i-Tree: Give it a Try Today

David V. Bloniarz, USDA Forest Service

Powerpoint and Resources

www.unri.org

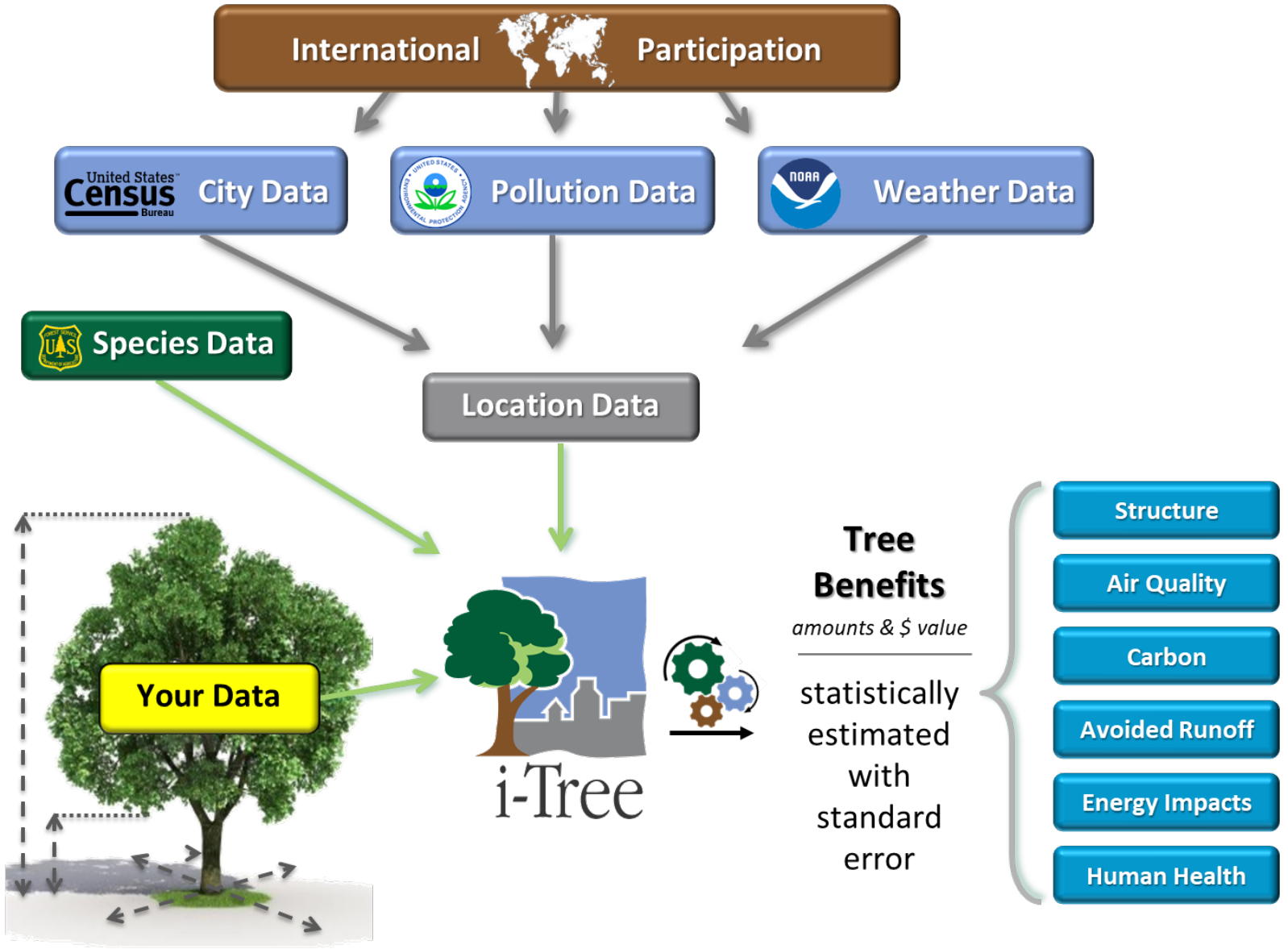
What is i-Tree?

"Putting US Forest Service science into the hands of users."

- Benefits-based approach
- Based on peer-reviewed research
- A 15-year collaborative effort
- Technical Support
- www.itreetools.org

DAVEY
Arbor Day Foundation
sma SOCIETY OF MUNICIPAL ARBORISTS
ISA
Casey Trees
ESF State University of New York College of Environmental Science and Forestry
NAASF
EPA United States Environmental Protection Agency

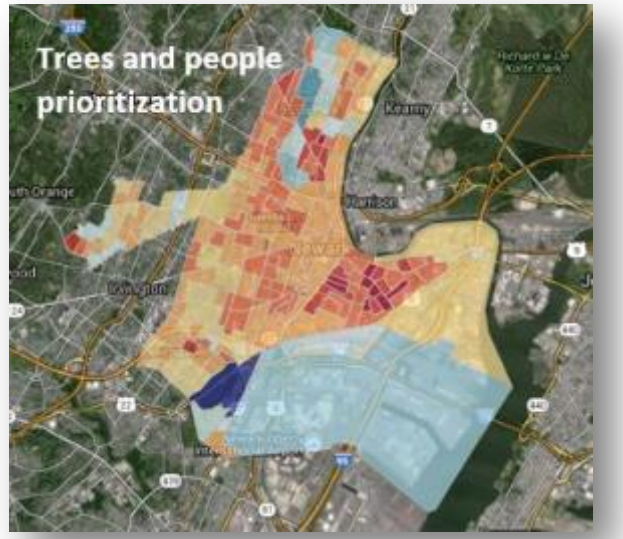
i-Tree Conceptual Model Schematic



Why i-Tree?

Opportunities for communities to…

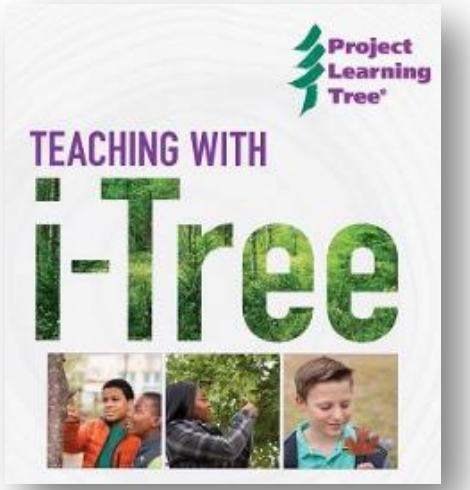
- Plan and manage urban forest resources more strategically to serve and protect citizens;
- Integrate urban forests in policies: sustainability, climate, resiliency, air quality, public health, stormwater, etc.;
- Support advocacy efforts with data;
- Improve preservation of trees and forests;
- Connect urban and rural forest importance.

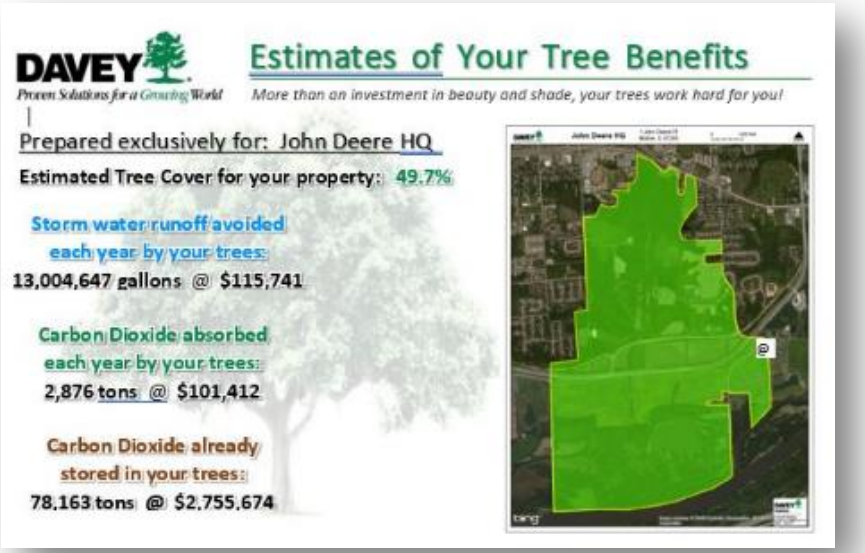


Why i-Tree?

Opportunities for communities to…

- Economic opportunities:
  attract & retain new businesses and residents;
- Promote green tourism and investment;
- Create green industry jobs;
- Sustainable development;
- Youth 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 *with* Science!

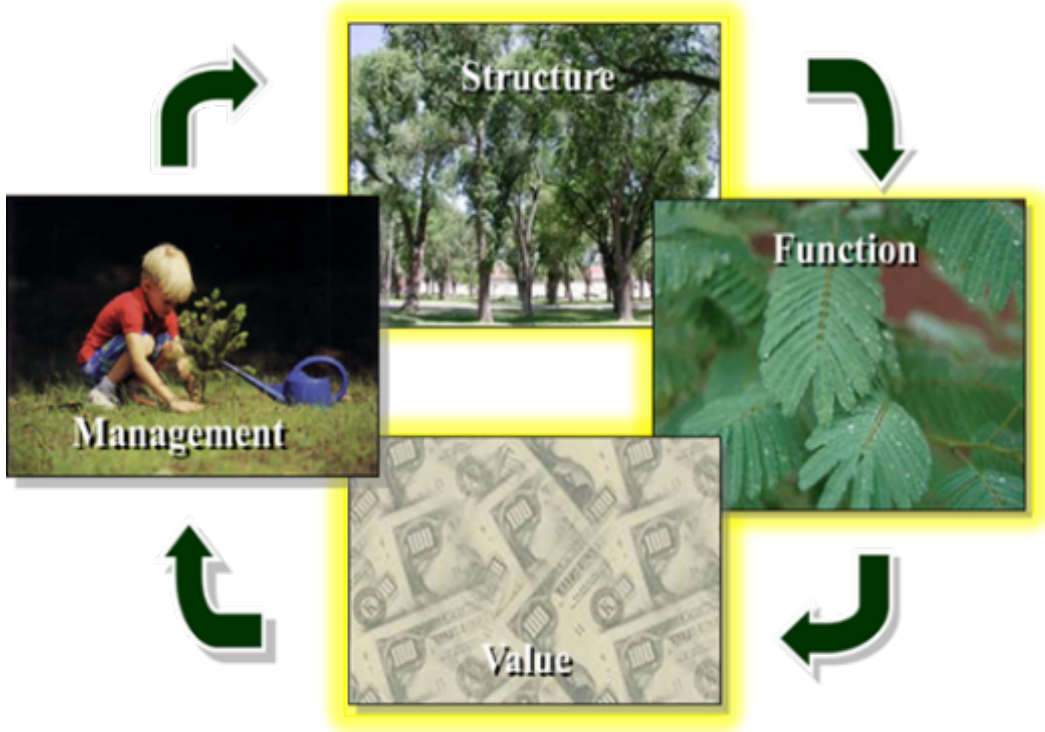
Carbon dioxide storage and sequestration
Air pollution removal
Storm water reduction

