

i-Tree Open Academy

2024

Session 3: The view from the top

Assessing your canopy cover with i-Tree Canopy and OurTrees

April 3, 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



- 🌳 www.itreetools.org
- 🌳 Sessions 1 & 2 now online!
- 🌳 **No Session Next Week!**
- 🌳 Office hours April 11 @ 2pET
- 🌳 Use Chat for questions
- 🌳 Certificates of completion available after Academy close

The screenshot shows the i-Tree website homepage. On the left, a dark box contains the i-Tree logo and text: "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." The main content area is titled "Tools for assessing individual trees" and lists several tools: MyTree (easy), i-Tree Design, i-Tree Eco (difficult), Tree canopy area assessment tools (OurTrees, i-Tree Landscape, i-Tree Canopy), and a link for "More tools...". At the bottom, it states "i-Tree is for everyone. These are free tools and free support for students of all levels, homeowners, community advocates, sustainability officers, urban foresters, and more!"

i-Tree Open Academy - Spring 2024

Register Here

What:

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.

Who:

This seminar-style offering will serve as both a refresher and an introduction to the newest tools and features, with one-hour virtual sessions over a six-week period. There is no fee for the Academy, and you can join all live sessions, or select those that meet your schedule and interests. Register by filling out the [participant form](#).

We will be offering continuing education credits (CEUs) for both the International Society of Arboriculture (ISA) and the New Jersey state Urban and Community Forestry program. One CEU is available for each of the live sessions attended.

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.

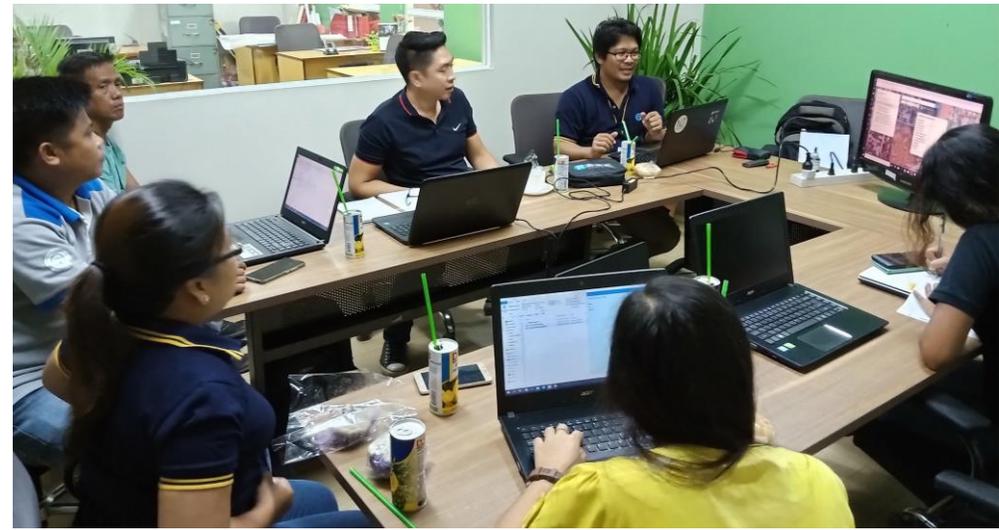
- **March 20th – Introduction to i-Tree.** Understand the basic science of i-Tree and the USFS research behind it. Explore the relationships between the i-Tree tools and the data they provide. Start to consider which i-Tree tools will be best for the application you have in mind.
 - Video Recording
 - Presenter Slides
 - Self-Directed Exercise - Session 1 Q&A
- **March 27th – Skills 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

Plan for today

1. Introduce the online canopy tools
2. i-Tree Canopy Demo
3. i-Tree Canopy for change analysis
4. OurTrees Demo

i-Tree Team

Jason Henning
Eric Greenfield
Krista Heinlen
Dave Bloniarz
Jay Heppler
Scott Maco
Ana Castillo



The 2023 i-Tree Suite of Tools



Core individual tree tools



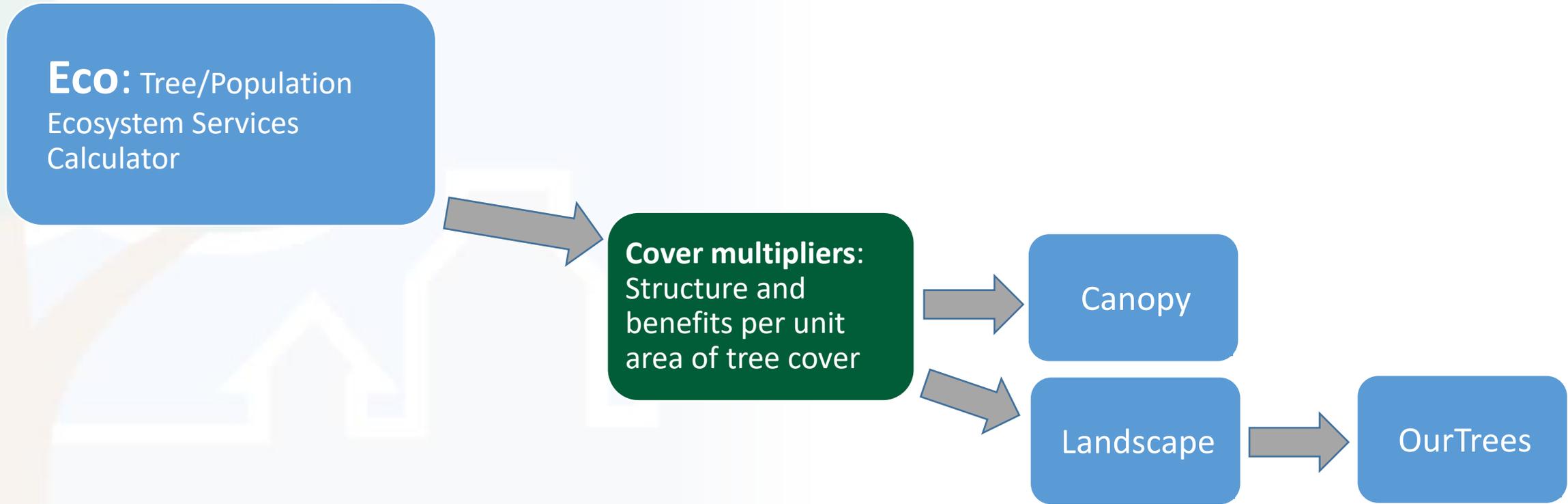
* *i-Tree Tools that can be used internationally*



