



i-Tree Overview



Assessing the value of urban trees

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Northern Research Station
Amherst, Massachusetts*



*i-Tree is a
Cooperative
Initiative*



Overview:



- ✦ **i-Tree and Eco overview**
- ✦ **Phase I: Early decisions and objectives**
 - ✦ Creating a sample
 - ✦ Gathering general data
- ✦ **Phase II: Getting started with Eco software**
- ✦ **Phase III: Field data collection**
- ✦ **Phase IV: Running Eco**
 - ✦ Reporting results
 - ✦ Data interpretation and use
- ✦ **Considerations for international users**

What is i-Tree?



 A suite of tools to assess urban vegetation and their ecosystem services and values



i-Tree Eco = UFORE

v. 3.0 programs

Public-Private Partnership



 **USDA Forest Service**



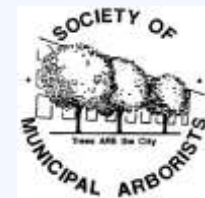
 **Davey Tree Expert Co.**



 **National Arbor Day Foundation**



 **Society of Municipal Arborists**



 **International Society of Arboriculture**

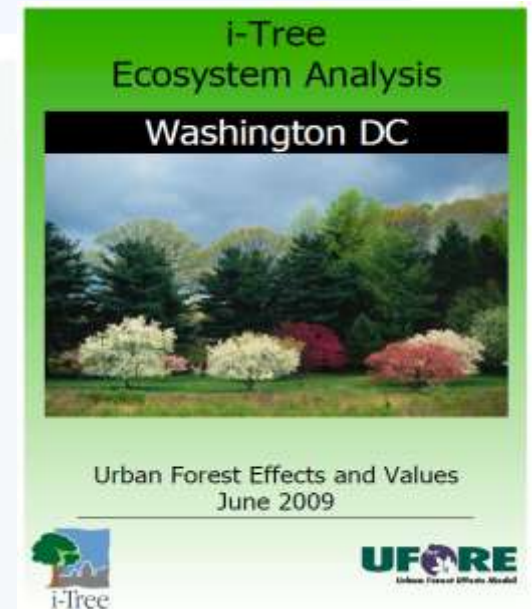
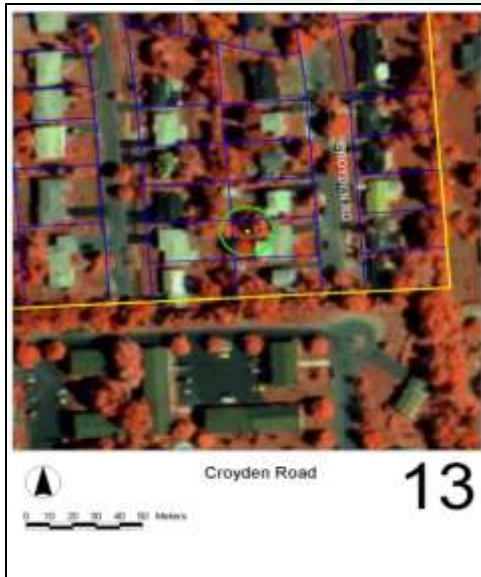


 **Casey Trees**



Goals

- ✿ Simple and low-cost tools and methods to aid in 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
- 🌳 Management needs
 - Pest risk
 - Tree health
 - Exotic/invasive spp.

I. Tree Characteristics of the Urban Forest

The urban forest of Washington DC has an estimated 2,043,000 trees with a tree cover of 29.6 percent. Trees that have diameters less than 6-inches constitute 56.7 percent of the population. The three most common species are American beech (14.60 percent), Red maple (6.43 percent), and Boxelder (6.17 percent).

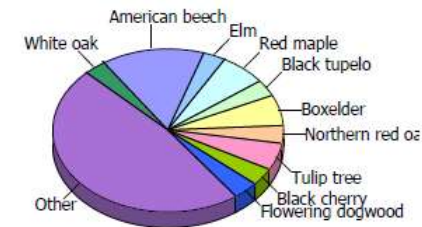


Figure 1. Tree species composition in Washington DC

Among the land use categories, the highest tree densities occur in Forest followed by Ag./Water/Wetlands and Developed, open. The overall tree density in Washington DC is 128 trees / hectare (see Appendix III for comparable values from other cities).

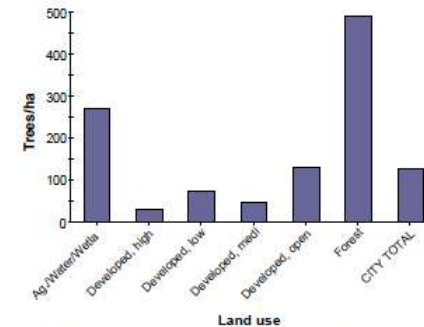


Figure 2. Number of trees/ha in Washington DC by land use

April 18, 2007

Maybe Only God Can Make a Tree, but Only People Can Put a Price on It

Climate change

Storm water mgt.

Pollution mitigation

Energy conservation

Carbon strategies

Public health issues



➤ **Economic development**

➤ **Green job creation**

Greater Public Scrutiny



"Instead of spending money planting trees on a causeway, we should fix the bridge on the causeway," ...

--Senator Tom Coburn (R-OK)

Monday, November 2nd, 2009



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Park Lane trees get report cards; some question program

3



The City of Kirkland has given each tree along Park Lane a report card and some of them are not doing so well. The report cards state that the city is "working to restore, enhance

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!”***

PARK LANE TREE INVENTORY

TREE REPORT CARD

Tree Number: 415
Species: Norway Maple
Diameter: 17.8"

A

Grade Definition:
A(Retain) B(Retain/Monitor) C(Monitor) F(Remove/Replace)

Tree Criteria:
• Vigor: Very Good
• Structure: Good
• Health: Good
• Impact on other trees/infrastructure: restricted soil
• Long term viability: Good
• Notes: Damage to sidewalk, curb, etc.

Working to restore, enhance and protect the City of Kirkland's Tree Assets

Tour of Park Lane Trees with City Urban Forester
Tuesday October 27th (8:30 am - 9:15 am): Meet at Park Lane and Lake Street

Phase I Implementation Plan
9:15 am - 10:15 am: Zerk's Place (124 Park Lane)
For more information, contact Karl Page 425-587-3011 kpage@co.kirkland.wa.us

*Shame on you
City of Kirkland!
Government Has
Too Much Money
IF we
can Afford to
Grade
Trees!*

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



i-Tree is...



