i-Tree Open Academy

2025

Session 1: Introduction to i-Tree

Understanding the benefits of trees for people, places, and planning

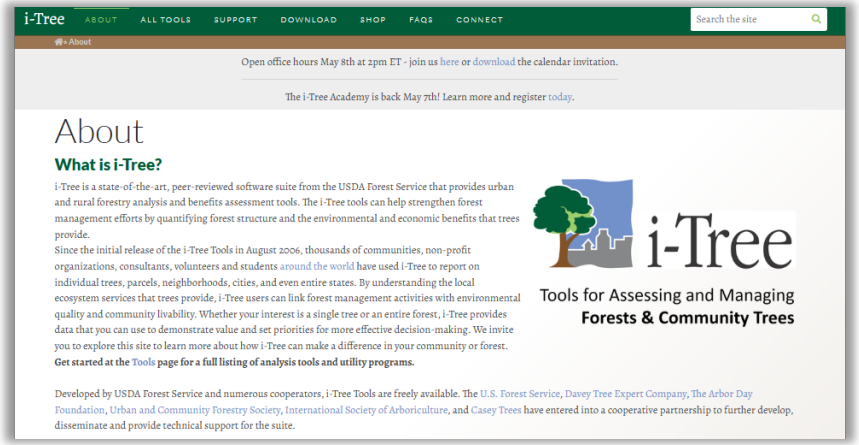
May 7, 2025
1:00pm ET

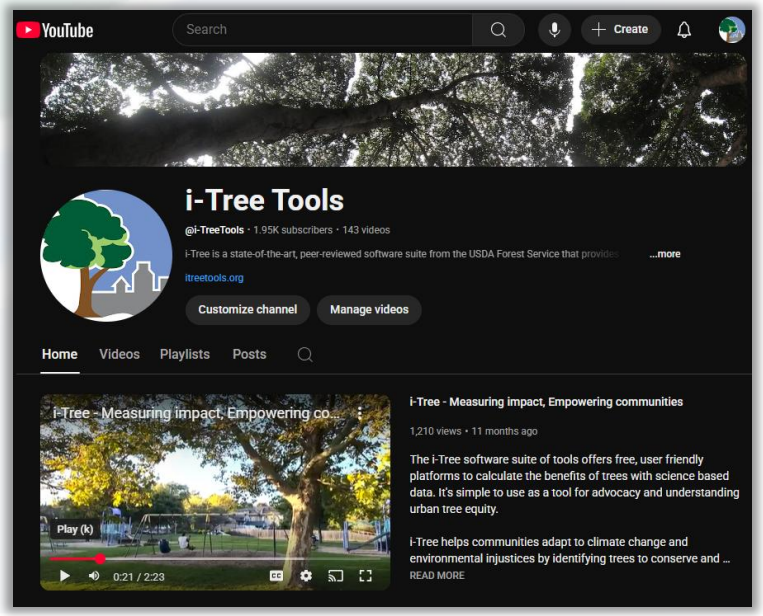
i-Tree is a Cooperative Initiative among these partners

Accessing the Science of Tree Benefits

Keeping up with your canopy

- Learning series for wide variety of users
- Easy to access live and via video
- Use Chat window for questions
- Q&A at the end with i-Tree Team and fellow i-Tree users
- Certificates of participation available after Academy ends





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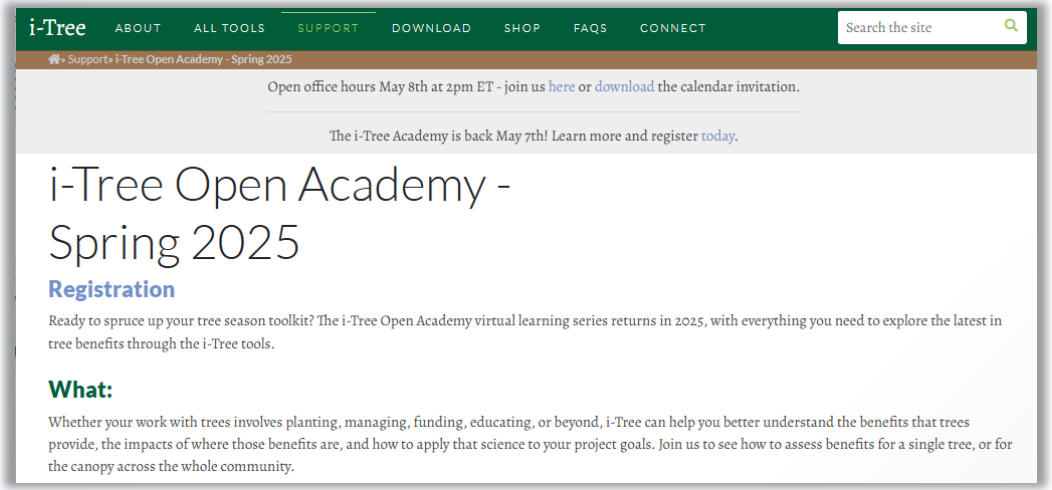
Academy Resources

- Web page updated each week
- Exercises for each tool
- Office Hours
- Email us anytime

info@itreetools.org



How:

All sessions will be streamed live via this **Microsoft Teams link**. They will also be recorded and posted below as well as on the i-Tree YouTube channel, so that you can catch up on anything you missed. There are no requirements for this course, and there will be self-directed exercises that you can use to gain experience using the tools. You are encouraged to submit any questions related to the course via info@itreetools.org, and there will be opportunities to ask questions during certain live sessions and office hours.

When:

Each session is one hour long and offered Wednesdays at 1:00 pm (Eastern US time). Note: Office hours days and times may vary.

- **March 20th – Introduction to i-Tree**. Understand the basic science of i-Tree and the USFS research behind it. Explore the relationships between the i-Tree tools and the data they provide. Start to consider which i-Tree tools will be best for the application you have in mind.
  - Video Recording
  - Presenter Slides
  - Self-Directed Exercise - Session 1
  - Q&A
- **March 27th – Online with MyTree, i-Tree Design, and i-Tree Planting**. Explore the easiest to use online i-Tree tools for individual trees. Get a better sense of their advantages and most common uses.
  - Video Recording
  - Presenter Slides
  - Self-Directed Exercise - Session 2
  - Q&A

Spring 2025 – i-Tree Open Academy

Session 1: **Introduction to i-Tree**

Understanding the benefits of trees for people, places, and planning

Jason Henning

Krista Heinlen

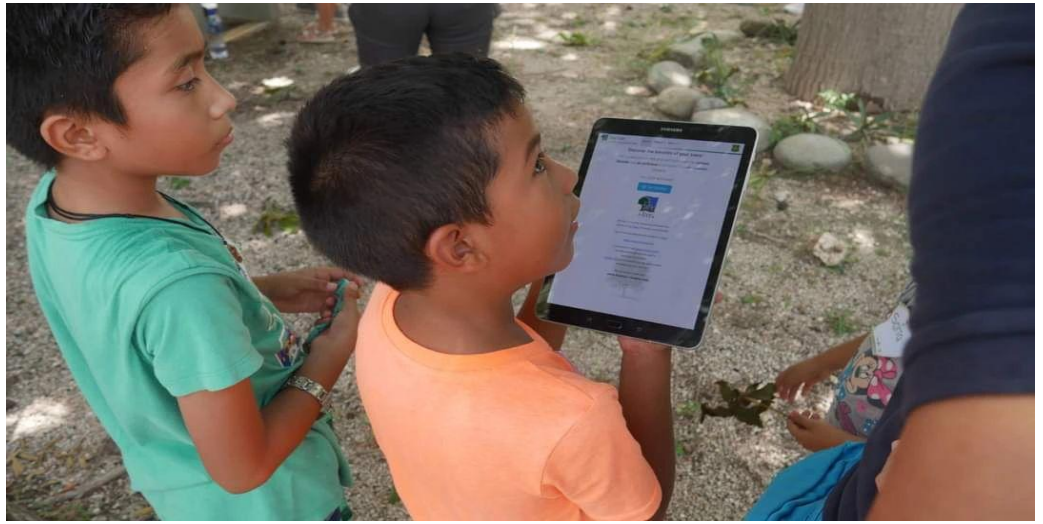
Ana Castillo

Jay Heppler

Alexis Ellis

Plan for today

1. What is i-Tree?
2. What results can I get from i-Tree?
3. Overview of the 2025 i-Tree tools
4. Introduction to the science of i-Tree
5. MyTree Demo and i-Tree uses



What is i-Tree?