i-Tree is a Cooperative Initiative among these partners



i-Tree Tool Relationships



i-Tree is a Cooperative Initiative among these partners

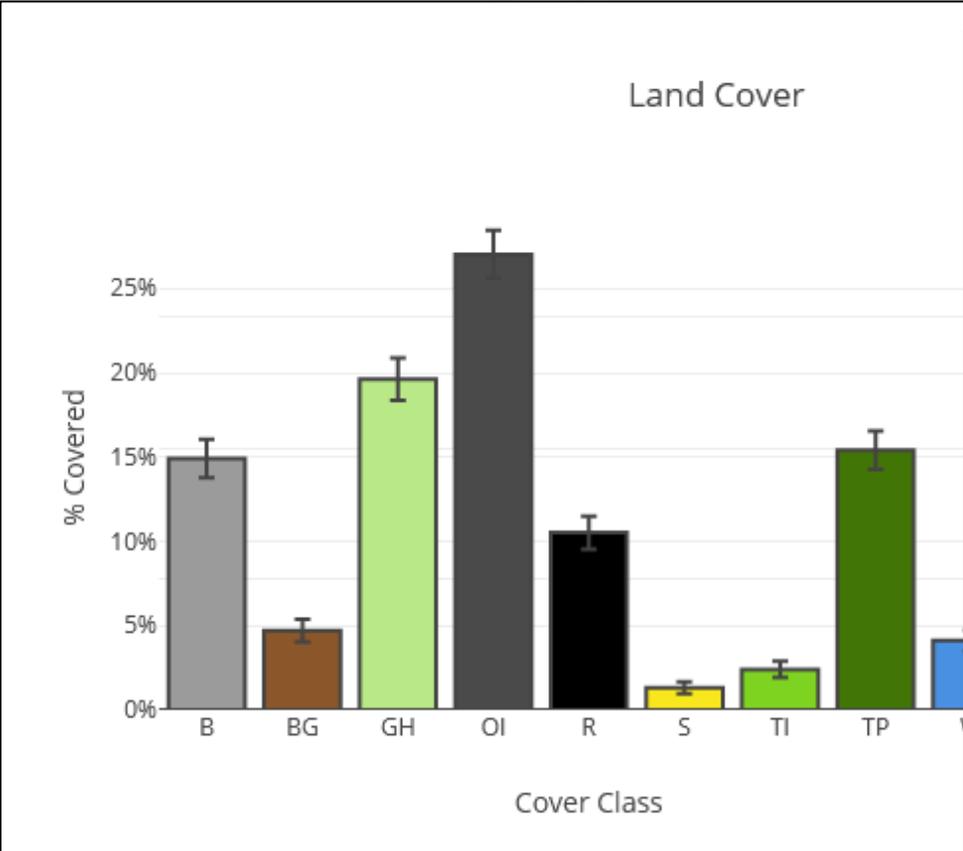


What does i-Tree Canopy give you?



Structure: Estimate of canopy and other landcover with standard error

Function and value: Ecosystem service estimates for carbon, hydrology, and air pollution



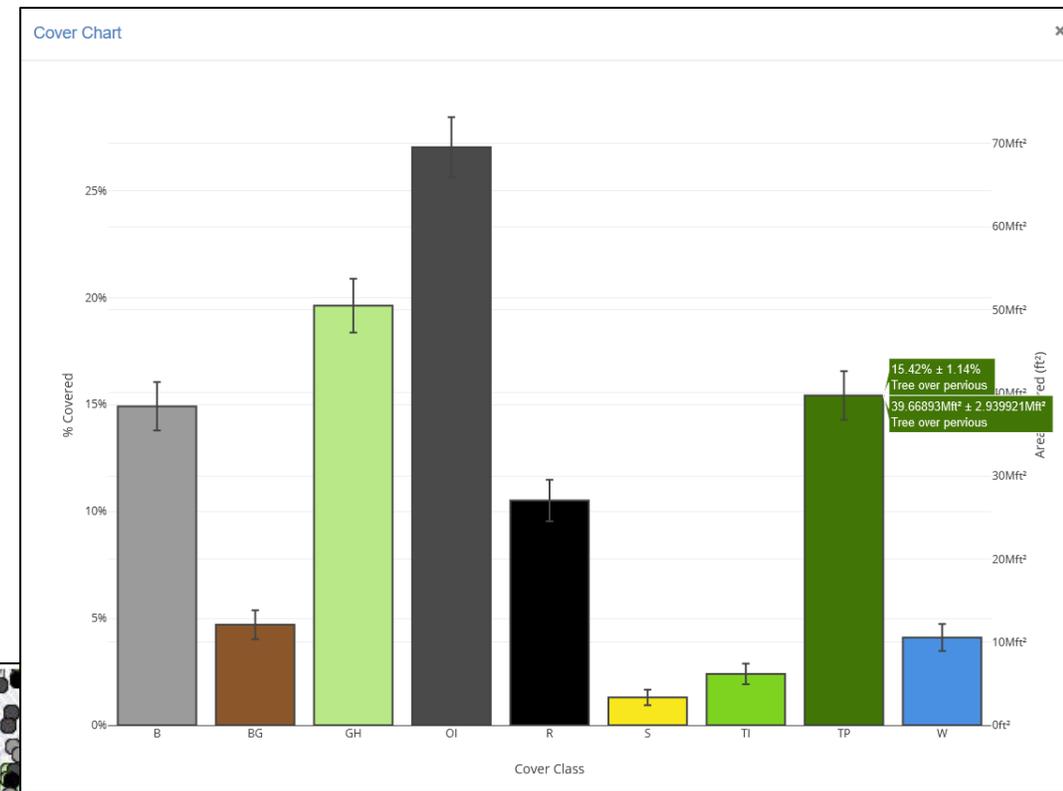
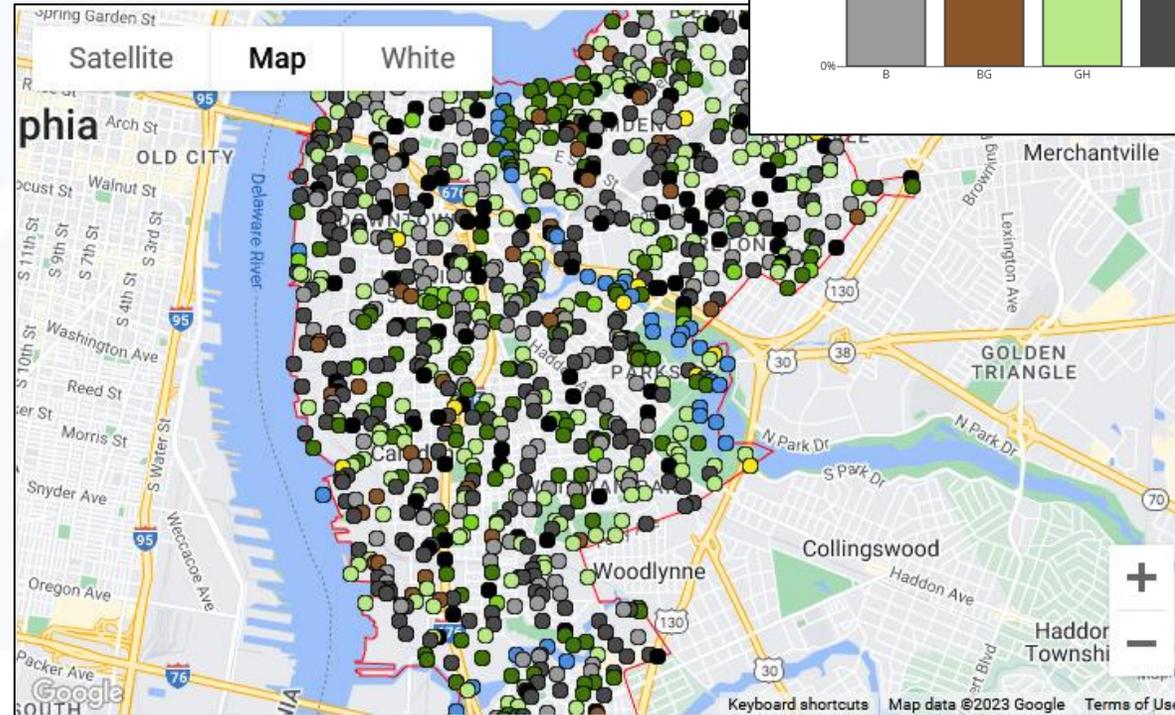
Tree Benefit Estimates: Air Pollution (English units)

