Thank You for the Invitation…

UMass Extension
CENTER FOR AGRICULTURE

UMass Extension's Green School

David Bloniarz, USDA Forest Service
Northern Research Station
Amherst, Massachusetts

i-Tree Overview

Assessing the value of urban trees

Today's Session

- Introduction
- Urban Forests in Context
- What is i-Tree: General Overview
- i-Tree Components & Tools
- Choosing the correct i-Tree Tool
- Conducting an i-Tree Project
- Review and Questions

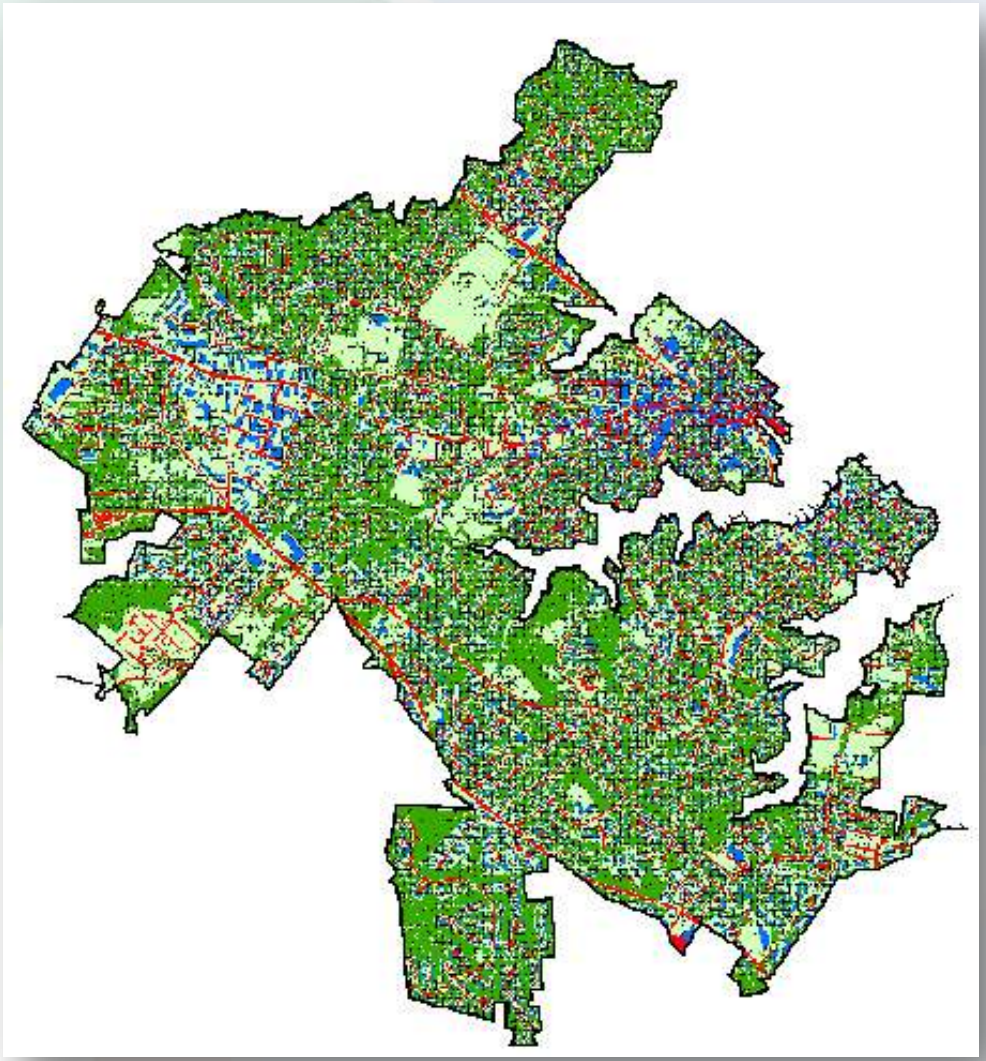
i-Tree Overview

Assessing the value of urban trees

www.unri.org/research-documents

Urban Forests & Tree Canopy

Urban Forests & Tree Canopy



Annapolis, MD

Urban Forests & Tree Canopy

Brooklyn, NY

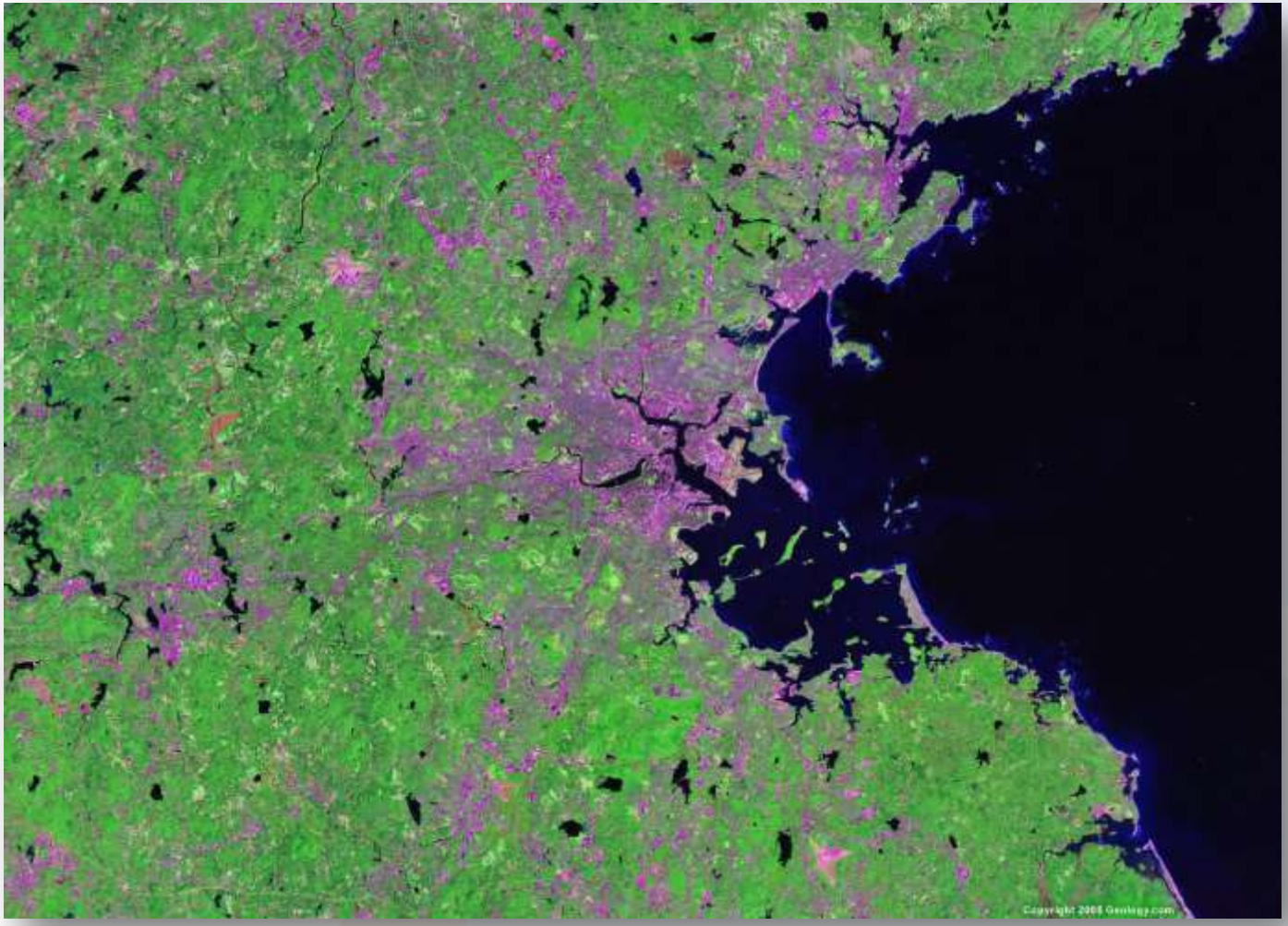
Urban Forests & Tree Canopy

Chicago, IL

Urban Forests & Tree Canopy

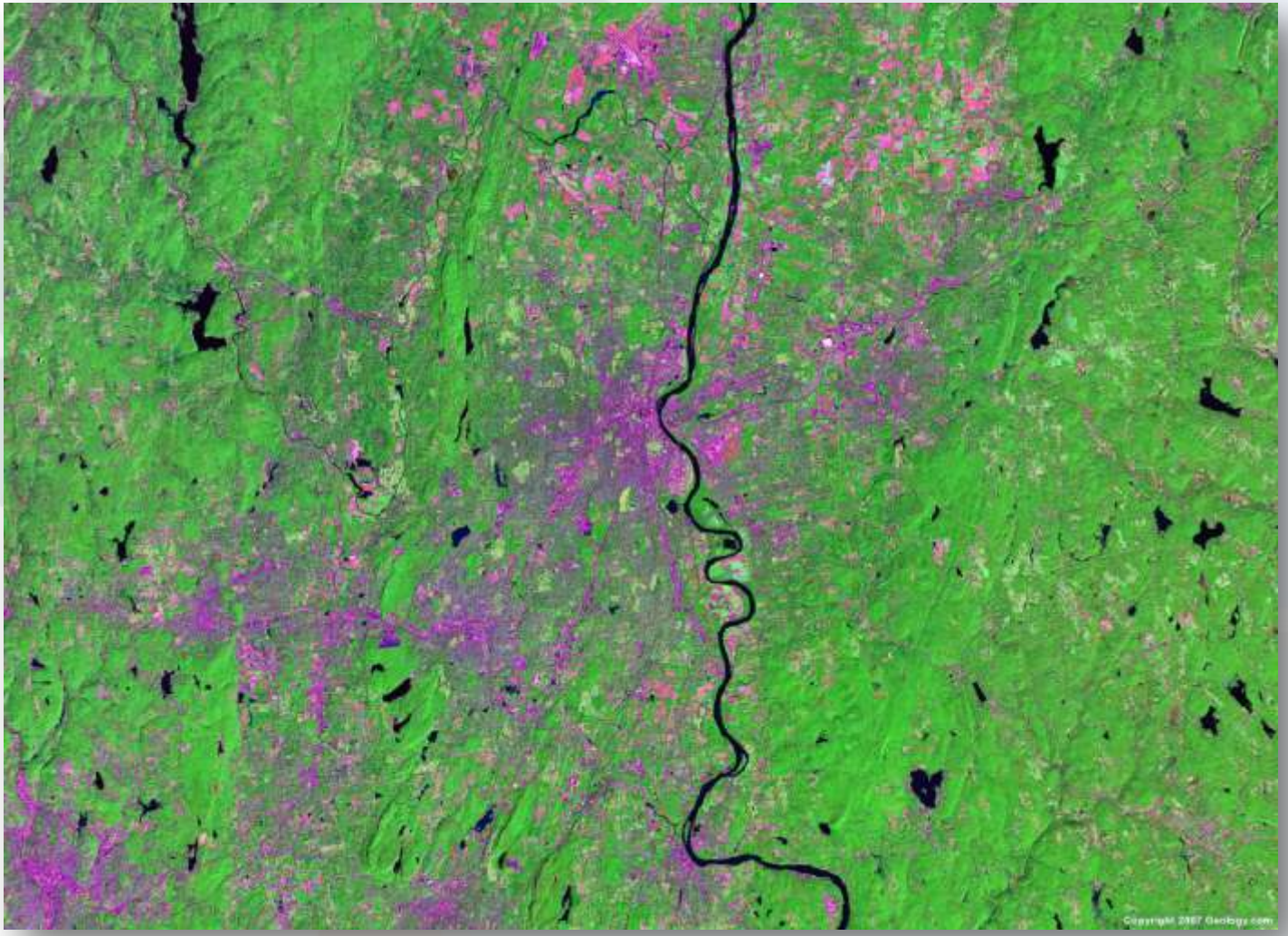
Detroit, MI

Urban Forests & Tree Canopy



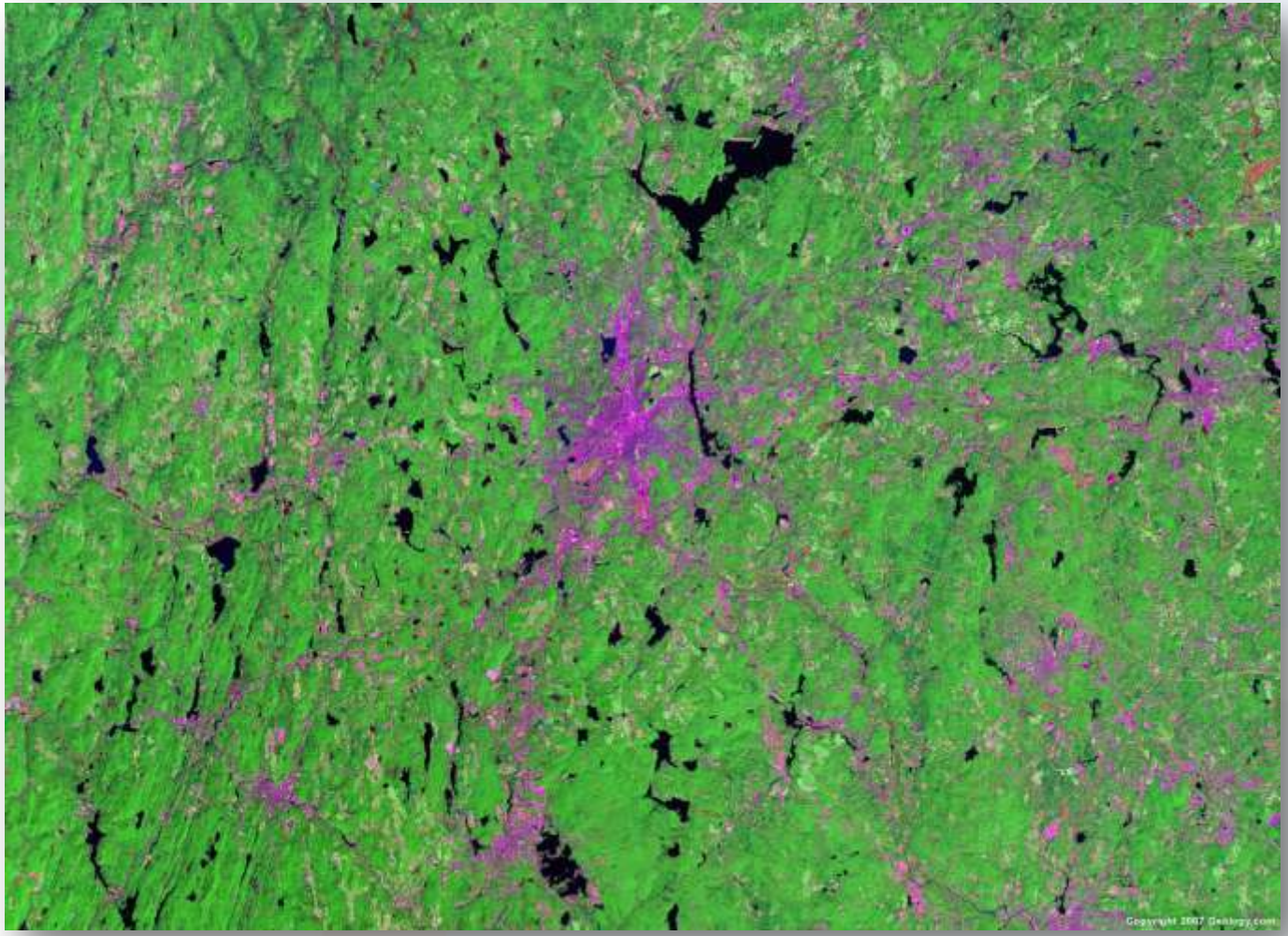
Boston, MA

Urban Forests & Tree Canopy



Hartford, CT