$2.94 in benefits
for every $1.00 spent

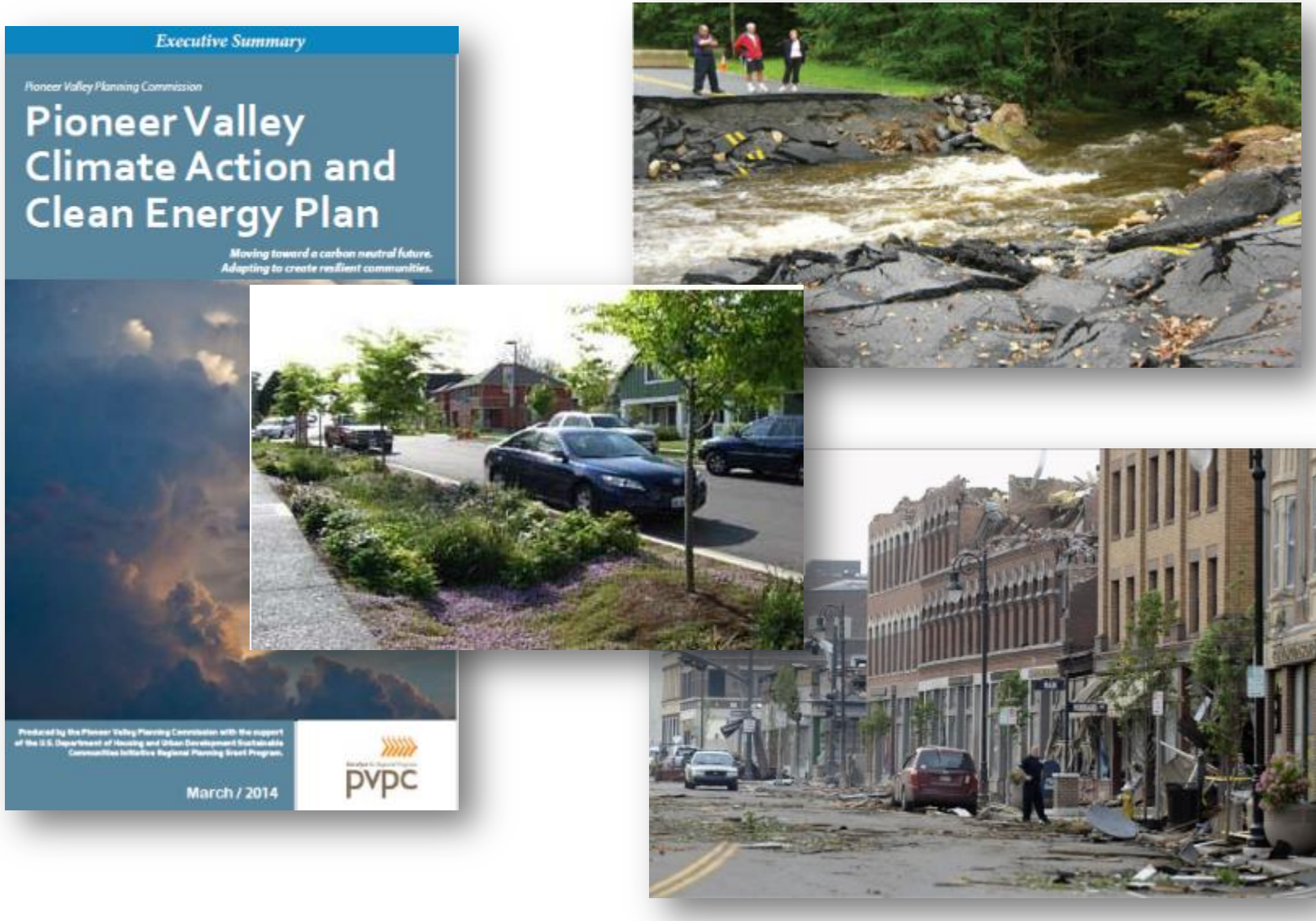
Benefit Summary for Pittsburgh's Street Trees

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.

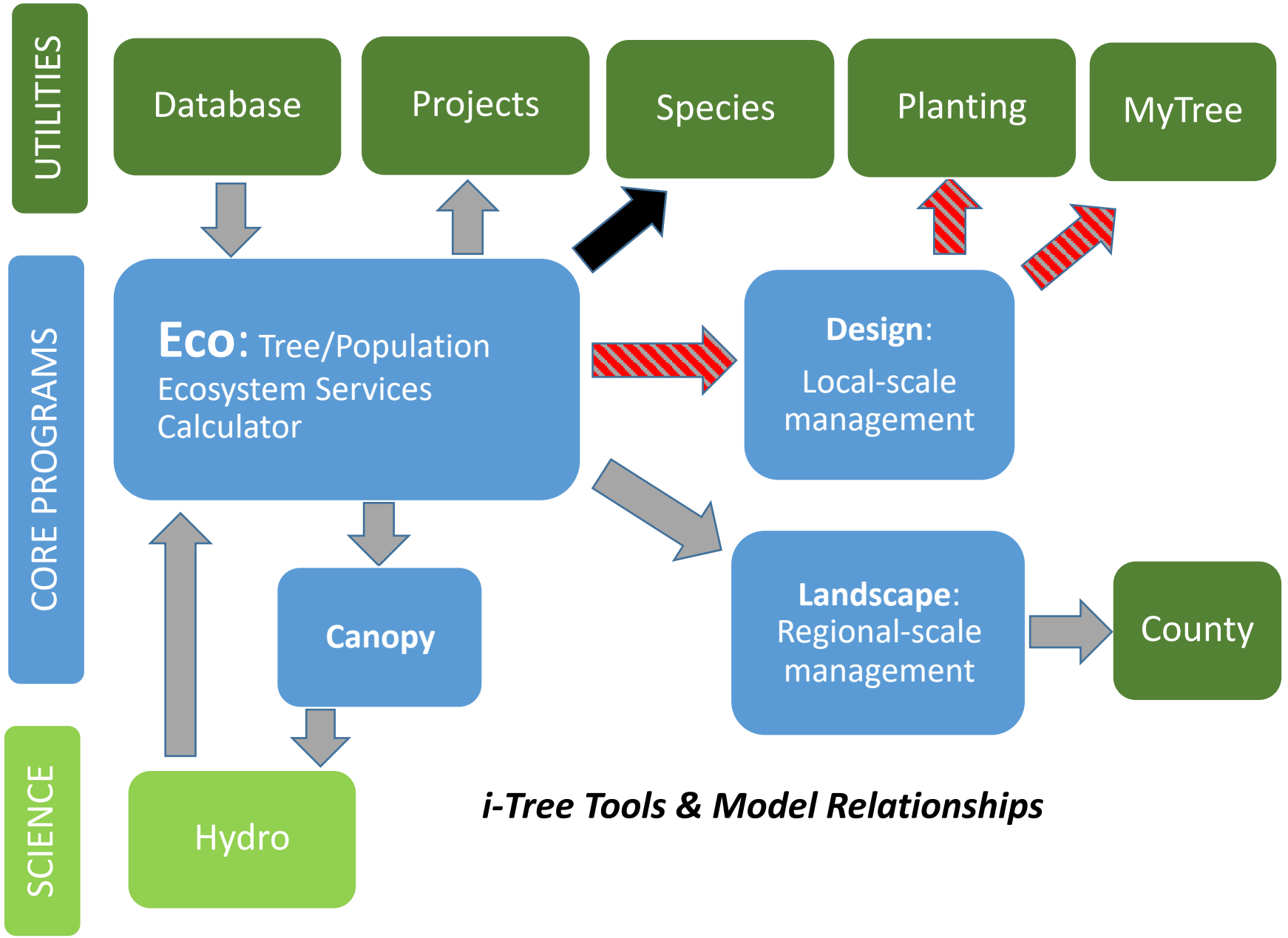


What are your urban forestry challenges and opportunities?



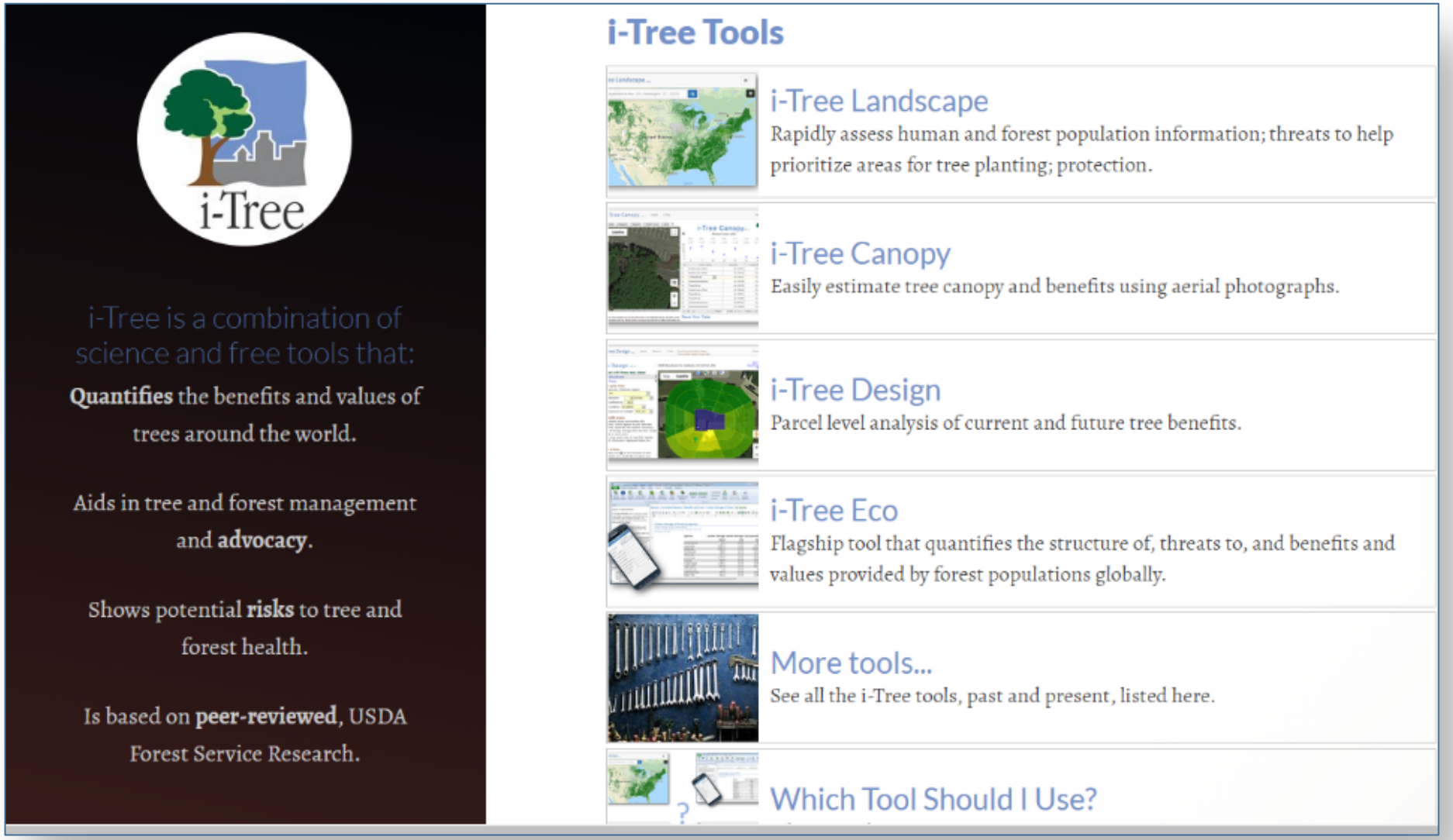
i-Tree Tool Selection Framework

- *My objectives?*
- *Tool advantages, limitations, and options?*
- *Available resources?*
- *Technical capacity or skillset?*
- *Timeline?*
- *Audience?*
- *What does success look like for me?*



