



Coastal & Island Conference

Introduction to the i-Tree Software Toolkit



David V. Bloniarz, USDA Forest Service

Powerpoint and Resources
www.unri.org/research-documents/

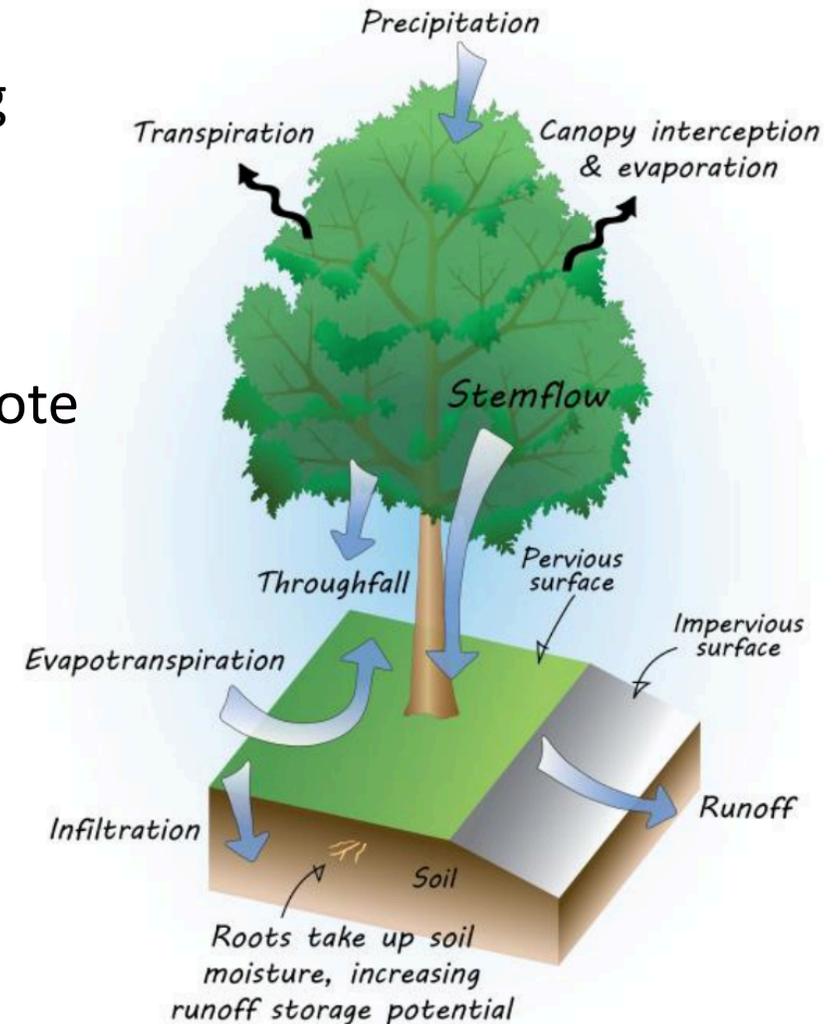


What are your challenges and opportunities related to resilience and sustainability ?



Trees are a key component in resilience and sustainability...

- Trees **reduce stormwater runoff** by capturing and storing rainfall in their canopy and releasing water into the atmosphere.
- Tree roots and leaf litter create soil conditions that promote the **infiltration of rainwater** into the soil.
- Trees help slow down and temporarily **store runoff and reduce pollutants** by taking up nutrients and other pollutants from soils and water through their roots.
- Trees help **transform pollutants** into less harmful substances.



Trees are a key component in resilience and sustainability...

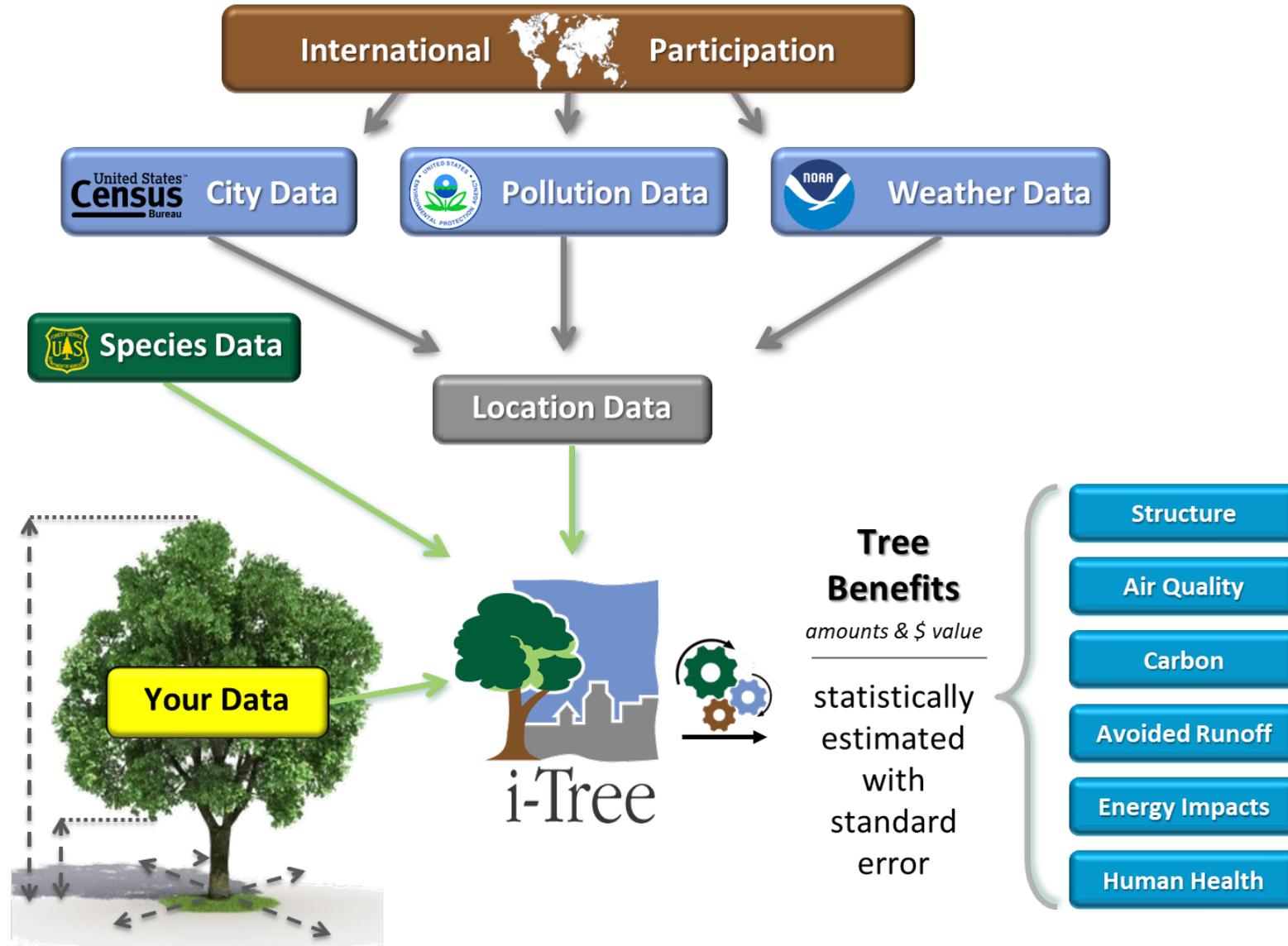
<i>Year Completed</i>	<i>i-Tree Reference City</i>	<i>Number of Trees Studied</i>	<i>Annual Stormwater Benefits (dollars)</i>	<i>Rainfall Intercepted Annually by Trees (million gallons)</i>
2006	Albuquerque, N.M.	4,586	\$55,833	11.1
2005	Berkeley, Calif.	36,485	\$215,645	53.9
2004	Bismarck, N.D.	17,821	\$496,227	7.1
2007	Boise, Idaho	23,262	\$96,238	19.2
2005	Boulder, Colo.	25,281	\$357,255	44.9
2006	Charleston, S.C.	15,244	\$171,406	28.3
2005	Charlotte, N.C.	85,146	\$2,077,393	209.5
2004	Cheyenne, Wyo.	17,010	\$55,301	5.7
2003	Fort Collins, Colo.	31,000	\$403,597	37.4
2005	Glendale, Ariz.	21,480	\$18,198	1.0
2007	Honolulu, Hawaii	235,800	\$350,104	35.0
2008	Indianapolis, Ind.	117,525	\$1,977,467	318.9
2005	Minneapolis, Minn.	198,633	\$9,071,809	334.8
2007	New York City, N.Y.	592,130	\$35,628,220	890.6
2009	Orlando, Fla.	68,211	\$539,151	283.7
2003	San Francisco, Calif.	2,625	\$466,554	99.2
2001	Santa Monica, Calif.	29,229	\$110,784	3.2

www.fs.fed.us/psw/programs/uesd/uep/tree_guides.php

i-Tree is a key component in resilience and sustainability...



i-Tree Conceptual Model Schematic



Why i-Tree?

Opportunities for communities to...

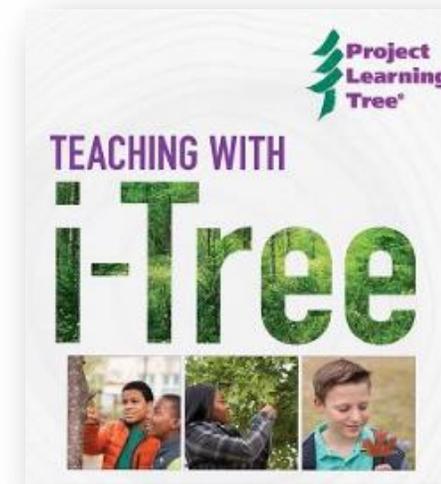
- **Plan and manage** urban forest resources more strategically to serve and protect citizens;
- **Integrate urban forests in policies:** sustainability, climate, resiliency, air quality, public health, stormwater, etc.;
- Support **advocacy efforts** with data;
- Improve **preservation** of trees and 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;
- Community **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 through Research & Science!

Carbon dioxide storage and sequestration

Air pollution removal

Storm water reduction

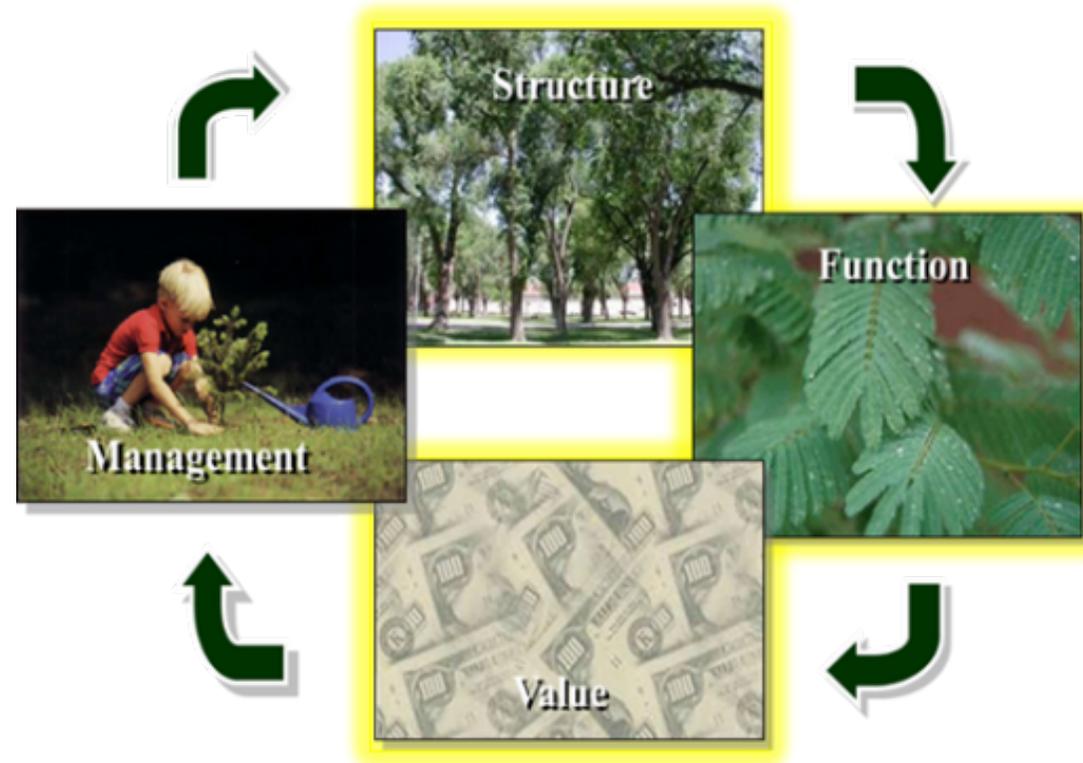
\$2.94 in benefits
for every \$1.00 spent

*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

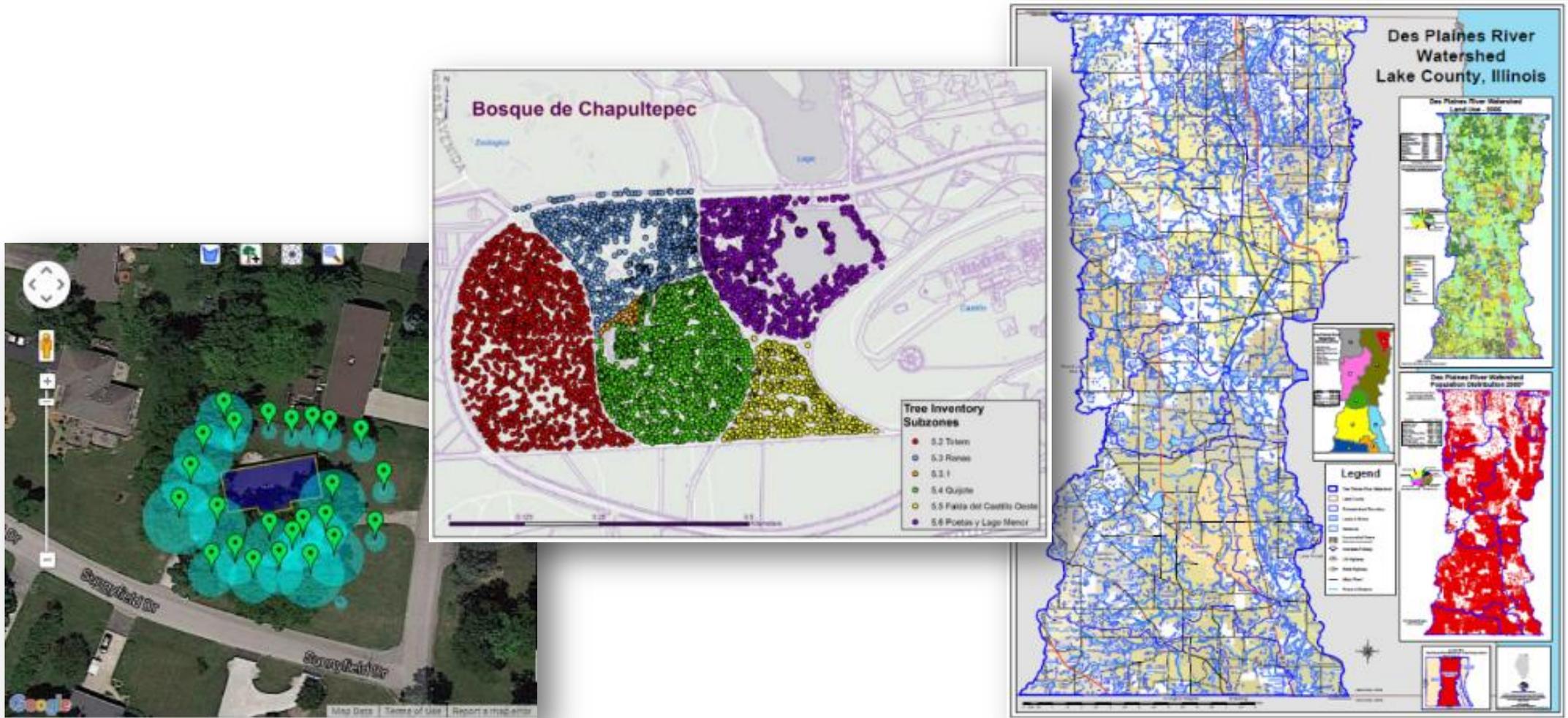


The only infrastructure
that increases in value
over time.



