

i-Tree Open Academy

2024

Session 1: Introduction to i-Tree

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

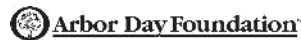
March 20, 2024

1:00pm Eastern Time

Davey Institute/USDA Forest Service



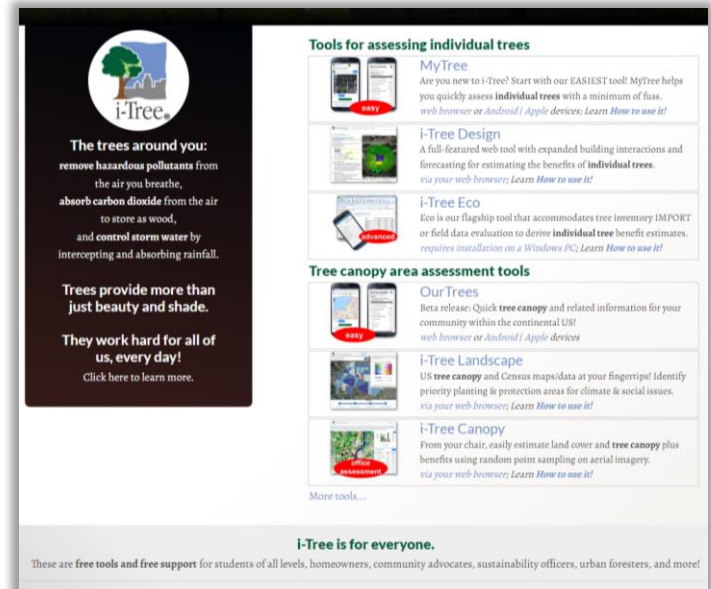
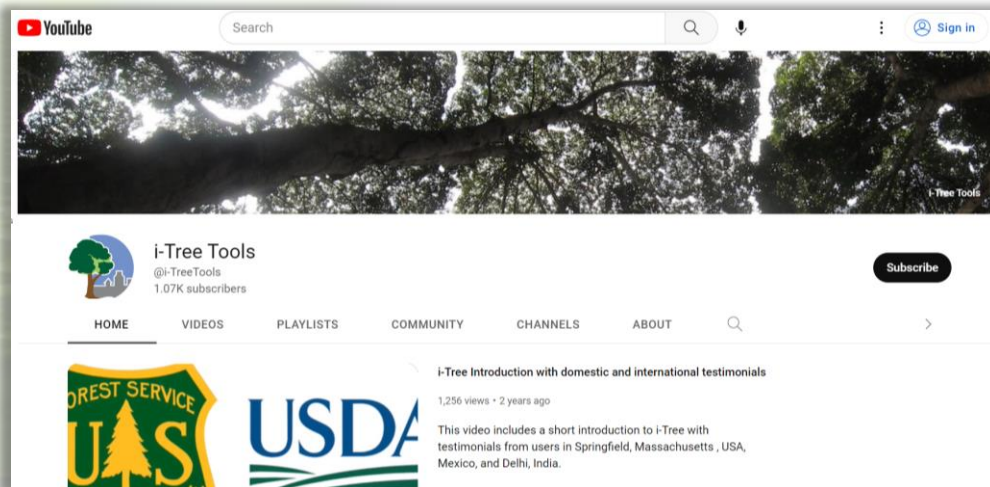
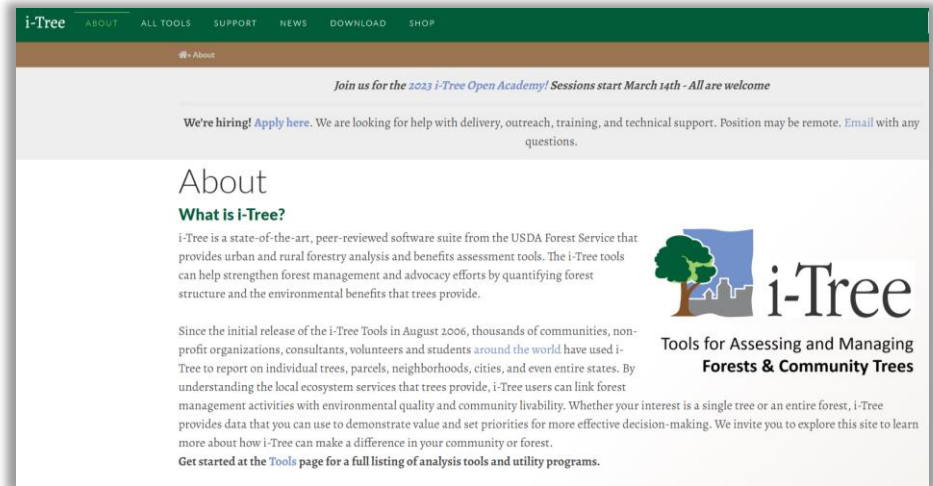
i-Tree is a
Cooperative
Initiative
among these
partners



Accessing the Science of Tree Benefits

Communicating Opportunities

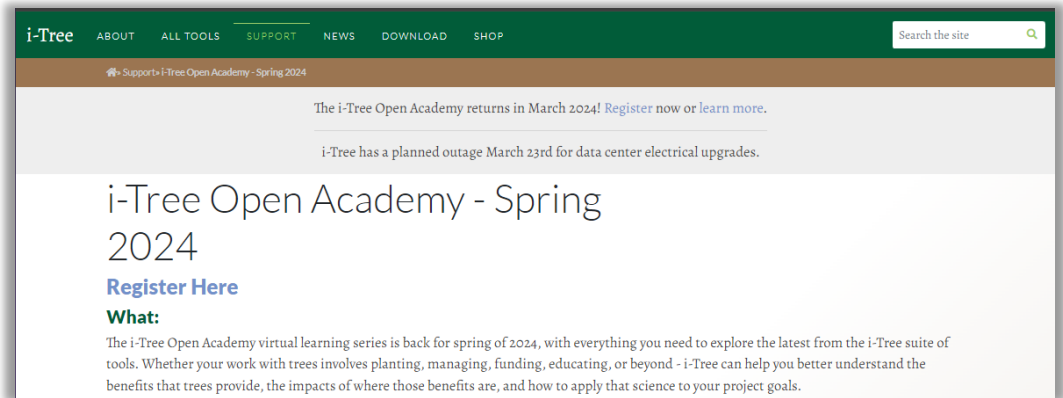
- 🌳 Learning series for wide variety of users
- 🌳 Easy to access live and via video
- 🌳 Exercises available
- 🌳 Connections to i-Tree Team and fellow i-Tree users
- 🌳 Use Chat window for questions
- 🌳 Certificates of participation available after Academy ends



Schedule of Events

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

info@itreetools.org



The screenshot shows the i-Tree website header with navigation links: ABOUT, ALL TOOLS, SUPPORT, NEWS, DOWNLOAD, SHOP. A search bar is in the top right. Below the header, there are two announcement lines: "The i-Tree Open Academy returns in March 2024! Register now or learn more." and "i-Tree has a planned outage March 23rd for data center electrical upgrades." The main heading is "i-Tree Open Academy - Spring 2024" with a "Register Here" link. A "What:" section follows, stating: "The i-Tree Open Academy virtual learning series is back for spring of 2024, with everything you need to explore the latest from the i-Tree suite of tools. Whether your work with trees involves planting, managing, funding, educating, or beyond - i-Tree can help you better understand the benefits that trees provide, the impacts of where those benefits are, and how to apply that science to your project goals."

