UMass Extension

Landscape, Nursery & Urban Forestry Program

i-Tree™

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

USDA

Examining the Structure, Function and Value of Urban Forests:

Examining the Structure, Function and Value of Urban Forests:

Using i-Tree as a Tool for Analysis and Action

David Bloniarz
US Forest Service
Northern Research Station
Amherst, MA

Emerging Approaches Examining Urban Forests

Emerging Approaches Examining Urban Forests

The Latest i-Tree Software for Tree Assessment and Analysis

view or download the presentations

http://www.unri.org/research-documents/

Today’s Session

- Session Agenda and Outline
- Introduction to Today’s Session - Overview of the presentation topics that we will cover during the class.
- Urban Forests in Context - Discussion of issues related to urban forests, resilience and sustainability.
- What is i-Tree? - A general overview of the i-Tree software applications
- ii-Tree Components & Tools - A closer look at the various software applications.
- Choosing the Correct i-Tree Tool - The i-Tree website, and helping determine which tools to use for your projects.
- Conducting an i-Tree Project - Tips for how to conduct an i-Tree analysis in your community.
- The USDA Forest Service - Leading the way in Urban and Community Forestry around the globe.
- Review and Questions - A recap of the class topics and session wrap-up.

Urban Forests & Tree Canopy

Flushing Meadows-Carona Park, Queens, New York City, NY

Urban Forests & Tree Canopy

Manhattan, New York City, NY

Urban Forests & Tree Canopy

Brooklyn, NY

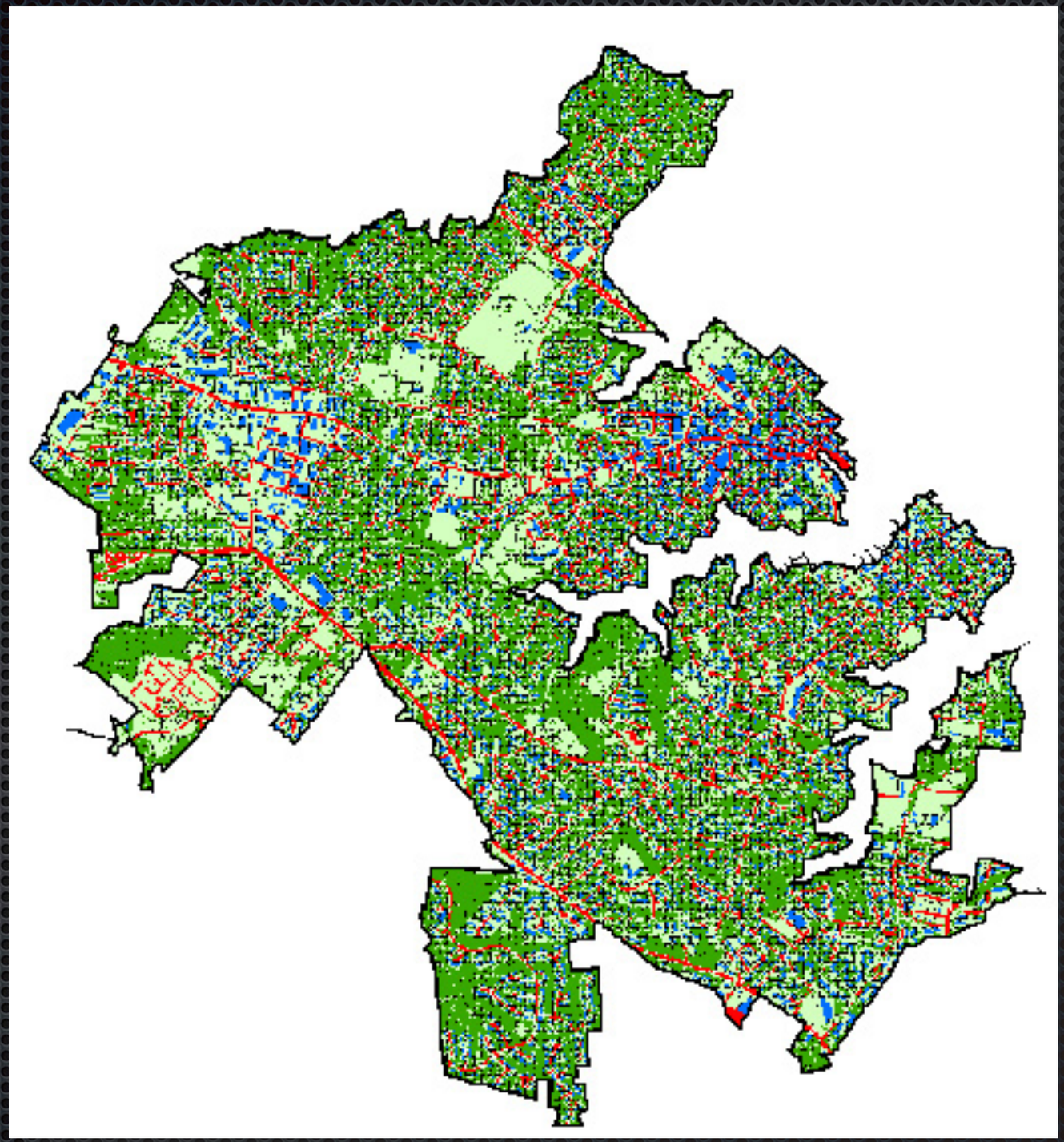
Urban Forests & Tree Canopy

Chicago, IL

Urban Forests & Tree Canopy

Detroit,MI

Urban Forests & Tree Canopy



Annapolis, MD

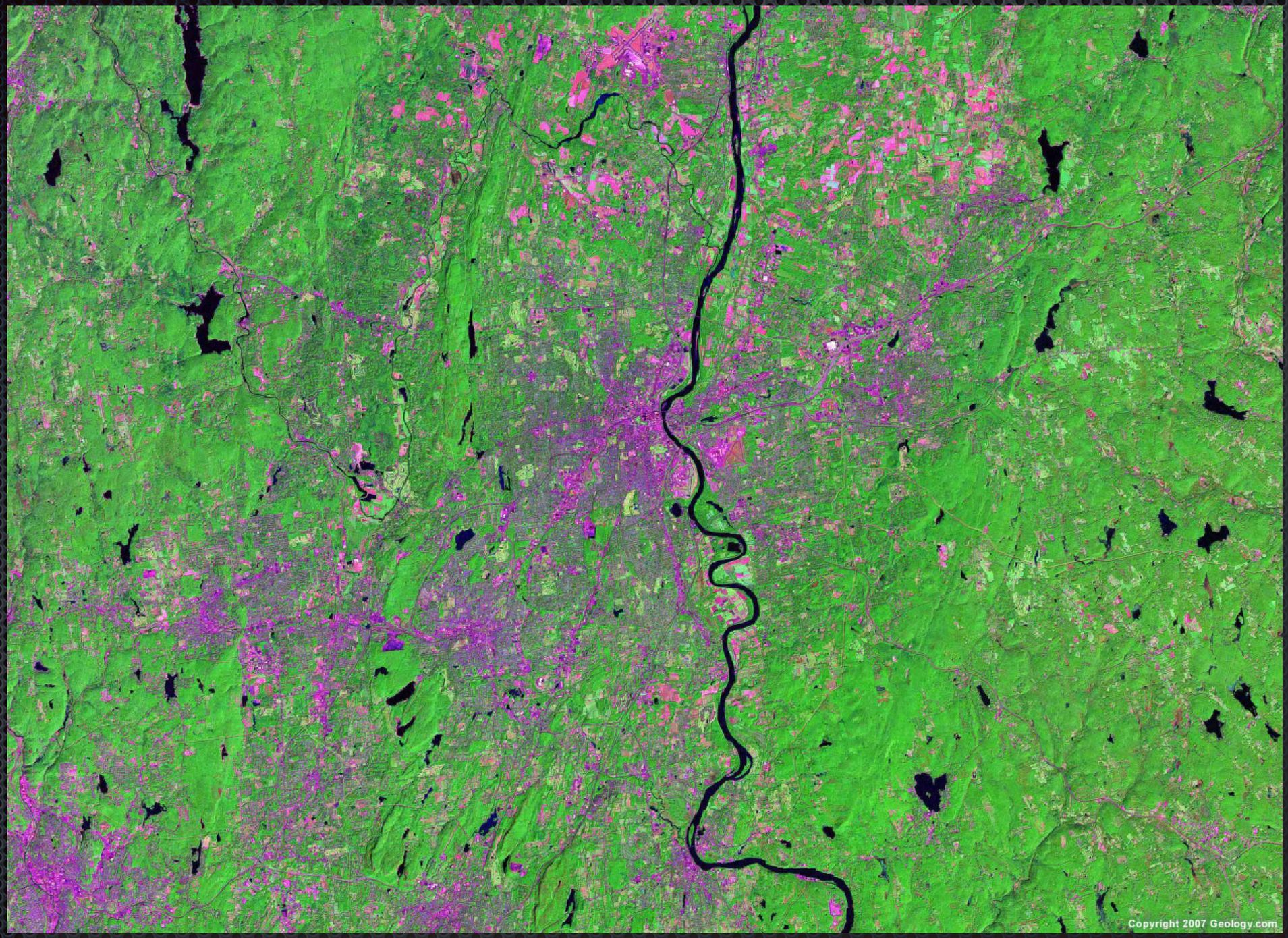
Urban Forests & Tree Canopy

Long Island, NY

Urban Forests & Tree Canopy

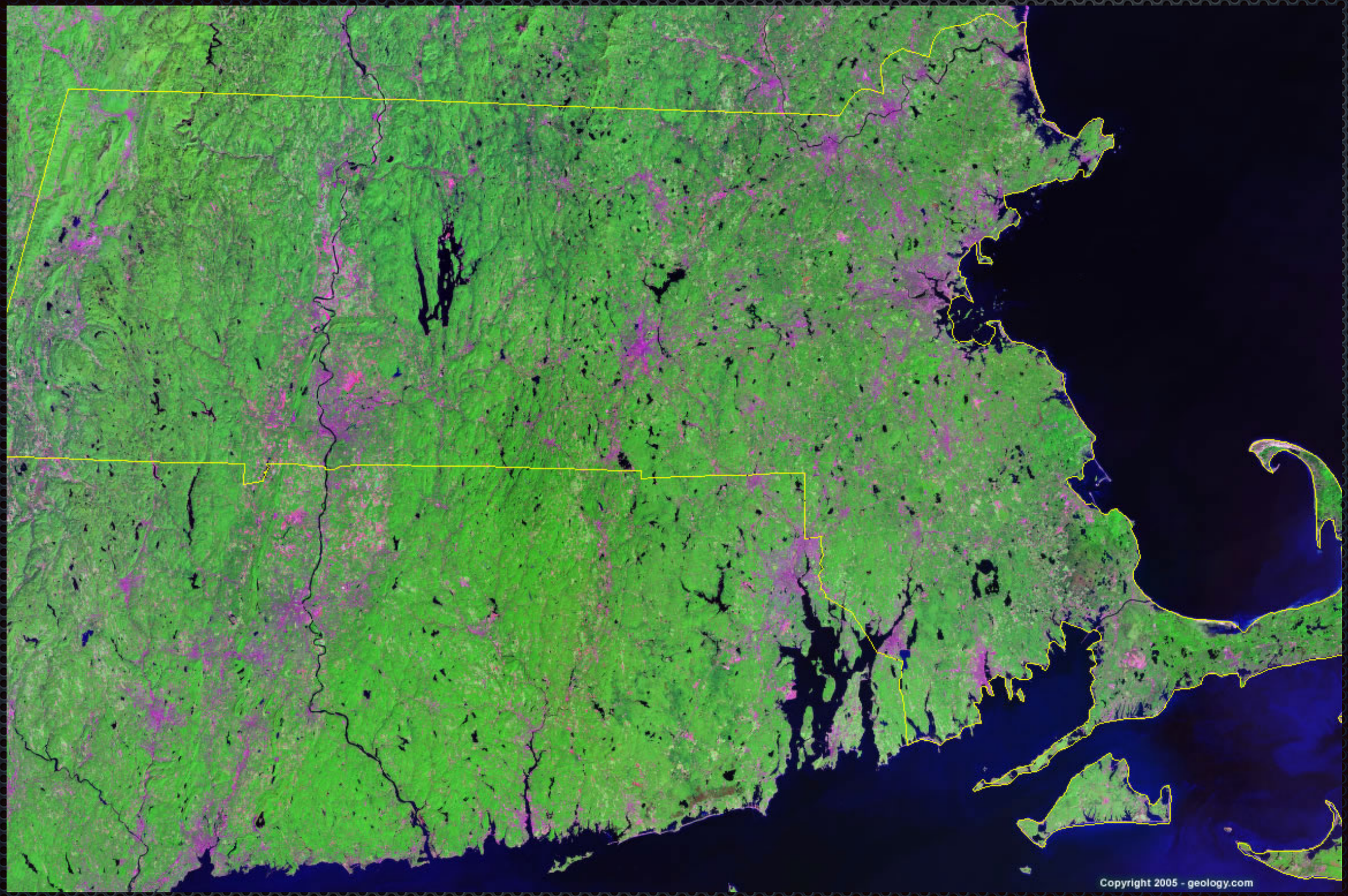
New York City

Urban Forests & Tree Canopy



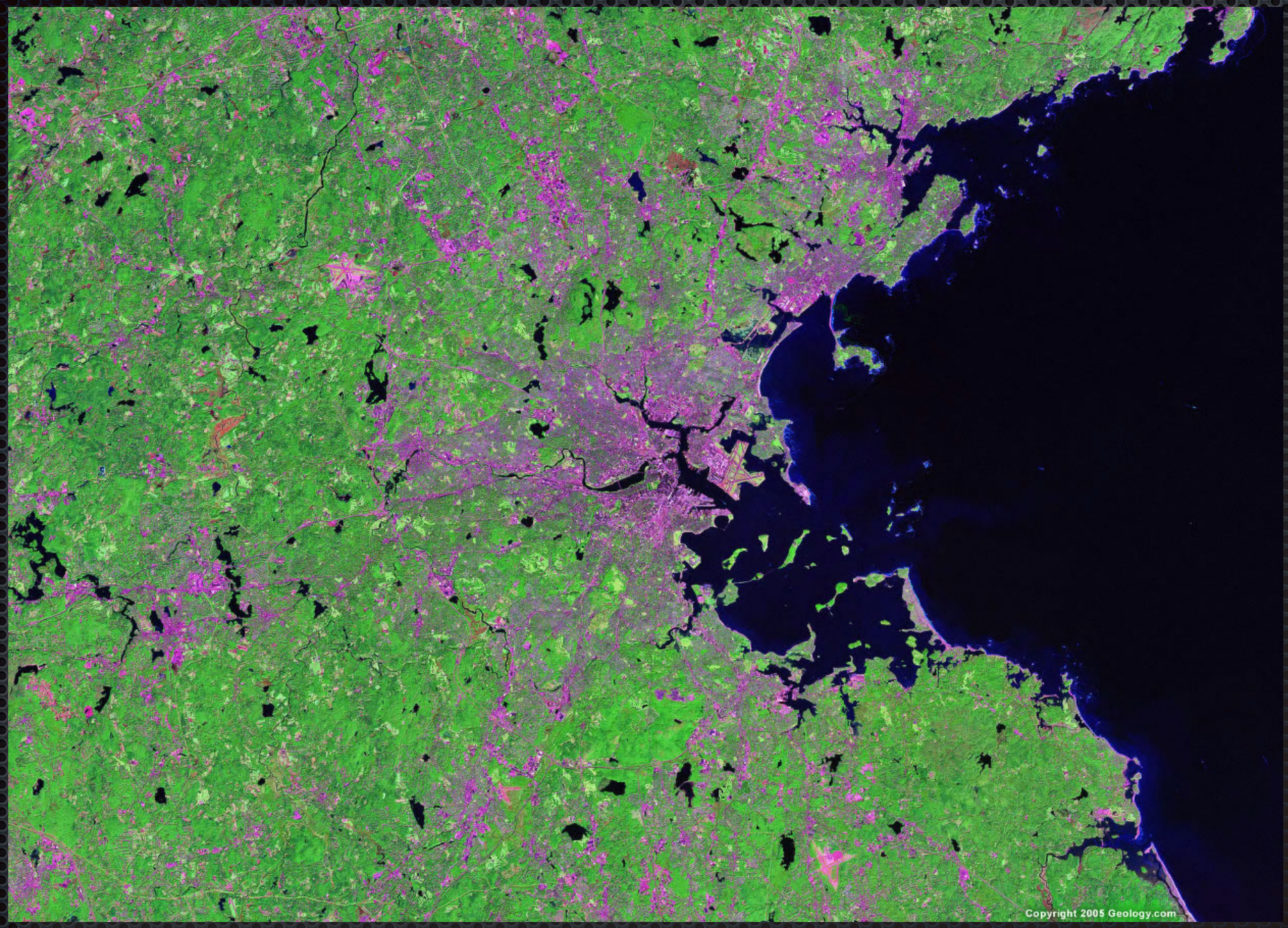
Hartford, CT

Urban Forests & Tree Canopy



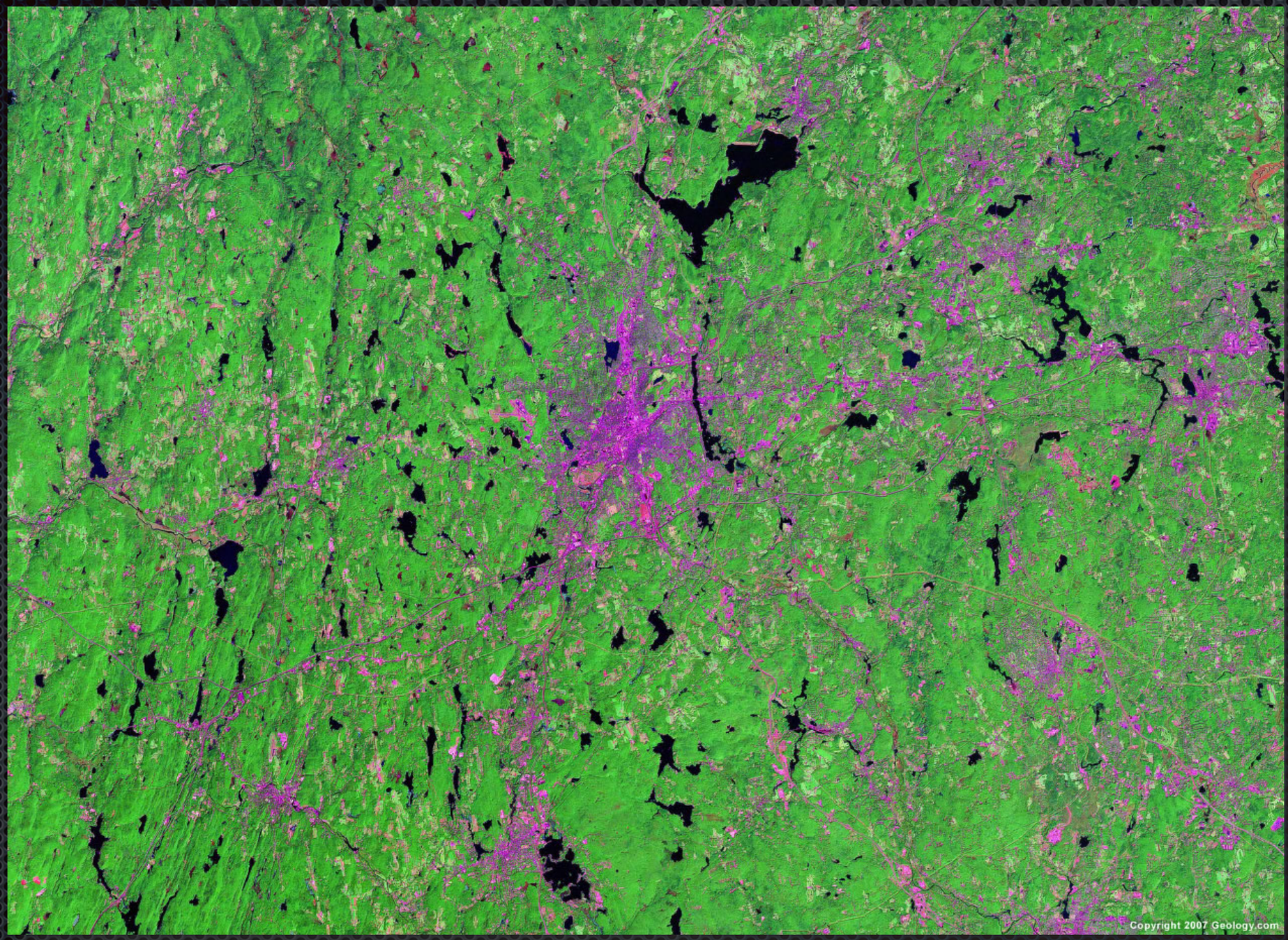
Massachusetts

Urban Forests & Tree Canopy



Boston, MA

Urban Forests & Tree Canopy



Worcester, MA

Urban Forests & Tree Canopy

Urban Forests & Tree Canopy

Tools for Assessment of the Urban Forest and Tree Canopy

Tools for Assessment of the Urban Forest and Tree Canopy

Establishing a valuation of the resource…

What is i-Tree?