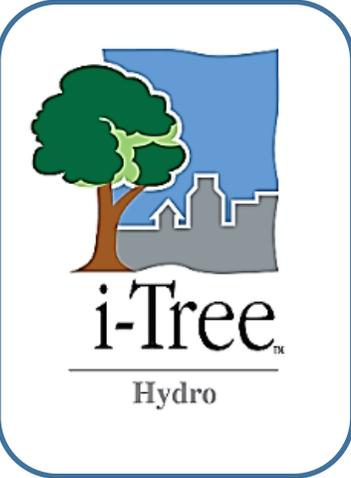
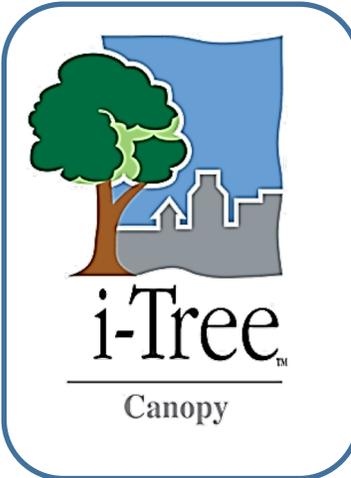
Structure → Function → Value

Concept applies to multiple scales and land types...



...home, park, forest, city, region or watershed.

The 2020 i-Tree Suite of Tools

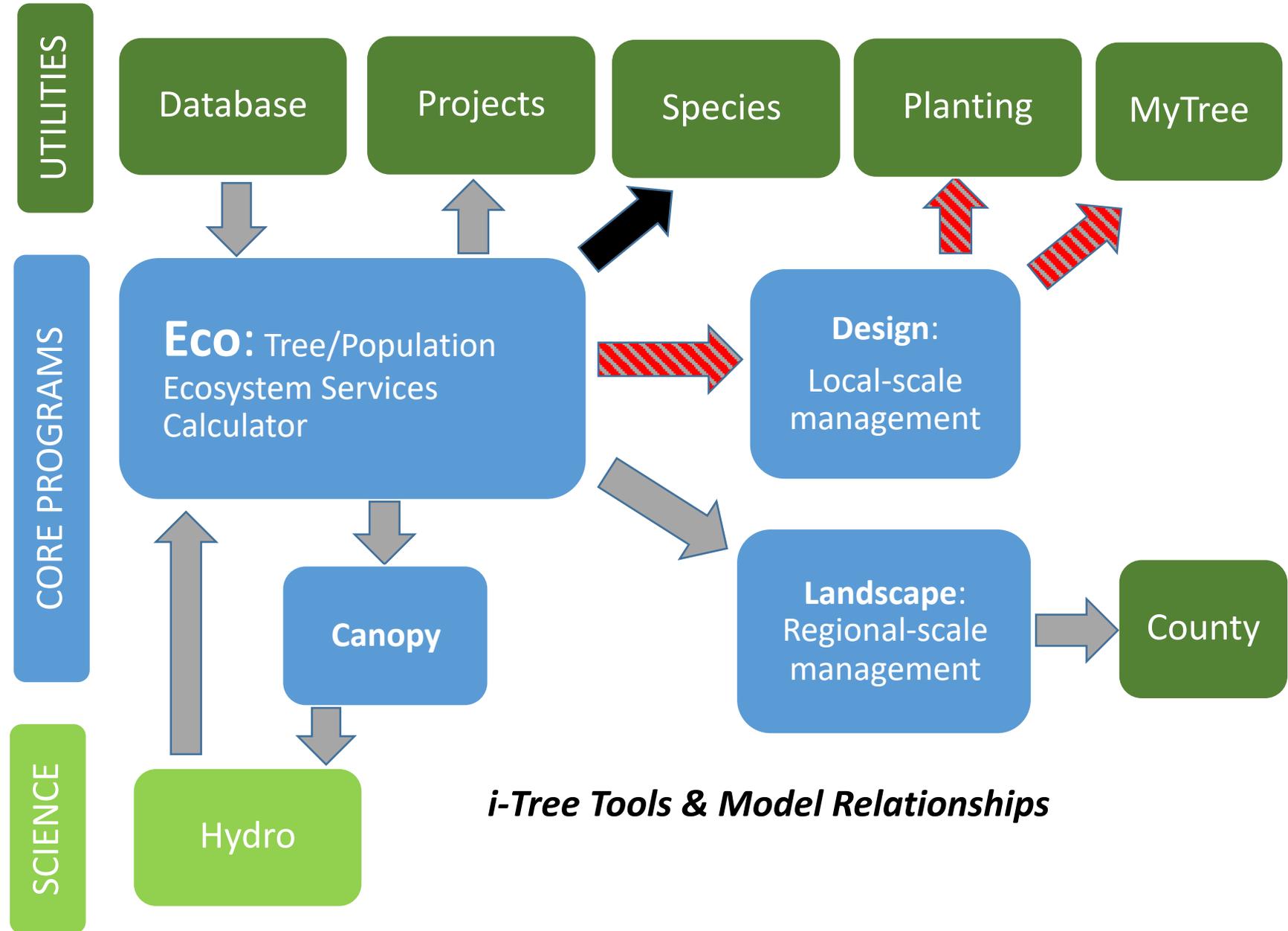


i-Tree is a Cooperative Initiative among these partners



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?*



The Foundation: Local Data

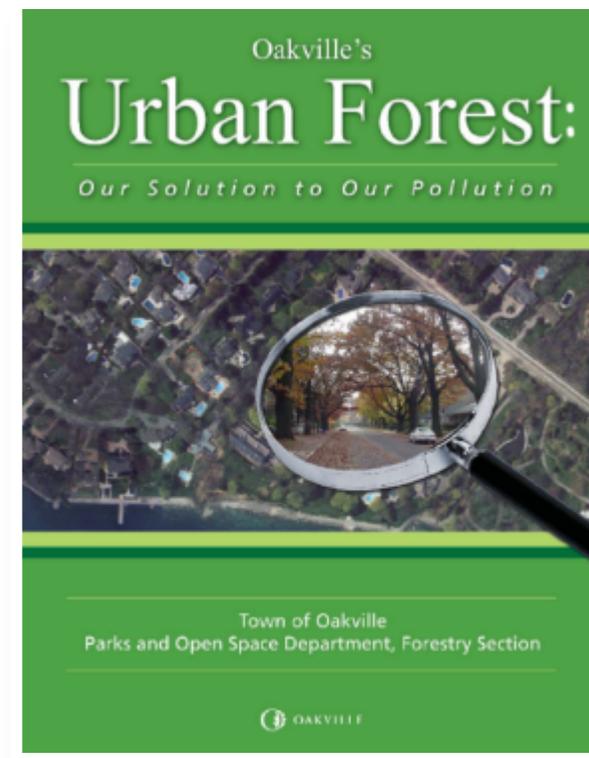
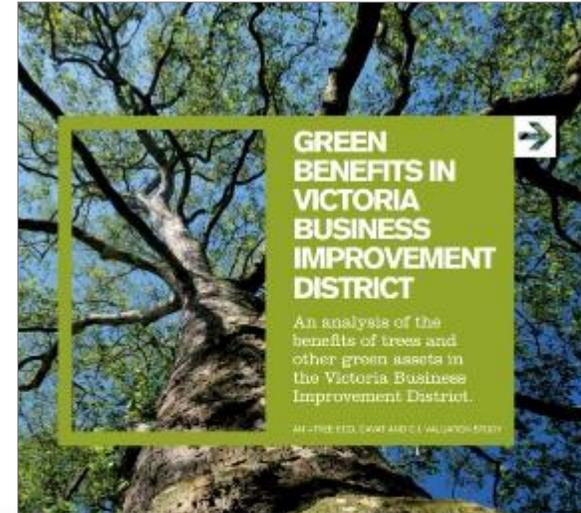
- Local Sample or Inventory
- Local information:
 - Weather
 - Pollution
 - Environmental Variables
- Hourly simulations



i-Tree Estimates Tree Benefits:

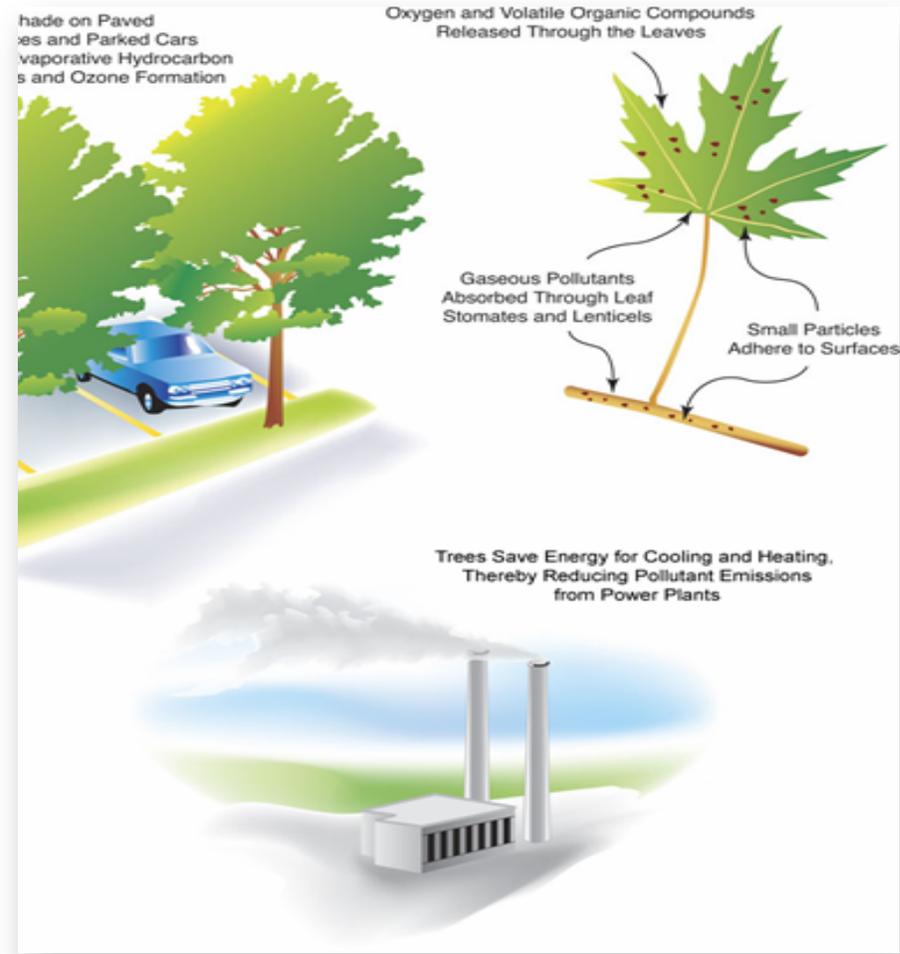
- Air pollution removal
- Carbon storage and annual carbon sequestration
- Avoided stormwater run-off (*hydrology effects*)
- Energy effects (*cooling & heating*)
- Structural assessment
- \$ Value for ecosystem services
- Public health impacts related to air quality

**Some model functions depend on tool and data collected, or are limited when applied outside the U.S. due to available research.*



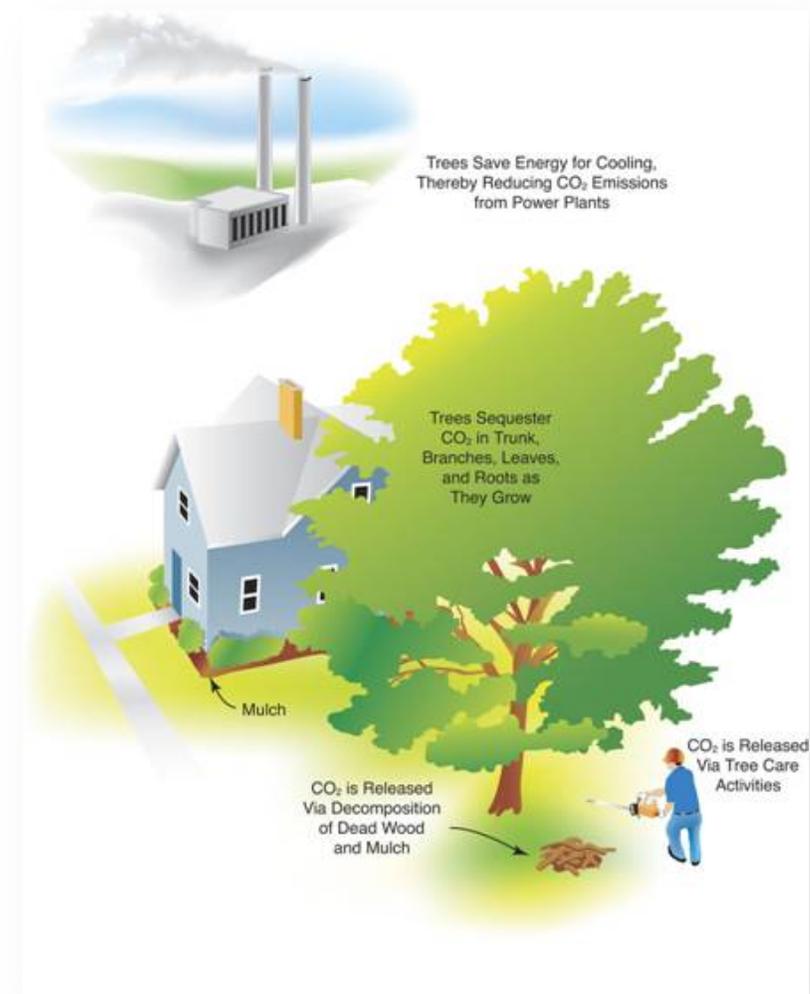
Tree Benefit: Improve Air Quality

- Absorb pollutants through leaf surfaces
 - O_3 (ozone)
 - NO_2 (nitrogen dioxide)
 - SO_2 (sulfur dioxide)
- Intercept dust and/or particulate matter (PM10 and PM2.5)
- A reduction in energy production needs reduces creation of many air pollutants
- Release oxygen