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.
- **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.
- **April 3rd – The view from the top: i-Tree Canopy and OurTrees.** You can't manage your forest resource unless you know what you have. Get an estimate of tree canopy cover for any area or monitor change with a few hours of image analysis. Or save your mouse clicks and see if a quick visit to OurTrees will get you what you need.
- **April 17th – i-Tree Landscape: Data, maps, and equity portal.** With dozens of layers covering a wide range of geographies it is easy to get lost in Landscape. This session will keep you on track to finish with a map of tree benefits and priority areas within your community.
- **April 24th – i-Tree Eco the flagship tool.** i-Tree Eco is where the latest science goes first. It is a large, flexible tool that offers much more than we can cover in a single hour. We'll help you decide if Eco is right for you and let you know where to go to learn more.
- **May 1st – Putting i-Tree to Work.** Take a whirlwind tour through the many ways that i-Tree can be used to further your tree initiatives, from communication to site selection to accountability metrics. Get inspired and make a plan to put i-Tree to work for you.

Since 2006, i-Tree has been a cooperative, public/private partnership between the USDA Forest Service, Davey Tree Expert Company, The Arbor Day Foundation, Urban and Community Forestry Society, International Society of Arboriculture, Casey Trees, and SUNY College of Environmental Science and Forestry.

i-Tree is a registered trademark.

www.itreetools.org

Website & online learning resources

www.itreetools.org

- Links for all tools
- Manuals and videos
- Project reports

Email us!

info@itreetools.org

i-Tree

Support & Resources Resources Overview Video Learning

Video Learning

Explore instructional videos and archived webinars to learn more about the i-Tree applications. You can learn about new i-Tree video learning opportunities by subscribing to the i-Tree Tools channel on YouTube!

i-Tree Eco v6

What's New in i-Tree Eco v6 - Highlights

Eco v6 highlights and overview - 5 min. - This YouTube video provides an overview of the new options available in the new i-Tree Eco v6 application.

How to convert an existing Eco v5 project to Eco v6

Converting Eco v5 to v6 project - 6 min. - This YouTube video shows you how to convert an existing Eco v5 project to use in Eco v6.

Importing inventory data into i-Tree Eco v6

Importing external inventory data into Eco v6 - 8 min. - This YouTube video shows you how to set up an Eco v6 inventory project and importing in existing data.

Creating an i-Tree Eco v6 sample project

Eco v6 sample project creation - 8 min. - This YouTube video shows you how to create a plot-based sample project using the new i-Tree Eco v6 application.

Creating an i-Tree Eco v6 complete inventory project

Eco v6 complete inventory project creation - 11 min. - This YouTube video shows you the steps to create a complete inventory project using the new i-Tree Eco v6 application.

Eco Plot Establishment

1. Basic Eco sample plot establishment - 2 min. - This YouTube video shows you how to set out a simple 1/10 acre plot for an Eco sample project.
2. Eco wooded plot establishment - 3 min. - This YouTube video shows you how to set up an Eco sample plot partially in a wooded area.
3. Measuring plot reference object - 2 min. - This YouTube video shows you how to measure a plot reference object.

Understanding i-Tree: Summary of Programs and Methods

i-Tree Tools Resource Guide

This guide is intended to help new and experienced users to find the tools, guides, and other resources on the i-Tree Website that you need to help make your project a success.

Find the tools

The core tools are all available directly on the homepage www.itreetools.org. This includes the tree assessment tools, [MyTree](#) and [i-Tree Design](#) as well as the canopy assessment tools [i-Tree Canopy](#) and [i-Tree Landscape](#). Beyond these web-based tools, you can also learn more about i-Tree Eco from the homepage or head directly to the [downloads](#) page to request your download link. For additional tools like [i-Tree Species](#) and [i-Tree Planting](#) visit the [All Tools](#) page.

Learn to use the tools

(for most of the web-based tools go to Menu/Help to find the "How to use" guide)

- [Video walkthroughs](#) - Start by checking our learning videos to see if we have any videos to help you get started or complete specific tasks. You can also head to our [YouTube channel](#) for even more videos, including recorded webinars and presentations.
- [Manuals, Guides, and Workbooks](#) - This page includes manuals for individual tools along with guides and workbooks to help you complete specific tasks like post-stratifying your i-Tree Eco project or looking up synonym species in the i-Tree database. Similar documentation in other languages can be found [here](#).
- [Teaching with the tools](#) - We have a collection of curricula and teaching resources created by the i-Tree team and others.

See how others have used the tools

- [User's reports](#) - Reports shared with the i-Tree team from a variety of different applications of the i-Tree tools. Additional international reports in a variety of languages can be found [here](#).
- [Project profiles](#) - For selected user's projects we have a deeper dive into how the project was used to change community perceptions and/or influence management strategies.

Understand the science of i-Tree

- [Understanding i-Tree](#) - This document is the starting point for all explorations of the science underlying the i-Tree models and estimates. It provides summary descriptions of all model workings and links to peer reviewed publications for additional details.
- [Methods documentation](#) - A collection of many of the publications, white papers, and data sources representing the science of i-Tree, broken down by tool and topic.
- [Software and Science change logs](#) - The i-Tree tools are continually updated with the latest research. Sometimes, the software is updated before the documentation can be added to the website. Check out the software and science change logs for the latest changes.

For international i-Tree users

- [International use](#) - Find information about the use of i-Tree outside the U.S. You can also find [reports](#) shared by international users and available [translated documentation](#) linked at the bottom of that page.

Get support

Email us - If you can't find the answers to your questions on the i-Tree website you can always reach our support team by emailing info@itreetools.org.

- [Feedback form](#) - Use the feedback form if you have suggestions on how to improve the tools or if you would like to share your own project on the i-Tree website.
- [User's forum and FAQs](#) - If you have a question others could benefit from, or you think you may have stumbled across a common problem, feel free to post to or search the forum.

Version date: December 2018

i-Tree ABOUT ALL TOOLS SUPPORT NEWS DOWNLOAD SHOP

Support i-Tree Open Academy - Spring 2023

Join us for the 2023 i-Tree Open Academy

We're hiring! [Apply here](#). We are looking for help with delivery, outreach, and more.

What:

Join us for our newest learning series! The i-Tree Open Academy will provide an opportunity for anyone interested in better understanding the benefits of i-Tree Open Academy, and we can accept the first 250 participants to each live session.

Who:

The intended audience is new i-Tree users or folks who haven't checked out the newest tools and features.

How:

All sessions will be streamed live via this [Microsoft Teams link](#). Ensure you have the up-to-date session information by filling out the [form](#). All sessions will be recorded and posted to this page as well as the [i-Tree YouTube channel](#), so that you can catch up on any sessions you miss. There are no requirements for this course, and there will be self-directed exercises that you can use to gain experience using the tools. We encourage you 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.

Plan for today

1. What is i-Tree?
2. What results can I get from i-Tree?
3. Overview of the 2024 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

www.itreetools.org

i-Tree delivers current, peer-reviewed tree benefits estimation science from the USDA Forest Service to all types of users with free tools and support.