Inventory of Tree Resources: Economic and Environmental

Examining the Structure, Function and Value of Urban Forests

i-Tree: Urban Forest Inventory Analysis Tool


i-Tree
TM

i-Tree: a suite of software tools to assess urban vegetation and their ecosystem services and values

i-Tree Eco

i-Tree Landscape

i-Tree Storm

i-Tree Species

i-Tree Hydro

i-Tree Canopy

i-Tree Planting

i-Tree MyTree

i-Tree Database

USDA Forest Service

DAVEY

The National Arbor Day Foundation

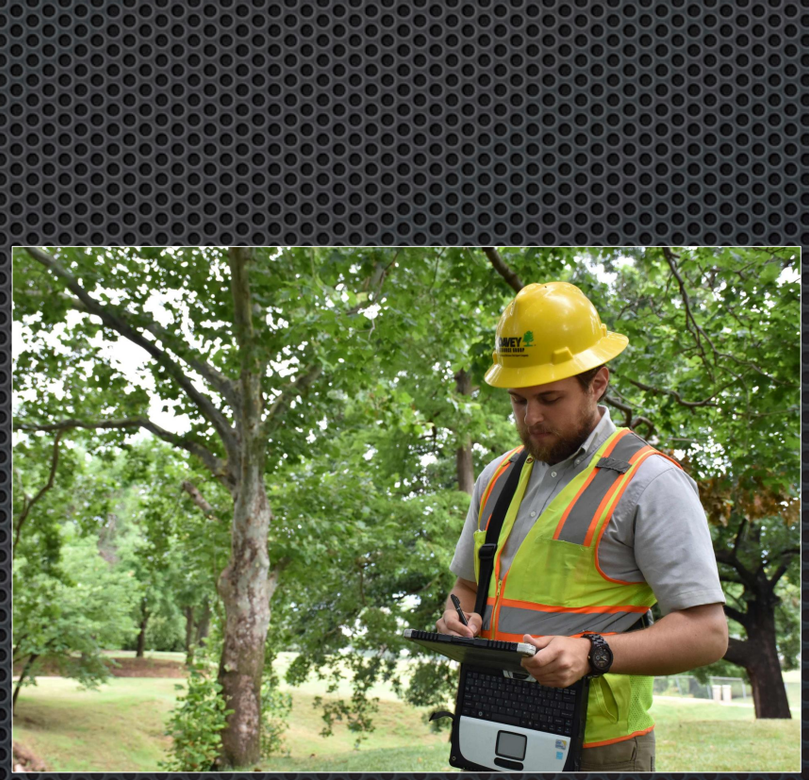
Society of Municipal Arborists

ISA International Society of Arboriculture

Casey Trees Washington DC

Research Science and Data Development

University Researchers



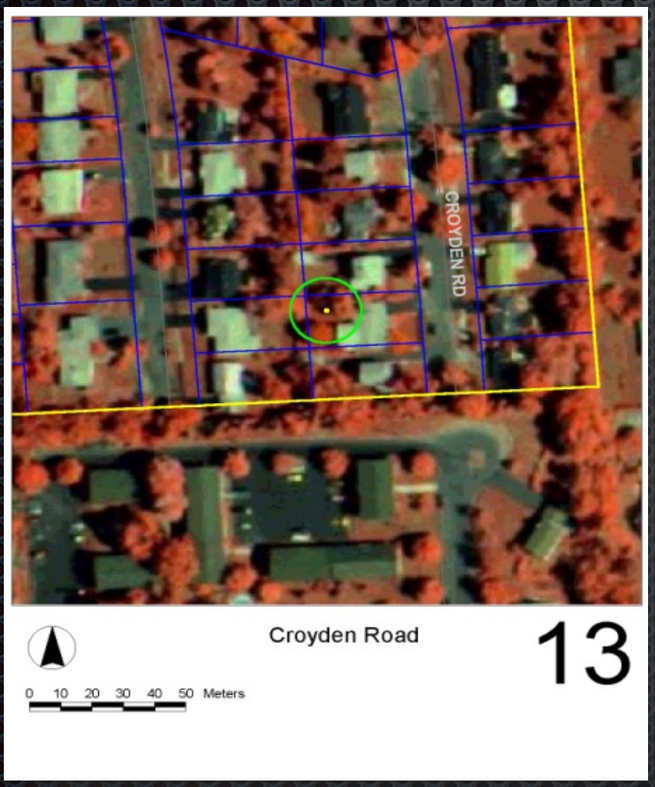
Commercial Practitioners

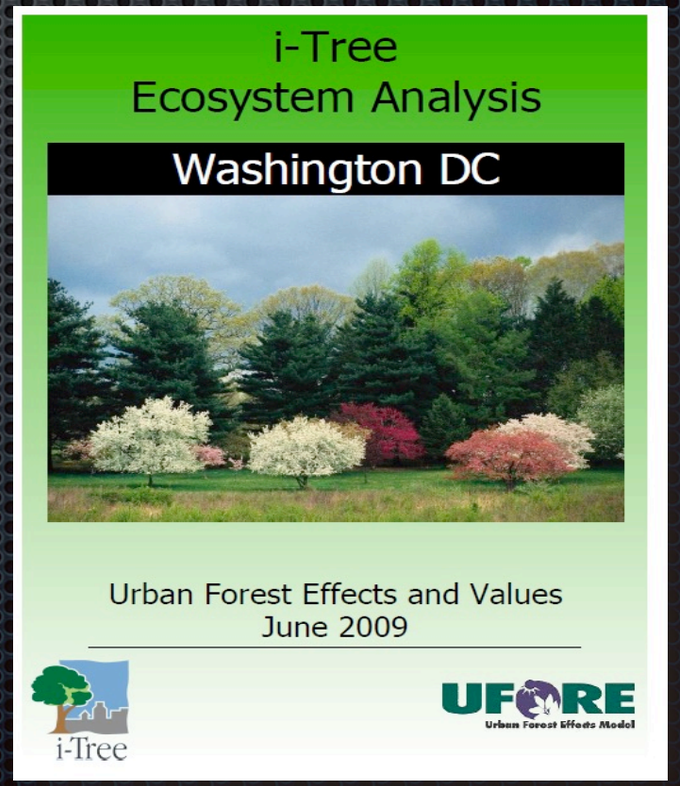
Citizen Scientists

Public-Private Partnership

Goals

- Simple and low-cost tools and methods to aid in urban forest planning and management
- Complete process – start to finish

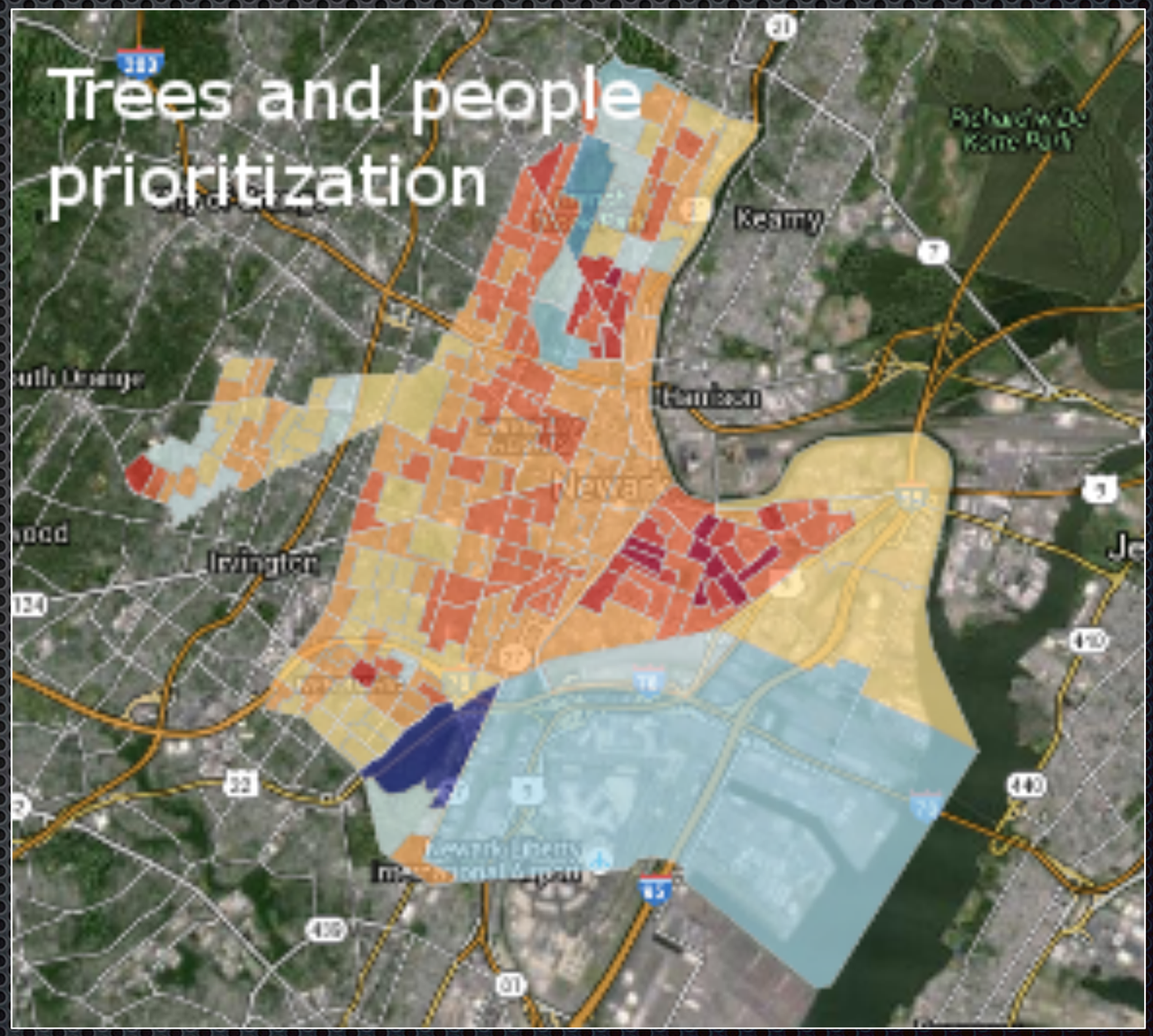




Assessing Tree Populations

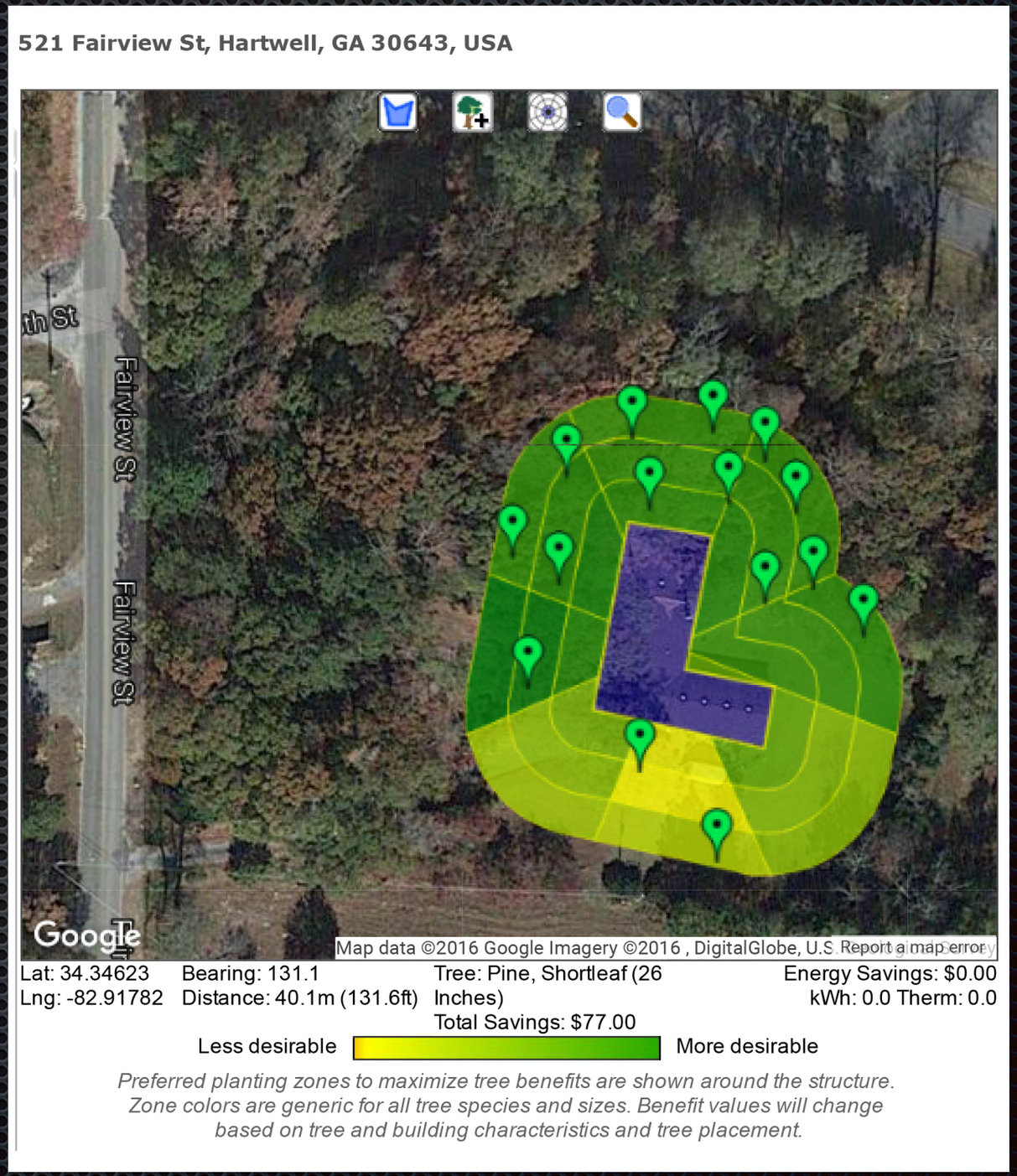
i-Tree assesses:

- **Structure**
- **Function**
  - Energy use
  - Air pollution
  - Carbon
  - VOC emissions
- **Value**



Assessing Tree Populations

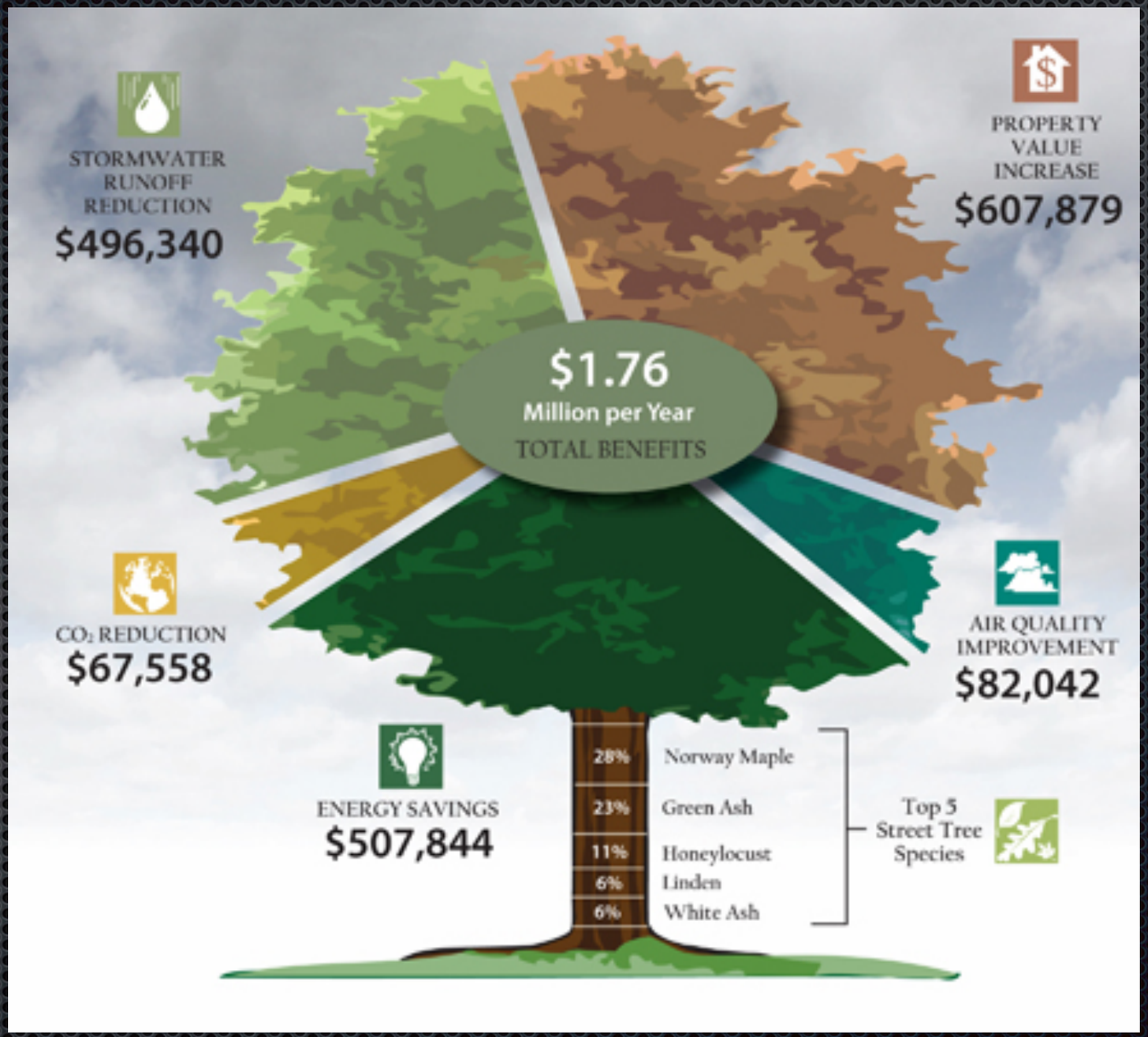
- Storm water management
- Pollution mitigation
- Energy conservation
- Carbon strategies
- Public health issues
- Addressing Climate change



Benefit-Based Approach

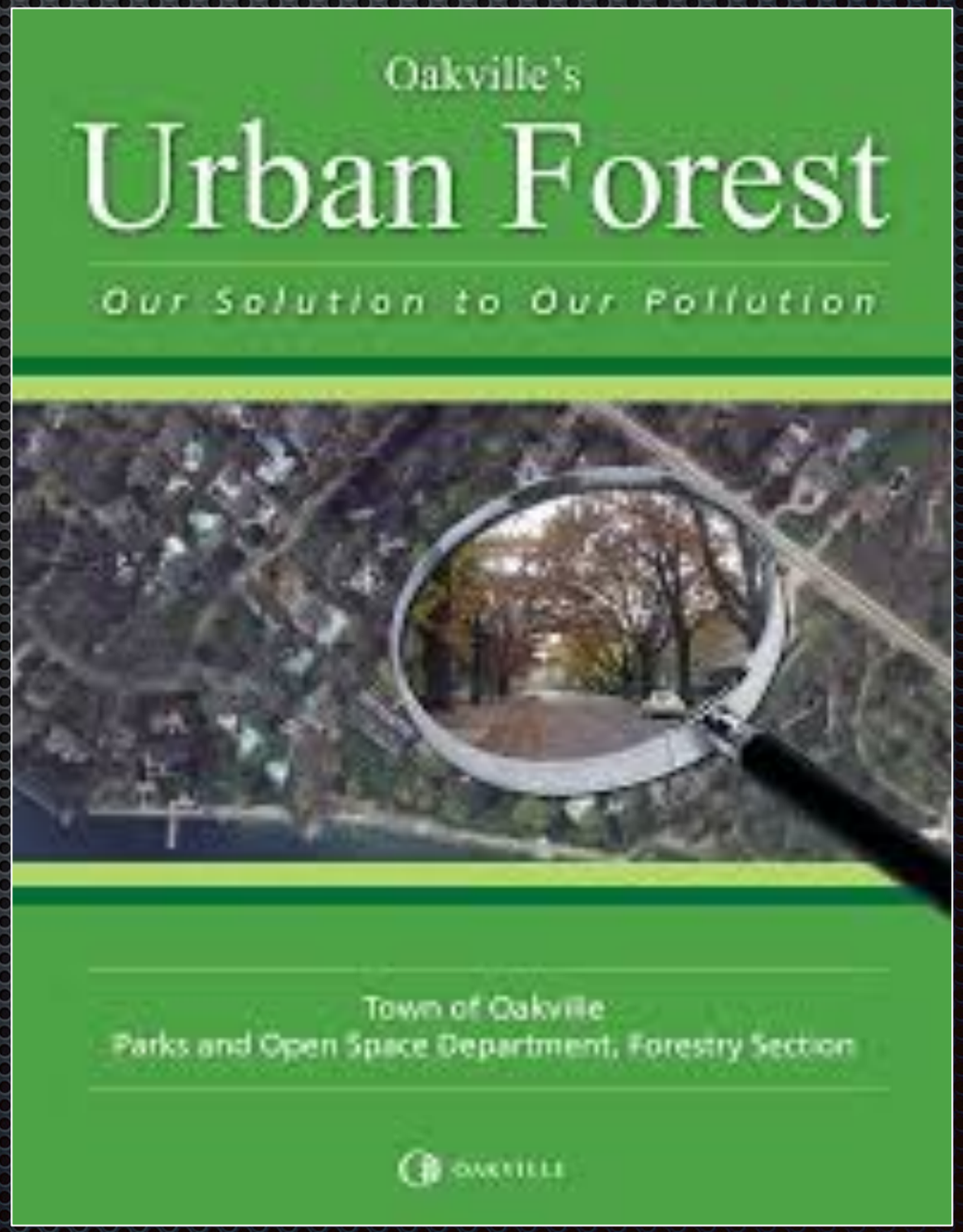
i-Tree Tools

Benefit-Based Approach



Using quantitative data to tell your story?

