

Processed Data to Import:

| Species | DBH 1 (in) |
|------------------|------------|
| Acer platanoides | 10 |
| Acer platanoides | 10 |
| Acer platanoides | 10 |
| Acer platanoides | 16 |
| Acer platanoides | 10 |
| Acer platanoides | 8 |
| Acer platanoides | 21 |
| Acer platanoides | 21 |
| Acer platanoides | 16 |
| Acer platanoides | 10 |
| Acer platanoides | 14 |
| Acer platanoides | 10 |
| Acer rubrum | 1 |
| Acer rubrum | 1 |

Click Finish to complete the import process or click Back to revise your settings and reprocess your data.

Please review your data after clicking Finish. Additional modifications may be required to meet your project specific requirements.

< Back Finish Cancel

Plot Sampling & Complete Inventories.

| | |
|-----------------------|-----------------------|
| Platanus x acerifolia | Platanus x acerifolia |
| Prunus serotina | Prunus serotina |

< Back Next > Cancel

i-Tree Eco v6

Active_Use] [Year: 2010] - i-Tree Eco v6.0.3

Mobile

Tree - General

Species: []
Land Use: Residential
Status: []
Direction (*): 32
Distance (ft): 21.3
Street Tree?: []
Comment: from tmp - se building co

Plot 4

Plot Info

Land Uses

Ground Covers

Reference Objects

Trees

Shrubs

Mark Plot as Completed

Tree 1 - Details

Dead Tree? []

Crown Condition: 85% - 90%
Height (ft): 7
Crown Top Height (ft): 7
Crown Base Height (ft): 1
Crown NS Width (ft): 1
Crown EW Width (ft): 1
Crown Percent Missing: 93
Crown Light Exposure: 4
Percent Impervious: 0
Percent Shrub: 63

| | | | | |
|------|-----------|---------|--|--|
| 3259 | | | | |
| 3260 | 11/1/2010 | Unknown | | |

Plot 1 - GPS Loc...

Type in coordinates, use device GPS, or tap a location on the map below.

Latitude: 41.908656011
Longitude: -84.0385827151

Device GPS (allow location access on device):
Start Clear

Timestamp: []
Accuracy (ft): []

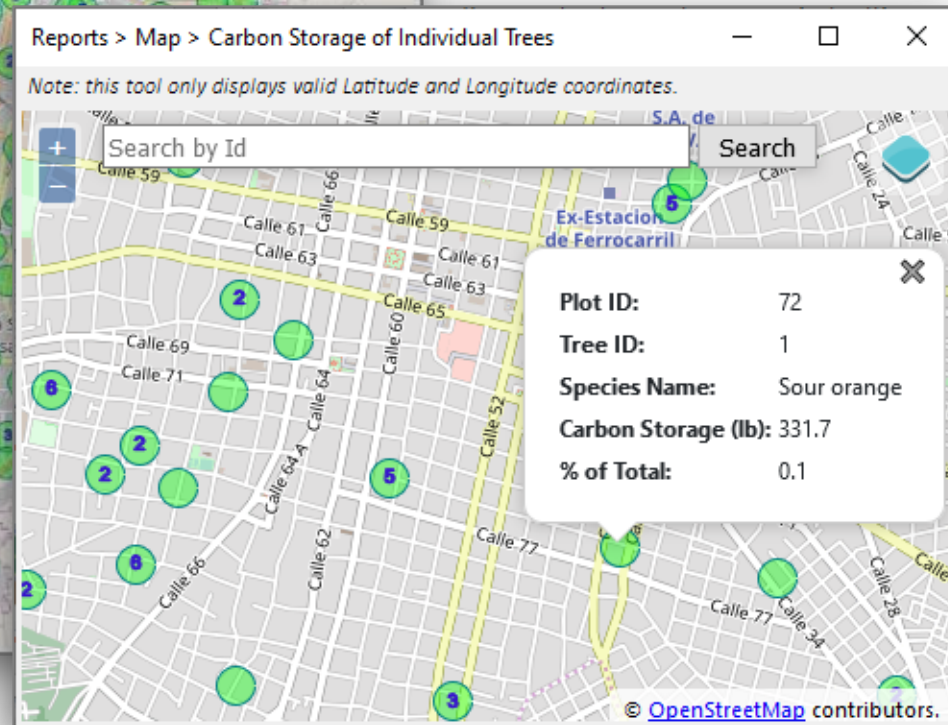
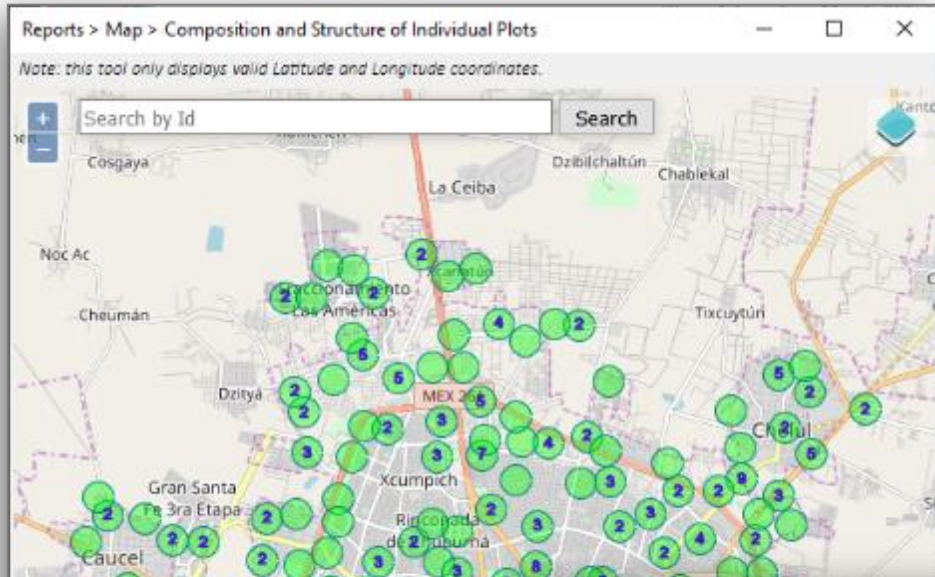
Tap map for coordinates (requires data connection):

1500 N Mantua St, Kent, OH, .

The Davey Tree Expert Company

Leaflet

i-Tree Eco v6



Flagship tool with best estimates for Composition and Benefits.