The trees around you:
remove hazardous pollutants from the air you breathe,
absorb carbon dioxide from the air to store as wood,
and control storm water by intercepting and absorbing rainfall.

Trees provide more than just beauty and shade.

They work hard for all of us, every day!
Click here to learn more.

Tools for assessing individual trees

MyTree
Are you new to i-Tree? Start with our EASIEST tool! MyTree helps you quickly assess **individual trees** with a minimum of fuss. *web browser or Android | Apple devices; Learn [How to use it!](#)*

i-Tree Design
A full-featured web tool with expanded building interactions and forecasting for estimating the benefits of **individual trees**. *via your web browser; Learn [How to use it!](#)*

i-Tree Eco
Eco is our flagship tool that accommodates tree inventory **IMPORT** or field data evaluation to derive **individual tree** benefit estimates. *requires installation on a Windows PC; Learn [How to use it!](#)*

Tree canopy area assessment tools

OurTrees
Beta release: Quick **tree canopy** and related information for your community within the continental US! *web browser or Android | Apple devices*

i-Tree Landscape
US **tree canopy** and Census maps/data at your fingertips! Identify priority planting & protection areas for climate & social issues. *via your web browser; Learn [How to use it!](#)*



i-Tree is a Cooperative Initiative



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

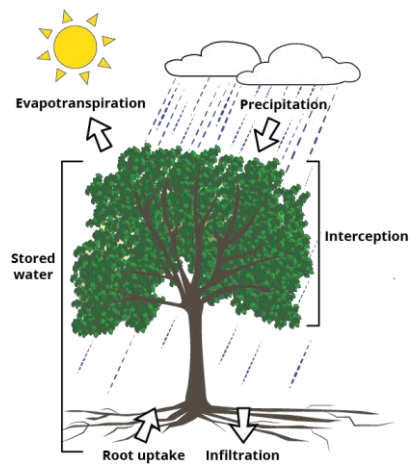
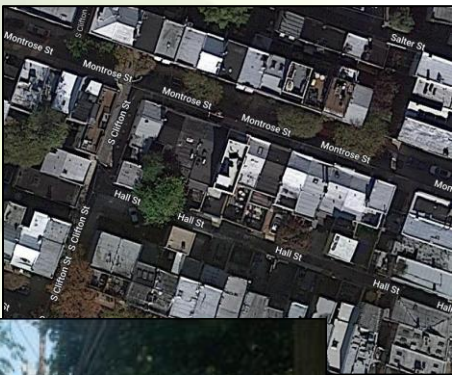
Structure



Function



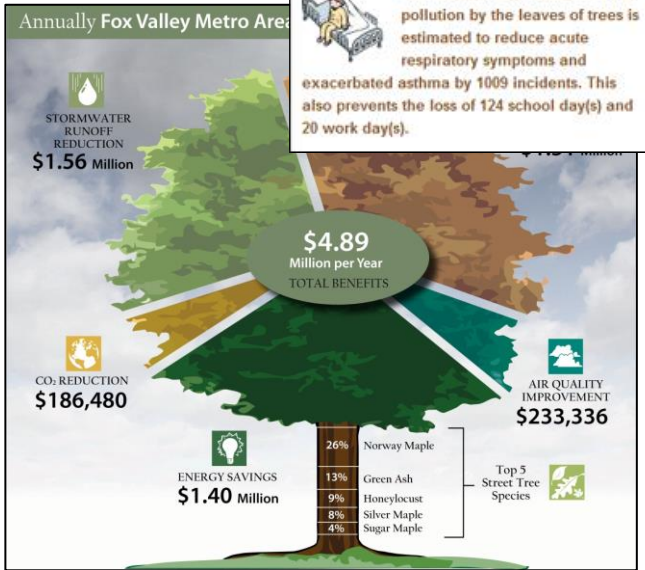
Value



Annual Tree Benefits for Baltimore, MD

Sequestering carbon as wood in trees counteracts the CO₂ emissions of 7,387 gasoline powered passenger cars.

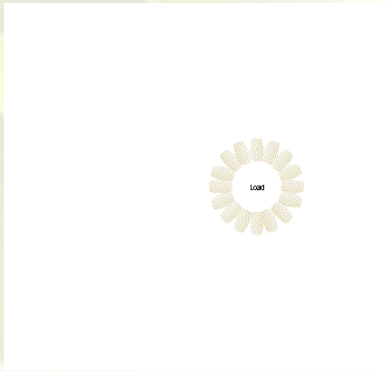
The filtration and removal of air pollution by the leaves of trees is estimated to reduce acute respiratory symptoms and exacerbated asthma by 1009 incidents. This also prevents the loss of 124 school day(s) and 20 work day(s).



What does i-Tree Estimate and Why?

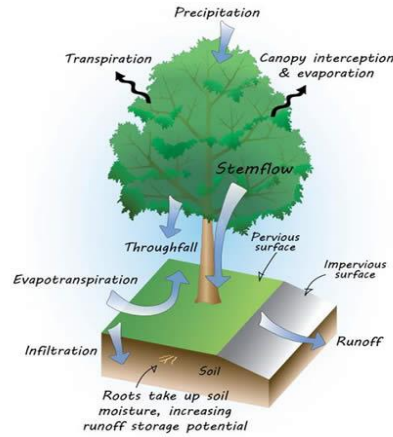
Energy

Tree impacts on heating and cooling



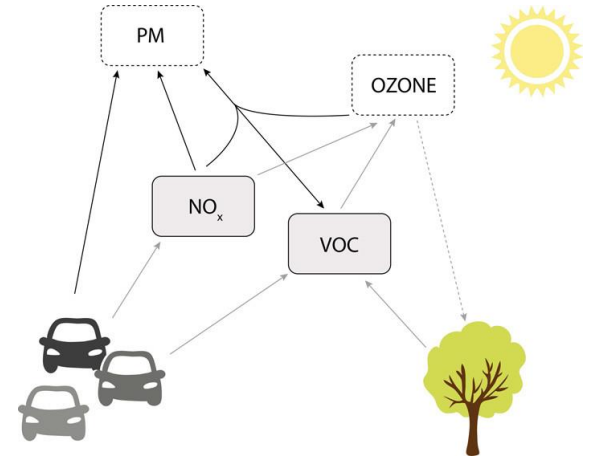
Stormwater

Avoided runoff, evaporation, transpiration



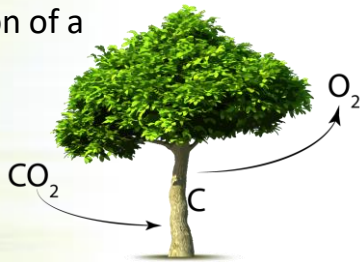
Air Quality

Interaction with EPA criterion pollutants resulting in improved health



Carbon dioxide

Storage and sequestration of a greenhouse gas



The 2024 i-Tree Suite of Tools

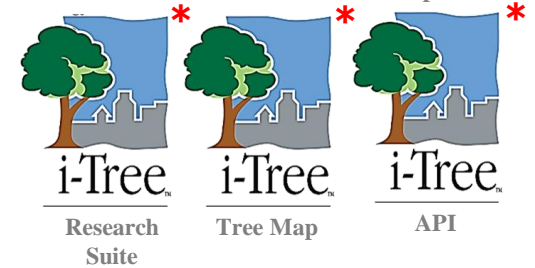
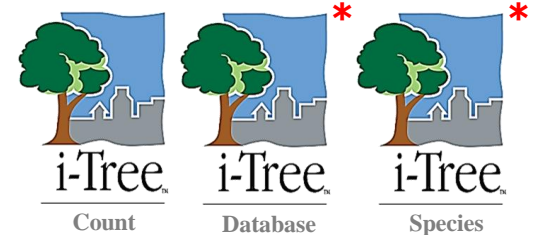
Core individual tree tools



Core canopy tools



Utilities



...