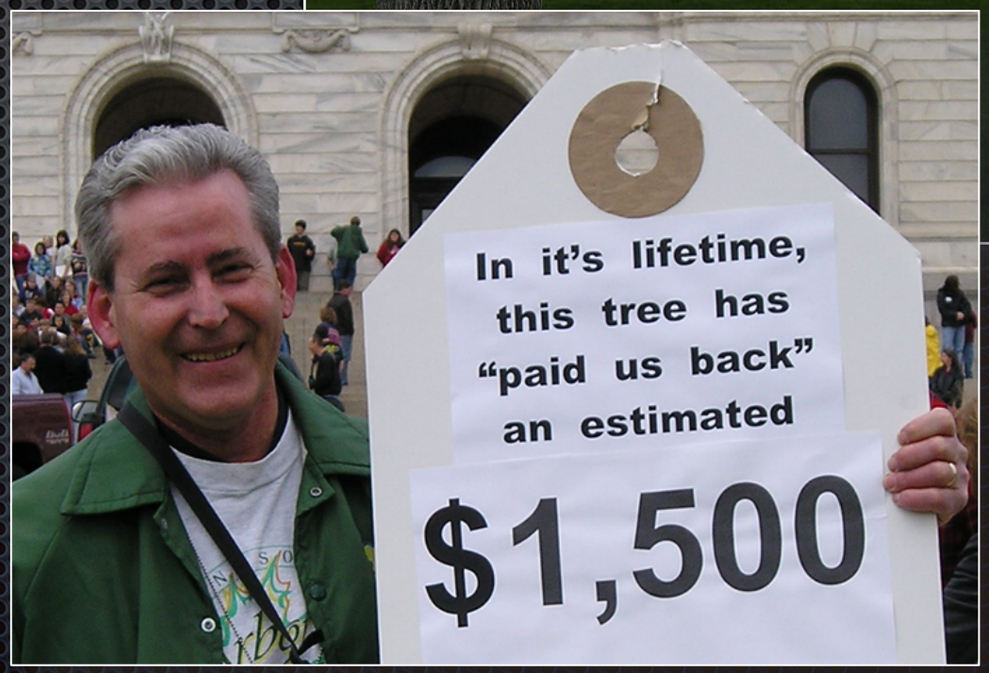
Using quantitative data to tell your story?



i-Tree: Demonstrating That Trees Pay Us Back!

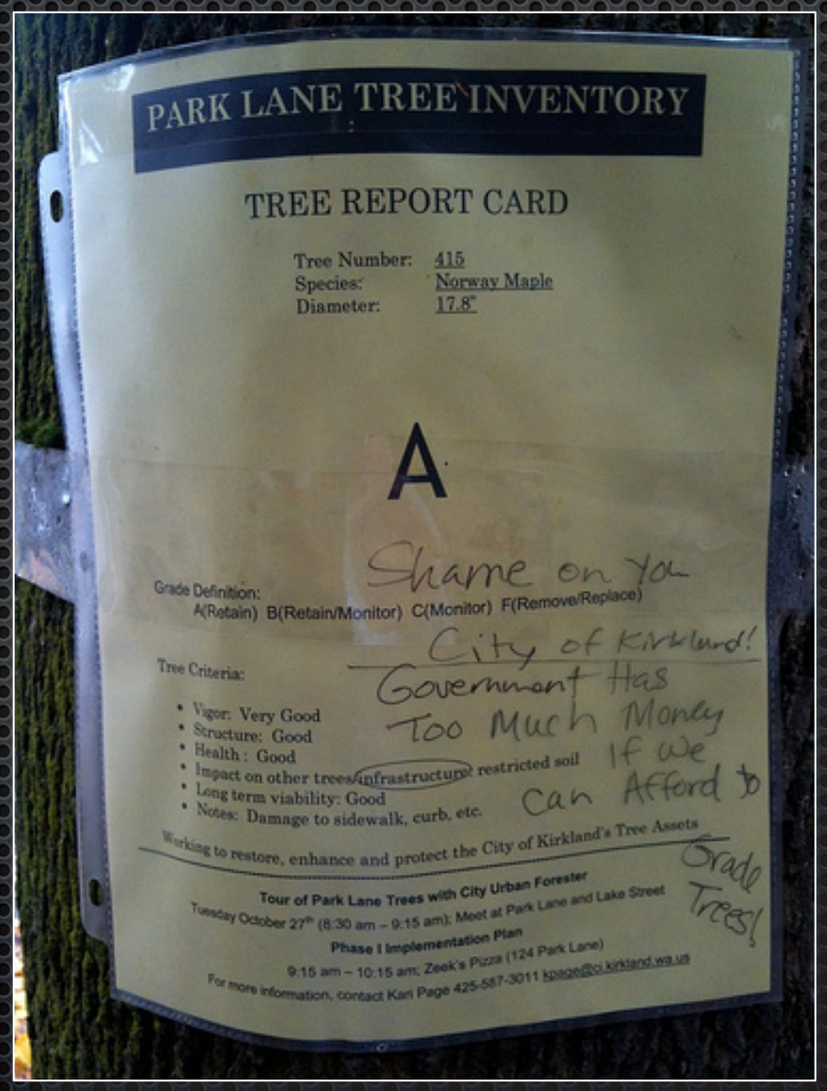
Street Tree Benefits in Minneapolis:

- $6.8 million in energy savings
- $9.1 million in reduced storm water runoff
- $7.1 million increase in property value
- $1 million improvements to air quality

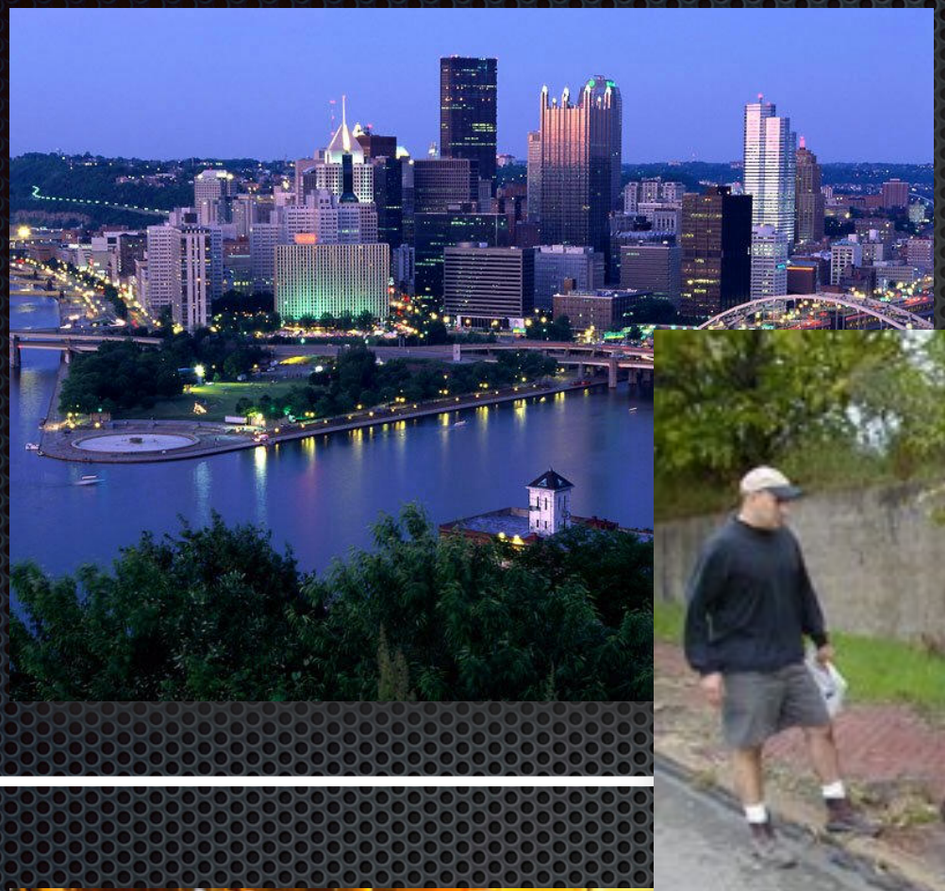


How do we communicate the value of community trees?

- *"Shame on you City of Kirkland! Government has too much money if we can afford to grade trees!"*



Pittsburgh's Urban Forest



$2.94 in benefits for every $1 spent

City of Pittsburgh, Pennsylvania
Municipal Forest Resource Analysis

April, 2008

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**

Milwaukee i-Tree Eco Assessment

EAB Structural Impacts:

- 17.4% Canopy Loss
- $221 Million structural damage (citywide)

EAB Functional Impacts:

- $243,785 less pollutant removal
- $138,000 less energy savings (cooling costs)
- $2.6 million reduction in storm water benefits (1996 study)