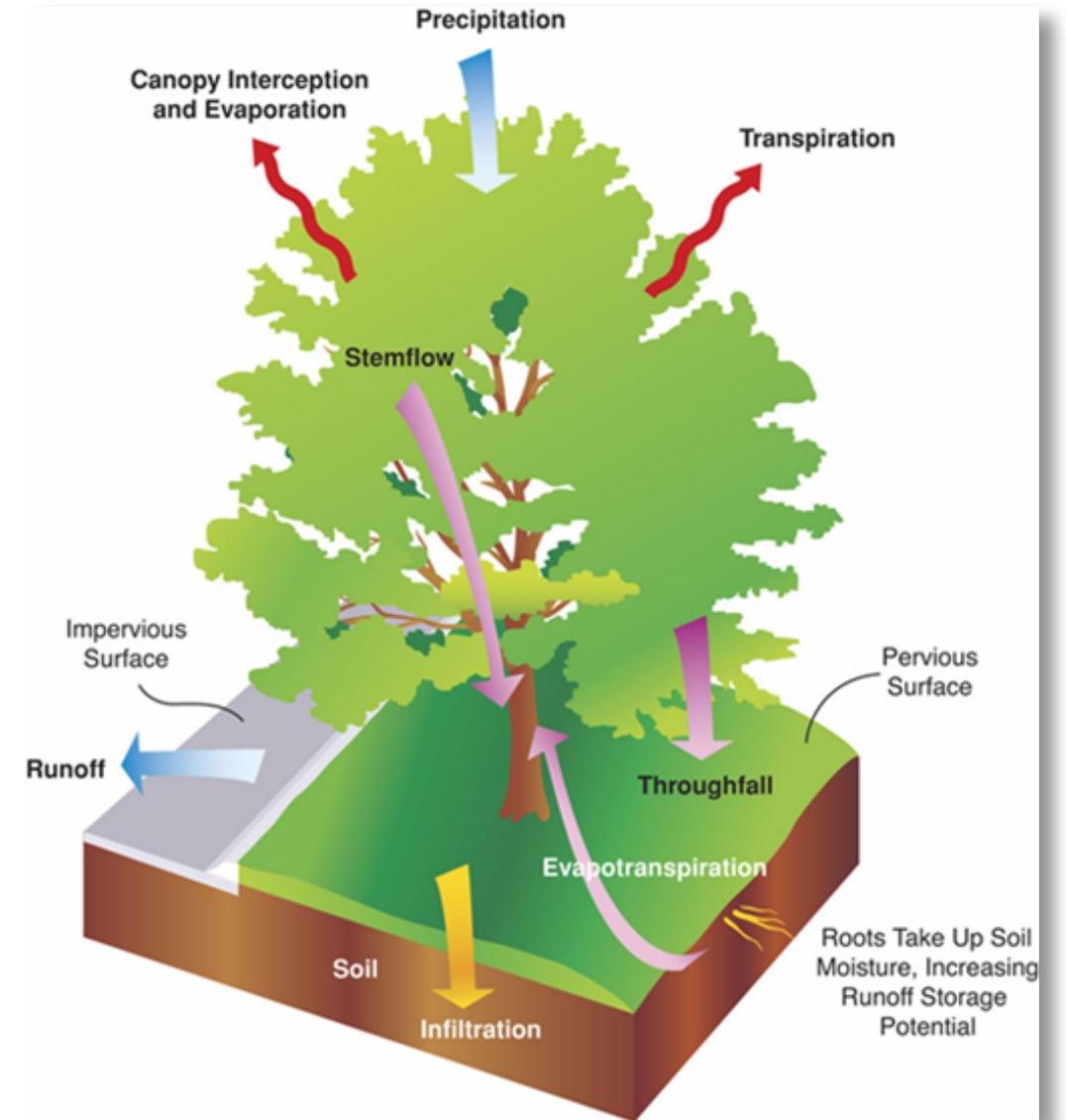
Tree Benefit: Reduce Carbon Dioxide CO₂

- Trees are largely made of carbon so they take carbon out of the air and turn it into tissue (bark, leaves, wood, etc.)
- Tree can help reduce home energy needs, which also reduces additional carbon emissions released from power plants in the first place (*Secondary benefit*)



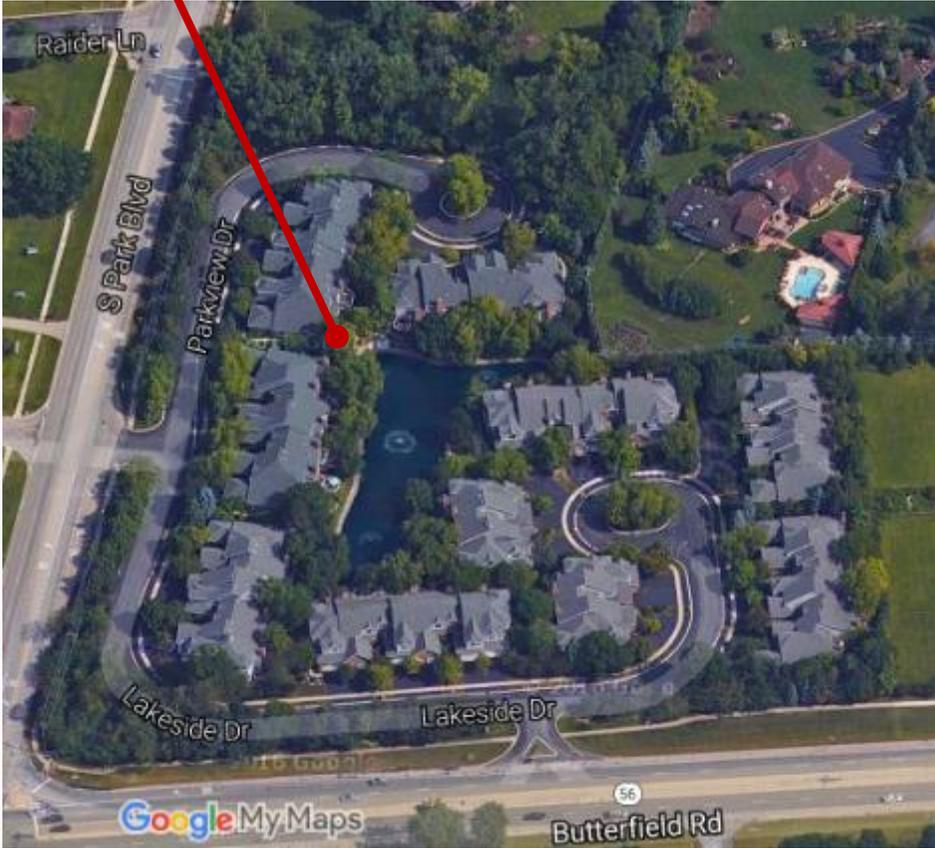
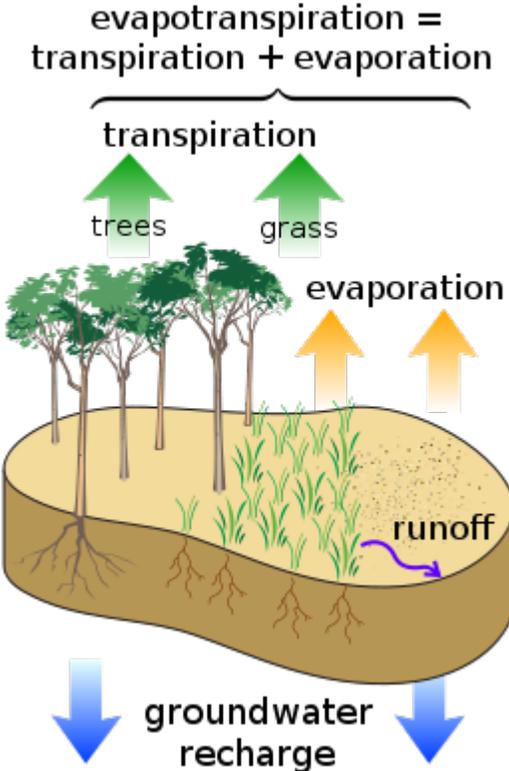
Tree Benefit: Hydrology Effects

- Intercepts and holds rain on leaves, branches, and other surfaces
- Reduces stormwater runoff
- Increases water storage in soil
- Increase infiltration and helps recharge aquifers (underground water)
- Reduces erosion



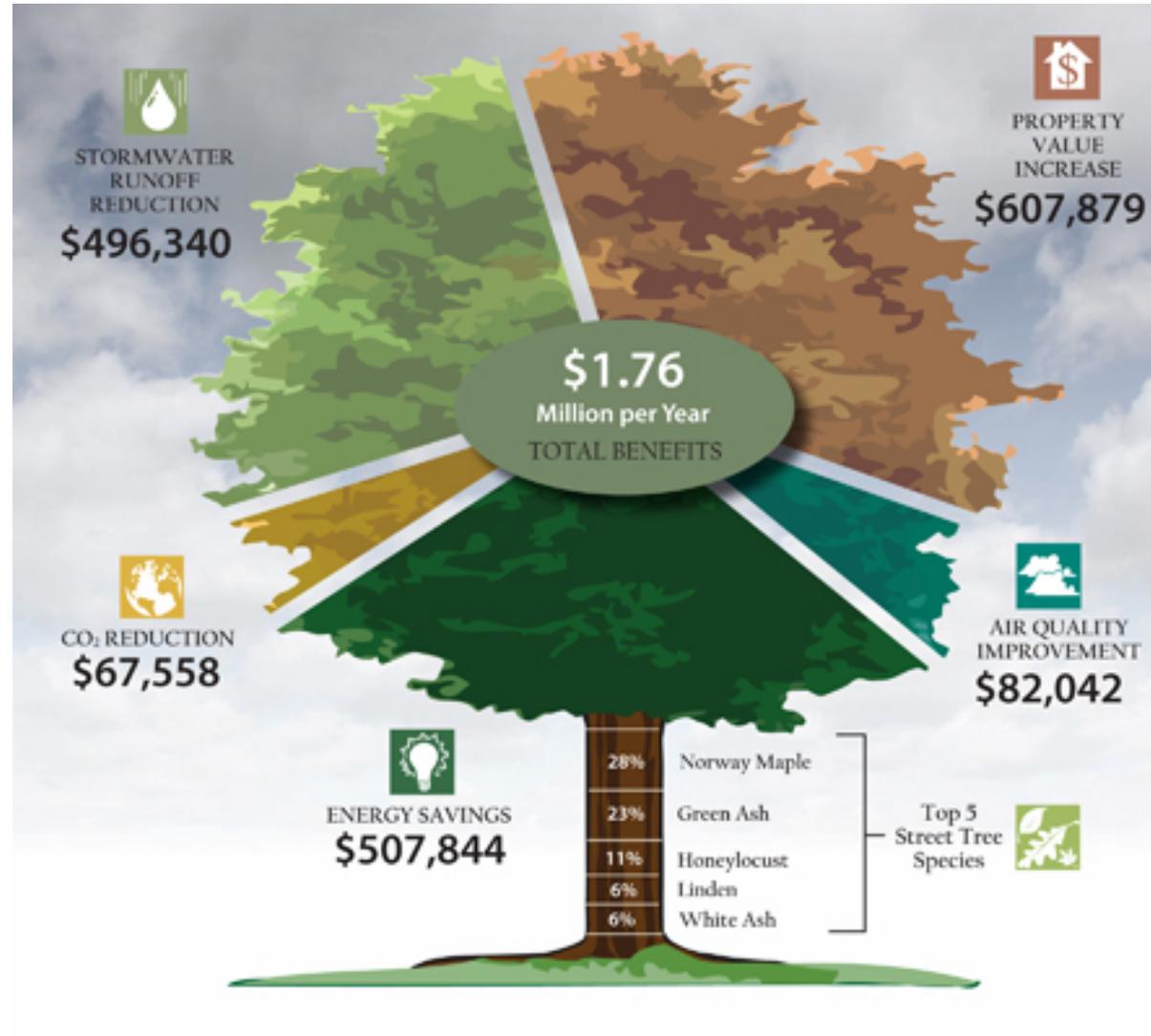
Trees & Energy – Combined Climate Effects

Combined effects of transpirational cooling along with shading of below canopy built surfaces can reduce air temps by as much as 9°F.

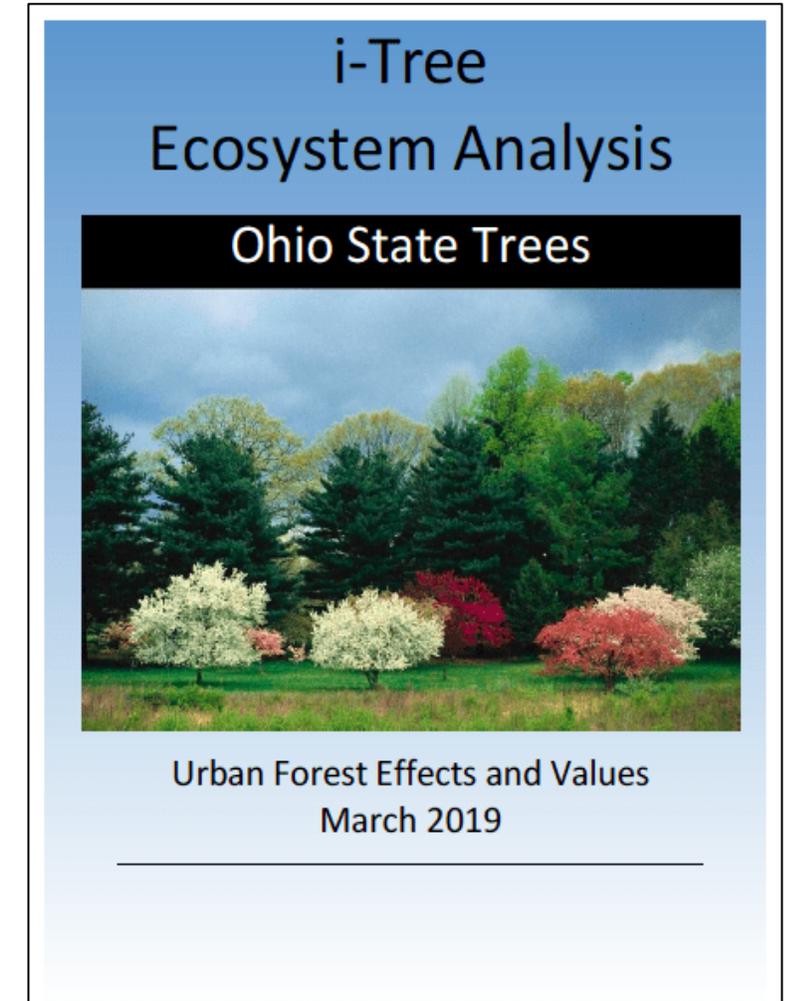
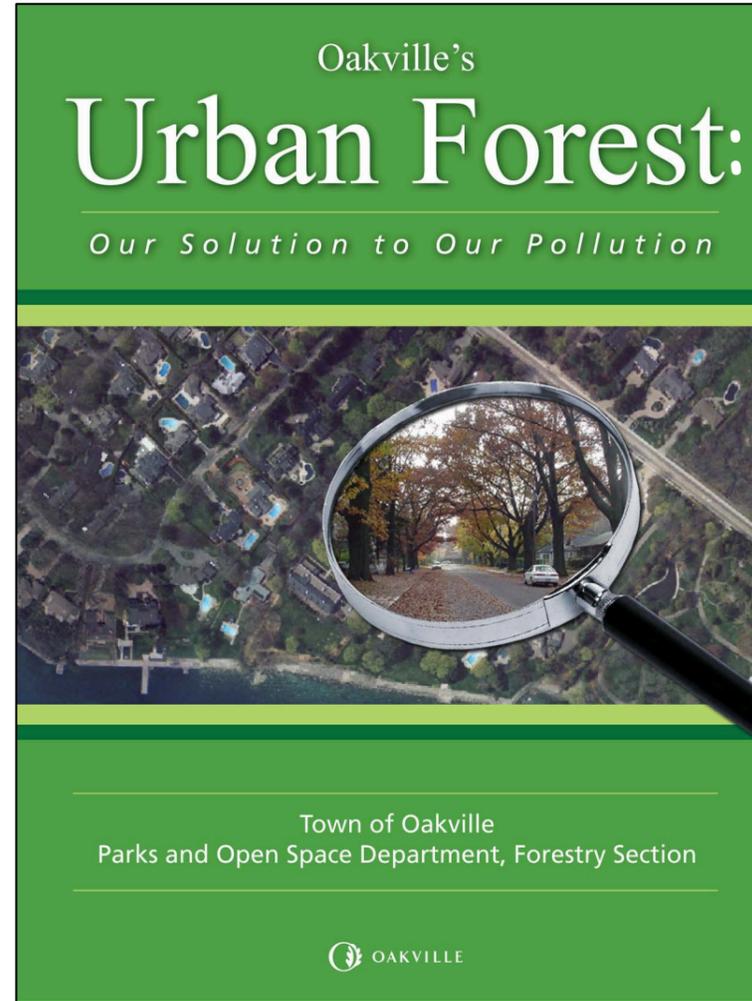
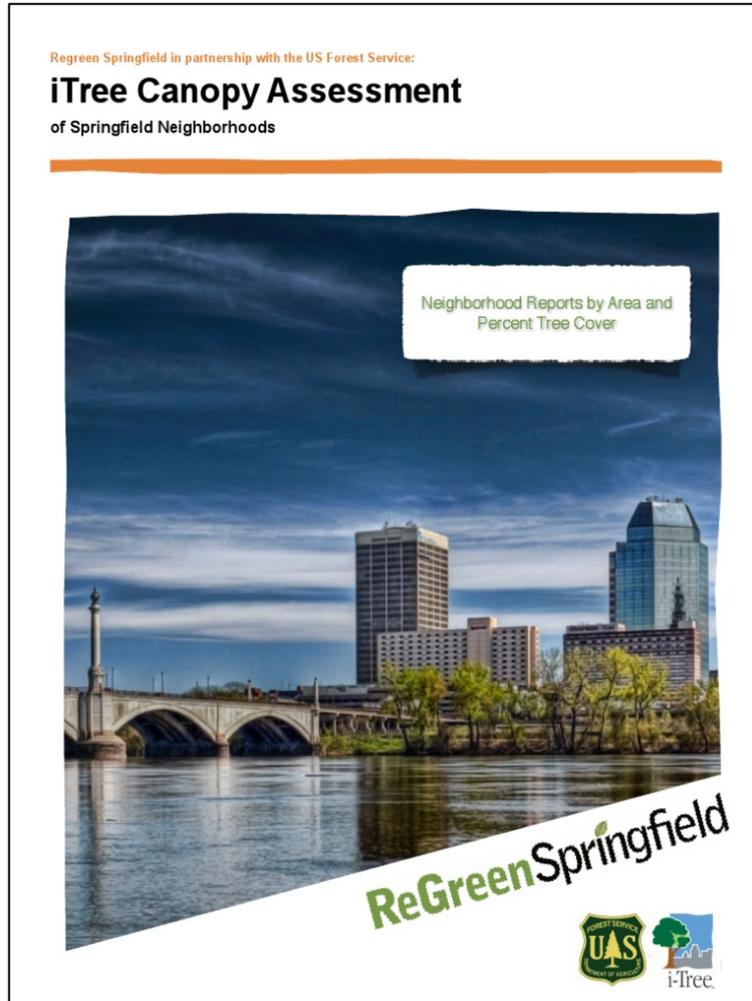