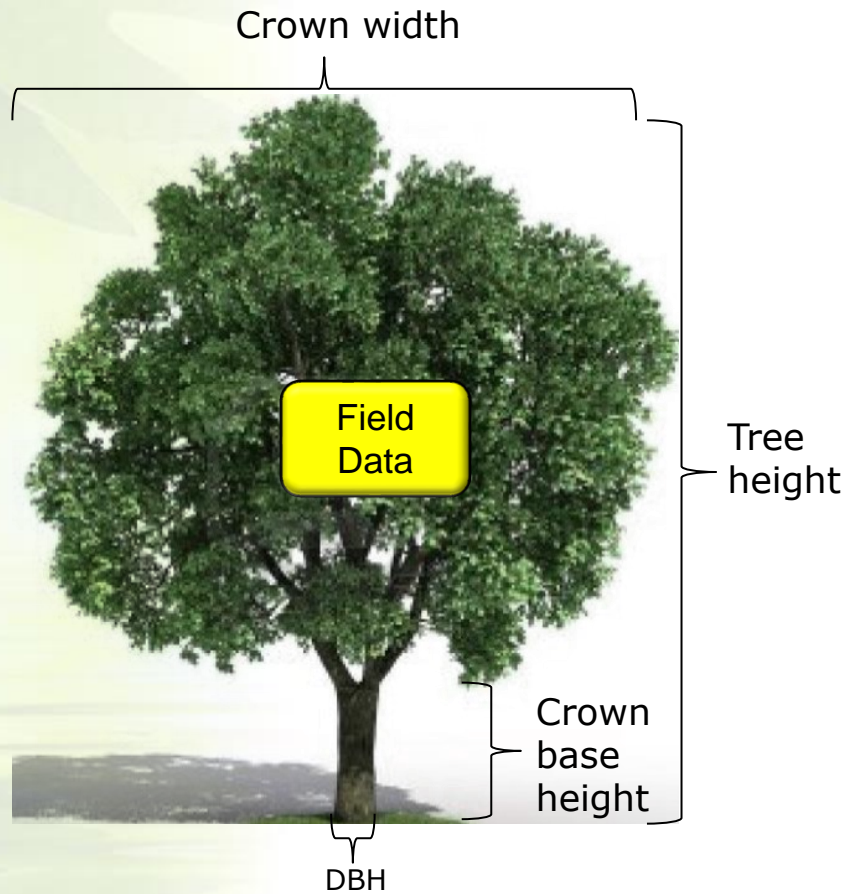
* i-Tree Tools that can be used internationally



i-Tree is a Cooperative Initiative among these partners



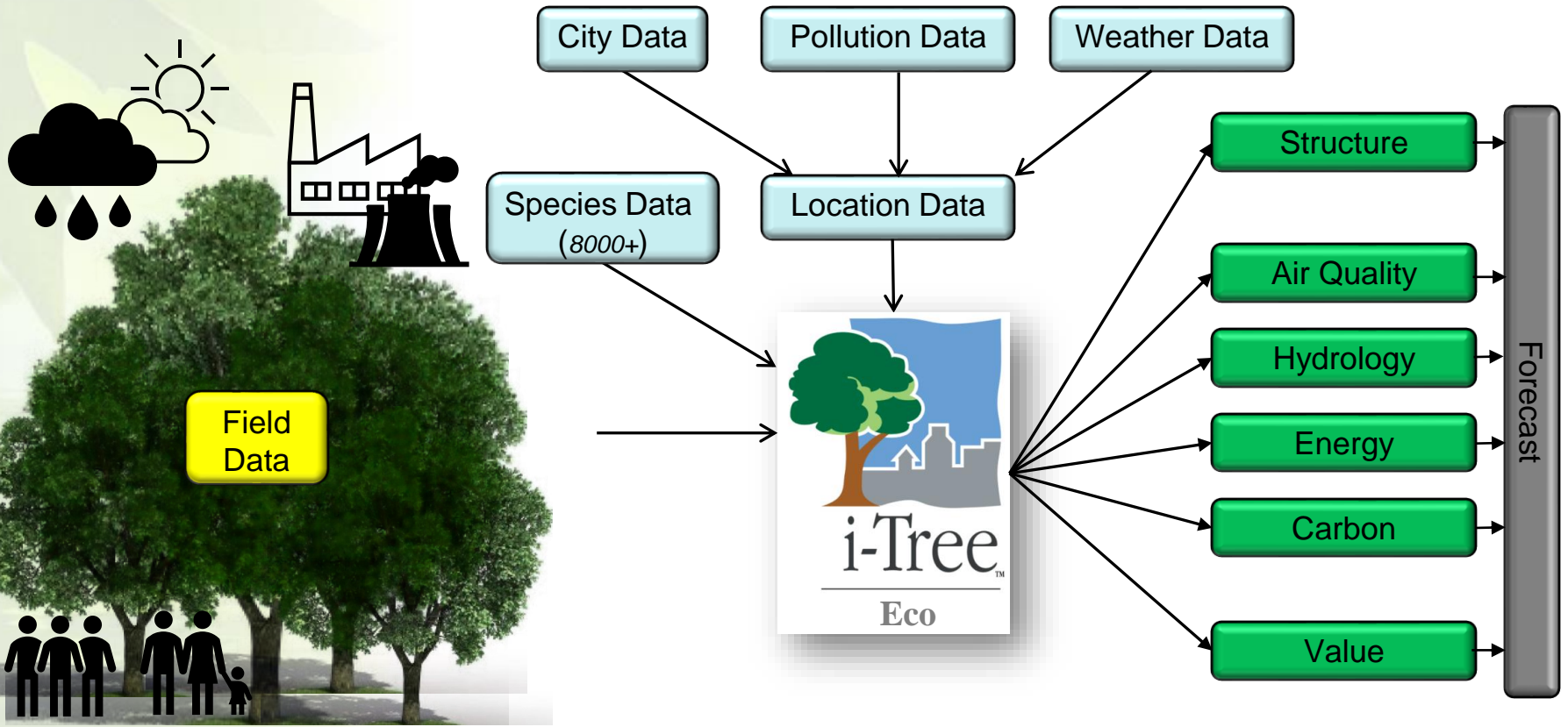
i-Tree Eco model basics: Inventory data → tree benefits