"Putting USFS Urban Forest science into the hands of users"

- Public domain science
- Free tools and technical support
- Continuously improved

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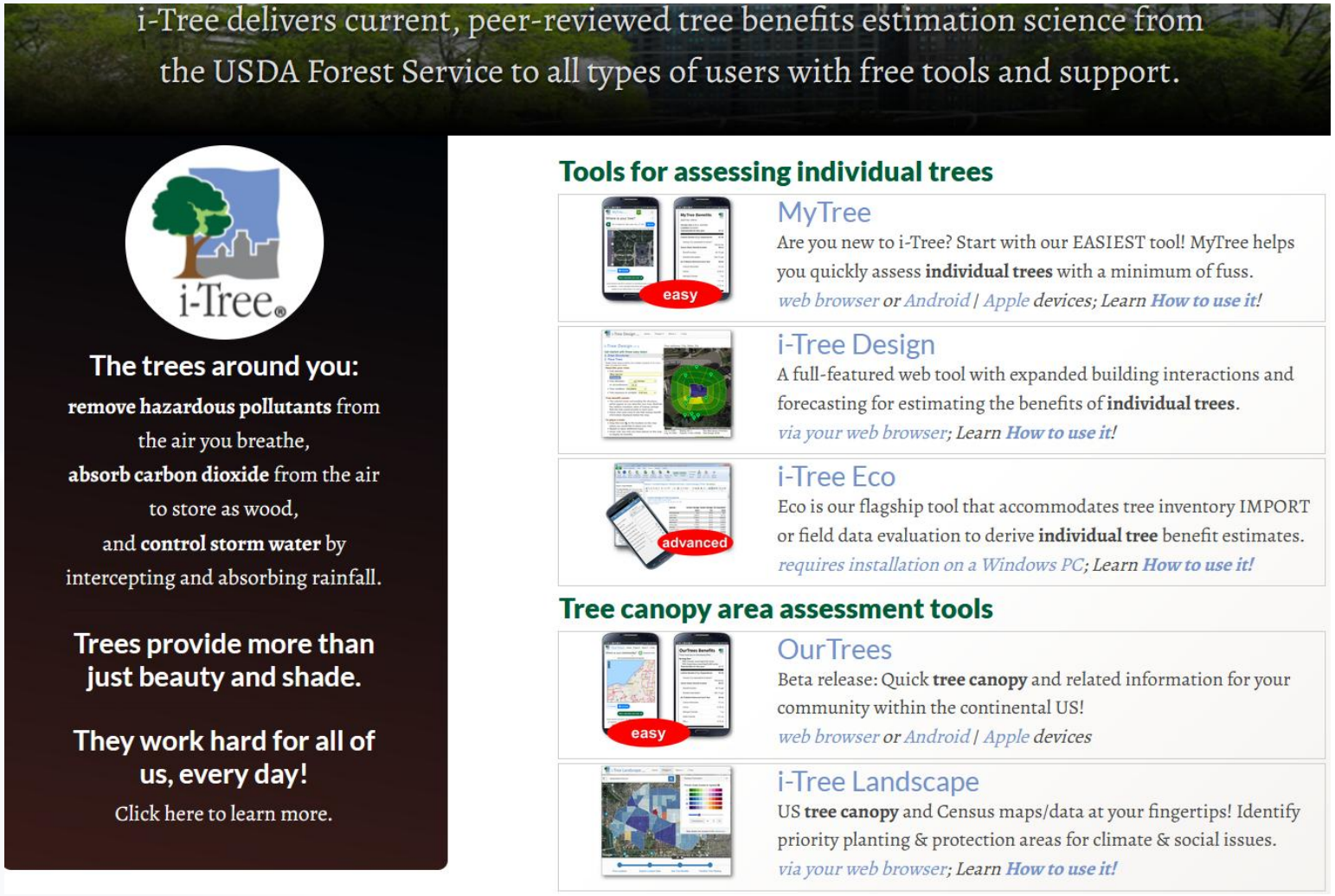


i-Tree is a Cooperative Initiative

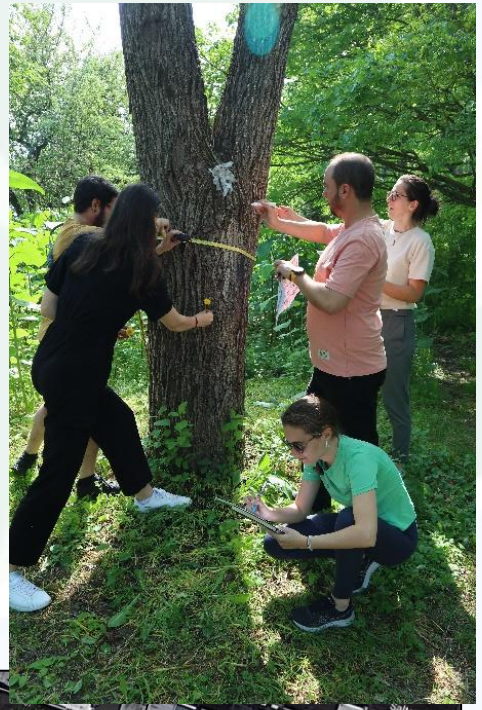
DAVEY · Arbor Day Foundation · UCFS URBAN & COMMUNITY FORESTRY SOCIETY · ISA · Casey Trees · ESF · American Forests

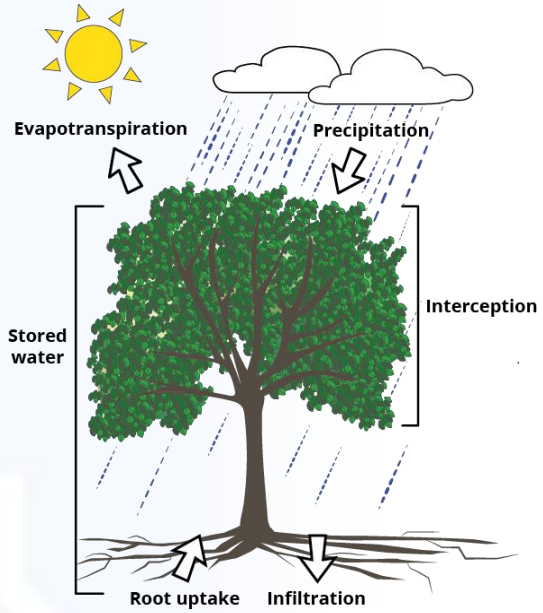
i-Tree's Vision

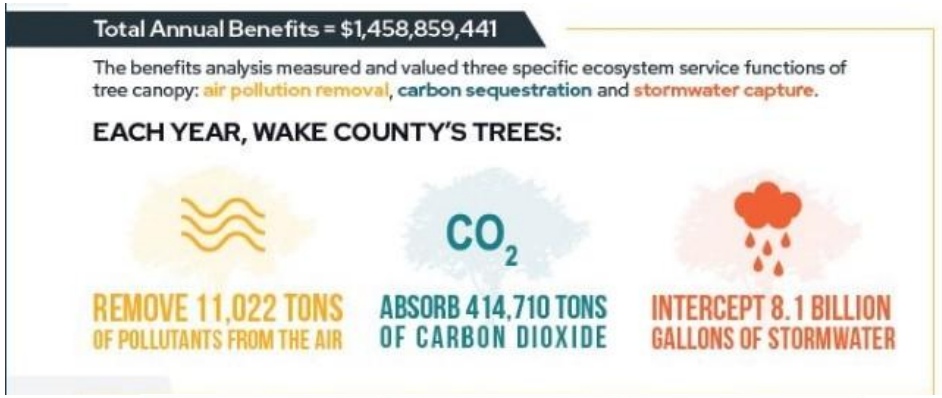
To improve forest and human health, and ***forest*** ***and city resiliency*** *through easy-to-use technology that engages* ***people*** ***globally*** *in enhancing forest management.*