Development, Dissemination, Support, & Refinement

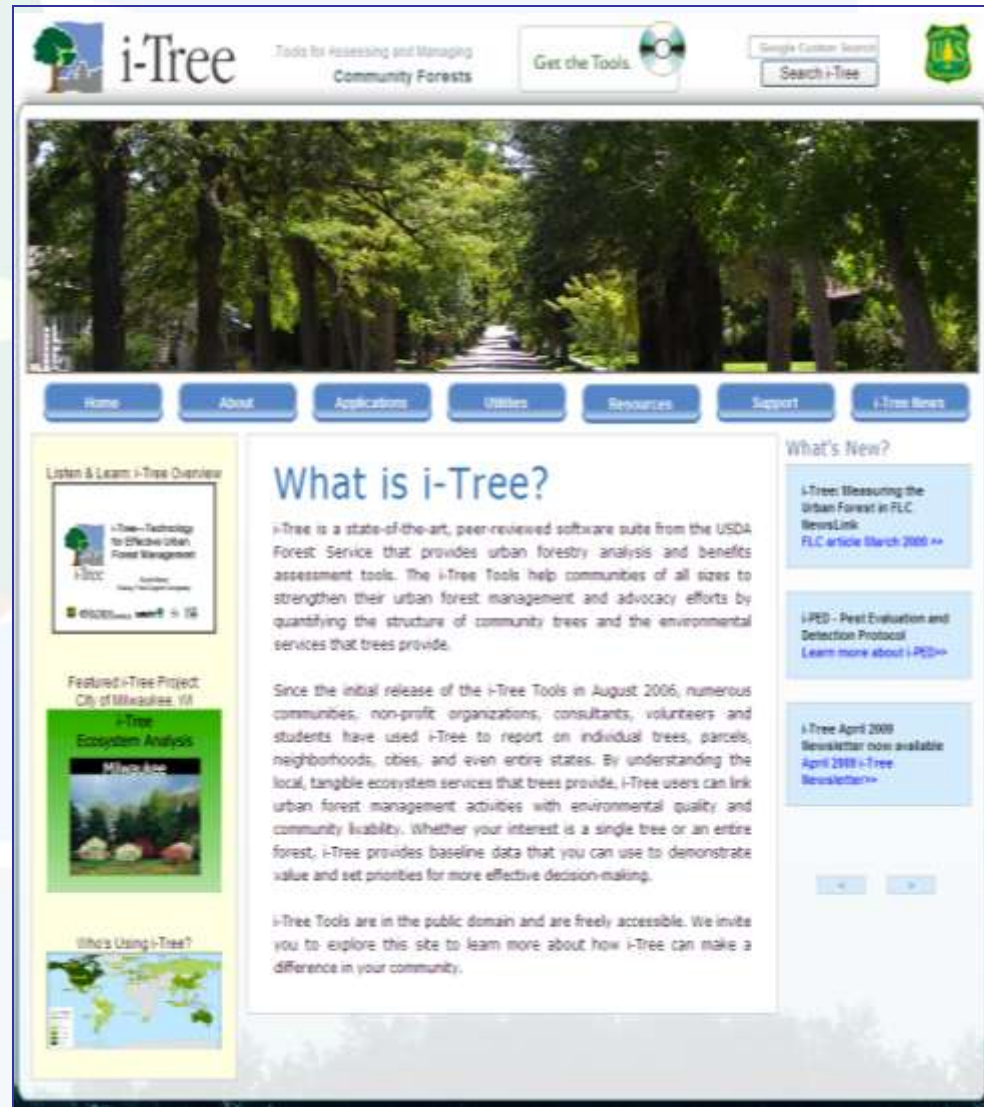
**Credible, USDA
FS peer-reviewed
tools**

Public Domain Software

Accessible

Technical Support

*“Putting USFS Urban Forest
science into the hands of users”*



The Foundation: Local Data

**Local Sample or
Inventory**

Local information:

- 🌳 Weather
- 🌳 Pollution
- 🌳 Environmental
variables

Hourly simulations



Benefit-Based Approach



Strategic Management
& Advocacy



Comprehensive
Value



Environmental
Services



Structure

Conserving Energy



Image courtesy of the Center for Urban Forest Research

Improving Air Quality

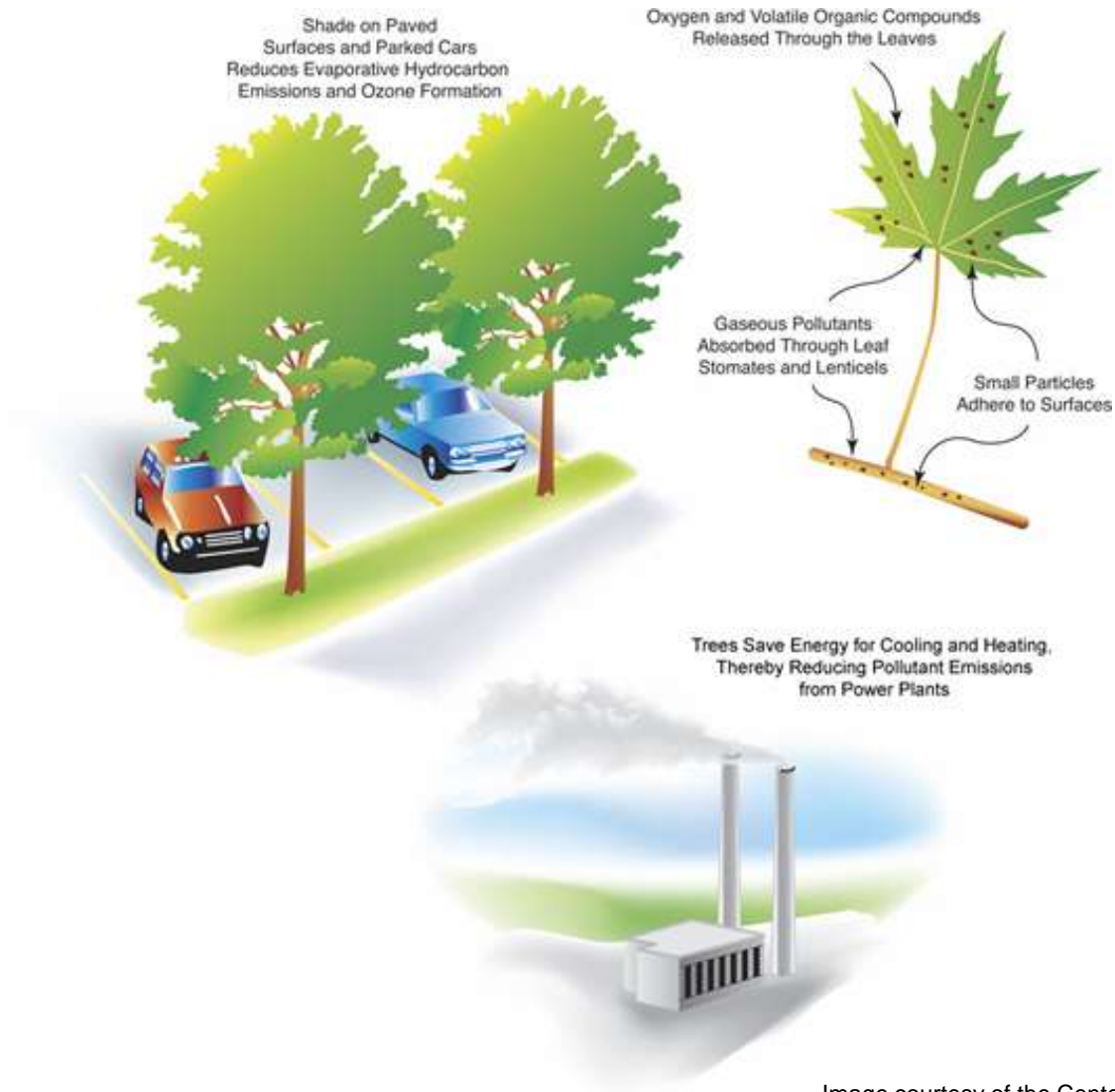


Image courtesy of the Center for Urban Forest Research