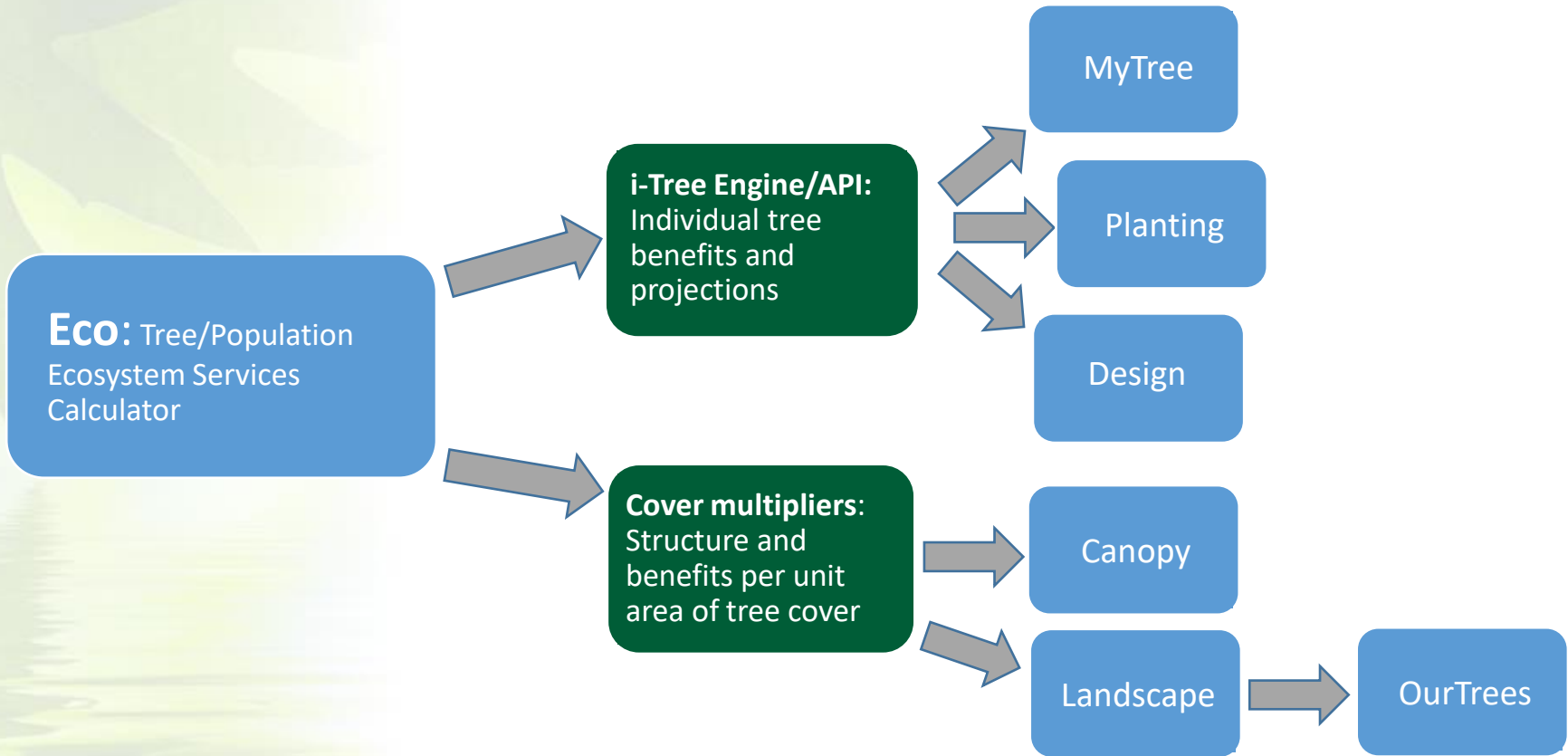
Key field variables

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

i-Tree model basics: Inventory data → tree benefits

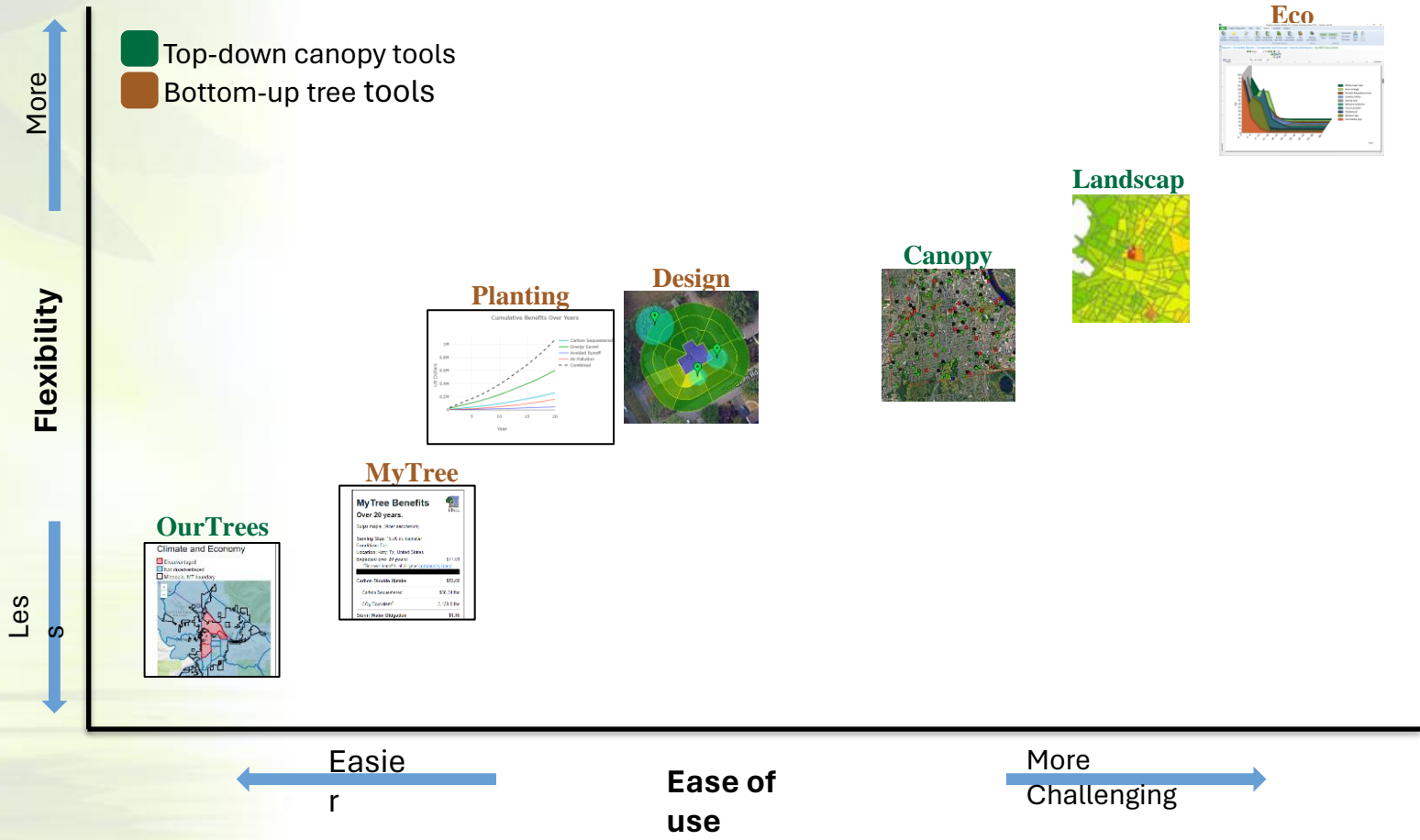


i-Tree Tool Relationships

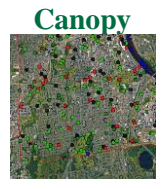
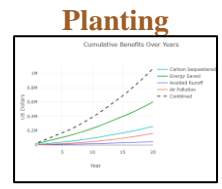
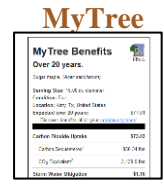
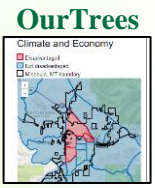