Abbr.	Description	Amount (T)	±SE	Value (USD)	±SE
CO	Carbon Monoxide removed annually	3.28	±0.25	\$2,042	±153
NO2	Nitrogen Dioxide removed annually	8.12	±0.61	\$1,956	±147
O3	Ozone removed annually	57.37	±4.31	\$77,040	±5,782
SO2	Sulfur Dioxide removed annually	1.54	±0.12	\$120	±9
PM2.5	Particulate Matter less than 2.5 microns removed annually	2.85	±0.21	\$156,116	±11,718
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	7.97	±0.60	\$26,901	±2,019
Total		81.12	±6.09	\$264,175	±19,828

Currency is in USD and rounded. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points. Air Pollution Estimates are based on these values in T/mi²/yr @ \$/T/yr and rounded:
 CO 0.697 @ \$622.27 | NO2 1.724 @ \$240.80 | O3 12.179 @ \$1,342.88 | SO2 0.326 @ \$78.22 | PM2.5 0.604 @ \$54,870.15 |
 PM10* 1.691 @ \$3,377.18 (English units: T = tons (2,000 pounds), mi² = square miles)

Why measure tree canopy?

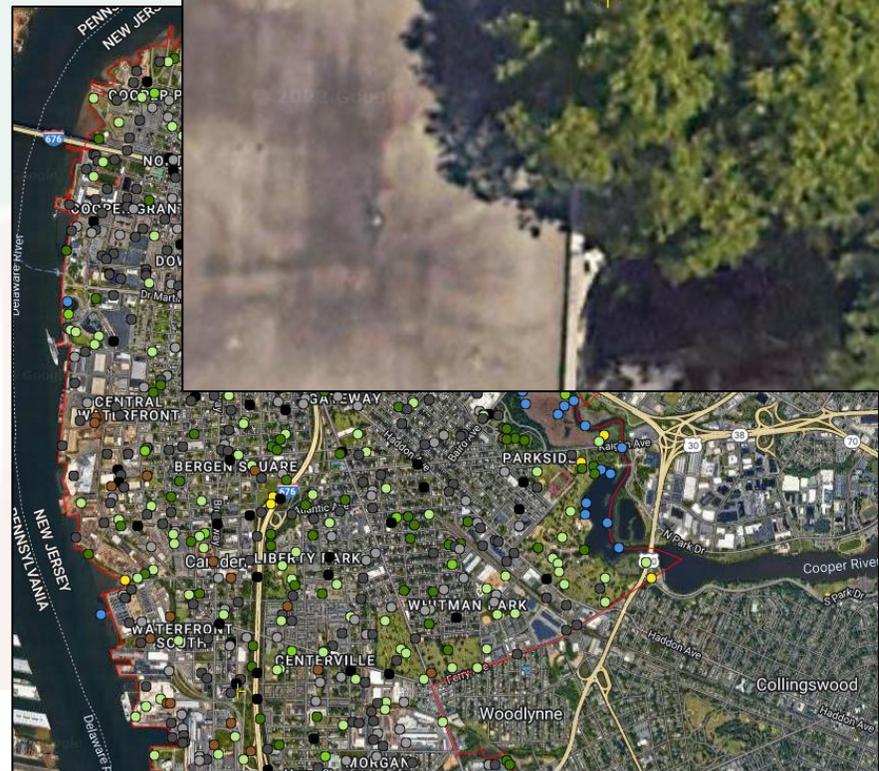
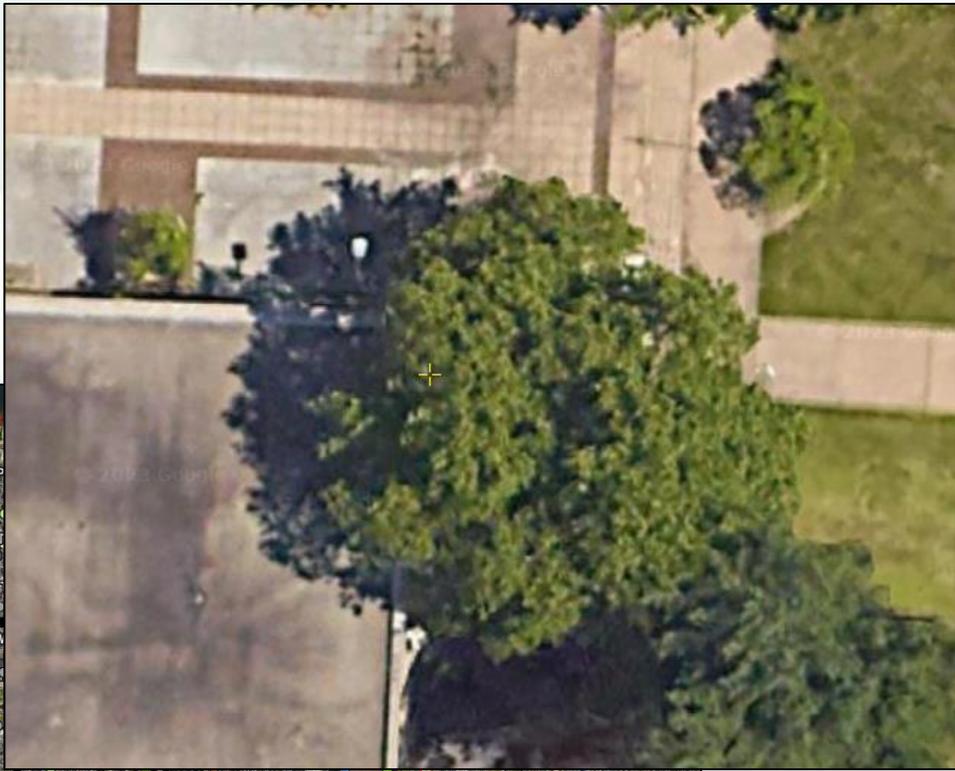
- The first step in managing your community's trees
- Establish a baseline
- Set goals
- Quickly estimate ecosystem services at scale
- Where is your community headed?