Milwaukee i-Tree Eco Assessment

The Foundation: Local Data

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

Conserving Energy

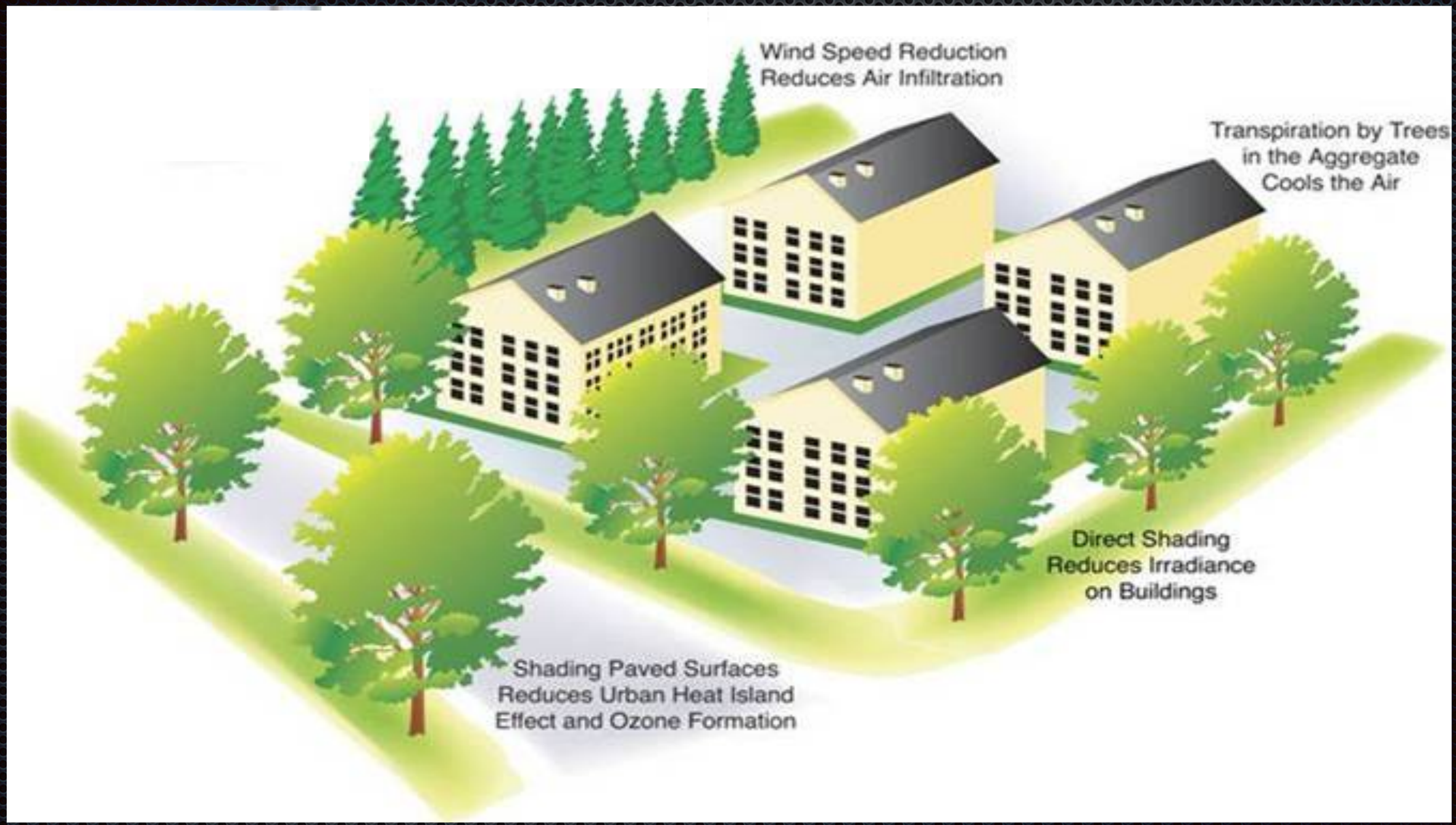


Image courtesy of the Center for Urban Forest Research

Improving Air Quality

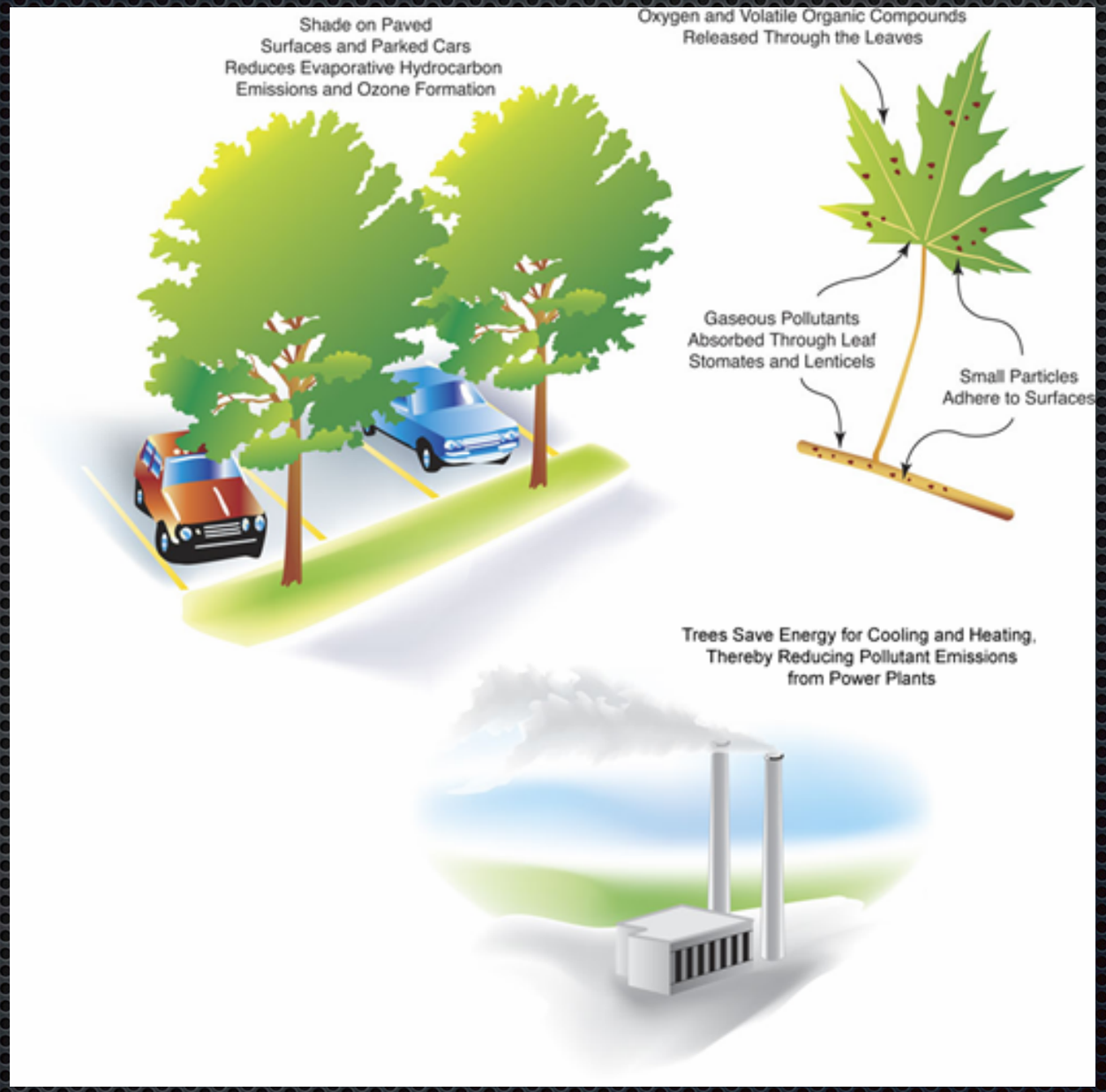


Image courtesy of the Center for Urban Forest Research

Reducing Atmospheric Carbon Dioxide

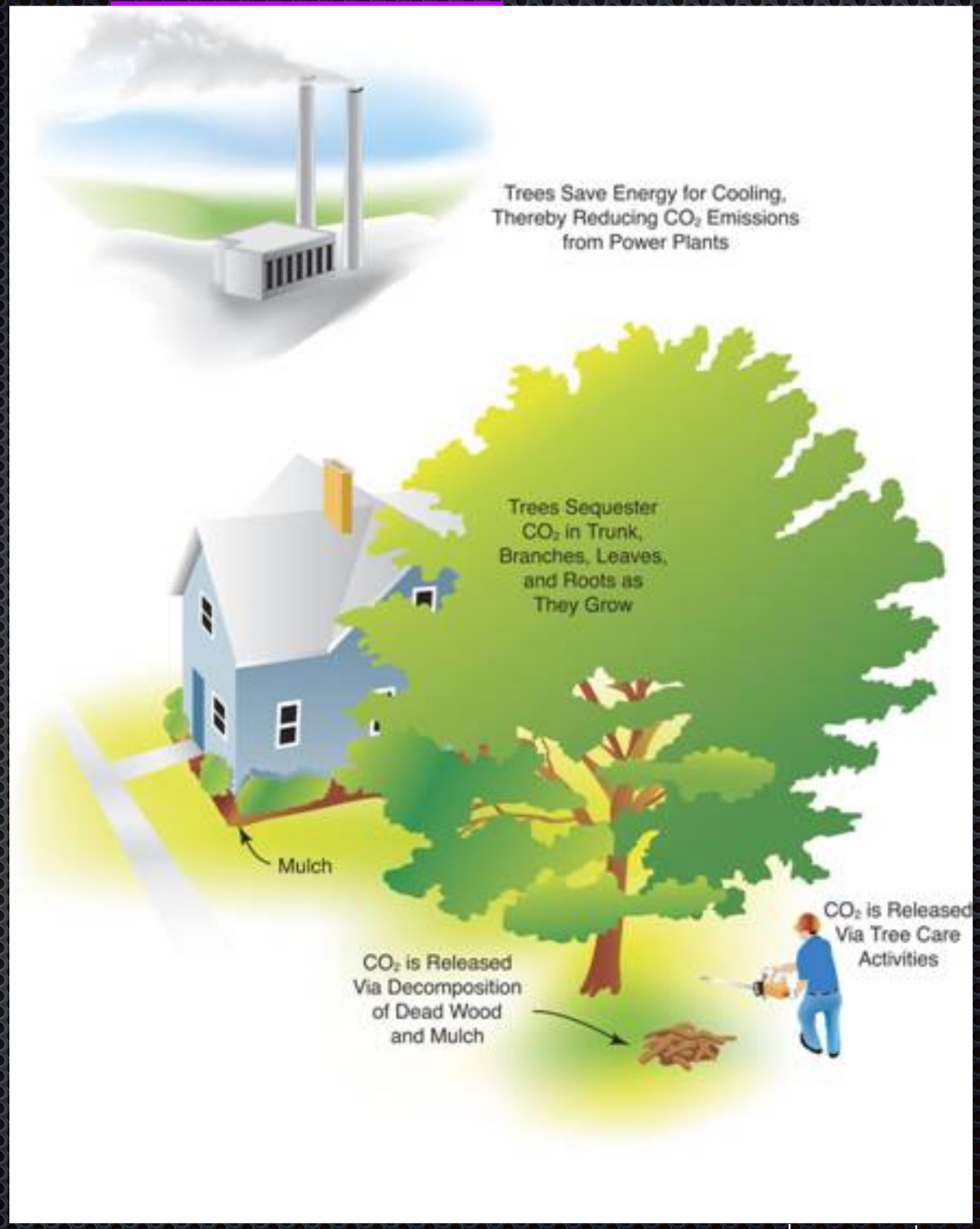


Image courtesy of the Center for Urban Forest Research

Reducing Stormwater Runoff

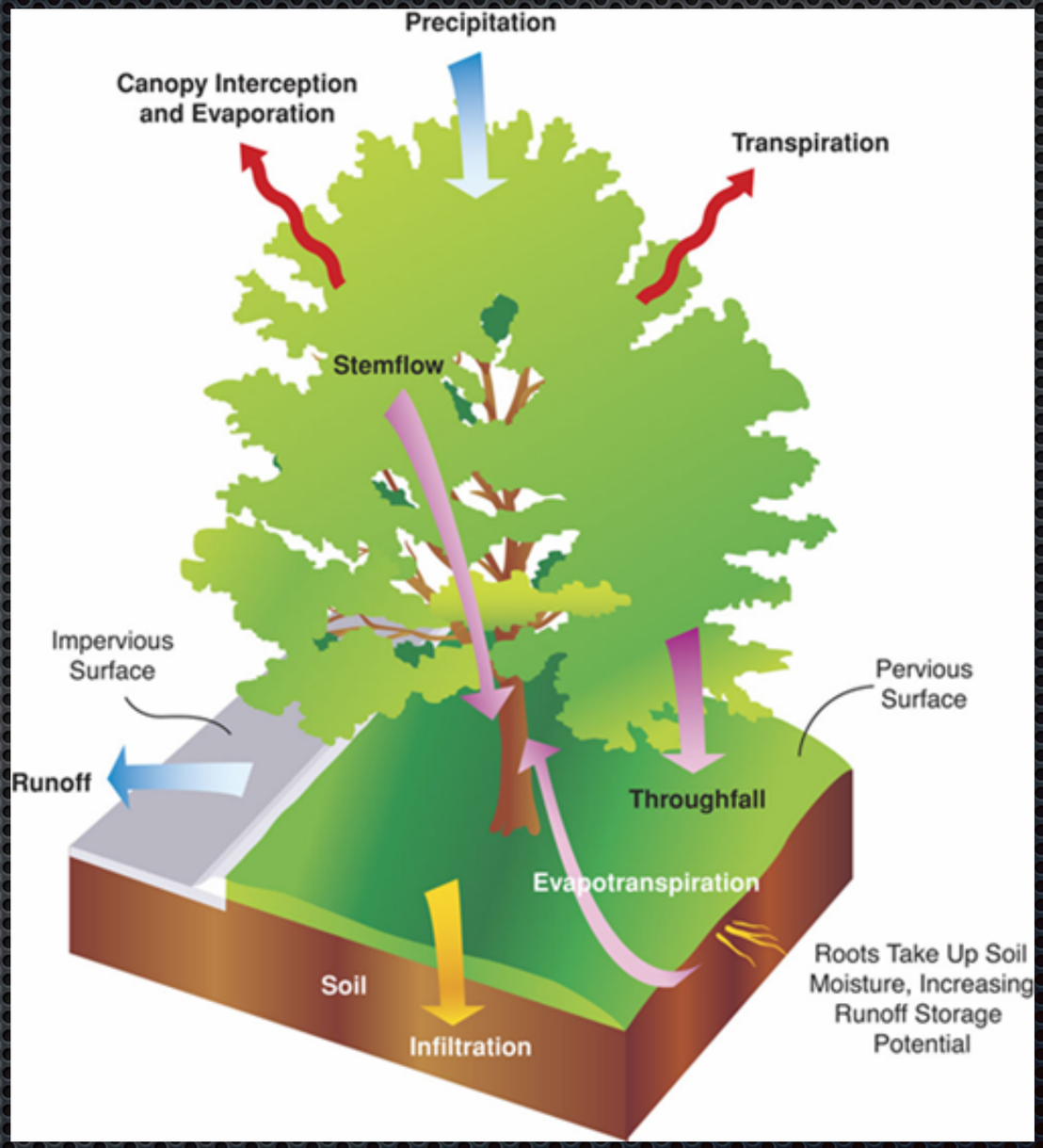


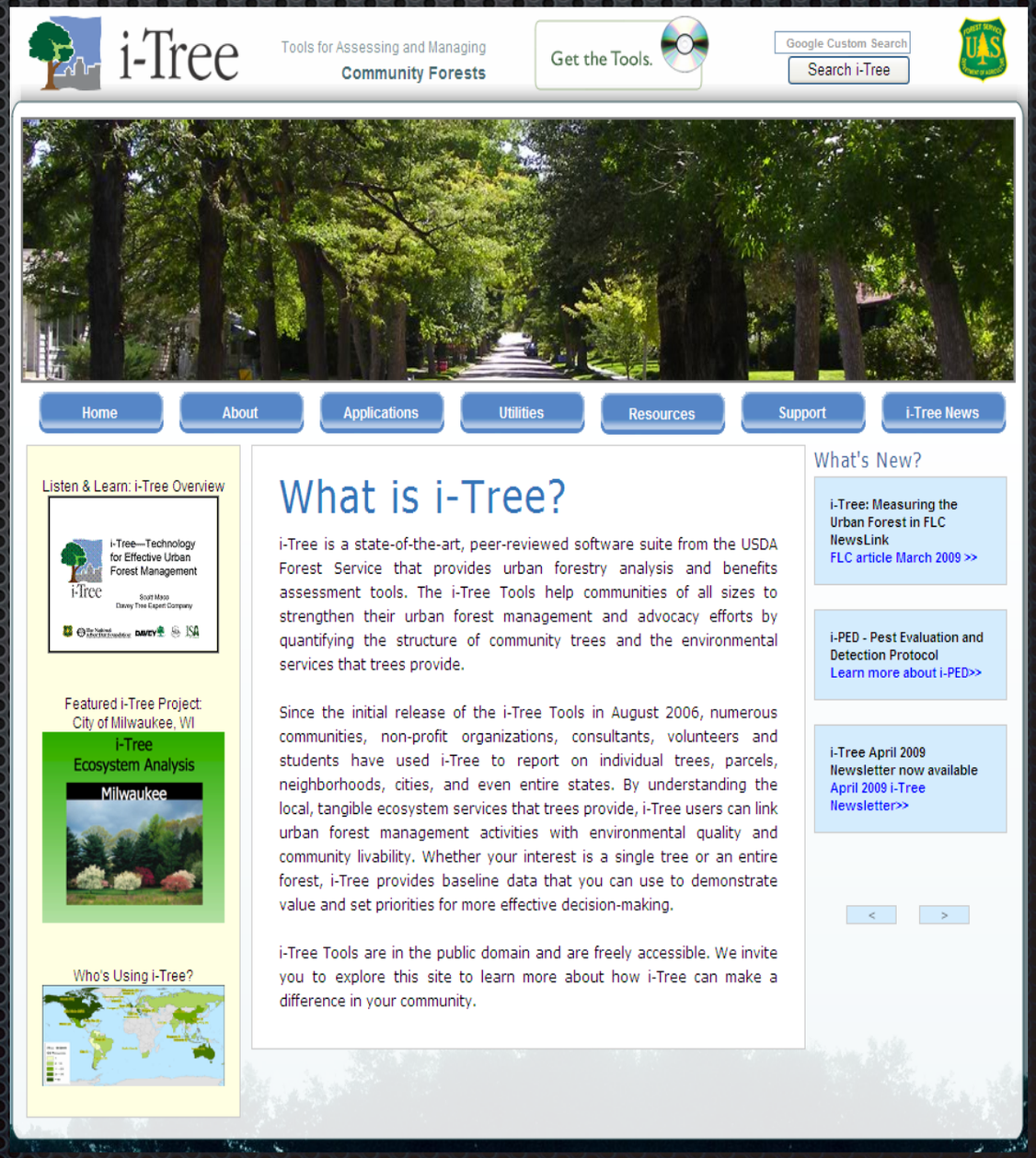
Image courtesy of the Center for Urban Forest Research

i-Tree is…

Development, Dissemination, Support, & Refinement

- Credible, USDA FS peer-reviewed tools
- Public Domain Software
- Accessible
- Technical Support

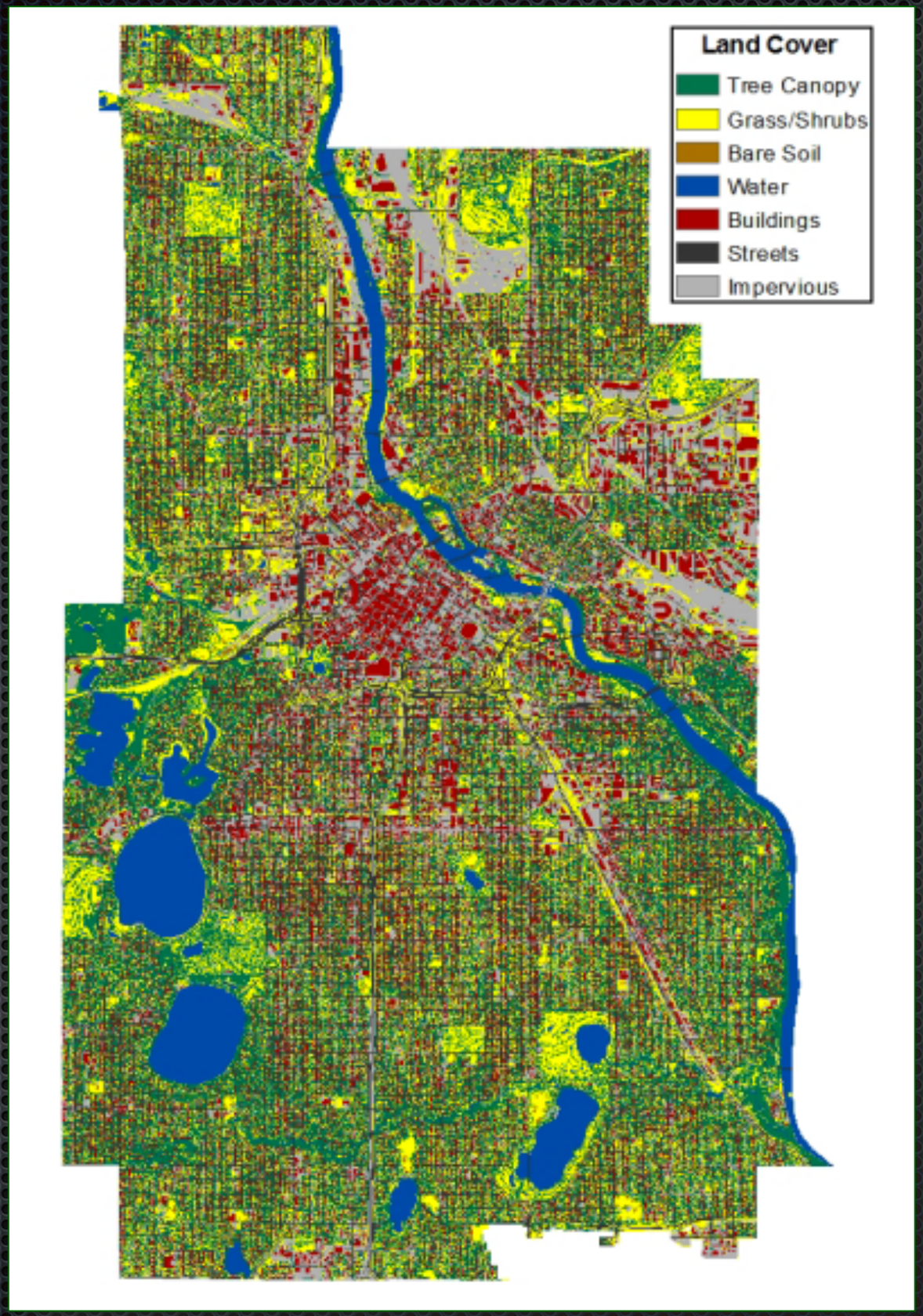
"Putting USFS Urban Forest science into the hands of users"



Urban Tree Canopy (UTC)

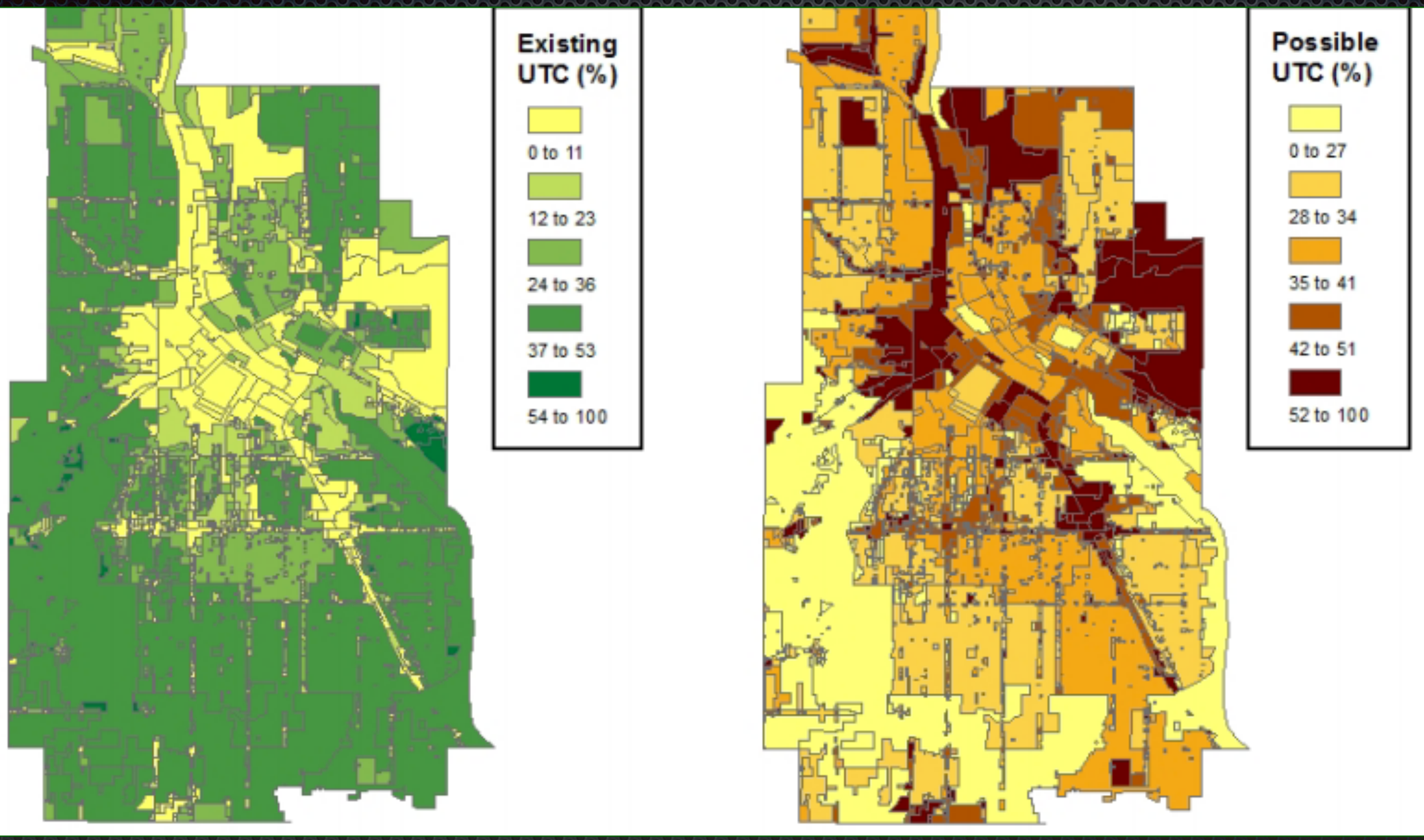
Assessment and Analysis

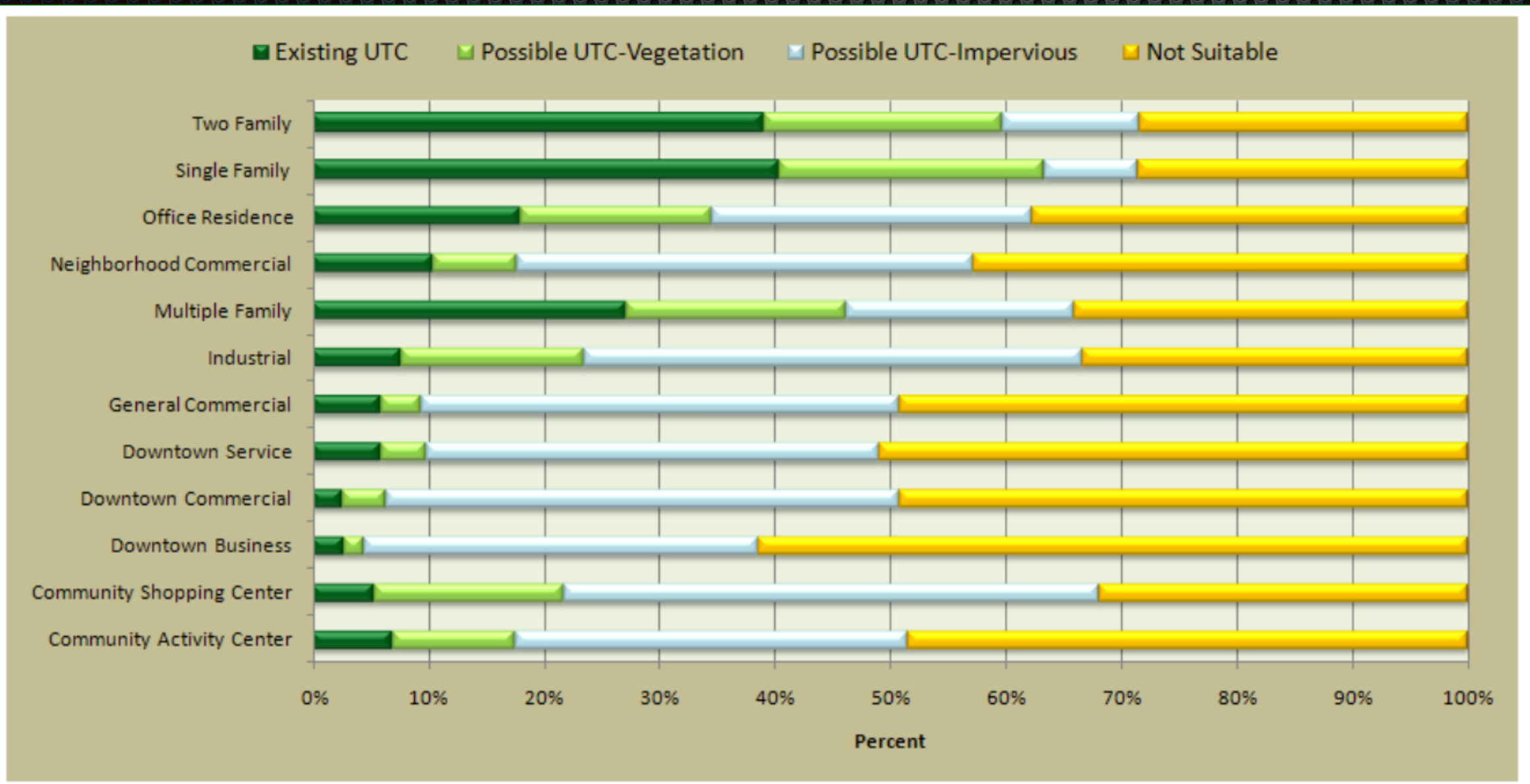
Minneapolis, MN


Land Cover
Tree Canopy
Grass/Shrubs
Bare Soil
Water
Buildings
Streets
Impervious


Existing UTC by Parcel
Existing UTC (%)
0 to 20
21 to 40
41 to 60
61 to 80
81 to 100


Possible UTC by Parcel
Possible UTC (%)
0 to 20
21 to 40
41 to 60
61 to 80
81 to 100


Existing UTC (%)
0 to 11
12 to 23
24 to 36
37 to 53
54 to 100
Possible UTC (%)
0 to 27
28 to 34
35 to 41
42 to 51
52 to 100


Existing UTC
Possible UTC-Vegetation
Possible UTC-Impervious
Not Suitable
Two Family
Single Family
Office Residence
Neighborhood Commercial
Multiple Family
Industrial
General Commercial
Downtown Service
Downtown Commercial
Downtown Business
Community Shopping Center
Community Activity Center
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent

Vancouver, WA

Vancouver 2011 Urban Tree Canopy Assessment Report

Acknowledgements

Vancouver City Council

Timothy D. Leavitt, Mayor
Jeanne Harris
Jeanne E. Stewart
Larry J. Smith
Pat Campbell
Jack Burkman
Bart Hansen