*i-Tree is a
Cooperative
Initiative
among these
partners*





■ Top-down canopy tools
■ Bottom-up tree tools



Step 1: Estimate tree structure: Leaf surface area



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

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

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

$$\begin{aligned} \ln \text{ of leaf area} = & -4.33 + 0.29 * \text{ht} + \\ & +0.7312 * \text{crown diam} \\ & + 5.72 \text{ species leaf density} \\ & + -0.015 \text{ crown surface area} \end{aligned}$$

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**

Honeylocus



**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
($\text{PM}_{2.5}$) and CO

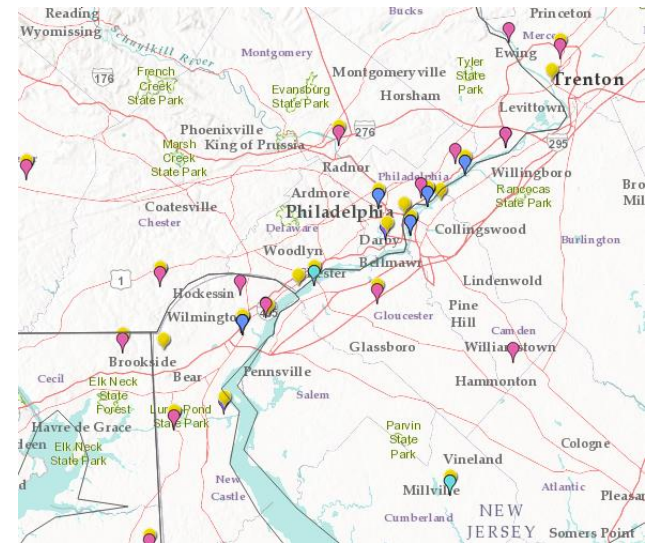
Local hourly weather data

- windspeed
- sunlight
- rainfall
- humidity

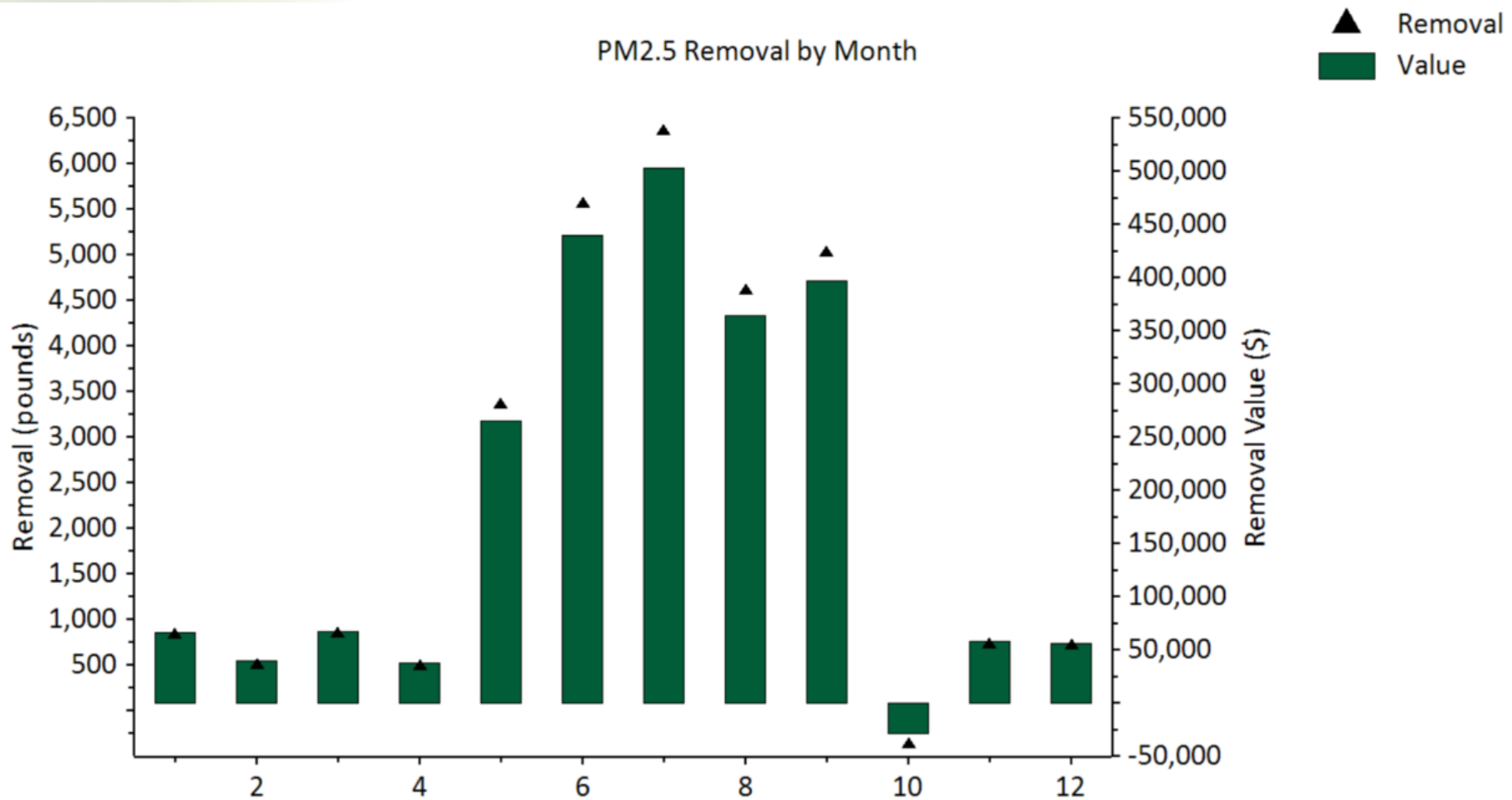
Local hourly pollution data

Tree structure data

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



Pollution removal by trees in Grand Rapids, MI

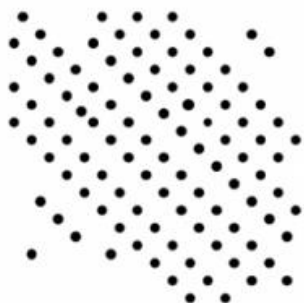


Step 3: Estimating value

Monetary value of pollution removal by trees



Benefits Mapping and analysis program (BenMAP)



→ \$5,000/admission →

$$100 \cdot \$5,000 = \mathbf{\$500,000}$$

An air quality policy reduces the number of hospital admissions by 100

The economic value of each avoided admission is \$5,000 in the year 2010

The economic value is the number of cases multiplied by the value of each admission