The i-Tree Framework: Demonstrating tree value

Structure → **Function** → **Value**

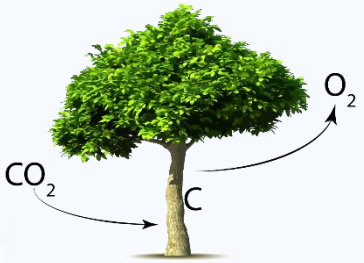




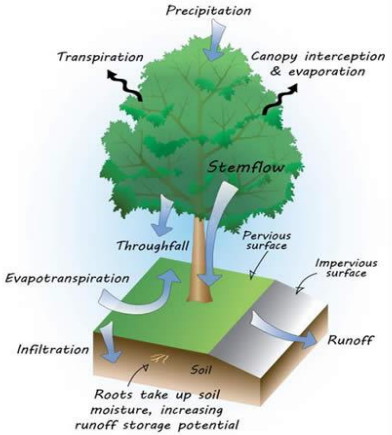


What does i-Tree Estimate and Why?

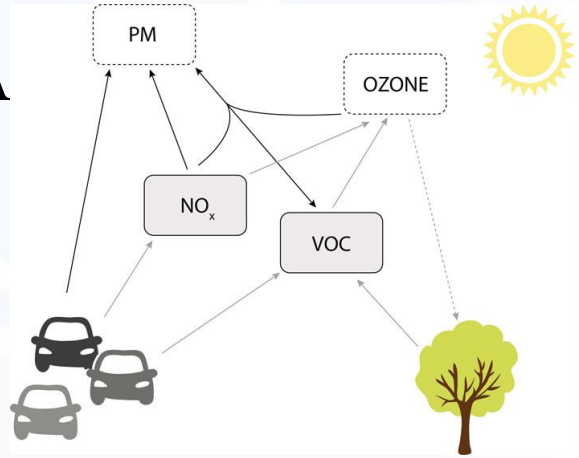
Carbon dioxide
Storage and sequestration of a greenhouse gas



Stormwater
Avoided runoff, evaporation, transpiration



Air Quality
Interaction with EPA criterion pollutants resulting in improved health



Energy
Tree impacts on heating and cooling

The 2025 i-Tree Suite of Tools

i-Tree

Core individual tree tools

*

*

Core canopy tools

*

Utilities

*

*

*

*

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i-Tree Tools that can be used internationally

i-Tree

i-Tree is a Cooperative Initiative among these partners

DAVEY

Arbor Day Foundation

UCFS URBAN & COMMUNITY FORESTRY SOCIETY

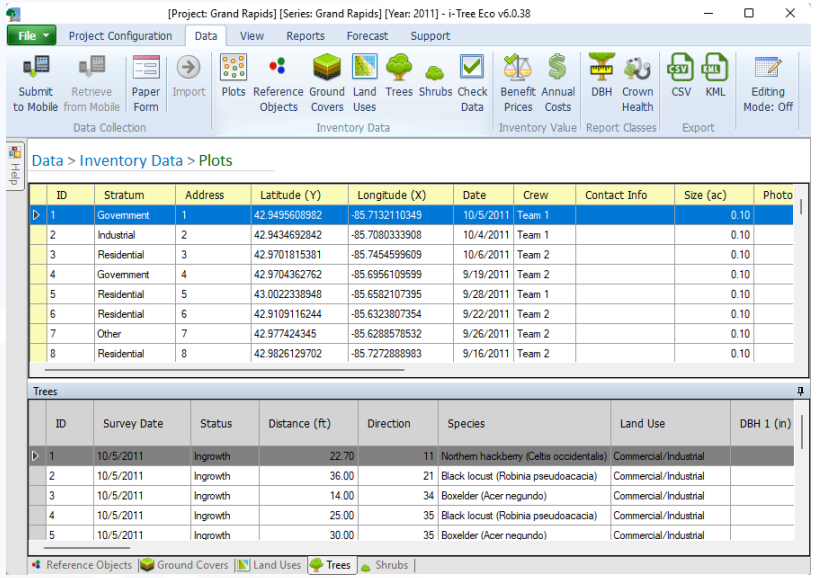
ISA

Casey Trees

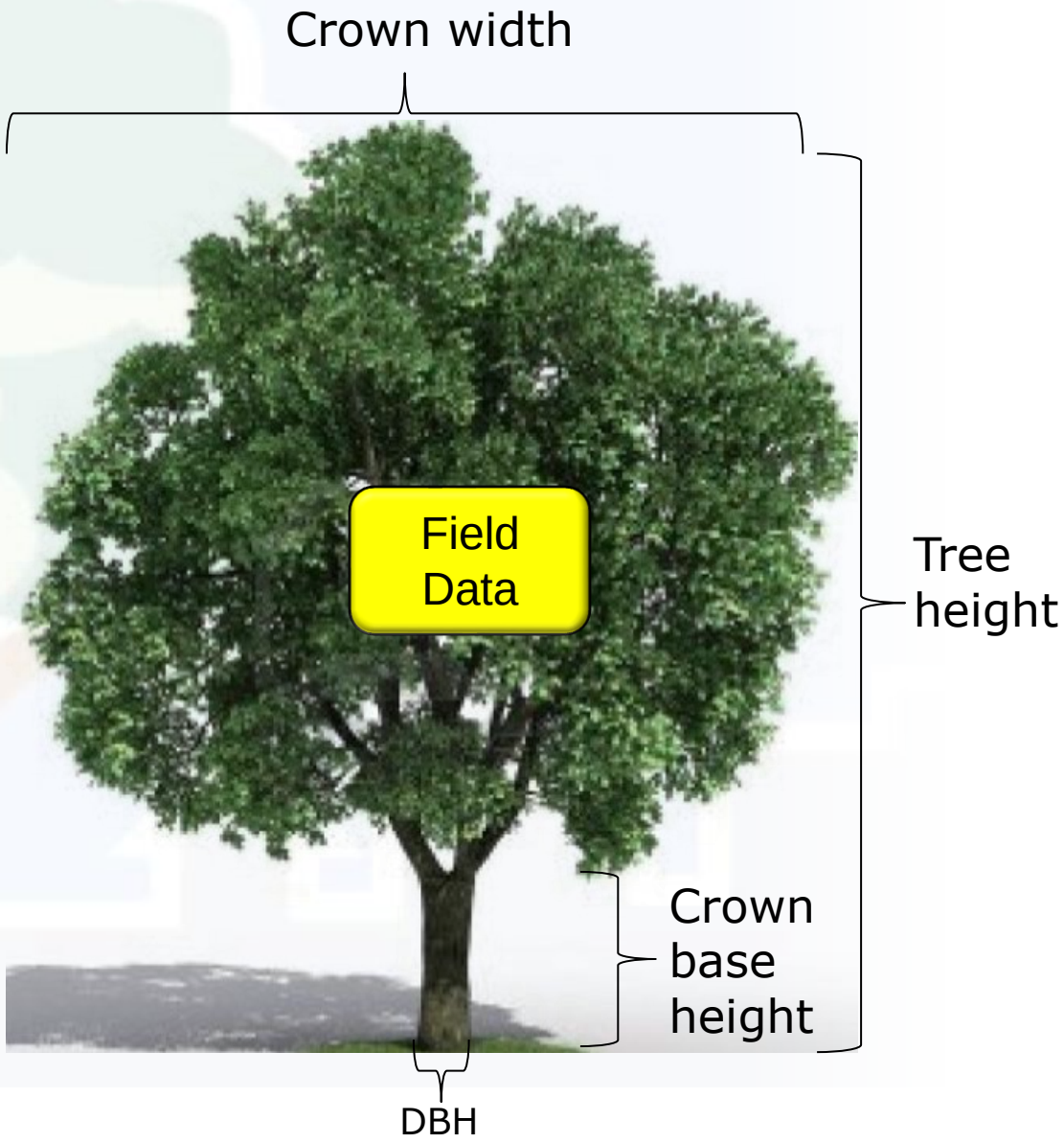
ESF State University of New York College of Environmental Science and Forestry