The science of i-Tree Canopy



Statistics



Benefits multipliers

Environmental Pollution 178 (2013) 229–236

Contents lists available at SciVerse ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol



Carbon storage and sequestration by trees in urban and community areas of the United States

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ARTICLE INFO	ABSTRACT
<p>Article history: Received 17 December 2012 Received in revised form 10 March 2013 Accepted 12 March 2013</p>	<p>Carbon storage and sequestration by urban trees in the United States was quantified to assess the magnitude and role of urban forests in relation to climate change. Urban tree field data from 28 cities and 6 states were used to determine the average carbon density per unit of tree cover. These data were applied to statewide urban tree cover measurements to determine total urban forest carbon storage and annual sequestration by state and nationally. Urban whole tree carbon storage densities average 7.69 kg C m^{-2} of tree cover and sequestration densities average 0.28 kg C m^{-2} of tree cover per year. Total tree carbon storage in U.S. urban areas (c. 2005) is estimated at 643 million tonnes (\$50.5 billion value; 95% CI = 597 million and 690 million tonnes) and annual sequestration is estimated at 25.6 million tonnes (\$2.0 billion value; 95% CI = 23.7 million to 27.4 million tonnes).</p>
<p>Keywords: Ecosystem services Global climate change Urban forestry Tree cover Forest inventory</p>	<p>Published by Elsevier Ltd.</p>

- [Carbon methods](#)
- [Hydrology and air pollution methods](#)
- [Statistics calculations](#)

Example: Ward level canopy assessments in the UK



Research

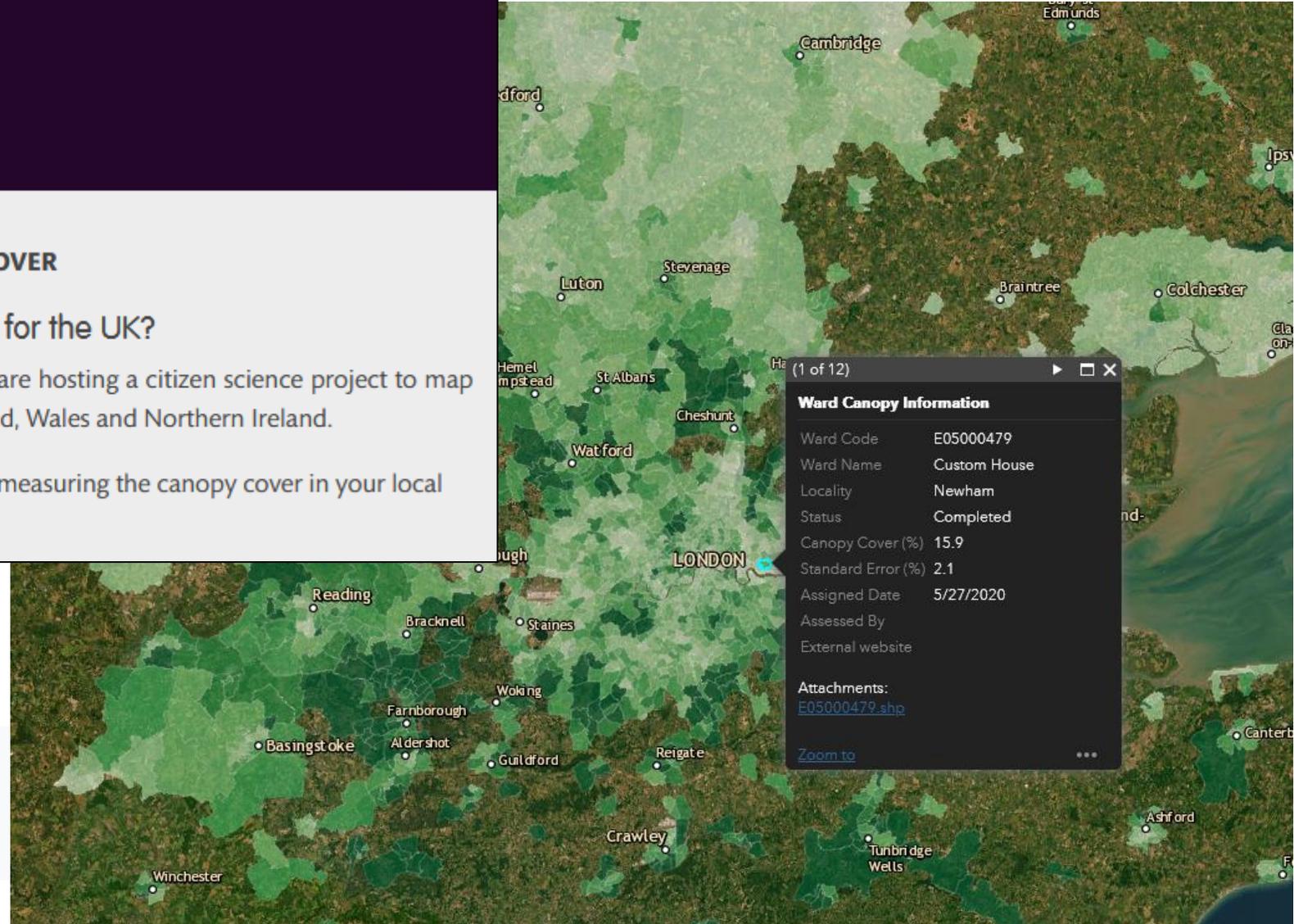
UK Urban Canopy Cover

[HOME](#) > [RESEARCH](#) > [I-TREE ECO](#) > [UK URBAN CANOPY COVER](#)