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Plot Sampling & Complete Inventories

i-Tree County



i-Tree County

A collaborative initiative with



AMERICAN FORESTS

Assess the following...

- Total carbon stored (tons and dollar value)
- Annual carbon sequestration (tons and dollar value)
- Air pollution removal per year (pounds of NO₂, SO₂, O₃ and PM₁₀ or PM_{2.5})
- Estimate of pollution removal effect relative to automobile emission (i.e., reduction in number of vehicles per year that equals pollution removal)
- Pollution removal value per year (dollar values associated with improved human health)
- Avoided health incidences due to improved air quality per year (numerous metrics including avoided mortality)
- Annual transpiration (millions of gallons)
- Annual interception (millions of gallons)
- Annual avoided runoff (millions of gallons, dollar value)

i-Tree County



AMERICAN FORESTS



i-Tree County v0.5 Home Project Menu i-Tree Feedback

My County Benefits My Project Benefits

Cuyahoga County, Ohio
Total Removal (lb/year)
Annual Air Pollution Removal
9,110,574.5 lb/yr
Valued at \$50,123,028
Disable popup for this selection?

County Benefits

- Carbon and Carbon Dioxide Benefits
- Annual Air Pollution Removal
- Total Removal (lb/year)
- CO₂ Removal (lb/year)
- N₂O Removal (lb/year)
- SO₂ Removal (lb/year)
- O₃ Removal (lb/year)
- PM_{2.5} Removal (lb/year)
- PM₁₀ Removal (lb/year)
- Equivalent Automobile Reduction
- Avoided Health Incidence
- Annual Hydrological Benefits
- Base Maps

Open Street Map

Use these tools to work with the map:

- Navigate
- Select

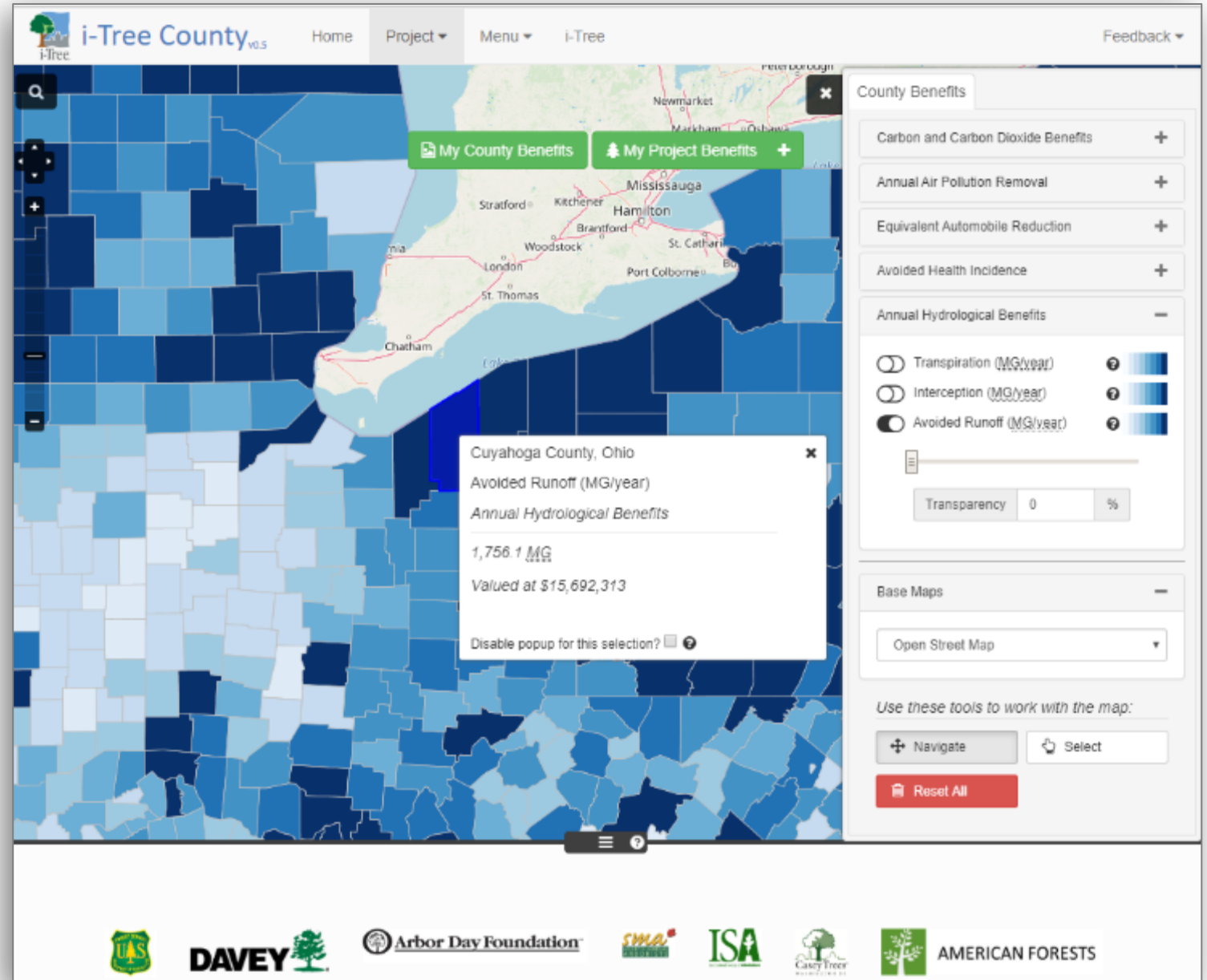
US Forest Service DAVEY Arbor Day Foundation SWA ISA Casey Tree