Reducing Atmospheric Carbon Dioxide



Reducing Stormwater Runoff

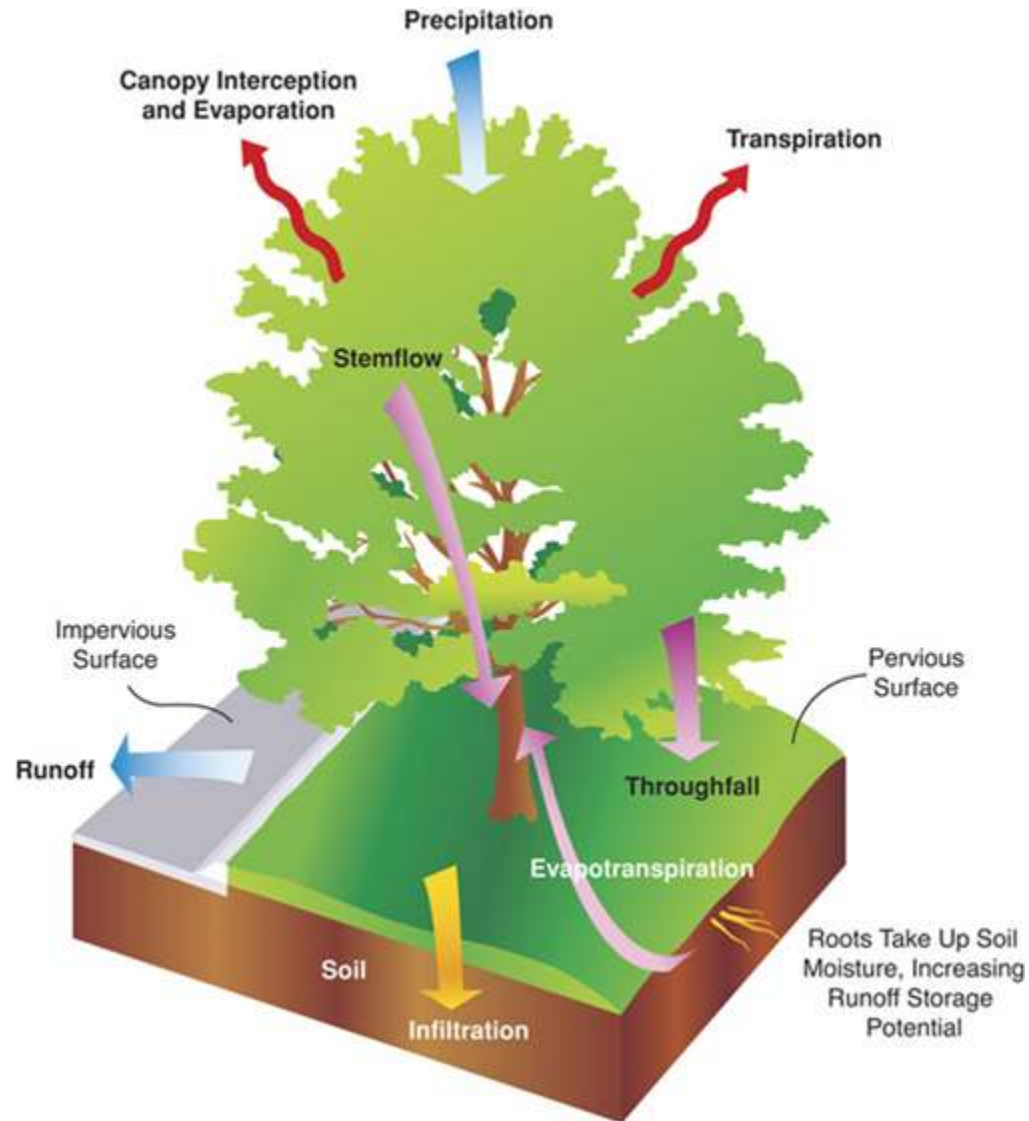


Image courtesy of the Center for Urban Forest Research

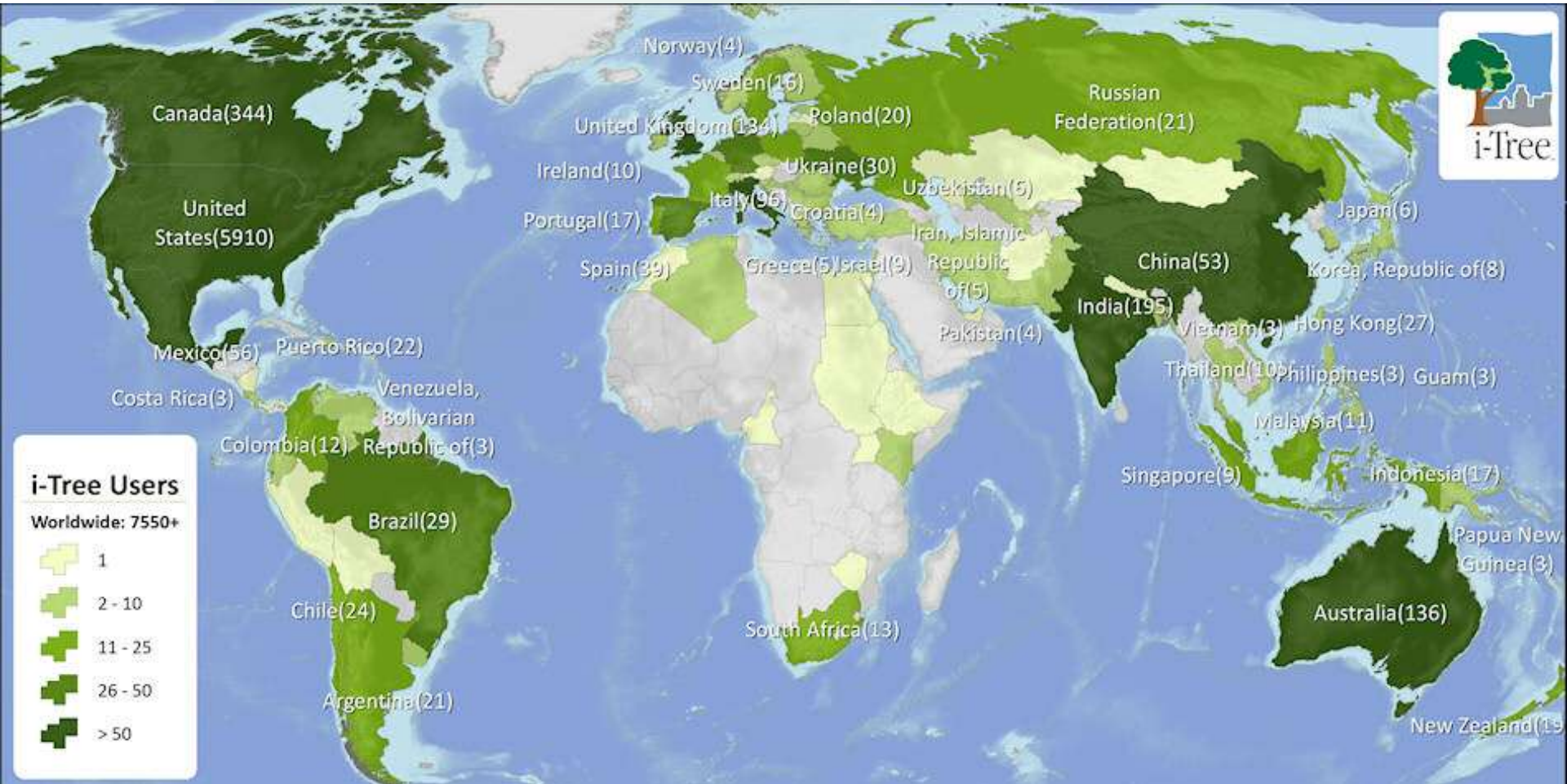
i-Tree: the early years



i-Tree Use



Program distribution increasing about 25% per year



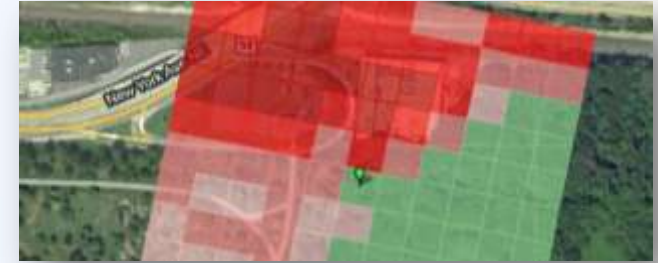
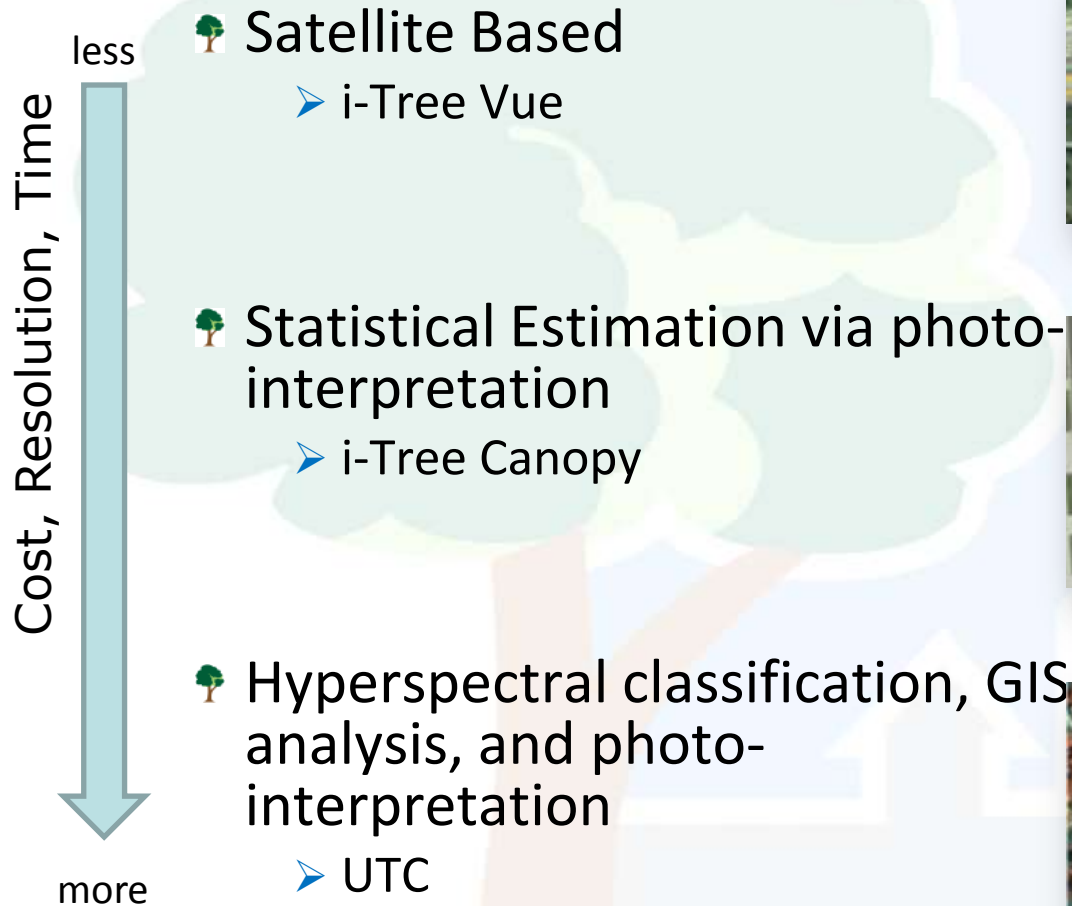
Distributed to over 90 countries