Source: Akbari et al.,1992. Cooling Our Communities: A Guide on Tree Planting and Light Colored Surfacing.

Benefit-Based Approach



i-Tree... Using quantitative data to tell your story.



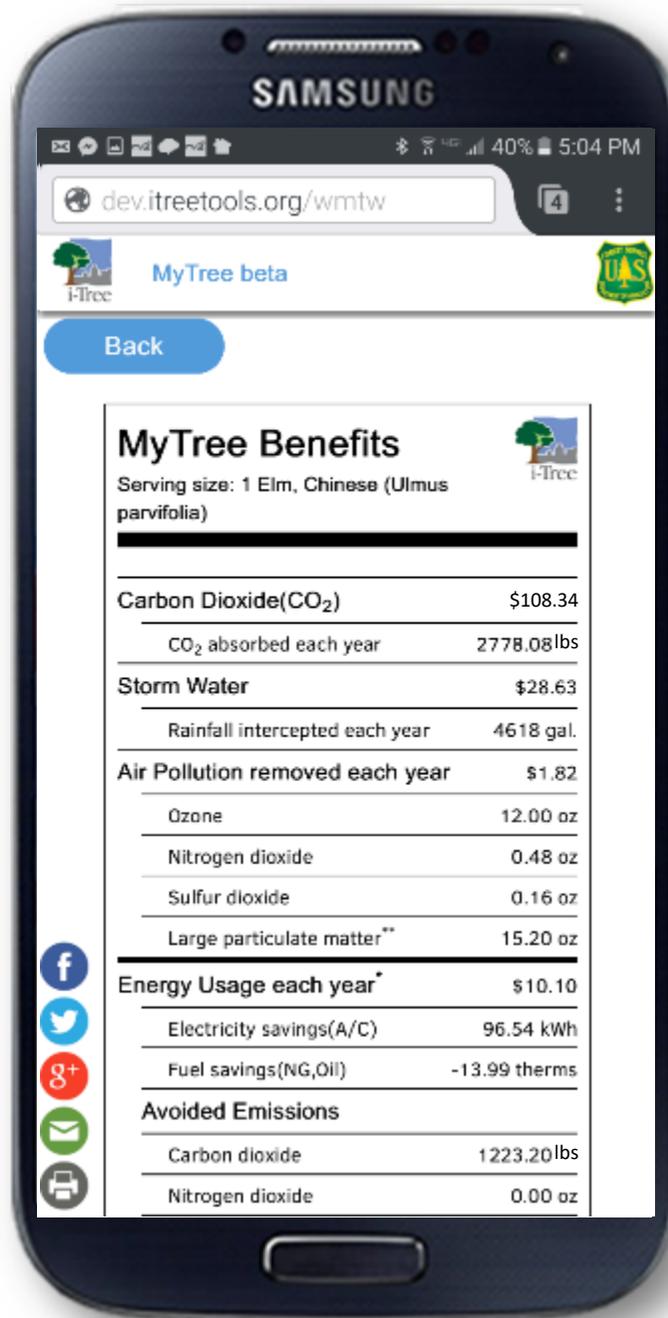
MyTree



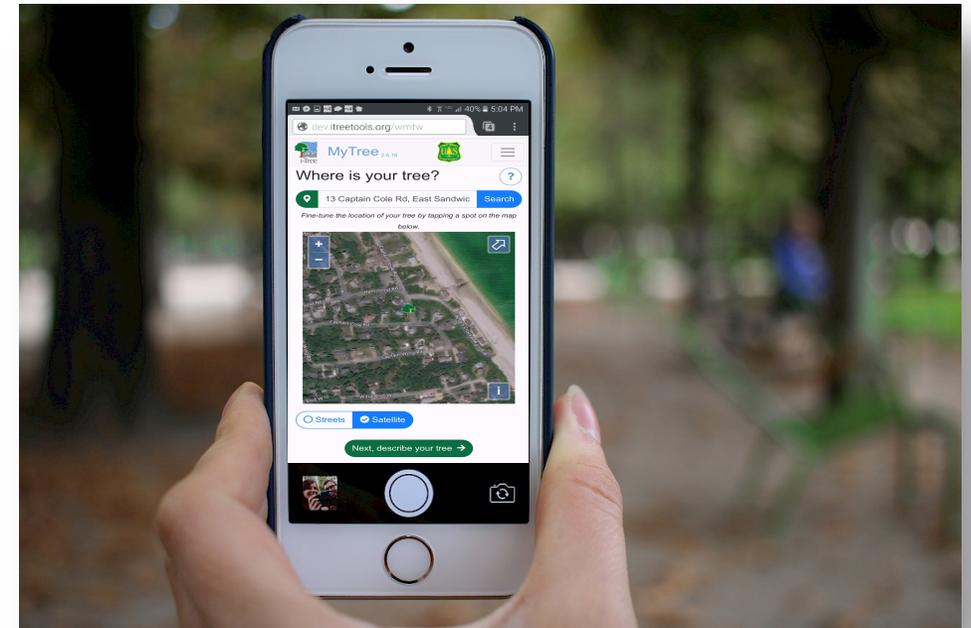


i-Tree™

MyTree



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



Tree Facts

Serving Size: 14 in DBH (35.6 cm)
Species: Pin Oak, *Quercus palustris*

Amount Per Serving

Carbon sequestered 259 lbs avoided 257 lbs

% Annual Value*

Total Carbon 537 lbs

O3 \$1.96

VOC(Volatile Organic Compounds) \$0.93

NO2(Deposited) \$0.85

NO2(Avoided) \$3.36

SO2(Deposited) \$0.25

SO2(Avoided) \$1.40

PM10(Deposited) \$1.77

PM10(Avoided) \$0.39

Conserved Kilowatt/hours 96 KwH

Reduced oil/natural gas consumption 28 therm(s)

Stormwater intercepted 1,527 gallons

Property value increase \$103.00 Natural Gas \$39.93

Stormwater \$12.21 Electricity \$12.92

*It should be noted that trees themselves emit biogenic volatile organic compounds (BVOCs) which can contribute to ground-level ozone production. This may negate the positive impact the tree has on ozone mitigation for some high emitting species (e.g. Willow Oak or Sweetgum). However, the sum total of the tree's environmental benefits always trumps this negative.

Source:
www.forestwatch.com/education/CarbonFootprintofTrees.pdf
USDA Forest Service Center for Urban Forest Research
*Free Tree ID #04 816 www.forestwatch.com/



i-Tree Eco





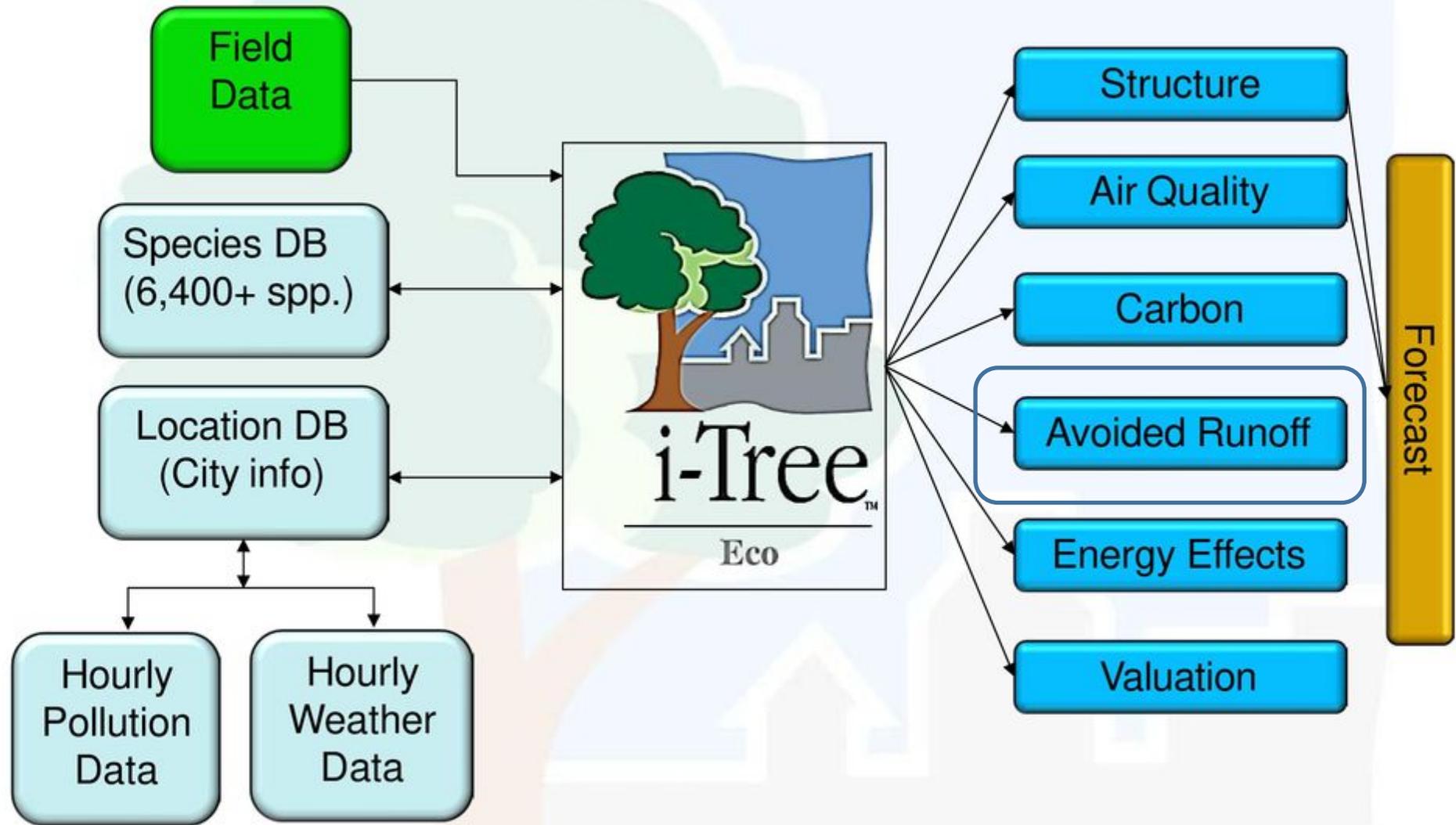
i-Tree Eco v6

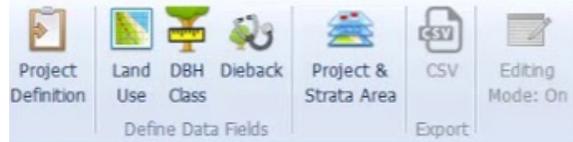
Flagship tool with best estimates for Composition and Benefits.

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

Plot Sampling & Complete Inventories

i-Tree Eco Model Schematic





Help
 through the other tabs, Project Settings and Data Collection Options, which are available in the Project Definition function. When you are satisfied with the project settings that you have entered, click OK in the top right-hand corner of the action panel.

Notes:

- For help classifying your study area as urban or rural, urban areas are typically defined as areas of high population density, at least 500 people per square mile (193 people per square kilometer). For additional urban land definitions, see the U.S. Census Bureau (<https://www.census.gov/geo/reference/ua/uafaq.html>).
- Depending on data availability in the weather year you choose, certain weather stations may not be shown on the map. If there is a weather station that you know you would like to use and it does not appear on the map, you may need to change the weather year that you have selected. Otherwise, the station may not be available because it does not collect the data necessary to run the i-Tree Eco model.
- Weather data quality is categorized as either Good, Fair, or Poor based on the number of missing hourly weather data. All required weather variables, excluding precipitation, need to meet the following conditions to be classified as: Good = < 720 (8.2%) hours of missing data; Fair = < 4,380 (50%) hours missing; Poor = < 8,760 (100%) hours missing. Weather stations that are completely missing data for any required variable are excluded from the weather monitor database. Missing weather data are filled in using procedures detailed in the document (https://www.itreetools.org/eco/resources/surface_weather_and_upper_air_preprocess_or_description.pdf).