Urban Forests & Tree Canopy



Worcester, MA

Urban Forests & Tree Canopy

Urban Forests & Tree Canopy

Urban Forests & Tree Canopy

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

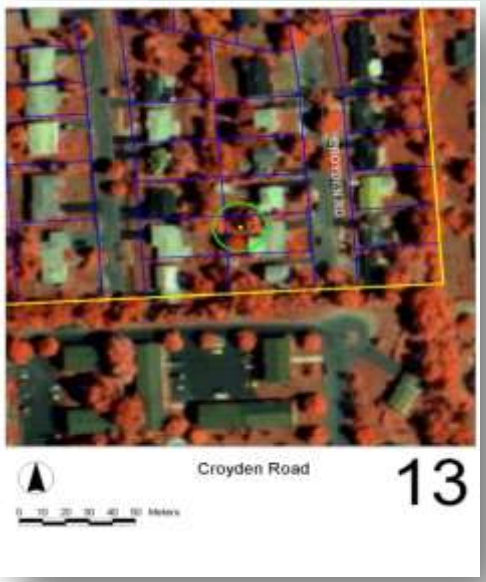
Public-Private Partnership

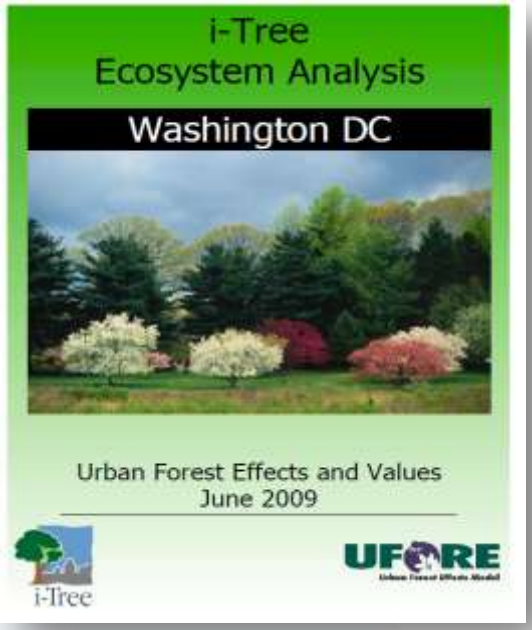
- USDA Forest Service
- Davey Tree Expert Co.
- National Arbor Day Foundation
- Society of Municipal Arborists
- International Society of Arboriculture
- Casey Trees

Goals

- Simple and low-cost tools and methods to aid in 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
- 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).

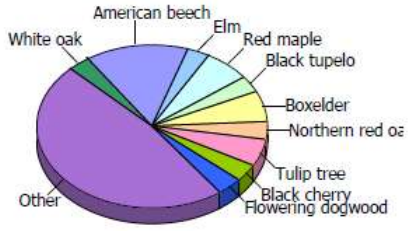


Figure 1. Tree species composition in Washington DC

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

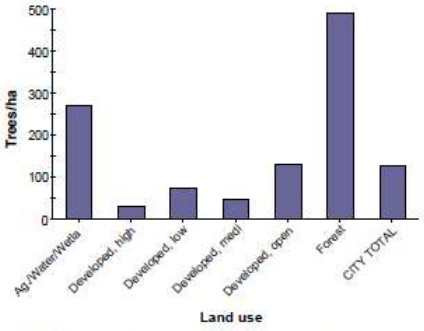


Figure 2. Number of trees/ha in Washington DC by land use

The Foundation: Local Data

Local Sample or Inventory

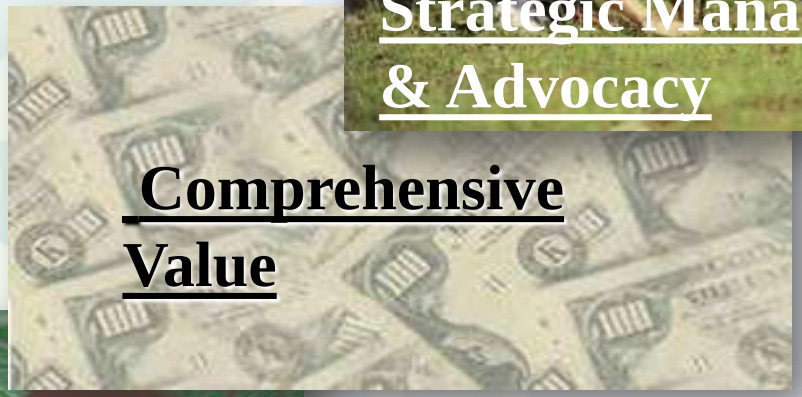
Local information:

- Weather
- Pollution
- Environmental variables

Hourly simulations

Benefit-Based Approach

i-Tree Tools



Conserving Energy

Image courtesy of the Center for Urban Forest Research

Improving Air Quality

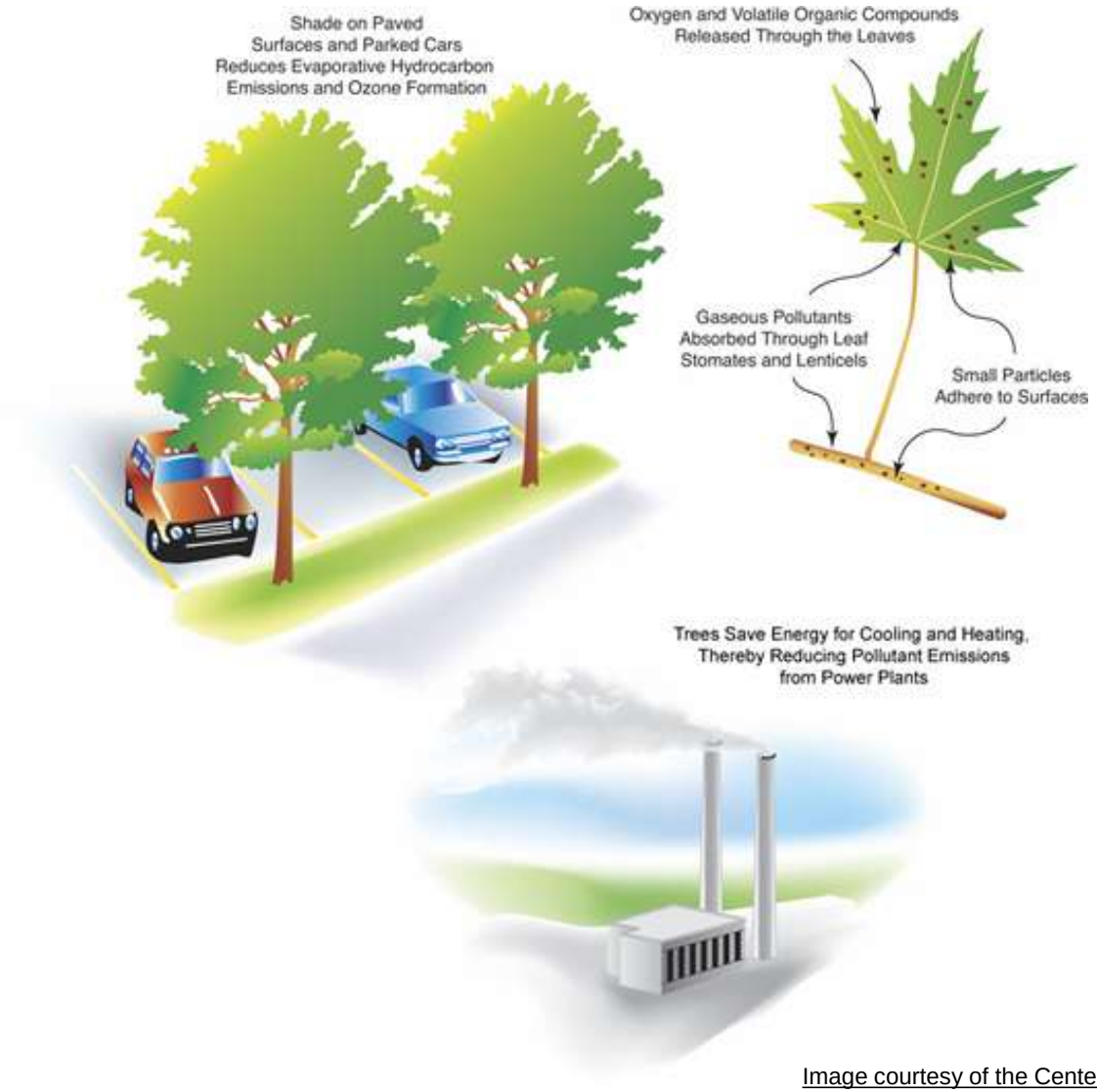


Image courtesy of the Center for Urban Forest Research

Reducing Atmospheric Carbon Dioxide

Image courtesy of the Center for Urban Forest Research

Reducing Stormwater Runoff

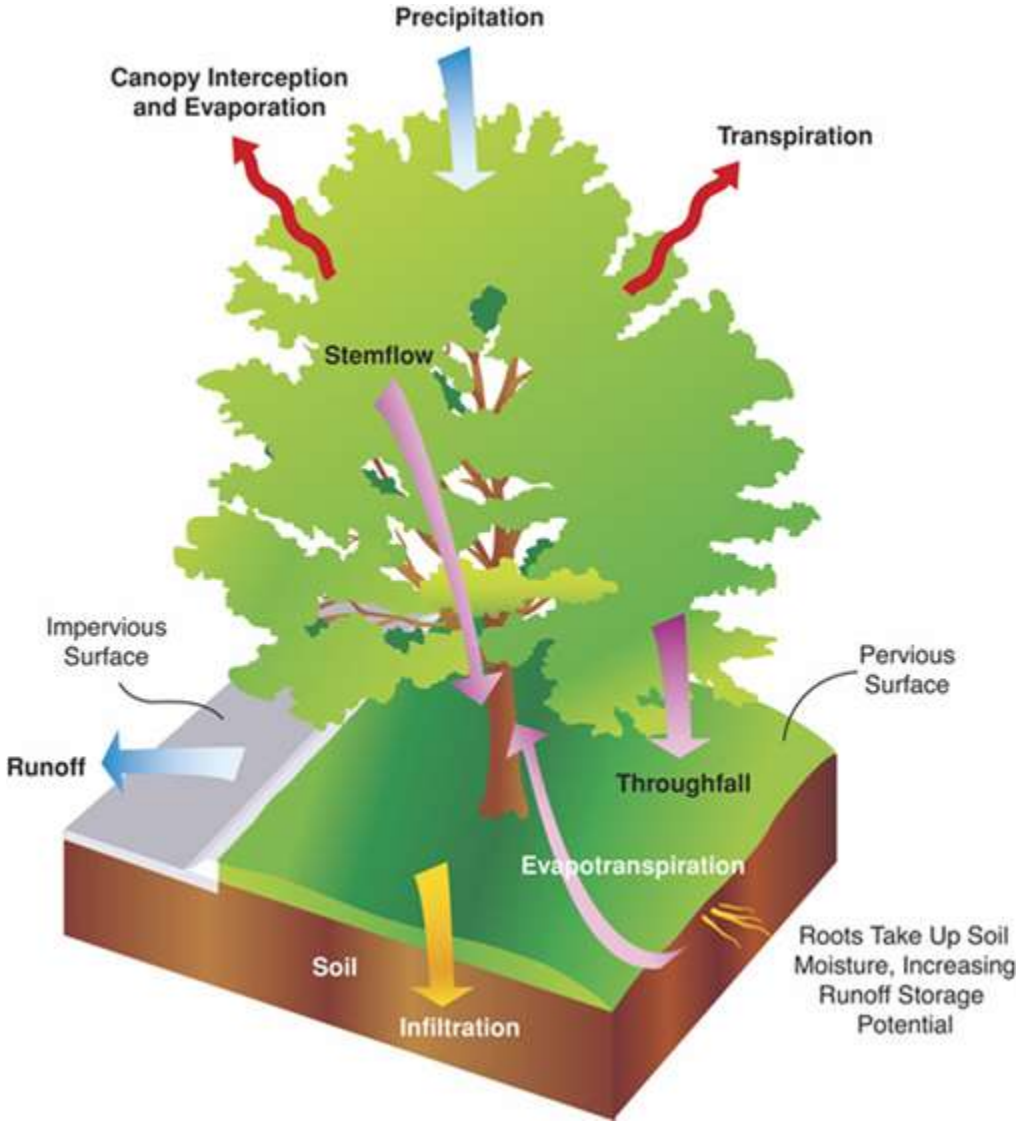


Image courtesy of the Center for Urban Forest Research

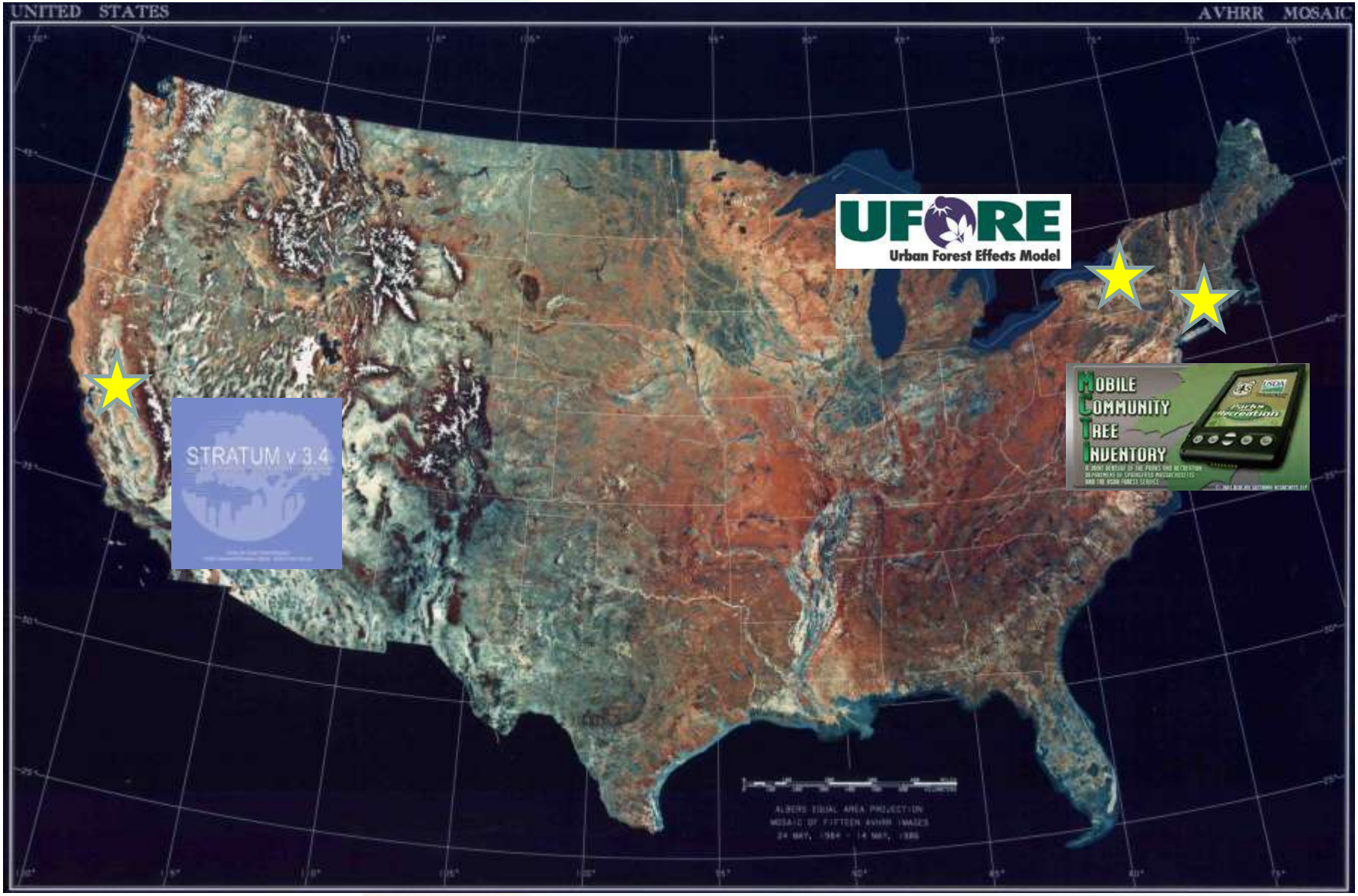
i-Tree is…

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"

i-Tree: the early years



What's being used?

i-Tree

i-Tree™

Eco

i-Tree™

Streets

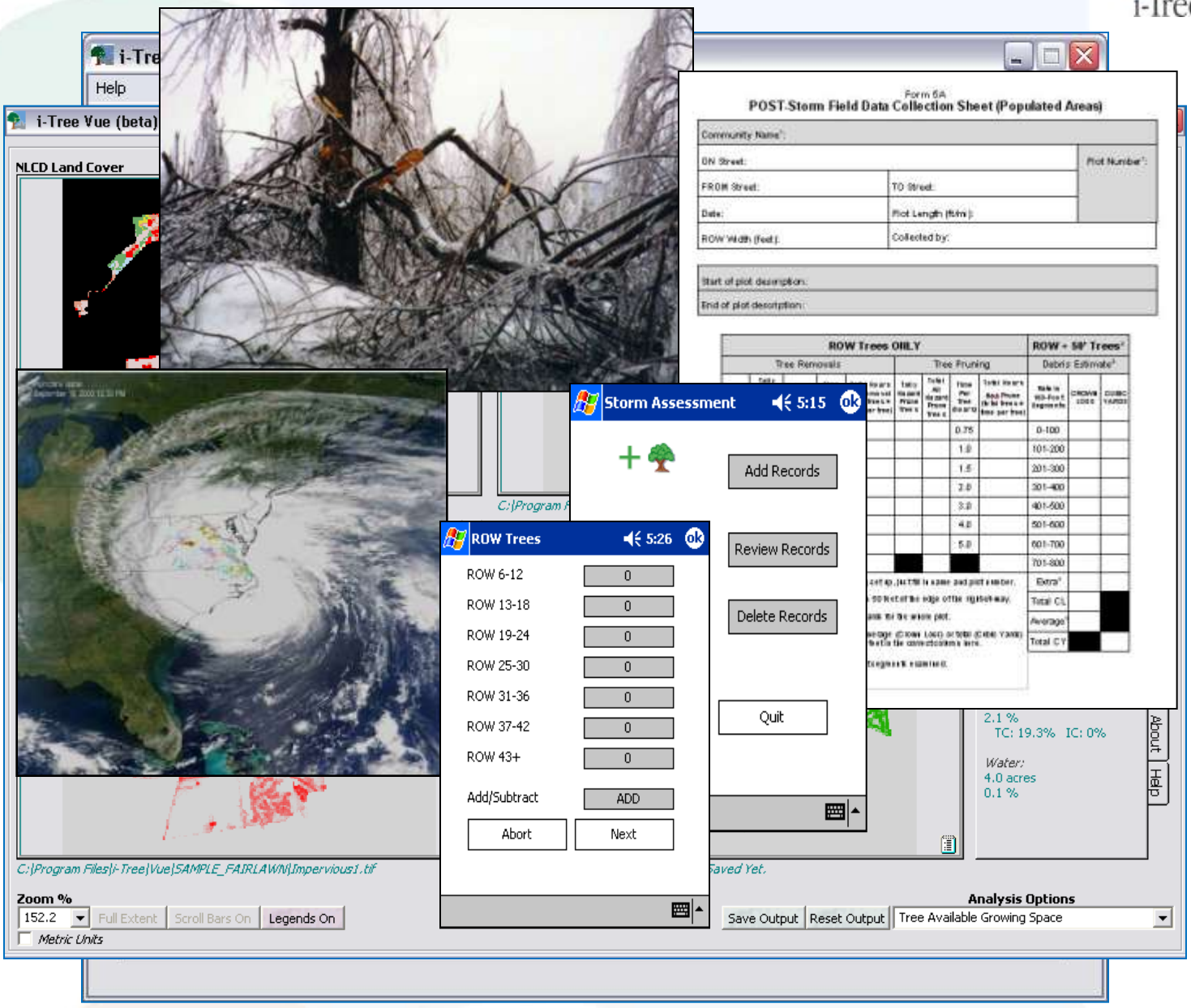
i-Tree Utilities:

i-Tree

i-Tree
Species

i-Tree
Vue

i-Tree
Storm

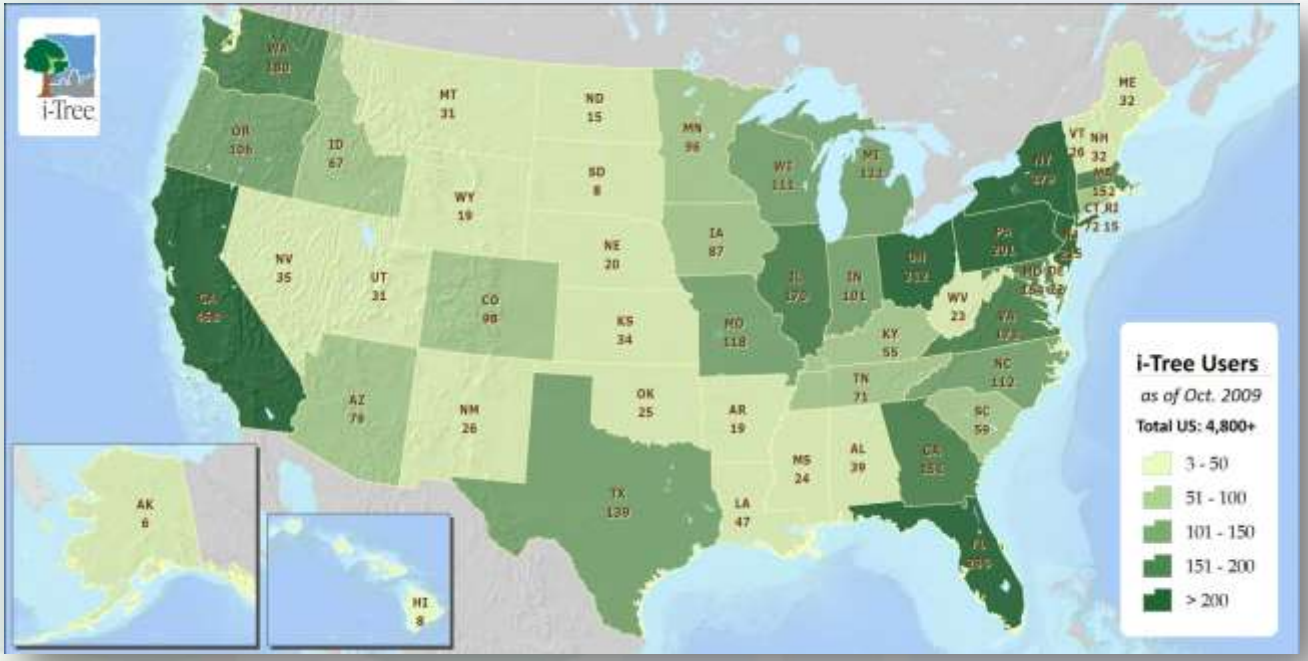


i-Tree user base continues to grow…

Consultants

Non-profits

Universities



Friday, November 14, 2008 | Modified: Monday, November 17, 2008

NFL favors proven strategies for a green Super Bowl

Tampa Bay Business Journal - by Alexis Muellner Editor

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Real carbon impacts

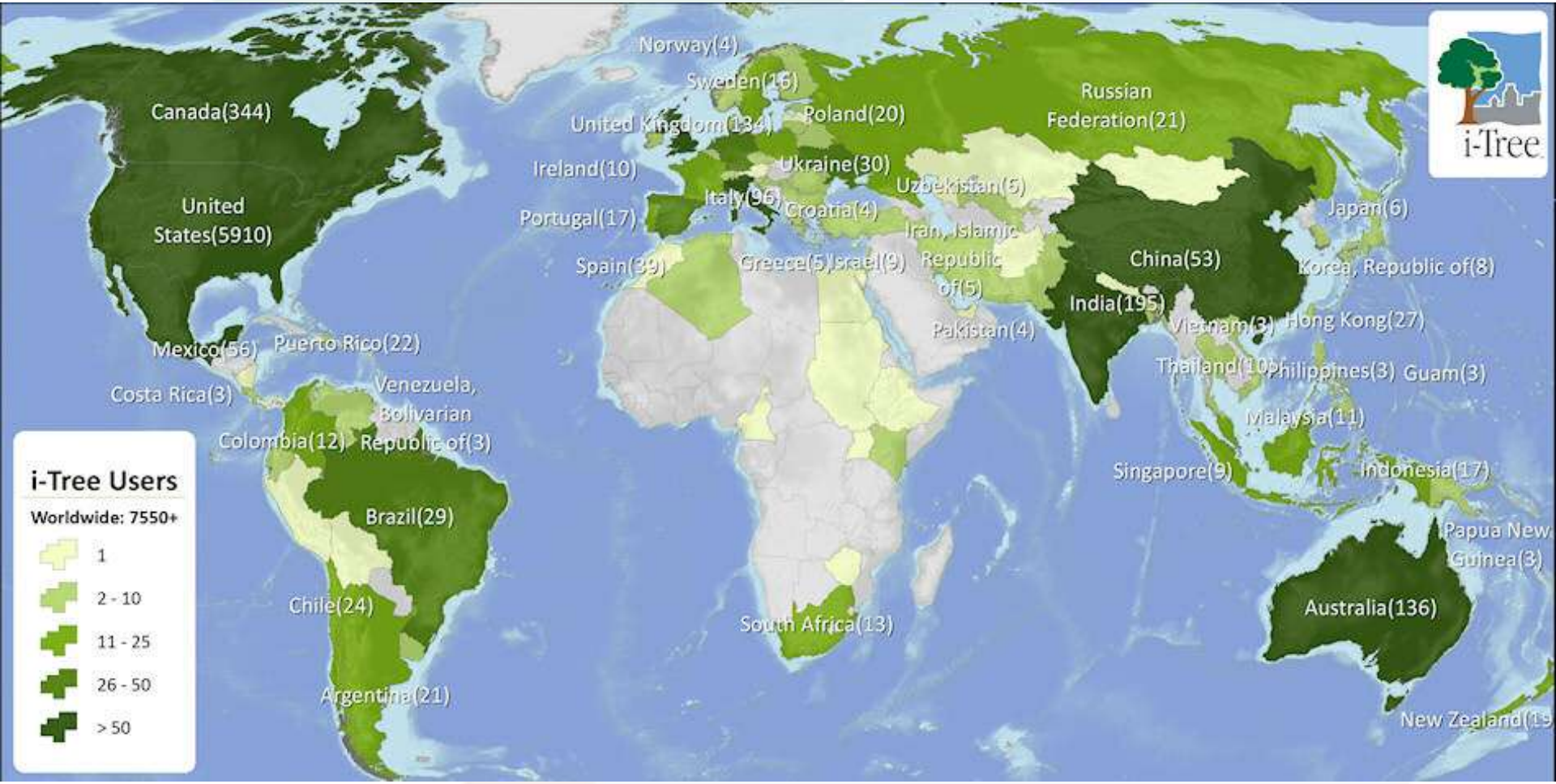
To that end, for the first time at a Super Bowl, the **U.S. Forest Service** is implementing in Tampa a public domain software monitoring system called i-Tree that it developed with Kent, Ohio-based **Davey Tree Expert Co.** The software, its components 10 years in the making, is expected to do a far more accurate job of monitoring the carbon impact of the tree-planting efforts than current systems offer.

State-wide projects

Municipal projects

i-Tree Use

Program distribution increasing about 25% per year



Distributed to over 90 countries

The New York Times
nytimes.com

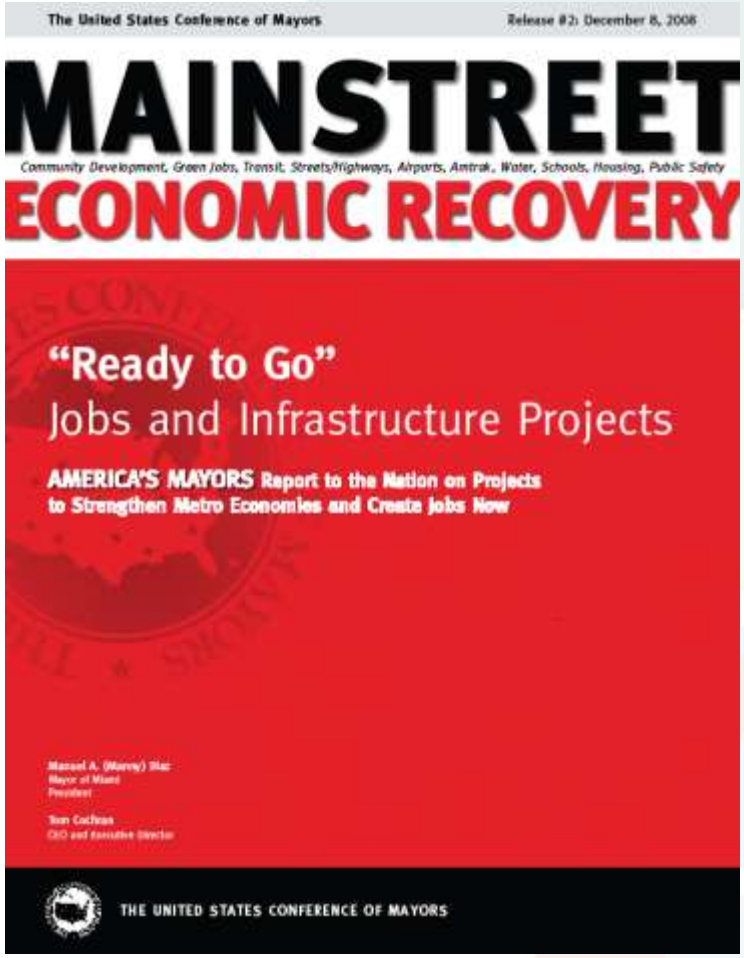
April 18, 2007

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)

Using technology to tell your story?

Credit: Waldo Nilo

Successful storytelling with i-Tree requires:

1. Understand your Vision
2. Plan & Implement Strategically
3. Turn your results into a compelling message
4. Make a difference

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

Monday, November 2nd, 2009

KirklandViews.com

Re-Elect Jo
McE
Integrity.Dedi

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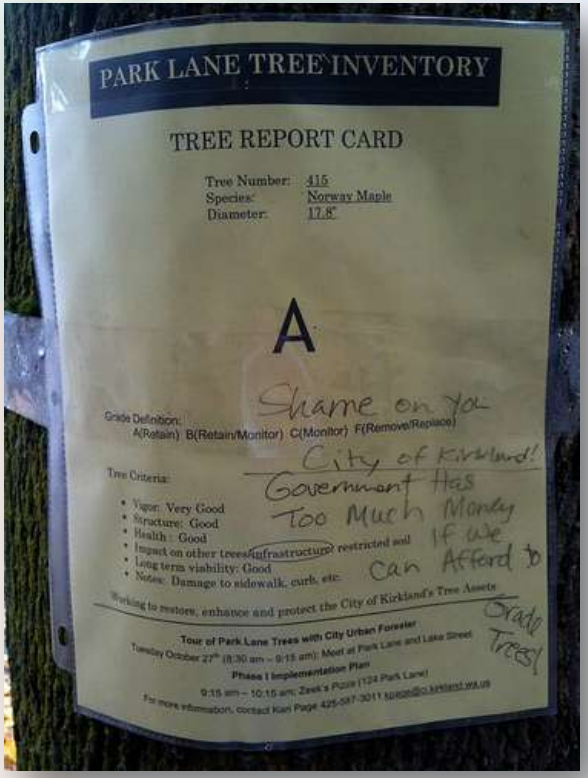
YOU ARE HERE: HOME / CITY HALL / PARK LANE TREES GET REPORT CARDS; SOME QUESTION PROGRAM

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!"***



Pittsburgh's Urban Forest

$2.94 in benefits for every $1 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**

Key Element for Success #1:

Understand Your Vision for Using the Results

Knowing why you are implementing i-Tree and specifically what you want out of it.

- Credibility
- Quantification using sound science

"Trees are a favorite tool because every tree intercepts about 1,400 gallons of rainfall"

--Danielle Crumrine

PITTSBURGH TRIBUNE-REVIEW

Larger text Smaller text SHARE

A coalition in East Liberty is tackling stormwater issues

By Mike Cronin
TRIBUNE-REVIEW
Tuesday, July 22, 2008

Buzz up!
Buzz up!

Not many things are less sexy than raw sewage flowing into Western Pennsylvania waterways. But few are more important, said Nate Wildfire, a policy coordinator for East Liberty Development Inc.

"People don't understand that the water you flush down the toilet and the water that goes into stormwater drains go to the same place," Wildfire said.

Multimedia

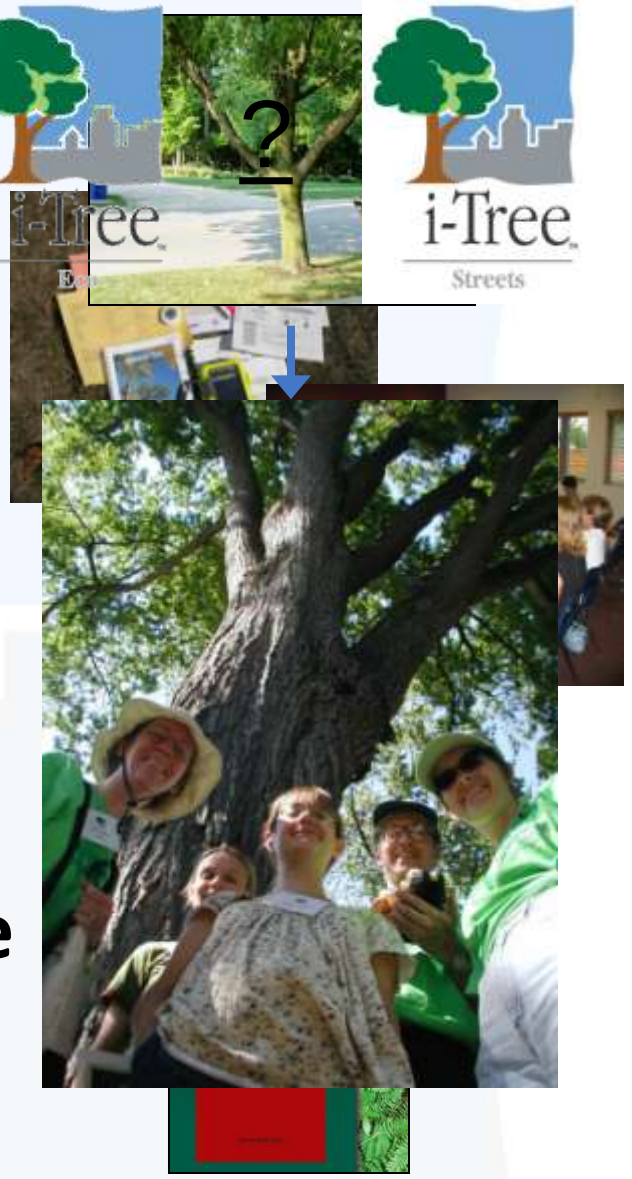
PDF: East Liberty
Porous streets
View PDF Now

Photo Gallery

click to enlarge

i-Tree – General Project Phases

- **Phase I: Getting Started**
  - Study area, inventory type
- **Phase II: Project Establishment**
  - Project parameters, mobilization
- **Phase III: Out in the Field**
  - Data collection, Management
- **Phase IV: Running the Software**
  - Reporting, interpretation



Chestertown, MD: linking technology with policy

Energy	**$31,280**
Carbon	**$7,760**
Air quality	**$8,287**
Stormwater	**$83,413**
Property	**$103,020**
Total annual benefits	**$223,750**

Chestertown i-Tree Project Details

Project expenses	**$2,000 approx.**
Funding assistance	**Chesapeake Bay Trust grant**
Key Partner	**Washington College- CES**
Project manager	**Local resident (retired forester)**
Inventory type	**15% random sample**
Data collection	**40 students & trained vols.**
Data collection	**3 - Days**
Total project time	**Approx. 3 months**

Key Element for Success #2: Plan & Implement Strategically

- Understand the advantages and limitations of i-Tree
- Assess your capacity to complete a project
- Identify barriers and how you will address these
- Develop an implementation plan, but stay flexible

THE CHESTERTOWN Spy

Tree Ordinance Takes a Whack

Posted by John Lang on September 8, 2009 · 5 Comments

If you've got a great big old tree in your yard in Chestertown and you don't like it for any reason, just chop it down, no approvals necessary. There's no such tree protection in the town ordinance anymore.