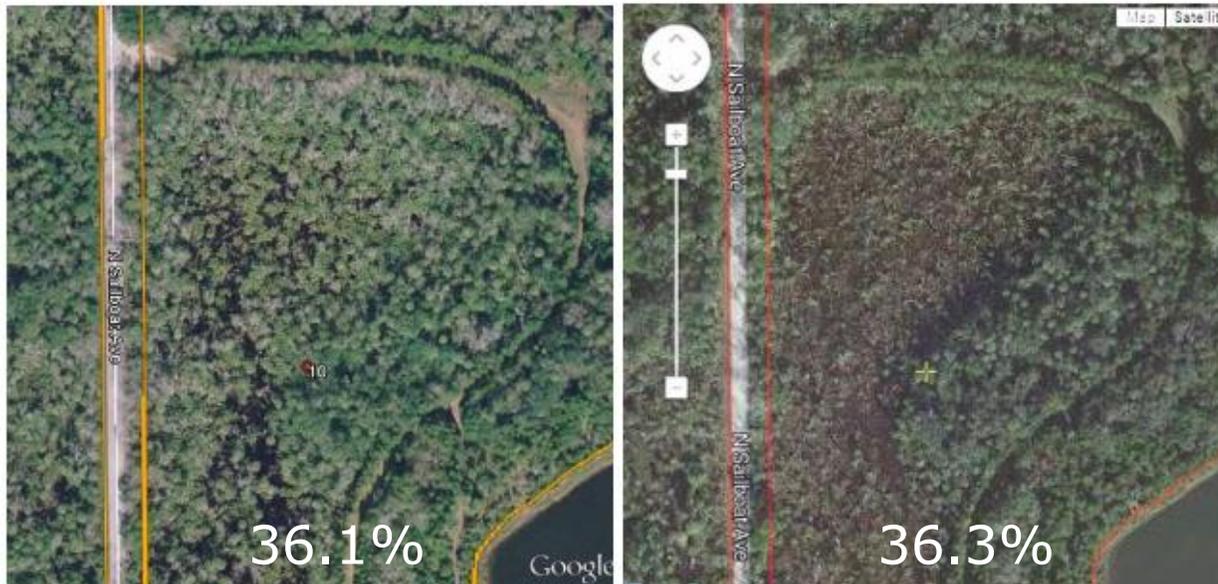
Can you help us build an urban canopy cover map for the UK?

Trees for Cities, Brillianto, Woodland Trust and Forest Research are hosting a citizen science project to map the canopy cover of towns and cities across the England, Scotland, Wales and Northern Ireland.

You can help us to build this [canopy cover map for the UK](#) by measuring the canopy cover in your local area.



Example: Canopy Change in Crystal River, FL



Protect & Maintain Existing Trees

- Develop and maintain tree protection ordinance and conservation easements.
- Ensure proper pruning in utility corridors.



Minimize & Restore Urban Tree Canopy Lost to Age, Mortality & Land Conversion

- Specify strategies within a Comprehensive Land Use Plan
- Adopt subdivision, zoning, and landscape ordinances.

Promote Public Education & Awareness

- Promote tree benefits (e.g., community website, newsletter, water bill insert)
- Promote proper tree planting
- Develop or participate in tree planting campaigns

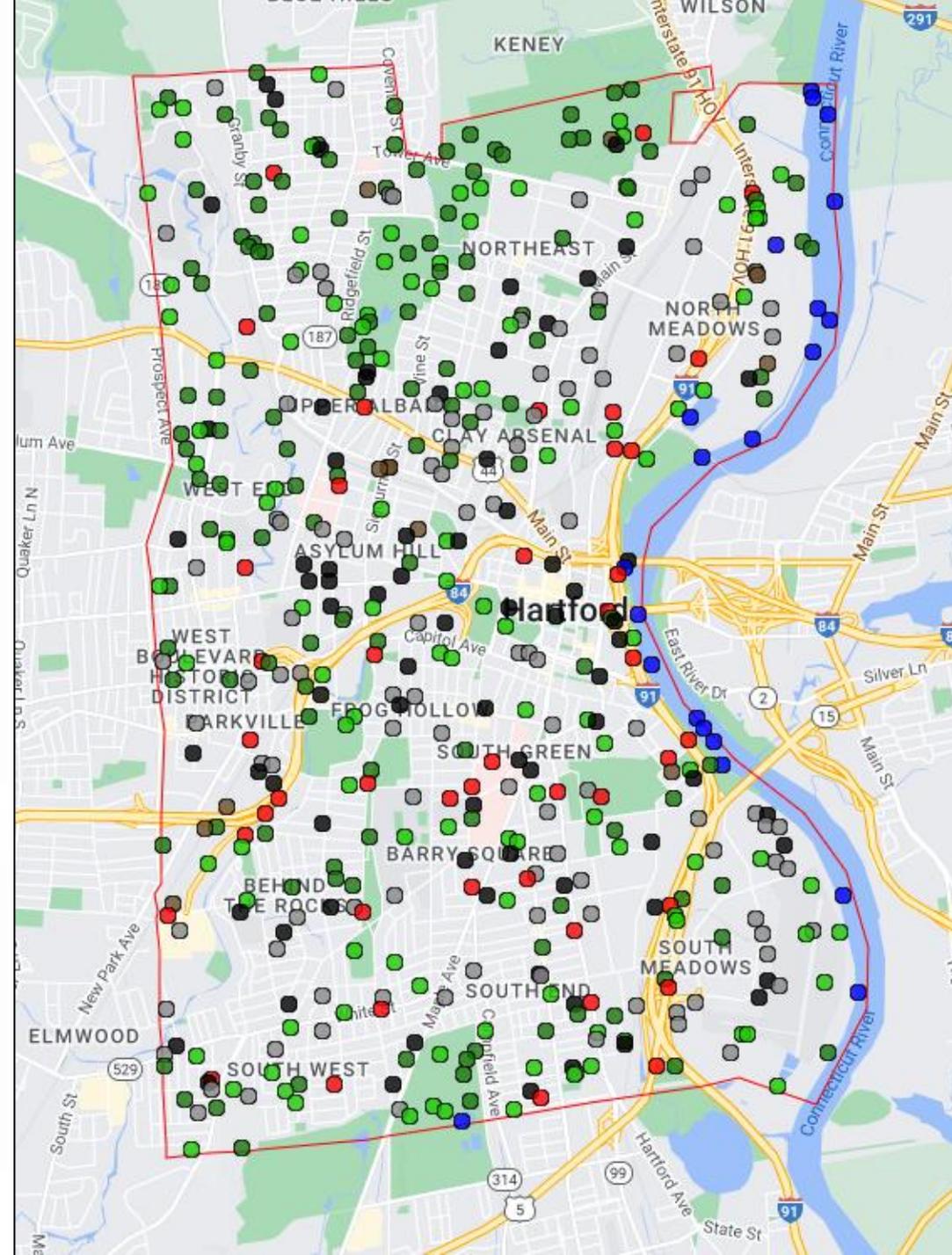
Plant New Trees

- Identify and prioritize planting sites community-wide
- Assess species diversity needs.
- Identify how trees will be maintained



Key features of i-Tree Canopy

- Flexible
- Precise results
- Quick turnaround
- Recent imagery
- Establish a baseline and set goals
- Change analysis



Defining Canopy Assets



- i-Tree Canopy

- Combining the magic of Google with US Forest Service science

There's a map for that...

i-Tree Canopy v7.1 Home Project Menu i-Tree Feedback

Conduct your survey: Add survey points by clicking or tapping the + button below. 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.