i-Tree County

Collaborative project with
American Forests



AMERICAN FORESTS



i-Tree County

Collaborative project with American Forests



AMERICAN FORESTS



Tree Benefits Report - i-Tree County v0.5

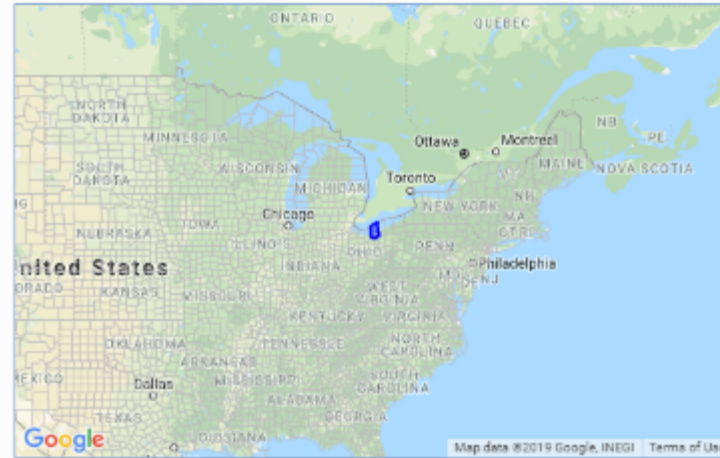


Generated: 11/14/2019

Total Area: 797,175.5 acres

Location: Cuyahoga County, Ohio

Canopy Area: 109,008.8 acres, 13.7% of total area



Cuyahoga county's trees provide the following benefits:



Annual Air Pollution Removal Benefits

| | | |
|-------------|-------|-----------------------------|
| 9,110,574.5 | lb/yr | Total Air Pollution Removal |
| 50,123,028 | \$/yr | |
| 135,154.9 | lb/yr | CO Removal |
| 90,115 | \$/yr | |
| 1,239,925.2 | lb/yr | NO ₂ Removal |
| 368,993 | \$/yr | |

Annual Avoided Health Incidence Due To Improved Air Quality

| | |
|---------|----------------------------|
| 8.19 | Emergency Room Visits |
| 12.39 | Hospital Admissions |
| 5392.06 | Acute Respiratory Symptoms |
| 1668.98 | Asthma Exacerbation |
| 5.62 | Mortality |
| 936.81 | School Loss Days |

i-Tree Planting





Welcome to the i-Tree Planting Calculator! v2.0.1

The i-Tree Planting Calculator is designed to help you estimate the long-term environmental benefits from a tree planting project. The focus is on greenhouse gases, but many co-benefits are included.

This is a newly updated version of i-Tree Planting. Please [clear](#) your web browser's cache for this site before using.

Users enter the following information:

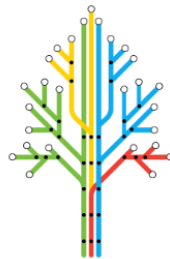
- Tree species
- Size of trees at planting
- Information on the distance and direction to the nearest building (optional)
- Information about the tree's growing conditions
- Estimated mortality (optional)
- The number of trees with each configuration
- Project lifetime (number of years)
- Specific greenhouse gas values (optional)

The following information is calculated (in units and associated dollar values) for the project life time:

- Greenhouse Gas (GHG) sequestered and avoided (owing to reductions in energy use)
- Energy conserved
- Air pollutants captured and avoided
- Stormwater filtered
- Tree total biomass



Use of this tool indicates acceptance of the [EULA](#).




Urban Ecos



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 **i-Tree Planting** v2.0.1 [Home](#) [Project](#) [Menu](#) [i-Tree](#) [Feedback](#)

[Location](#) [Parameters](#) [Trees](#) [Report](#)

Location

Select a location at, or near, the project site.

State/Province

County/Division

City








WARNING: *If you already have tree groups entered, they will be retained, but changing the location will change the Report results.*

[Next](#) →

Each of the three location selections needs to be completed in order:


- State
- County
- City

At this time, the i-Tree Planting Calculator is only for users located within the United States. Please contact support@itreetools.org for more information about funding needed for your area.



A collaborative initiative with



 **i-Tree Planting** v2.0.1 [Home](#) [Project](#) [Menu](#) [i-Tree](#) [Feedback](#)

[Location](#) [Parameters](#) [Trees](#) [Report](#)

Project Parameters

Configure the local parameters for the project.

Electricity Emissions Factor

This field is required.

Units

pounds CO₂ equivalent/MWh kilograms CO₂ equivalent/MWh

Fuel Emissions Factor

This field is required.

Units

pounds CO₂ equivalent/MMBtu kilograms CO₂ equivalent/MMBtu

Years for the Project (1 thru 99)

Tree Mortality over Project Lifetime, as an estimated percentage (Optional, 0 thru 100)

[Next](#) →

A collaborative initiative with



i-Tree Planting v2.0.1 [Home](#) [Project](#) [Menu](#) [i-Tree](#) [Feedback](#)

[Location](#) [Parameters](#) [Trees](#) [Report](#)

Tree Planting Configurations

Enter the tree groups for the project.

Units
 English (feet & inches) Metric (meters & cm)

Nomenclature
 Common Name Scientific Name

| Tree Group Information | | | Building Information | | | | Tree Details | | | |
|-------------------------------------|--------------|---|----------------------|-----------------------------|--------------------------|------------------|------------------|-----------|----------------------|--------|
| | Group Number | Species | DBH in inches | Distance to Nearest in feet | Tree is ____ of Building | Vintage | Climate Controls | Condition | Exposure to Sunlight | Number |
| <input checked="" type="checkbox"/> | 1 | <ul style="list-style-type: none">✓ AppleApple, ParadiseAshAsh, American mountainAsh, BlackAsh, CarolinaAsh, European mountainAsh, GreenAsh, SummitAsh, WhiteAspen, BigtoothAspen, QuakingBaldcypressBasswoodBasswood, AmericanBayberry, SouthernBeech | | 0-19 | North (0°) | Built after 1980 | Heat & A/C | Excellent | Full Sun | 1 |

[Next](#)

Use of this tool indicates acceptance of the [EULA](#).