American Forests

The science of i-Tree: Measurements to Benefits to Value



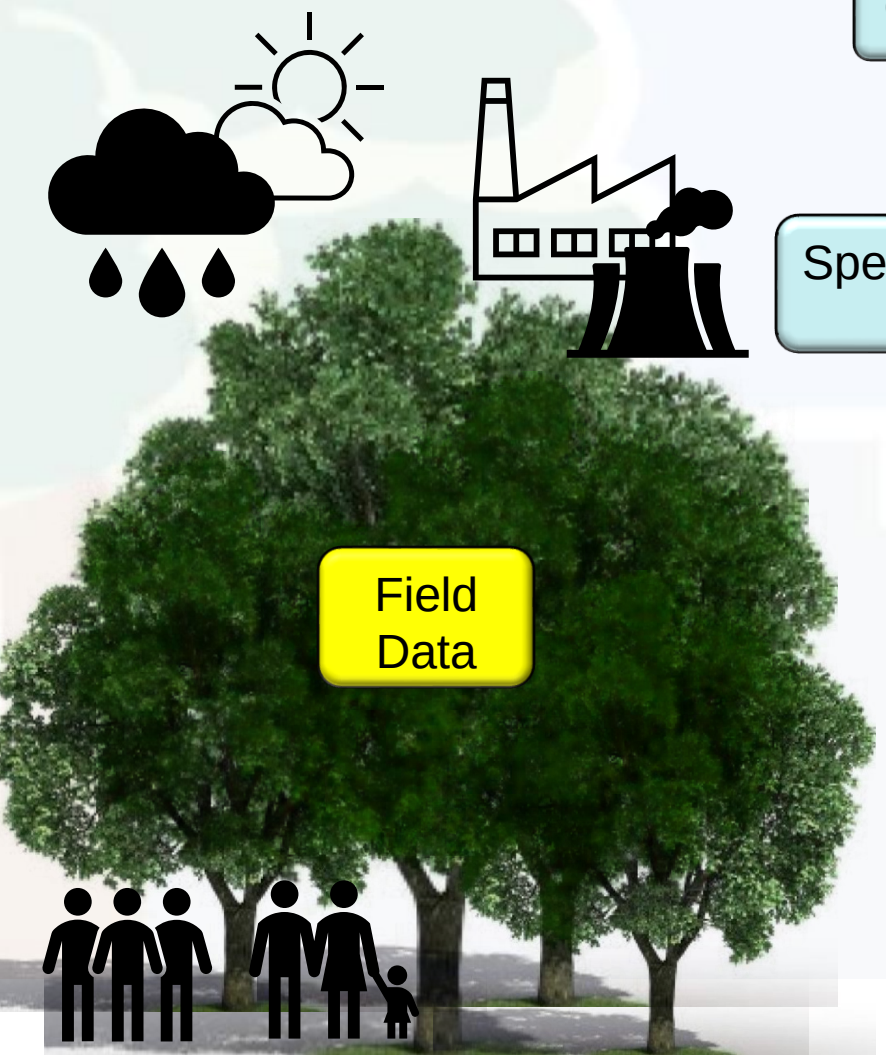
i-Tree Eco model basics: Start with your tree data



Key field variables

- **DBH**
- **Species**
- Crown measurements
- Tree health
- Building interactions
- Light availability

i-Tree model basics: Inventory data ➡ tree benefits



Field Data

City Data

Pollution Data

Weather Data

Species Data (*8000+*)