i-Tree Tools & Model Relationships

www.itreetool.org Resoures



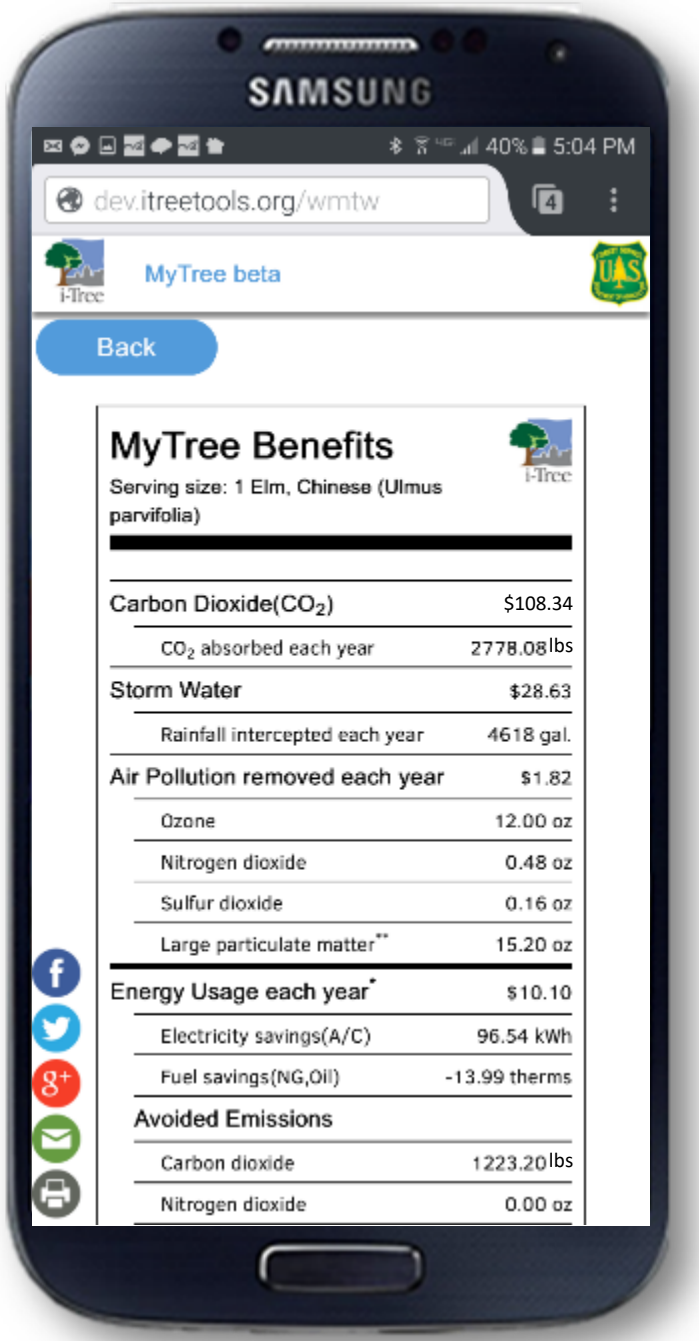
Keys to Using i-Tree Effectively

- Understand tool advantages, limitations, and options available.
- Define your objectives.
- Can i-Tree can be used to help you achieve desired outcomes?
- Evaluate your available resources (*time, equipment, money, technical capacity, potential collaborators*) to plan, manage and complete a project.
- Consider pilot projects that can be used to learn, show potential, and justify scaling up projects.
- Connect data and results to things that matter to people.

MyTree

i-Tree

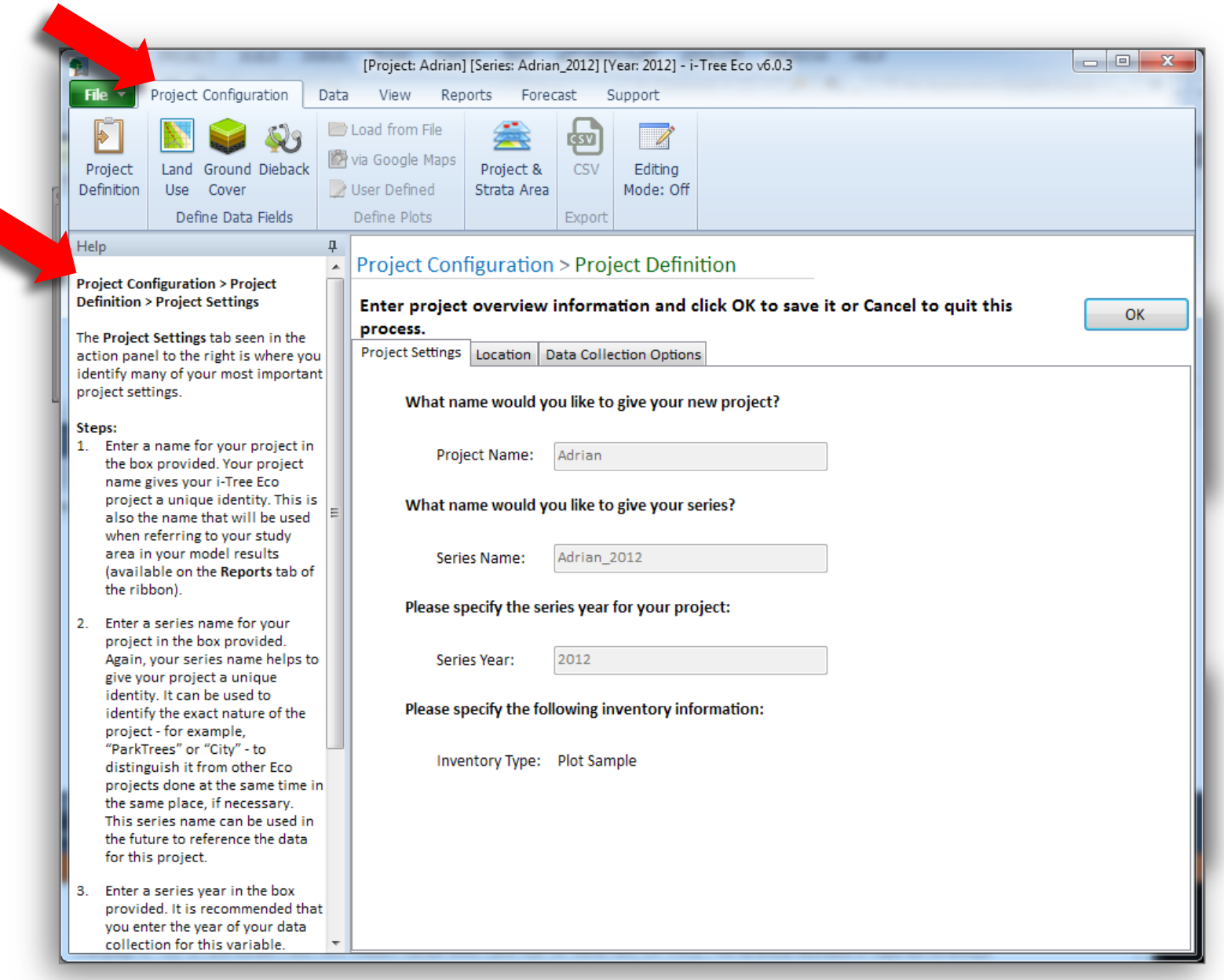
MyTree



i-Tree on the go…

for individual or multiple trees!