A collaborative initiative with



i-Tree Planting
v2.0.1

Home
Project ▾
Menu ▾
i-Tree

Feedback ▾

Location
Parameters
Trees
Report

Print

Planting Report

NOTE: Printing is recommended as the "landscape" orientation or at a reduced scale.

Project Report - i-Tree Planting Calculator v2.0.1

Location: Springfield, Massachusetts 01109
 Electricity Emissions Factor: 505.21 kilograms CO2 equivalent/MWh
 Fuel Emissions Factor: 68.71 kilograms CO2 equivalent/MMBtu
 Lifetime: 40 years
 Tree Mortality: 10%

All amounts in the tables are for the full lifetime of the project.

Units

English (pounds & tons; kWh & MMBtu; gallons)
 Metric (kilograms & metric tons; kWh & MMBtu; cubic meters)

Copy
Export
CO₂
Energy
Eco
Air Pollution

Search:

| Location | | CO ₂ Benefits | | | |
|------------------|---|----------------------------------|------------------------------|--------------------------------------|----------------------------------|
| ↓↑ | | ↓↑ | ↓↑ | ↓↑ | ↓↑ |
| Group Identifier | Tree Group Characteristics | CO ₂ Avoided (pounds) | CO ₂ Avoided (\$) | CO ₂ Sequestered (pounds) | CO ₂ Sequestered (\$) |
| 1 | <ul style="list-style-type: none"> (1.0) Apple (Malus species) at 1.0 inch DBH. Planted 0-19 feet and north (0°) of buildings that were built post-1980 with heat and A/C. Trees are in excellent condition and planted in full sun. | 2,649.2 | \$61.61 | 2,192.2 | \$50.98 |

i-Tree Canopy



i-Tree Canopy

Quick, statistical estimate of Canopy cover and associated benefits.

- Create custom cover classes
- Random point locations
- Does not automatically assign cover class at point

Enhanced UI coming soon!



| Cover Class | Description | Abbr. | Points | % Cover |
|-------------|--------------------|-------|--------|-----------|
| Tree | Tree, non-shrub | T | 11 | 10.3 ±5.0 |
| Non-Tree | All other surfaces | NT | 49 | 81.7 ±5.0 |

| Abbr. | Benefit Description | Value | ±SE | Amount |
|---------|---|----------------|-------------|----------------|
| CO | Carbon Monoxide removed annually | \$174.40 | ±47.52 | 656.72 lb |
| NO2 | Nitrogen Dioxide removed annually | \$156.26 | ±42.58 | 1,511.65 lb |
| O3 | Ozone removed annually | \$9,249.84 | ±2,520.35 | 9.48 T |
| PM2.5 | Particulate Matter less than 2.5 microns removed annually | \$17,942.75 | ±4,888.94 | 848.77 lb |
| SO2 | Sulfur Dioxide removed annually | \$6.22 | ±1.69 | 133.89 lb |
| PM10* | Particulate Matter greater than 2.5 microns and less than 10 microns removed annually | \$6,763.14 | ±1,842.78 | 2.48 T |
| CO2seq | Carbon Dioxide sequestered annually in trees | \$81,603.57 | ±22,234.90 | 2,314.64 T |
| CO2stor | Carbon Dioxide stored in trees (Note: this benefit is not an annual rate) | \$1,321,118.93 | ±359,971.39 | 37,472.84 T ±1 |

The screenshot shows the i-Tree Canopy web application interface. At the top, the browser address bar shows 'localhost:8001/map#'. The application header includes the i-Tree logo, version 'v6.1', and navigation links for 'Home', 'Project', 'Menu', and 'i-Tree'. A 'Feedback' link is also present.

The main content area features a Google Maps satellite view of a coastal region. A central dialog box titled 'Select a Shapefile' is open, containing two file selection fields: 'Shapefile (*.shp):' and 'Projection (*.prj):', each with a 'Choose File' button and a 'Browse' button. A warning message below these fields states: 'Using projections other than WGS84 (EPSG:4326) may not produce the correct results. This feature is currently experimental.' The dialog has 'OK' and 'Cancel' buttons at the bottom.

Two red arrows originate from the 'Browse' buttons in the dialog box and point to the 'Load ESRI Shapefile' button in the right-hand sidebar. The sidebar contains a search bar, a 'Launch Our Example Project' button, and a section titled 'US Boundaries' with a list of administrative layers: 'US Census Block Groups', 'US Census Places', 'County Subdivisions', 'US Counties', 'US 115th Congressional Districts', and 'US States'. Below this is a 'Load ESRI Shapefile' button and a 'Draw or Add Areas' section with 'Select', 'Draw', and 'Delete' buttons.

At the bottom right of the map area, there is a 'Next' button. The footer includes 'Map data ©2019 Imagery ©2019 NASA, TerraMetrics' and a 'Terms of Use' link.

i-Tree Canopy preview

i-Tree Canopy v6.1 Home Project Menu i-Tree Feedback

Configuration step 1 of 3: Use the map and tools provided to define the area you want to survey. The easiest option is to select a pre-existing boundary, but you can draw your own areas right on the map, or load in one or more shapefiles.

Search

Just curious? Dive right into survey mode with an existing project.

Launch Our Example Project

Ready to survey your own area? Use these functions to define map areas.

US Boundaries

Administrative

- US Census Block Groups
- US Census Places
- County Subdivisions
- US Counties
- US 115th Congressional Districts
- US States

Load ESRI Shapefile

Draw or Add Areas

Use one of these tools to work with the map.