Project Configuration

Enter project overview

Project Settings Location

Please select a location

Hint: Use the Data Collection Options

Not all cities are available

Nation:

State:

Delegacion:

Place:

Is the study area:

Population:

Please specify:

Weather & climate:

Please select a weather year:

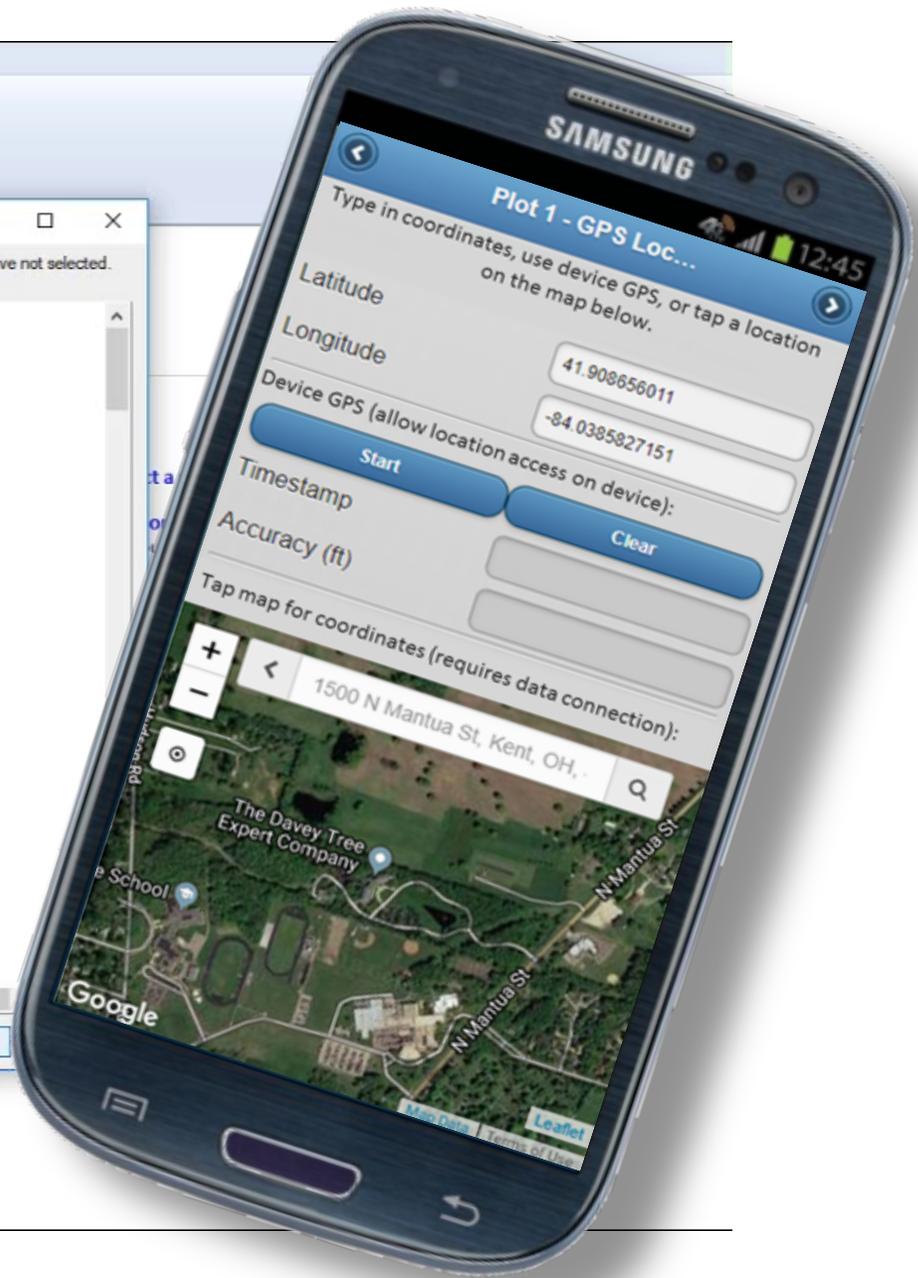
Weather Station:

Report Availability

Some reports will be unavailable as indicated in red below. These require Data Collection Options you have not selected.

- Formatted Reports
 - Written Report
 - Composition and Structure
 - Structure Summary
 - By Species
 - By Stratum and Species
 - Population Summary
 - By Species
 - By Stratum
 - By Stratum per Unit Area
 - Public and Private by Stratum
 - Street Trees by Stratum (Unavailable: "Street tree/non-street tree" not checked)
 - Species Distribution
 - By DBH Class (chart)
 - By DBH Class (vertical table)
 - By DBH Class (horizontal table)
 - By DBH Class and Stratum (vertical table)
 - By DBH Class and Stratum (horizontal table)
 - Importance Values
 - By Species
 - Diversity Indices (Unavailable for this project type or location)
 - By Stratum (Unavailable for this project type or location)
 - Species Range
 - Native Status by Stratum
 - Condition
 - By Species
 - By Stratum and Species
 - Leaf Area
 - By Stratum

Click OK to proceed or Cancel to return to Data Collection Options.



i-Tree Eco Assesses:

- Structure
- Function
 - Air quality
 - Carbon
 - **Avoided runoff**
 - Energy effects
 - Human health impacts
- Value (\$)
- Management info
 - Pest risk
 - Tree health
 - Exotic/invasive species

Lake Forest Park:City (2010) - i-Tree Eco

FILE Project Configuration Data View Reports Forecast Support

Project Metadata Run Models Written Report and Structure Composition and Costs Benefits and Costs Individual Tree Details Pest Analysis Air Quality Health Impacts and Values Pollution and Weather Model Notes Metric Species Names

Formatted Reports Charts Units

Reports > Formatted Reports > Written Report

100% Page 14 of 39

Structure Summary by Species

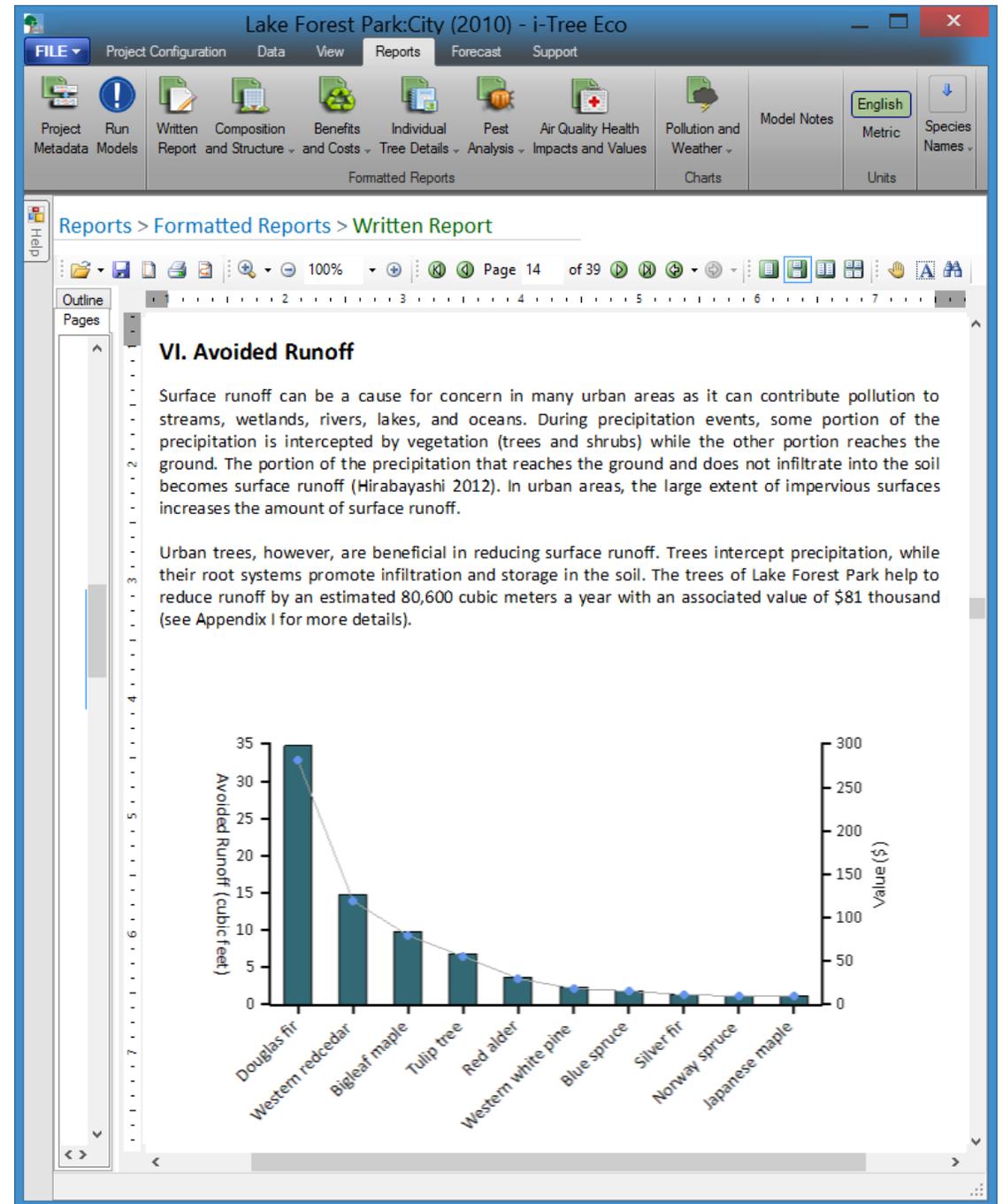
Location: Sandwell, West Midlands, England, United Kingdom
Project: Brunswick Pebbles Grant, Series: Second survey info, Year: 2019
Generated: 17/04/2019

Species	Trees		Leaf Area (ha)		Leaf Biomass (metric ton)		Tree Dry Weight Biomass (metric ton)		Average Condition (%)
	Number	SE		SE		SE		SE	
London plane	21	±0	0.645	±0.000	0.296	±0.000	107.346	±0.000	94.50
European ash	18	±0	0.344	±0.000	0.366	±0.000	31.031	±0.000	94.50
Horse chestnut	16	±0	0.299	±0.000	0.209	±0.000	58.558	±0.000	94.50
English holly	12	±0	0.059	±0.000	0.078	±0.000	4.816	±0.000	94.50
Indian paper birch	8	±0	0.038	±0.000	0.022	±0.000	5.258	±0.000	94.50
Common ash	8	±0	0.077	±0.000	0.054	±0.000	13.781	±0.000	94.50
Lombardy poplar	8	±0	0.040	±0.000	0.029	±0.000	35.548	±0.000	94.50
Crimson king norway maple	6	±0	0.071	±0.000	0.040	±0.000	5.555	±0.000	94.50
European hornbeam	6	±0	0.085	±0.000	0.051	±0.000	6.659	±0.000	94.50
Carolina poplar	6	±0	0.105	±0.000	0.097	±0.000	24.361	±0.000	94.50
English oak	6	±0	0.104	±0.000	0.069	±0.000	16.583	±0.000	94.50
Smooth-leaf elm	5	±0	0.056	±0.000	0.038	±0.000	6.186	±0.000	94.50
Cappadocian Maple	4	±0	0.077	±0.000	0.043	±0.000	6.266	±0.000	94.50
Red horsechestnut	4	±0	0.071	±0.000	0.052	±0.000	12.083	±0.000	94.50
Port orford cedar	4	±0	0.017	±0.000	0.042	±0.000	2.351	±0.000	94.50
Silver maple	2	±0	0.044	±0.000	0.023	±0.000	3.716	±0.000	94.50
Blue Pencil Pine	2	±0	0.007	±0.000	0.011	±0.000	1.091	±0.000	94.50
Narrow-leafed ash	2	±0	0.032	±0.000	0.023	±0.000	2.320	±0.000	94.50
Monkeypuzzle tree	1	±0	0.021	±0.000	0.032	±0.000	0.464	±0.000	94.50
Blue atlas cedar	1	±0	0.038	±0.000	0.059	±0.000	2.297	±0.000	94.50
Leyland cypress	1	±0	0.002	±0.000	0.002	±0.000	0.719	±0.000	94.50
Golden chain tree	1	±0	0.001	±0.000	0.001	±0.000	1.172	±0.000	94.50
European turkey oak	1	±0	0.011	±0.000	0.011	±0.000	2.088	±0.000	94.50
White willow	1	±0	0.017	±0.000	0.011	±0.000	4.495	±0.000	94.50

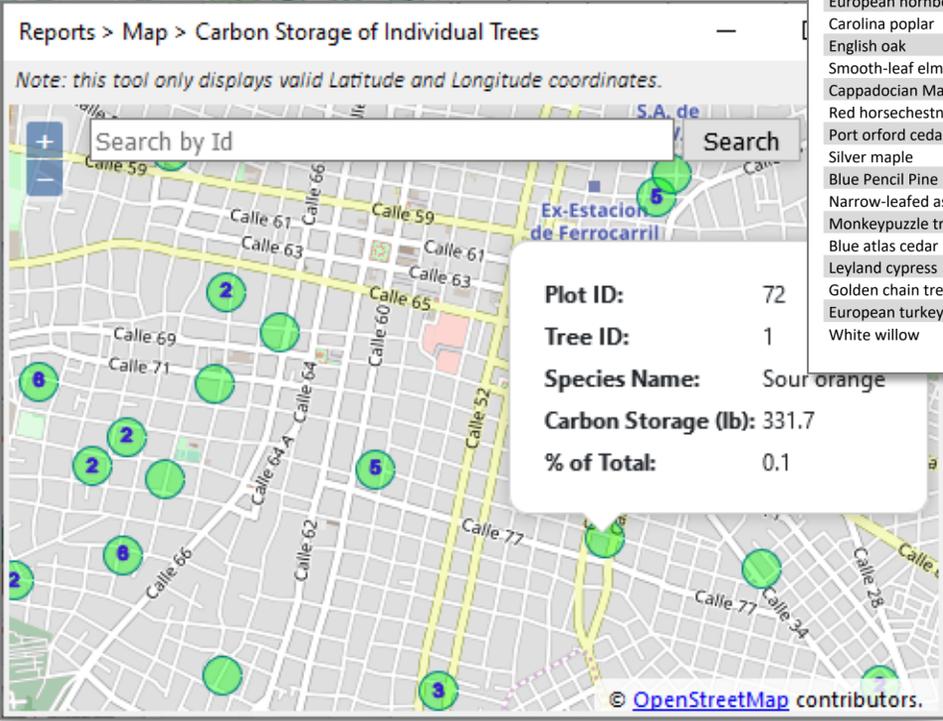
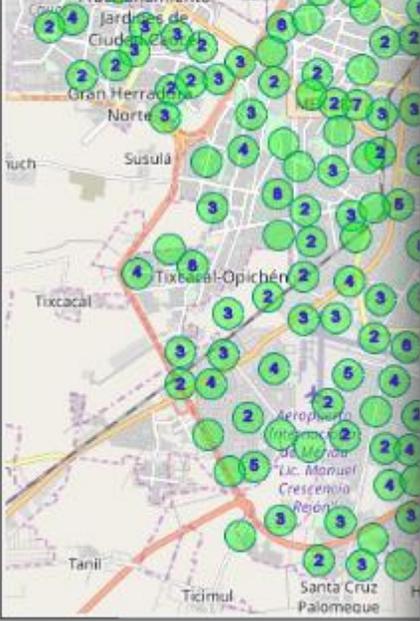
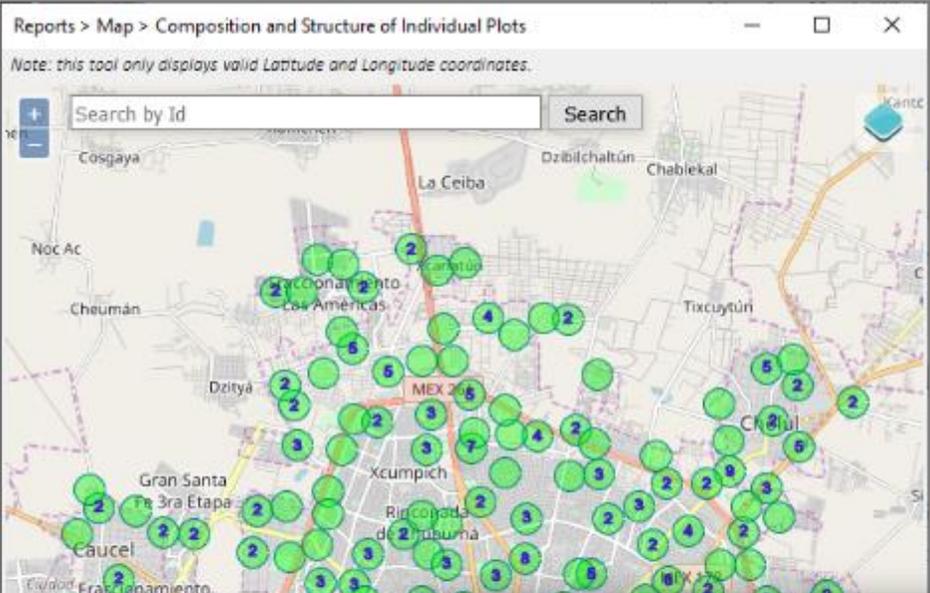
Page 1

i-Tree Eco Assesses:

- Structure
- Function
 - Air quality
 - Carbon
 - **Avoided runoff**
 - Energy effects
 - Human health impacts
- Value (\$)
- Management info
 - Pest risk
 - Tree health
 - Exotic/invasive species



i-Tree Eco v6



Structure Summary by Species

Location: Sandwell, West Midlands, England, United Kingdom
 Project: Brunswick Pebbles Grant, Series: Second survey info, Year: 2019
 Generated: 17/04/2019



Species	Trees		Leaf Area (ha)		Leaf Biomass (metric ton)		Tree Dry Weight Biomass (metric ton)		Average Condition (%)
	Number	SE		SE		SE		SE	
London plane	21	±0	0.645	±0.000	0.296	±0.000	107.346	±0.000	94.50
European ash	18	±0	0.344	±0.000	0.366	±0.000	31.031	±0.000	94.50
Horse chestnut	16	±0	0.299	±0.000	0.209	±0.000	58.558	±0.000	94.50
English holly	12	±0	0.059	±0.000	0.078	±0.000	4.816	±0.000	94.50
Indian paper birch	8	±0	0.038	±0.000	0.022	±0.000	5.258	±0.000	94.50
Common ash	8	±0	0.077	±0.000	0.054	±0.000	13.781	±0.000	94.50
Lombardy poplar	8	±0	0.040	±0.000	0.029	±0.000	35.548	±0.000	94.50
Crimson king norway maple	6	±0	0.071	±0.000	0.040	±0.000	5.555	±0.000	94.50
European hornbeam	6	±0	0.085	±0.000	0.051	±0.000	6.659	±0.000	94.50
Carolina poplar	6	±0	0.105	±0.000	0.097	±0.000	24.361	±0.000	94.50
English oak	6	±0	0.104	±0.000	0.069	±0.000	16.583	±0.000	94.50
Smooth-leaf elm	5	±0	0.056	±0.000	0.038	±0.000	6.186	±0.000	94.50
Cappadocian Maple	4	±0	0.077	±0.000	0.043	±0.000	6.266	±0.000	94.50
Red horsechestnut	4	±0	0.071	±0.000	0.052	±0.000	12.083	±0.000	94.50
Port orford cedar	4	±0	0.017	±0.000	0.042	±0.000	2.351	±0.000	94.50
Silver maple	2	±0	0.044	±0.000	0.023	±0.000	3.716	±0.000	94.50
Blue Pencil Pine	2	±0	0.007	±0.000	0.011	±0.000	1.091	±0.000	94.50
Narrow-leaved ash	2	±0	0.032	±0.000	0.023	±0.000	2.320	±0.000	94.50
Monkeypuzzle tree	1	±0	0.021	±0.000	0.032	±0.000	0.464	±0.000	94.50
Blue atlas cedar	1	±0	0.038	±0.000	0.059	±0.000	2.297	±0.000	94.50
Leyland cypress	1	±0	0.002	±0.000	0.002	±0.000	0.719	±0.000	94.50
Golden chain tree	1	±0	0.001	±0.000	0.001	±0.000	1.172	±0.000	94.50
European turkey oak	1	±0	0.011	±0.000	0.011	±0.000	2.088	±0.000	94.50
White willow	1	±0	0.017	±0.000	0.011	±0.000	4.495	±0.000	94.50



United States Department of Agriculture

The Urban Forest of New York City



Forest Service

Northern Research Station

Resource Bulletin NRS-117

September 2018



USAID

FROM THE AMERICAN PEOPLE

TECHNICAL REPORT

I-TREE URBAN FOREST ASSESSMENT IN SANTO DOMINGO'S COLONIAL CITY



March 2016

This publication was produced for review by the United States Agency for International Development. It was prepared by Jerry Bauer, Marlene Perez and Sofia Olivares.



Forest Research

Evaluation of i-Tree Eco surveys in Great Britain

Impacts and key lessons: The views of stakeholders

Clare Hall, Liz O'Brien, Kathryn Hand, Susanne Raum, 2018



The Research Agency of the Forestry Commission

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

Cover Class	Description	Abbr.	Points	% Cover
Tree	Tree, non-shrub	T	11	10.3 ±5.00
Non-Tree	All other surfaces	NT	49	81.7 ±5.00

Abbr.	Benefit Description	Value	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	\$174.40	±47.52	656.72 lb	±178.94
NO2	Nitrogen Dioxide removed annually	\$156.26	±42.58	1,511.65 lb	±411.89
O3	Ozone removed annually	\$9,249.84	±2,520.35	9.48 T	±2.58
PM2.5	Particulate Matter less than 2.5 microns removed annually	\$17,942.75	±4,888.94	848.77 lb	±231.27
SO2	Sulfur Dioxide removed annually	\$6.22	±1.69	133.89 lb	±36.48
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	\$6,763.14	±1,842.78	2.48 T	±0.68
CO2seq	Carbon Dioxide sequestered annually in trees	\$81,603.57	±22,234.90	2,314.64 T	±630.68
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	±10,210.40

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, 'i-Tree Canopy 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 interface with a search bar at the top left. A 'Select a Shapefile' dialog box is open in the center, 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 box has 'OK' and 'Cancel' buttons at the bottom.

On the right side, a sidebar contains several sections: 'Just curious? Dive right into survey mode with an existing project.' with a 'Launch Our Example Project' button; 'Ready to survey your own area? Use these functions to define map areas.'; 'US Boundaries' with a list of administrative layers including 'US Census Block Groups', 'US Census Places', 'County Subdivisions', 'US Counties', 'US 115th Congressional Districts', and 'US States', each with a toggle icon and a colored line; 'Load ESRI Shapefile' button; and 'Draw or Add Areas' with 'Select', 'Draw', and 'Delete' buttons.

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

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

- 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.



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

- 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

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

i-Tree Canopy v6.1
Cover Assessment and Tree Benefits Report
Estimated using random sampling statistics on 7/14/19

Land Cover

Cover Class	Description	Abbr.
Grass/Herbaceous		H
Tree/Shrub		T
Impervious Buildings		IB
Impervious Road		IR
Impervious Other		IO
Water		W
Soil/Bare Ground		S

Abbr.	Description	Count	Area Covered (mi²)	±SE
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	±7,784.82

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: CO 2.178 @ \$922.27; NO2 5.308 @ \$240.89; O3 38.960 @ \$1,342.60; PM2.5 1.688 @ \$14,670.16; SO2 1.020 @ \$70.22; PM10* 5.284 @ \$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/m²/yr: AVRO 4.64; E 47.5; I 47.6; T 78.6; PE 205.9; PET 290.8. Hydrological Value is based on amount of Avoided Runoff @ \$2,395.92/Mgal/yr. Currency is in USD. Standard errors of removal and benefit amounts are based on standard errors of sampled and classified points.

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 Binkley, and Scott Maco (The Davey Tree Expert Company).

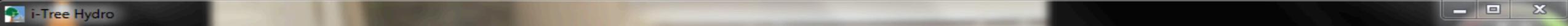
Limitations of i-Tree Canopy
The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points 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 Hydro



i-Tree Hydro: Model interface



Welcome to i-Tree Hydro!

- [What is Hydro?](#)
- [How to Run i-Tree Hydro](#)
- [About the Sample Project](#)
- [New Project Steps](#)

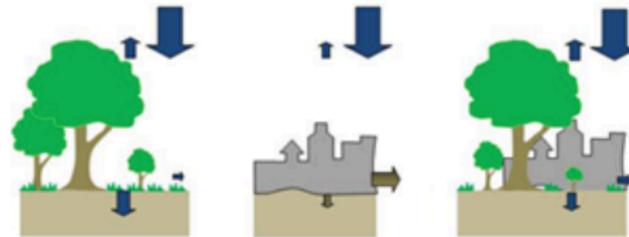
General References:

- [i-Tree Hydro webpage](#)
- [Hydrologic Cycle](#)
- [Soil Profile](#)
- [User's Manual](#)

What is Hydro?

i-Tree Hydro is a simulation tool that analyzes how land cover influences the volume and quality of runoff. It can analyze historical or future hydrological events and allow the user to contrast runoff volume and quality from existing land cover (referred to as the Base Case) with runoff from the Alternative Case land cover. The i-Tree Hydro model differs from other i-Tree products in the following ways:

- The model simulation area is loaded into the program either as a digital elevation model (DEM) file or as a topographic index (TI) file. It is not hand-delineated in the program by the user. If the user is interested in a watershed, they can load a DEM or TI file. If the user is interested in a city or parcel that is not defined by a single watershed they load a TI file.
- The model simulation can be run in calibration mode or non-calibration mode. For calibration runs the user loads observed streamflow data from a gauging station and the model will identify the optimal hydrological parameters to fit the observed streamflow data. Observed streamflow data are provided for thousands of watershed areas. For non-calibration runs the user can use previously calibrated parameters or independently set the land cover and hydrological parameter values by adjusting the default values that the model provides.



Current Project:

No project loaded.

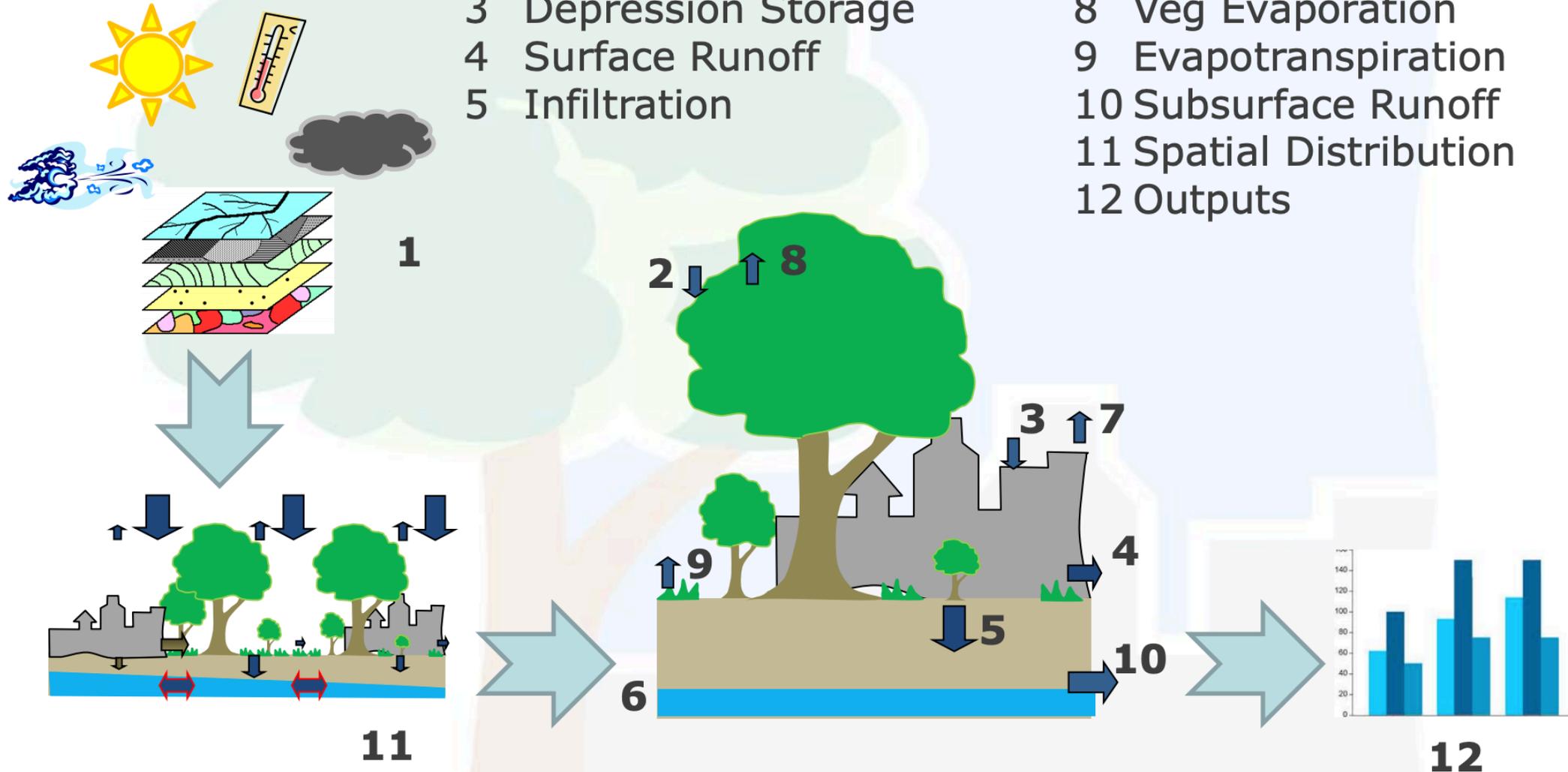


Hydro Conceptual Models



- 1 Inputs
- 2 Canopy Interception
- 3 Depression Storage
- 4 Surface Runoff
- 5 Infiltration

- 6 Soil Moisture
- 7 Surface Evaporation
- 8 Veg Evaporation
- 9 Evapotranspiration
- 10 Subsurface Runoff
- 11 Spatial Distribution
- 12 Outputs



Hydro - Inputs



Step 1) i-Tree Hydro Project Area Information

Geographic Reference Location

Nation: United States of America
State: New York
County: Onondaga
City: Syracuse

Project Time Period

Start Date / Time (Local): 01/01/2012 00:00:00
End Date / Time (Local): 12/30/2012 00:00:00

Topographic Data

Browse for my own DEM file
*DEM File:
G:\j-Tree_Hydro\SVN\Hydro\weftec_branch_step_2\wc\Hydro\bin\x86\Debug\Sample Data\dem.dat*

Select preprocessed topographic data

Weather Station Data

Select a weather station from map
 Select raw NCDC weather file
Weather Station ID: 725190-14771
 Select processed weather files

Calibration Data

Select USGS gage from map
 Select raw USGS data file
Stream Gage ID: 04240100
 Select processed data file
 Not calibrating