i-Tree Eco

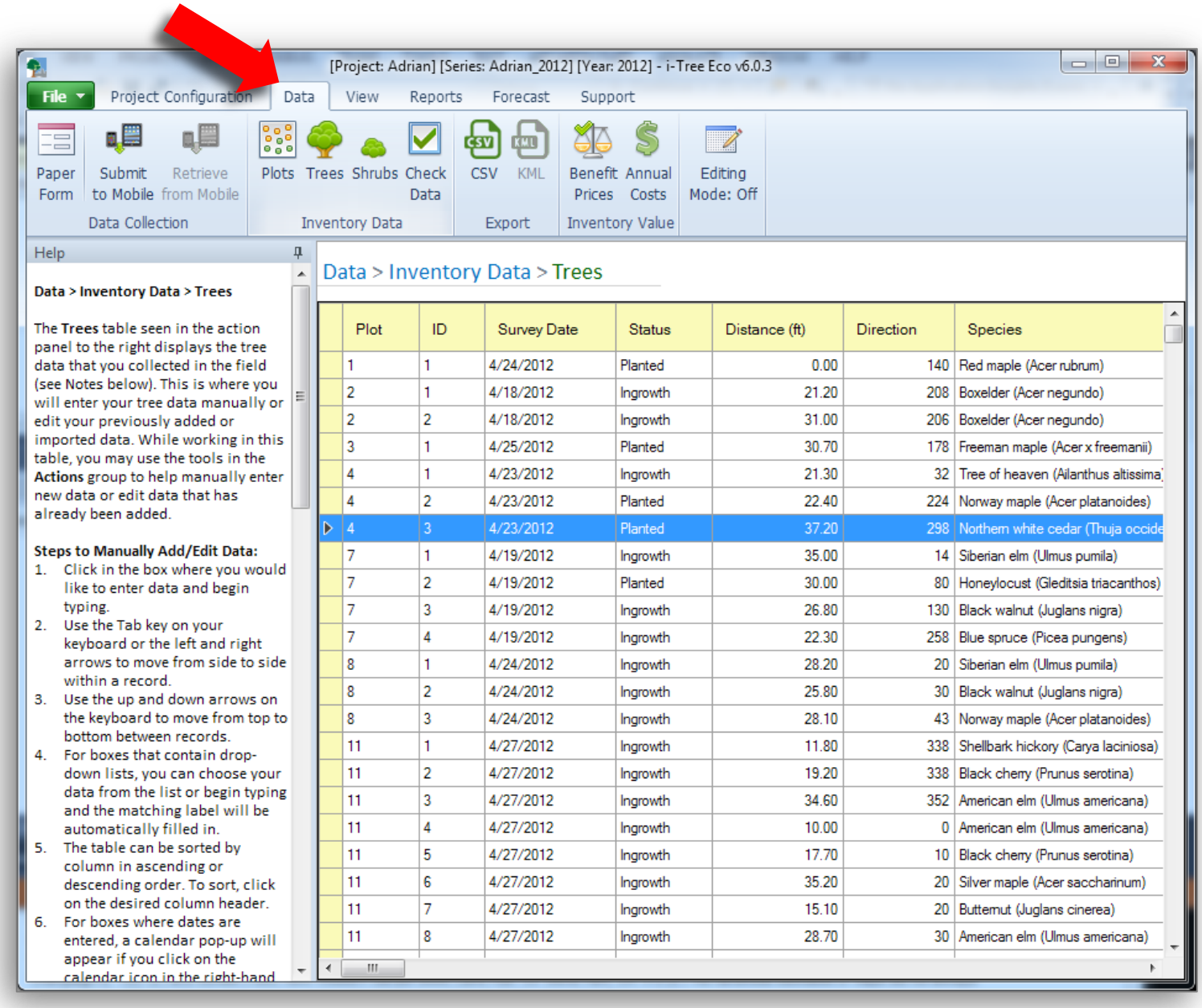


i-Tree Eco v6

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



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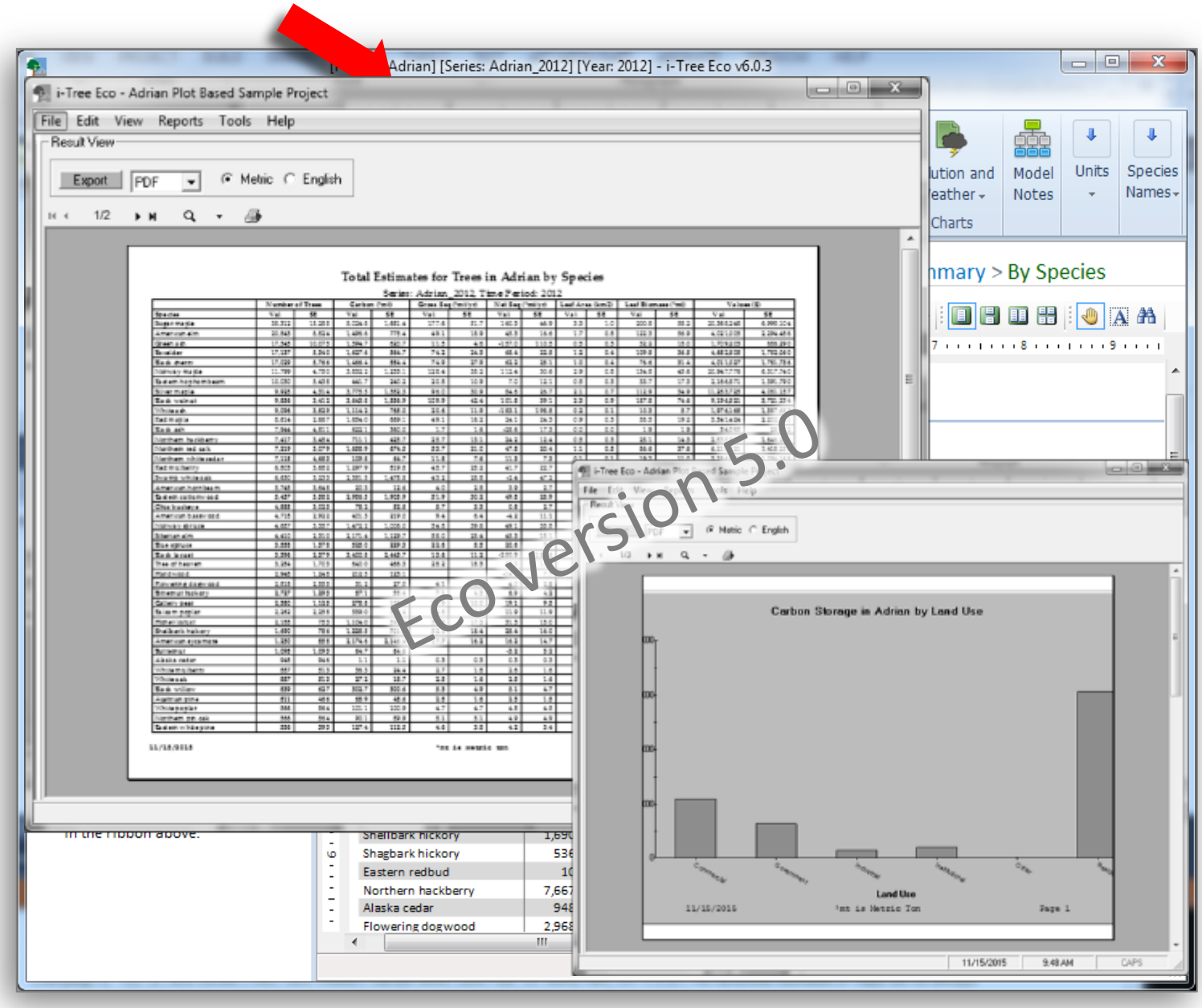

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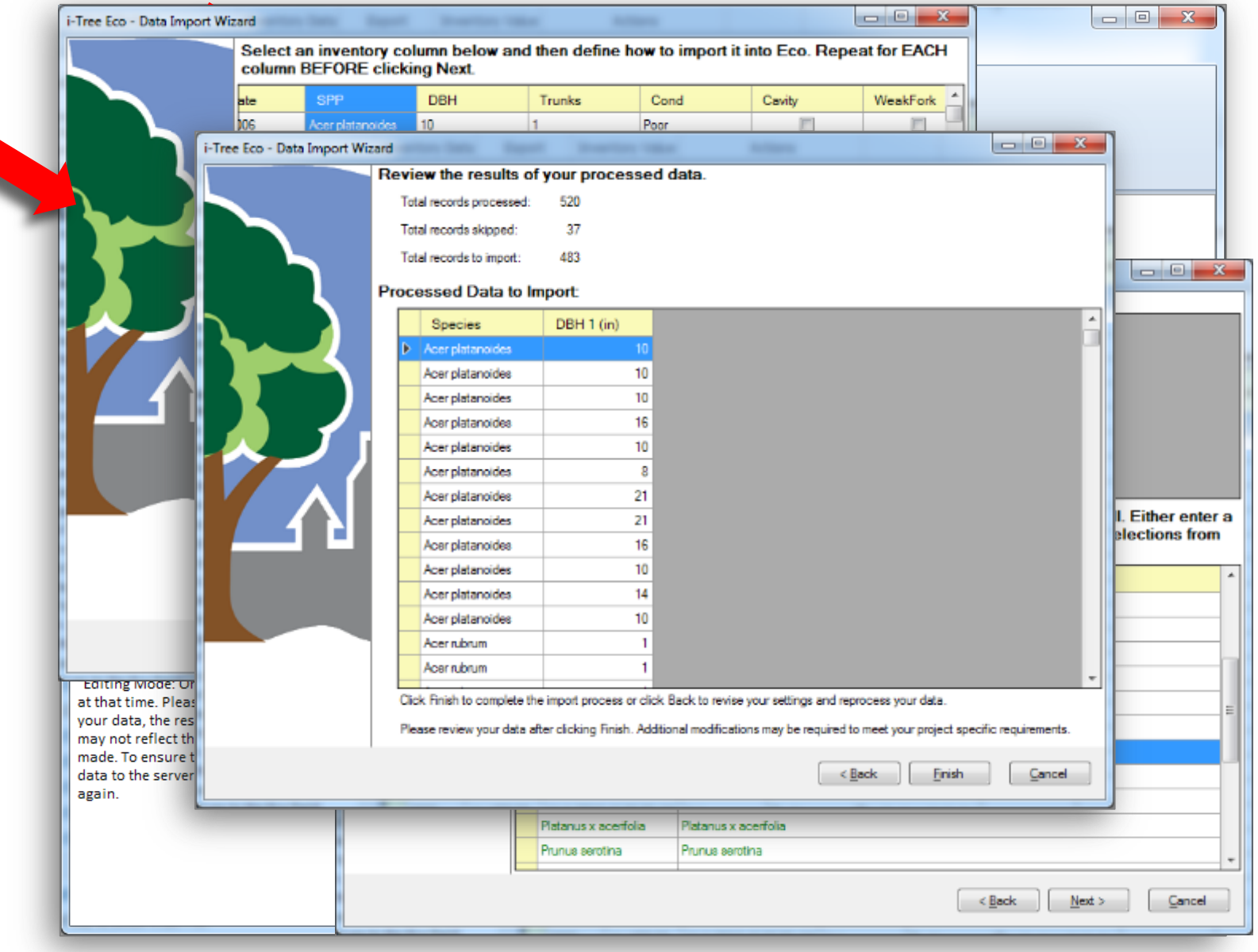