Cover Class Legend: BE (Bare Earth), G (Grass), I (Impervious), T (Tree), W (Water)

Summary: pervious: 33.0% ± 1.92 Tree: 23.7% ± 1.74 Water: 1.1% ± 0.12

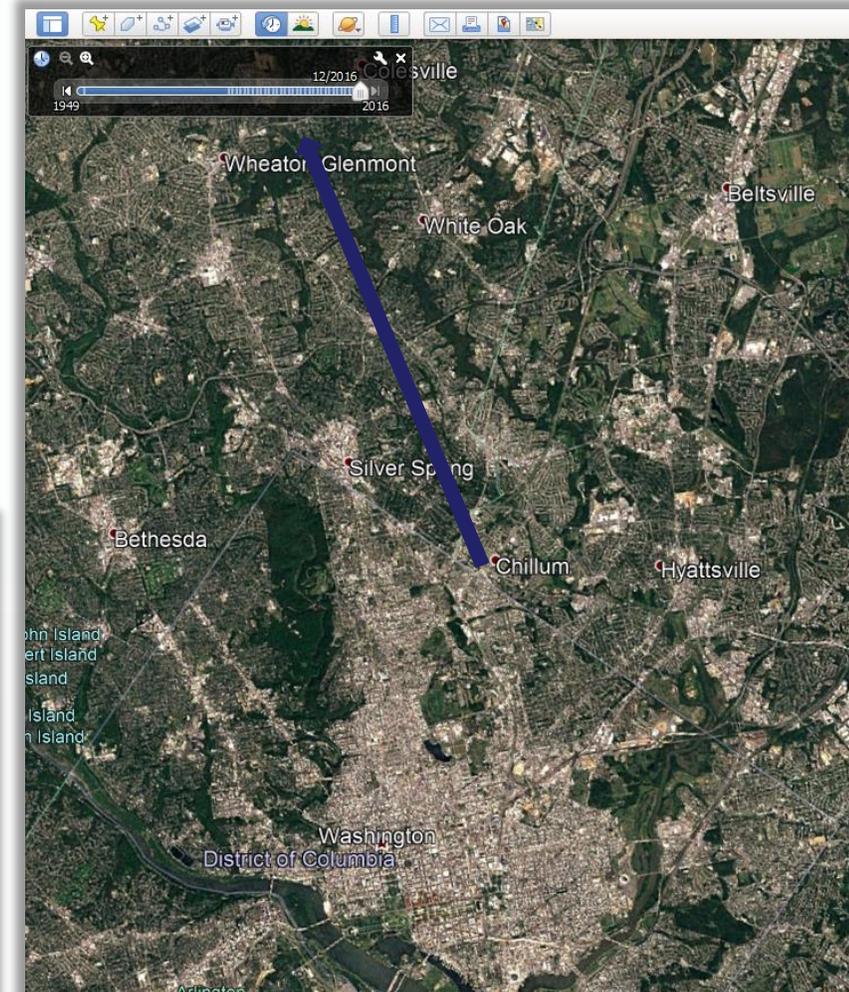
ID	Cover Class	Latitude	Longitude
1	Impervious	41.63463	-86.24499
2	Impervious	41.65614	-86.27871
3	Grass	41.75738	-86.32580
4	Grass	41.66447	-86.30023
5	Impervious	41.66999	-86.20212
6	Grass	41.73040	-86.33129
7	Impervious	41.69898	-86.27998
8	Grass	41.61184	-86.21994
9	Grass	41.66045	-86.32086
10	Bare Earth	41.71759	-86.31191

Save your Project Save Save often - don't lose your data!

Logos: ISA, DAVEY, Arbor Day Foundation, SMA ARBORISTS, ISA, Casey Trees

Canopy Change Survey

- Utilizes **Google Earth Pro** to evaluate trends and projects with historic images
 - Free to download
 - Canopy points to KML
 - Capture changes to your sample over time



Land Use	2005	2016
Tree (+)	23.0%	23.7%
Impervious (+)	32.1	33.0
Grass	36.8 (-)	38.4
Bare Ground	4.33	3.83 (-)
Water	2.67 (+)	2.16