Location Data

i-Tree Eco

Structure

Air Quality

Hydrology

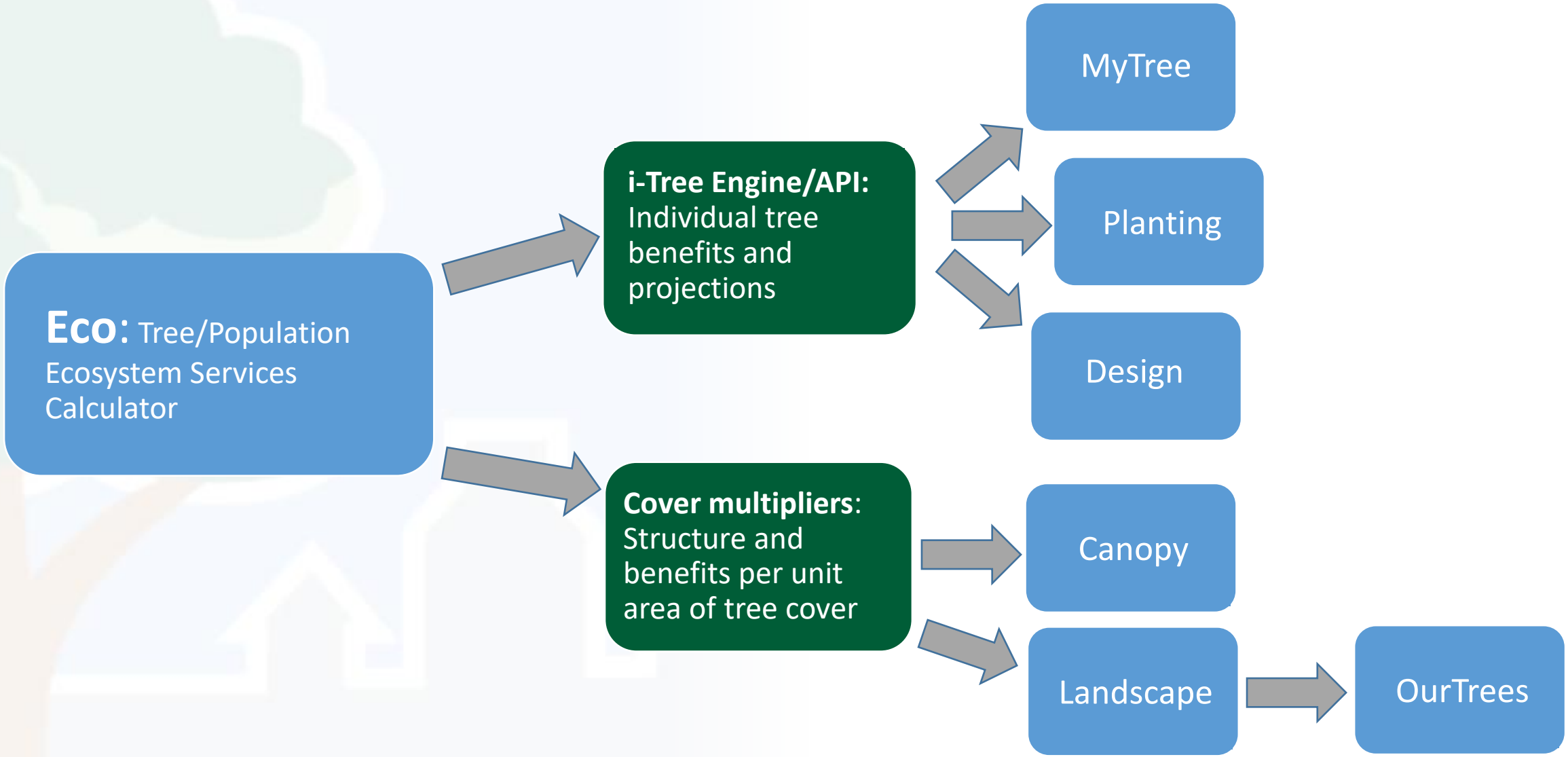
Energy

Carbon

Value

Forecast

i-Tree Tool Relationships



Top-down canopy tools

Bottom-up tree tools

More

Flexibility

Less

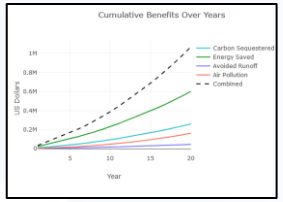
Eco

Landscape

Canopy

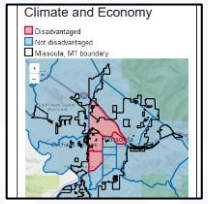
Design

Planting



MyTree

OurTrees



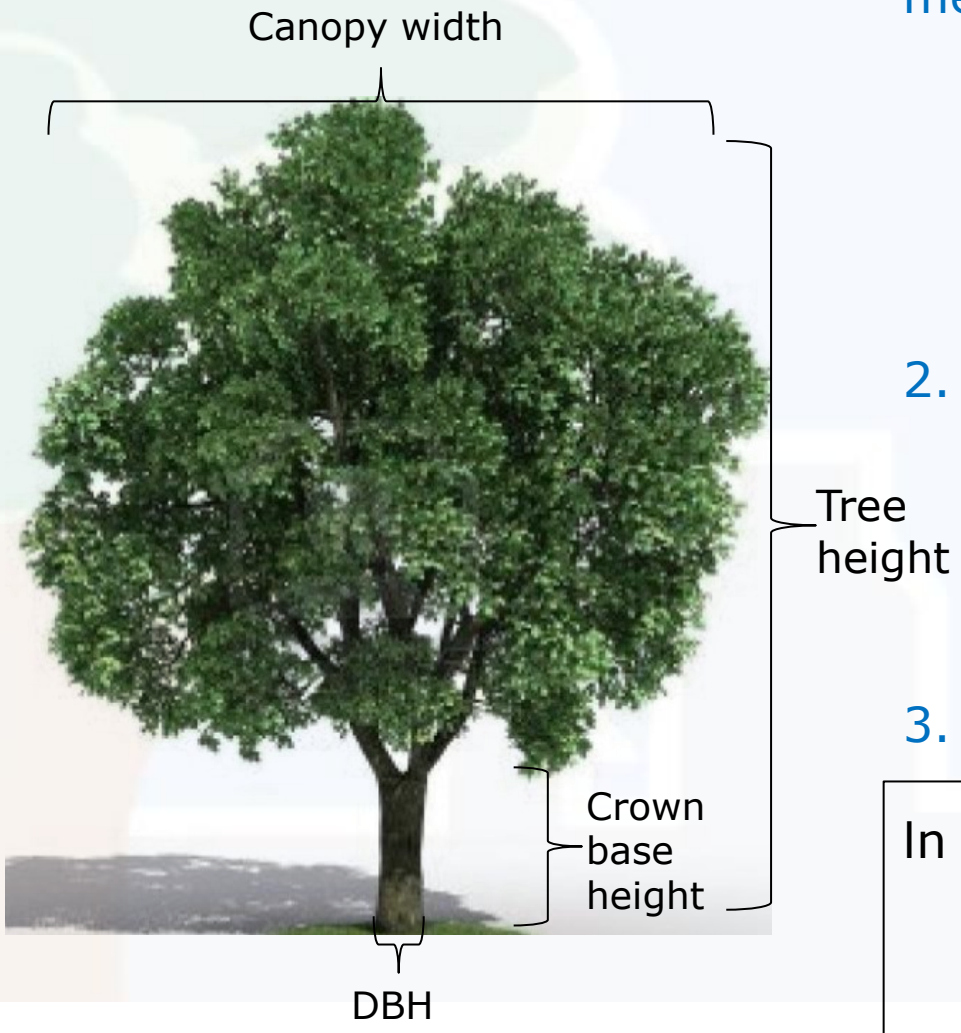
Easier

Ease of use

More Challenging

Science of i-Tree - Air pollution benefits

Step 1: Estimate tree structure: Leaf surface area

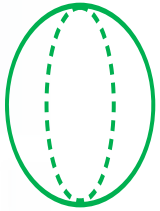


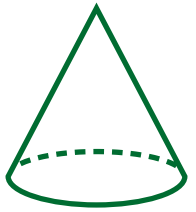
1. With at least dbh and species we can predict crown size measurements

Red maple height = $e^{(2.6393 + (\ln(DBH) * 0.5613))}$

18 in dbh red maple has an estimate height of 70 ft

2. With crown size measurements we can estimate crown surface





3. With crown surface we can estimate leaf surface area

ln of leaf area = -4.33 + 0.29 * ht +
+0.7312 * crown diam
+ 5.72 species leaf density
+ -0.015 crown surface area