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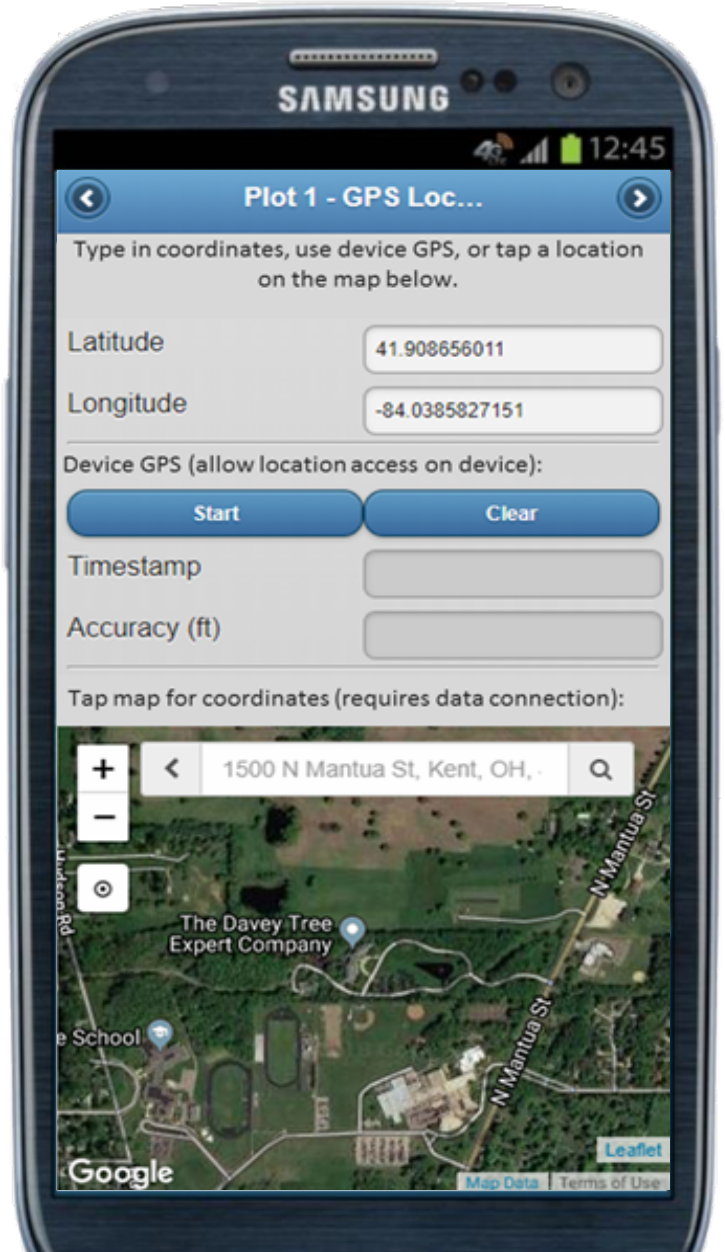
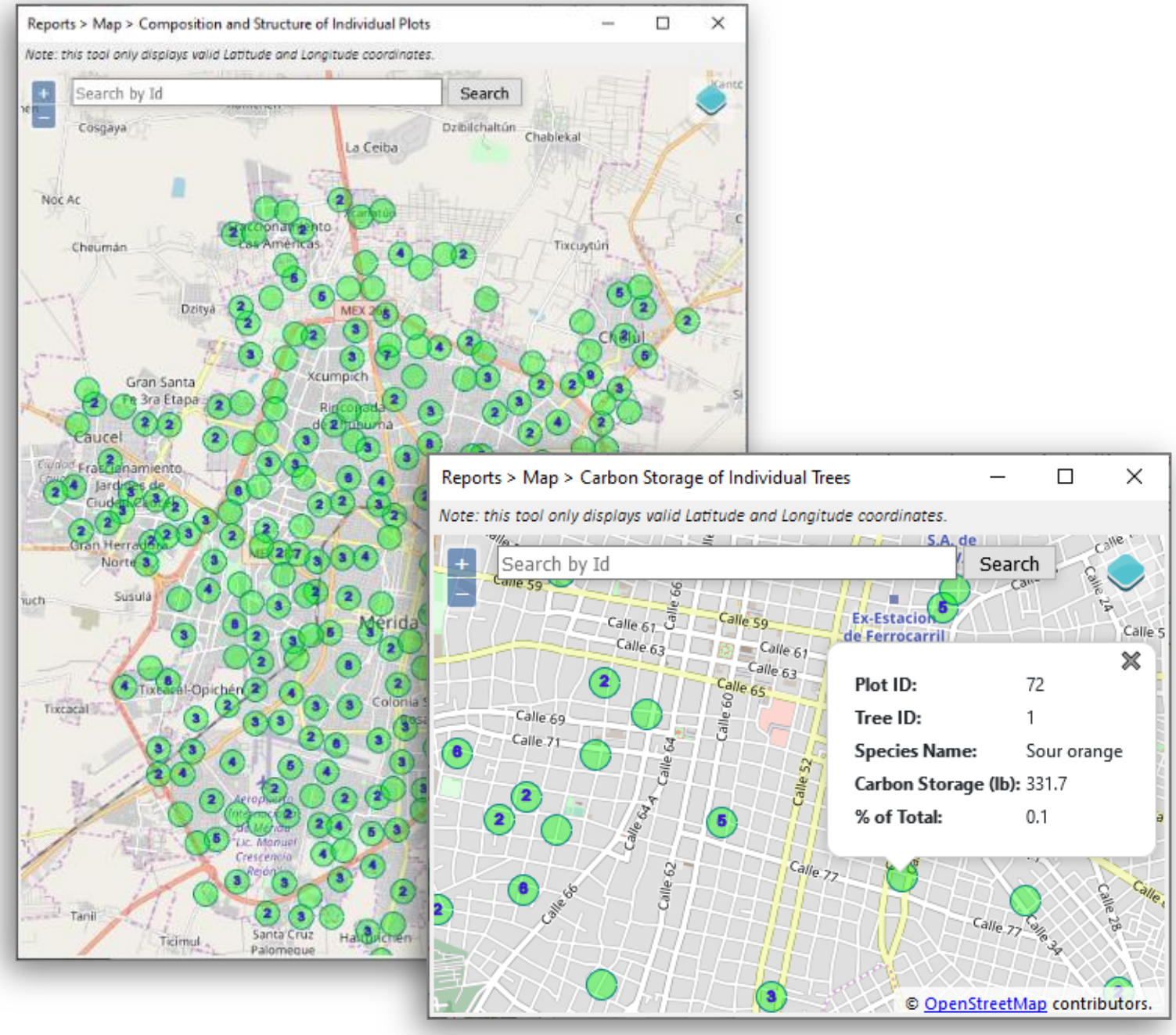
i-Tree Eco v6


SAMSUNG
Back
Tree - General
Species
Land Use
Status
Direction (°)
Distance (ft)
Street Tree ?
Comment
Plot 4
Plot Info
Land Uses
Ground Covers
Reference Objects
Trees
Shrubs
Mark Plot as Completed
12:45
Back
Tree 1 - Details
Save
Dead Tree?
Crown Condition
85% - 90%
Height (ft)
Crown Top Height (ft)
Crown Base Height (ft)
Crown NS Width (ft)
Crown EW Width (ft)
Crown Percent Missing
Crown Light Exposure
Percent Impervious
Percent Shrub
Paper Form
Help
3259
3260
11/1/2010


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
Leaflet
Map Data
Terms of Use



i-Tree Eco v6

Flagship tool with best estimates for Composition and Benefits.

- User interface & Help text
- Reporting
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- Basic mapping

Plot Sampling & Complete Inventories

i-Tree County

i-Tree County

A collaborative initiative with

AMERICAN FORESTS

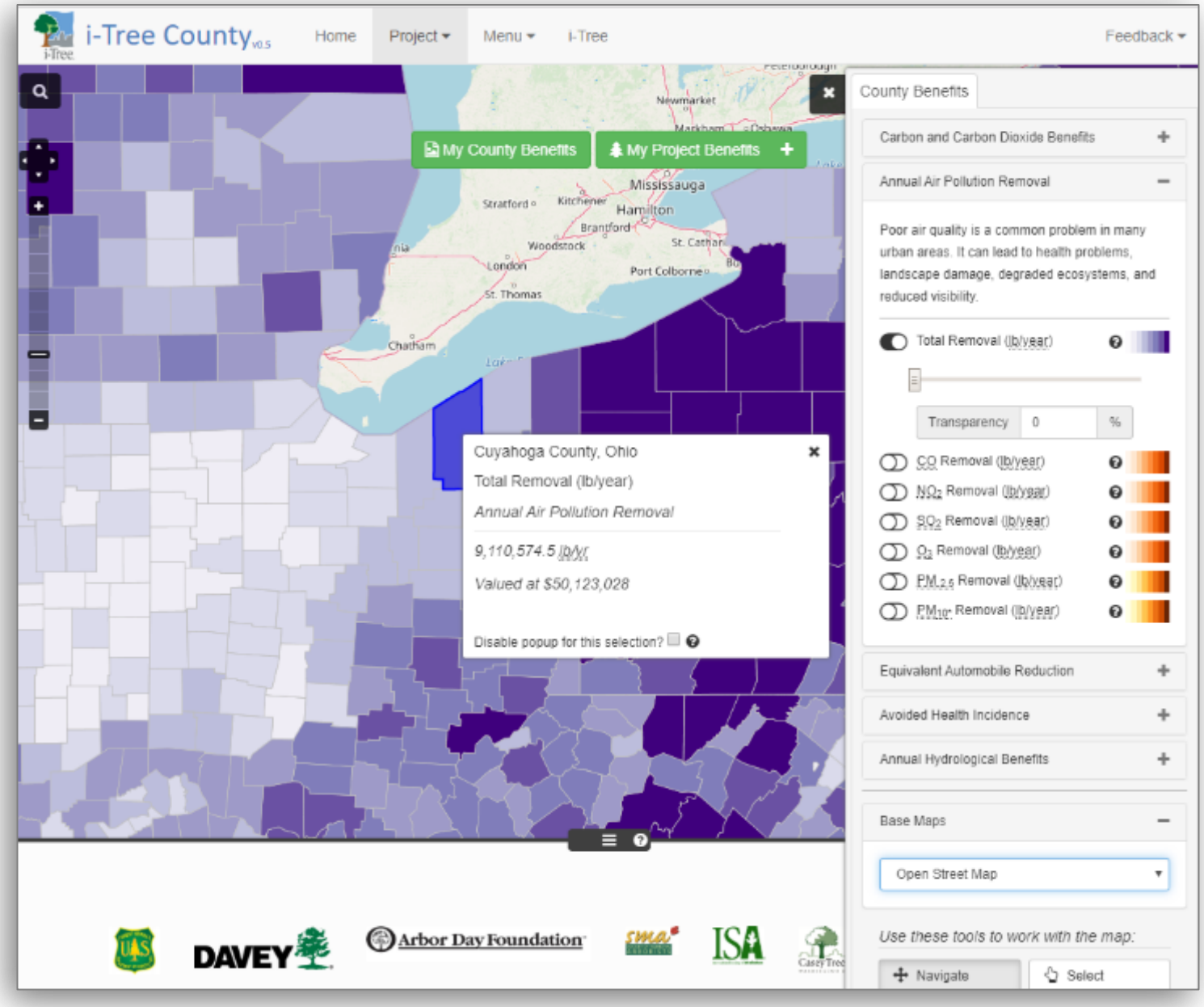
Assess the following…

- Total carbon stored (tons and dollar value)
- Annual carbon sequestration (tons and dollar value)
- Air pollution removal per year (pounds of NO_2, SO_2, O_3 and PM_{10} or $PM_{2.5}$)
- Estimate of pollution removal effect relative to automobile emission (i.e., reduction in number of vehicles per year that equals pollution removal)
- Pollution removal value per year (dollar values associated with improved human health)
- Avoided health incidences due to improved air quality per year (numerous metrics including avoided mortality)
- Annual transpiration (millions of gallons)
- Annual interception (millions of gallons)
- Annual avoided runoff (millions of gallons, dollar value)