Select Draw Delete

Google

Map data ©2019 Imagery ©2019 NASA, TerraMetrics | Terms of Use

Next

i-Tree Canopy preview

i-Tree Canopy v6.1 Home Project Menu i-Tree Feedback

Configuration step 1 of 3: Use the map and tools provided to define the area you want to survey. The easiest option is to select a pre-existing boundary, but you can draw your own areas right on the map, or load in one or more shapefiles.

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Map data ©2019 Imagery ©2019 NASA, TerraMetrics Terms of Use

Next

i-Tree Canopy preview

i-Tree Canopy v6.1 Home Project Menu i-Tree Feedback

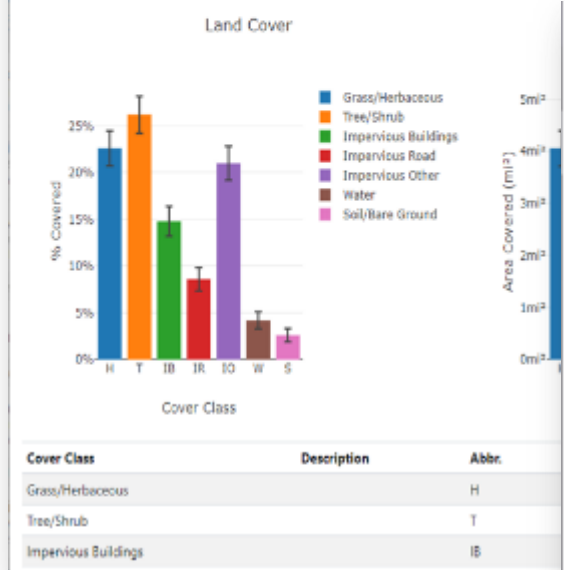
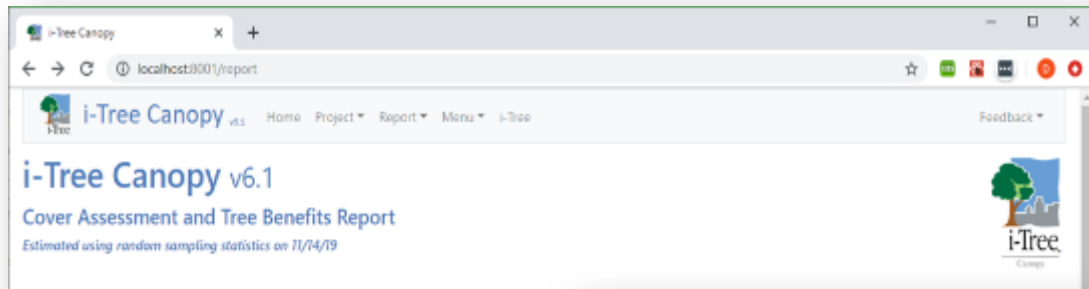
Conduct your survey: With each point you add, the map will shift to a new, random location where you assess the land cover at the yellow crosshairs in the center of the map. The more points you survey, the lower your standard error, and the more precise your sampling will be. More points provide a better estimation of Land Cover across your study area.



| ID | Cover Class | Latitude | Longitude |
|----|------------------|----------|-----------|
| 1 | Impervious Other | 41.74094 | -72.65320 |
| 2 | Impervious Road | 41.74315 | -72.66277 |
| 3 | Tree/Shrub | 41.76941 | -72.68937 |
| 4 | Grass/Herbaceous | 41.78738 | -72.69409 |
| 5 | Tree/Shrub | 41.73479 | -72.67216 |
| 6 | Impervious Other | 41.78946 | -72.66989 |
| 7 | Tree/Shrub | 41.79791 | -72.71115 |
| 8 | Tree/Shrub | 41.74369 | -72.66156 |
| 9 | Grass/Herbaceous | 41.80402 | -72.71483 |
| 10 | Grass/Herbaceous | 41.79908 | -72.65136 |

+ Page 1 of 50

Map data ©2019 Imagery ©2019 Terms of Use Report a map error



| Abbr. | Description | Count | % | Area (mi ²) |
|--------------|----------------------|-------|-------------|-------------------------|
| H | Grass/Herbaceous | 113 | 22.6 ± 1.87 | 4.06 ± 0.34 |
| T | Tree/Shrub | 131 | 26.2 ± 1.97 | 4.71 ± 0.35 |
| IB | Impervious Buildings | 74 | 14.8 ± 1.59 | 2.66 ± 0.29 |
| IR | Impervious Road | 43 | 8.60 ± 1.25 | 1.55 ± 0.23 |
| IO | Impervious Other | 105 | 21.0 ± 1.82 | 3.76 ± 0.33 |
| W | Water | 21 | 4.20 ± 0.90 | 0.76 ± 0.16 |
| S | Soil/Bare Ground | 13 | 2.60 ± 0.71 | 0.47 ± 0.13 |
| Total | | | | |

Tree Benefit Estimates: Carbon (English units)

| Description | Carbon (T) | ±SE |
|--|------------|-----------|
| Sequestered annually in trees | 4,129.69 | ±309.82 |
| Stored in trees (Note: not an annual rate) | 103,711.91 | ±7,784.23 |

Currency is in USD. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points.

Tree Benefit Estimates: Air Pollution (English units)

| Abbr. | Description | Value (USD) | ±SE | Amount (T) | ±SE |
|--------------|---|---------------------|-------------------|--------------|--------------|
| CO | Carbon Monoxide removed annually | \$2,042.42 | ±153.30 | 3.29 | ±0.25 |
| NO2 | Nitrogen Dioxide removed annually | \$1,955.81 | ±146.80 | 8.15 | ±0.61 |
| O3 | Ozone removed annually | \$77,039.58 | ±5,782.38 | 57.57 | ±4.32 |
| PM2.5 | Particulate Matter less than 2.5 microns removed annually | \$156,116.15 | ±11,717.65 | 2.86 | ±0.21 |
| SO2 | Sulfur Dioxide removed annually | \$120.28 | ±9.03 | 1.54 | ±0.12 |
| PM10* | Particulate Matter greater than 2.5 microns and less than 10 microns removed annually | \$26,900.62 | ±2,019.09 | 7.99 | ±0.60 |
| Total | | \$264,174.87 | ±19,828.23 | 81.41 | ±6.11 |

Air Pollution Estimates are based on these values in \$/ton/yr @ \$/T/yr: CO 2.178 @ \$622.27 | NO2 3.308 @ \$240.80 | O3 38.960 @ \$1,942.60 | PM2.5 1.688 @ \$14,670.16 | SO2 1.020 @ \$70.22 | PM10* 3.284 @ \$3,377.10. Currency is in USD. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points.