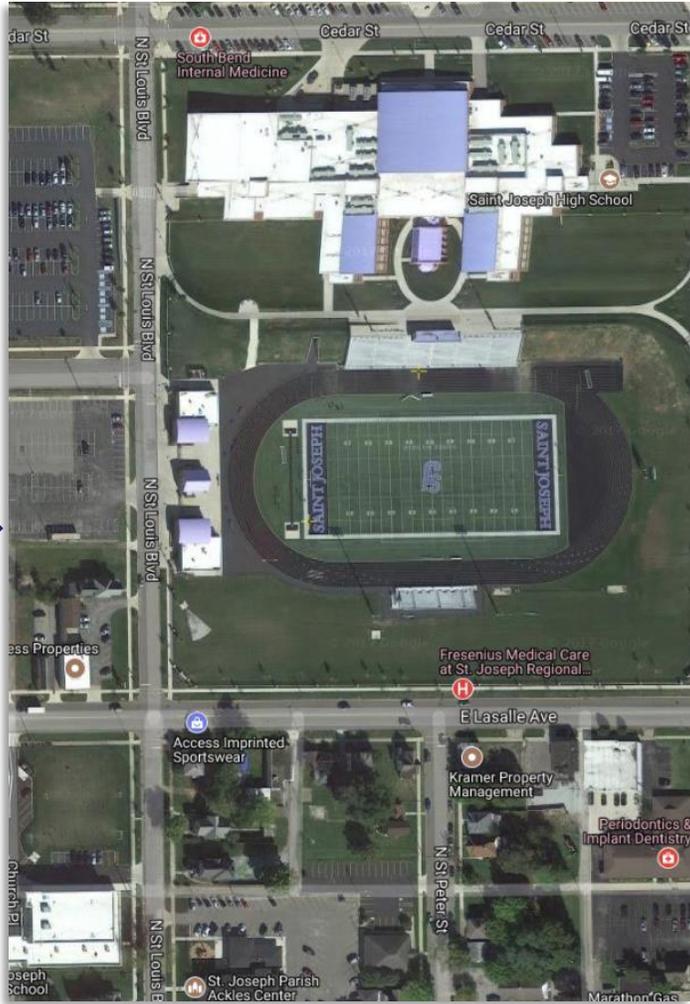
Canopy Change Over Time



2005



2016

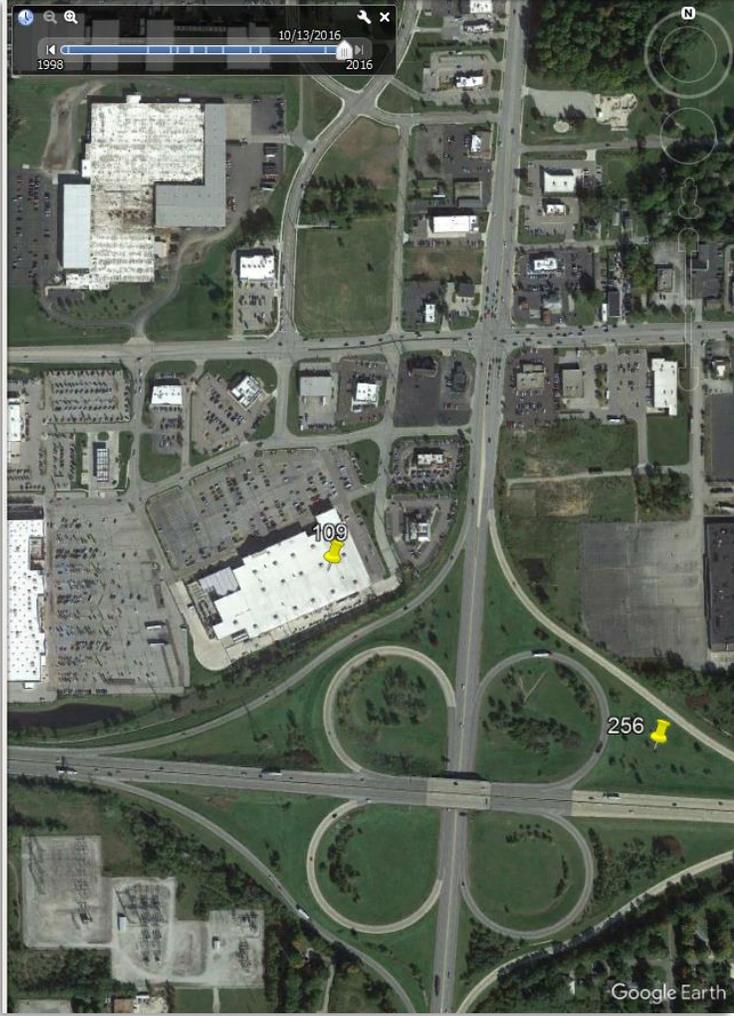


Canopy Change Over Time

2005

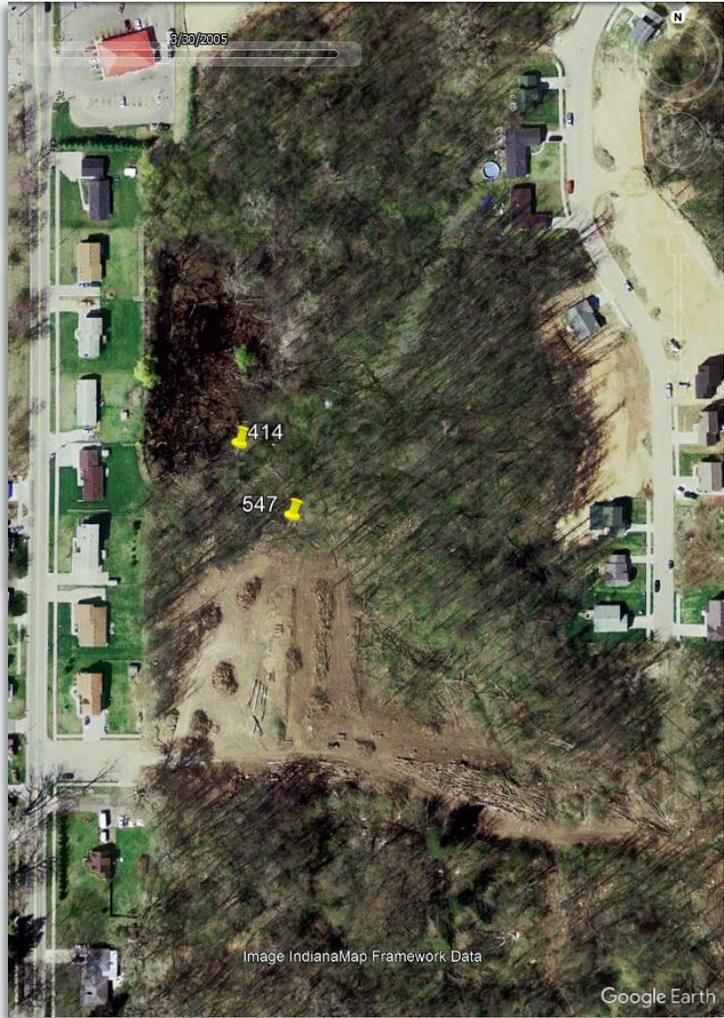


2016

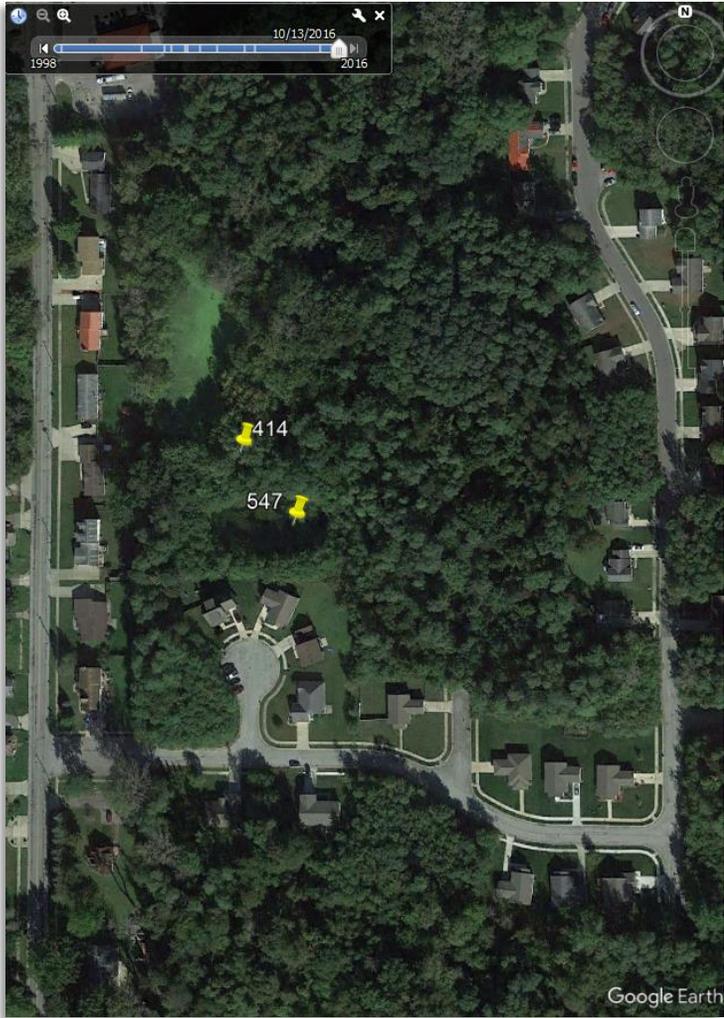


Canopy Change Over Time

2005



2016



Canopy – Now What?

- What you know powers the way forward
 - *What You Have, Where You Have It*
- Even subtle changes can be meaningful
- Stormwater → Impervious just as important as Canopy
- Changes can drive conversations with communities and policy makers
 - Opportunities for engagement, stewardship, and resource management
- *Strategies that can build resilience for both trees and neighborhoods*



OAKS OF NORTH LAWNDALE

Community Roots That Grow On Trees

Spotlight: North Lawndale, Chicago, IL
 The ways that trees benefit a community are as numerous as their branches. Planning for trees, understanding their benefits, planting them and caring for them fosters engagement, stewardship and sustainability.

When you add that to their public health and environmental advantages, trees can have a positive impact on neighborhoods for generations.

Inspired by the 7000 Oaks art installation, the Oaks of North Lawndale project partners neighborhood residents with the city and the School of the Art Institute of Chicago in an effort to nurture a greener, peaceful, and re-forested community.

Photo courtesy of Foundation for Human Square

In September 2017, SAIC set up its mobile foundry at their moman Square campus, site of the project launch event with artist Pedro Reyes, who joined residents in the melting of weapons to create shovel heads which were used to plant the first trees.

The Oaks of North Lawndale project could raise canopy coverage in the neighborhood to at least 23%, representing an increase of more than 38% over current canopy amounts.

Trees would be planted over a multi-year period, providing opportunities for sustained collaboration among neighbors, artists and educators at SAIC, a local tree nursery and gardeners, the North Lawndale Employment Network and job skills training programs, along with other organizations.

Trees in urban environments are known to...

- ...improve human health.
 - Improve air quality
 - Improve respiratory health, overall well-being, and reduce stress
 - Protect from harmful UV light
- ...benefit the community.
 - Reduce crime by fostering neighborhood social interactions
 - Lower summer air temperatures and reduce energy costs
 - Provide aesthetic benefits and promote community equity
 - Enhance property values
- ...provide environmental services.
 - Reduce stormwater runoff
 - Absorb carbon dioxide a greenhouse gas that traps heat in the atmosphere

7,000 trees can

- Shade 3.5 million (like 60 football fields)
- Add \$6.8 million in landscape value based on mature tree worth
- Provide \$1.4 million in health savings through air pollution removal
- Divert 17 million gallons of stormwater runoff (about 130,000,000 gallons)
- Store 1500 tons of carbon (\$285,000)

Impacts from 7,000 newly planted trees in North Lawndale as they grow to maturity over 30 years

the community of North face temperatures about 10 than the regional average. trees in Douglas Park help by more than 3 degrees.