Milwaukee i-Tree Eco Assessment

EAB Structural Impacts:

17.4% Canopy Loss

$221 Million structural damage (citywide)

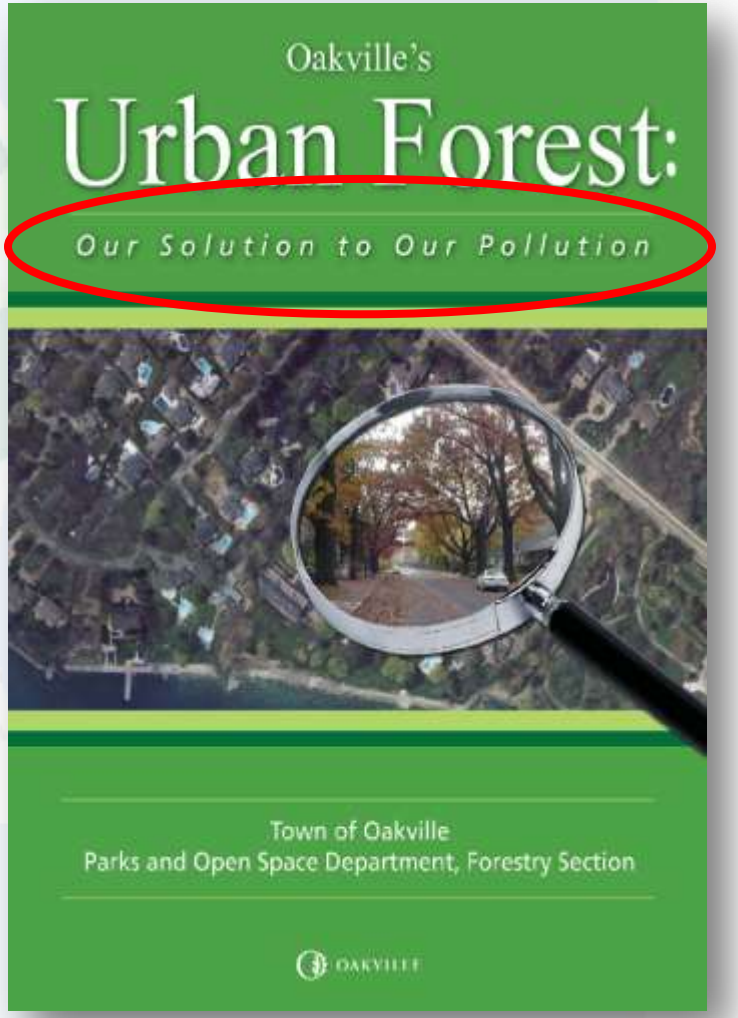
EAB Functional Impacts:

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

Milwaukee Ecosystem Assessment

Key Element for Success #3: Make the message compelling.

- Craft your message for your intended audience
- Make local, tangible connections
- Link tree benefits to themes and current initiatives

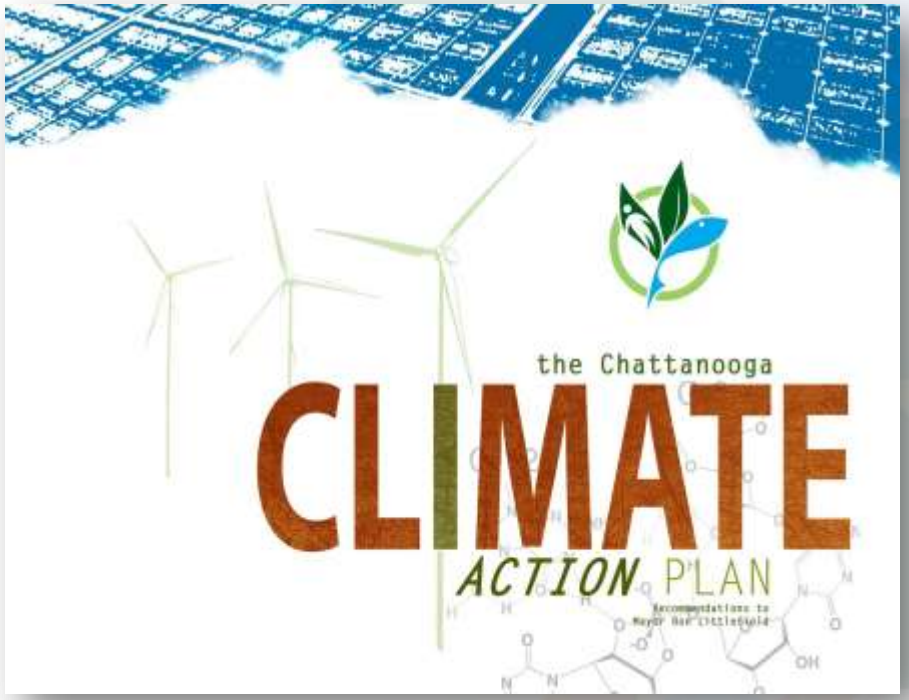


THE UNITED STATES CONFERENCE OF MAYORS

CLIMATE PROTECTION CENTER

i-Tree

Chattanooga, Tennessee



GOAL: Reduce global warming pollution levels to 7 percent below 1990 levels by 2012.

U.S. Conference of Mayors, Climate Protection Agreement

CLIMATE ACTION PLAN: RECOMMENDATIONS

URBAN AND REGIONAL FORESTS

FIGURE 35: INCREASE URBAN FOREST

Estimated GHG Reduction (metric tons)	Estimated Cost	Estimated $ Savings	
63	$	★	

FIGURE 36: MODIFY LANDSCAPE ORDINANCE TO RETAIN TREES

Estimated GHG Reduction (metric tons)	Estimated Cost	Estimated $ Savings	
501	NOT CALCULATED	★	

60

Detailed, Species Specific Data

Table 13. Net Atmospheric CO_2 Reduction by Chattanooga's Street Trees—City-Managed Population Only

Species	Sequestered (lb)	Sequester									% of		ee
hackberry	3219030	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
flowering dogwood	660577	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
black cherry	1132151	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
mimosa	259225	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
crapemyrtle	220719	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
slippery elm	783416	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
boxelder	1476852	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
red maple	1237812	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
sweetgum	398331	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
sugar maple	622267	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
white oak	1757987	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
eastern red cedar	222030	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
tree of heaven	262374	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
callery pear	390189	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
eastern white pine	740275	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
silver maple	1798692	13,490.19	-78831	-397	- 594.21	369853	2,773.89	2089317	15,669.88	(±4,113)	2.2	6.2	4.38
Yoshino flowering cherry	[illegible]	[illegible]	[illegible]	[illegible]	- 6.29	37049	277.87	85741	643.06	(±450)	2.1	0.3	0.18
Virginia pine	361588	2,711.91	-13722	-382	- 105.78	110879	831.59	458363	3,437.72	(±802)	2.1	1.4	1.00
loblolly pine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	126057	945.42	587090	4,403.18	(±1,340)	2.0	1.8	1.34
shortleaf pine	367183	2,753.87	-10485	-344	- 81.22	90842	681.31	447194	3,353.96	(±1,031)	1.9	1.3	1.08
eastern redbud	137464	1,030.98	-4388	-333	- 35.41	36638	274.78	169380	1,270.35	(±566)	1.8	0.5	0.42
willow oak	1099667	8,247.50	-91351	-307	- 687.43	270410	2,028.07	1278419	9,588.14	(±2,492)	1.7	3.8	3.46
winged elm	143218	1,074.14	-2294	-255	- 19.12	24976	187.32	165645	1,242.34	(±452)	1.4	0.5	0.54
chestnut oak	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	847187	6,353.90	(±2,085)	1.3	2.5	2.85
water oak	635487	[illegible]	-32257	-243	- 243.75	[illegible]	998.39	736106	5,520.80	(±1,663)	1.3	2.2	2.52
white ash	412970	3,097.27	-13419	-228	- 102.35	115432	865.74	514755	3,860.66	(±1,250)	1.2	1.5	1.87
Chinese elm	572308	4,292.31	-11933	-221	- 91.15	96271	722.03	656425	4,923.19	(±1,945)	1.2	2.0	2.47
southern red oak	[illegible]	[illegible]	-44188	[illegible]	- 333.01	[illegible]	[illegible]	826246	[illegible]	(±1,626)	1.2	2.5	3.22
black tupelo	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.08
Other street trees	6645139	49,838.54	-281435	-3901	- 2,140.02	1835412	13,765.59	8195215	61,464.11	(±6,623)	21.2	24.5	1.75
Citywide Total	**27620224**	**$207,151.70**	**-1110142**	**-18399**	**-$8,464.06**	**6969860**	**$52,273.95**	**33461542**	**$250,961.59**	**(±30,808)**	**100.0**	**100.0**	**$1.51**

Net Total (lb)	Total ($)	SE	% of Total Tree Numbers	% of Total $	Avg. $/tree
4041645	30,312.34	(±5,126)	10.8	12.1	1.69
798960	5,992.20	(±1,285)	6.9	2.4	0.52
1398996	10,492.47	(±2,031)	4.5	4.2	1.41
322339	2,417.54	(±592)	3.9	1.0	0.37
311476	2,336.07	(±712)	3.6	0.9	0.39

- ➢ Average $C0_2$ reduction = 200 lbs
- ➢ Average tree maintenance costs = $3.46

- ✓ **Cost of $C0_2$ reduction = $35 per ton**
- ✓ **25% of Carbon emissions offset by municipal trees**

Springfield Massachusetts
June 1, 2011 Tornado

Springfield Massachusetts
June 1, 2011 Tornado

Northern
RESEARCH STATION
USDA Forest Service

i-Tree Streets Analysis of Springfield Tornado Impact Zone

INFORMATIONAL BRIEF

3.0

June 23, 2011

Kipling Street
East Forest Park
Springfield, MA

Tornado Damage Quick Facts

Impacts on Springfield's Street Trees

On June 1, 2011 a series of three tornadoes ripped through Western Massachusetts, and included the second strongest tornado ever recorded in Massachusetts, with wind speeds estimated at 136 to 165 mph, according to the National Weather Service. The most severe tornado was the EF-3, on the Enhanced Fujita Damage Classification Scale, that carved a half-mile-wide path for 39 miles from Westfield to Charlton, killing three people and injuring 200. In Springfield, the tornados impacted city's South End, Six Corners, East Forest Park and Sixteen Acres neighborhoods.

In the neighborhoods of Springfield affected by the storms, damage to the street trees was extensive, destroying or severely many of the public trees growing in these areas. A team of US Forest Service and City of Springfield personnel conducted a preliminary review of the streets in these neighborhoods, and an initial summary of the storm impacts was developed.

A preliminary review of the storm damage to Springfield public street trees follows here:

- 87 miles of the 540 total miles of city streets were impacted by the storms;
- 16.1 % of Springfield's streets showed some damage to the public trees growing on them;
- Approximately 1,340 of the 3,830 streets trees, growing in the impacted areas, were destroyed or severely damaged, necessitating removal;
- Immediate impacts include the reduction of rainwater interception by 2,444,252 gallons;
- Reduced storage of 7,220,361 pounds of carbon;
- Approximately 331,232 pounds of sequestered CO^2 has been lost.

Northern Research Station

For more information please contact:

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i-Tree Streets

Annual Loss in Benefits of Springfield's Street Trees

Annual Benefits of Impact Zone Street Trees			
Benefit	**Quantity**	**Impact Zone Value**	**Loss Value**
Energy Saved			
Electricity (MWh)	360.6	$18,393	$4,598
Natural Gas (therms)	129,018.6	$85,439	$29,903
Total ($)		**$103,832**	**$34,501**
Carbon Dioxide			
CO_2 Sequestered (lbs)	946,377	$3,123	$1,093
CO_2 Released (lbs)	-244,714	-$808	-$283
CO_2 Avoided (lbs)	1,086,259	$3,585	$1,255
Total (lbs, $)	**1,787,922**	**$5,900**	**$2,065**
Air Quality			
Avoided pollutants* (lbs)	4954	$21,451	$7,508
Deposited pollutants** (lbs)	4264	$22,958	$8,035
BVOC emitted (lbs, $)	-1,140	-$2,634	-$922
Total (lbs, $)	**8,078**	**$41,775**	**$14,621**
Storm Water			
Rainfall intercepted (gal)	6,983,576	**$55,872**	**$19,555**
Aesthetic/Other			
Added Property Value		**$140,569**	**$49,199**
TOTAL VALUE		**$347,948**	**$121,782**

*NO 2 , SO 2 , VOC, PM10 **O 3 , NO 2 , PM10, SO 2

i-Tree Streets Analysis of Springfield Tornado Impact Zone

An Initial Report on the Status of Street Trees in Springfield, Massachusetts

Tornado Damage to Springfield's Street Trees

June 2011

prepared for:

The City of Springfield, Massachusetts

prepared by:

Alex Sherman, City of Springfield
Rob Dill, City of Springfield
Edward Casey, City of Springfield

David V. Bloniarz, USDA Forest Service
Northern Research Station

INFORMATIONAL BRIEF

July 7, 2011

Arcadia Boulevard Springfield, MA

Tornado Damage Quick Facts

Impacts on Springfield's Urban Forest

On June 1, 2011 a series of three tornadoes ripped through Western Massachusetts, and included the second strongest tornado ever recorded in Massachusetts, with wind speeds estimated at 136 to 165 mph, according to the National Weather Service. The most severe tornado was the EF-3, on the Enhanced Fujita Damage Classification Scale, that carved a half-mile-wide path for 39 miles from Westfield to Charlton, killing three people and injuring 200. In Springfield, the tornados impacted city's South End, Six Corners, East Forest Park and Sixteen Acres neighborhoods.