Tree Benefit Estimates: Hydrological (English units)

| Abbr. | Benefit | Value (USD) | ±SE | Amount (Mgal) | ±SE |
|-------|------------------------------|--------------|------------|---------------|---------|
| AVRO | Avoided Runoff | \$191,147.69 | ±14,347.02 | 21.39 | ±1.61 |
| E | Evaporation | N/A | N/A | 223.52 | ±16.78 |
| I | Interception | N/A | N/A | 224.07 | ±16.82 |
| T | Transpiration | N/A | N/A | 370.12 | ±27.78 |
| PE | Potential Evaporation | N/A | N/A | 1,864.93 | ±139.98 |
| PET | Potential Evapotranspiration | N/A | N/A | 1,369.84 | ±102.82 |

Hydrological Estimates are based on these values in \$/Mgal/yr: AVRO 4.64 | E 47.2 | I 47.6 | T 78.6 | PE 265.9 | PET 290.8. Hydrological Value is based on amount of Avoided Runoff @ \$2,396.92/Mgal/yr. Currency is in USD. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points.

Tree Benefit Estimates: Hydrological (English units)

| Abbr. | Description | Value (USD) | ±SE | Amount (T) | ±SE |
|--------------|---|---------------------|-------------------|--------------|--------------|
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About i-Tree Canopy

The concept and prototype of this program were developed by David L. Nowak, Jeffrey T. Walton, and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Gillingworth, Mike Benley, and Scott Maco (The Davey Tree Expert Company).

Limitations of i-Tree Canopy

The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard error will be too high to have any real certainty of the estimate.

Use of this tool indicates acceptance of the EULA.

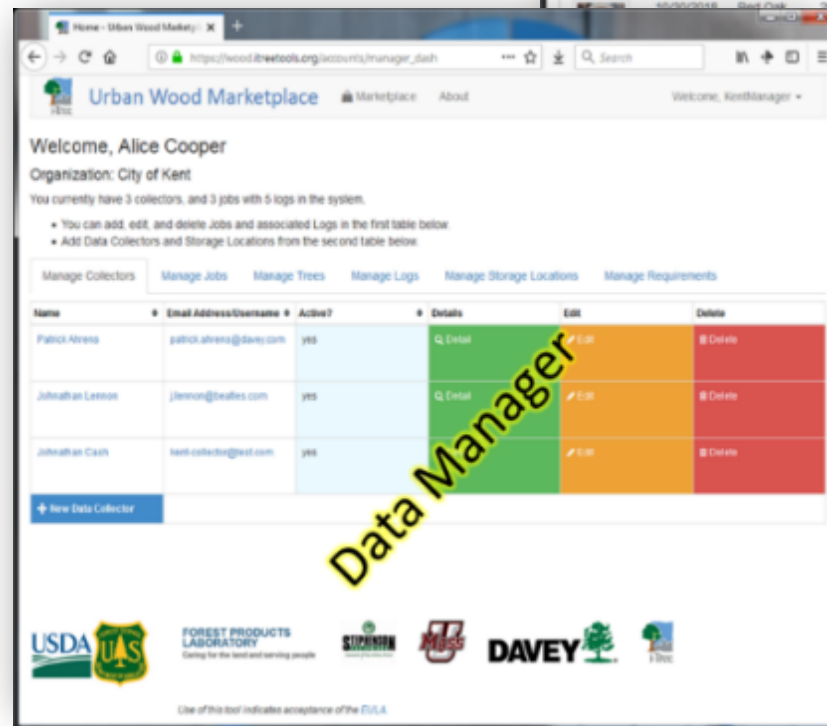
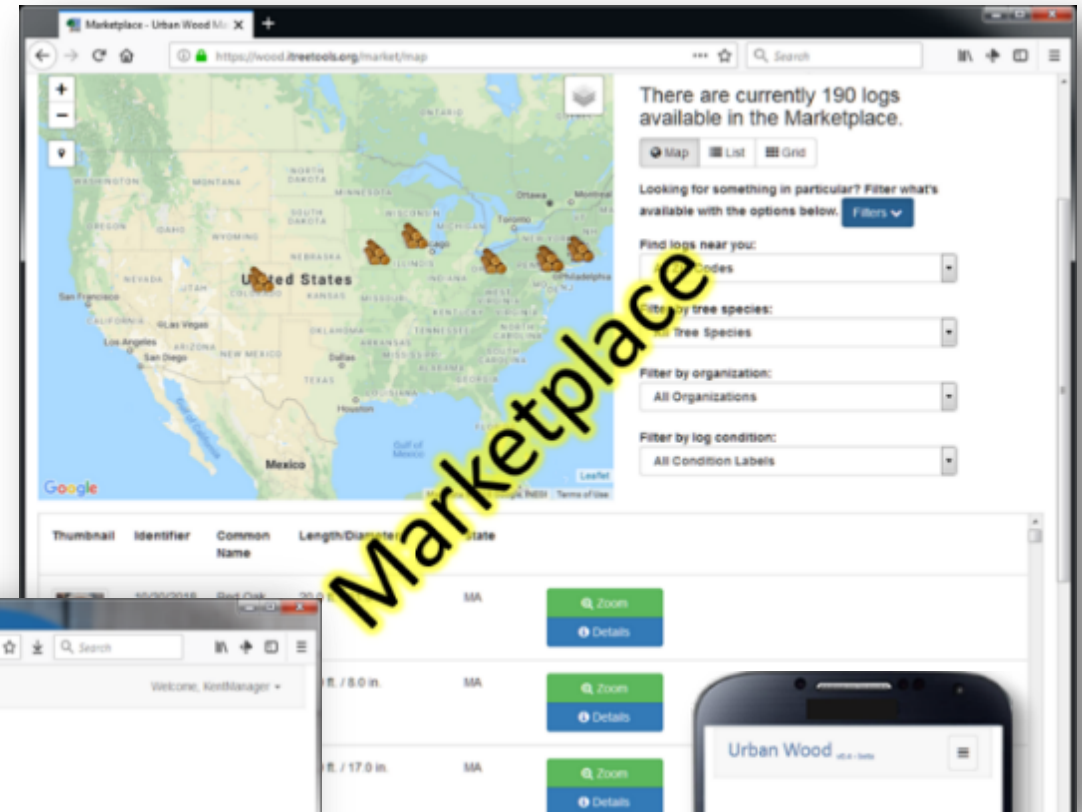
i-Tree Wood Marketplace