i-Tree Version 4.0

5 New or Enhanced Tools




Remote Sensing Canopy Assessment Tools






i-Tree Design






i-Tree
Tools for Assessing and Managing
Community Forests

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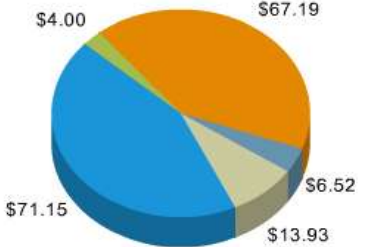
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i-Tree Benefit Calculator

1500 N Mantua St, Kent, OH 44240, USA
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[Calculate another tree](#)

Overall Benefit
Storm Water
Energy
Air Quality
CO2
About Model

Stormwater
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Breakdown of your tree's benefits


Click on one of the tabs above for more detail

This 21 inch Northern pin oak provides overall benefits of: \$163 every year.

While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees' specific geography, climate, and interactions with humans and infrastructure is highly variable and makes precise calculations that much more difficult. Given these complexities, the results presented here should be considered initial approximations—a general accounting of the benefits produced by urban street-side plantings.

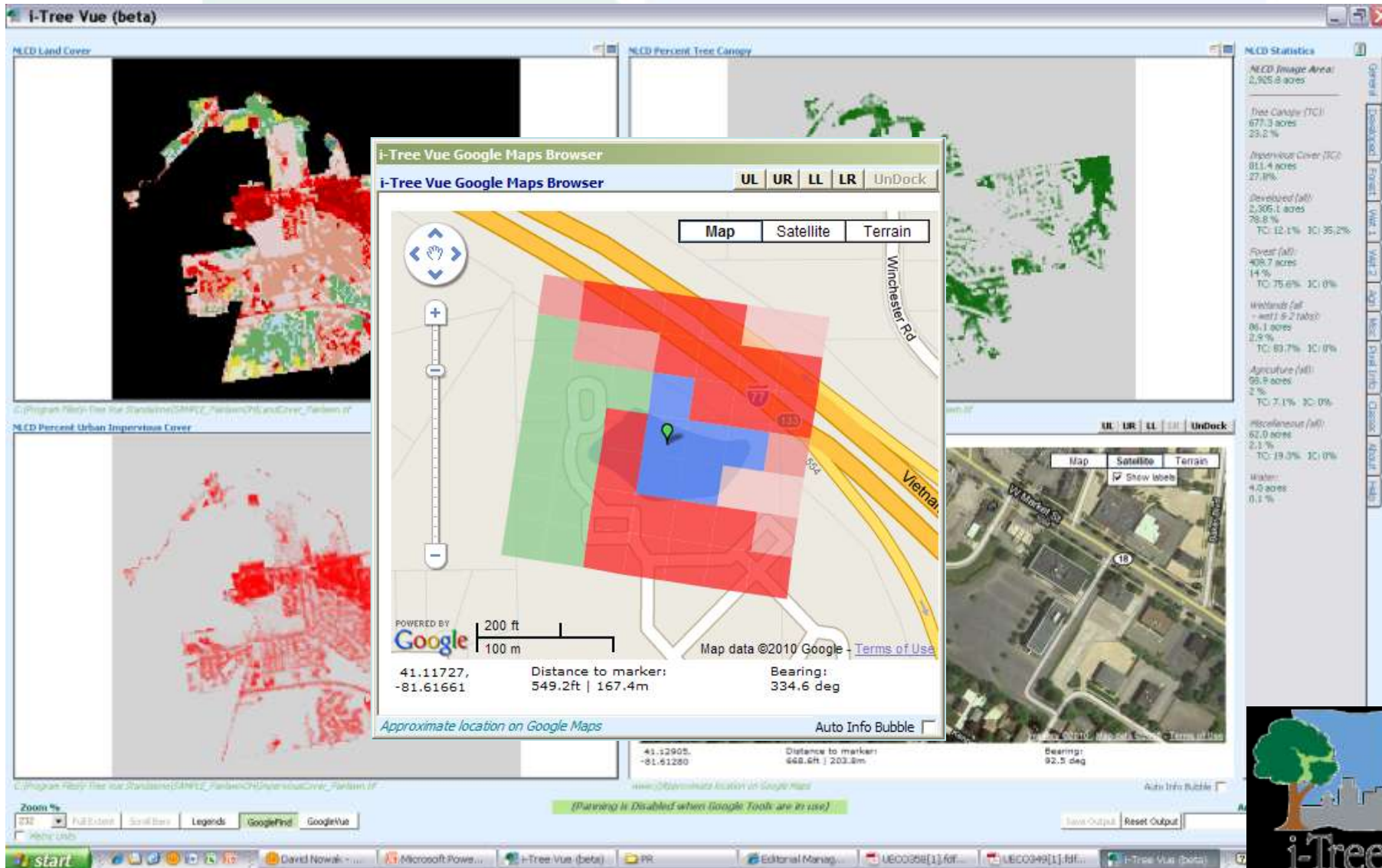
Benefits of trees do not account for the costs associated with trees' long-term care and maintenance.

If this tree is cared for and grows to 26 inches, it will provide \$195 in annual benefits.



Northern pin oak
Quercus ellipsoidalis

Vue – Estimates Ecosystem Services from National Cover Maps and Google Maps



i-Tree Canopy



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


http://www.itreetools.org/canopy/index.jsp


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 **i-Tree** Tools for Assessing and Managing Community Forests


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i-Tree Canopy

Get started in three easy steps!