Help for items on this page:

Next: Step 2) i-Tree Hydro Land Cover Parameters

Cancel OK Next

Hydro - Inputs

Step 2) Land Cover Inputs

Project Area
 Area: 26237500 Units: m²

Evergreen Cover
 Evergreen Canopy: 0.042 (%)
 Evergreen Shrub Canopy: 0.21 (%)

Land Cover Area

	Base Case		Alternate Case 1	Alternate Case 2	Alternate Case 3
	%	Area	(%)	(%)	(%)
Tree Canopy (TC)	39.20	10285100.0	34.20	44.20	41.70
Pervious under TC	38.49	10098813.0	33.49	38.49	38.49
Impervious under TC	1.80	472275.00	1.80	6.80	4.30
Shrub Canopy	33.50	8789562.50	33.50	33.50	33.50
Herbaceous	15.00	3935625.00	15.00	15.00	15.00
Water	2.00	524750.00	2.00	2.00	2.00
Impervious	10.30	2702462.50	15.30	5.30	7.80
Bare Soil	0.0	0.0	0.0	0.0	0.0

Green Infrastructure

	Base Case	Alt Case 1	Alt Case 2	Alt Case 3
Tree Pit	0.0	0.0	0.0	0.0
Rain Garden	0.0	0.0	0.0	0.0
Green Roof	0.0	0.0	0.0	0.0
Rain Barrel	0.0	0.0	0.0	0.0
Porous Pavement	0.0	0.0	0.0	0.0

Total Cover

	Base Case	Alt Case 1	Alt Case 2	Alt Case 3
Total Cover	100.0	100.0	100.0	100.0

Directly Connected Impervious Area

	Base Case	Alt Case 1	Alt Case 2	Alt Case 3
Directly Connected IA	4.21	12.07	2.77	4.21

Canopy Parameters

	Base Case	Alt Case 1	Alt Case 2	Alt Case 3
Tree Leaf Area	5.0	5.0	5.0	5.0
Shrub Leaf Area	2.0	2.0	2.0	2.0
Herbaceous Leaf Area	2.0	2.0	2.0	2.0

Next: Step 3) Parameterize and Calibrate Model

Rain Garden

GI Footprint (%) Area (m²)

GI Footprint 0 0

Land Cover

Tree Cover 0 0

Shrub Cover 0 0

Herbaceous Cover 0 0

Soil Cover 0 0

Total Cover 0 0

Canopy Properties

Tree LAI 5

Shrub LAI 2

Herbaceous LAI 2

Soil Properties

Max Ponding Depth (m) 0

Root Zone Depth 0

Storage Zone Depth 0

Soil Porosity 0

Infiltration Rate 0

Soil Type

Hydraulic Properties

Contributing Area (m²) 0

Impervious (%) 0

Pervious (%) 0

Underdrain False

Cancel OK

Hydro - Inputs



Step 3) Parameterize & Calibrate Model

These parameters define project area soil and vegetation properties and model conditions. Starting with the Suggested Default Values, these parameters can be adjusted in one of two ways: (1) manually based on prior knowledge, testing or research and (2) through calibration to observed streamflow values.

Note: Calibration of a parameter set is available only when modeling a watershed with observed streamflow values. Calibration of a parameter set adjusts the hydrological parameters to reduce the differences between the predicted streamflow and observed streamflow values across the time step set within the calibration window on the right.

Current parameter set: Suggested Default Values

Save Save As Delete

Parameters:

We start with a preliminary value for the amount of water coming through the gauge.

Annual Average Flow at Gauging Station (cms)

Then we select a soil type to account for the way water moves into and through the ground.

Soil Type Sandy Clay Loam

Wetting Front Suction (m)

Wetted Moisture Content (m)

Surface Hydraulic Conductivity (cm/h)

Condition of the soil in terms of root penetration and water content is set next.

Depth of Root Zone (m)

Initial Soil Saturation Condition (%)

Calibration

Time Step Hourly

Calibrate Compare Parameter Sets

Advanced Settings

Leaf Transition Period (days)	<input type="text" value="28"/>
Leaf On Day (Day of year 1-365)	<input type="text" value="127"/>
Leaf Off Day (Day of year 1-365)	<input type="text" value="280"/>
Tree Bark Area Index	<input type="text" value="1.7"/>
Shrub Bark Area Index	<input type="text" value="0.5"/>
Leaf Storage (mm)	<input type="text" value="0.2"/>
Pervious Depression Storage (mm)	<input type="text" value="1.0"/>
Impervious Depression Storage (mm)	<input type="text" value="2.5"/>
Scale Parameter of Power Function	<input type="text" value="2"/>
Scale Parameter of Soil Transmissivity	<input type="text" value="0.023"/>
Transmissivity at Saturation (m ² /h)	<input type="text" value="0.13"/>
Unsaturated Zone Time Delay (h)	<input type="text" value="10"/>
Time Constant for Surface Flow: Alpha (h)	<input type="text" value="1.0"/>
Time Constant for Surface Flow: Beta (h)	<input type="text" value="2.0"/>
Watershed area where rainfall rate can exceed infiltration rate (%)	<input type="text" value="100"/>

Help for items on this page:

Soil Type

properties are important for correctly modeling infiltration and runoff generation processes. In general terms, pick the best soil type that describes most of your watershed area. Values range from extremely porous sand through relatively impervious clay, with many soil types found in between.

units: none

Based on the soil type, Hydro will supply values for:

Wetting Front Suction

- Wetting front suction (m), controls the maximum infiltration rates. It is used to describe the rate at which water is pulled into the soil when it is dry during the early part of the infiltration process. Estimated from soil physical properties used in Green-Ampt lookup tables.

Next: Step 4) i-Tree Hydro Run Model

Cancel OK Next

Change in Impervious Surface Runoff: 2015-2010

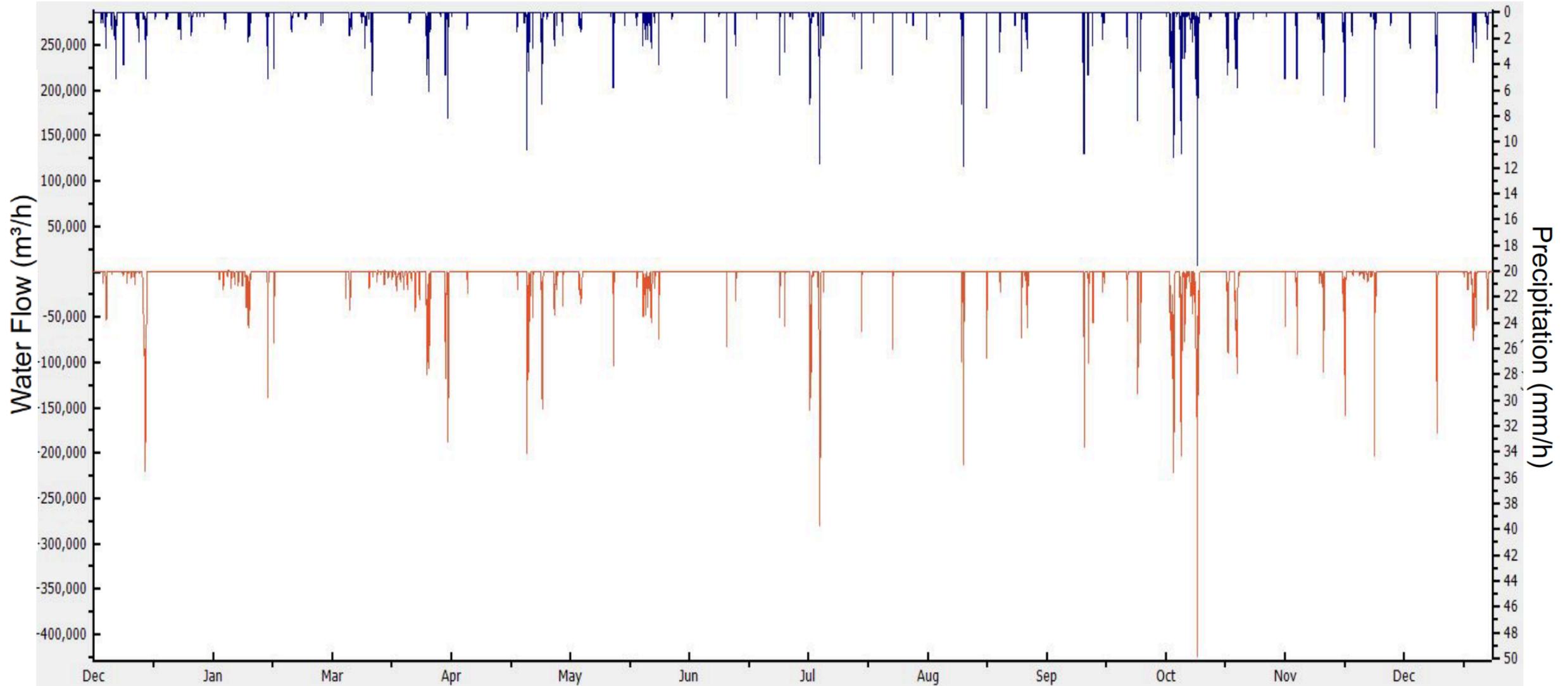


Figure 4: The graph above subtracts the flow rates modeled for 2010 from 2015 to show the net difference between the two years. The bottom line shows that difference in impervious surface flow, while the top line shows precipitation.

Change in Impervious Surface Runoff: 2010-2008

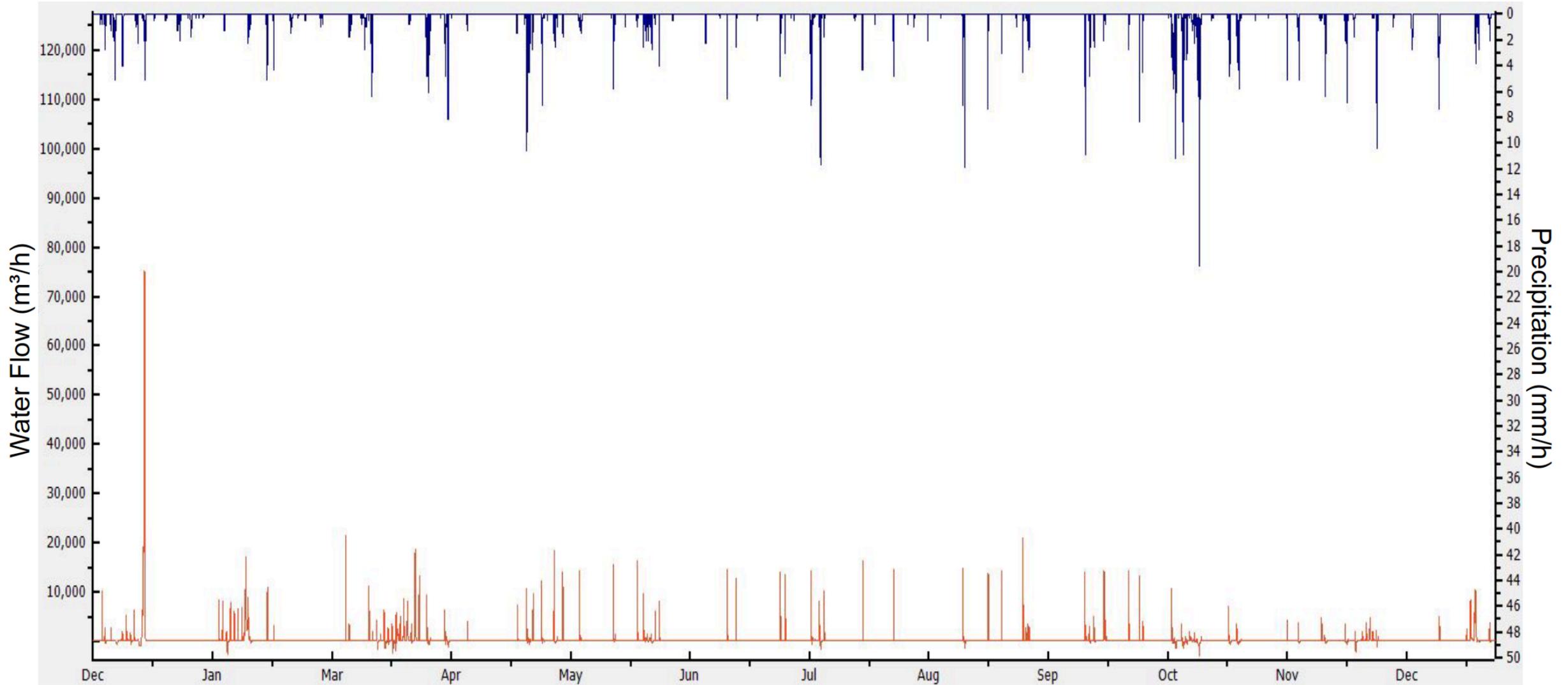
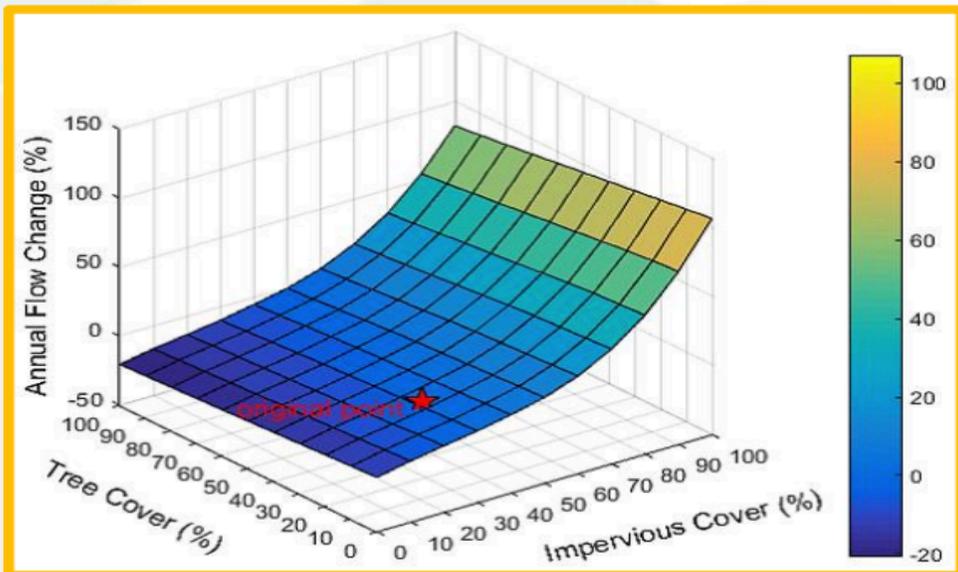
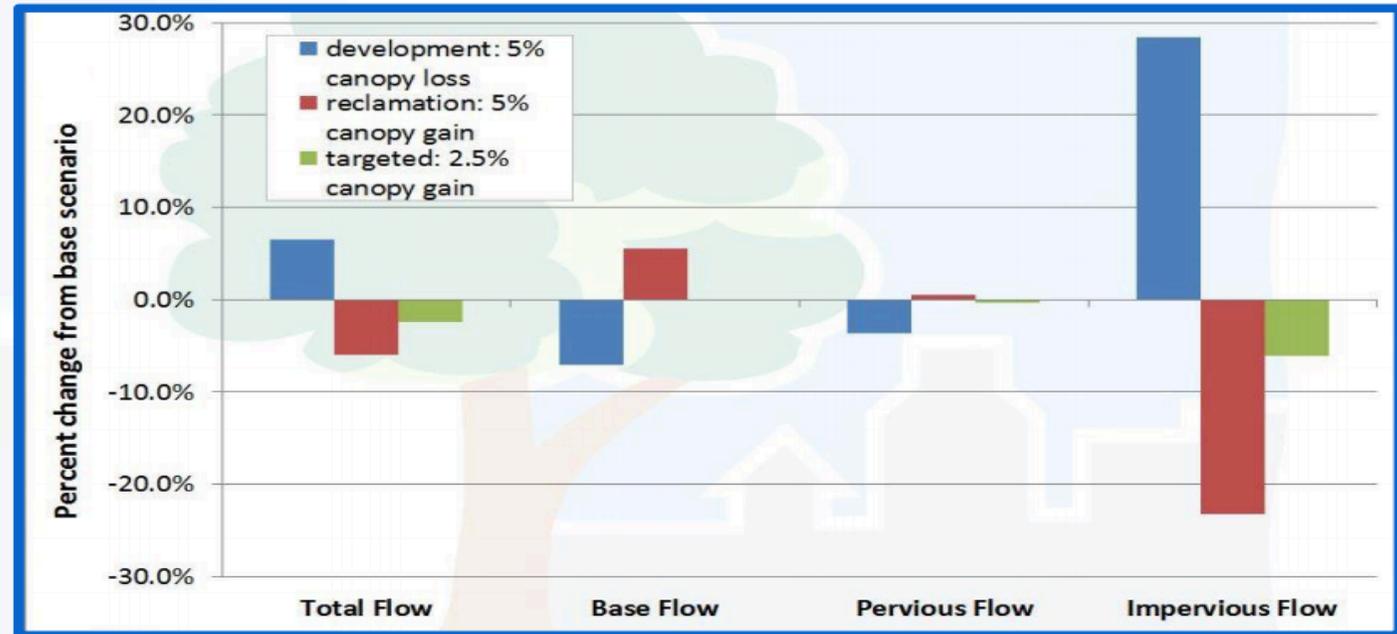


Figure 4: The graph above subtracts the flow rates modeled for 2008 from 2010 to show the net difference between the two years. The bottom line in each shows that difference in impervious surface flow, while the top line shows precipitation.