Wood Marketplace

“Connecting urban wood harvests to the creative community.”

- Municipalities
- Tree Care Companies
- Artisans
- Woodworkers
- Furniture Makers
- Individuals



i-Tree Landscape



i-Tree Landscape

Gateway to tree benefits – available to anyone and everyone in the US.

- Uses existing boundaries.
- Canopy, Land, and Impervious Cover across the US.
 - UTC – send us yours!
 - High Resolution Urban Tree Canopy Assessments
- 250+ map layers
 - 7 base maps
 - 10 boundaries, plus 26 federal types
 - 7 canopy and land
 - 6 forest risk, plus 47 pests
 - 17 health risk
 - 144 future climate
 - Up to 18 new ones coming with v5.0
- 1,000's of data attributes and tree benefits organized for easy exploration.
- Planting prioritization tool

The screenshot displays the i-Tree Landscape web application interface. At the top, a navigation bar includes the i-Tree logo and the text "i-Tree Landscape". Below the navigation bar, a map shows a geographic area with various layers overlaid. A "Find Locations" button is visible below the map. To the right of the map, a "Start on Main, then explore the map layer tabs." panel is open, showing a list of map layers categorized by "Main", "Canopy & Land", "Forest Risk", "Health Risk", and "Future Climate". The "Future Climate" category is selected, and a list of climate scenarios (RCP 4.5 and RCP 8.5) for years 2020 through 2100 is displayed. To the right of the layer selection panel, a "Boundaries" panel is open, showing a list of boundary types categorized by "Administrative", "Forest (US Forest Service)", "Water", and "US Federal Lands". Each boundary type has a radio button and a color-coded icon. The "Administrative" category includes US Census Block Groups, US Census Places, US County Subdivisions, US Counties, US 115th Congressional Districts, and US States. The "Forest (US Forest Service)" category includes National Forests, Ranger Districts, and CFLR Boundaries. The "Water" category includes Watershed (HUC12). The "US Federal Lands" category includes Native American Reservation, Bureau of Land Management, Bureau of Reclamation, Department of Defense, Department of Energy, Forest Service, Fish and Wildlife Service, and National Park Service. At the bottom of the interface, there is a "Let's Get Started" section with a "Find Locations" button and a note about the data source: "Note: Predicted temperature and precipitation based on CCSM4.0 from National Center for Atmospheric Research." and "Map details are located in the references."