Leaf surface area for our 18 in red maple =
5,842 sq ft

Leaf surface area of 18” dbh trees

Eastern white pine

5,516 sq ft

Honeylocust

4,281 sq ft

Northern red oak

6,038 sq ft

Step 2: Estimate tree function

Gas exchange - NO_2, O_3, SO_2

Deposition - particulate matter (PM2.5) and CO

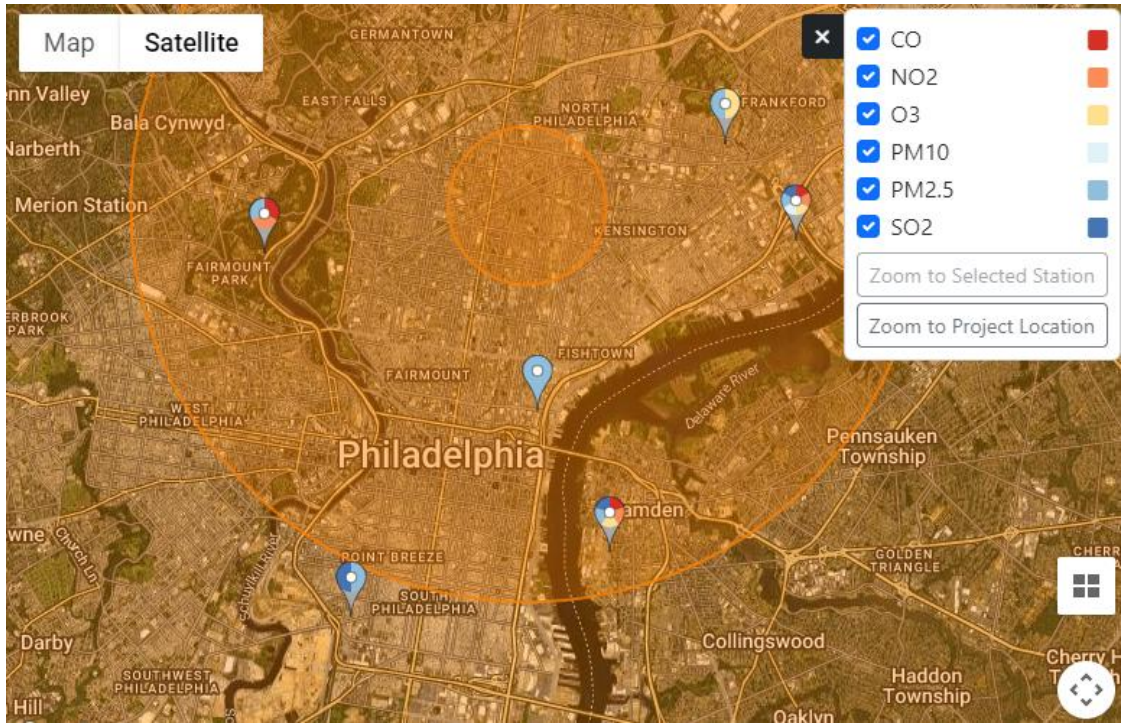
Local hourly weather data

- windspeed
- sunlight
- rainfall
- humidity

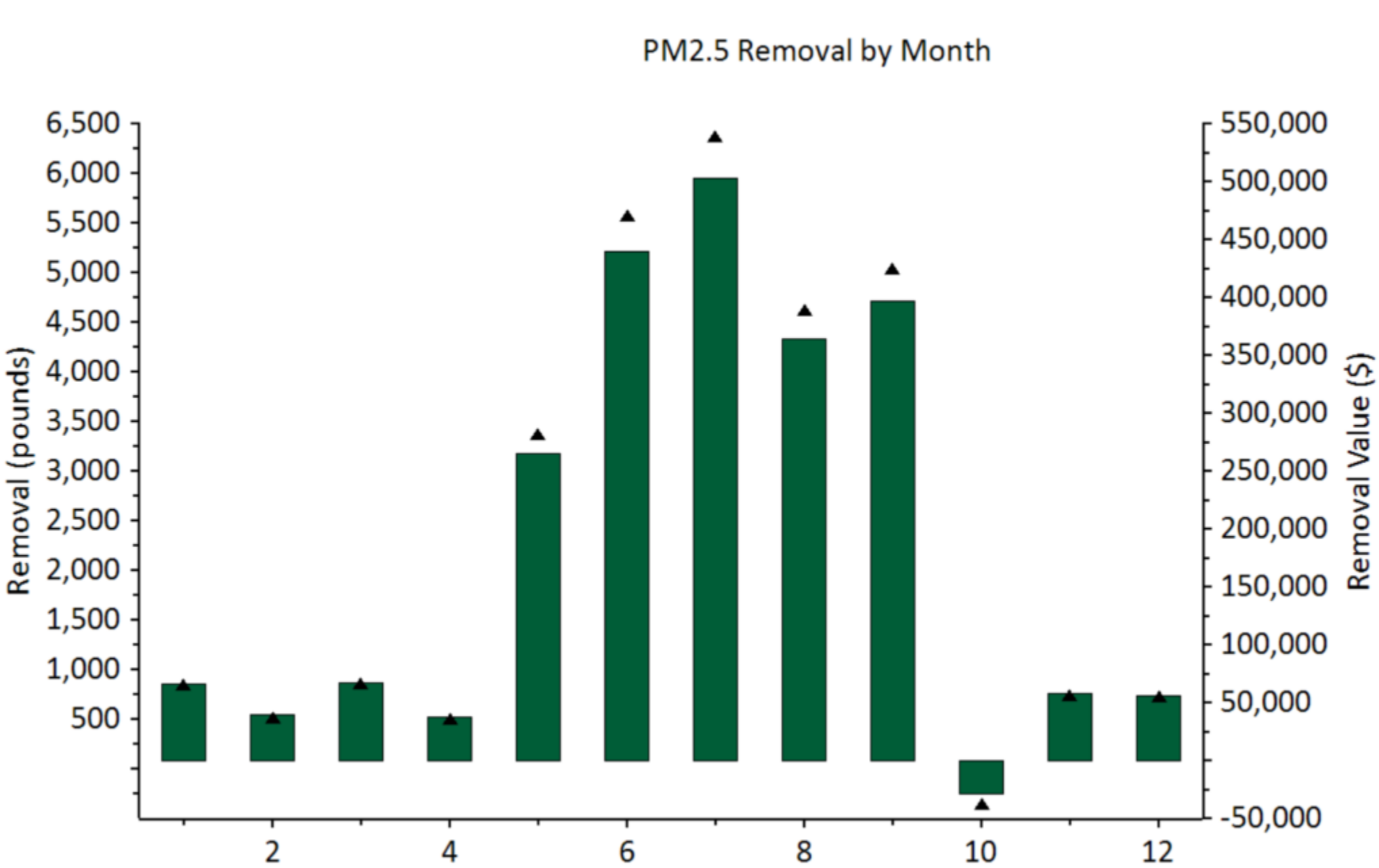
Local hourly pollution data

Tree structure data

- leaf area
- leaf on/off dates
- deciduous vs. evergreen



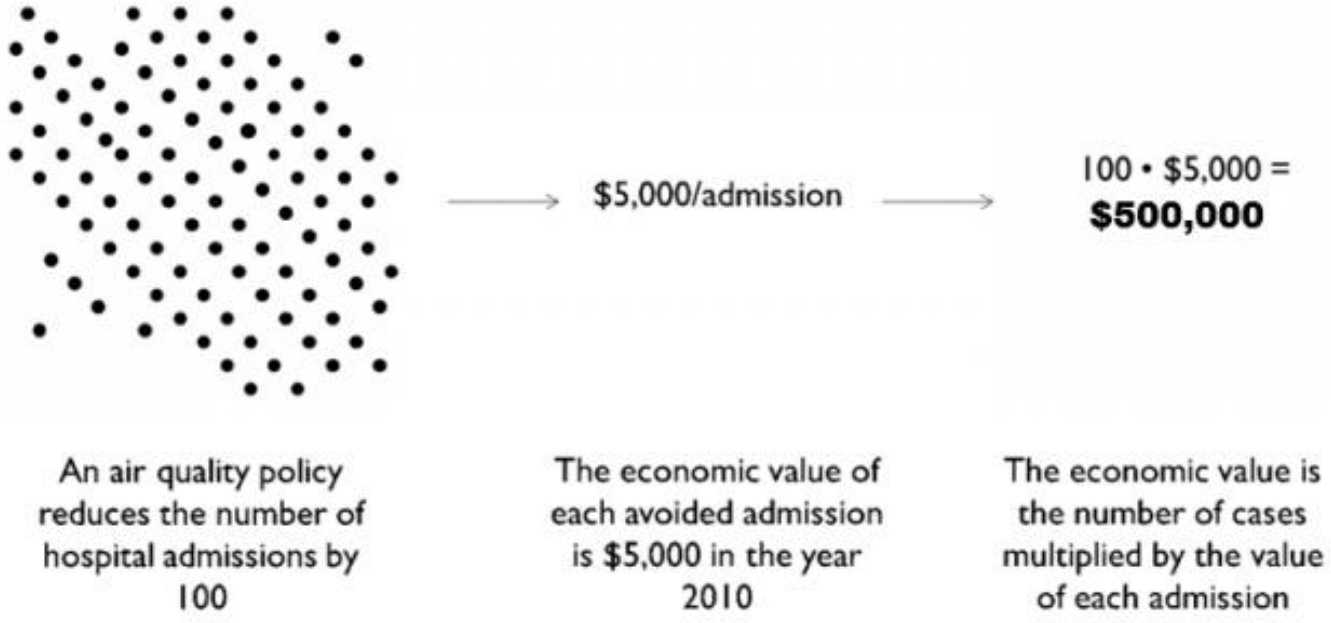
Pollution removal by trees in Grand Rapids, MI



Step 3: Estimating value
Monetary value of pollution removal by trees

EPA United States Environmental Protection Agency

Benefits Mapping and analysis program (BenMAP)