Inputs:

Local census data

- total population
- population by age

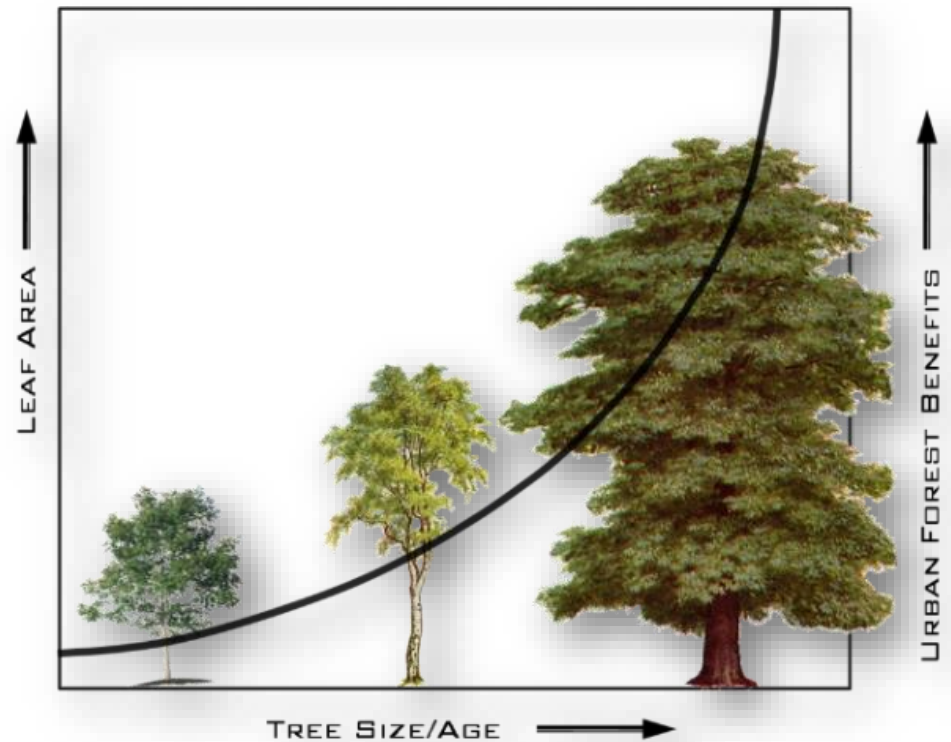
Estimates of pollution reduction

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

Key points about the science of i-Tree

- Based on research from over a dozen different researchers
- Researchers associated with half a dozen different organizations
- Research is continuously updated



Understanding i-Tree



Northern Research Station | General Technical Report NRS-200-2021 | December 2021

Understanding i-Tree: 2021 Summary of Programs and Methods

David J. Nowak

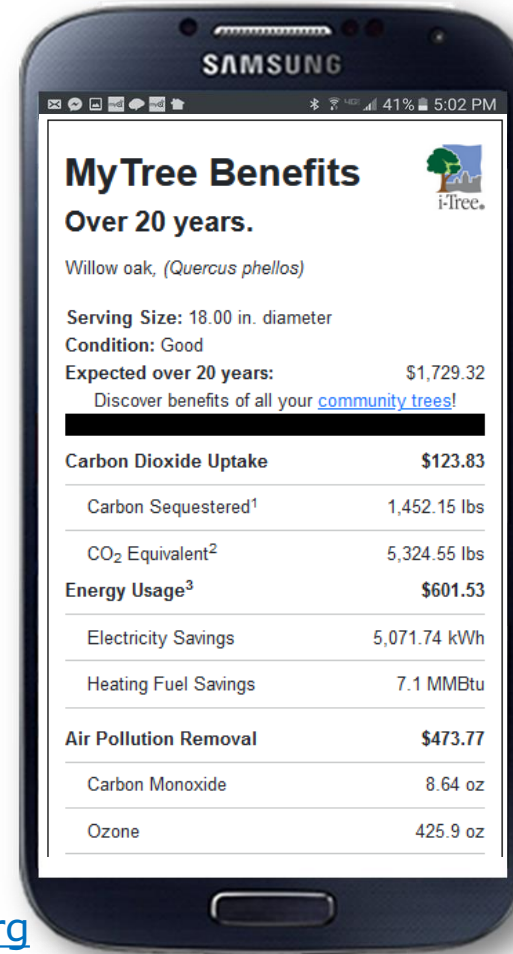
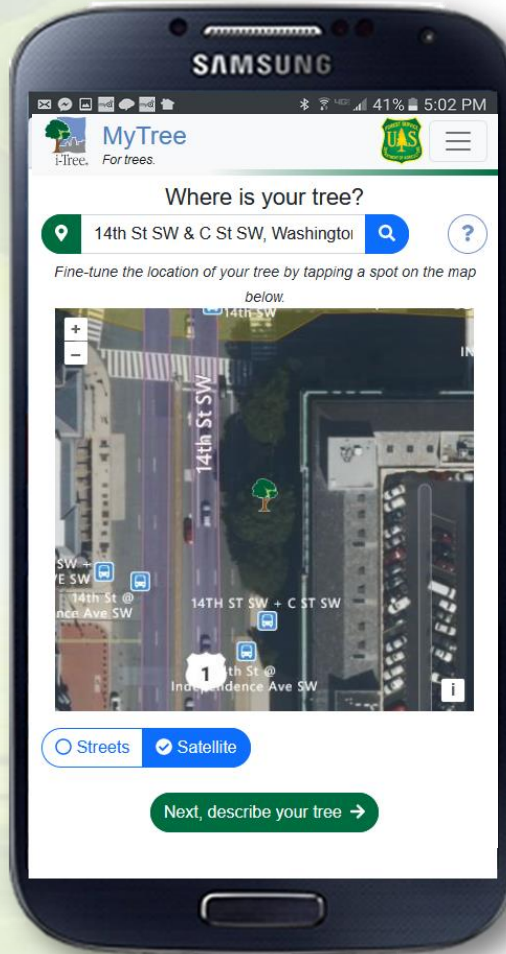


Table 2.—Summary of which directly field-measured characteristics are used to estimate derived variables and ecosystem services. D= directly used; I= indirectly used; C= conditionally used.