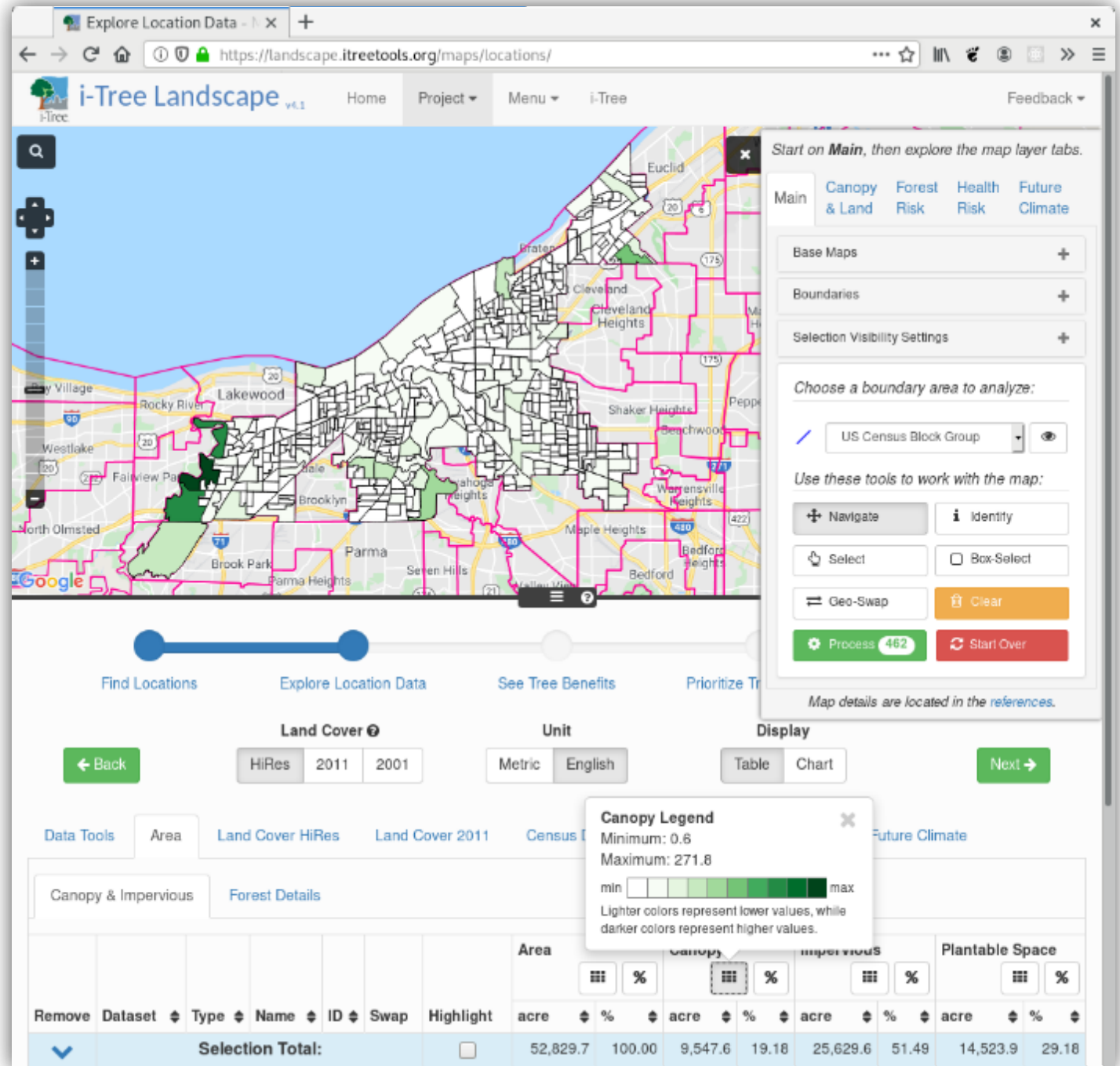
i-Tree Landscape

Gateway to tree benefits – available to anyone and everyone in the US.

A good place to get people started in i-Tree.

A quick tour of...

- Location Data
 - Making a selection
 - Land Cover classifications
 - and tree canopy
 - Thematic mapping



i-Tree Landscape

Gateway to tree benefits – available to anyone and everyone in the US.

A good place to get people started in i-Tree.

A quick tour of...

- Tree Benefits
 - Carbon (CO²), air pollution, hydrology
- Planting Prioritization
 - Weighted prioritizations
 - Custom scenarios
 - Maintenance vs new planting
 - (vs highest priority; i.e. both)

The screenshot shows the i-Tree Landscape web application interface. The browser address bar displays the URL: <https://landscape.itreetools.org/maps/prioritize/>. The main navigation bar includes "Find Locations", "Explore Location Data", and "See". Below this, there is a "Land Cover" section with a "Back" button and a dropdown menu showing "HiRes", "2011", and "2001".

How To Prioritize Tree Planting

To map optimal areas to plant trees, create a "Priority Planting Index" scenario from user-specified, weighted criteria (under Custom Scenarios) or use one of the Common Scenarios (above). Scenarios are based upon the **Land Cover** dataset selected (above) - *HiRes, 2011, 2001*.

The three **Common Scenarios** are:

- **Population:** (default) an index weighted towards areas of *relatively high population density*, low tree cover per capita, and high available planting space.
- **Minorities:** an index weighted towards areas of *relatively high minority population density*, low tree cover per capita, and high available planting space.
- **Poverty:** an index weighted towards areas of *relatively high proportion of population below the poverty line*, low tree cover per capita, and high available planting space.

To create a **Custom Scenario**:

1. Select from one or more criteria (the blue boxes under Custom Scenarios) by using the + **Add Criteria** button and their drop-down.
 - For each criteria, set an **Importance** (from 0 to 100). The sum of the all weights must equal 100.
 - Optional: to distribute weights equally among the selected criteria, click the **Equalize** button.
2. Click **Update Map Display** to see the results on map (above) and legend (below).
3. Each Custom Scenario can be stored by clicking **Store Scenario**. These saved scenarios can be included in your report when you **Generate Results**.

Current Prioritization Scenario Legend

The index is from 0 to 100, where 0 is a low priority and 100 is a high priority.

How?

Each criteria is standardized on a scale of 0 to 1, with 1 representing the

Priority Planting Index Extras

- Non-wooded to low density developed 2100
- Wooded to high density developed 2100
- Wooded to low density developed 2100

Tree Canopy Benefits

- Carbon Storage
- Carbon Sequestration
- CO₂ Equivalent Storage
- CO₂ Equivalent Sequestration
- CO Removal
- NO₂ Removal
- O₃ Removal
- PM_{2.5} Removal

Tree Cover per Capita

High Low **Tree Cover per Capita**

Importance (weight) 30 %

100% Equalize

+ Add Criteria Store Scenario Update Map Display

Stored Planting Prioritization Scenarios

Remember to update the map's display after restoring a custom prioritization scenario.

| Remove | Title | Criteria | Restore |
|--------|--------------------|----------|---------|
| | My Custom Scenario | | |

i-Tree Landscape

Gateway to tree benefits – available to anyone and everyone in the US.

A good place to get people started in i-Tree.

A quick tour of...

- Reporting
 - Title and description
 - Example tables
 - Example thematic map
 - Example prioritization map

landscape.itreetools.org

The screenshot displays a web browser window with the URL <https://landscape.itreetools.org/report/>. The page is titled "Report - i-Tree Landscape" and contains the following sections:

Tree Benefits

Carbon and CO₂ (High Resolution UTC)

| | Carbon Storage | | Carbon Sequestration | | CO ₂ Equivalent Storage | | CO ₂ Equivalent Sequestration | |
|--|-------------------------|-----------|----------------------|--------|------------------------------------|-----------|--|--------|
| | \$ | Short Ton | \$/yr | t/yr | \$ | Short Ton | \$/yr | t/yr |
| | Selection Total: | 1,887,066 | 11,064.6 | 60,259 | 353.3 | 1,887,066 | 40,570.0 | 60,259 |

Prioritization

Population (High Resolution UTC)

Legend: min [color scale] max

At the bottom of the page, there is a row of logos for partner organizations: UAS, DAVEY, Arbor Day Foundation, CMAA, ISA, Casey Trees, ESF, and NAASF. Below the logos is the text: "Use of this tool indicates acceptance of the EULA."



www.unri.org

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www.itreetools.org