Vancouver Urban Forestry Commission

James Wasden, Chair
Terry Toland, Vice-Chair
Phil Kimery
Tim Carper
Alexander Chabert
Craig Smith
Anne Friesz, Parks and Recreation Advisory Commission Liaison

City of Vancouver

Eric Holmes, City Manager
Brian Carlson, Public Works Director
Rich McConaghy, Environmental Resources Manager
Charles Ray, Urban Forester
Annette Griffy, Surface Water Engineering Manager
Dorie Sutton, Senior Engineering Technician
Eugene Durshpek, Asset Management/Engineering GIS Supervisor
Merek Strand, Senior Engineering Technician
Jessica Antoine, Urban Forestry Outreach Coordinator
Nick Redmond, Urban Forestry Specialist

Prepared by:

AMEC Environment and Infrastructure

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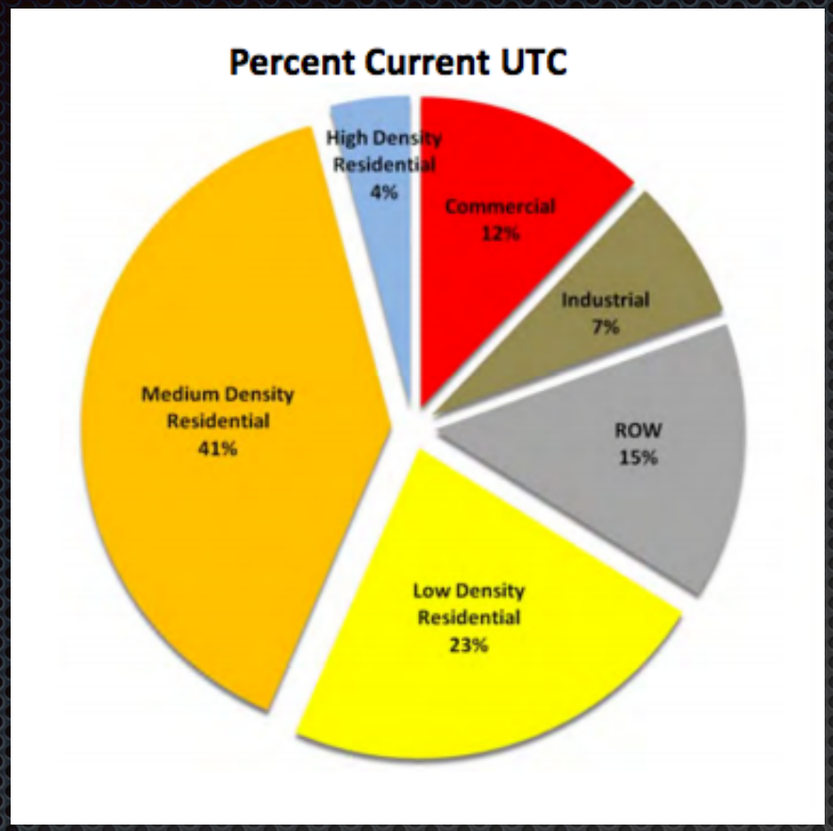
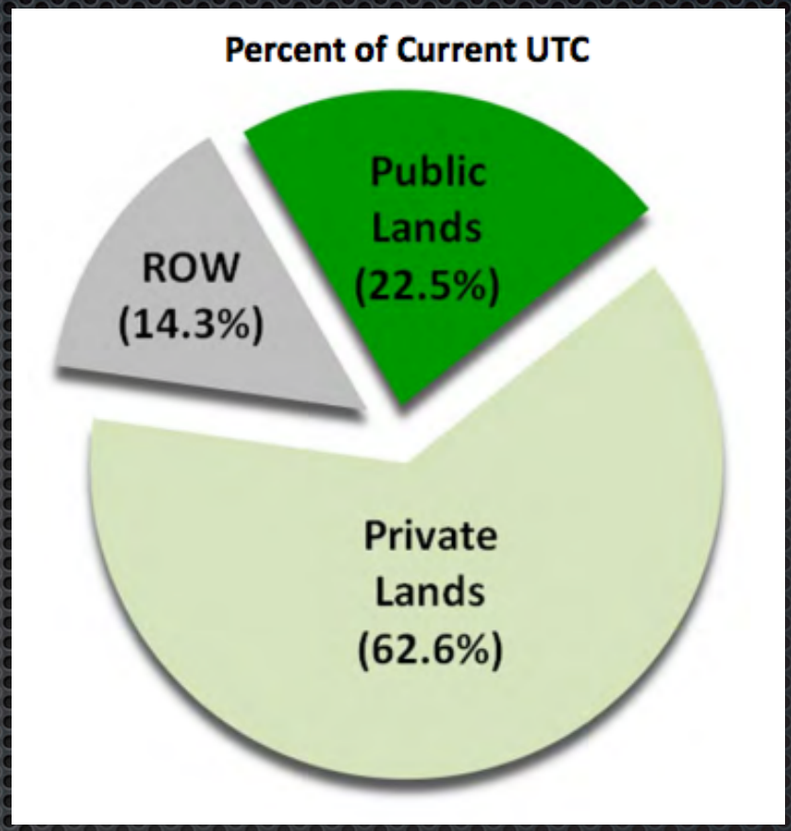
Kim Soulliere, GIS Technician

Funding assistance for this assessment was provided by the USDA Forest Service and the Washington State Department of Natural Resources Urban and Community Forestry Programs. The USDA is an equal opportunity provider and employer.

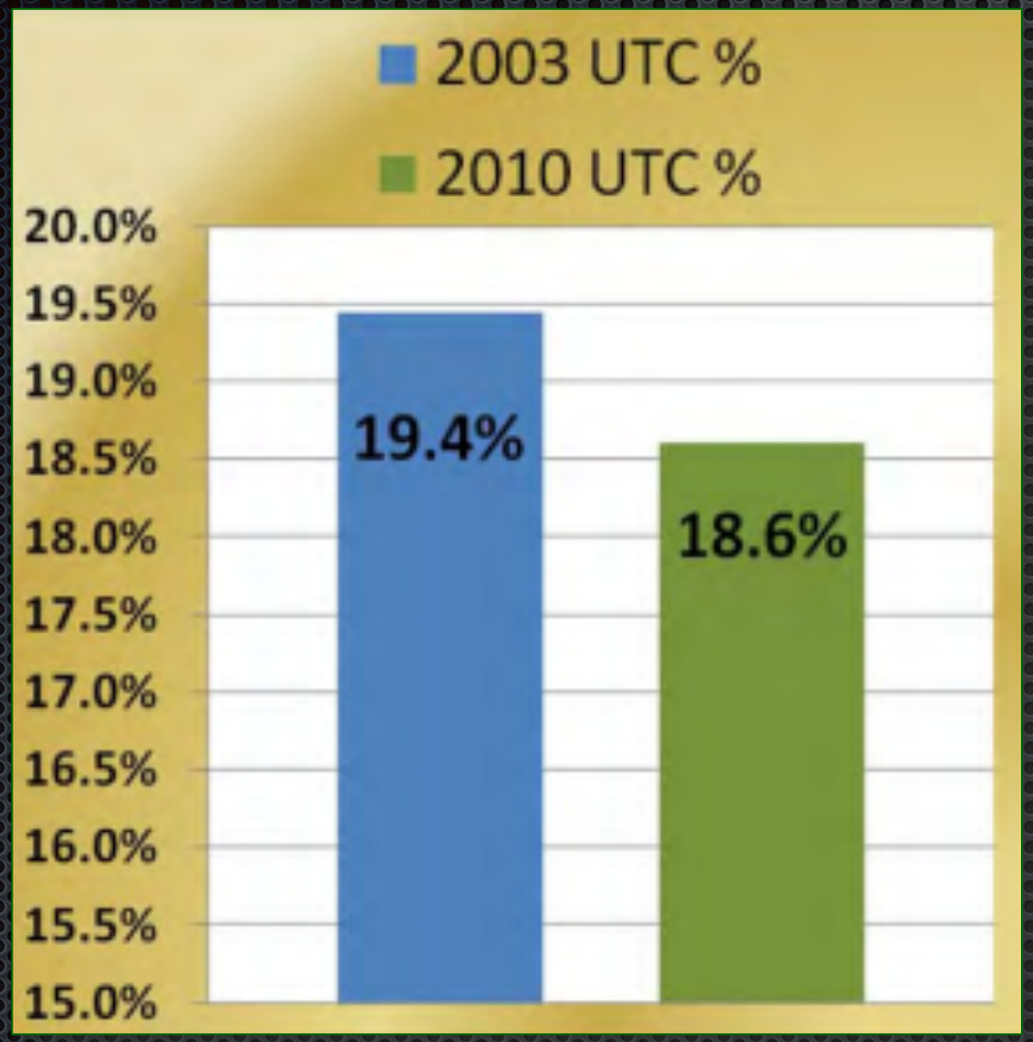
i-Tree VUE / Landscape





	Total Acres	Trees Acres	Trees %	Veg/ Non-Forest Acres	Veg/ Non-Forest %	Impervious Acres	Impervious %	Water Acres	Water %	Soil/Dry Veg Acres	Soil/Dry Veg %
City of Vancouver	32,436	5,579	17%	9,952	31%	12,370	38%	2,437	8%	2,097.00	6%

Urban Tree Canopy Changes



253

Acres of forest lost mainly due to development between 2003 and 2010 in Vancouver (4.3% of total 2003 tree canopy)

I-Tree Software Tools

Getting started with inventory and analysis in your community

i-Tree Design

i-Tree Design

Start Over
Return to Setup

i-Tree

Tools for Assessing and Managing
Community Forests

Get the Tools.

Google Custom Search | Search
Username | Password | Login | Register
Forgot Username or Password?

Home | About | Applications | Utilities | Resources | Support | News

i-Tree Benefit Calculator

1500 N Mantua St, Kent, OH 44240, USA

Home

Get started with three easy steps:

1. **Draw your house or building and locate your tree:**
   Use the drawing tool to outline your house or building. Be sure to outline "conditioned" living area only; garages and other unheated or cooled spaces should not be included. Use the tree tool to locate your tree; place the marker as close to the base (or center) of the tree as possible. Planting on the East and West sides of your house will save you money on your summer cooling bills.

   You may find it easier to outline the building and place your tree by zooming in.

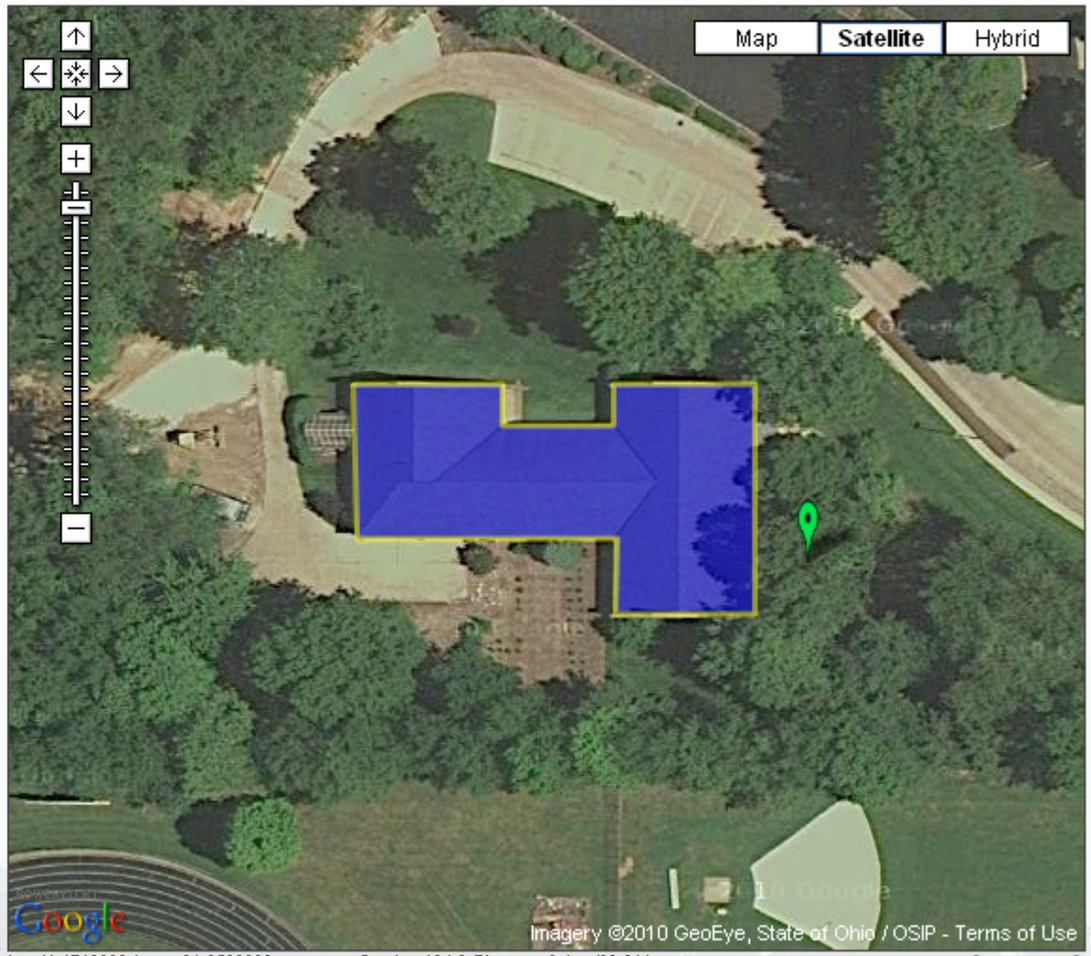
2. **Indicate when your house or building was built:** 1950-1980

3. **Enter your tree's information:**
   Oak, Northern pin
   If you're looking for a Willow Oak it's listed as "Oak, Willow". If your tree isn't listed, use the general "Other" listings.

   21 Enter the diameter of the tree; how wide is the trunk of your tree at about 4.5 feet above the ground?

   Good Finally, enter what type of condition best describes your tree.

Calculate Benefits



Lat:41.1713839 Long:-81.3589928 Bearing:104.3,Distance:6.1m (20.0ft) Vertices:12; Area:961.2 m^2 (10346.5 ft^2)

i-Tree Canopy

i-Tree Canopy

i-Tree Canopy - Windows Internet Explorer provided by USDA Forest Service

http://dev.itreetools.org/canopy/index.php

File Edit View Favorites Tools Help

Favorites | Get More Add-ons

i-Tree Canopy

Page Safety Tools

i-Tree

Tools for Assessing and Managing **Community Forests**

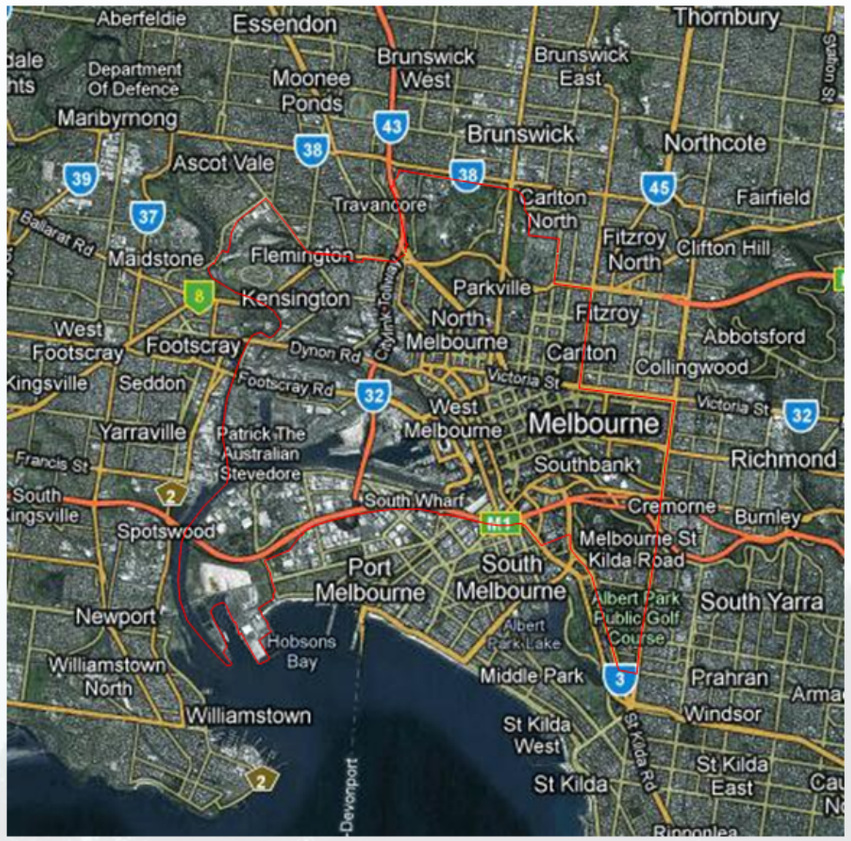
Get the Tools.

Google Custom Search | Search

Username | Password | Login

Forgot Username or Password? | Register

Home | About | Applications | Utilities | Resources | Support | News



- *With i-Tree Canopy, you can load a polygon boundary in ESRI Shapefile format on the map above and conduct a cover assessment for a project area.*
- *Collect data on your own cover classes of interest.*
- *500-1000 survey points are suggested; the more points you complete, the better your*

i-Tree Canopy

Get started in three easy steps!

One Browse to your project area boundary GIS file. The file must be in ESRI Shapefileformat and in lat/long coordinates.

Load ESRI Shapefile ? **Or** Load Sample Project ›

Two Configure the cover classes for your survey.

Configure Survey › ?

Three Begin i-Tree Canopy Survey › ?

Been here before?

Already started an i-Tree Canopy survey? Load it here and resume your work.

Load Previous i-Tree Canopy Survey ?

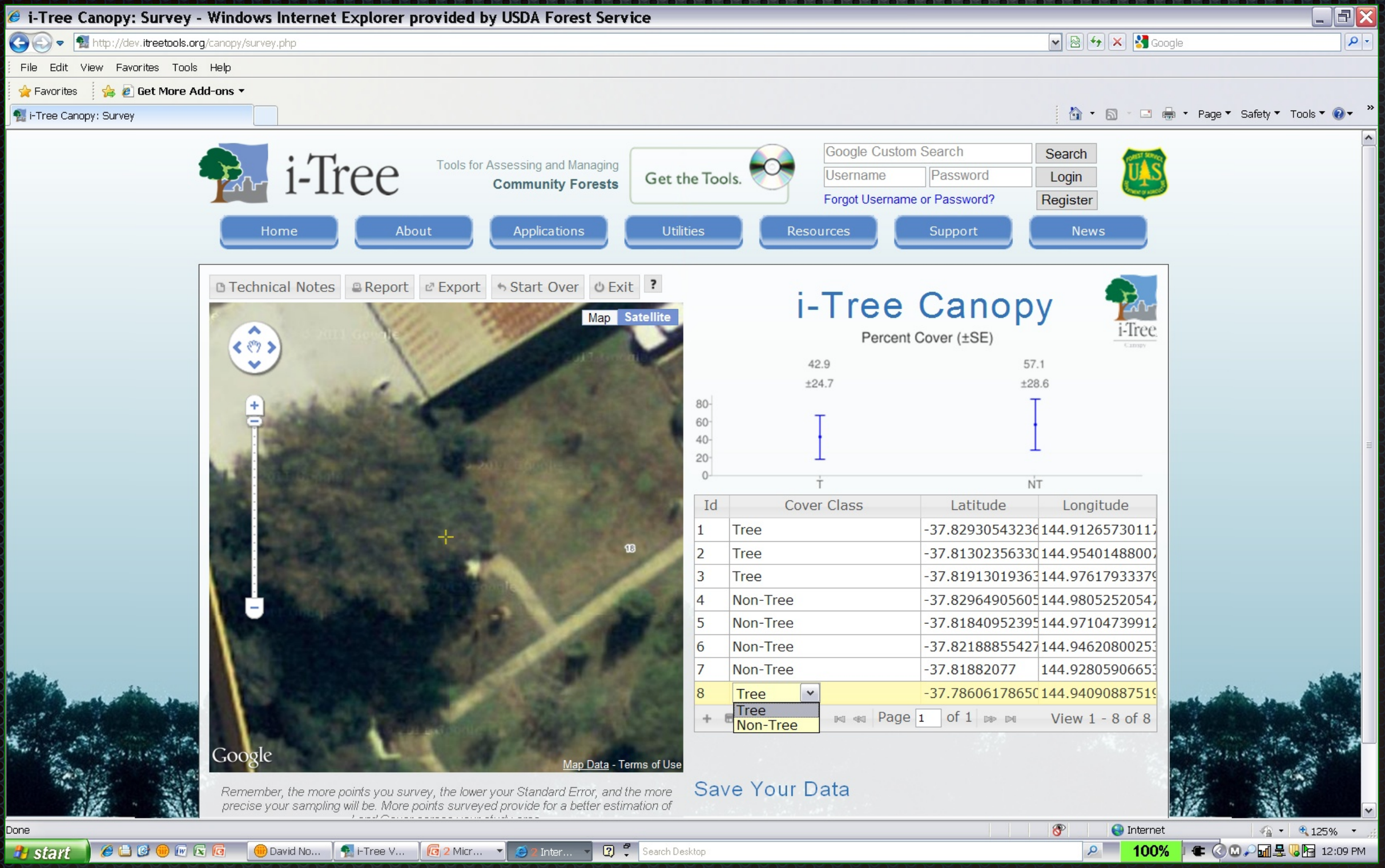
More Information!