	DERIVED VARIABLES		ECOSYSTEM SERVICES										
	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
DIRECT MEASURES													
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://www.fs.usda.gov/research/treearch/63636>

MyTree: Making i-Tree Easy

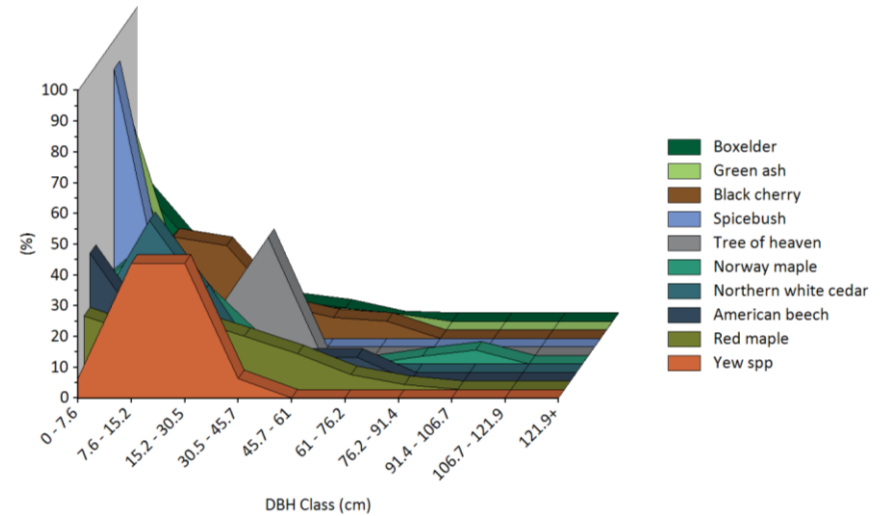
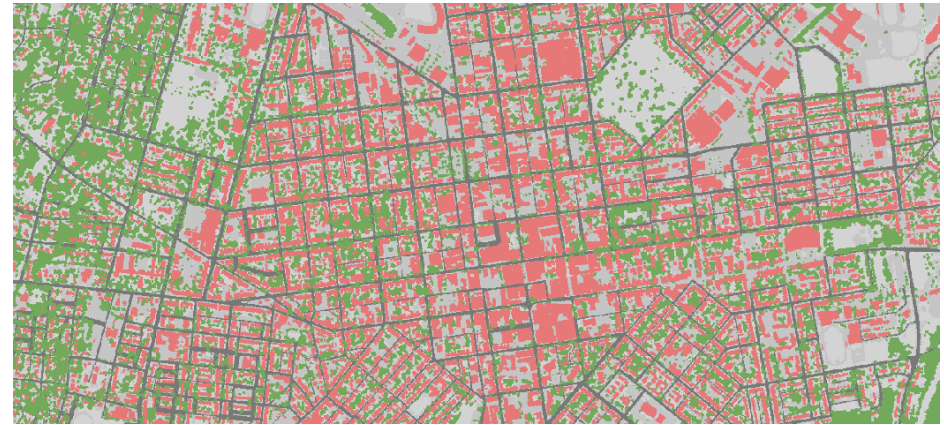


MyTree.itreetools.org

Using i-Tree

**If you can't measure it,
you can't manage it.**

- 🌳 Map your canopy
- 🌳 Understand ownership
- 🌳 Species
- Diversity/Composition
- 🌳 Size/Age Class Distribution



**How does the structure of your forest
impact the benefits trees provide?**

Opportunities for Communities...

- 🌳 Integrate urban forests in policies: sustainability, equity, climate, resiliency, air quality, public health, stormwater
- 🌳 Plan and manage urban forest resources more strategically to serve and protect people
- 🌳 Advocate with data
- 🌳 Improve preservation & health of trees and forests
- 🌳 Sustainable development
- 🌳 Create and support green industry jobs
- 🌳 Youth education & community engagement





“These six trees store 14,291 lbs of carbon and continue to sequester 470 lbs of carbon each year. For comparison, the 1,316 small trees between 1-4 inches DBH in this study store a combined total of 16,567 lbs of carbon”



From Corey Bassett, https://www.itreetools.org/documents/352/UPenn_iTreeEcoInventory.pdf

Keys to using i-Tree effectively

- Define objectives. *What does success look like?*
- Understand advantages, limitations, and options available with different i-Tree tools.
- Can i-Tree help you achieve desired outcomes?
- Evaluate your 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 issues that matter to people



There are lots of resources to help

www.itreetools.org

Videos

Documentation

Online tools

Support

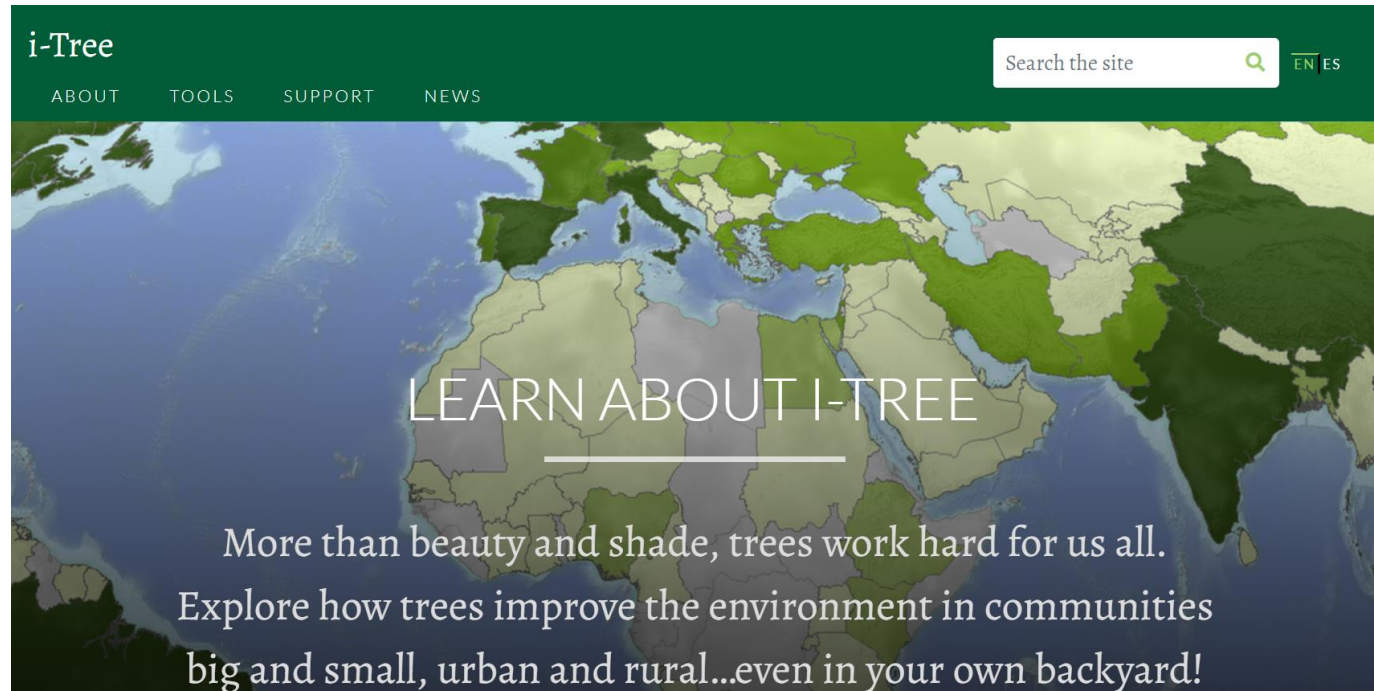
Examples

Downloads

Newsletters

Webinars

info@itreetools.org



The image shows a screenshot of the i-Tree website homepage. The top navigation bar is dark green with the 'i-Tree' logo on the left and a search bar on the right containing the text 'Search the site' and a magnifying glass icon. Below the search bar are language options 'EN' and 'ES'. The main content area features a world map with a green overlay. The text 'LEARN ABOUT I-TREE' is centered over the map, with a horizontal line underneath. Below this, a paragraph reads: 'More than beauty and shade, trees work hard for us all. Explore how trees improve the environment in communities big and small, urban and rural...even in your own backyard!'.