In the neighborhoods of Springfield affected by the storms, damage to the urban forest canopy was extensive, destroying or severely many of the trees growing in these areas. A team of US Forest Service and City of Springfield personnel conducted a preliminary review of the streets in the impacted neighborhoods, and utilized i-Tree modeling software to analyze the impacts of the storms on the urban forest, and an initial summary of the damage n was developed.

A preliminary review of the storm damage to Springfield's urban tree canopy follows here:

- Based on initial estimates, over 13,000 trees were destroyed or severely damaged;
- Immediate impacts include the reduction of rainwater interception by over 7.5 million gallons per year;
- Reduced storage of over 30 million pounds of carbon annually;
- Approximately 1.4 million pounds of sequestered CO^2 has been lost.

Northern Research Station

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i-Tree Canopy Analysis of Springfield Tornado Zone

i-Tree™

Canopy

i-Tree Canopy Analysis of Springfield Tornado Zone

- Over13,000 trees were destroyed or severely damaged;
- Immediate impacts include the reduction of rainwater interception by over 7.5 million gallons per year;
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Micro-climate Changes in Springfield's Tornado Zone

SPRINGFIELD TORNADO IMPACTS ON TREE CANOPY, TEMPERATURE & HUMIDITY

Fall 2011
USDA Forest Service
Northern Research Station

TREE CANOPY LOSS IN THE TORNADO IMPACT ZONE WAS EXTENSIVE, WITH MANY LARGE SHADE TREES DESTROYED.

The June 2011 Massachusetts tornado profoundly altered the landscape over a wide geographic area.

On June 1, 2011 a series of tornadoes ripped through Western Massachusetts, and included the second strongest tornado ever recorded in Massachusetts, with wind speeds estimated at 166 to 165 mph, according to the National Weather Service. The most severe tornado was the EF-3, on the Enhanced Fujita Damage Classification Scale, that carved a half-mile-wide path for 69 miles from Westfield to Charlton, killing three people and injuring 200. In Springfield, the tornados impacted city's South End, Upper Hill, Metro Center, Six Corners, East Forest Park and Sixteen Acres neighborhoods.

CANOPY LOSS

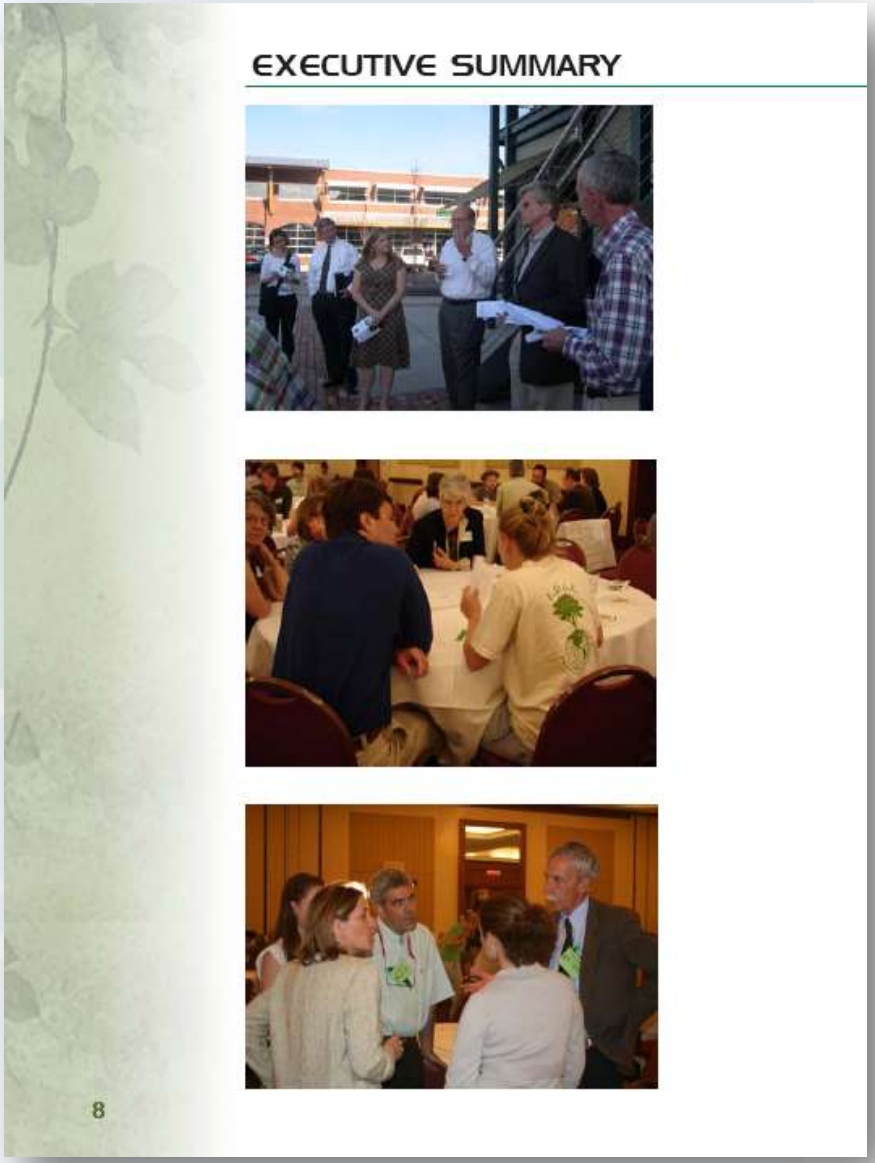
TREE FAILURE

STRUCTURE DAMAGE

Northern RESEARCH STATION
USDA Forest Service

Key to Success # 4: Make a difference

- Share your results strategically with numerous audiences in multiple formats
- Teach others how trees can be part of the solution to THEIR problem

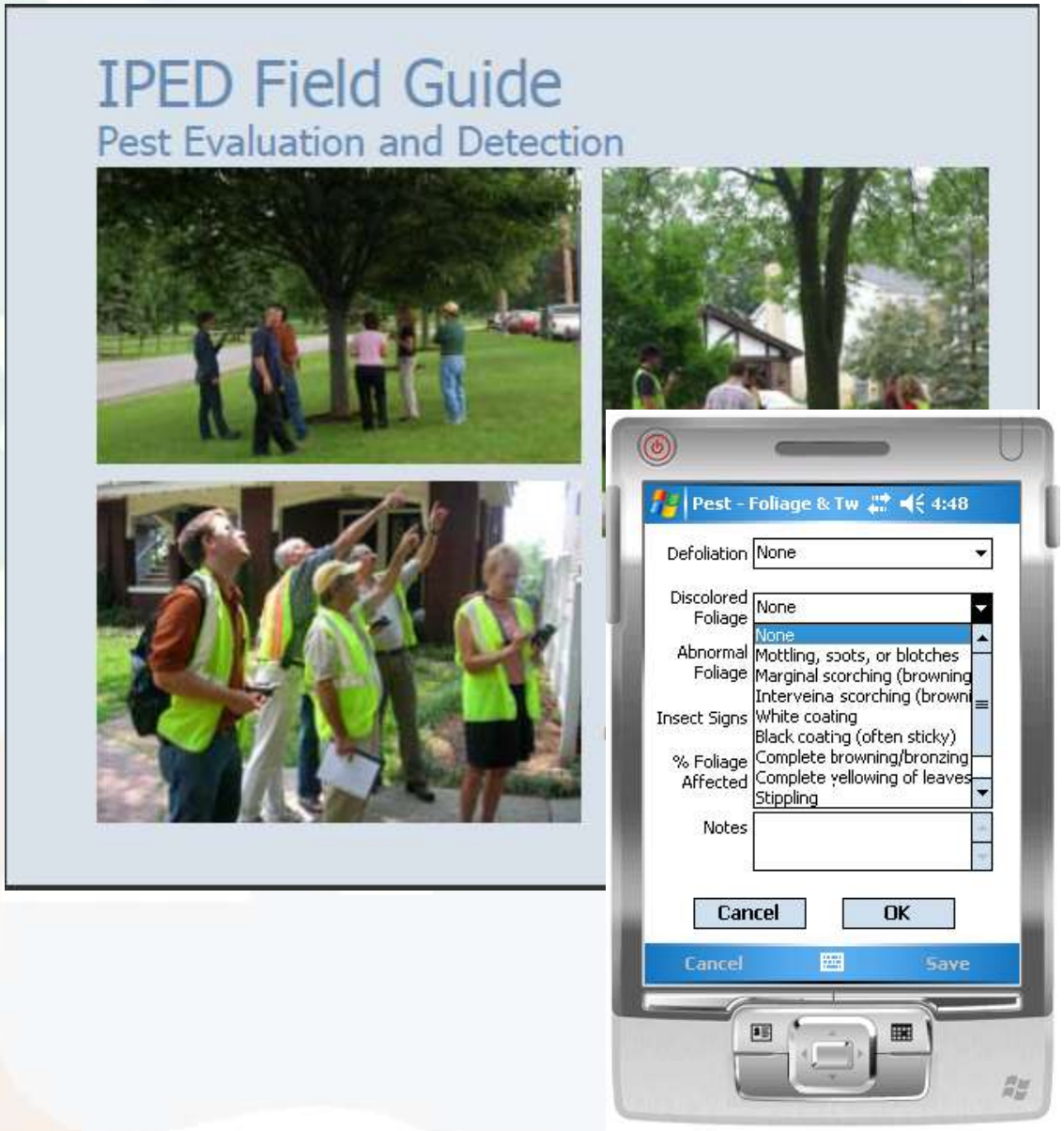


i-Tree Version 4.0

- **5 New or Enhanced Tools**

Pest detection Protocol

- **Component of Streets in i-Tree v.4.0**
- **Collect Pest & Disease**
  - Signs
  - Symptoms
- **Reports**
  - Associated pest & diseases
  - Trends/patterns



Remote Sensing Canopy Assessment Tools

Cost, Resolution, Time

less

more

- Satellite Based
  - **i-Tree Vue**

- Statistical Estimation via photo-interpretation
  - **i-Tree Canopy**

- Hyperspectral classification, GIS analysis, and photo-interpretation
  - **UTC**

i-Tree Design

i-Tree Design

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

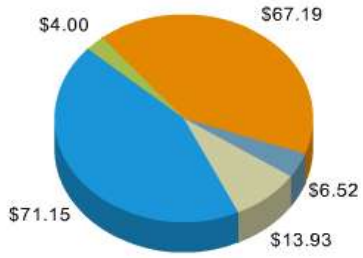
i-Tree Benefit Calculator

1500 N Mantua St, Kent, OH 44240, USA

Home
Calculate another tree

Overall Benefit | Storm Water | Energy | Air Quality | CO2 | About Model

Stormwater | Cooling | Heating | Air Quality | CO2



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.

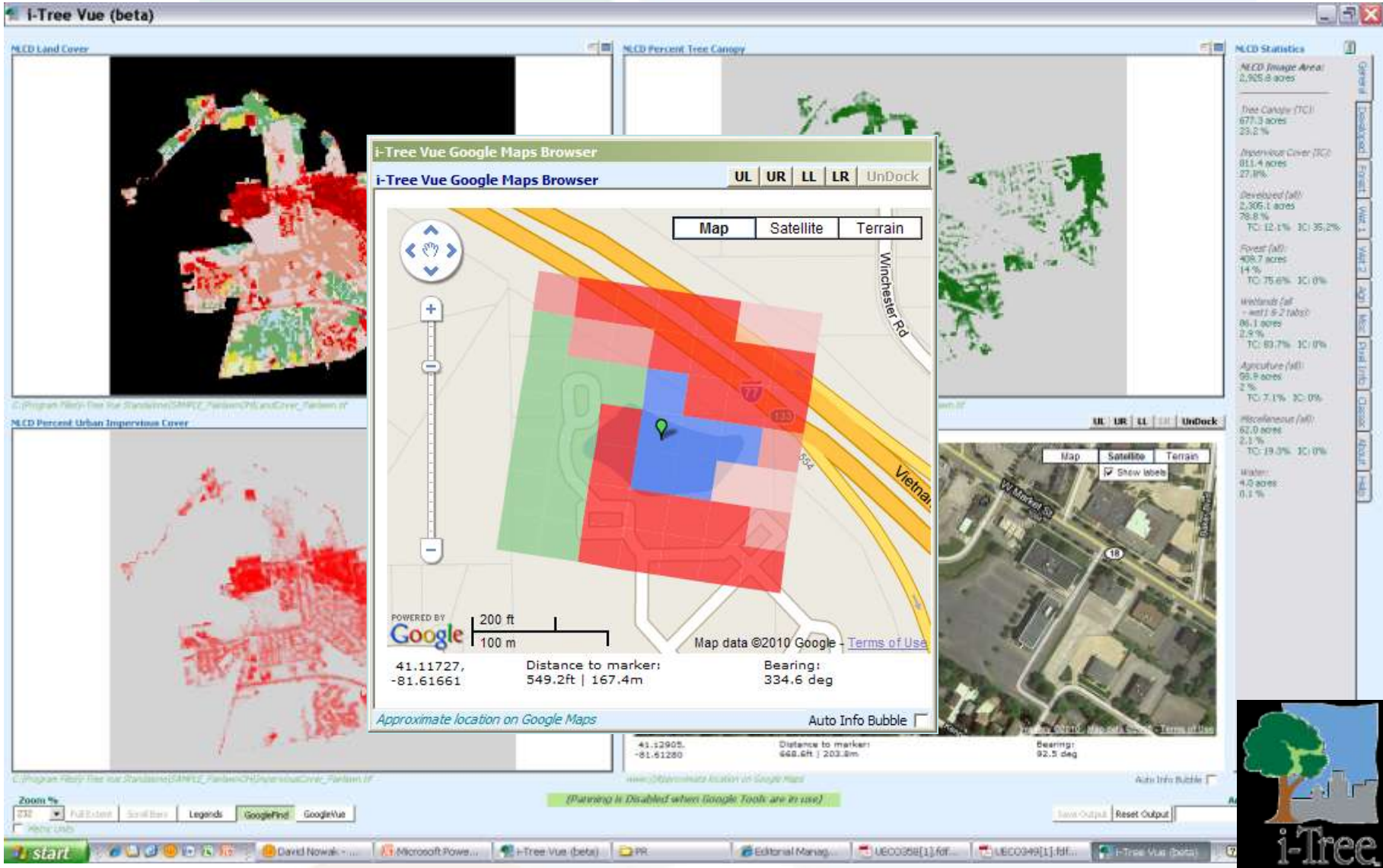
While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees' specific geography, climate, and interactions with humans and infrastructure is highly variable and makes precise calculations that much more difficult. Given 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.