Technical Notes

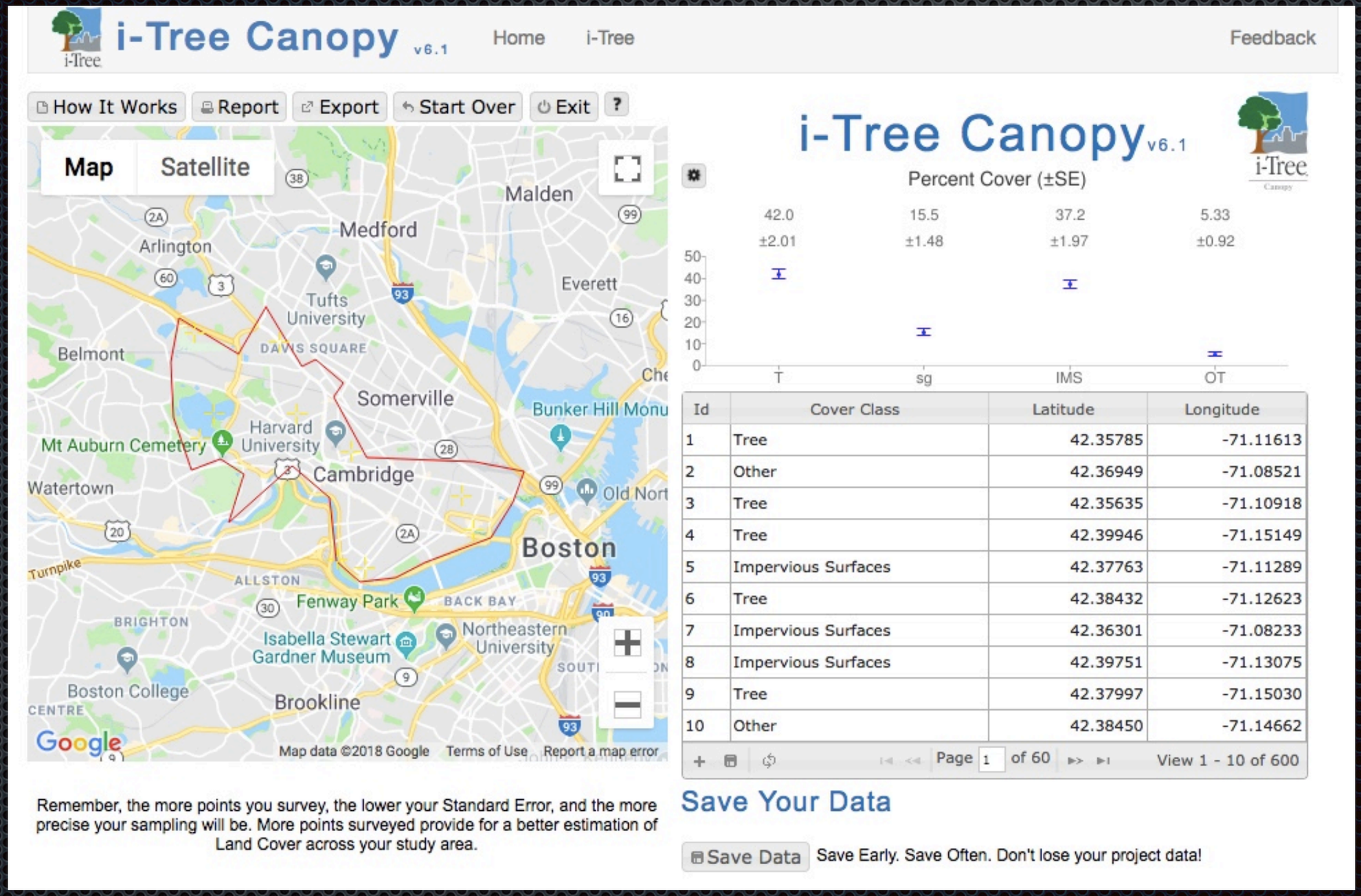
Done | Internet | 125%

start | David No... | i-Tree V... | 2 Micr... | 2 Inter... | Search Desktop | 100% | 12:04 PM

Classify random points



Classify random points



File Edit View History Bookmarks Tools Help

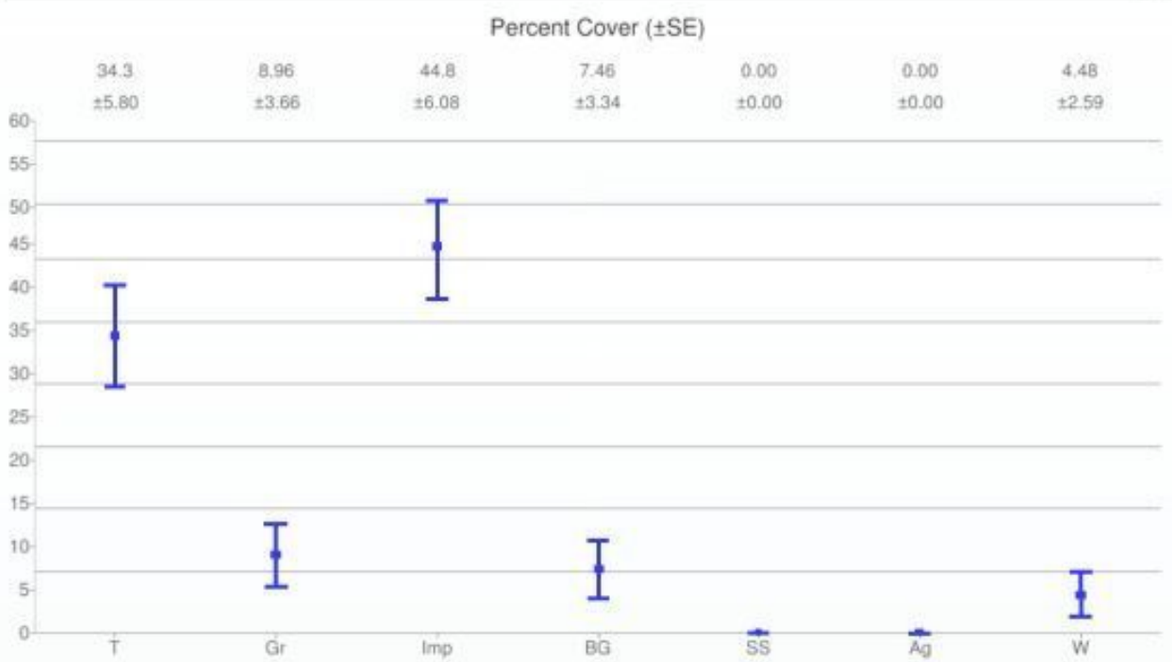
http://www.itreetools.org/canopy/report.php

Google

i-Tree Canopy: Cover Report

i-Tree Canopy

Cover Report



Cover Class	Description	Abbr.	% Cover
Tree	tree, non-shrub	T	34.3 ±5.80
Grass	herbaceous ground cover	Gr	8.96 ±3.66
Impervious	artificial surfaces	Imp	44.8 ±6.08
Bare Ground	soil or barren	BG	7.46 ±3.34
Shrub/Scrub	non tree woody land cover	SS	0.00 ±0.00
Agriculture	crops, pasture, hay	Ag	0.00 ±0.00
Water	lakes, streams	W	4.48 ±2.59
Other	other land cover	O	0.00 ±0.00

About i-Tree Canopy

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

Limitations of i-Tree Canopy

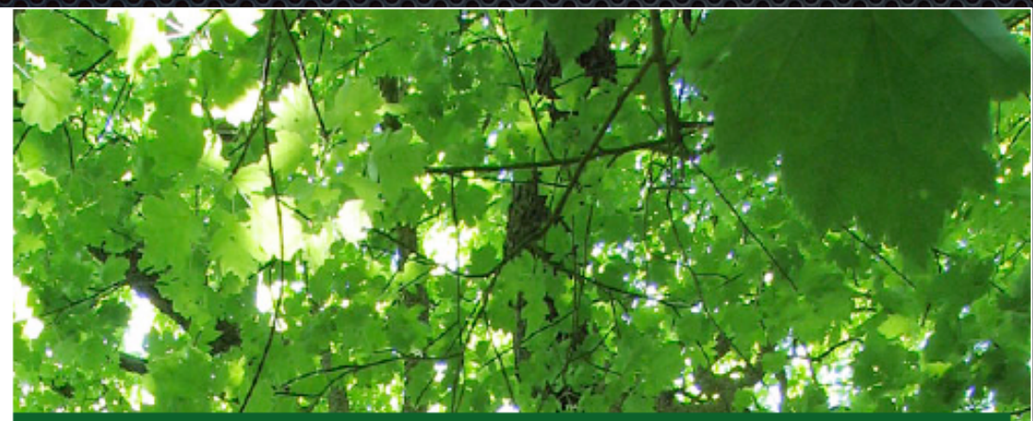
The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard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

A Cooperative Initiative Between:

DAVEY Arbor Day Foundation sma ISA Casey Trees

‹ Back

i-Tree
Canopy



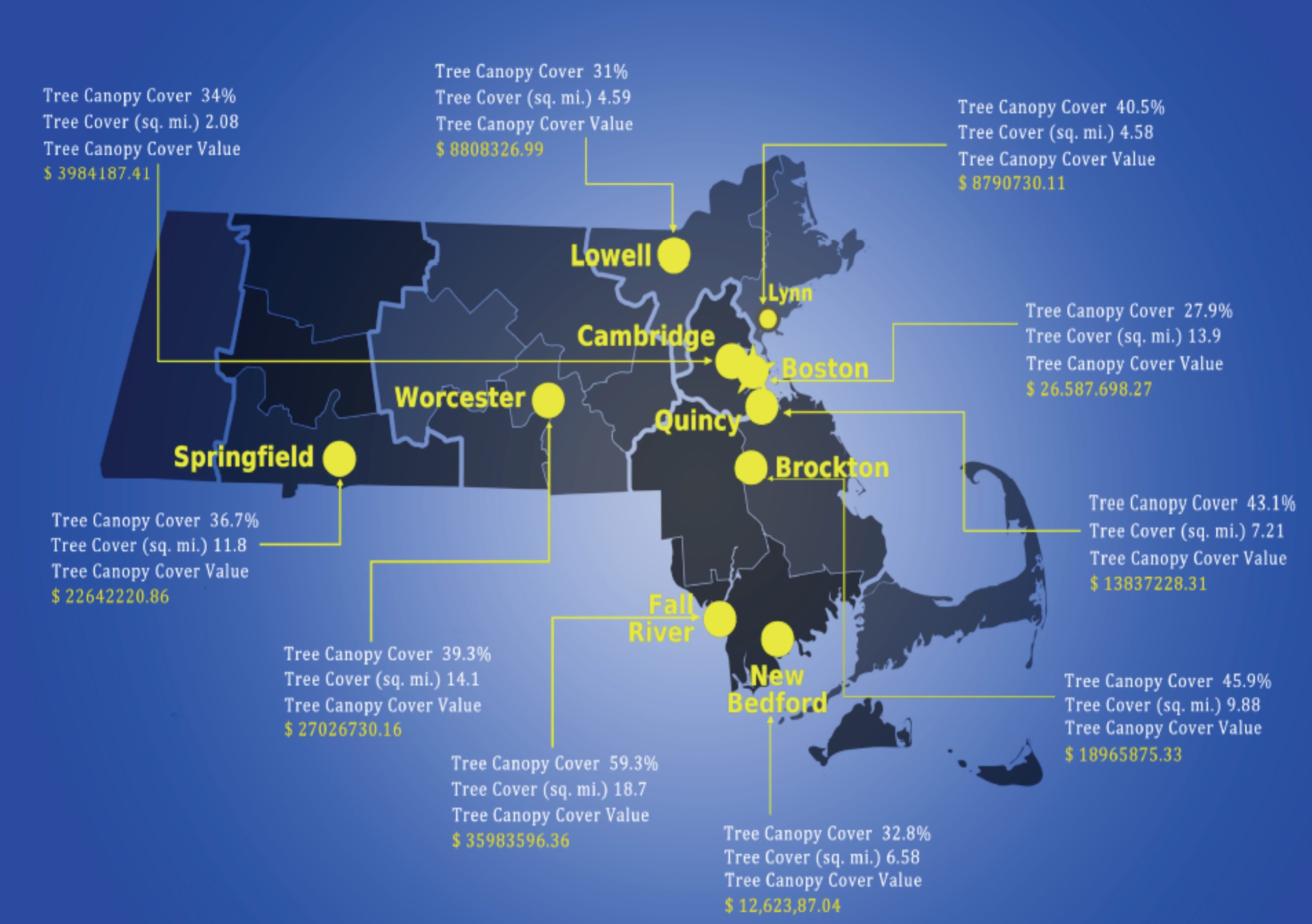
Urban Tree Canopy (UTC) Assessment for Massachusetts 10 Largest Communities

September 2014

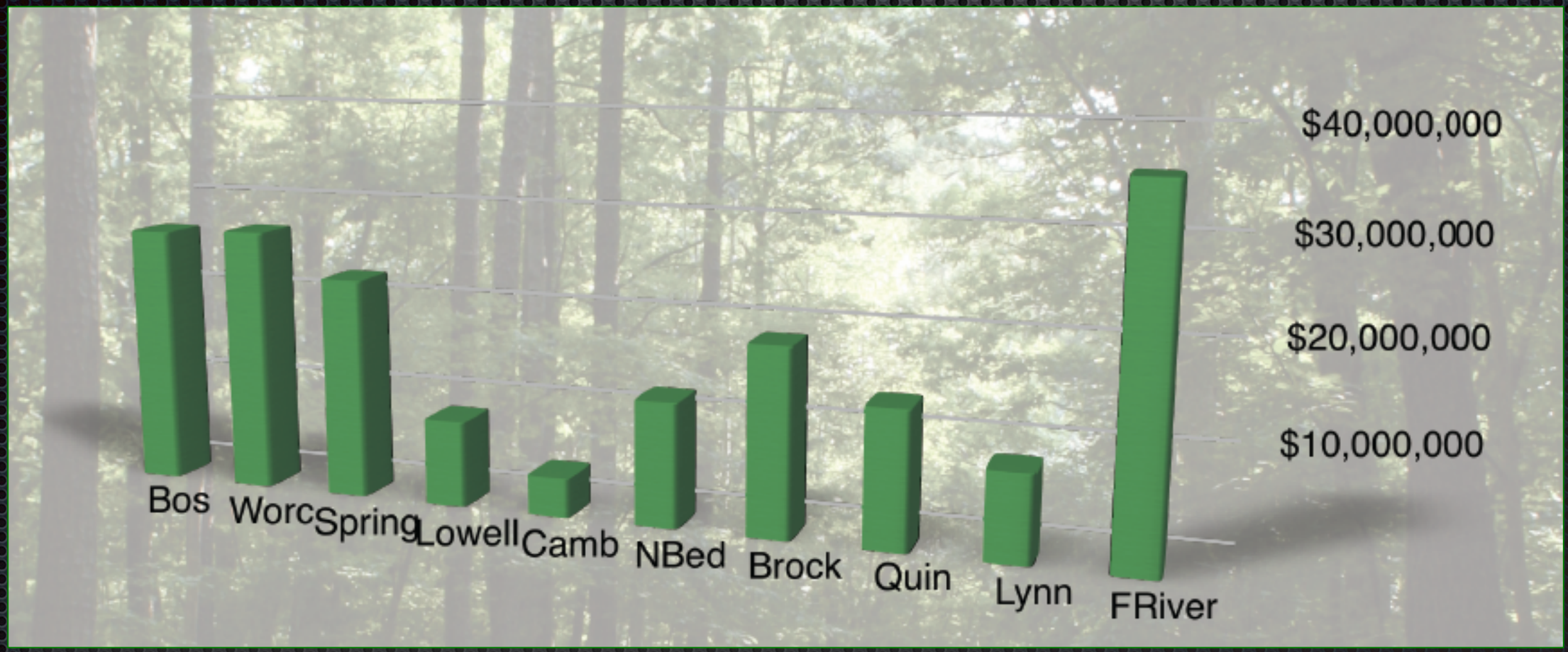
Boston
Worcester
Springfield
Lowell
Cambridge
New Bedford
Brockton
Quincy
Lynn
Fall River

Prepared using i-Tree Canopy, a state –of-the-art analysis tool, developed by the US Forest Service and its key research partners.


Lowell
Lynn
Cambridge
Boston
Quincy
Worcester
Springfield
Brockton
Fall River
New Bedford
Massachusetts Ten Largest Communities by Population


Tree Canopy Cover 34%
Tree Cover (sq. mi.) 2.08
Tree Canopy Cover Value
$ 3984187.41
Tree Canopy Cover 31%
Tree Cover (sq. mi.) 4.59
Tree Canopy Cover Value
$ 8808326.99
Tree Canopy Cover 40.5%
Tree Cover (sq. mi.) 4.58
Tree Canopy Cover Value
$ 8790730.11
Lowell
Lynn
Cambridge
Boston
Tree Canopy Cover 27.9%
Tree Cover (sq. mi.) 13.9
Tree Canopy Cover Value
$ 26.587.698.27
Worcester
Quincy
Springfield
Brockton
Tree Canopy Cover 43.1%
Tree Cover (sq. mi.) 7.21
Tree Canopy Cover Value
$ 13837228.31
Tree Canopy Cover 36.7%
Tree Cover (sq. mi.) 11.8
Tree Canopy Cover Value
$ 22642220.86
Fall River
New Bedford
Tree Canopy Cover 39.3%
Tree Cover (sq. mi.) 14.1
Tree Canopy Cover Value
$ 27026730.16
Tree Canopy Cover 45.9%
Tree Cover (sq. mi.) 9.88
Tree Canopy Cover Value
$ 18965875.33
Tree Canopy Cover 59.3%
Tree Cover (sq. mi.) 18.7
Tree Canopy Cover Value
$ 35983596.36
Tree Canopy Cover 32.8%
Tree Cover (sq. mi.) 6.58
Tree Canopy Cover Value
$ 12,623,87.04

City Size Rank	City	% Canopy Cover	Report by Area (mi
1	Boston	27.9	13.9
2	Worcester	39.3	14.1
3	Springfield	36.7	11.8
4	Lowell	31	4.59
5	Cambridge	34	2.08
6	New Bedford	32.8	6.58
7	Brockton	45.9	9.88
8	Qunicy	43.1	7.21
9	Lynn	40.5	4.58
10	Fall River	59.3	18.7


$40,000,000
$30,000,000
$20,000,000
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Bos
Worc
Spring
Lowell
Camb
NBed
Brock
Quin
Lynn
FRiver

Boston Urban Forest Canopy Assessment

Tree Benefit Estimates

Abbr.	Benefit Description	Value	±SE	Amount	±SE
CO	Carbon Monoxide removed annually	$340.09	±19.34	4.01 T	±0.23
NO2	Nitrogen Dioxide removed annually	$585.50	±33.30	21.87 T	±1.24
O3	Ozone removed annually	$30,491.74	±1,734.09	217.84 T	±12.39
PM2.5	Particulate Matter less than 2.5 microns removed annually	$63,032.01	±3,584.69	10.59 T	±0.60
SO2	Sulfur Dioxide removed annually	$102.33	±5.82	13.78 T	±0.78
PM10*	Particulate Matter greater than 2.5 microns and less than 10 microns removed annually	$22,136.22	±1,258.91	72.97 T	±4.15
CO2seq	Carbon Dioxide sequestered annually in trees	$844,821.44	±48,045.80	43,629.95 T	±2,481.28
CO2stor	Carbon Dioxide stored in trees (Note: this benefit is not an annual rate)	$25,626,188.94	±1,457,385.70	1,323,438.65 T	±75,265.21

i-Tree Canopy Annual Tree Benefit Estimates based on these values in lbs/acre/yr and $/T/yr: CO 0.902 @ $85.08 | NO2 4.917 @ $26.86 | O3 48.968 @ $140.47 | PM2.5 2.379 @ $5,975.67 | SO2 3.098 @ $7.45 | PM10 16.403 @ $304.43 | CO2seq 9,807.385 @ $19.43 | CO2stor is a total biomass amount of 297,489.961 @ $19.43*
Note: Standard errors of removal amounts and benefits were calculated based on standard errors of sampled and classified points.