i-Tree County

AMERICAN FORESTS

i-Tree County



i-Tree County

Collaborative project with American Forests

AMERICAN FORESTS

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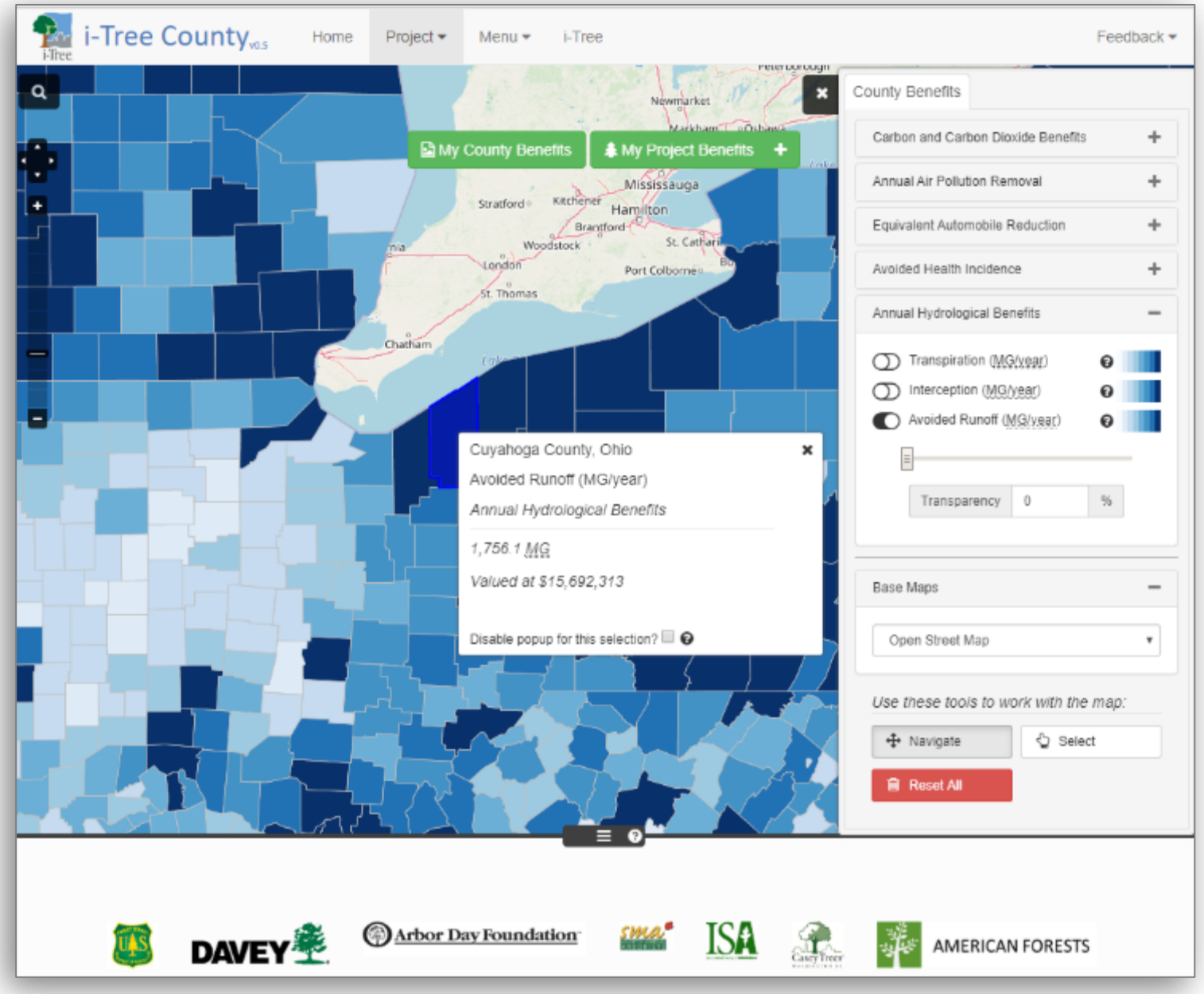

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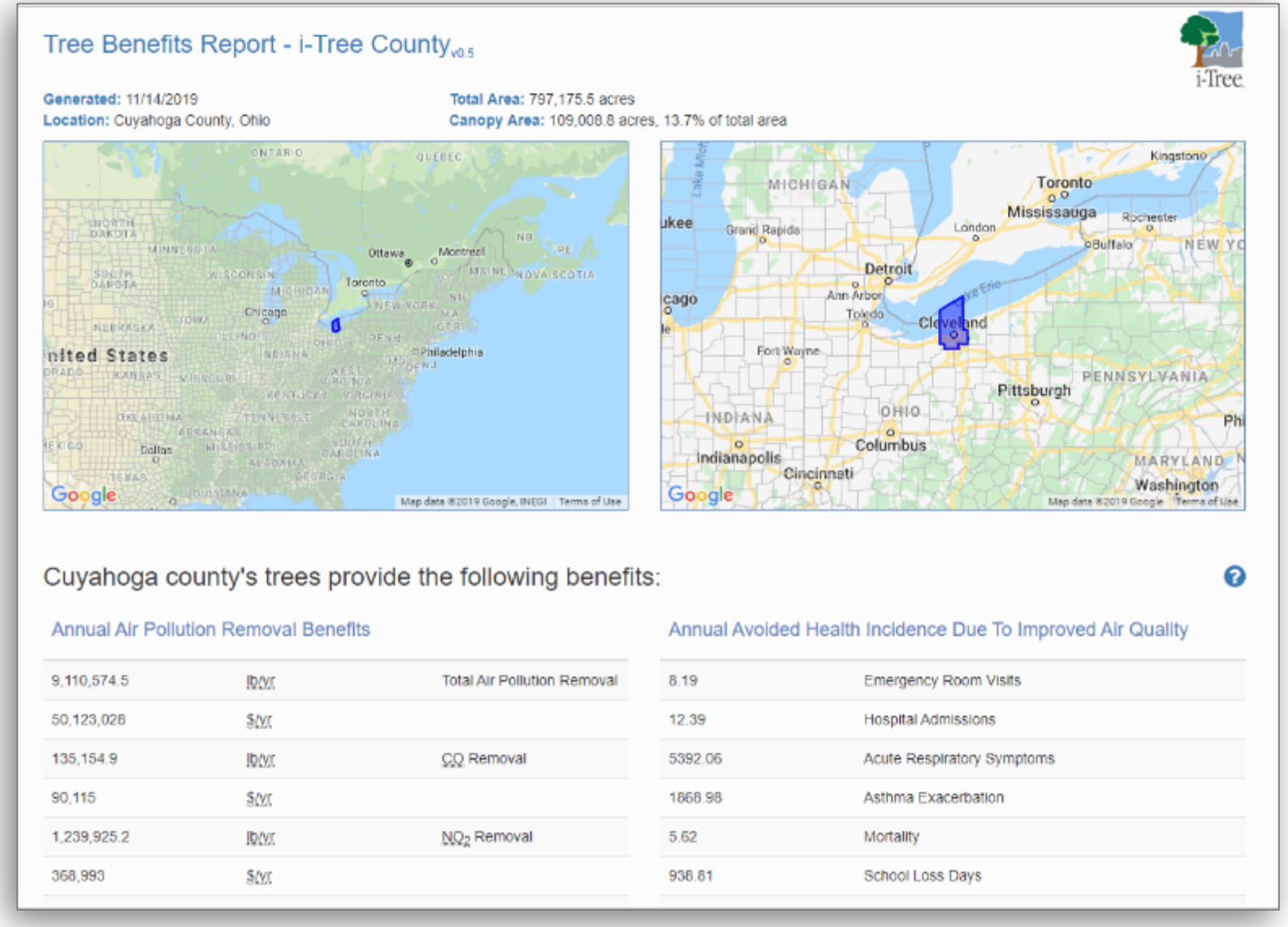


Tree Benefits Report - i-Tree County v0.5

Generated: 11/14/2019
Location: Cuyahoga County, Ohio

Total Area: 797,175.5 acres
Canopy Area: 109,008.8 acres, 13.7% of total area

Cuyahoga county's trees provide the following benefits:

Annual Air Pollution Removal Benefits

9,110,574.5	lb/yr	Total Air Pollution Removal
50,123,028	$/yr	
135,154.9	lb/yr	CO Removal
90,115	$/yr	
1,239,925.2	lb/yr	NO_2 Removal
368,993	$/yr	

Annual Avoided Health Incidence Due To Improved Air Quality

8.19	Emergency Room Visits
12.39	Hospital Admissions
5392.06	Acute Respiratory Symptoms
1868.98	Asthma Exacerbation
5.62	Mortality
936.81	School Loss Days

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

i-Tree Planting

Get Started

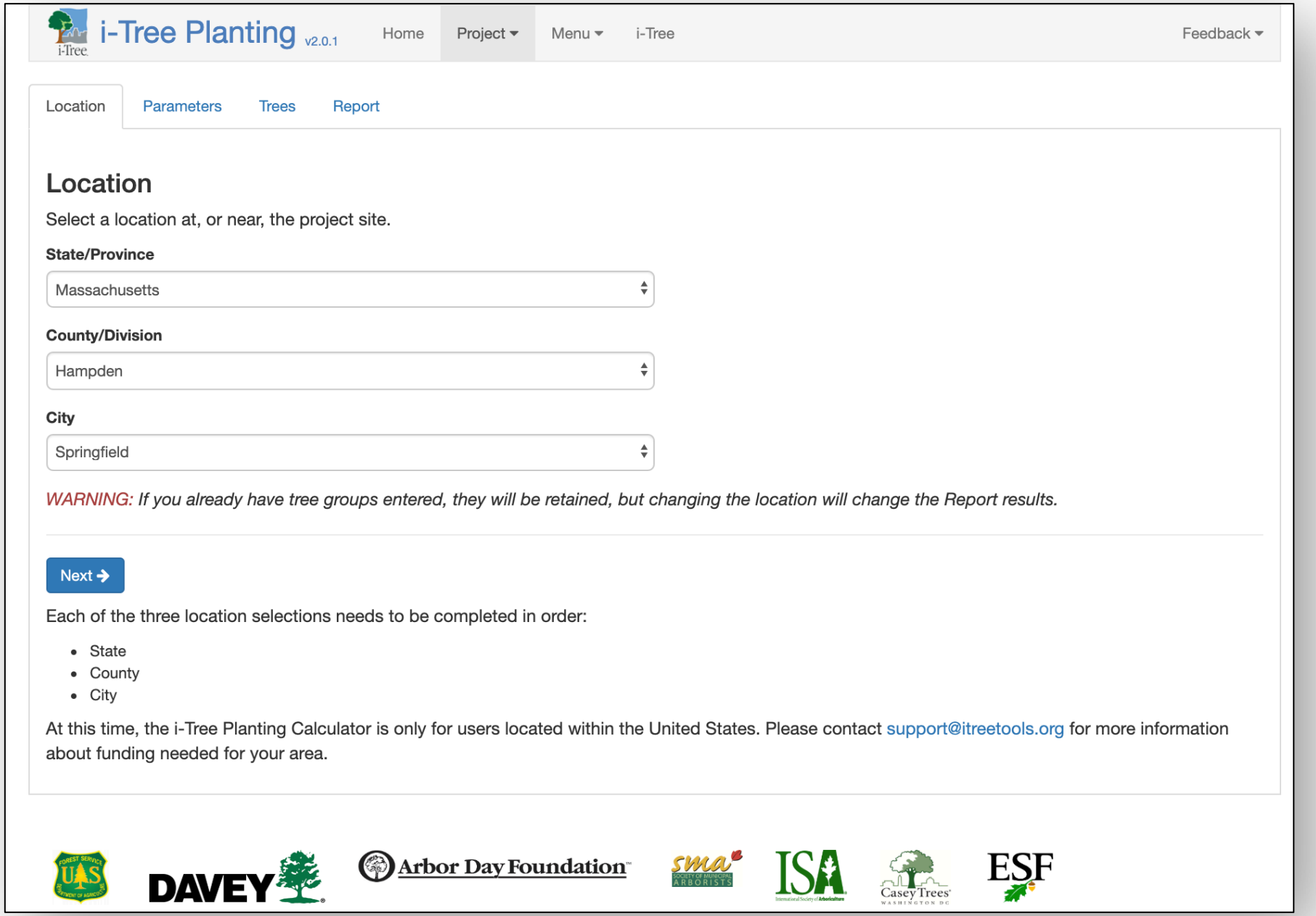
Use of this tool indicates acceptance of the EULA.