One Browse to your project area boundary GIS file. The file must be in ESRI Shapefile format 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](#)

- 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 assessment.

start

David No... i-Tree V... i-Tree M... i-Tree

Search Desktop

Internet 100% 12:04 PM

Classify random points



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

http://i-Tree.org/canopy/survey.php

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Google

Map Data - Terms of Use

Remember, the more points you survey, the lower your Standard Error, and the more precise your sampling will be. More points surveyed provide for a better estimation of

i-Tree Canopy

Percent Cover (\pm SE)

42.9 \pm 24.7 57.1 \pm 26.6

Id	Cover Class	Latitude	Longitude
1	Tree	-37.82930543236	144.91265730117
2	Tree	-37.81302356330	144.95401488007
3	Tree	-37.81913019363	144.97617933379
4	Non-Tree	-37.82964905605	144.98052520547
5	Non-Tree	-37.81840952395	144.97104739912
6	Non-Tree	-37.82188855427	144.94620800253
7	Non-Tree	-37.81882077	144.92805906653
8	Tree	-37.78606178650	144.94090887510

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Save Your Data

100%

12:09 PM



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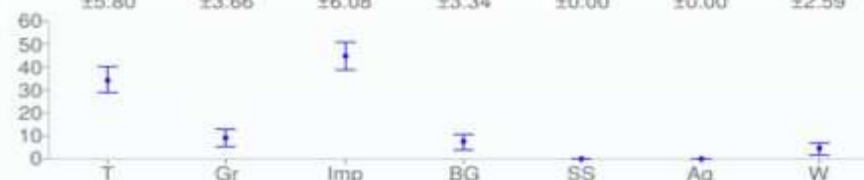
⏏ Exit

?

i-Tree Canopy

Percent Cover (\pm SE)

34.3	8.96	44.8	7.46	0.00	0.00	4.48
+5.80	+3.66	+6.08	+3.34	+0.00	+0.00	+2.59



Id	Cover Class	Latitude	Longitude
61	Tree	38.902153927112	-76.965047428253
62	Water	38.923799096149	-77.110429223729
63	Tree	38.961324676131	-77.03983893727
64	Impervious	38.866540734234	-76.965398989474
65	Tree	38.888206252128	-76.951066339859
66	Grass	38.891553823381	-77.04287817671
67	Impervious	38.907230806429	-77.049487697045
	Bare Ground		
	Shrub/Scrub		
	Agriculture		

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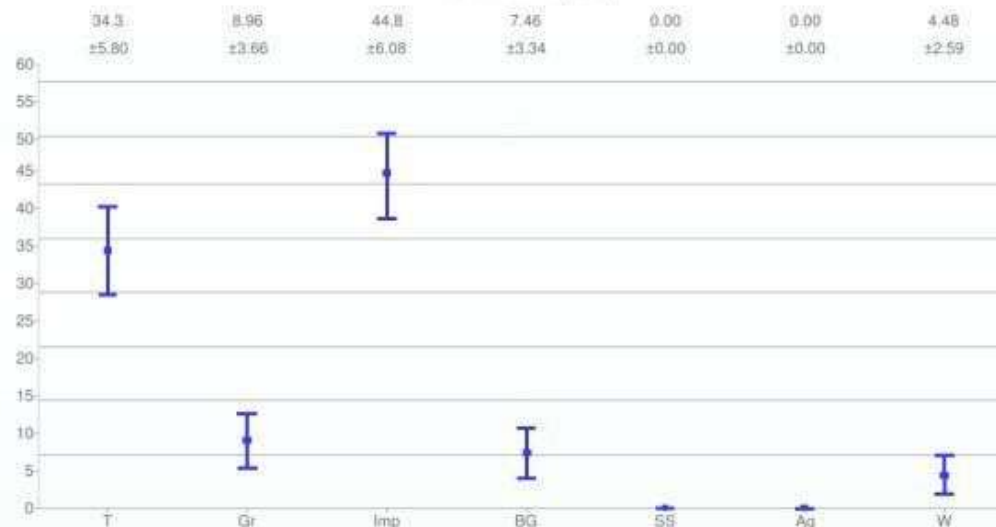
Remember, the more points you survey, the lower your Standard Error, and the more precise your sampling will be. More points surveyed provide for a better estimation of Land Cover across your study area.

Save Your Data

Save Data

Save Early. Save Often. Don't lose your project data!

i-Tree Canopy Cover Report

Percent Cover (\pm SE)