Exported Outputs & Examples of Additional Processing



Site condition	Total flow (m ³)	Base flow (m ³)	Pervious flow (m ³)	Impervious flow (m ³)
Current	12,322	5,063	4,700	2,559
Post-development	37,277	6,488	14,327	16,462
Increased Gallons	6.6 million	376 K	2.5 million	3.7 million
Percent Increase	303%	28%	305%	643%



Exported Outputs & Examples of Additional Processing

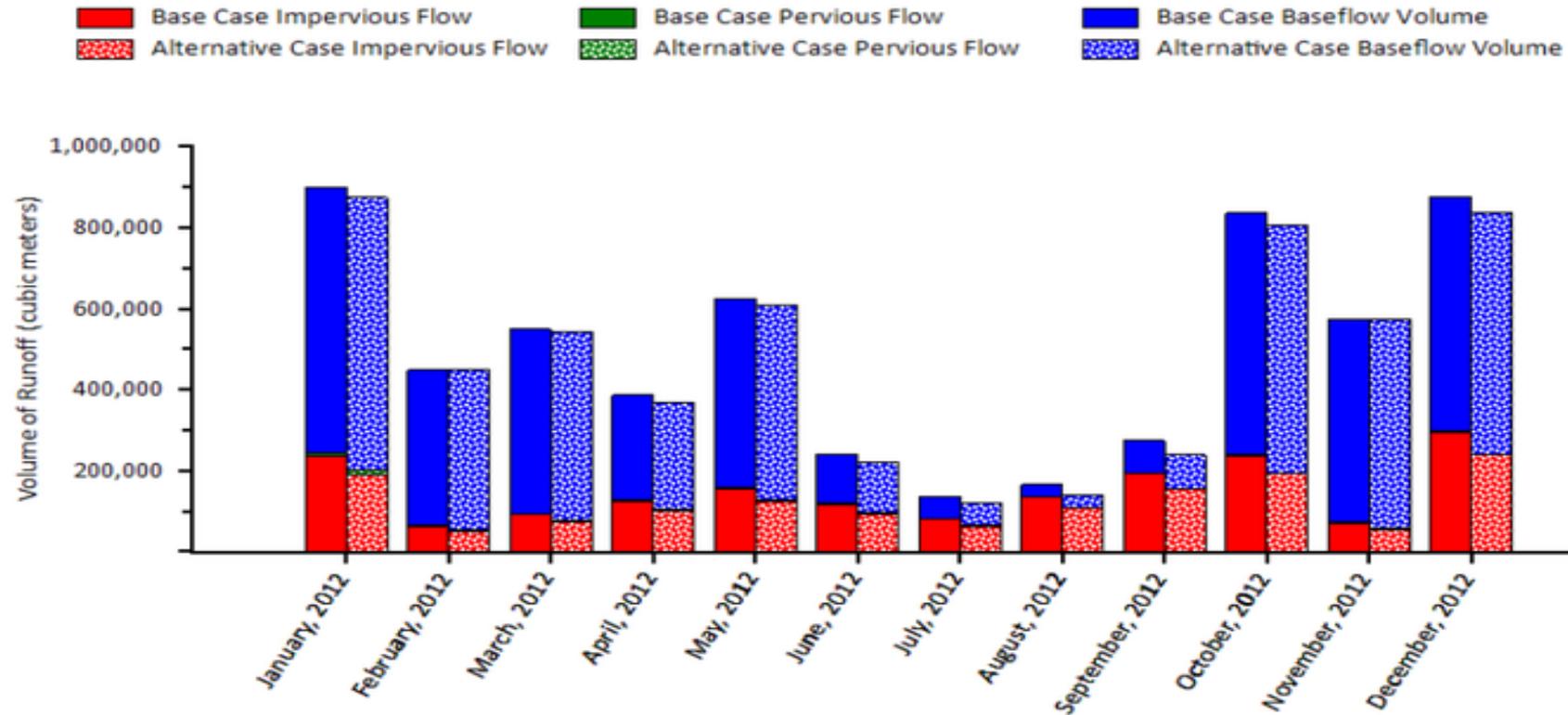


i-Tree Hydro Executive Summary

Project Location: Syracuse, New York

Project Time Span: 01/01/2012 - 12/30/2012

Base Case vs. Alternative Case Predicted Streamflow Components



Note: Solid colors represent Base Case values while the hatched pattern indicates Alternative Case values

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:

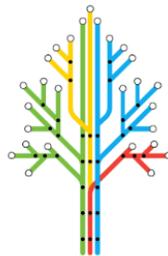
- Tree species
- Size of trees at planting
- Information on the distance and direction to the nearest building (optional)
- Information about the tree's growing conditions
- Estimated mortality (optional)
- The number of trees with each configuration
- Project lifetime (number of years)
- Specific greenhouse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



A collaborative initiative with



 **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

Massachusetts

County/Division

Hampden

City

Springfield

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	Num
<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 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

Maps - i-Tree Landscape x +

https://landscape.itreetools.org/maps/

i-Tree Landscape v4.1 Home Project Menu i-Tree Feedback

1400 Independence Ave. SW, Washington, DC, 20250

Start on Main, then explore the map layer tabs.

Main Canopy & Land Forest Risk Health Risk Future Climate

Base Maps -

Google Streets

Boundaries +

Selection Visibility Settings -

Selection

Transparency 0 %

Center On Selection

Choose a boundary area to analyze:

Watershed (HUC12)

Use these tools to work with the map:

Navigate Identify

Select Box-Select

Geo-Swap Clear

Process 8 Start Over

Map details are located in the references.

The following descriptions provide a general overview of the steps involved in completing an analysis with more details and a thorough How-To!

Let's Get Started!

Each i-Tree Landscape project is broken into the 5, simple steps outlined below. The current stage of a project is represented by the progress bar shown below the map. (To move between steps, click the **Next** or **Back** buttons or click on the desired step in the progress bar.)

Find Locations

i-Tree Landscape

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

A good place to get started in i-Tree.

A quick tour of...

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

The screenshot displays the i-Tree Landscape web application interface. At the top, there is a navigation bar with the i-Tree logo and menu options: Home, Project, Menu, and i-Tree. Below the navigation bar is a map of Cleveland, Ohio, showing various neighborhoods and street grids. The map is overlaid with a grid of colored polygons representing different land cover types. A sidebar on the right contains a search bar and several tabs: Main, Canopy & Land, Forest Risk, Health Risk, Future Climate, and Base Maps. Below the tabs are sections for 'Base Maps', 'Boundaries', and 'Selection Visibility Settings'. A dropdown menu is open, showing 'US Census Block Group' as the selected boundary area. Below this, there are several tool buttons: 'Navigate', 'Identity', 'Select', 'Box-Select', 'Geo-Swap', 'Clear', 'Process' (with a count of 462), and 'Start Over'. A progress bar is visible at the bottom of the map area, with the 'Explore Location Data' step currently active. Below the map, there are several data panels. The 'Land Cover' panel shows 'HiRes' data for '2011' and '2001'. The 'Unit' panel shows 'Metric' and 'English'. The 'Display' panel shows 'Table' and 'Chart'. A 'Canopy Legend' popup is visible, showing a color scale from light green (minimum: 0.6) to dark green (maximum: 271.8). The legend text reads: 'Lighter colors represent lower values, while darker colors represent higher values.' Below the legend, there are several data tables. The first table has columns for 'Remove', 'Dataset', 'Type', 'Name', 'ID', and 'Swap'. The second table has columns for 'Area', 'Canopy', 'Impervious', and 'Plantable Space', each with sub-columns for 'acre' and '%'. The 'Selection Total' row shows: 52,829.7 acres (100.00%) for Canopy, 9,547.6 acres (19.18%) for Impervious, and 14,523.9 acres (29.18%) for Plantable Space.

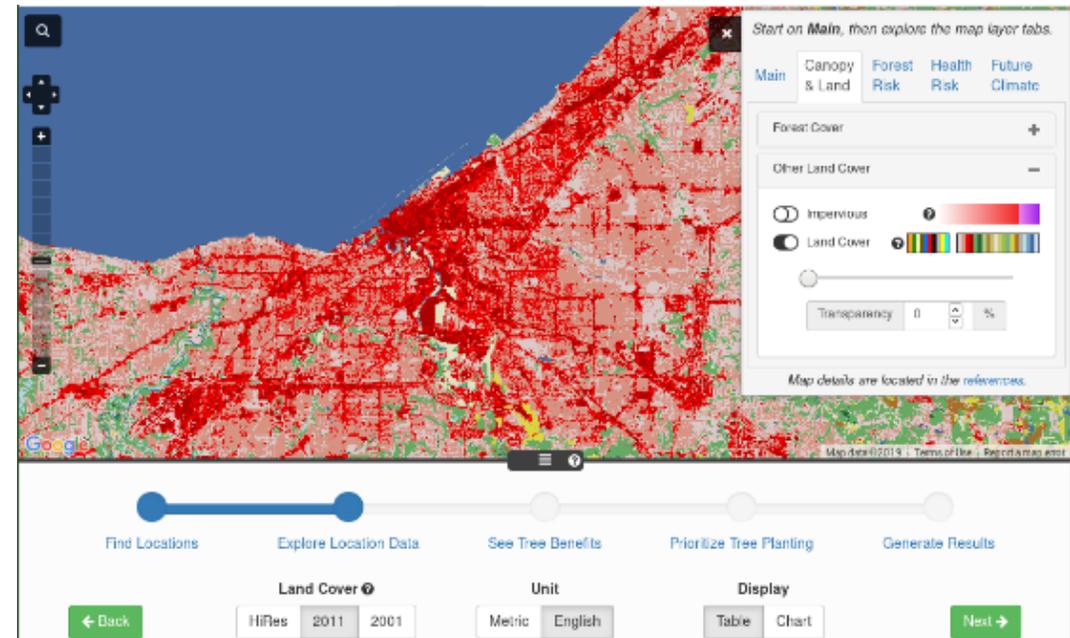
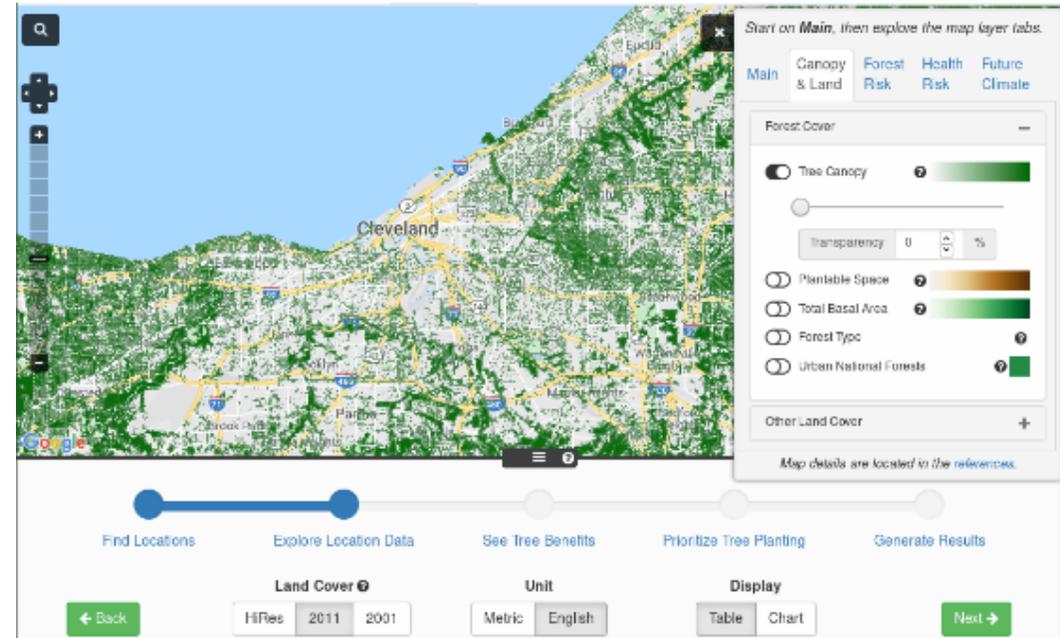
i-Tree Landscape

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

A good place to get 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.

The screenshot shows the 'Prioritize Tree Planting' interface on the website <https://landscape.itreetools.org/maps/prioritize/>. The interface includes a navigation bar with 'Find Locations', 'Explore Location Data', and 'See'. Below this is a 'Land Cover' section with a 'Back' button and a dropdown menu for 'HiRes', '2011', and '2001'. The main content area is titled 'How To Prioritize Tree Planting' and contains a detailed explanation of the 'Priority Planting Index' scenario, including three common scenarios: Population, Minorities, and Poverty. It also provides instructions on how to create a custom scenario. To the right, a legend lists various criteria for prioritization, such as 'Population Density', 'Tree Stocking Level', 'Tree Cover per Capita', and 'Carbon Storage'. Below the legend is a control panel with a 'Tree Cover per Capita' dropdown set to 'High', a slider for 'Importance (weight)' set to 30%, and buttons for 'Add Criteria', 'Store Scenario', 'Update Map Display', and 'Equalize'. At the bottom, there is a section for 'Current Prioritization Scenario Legend' and a table for 'Stored Planting Prioritization Scenarios'.

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

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

Map data ©2019 Terms of Use Report a map error

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."



David Bloniarz
USDA Forest Service
Northern Research Station
David.Bloniarz@usda.gov
txt 413-537-3748
www.unri.org

i-Tree Website
www.itreetools.org