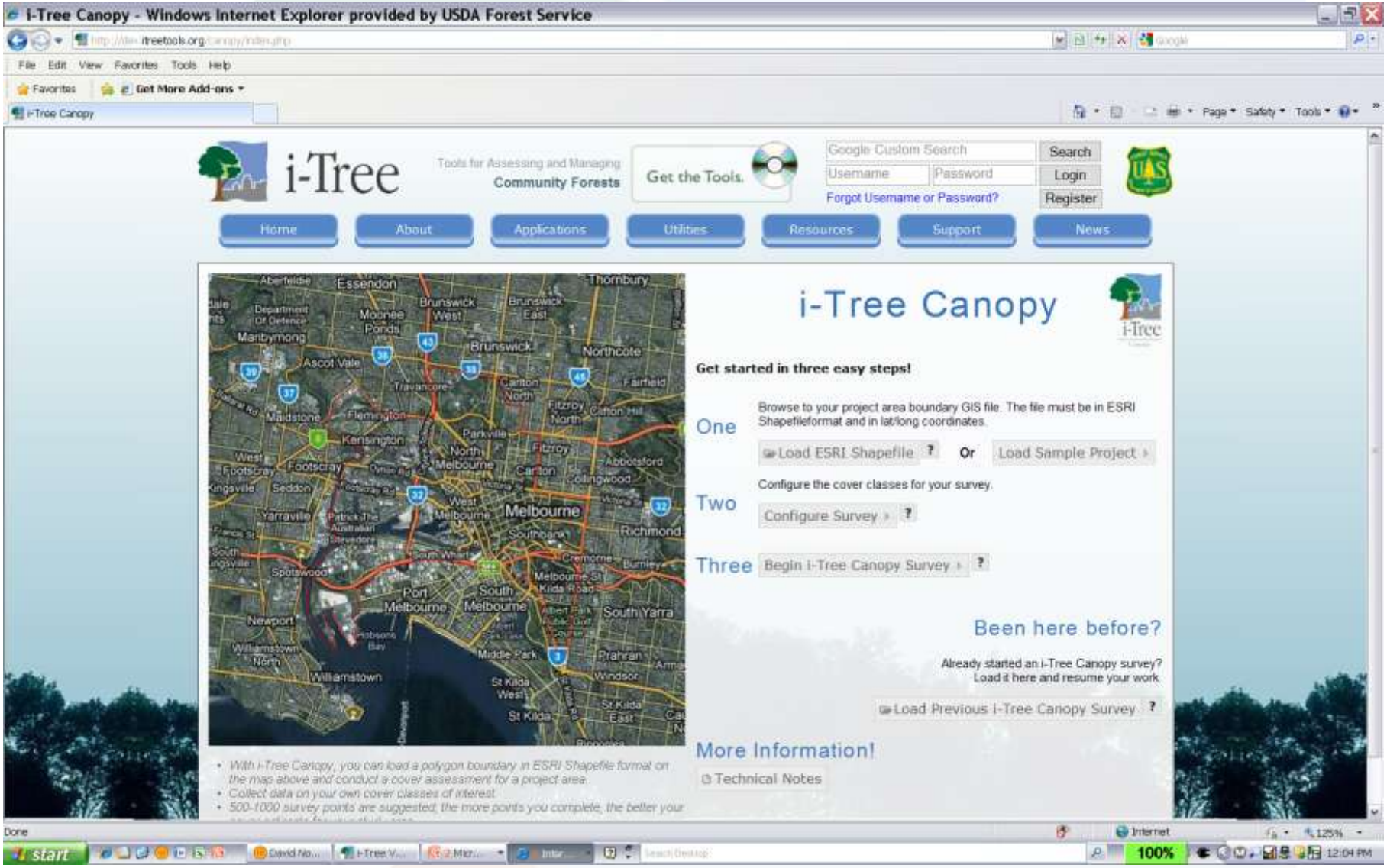
If this tree is cared for and grows to 26 inches, it will provide $195 in annual benefits.

Northern pin oak
Quercus ellipsoidalis

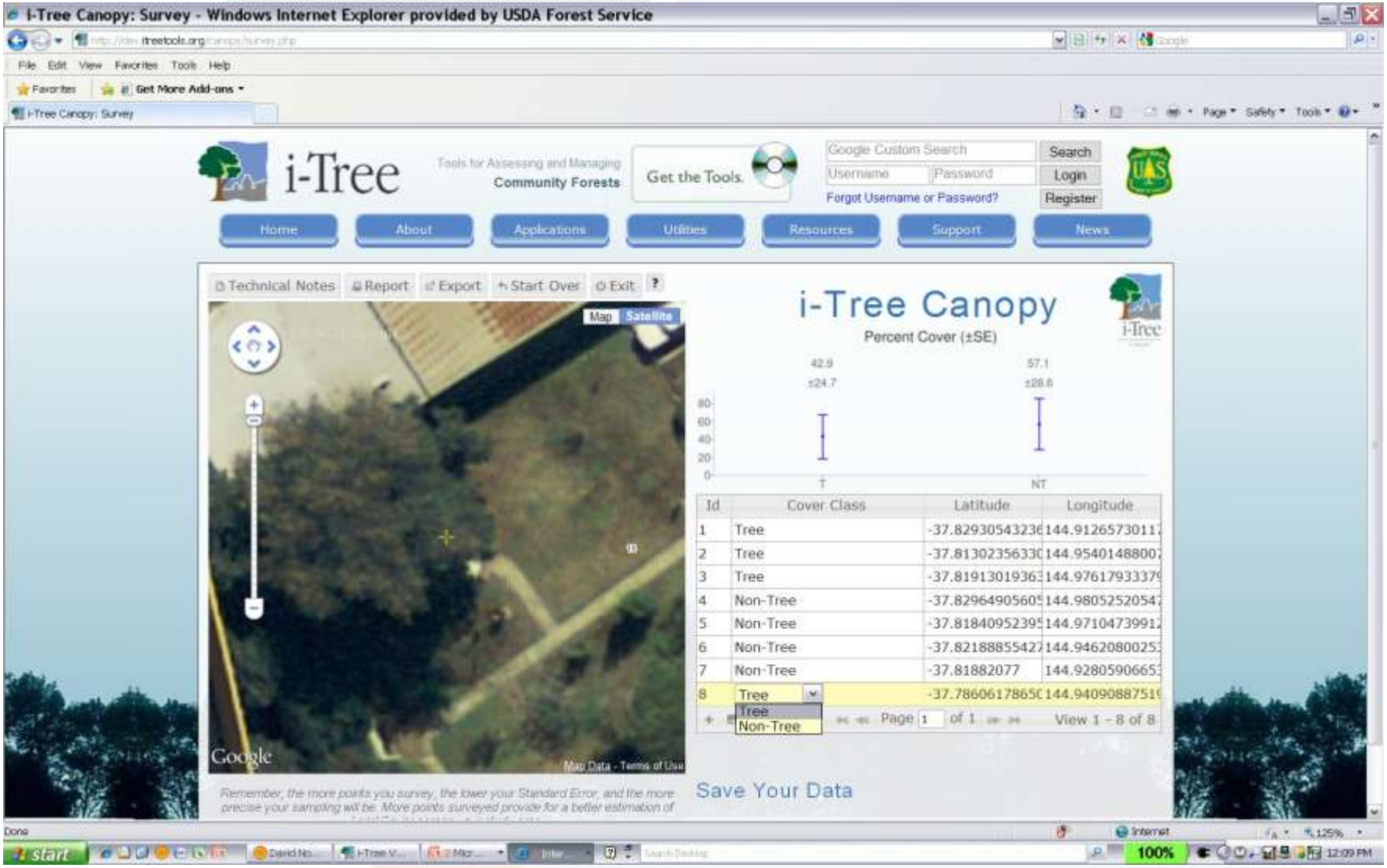
Vue – Estimates Ecosystem Services from National Cover Maps and Google Maps



i-Tree Canopy



Classify random points



File Edit View History Bookmarks Tools Help

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

i-Tree Canopy: Survey

i-Tree

Tools for Assessing and Managing **Community Forests**

Get the Tools.

Google Custom Search | Search

Username | Password | Login

Forgot Username or Password? | Register

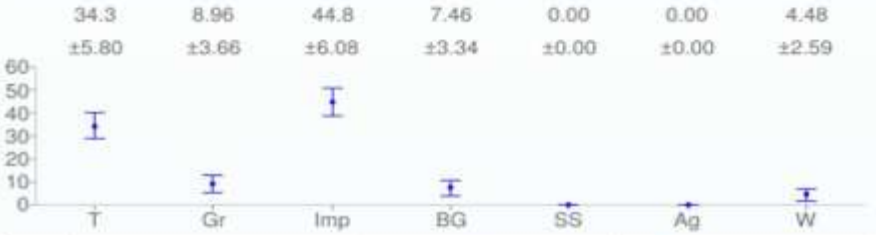
Home | About | Applications | Utilities | Resources | Support | News

Technical Notes | Report | Export | Start Over | Exit | ?

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.

i-Tree Canopy

Percent Cover (±SE)



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		38.888206252128	-76.951066339859
66		38.891553823381	-77.04287817671
67		38.907230806429	-77.049487697045

Tree
Grass
Impervious
Bare Ground
Shrub/Scrub
Agriculture
Water
Other

+ | Page 7 of 7 | View 61 - 67 of

Save Your Data

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

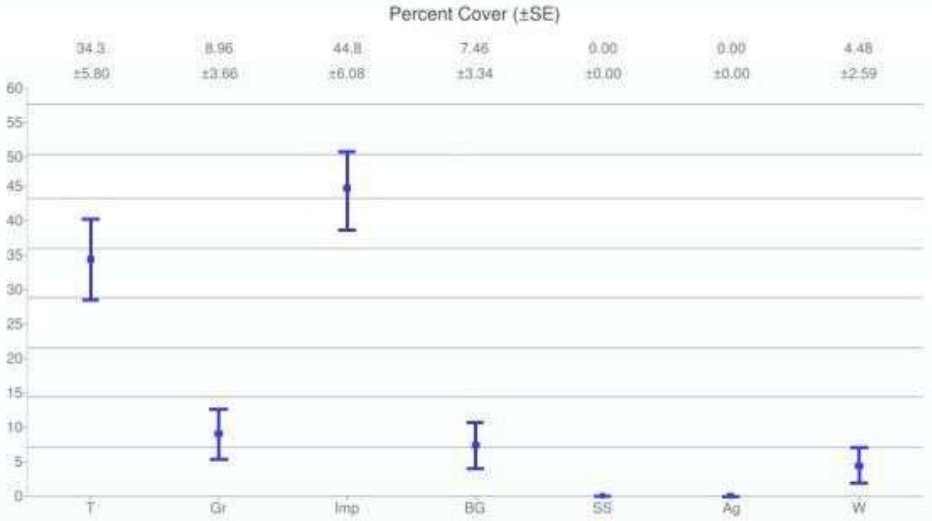
File Edit View History Bookmarks Tools Help

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

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.