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



Casey Trees
WASHINGTON, DC

Pest detection Protocol



Component of Streets in i-Tree v.4.0

Collect Pest & Disease

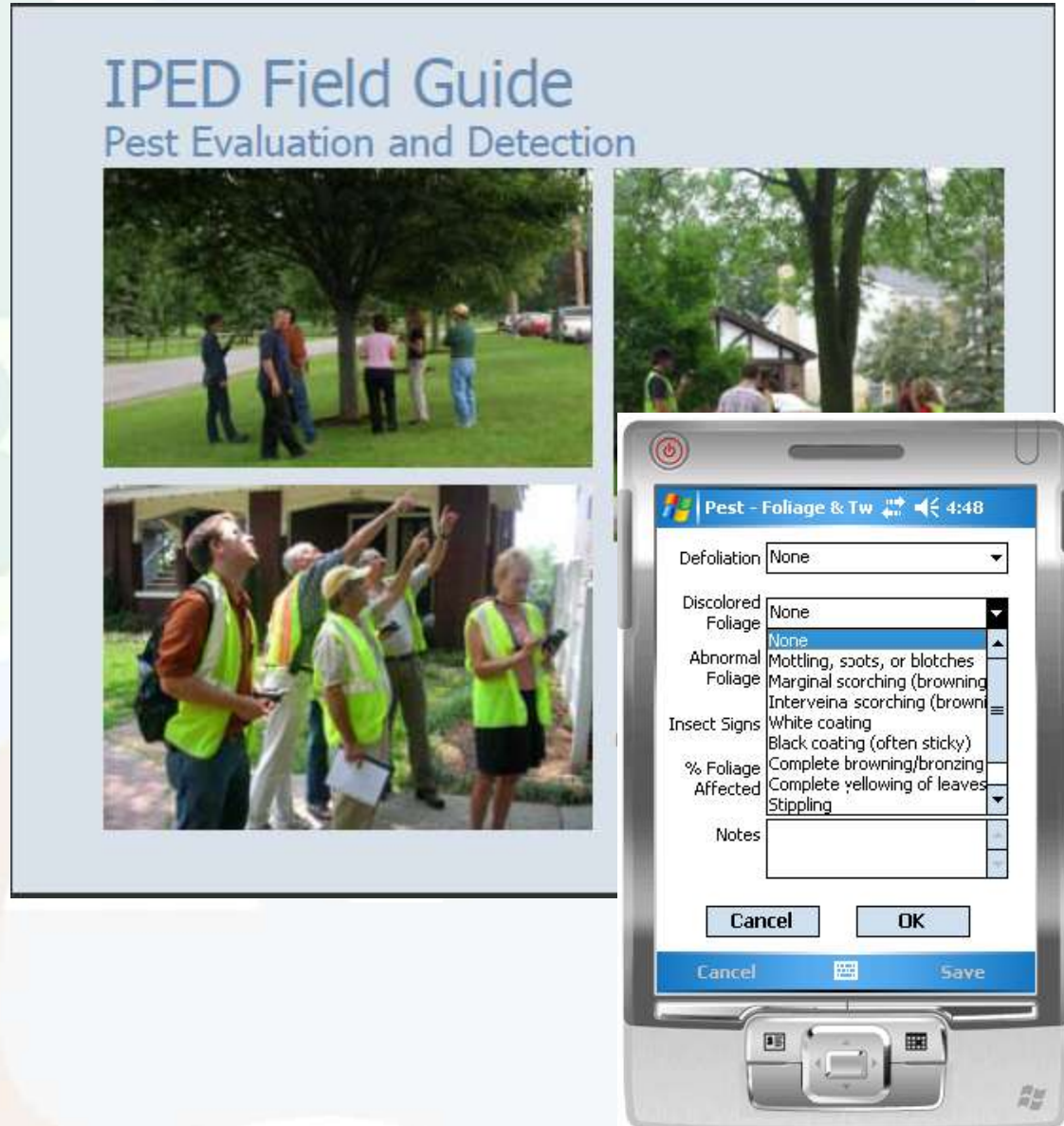
Signs

Symptoms

Reports

Associated pest & diseases

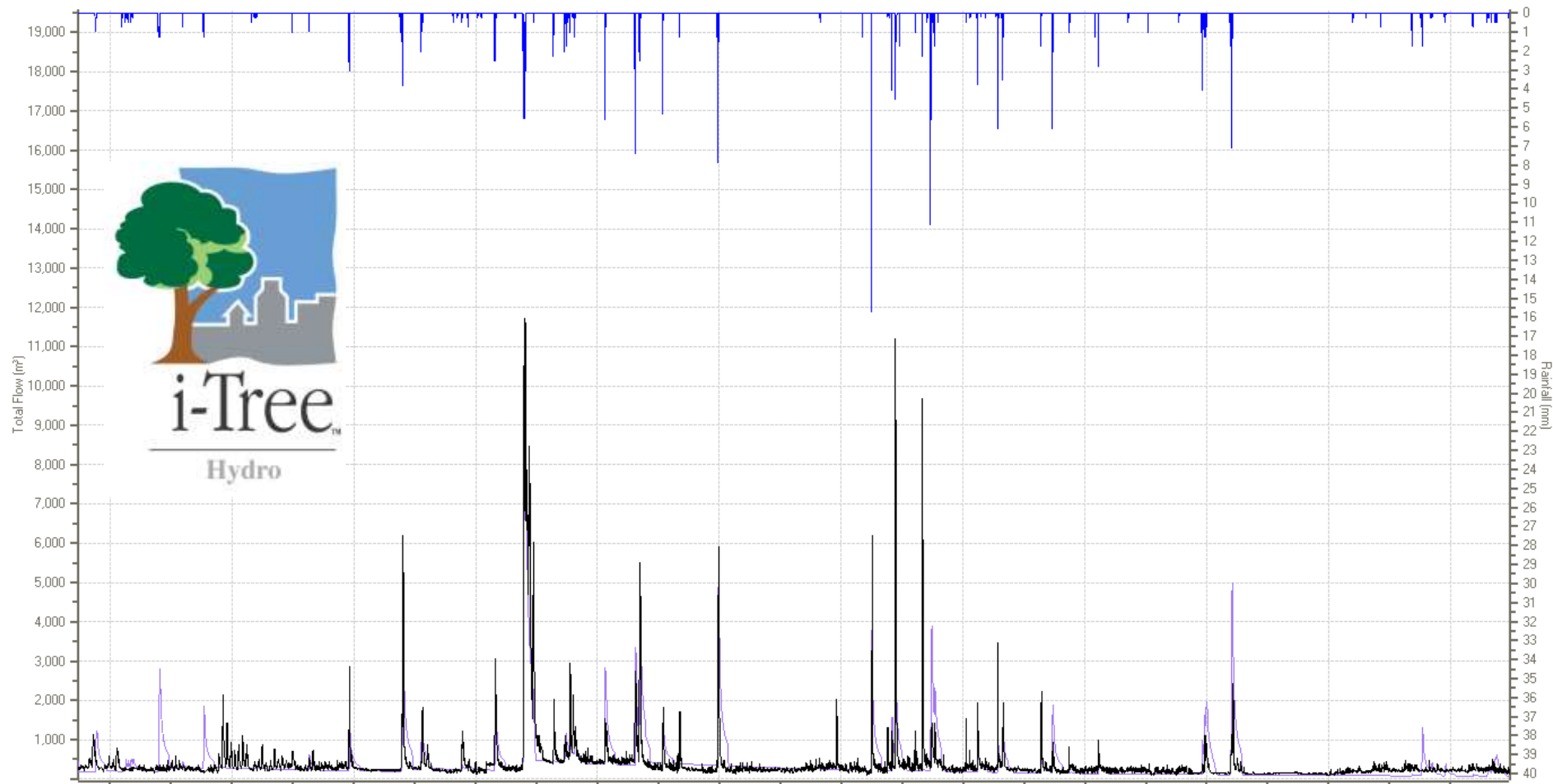
Trends/patterns



i-Tree-Hydro

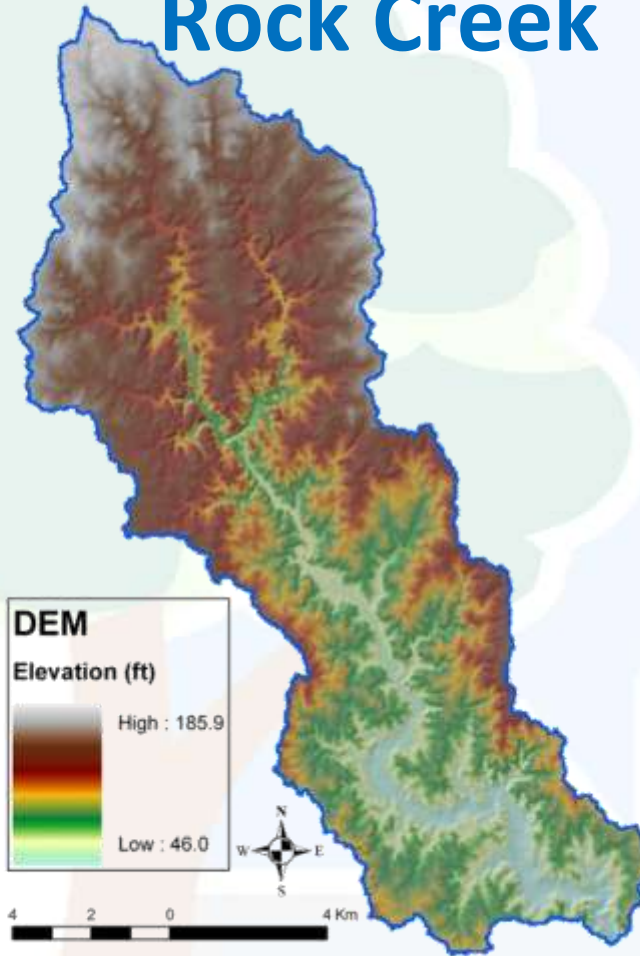


- 🌳 Separate GIS program
- 🌳 Calibrates against stream flow data





Rock Creek

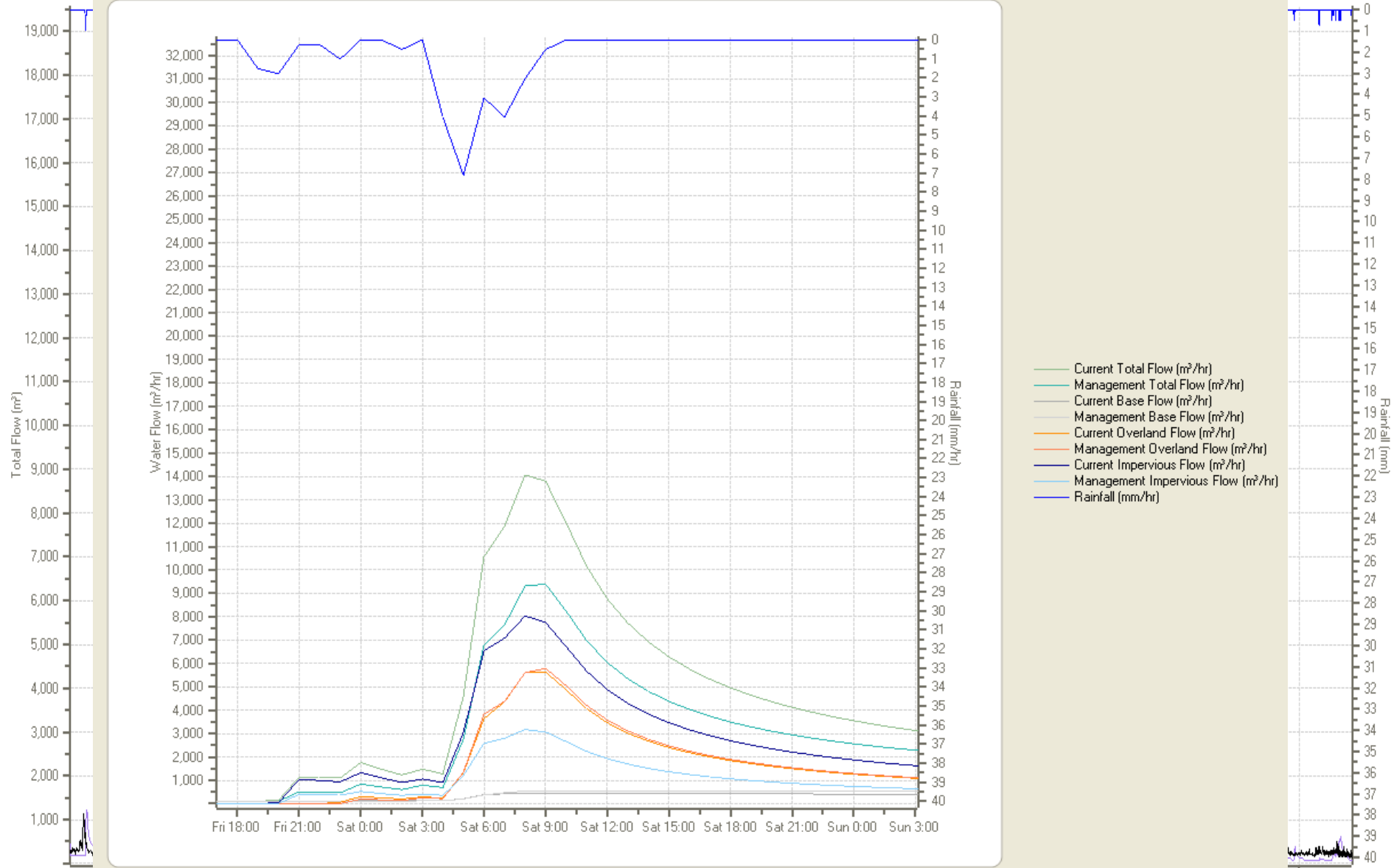


Watershed Area (m2)	161,653,500
Percent Impervious cover	15.8
Percent Tree Cover	27
Percent of Tree Cover over Impervious Area	10
Percent Water Cover	0.3
Average Tree Leaf Area Index (LAI)	3.5
Percent Shrub Cover	7.8
Percent Grass Cover	33.8
Percent Evergreen Trees	4.2
Percent Evergreen Shrubs	21
Shrub LAI	3.9
Leaf on Day	80
Leaf off Day	294

Hydro Reporting



Current vs. Management Scenario



i-Tree 2nd Generation



Online
Mapping tools

Growth, Mortality,
& Influx Rates

Tree Cover Maps
Landscape change



Local

SCALE

Regional



Upcoming i-Tree Features

- 🌳 Projections of tree pop. and canopy cover
- 🌳 Enhanced differentiation by species
- 🌳 Invasive plant composition / risk
- 🌳 New pest ratings (pests and range)
- 🌳 Climate change projections
- 🌳 GIS server and mobile apps
- 🌳 Projected development patterns
- 🌳 Priority planting and protection maps
 - 🌳 Temperature, pollution, eco. services, etc.

i-Tree 2nd Generation (3 Flagship Programs)