Inputs:
Local census data
- total population
- population by age

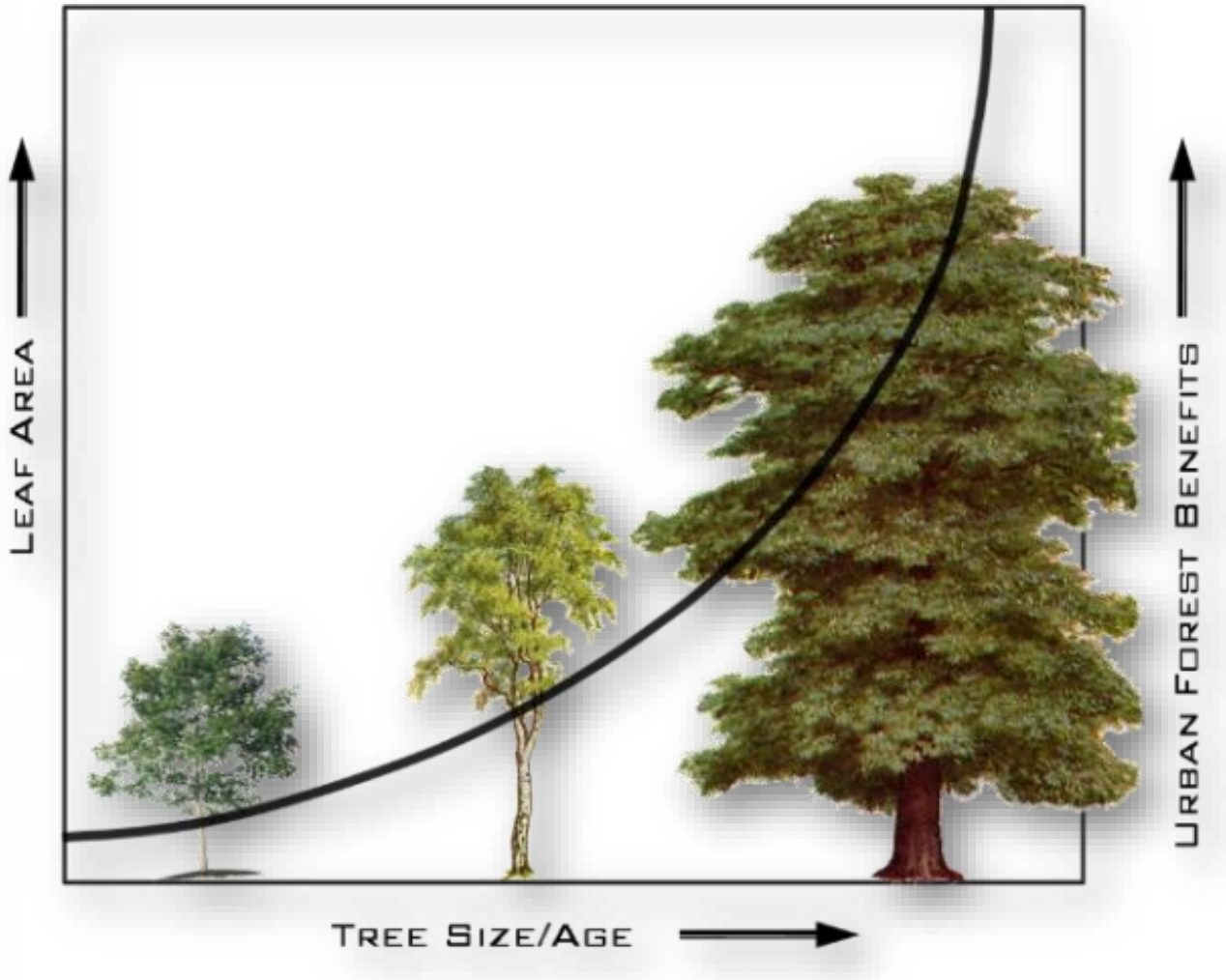
Estimates of pollution reduction

Grand Rapids, MI pollution removal value

	PM2.5 Incidence (Reduction/yr)	Value ($/yr)
Acute Bronchitis	0.206	18.12
Acute Myocardial Infarction	0.051	4,543.25
Acute Respiratory Symptoms	112.666	11,043.29
Asthma Exacerbation	88.133	7,164.56
Chronic Bronchitis	0.086	24,042.76
Emergency Room Visits	0.134	55.73
Hospital Admissions		
Hospital Admissions, Cardiovascular	0.030	1,164.32
Hospital Admissions, Respiratory	0.026	821.49
Lower Respiratory Symptoms	2.486	129.08
Mortality	0.285	2,214,131.18
School Loss Days		
Upper Respiratory Symptoms	2.048	91.95
Work Loss Days	19.238	3,298.60
Total	**225.389**	**2,266,504.33**

Unique Features of the i-Tree Science

- i-Tree is local
- i-Tree is species specific
- i-Tree benefits are specific to your tree
- i-Tree is powered by large databases
- Consistent and comparable between places and over time
- Research is continuously updated