california urbanforests council

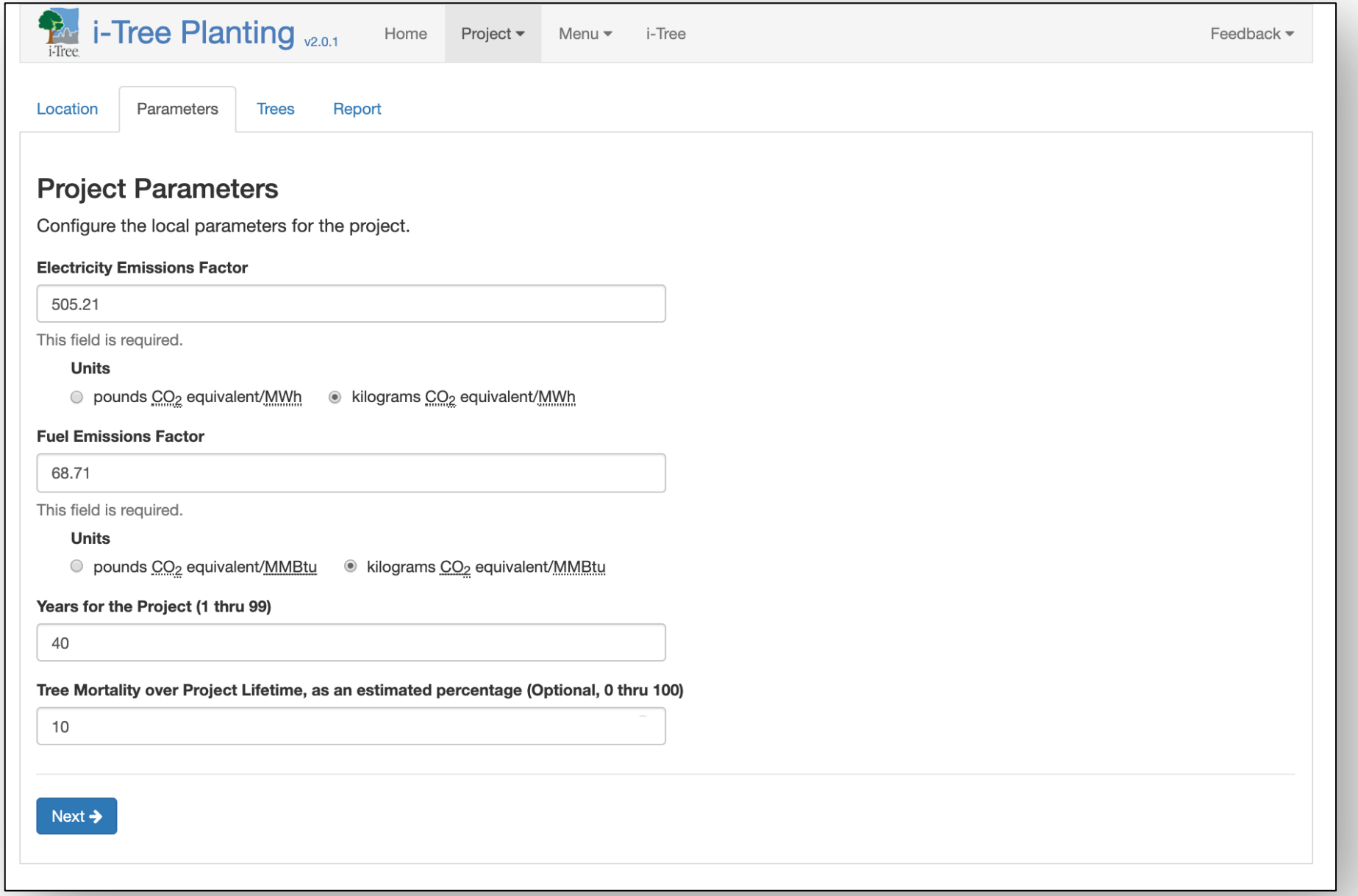
Urban Ecos

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION CAL FIRE SINCE 1885

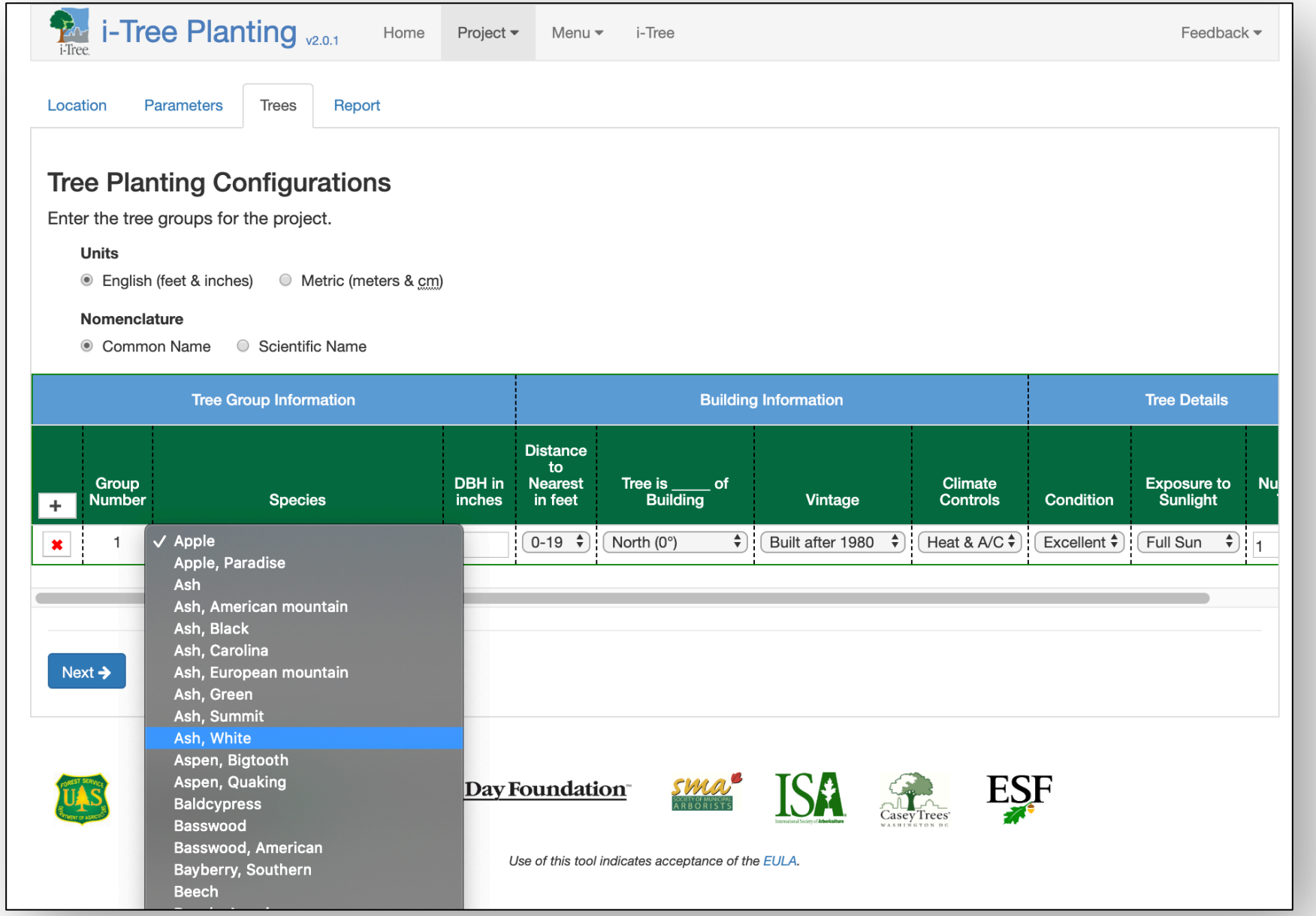
A collaborative initiative with



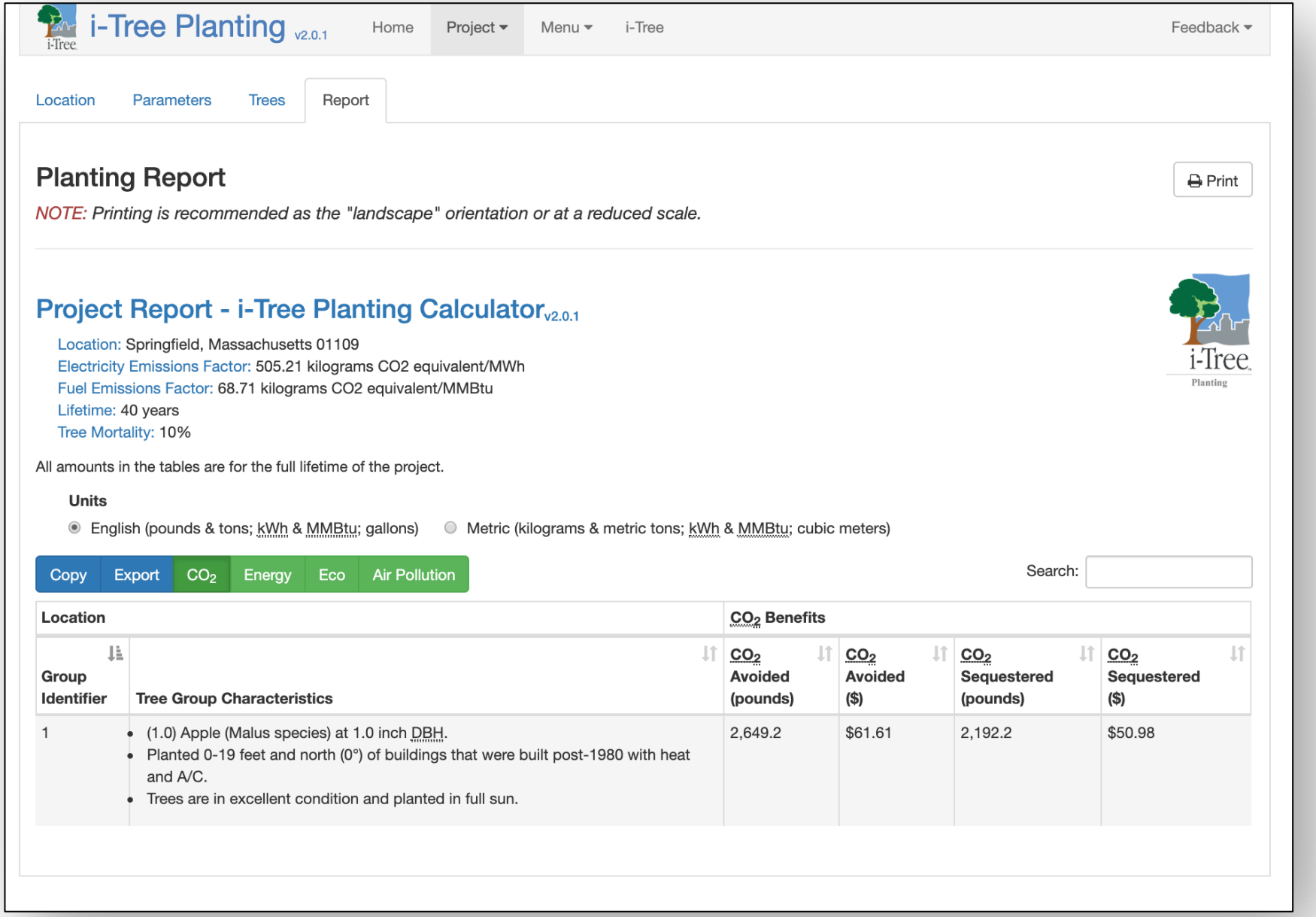
A collaborative initiative with



A collaborative initiative with



A collaborative initiative with