Where the numbers come from: The benefits and values associated with trees were estimated using *i-Tree Eco and Landscape* software from the US Forest Service. The programs use local weather, pollution, and population data to estimate how the woody and leafy parts of trees interact with the environment and the people who live there.

The growth was predicted using i-Tree's Forecast module, and assumed that all trees are cared for and survive to maturity. The growth predictions consider local climate along with the rates different sizes and species of trees typically grow. Five common trees were modeled to represent future tree species to be planted.

...newly help us cooling the surrounding air and providing shade. Higher temperatures magnify health risks, increase energy use, and worsen air pollution impacts. Increasing and protecting community tree canopy can help lessen these negative impacts.

Trees absorb carbon dioxide from the air and store it as wood. Carbon dioxide (CO2) is a greenhouse gas that traps heat in the atmosphere. It enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, and fire wood, and also as a result of certain chemical reactions (e.g., manufacturing of cement).

Planning (0 years since planting)
Year 10 (10 years since planting)
Year 30 (30 years since planting)

A typical block of newly planted street trees (left) would see an increase of more than 10,000 sq. ft. in canopy coverage, and the environmental, economic, and health benefits that come with them.

Want to get involved? Visit <https://www.facebook.com/oaksofnorthlawndale/> to learn more about the project and how to lend a hand.

Powered by i-Tree and The Davey Institute. i-Tree represents cutting-edge peer reviewed, open source. Service research packages into tools and applications easily used by everyone. www.i-treetools.org



OurTrees

We've already done the hard work for selected geographies in the US.

OurTrees Benefits



Trees in Chester, PA

Serving Size:

9.59% tree canopy on 297 acres

54.33% impervious surfaces over 1,683 acres

Total benefits for this year: \$227,664

Annual values:	
Carbon Dioxide Uptake	\$54,659
Carbon Sequestered	320 tn
CO ₂ Equivalent ¹	1,175 tn
Storm Water Mitigation	\$35,630
Runoff Avoided	4 MG/yr
Rainfall Intercepted	22 MG/yr
Air Pollution Removal	\$137,376
Carbon Monoxide	254 lb/yr
Ozone	13,088 lb/yr
Nitrogen Dioxide	2,411 lb/yr
Sulfur Dioxide	1,761 lb/yr
PM _{2.5}	1,046 lb/yr

Values are totals to date:	
Carbon Dioxide Uptake	\$1,541,288
Carbon Storage	9,037 tn
CO ₂ Equivalent ¹	33,136 tn

OurTrees Story

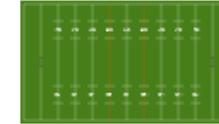


The impacts of tree benefits can be hard to grasp. Below are some real-world examples of how trees work hard for our community.

Trees in Chester, PA

Trees lower air temperature and absorb water, while impervious areas do the opposite.

Trees shade an area equivalent to 225 professional football fields!



The land area covered by impervious surfaces – typically buildings and pavement – is like a 2.6 square mile parking lot.

Annual Tree Benefits for Chester, PA

Sequestering carbon as wood in trees counteracts the CO₂ emissions of 230 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 30 incidents. This also prevents the loss of 0 school day(s) and 1 work