Understanding i-Tree

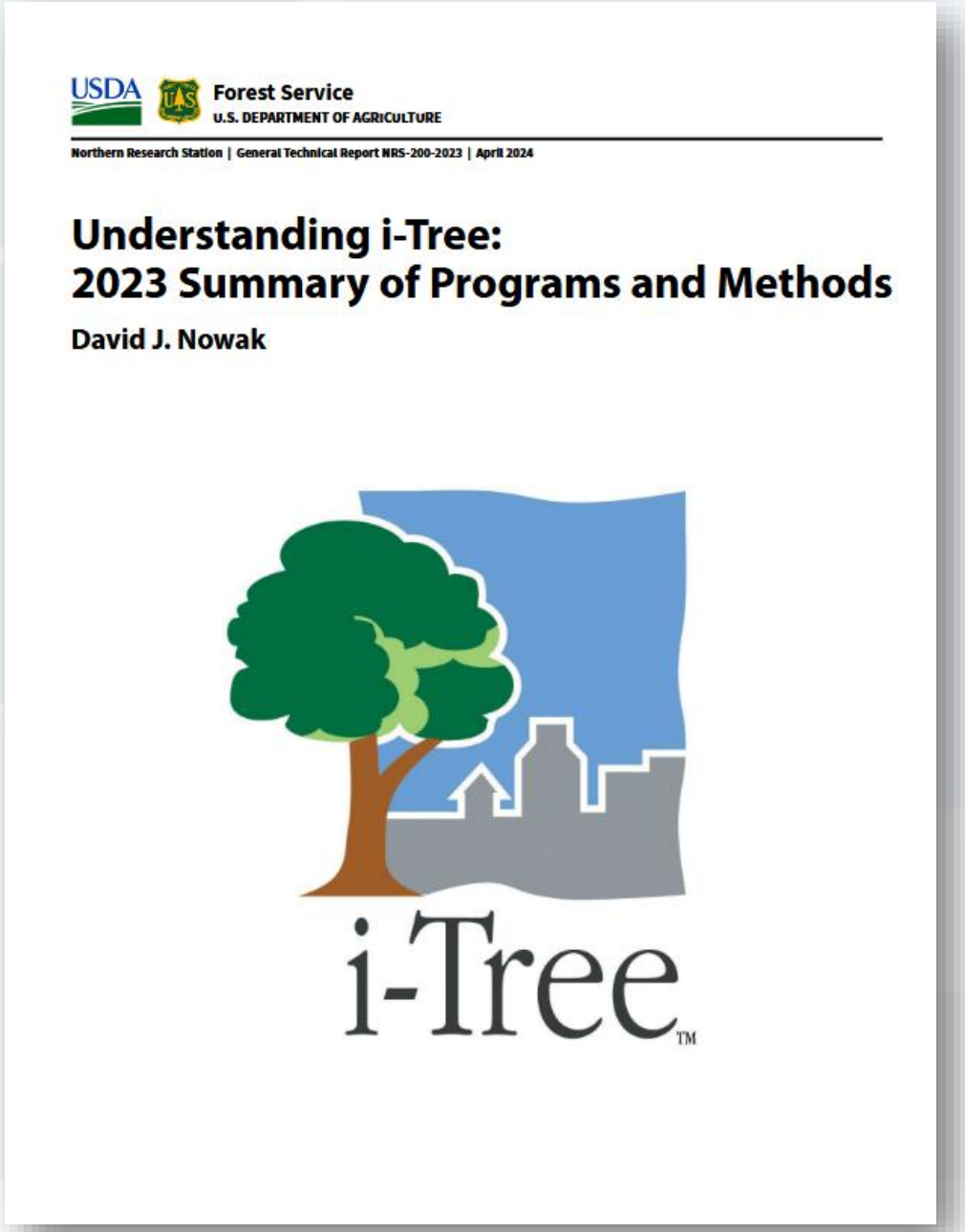
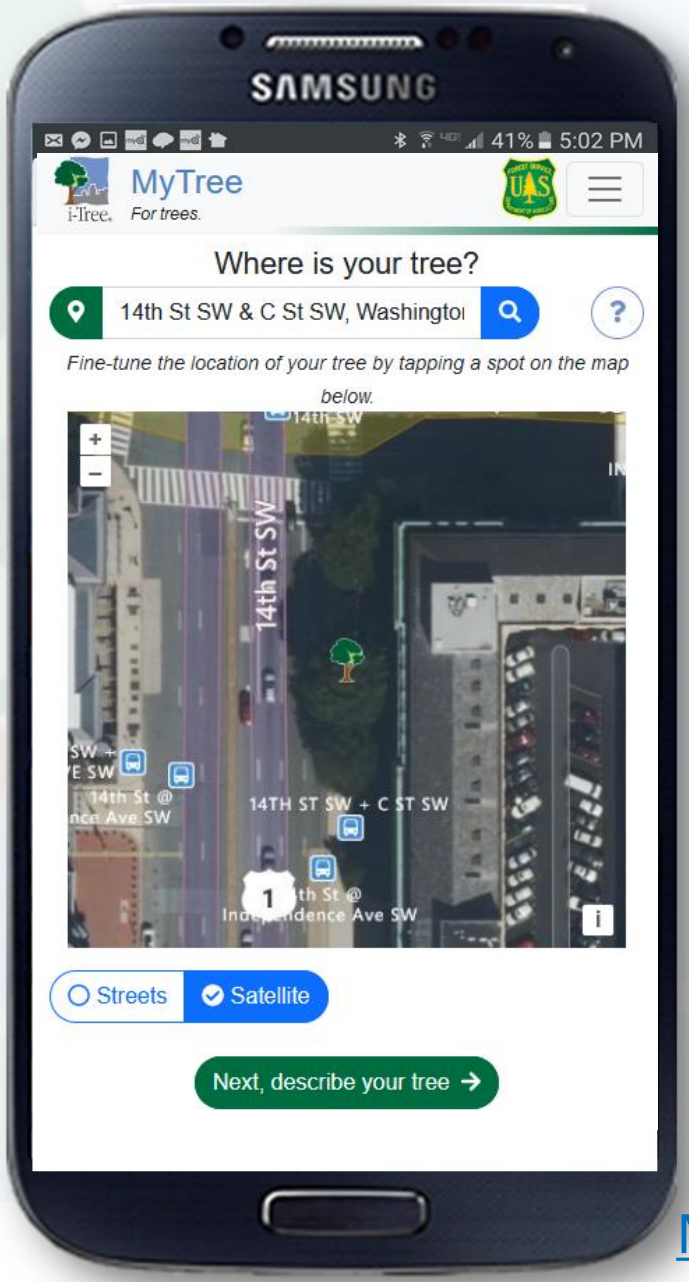


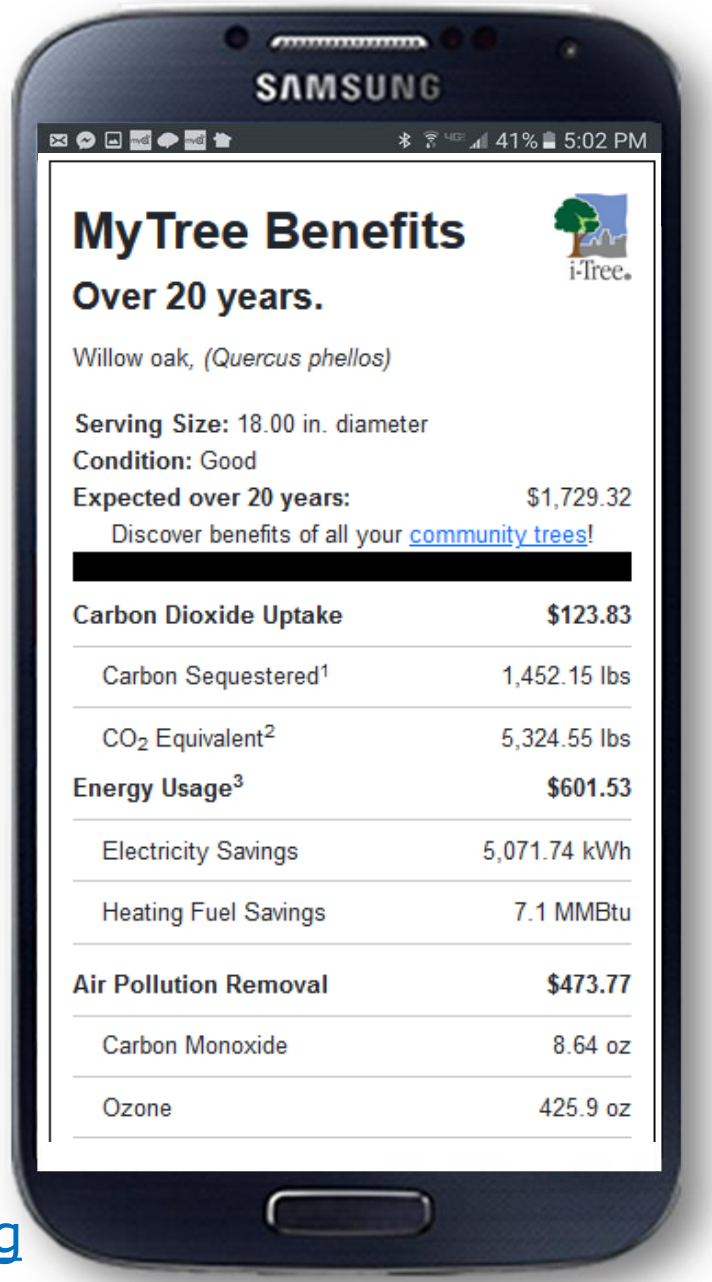
Table 2.—Summary of which directly field-measured characteristics are used to estimate derived variables and ecosystem services. D= directly used; I= indirectly used; C= conditionally used.

	DERIVED VARIABLES		ECOSYSTEM SERVICES										
DIRECT MEASURES	Leaf Area	Leaf Biomass	Carbon Storage	Gross Carbon Sequestration	Net Carbon Sequestration	Energy Effects	Air Pollution Removal	Avoided Runoff	Transpiration	VOC Emissions	Compensatory Value	Wildlife Suitability	UV Effects
Species	D	D	D	D	D	D	I	I	I	D	D		
Diameter at breast height (d.b.h.)			D	D	D						D	D	
Total height	D	D	C	C	C	D	I	I	I	I		D	
Crown base height	D	D	C				I	I	I	I			
Crown width	D	D	C				I	I	I	I			
Crown light exposure			C	D	D								
Percent crown missing	D	D	C	C	C	D	I	I	I	I			
Crown health (condition/ dieback)				D	D						D	D	
Field land use				D							D	D	
Distance to building						D							
Direction to building						D							
Percent tree cover						D	D	D				D	D
Percent shrub cover							D					D	
Percent building cover						D							
Ground cover composition							I					D	

https://research.fs.usda.gov/treesearch/68438

MyTree: Making i-Tree Easy





MyTree.itreetools.org