About i-Tree Canopy

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

Limitations of i-Tree Canopy

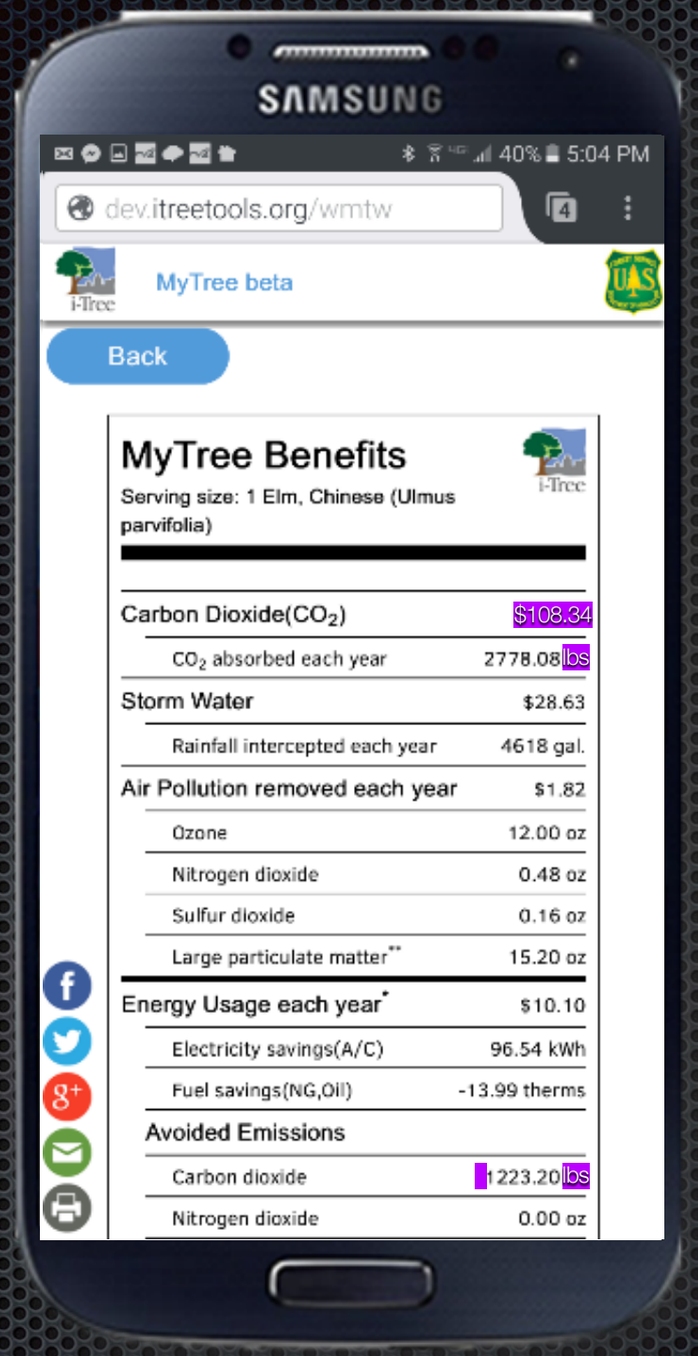
The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard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

A Cooperative Initiative Between:

www.itreetools.org

Impervious Surfaces	IS	373	46.6 ±1.76
Other	O	83	10.4 ±1.08

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

USDA Forest Service's Center for Urban Forest Research

i-Tree Tools CD-ROM:

42000 06200

i-Tree Eco

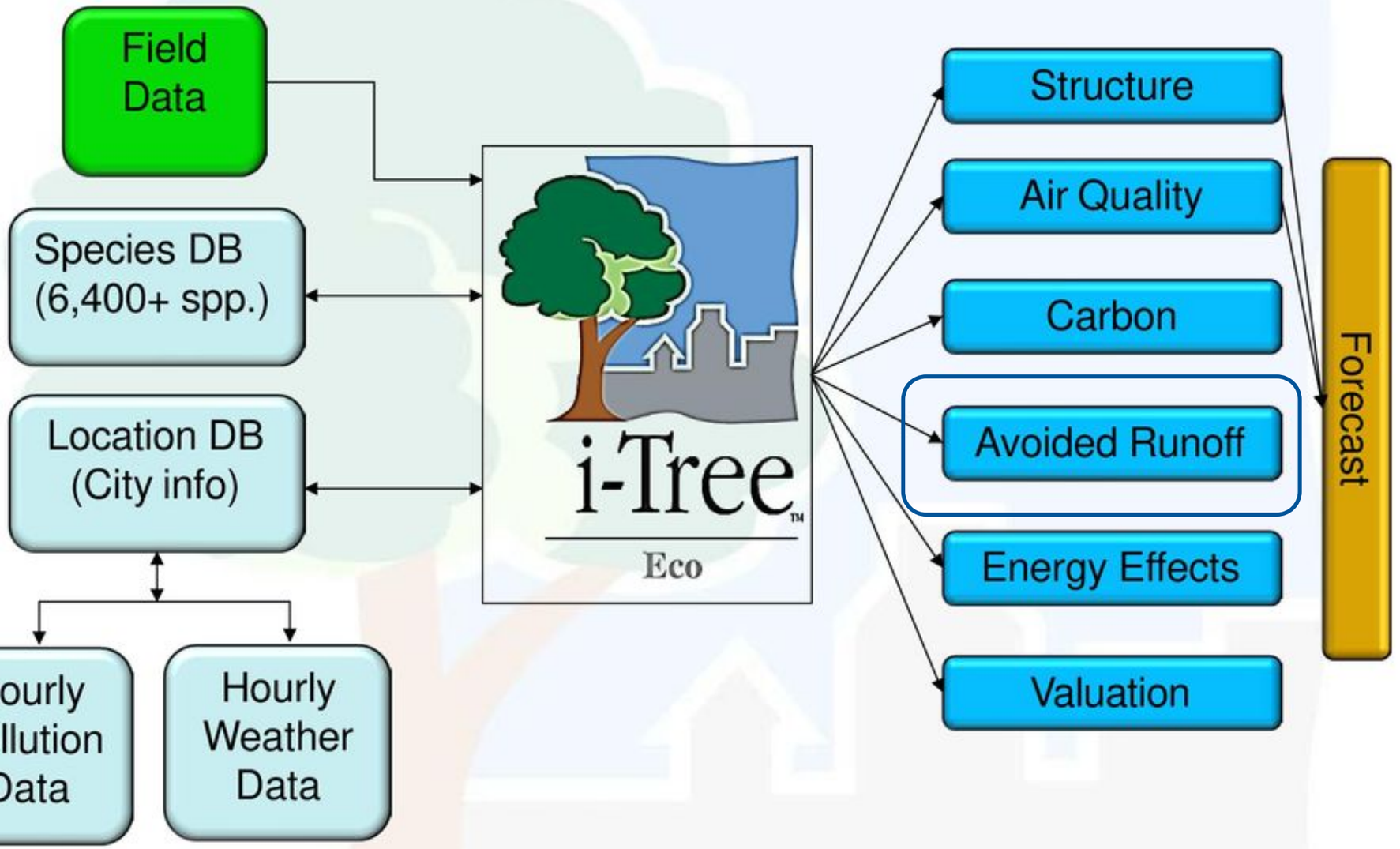
i-Tree Eco v6

Flagship tool with best estimates for Composition and Benefits.

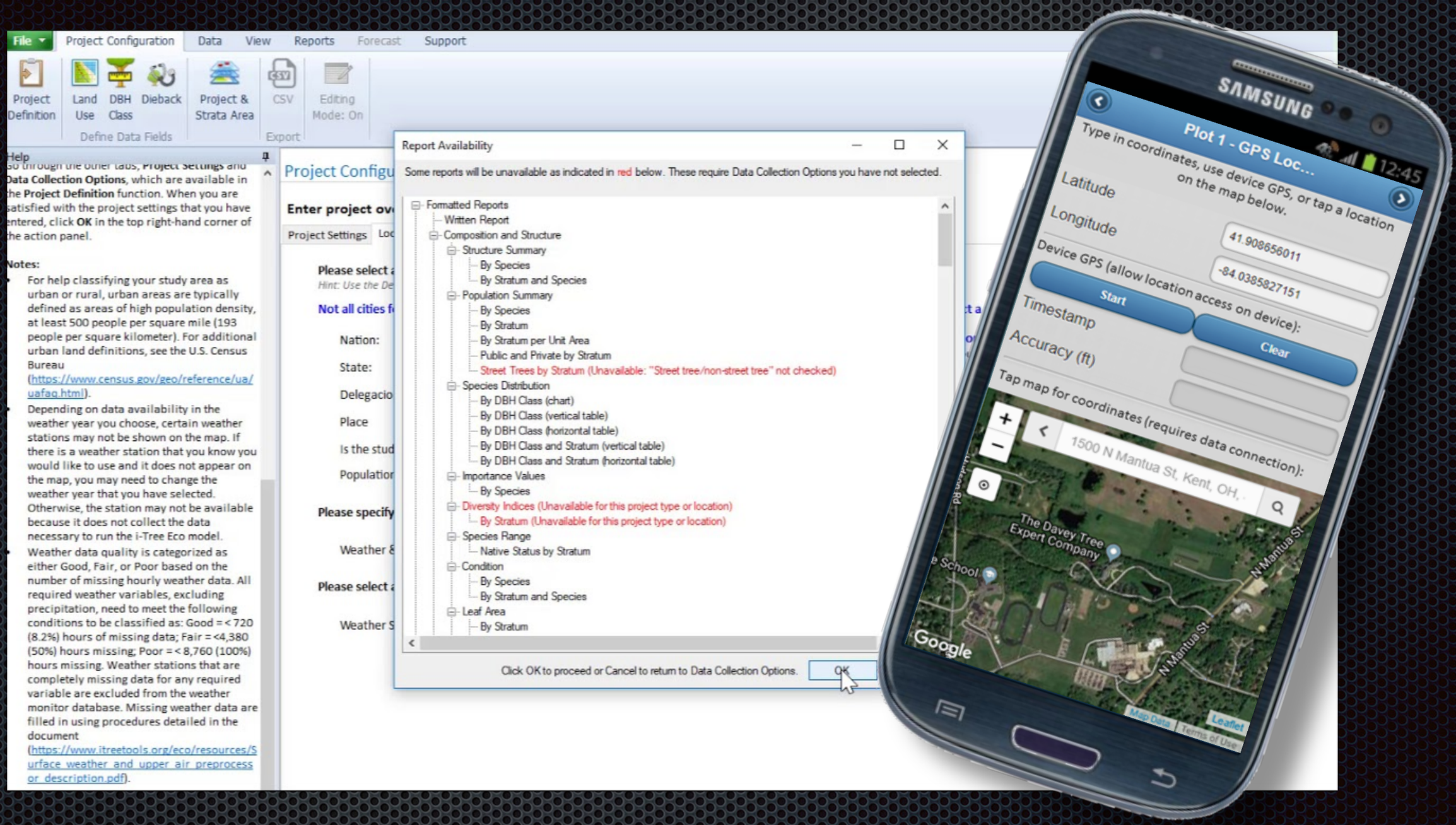
- User interface & Help text
- Reporting
- Tree inventory import
- Mobile data collector
- Help text

Plot Sampling & Complete Inventories

i-Tree Eco Model Schematic



www.itreetools.org/resources/archives.php


File
Project Configuration
Data
View
Reports
Forecast
Support
Project Definition
Land Use
DBH Class
Dieback
Define Data Fields
Project & Strata Area
CSV
Export
Editing Mode: On
Help
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_preprocessor_description.pdf).
Project Configu
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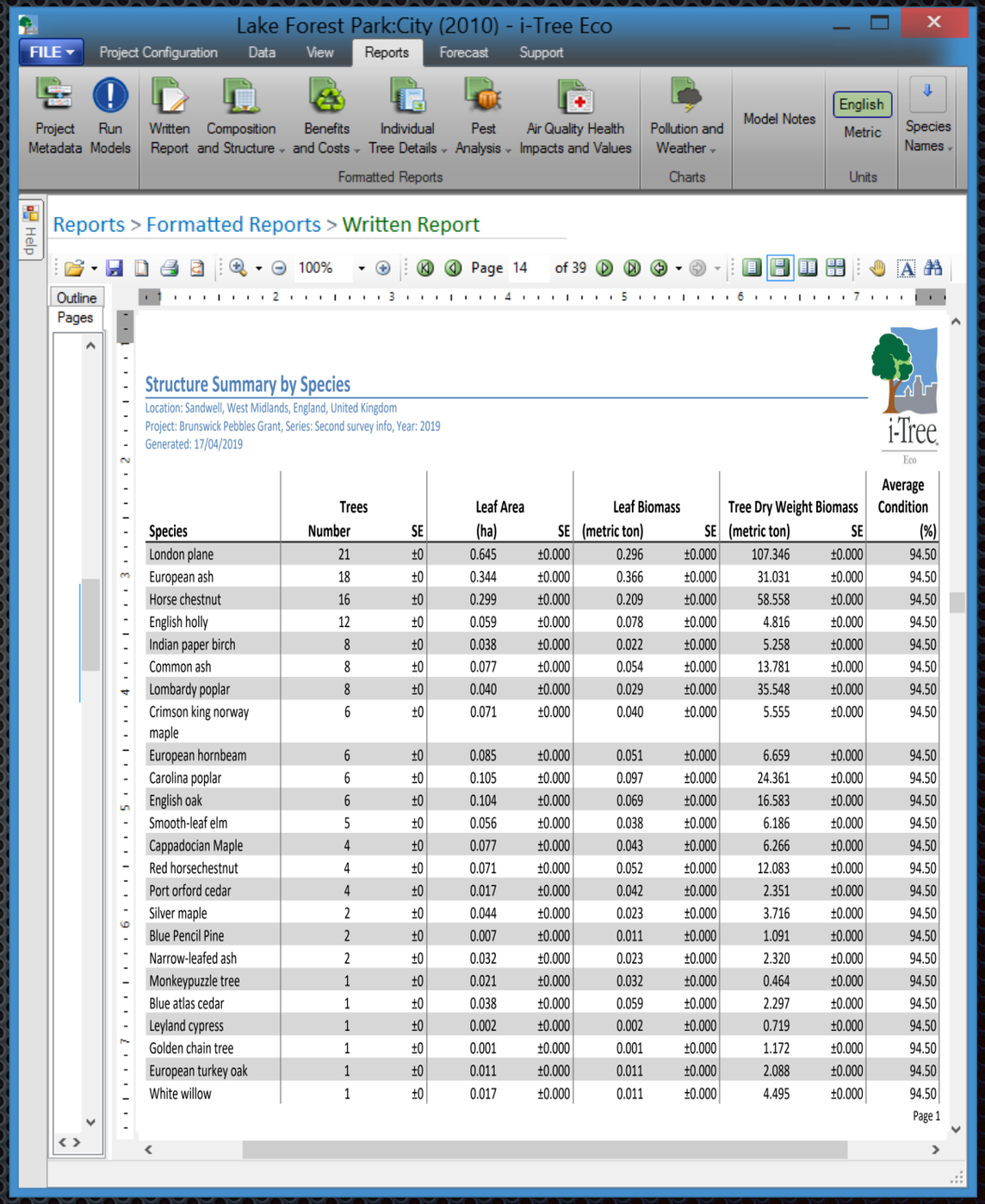
Report Availability
Some reports will be unavailable as indicated in red below. These require Data Collection Options you have not selected.
Formatted Reports
Written Report
Composition and Structure
Structure Summary
By Species
By Stratum and Species
Population Summary
By Species
By Stratum
By Stratum 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.
OK
SAMSUNG
12:45
Plot 1 - GPS Loc...
Type in coordinates, use device GPS, or tap a location on the map below.
Latitude
41.908656011
Longitude
-84.0385827151
Device GPS (allow location access on device):
Start
Clear
Timestamp
Accuracy (ft)
Tap map for coordinates (requires data connection):
1500 N Mantua St, Kent, OH,
The Davey Tree Expert Company
N Mantua St
Google
Map Data
Terms of Use
Leaflet

i-Tree Eco Assesses:

- Structure
- Function
  - Air quality
  - Carbon
  - Avoided runoff
  - Energy effects
  - Human health impacts



Species	Trees Number	SE	Leaf Area (ha)	SE	Leaf Biomass (metric ton)	SE	Tree Dry Weight Biomass (metric ton)	SE	Average Condition (%)
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

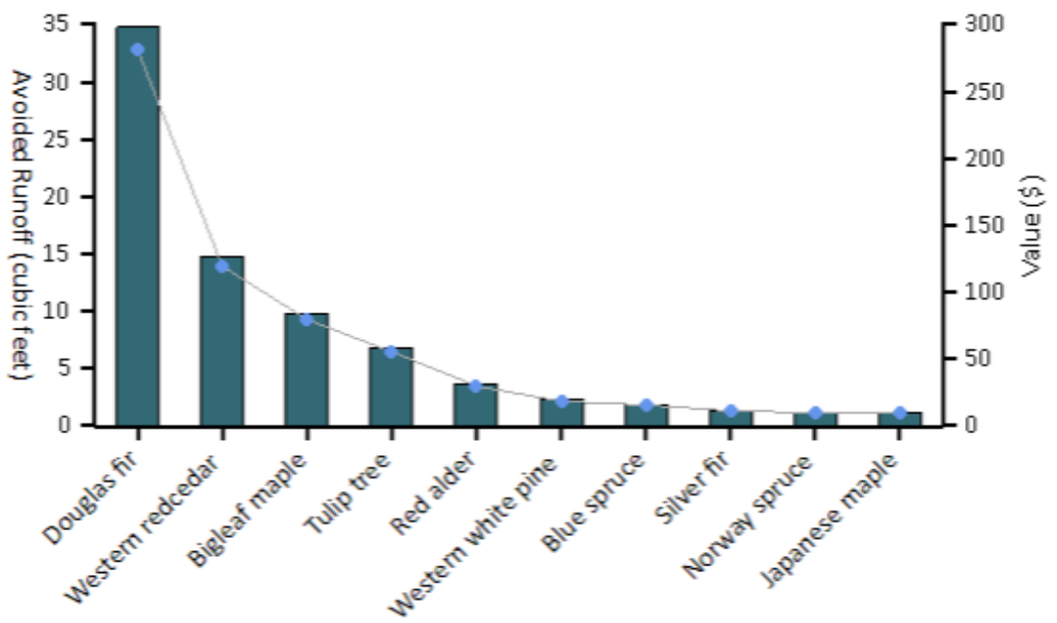
i-Tree Eco Assesses:

- Value ($)
- Management info
  - Pest risk
- Tree health
- Exotic/invasive species