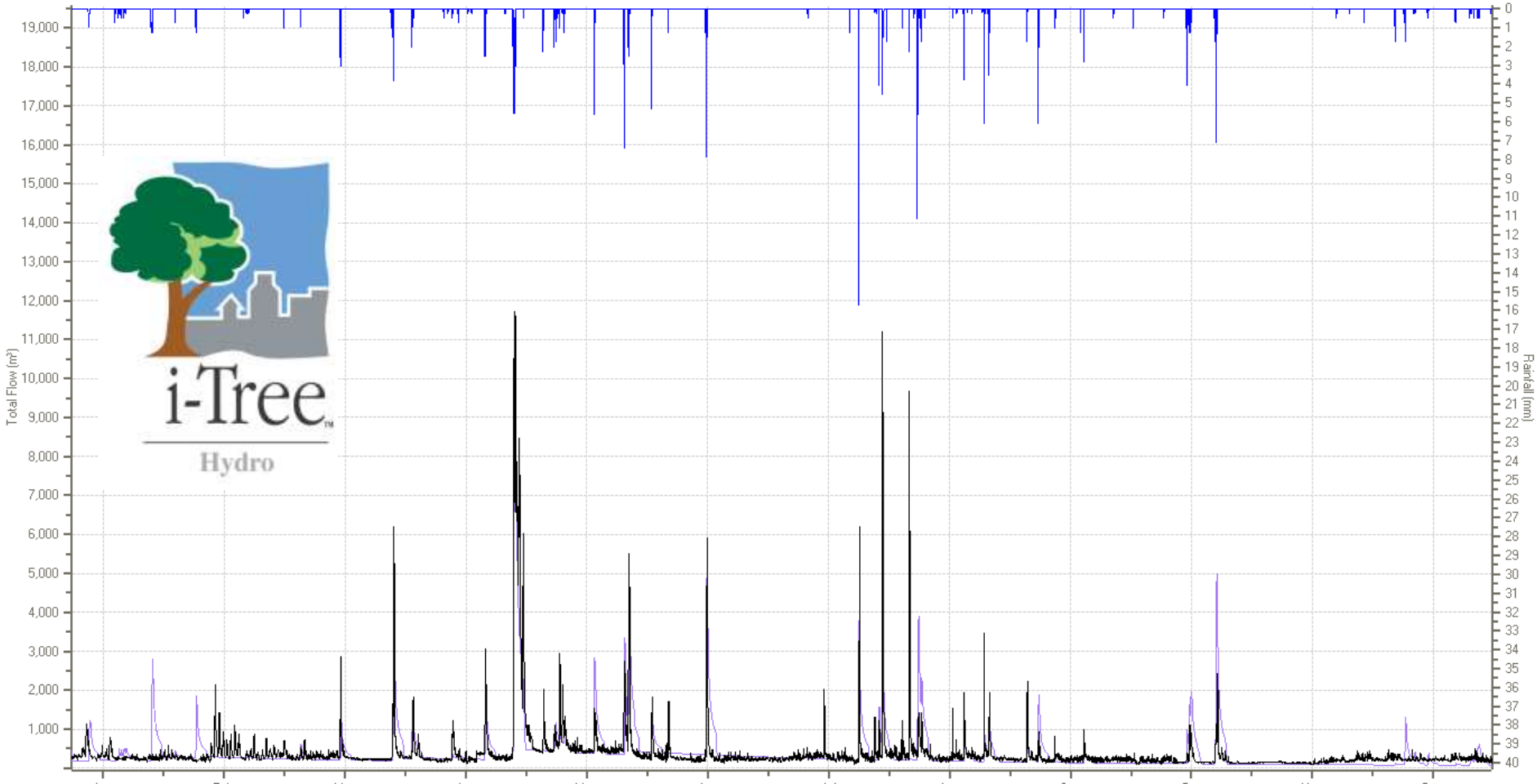
A Cooperative Initiative Between:

DAVEY Arbor Day Foundation SMA ISA Casey Trees

‹ Back

i-Tree-Hydro

- Separate GIS program
- Calibrates against stream flow data

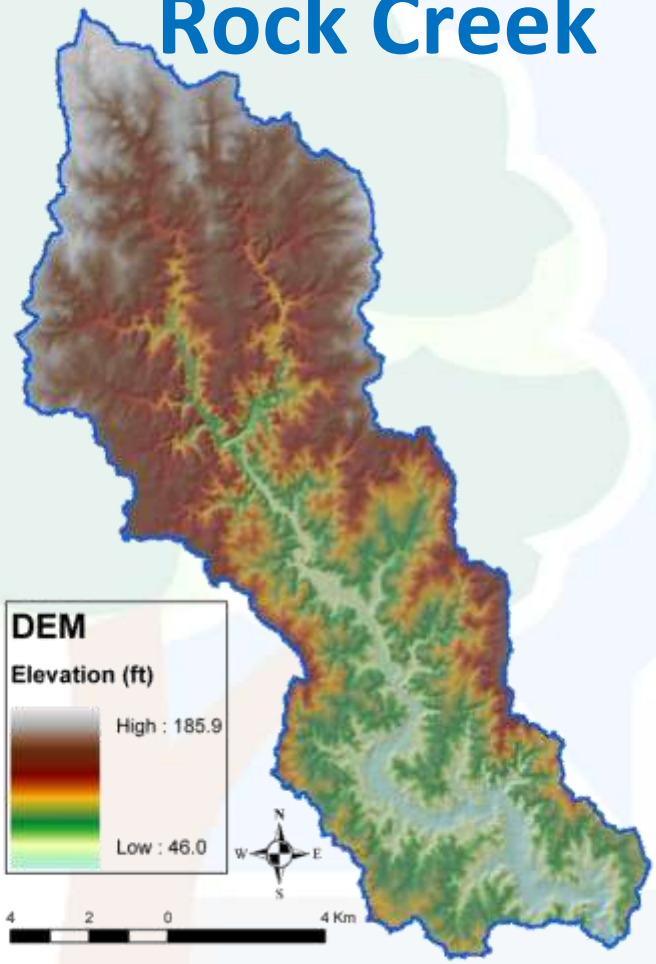


i-Tree™

Hydro

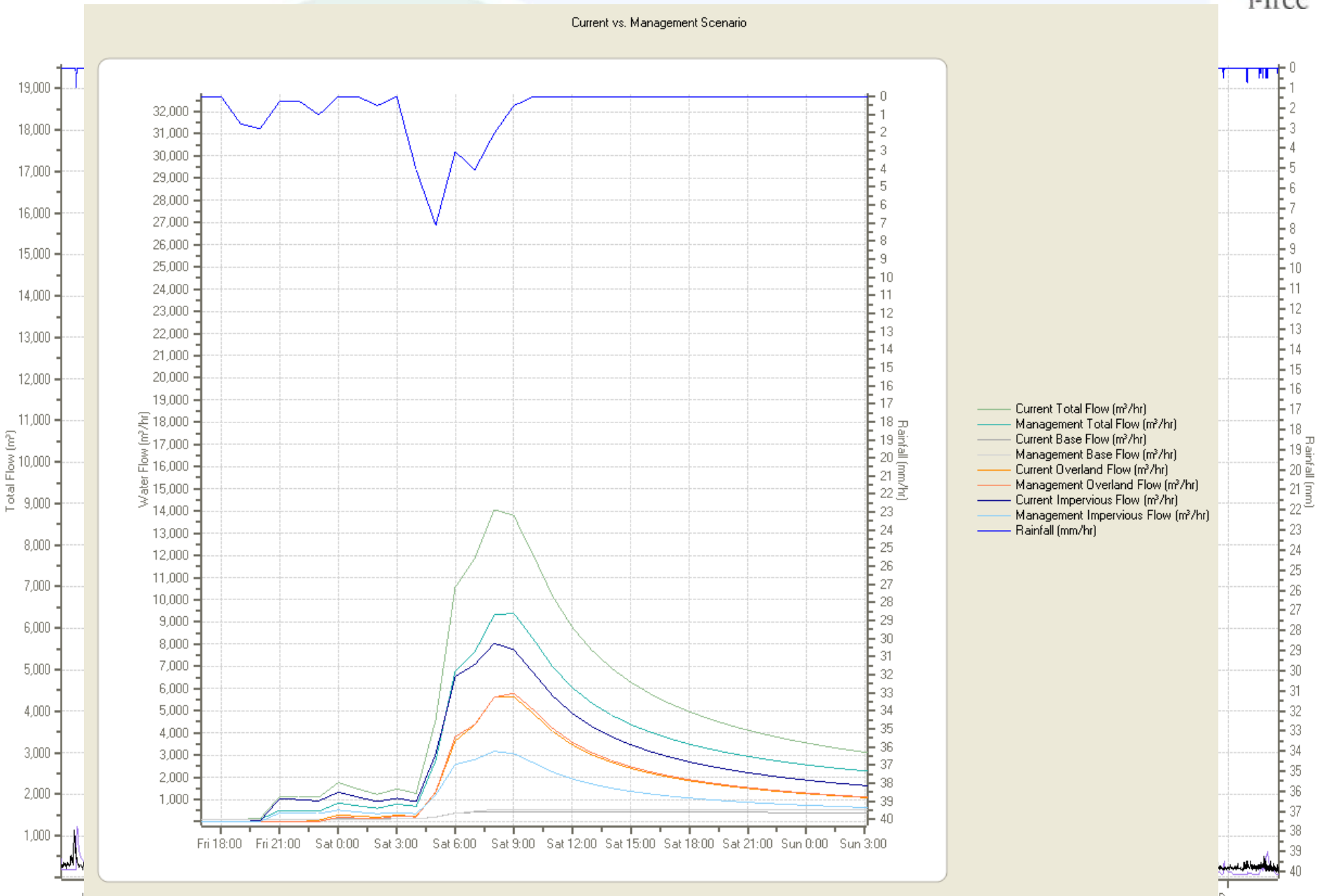
i-Tree

Rock Creek

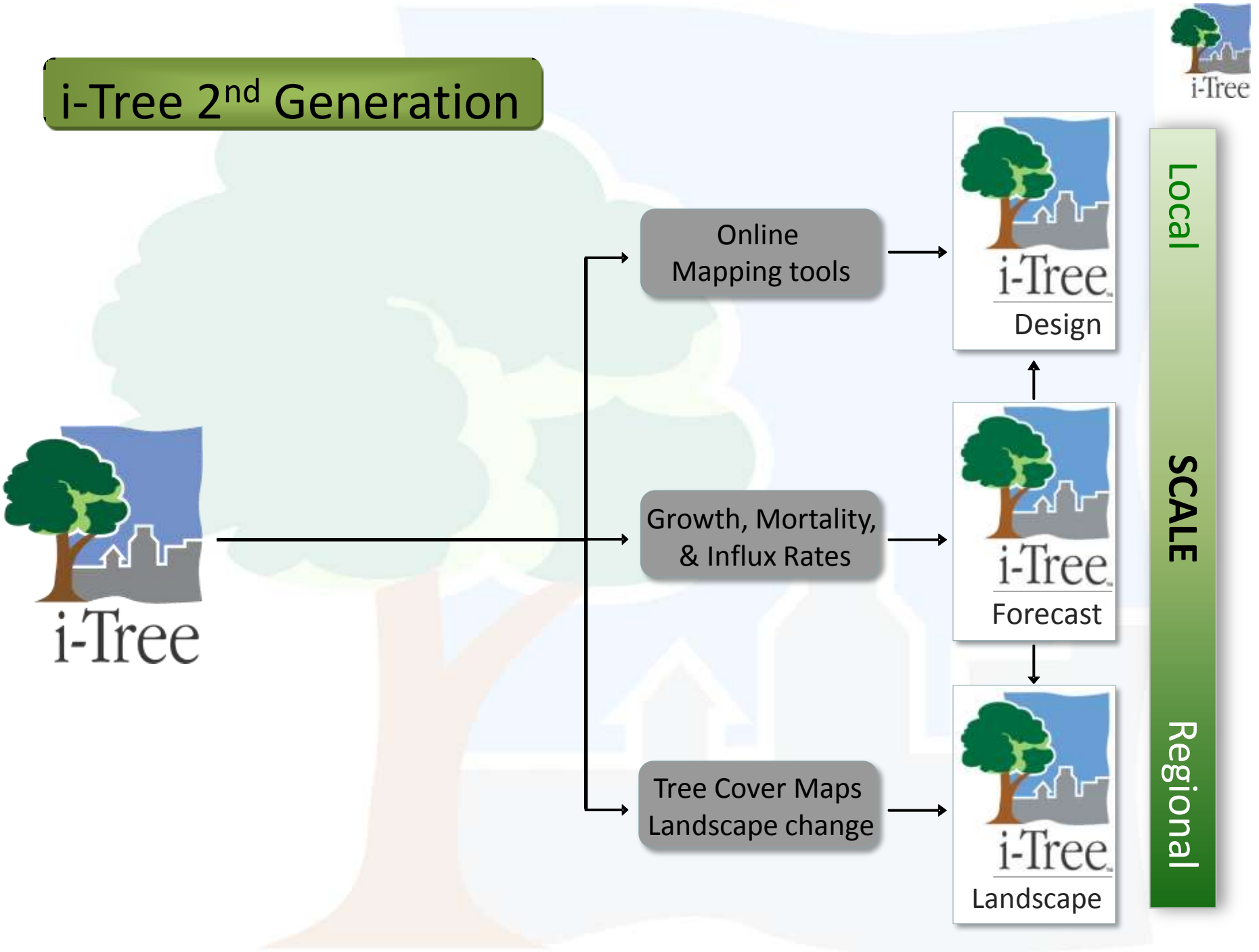


Watershed Area (m2)	**161,653,500**
Percent Impervious cover	**15.8**
Percent Tree Cover	**27**
Percent of Tree Cover over Impervious Area	**10**
Percent Water Cover	**0.3**
Average Tree Leaf Area Index (LAI)	**3.5**
Percent Shrub Cover	**7.8**
Percent Grass Cover	**33.8**
Percent Evergreen Trees	**4.2**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

Hydro Reporting



i-Tree 2nd Generation



i-Tree 5.0 Tools for Urban Forest Assessment

Now, any questions…

i-Tree Overview

Assessing the value of urban trees

www.unri.org/research-documents