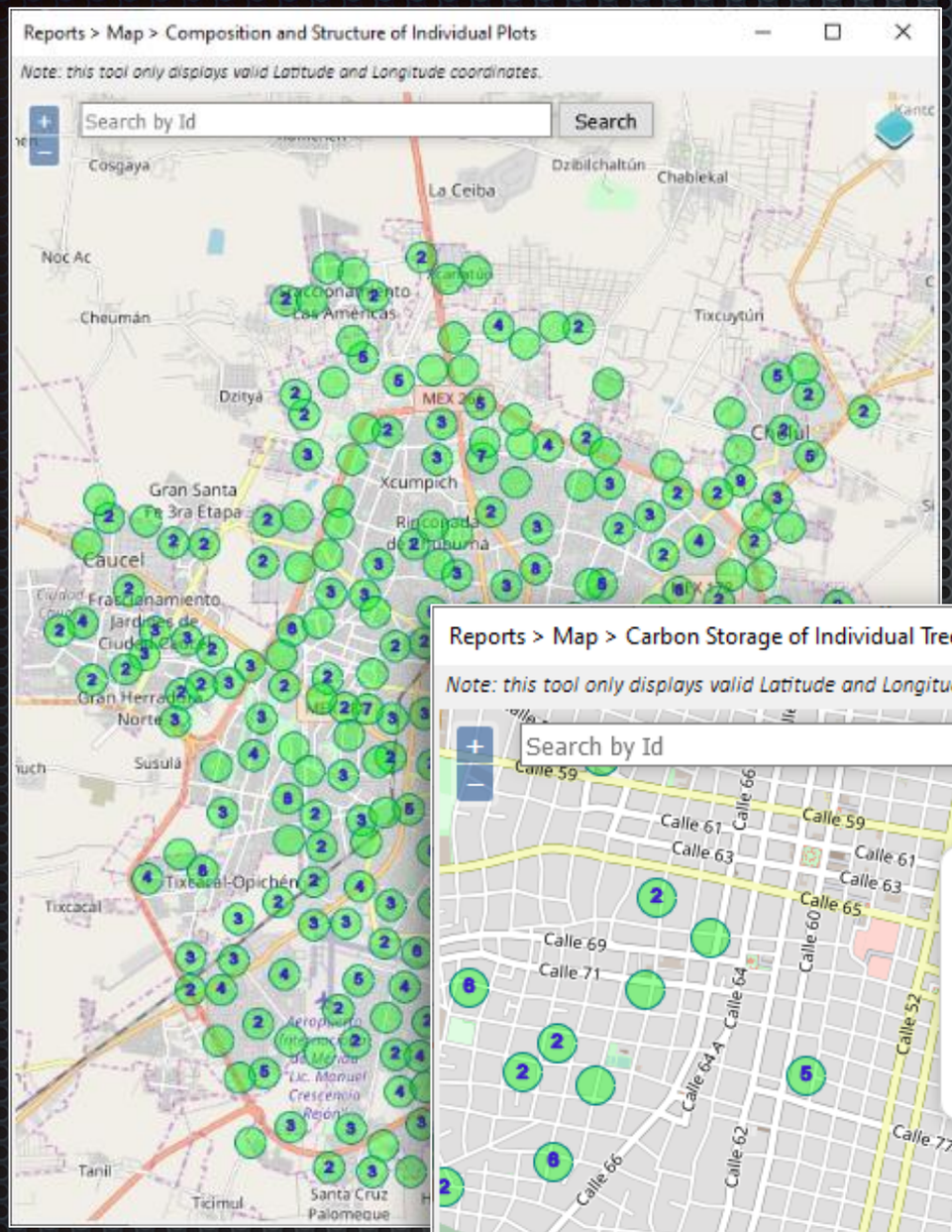
VI. Avoided Runoff

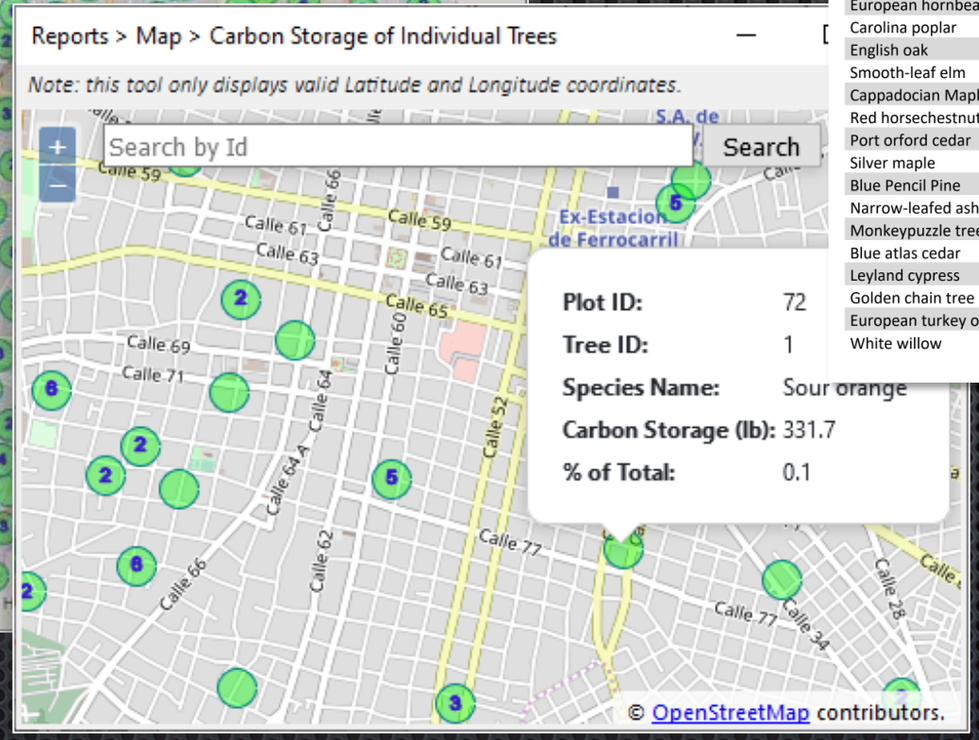
Surface runoff can be a cause for concern in many urban areas as it can contribute pollution to streams, wetlands, rivers, lakes, and oceans. During precipitation events, some portion of the precipitation is intercepted by vegetation (trees and shrubs) while the other portion reaches the ground. The portion of the precipitation that reaches the ground and does not infiltrate into the soil becomes surface runoff (Hirabayashi 2012). In urban areas, the large extent of impervious surfaces increases the amount of surface runoff.

Urban trees, however, are beneficial in reducing surface runoff. Trees intercept precipitation, while their root systems promote infiltration and storage in the soil. The trees of Lake Forest Park help to reduce runoff by an estimated 80,600 cubic meters a year with an associated value of $81 thousand (see Appendix I for more details).



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

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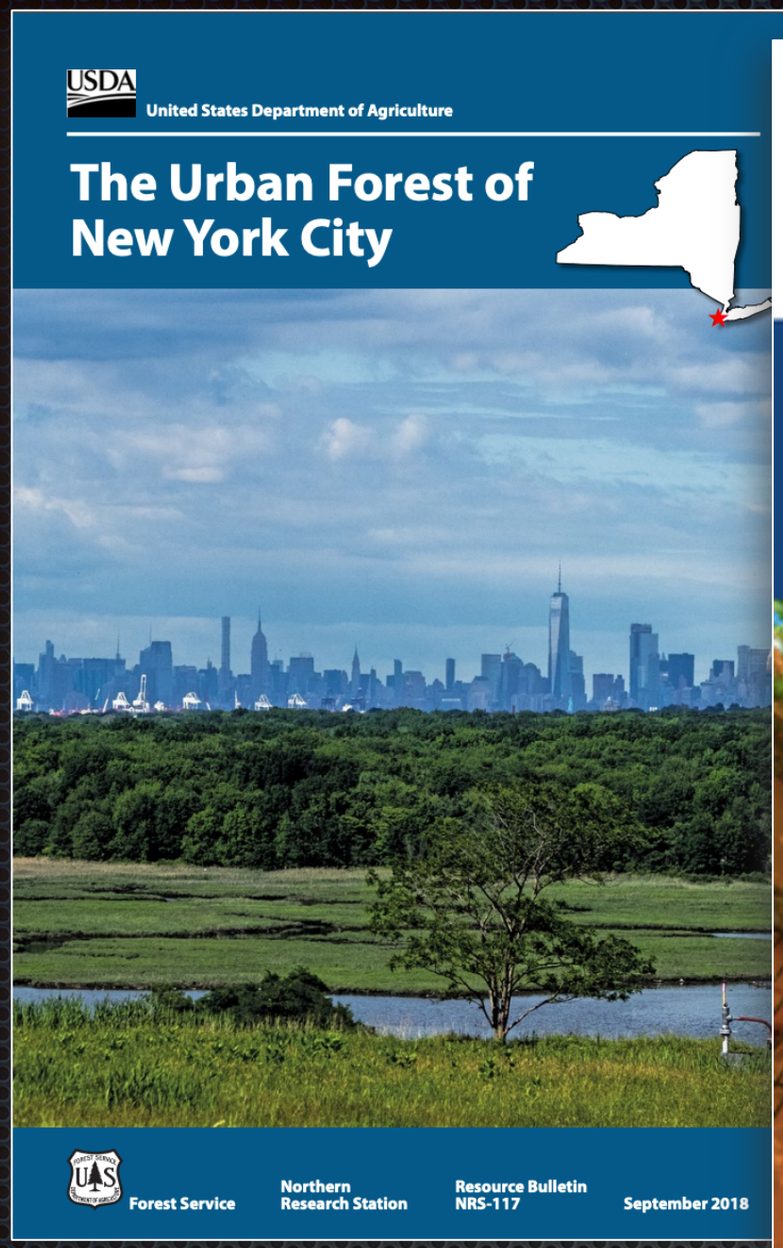
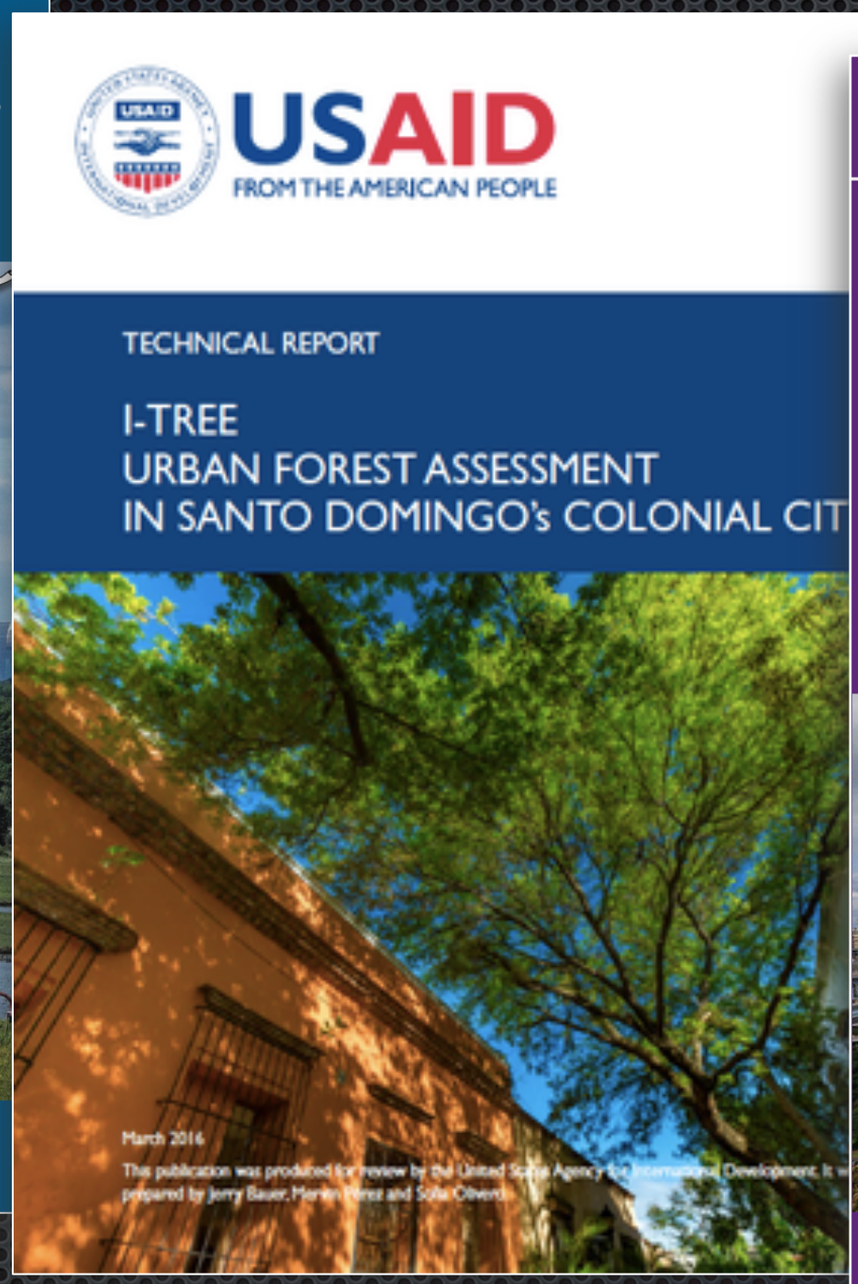
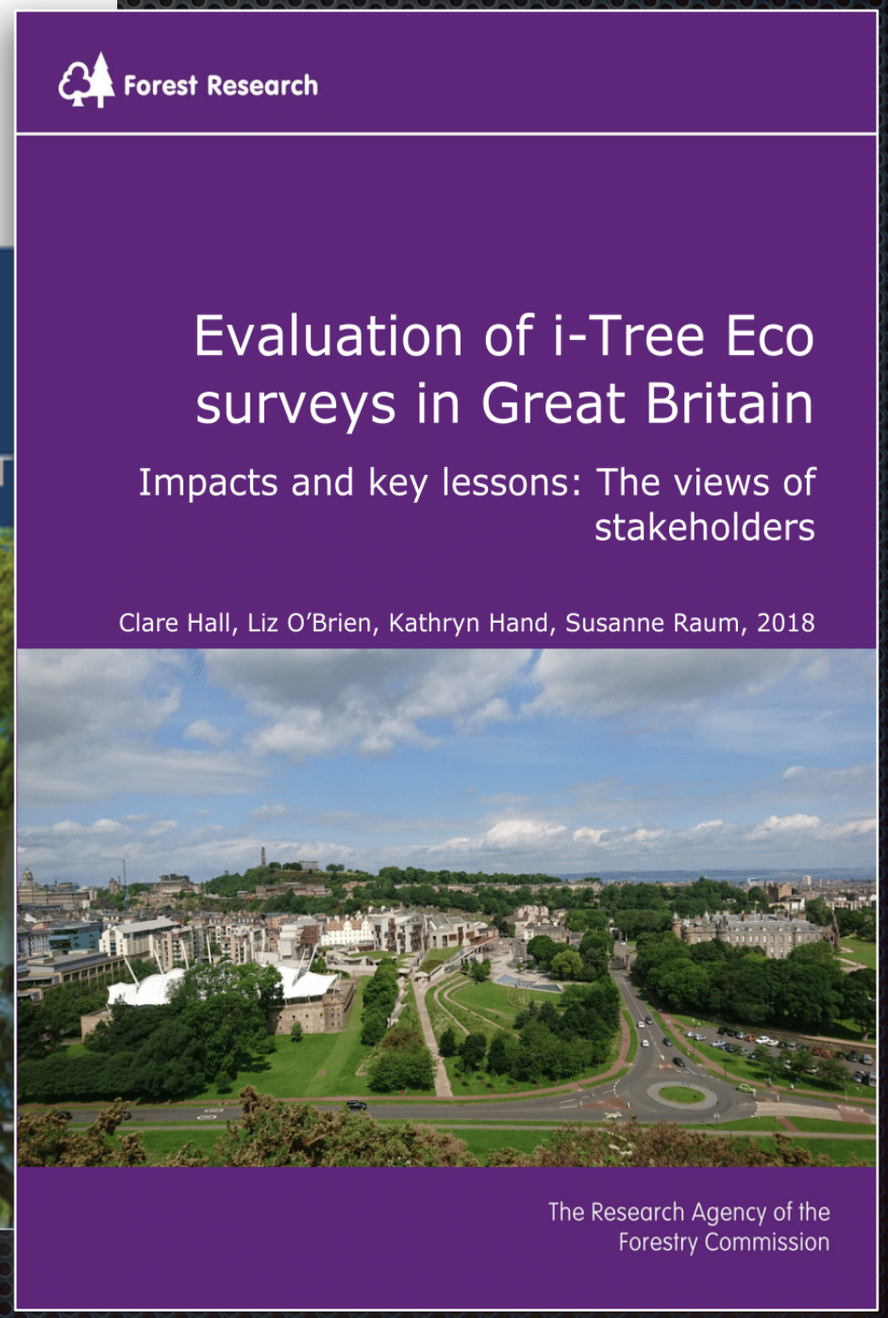

USDA
United States Department of Agriculture
The Urban Forest of New York City
Forest Service
Northern Research Station
Resource Bulletin NRS-117
September 2018


USAID
FROM THE AMERICAN PEOPLE
TECHNICAL REPORT
I-TREE
URBAN FOREST ASSESSMENT
IN SANTO DOMINGO's COLONIAL CIT
March 2016


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 Landscape

Environmental Justice and Demographic Analysis

i-Tree

Landscape

Features

- Cornerstone of the exciting updates and features included in the i-Tree 2018 Suite.
- Builds on the success of tools like i-Tree Design and i-Tree Canopy.
- Sophisticated Forest Service science in an accessible, web-based platform.
- Preloaded with land cover data and US Census demographics.

How does it work

- Users select their areas of interest to begin exploring.
- Create engaging maps and graphs that capture how people and trees interact.
- In less than ten minutes, a user can identify locations of interest and begin to explore the challenges and opportunities facing their urban forest.

Why Landscape Matters

- ***Engaging Visuals*** - Maps convey a wealth of information that is easily understood by target audiences.
- ***Affordability*** - Traditionally, the expertise and cost necessary to create informative maps place them out of reach of many managers.
- ***Adaptable*** - communities of all sizes can create maps and summaries to convey information for more effective management and advocacy efforts.

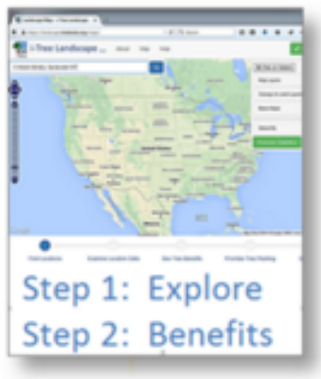
Quick & Simple

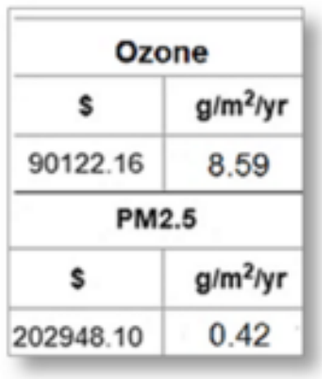
- Landscape is not designed to replace other assessment tools.
- Augments them by quickly showing where the tree canopy is.
- Estimates the services trees provide.
- Prioritize stewardship efforts based on US Census demographic data.

“All Lands” Approach

- Allows for planning that extends beyond public spaces and truly encompasses all lands including urban and rural forests.
- Includes backyards, commercial and corporate campuses, and other private ownerships falling outside typical public tree management.
- This supports an “all lands” approach to capturing the services trees provide regardless of where they have their roots.

The Process





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$	g/m²/yr
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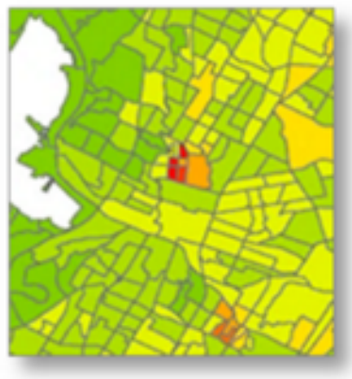
PM2.5	
$	g/m²/yr
202948.10	0.42



Find Locations — Explore Location Data — See Tree Benefits — Prioritize Tree Planting — Generate Results

New Tab | Report - i-Tree Landscape | Home - i-Tree Landscape | UNRI Online

https://landscape.itreetools.org

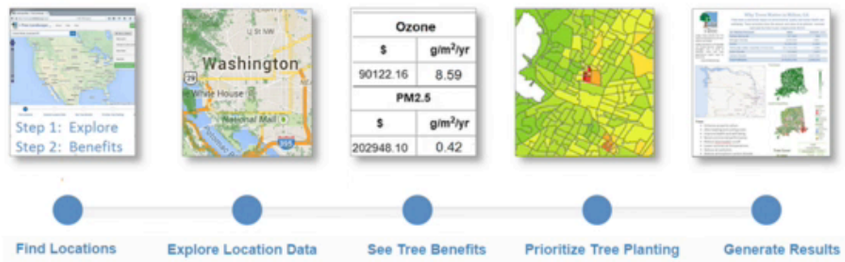
Apps | Bookmarks | BookmarksBar | UMass Teaching | Spongelab | A Globa | LDCONT 105 | soak up the rain | ArborDesign 2014 W | UNH Stormwater Cen | Welcome to Faceboo | Other Bookmarks

i-Tree Landscape v1.2 beta

Home | Project | Help | Feedback

Welcome to i-Tree Landscape! v1.2 beta

Offering more than just beauty and shade, trees provide intangible benefits, such as removal of atmospheric carbon dioxide and pollution, stormwater reduction, temperature modification, and more. i-Tree Landscape allows you to explore tree canopy, land cover, and basic demographic information in a location of your choosing. With the information provided by i-Tree Landscape, you will learn about the benefits of trees in your selected location, see how planting trees will increase the benefits provided, and map the areas where you decide to prioritize your tree planting efforts.



i-Tree Landscape

Get Started

By removing carbon dioxide, trees help mitigate climate change. The shade provided by urban tree canopies can also help minimize the urban heat island effect. In addition, trees intercept stormwater, which can reduce flooding and improve water quality, and reduce air pollution, such as ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, and fine particulate matter. Reduction of air pollution has proven benefits to human health - trees truly can enhance our lives! Click **Get Started** to begin an i-Tree Landscape project now.

---

i-Tree and its partners do not endorse any specific web-browser, but i-Tree Landscape has been tested to work well with modern versions of Chrome, Firefox, Internet Explorer, and Safari. Please, use the Feedback form to report issues.

USFS | DAVEY | Arbor Day Foundation | sma Society of Municipal Arborists | ISA | Casey Trees Washington DC | ESF | NAASF

i-Tree: a suite of software tools to assess urban vegetation and their ecosystem services and values

i-Tree Eco

i-Tree Landscape

i-Tree Storm

i-Tree Species

i-Tree Hydro

i-Tree Canopy

i-Tree Planting

i-Tree MyTree

i-Tree Database

i-Tree Design

USDA Forest Service

DAVEY

The National Arbor Day Foundation

Society of Municipal Arborists

ISA International Society of Arboriculture

Casey Trees Washington DC

Examining the Structure, Function and Value of Urban Forests:

Using i-Tree as a Tool for Analysis and Action

David Bloniarz
US Forest Service
Northern Research Station
Amherst, MA

Examining the Structure, Function and Value of Urban Forests:

Using i-Tree as a Tool for Analysis and Action

To view or download
http://www.unri.org/research-documents/
e-mail: dbloniarz@fs.fed.us