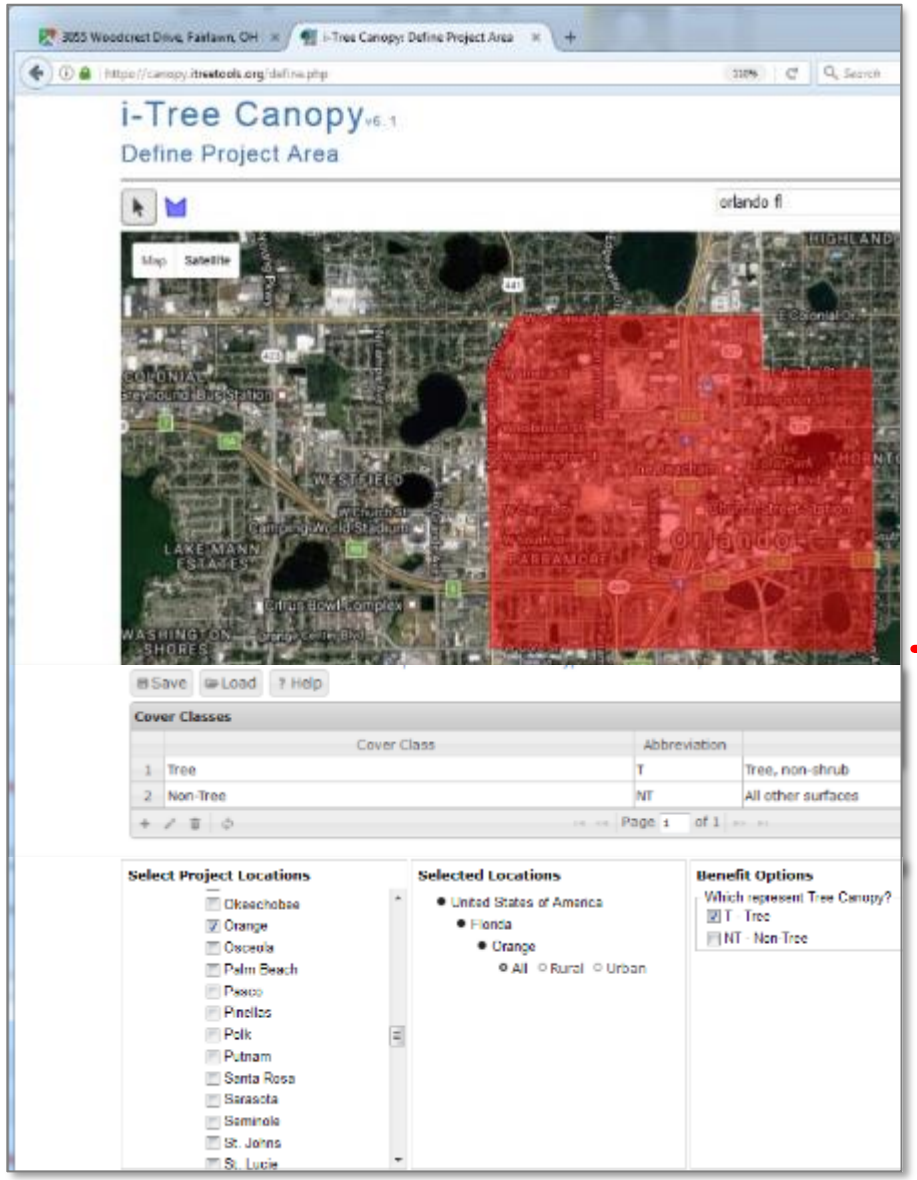
i-Tree Canopy

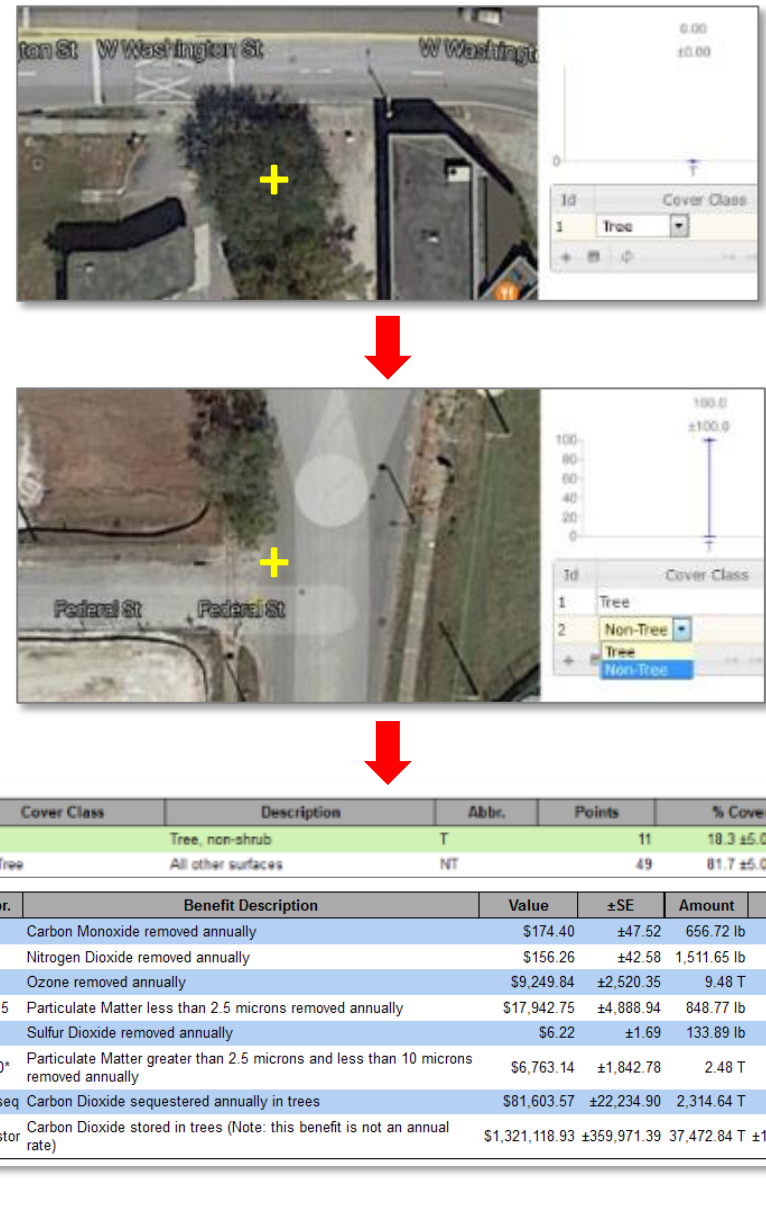
i-Tree Canopy

Quick, statistical estimate of Canopy cover and associated benefits.

- Create custom cover classes
- Random point locations
- Does not automatically assign cover class at point

Enhanced UI coming soon!

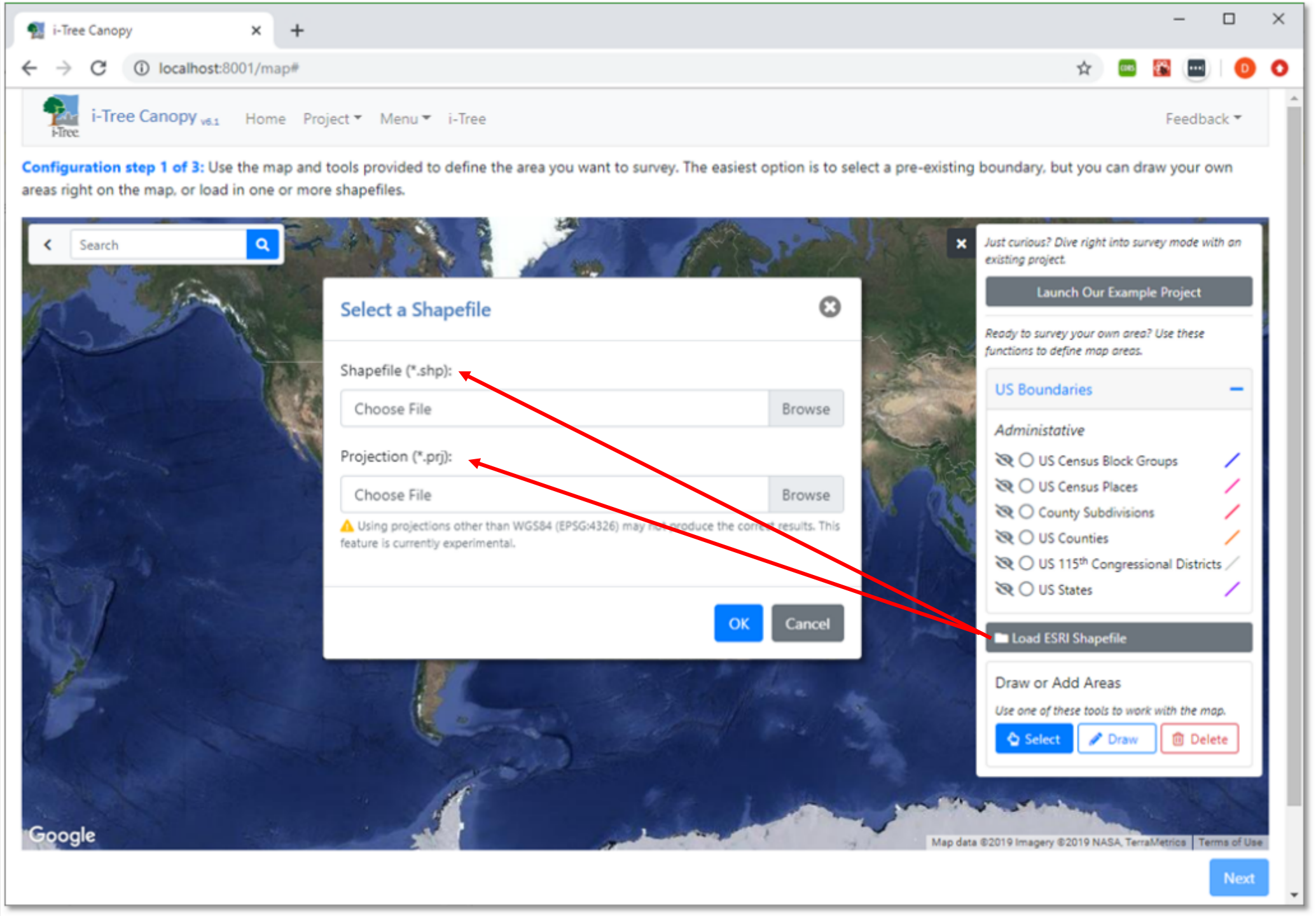




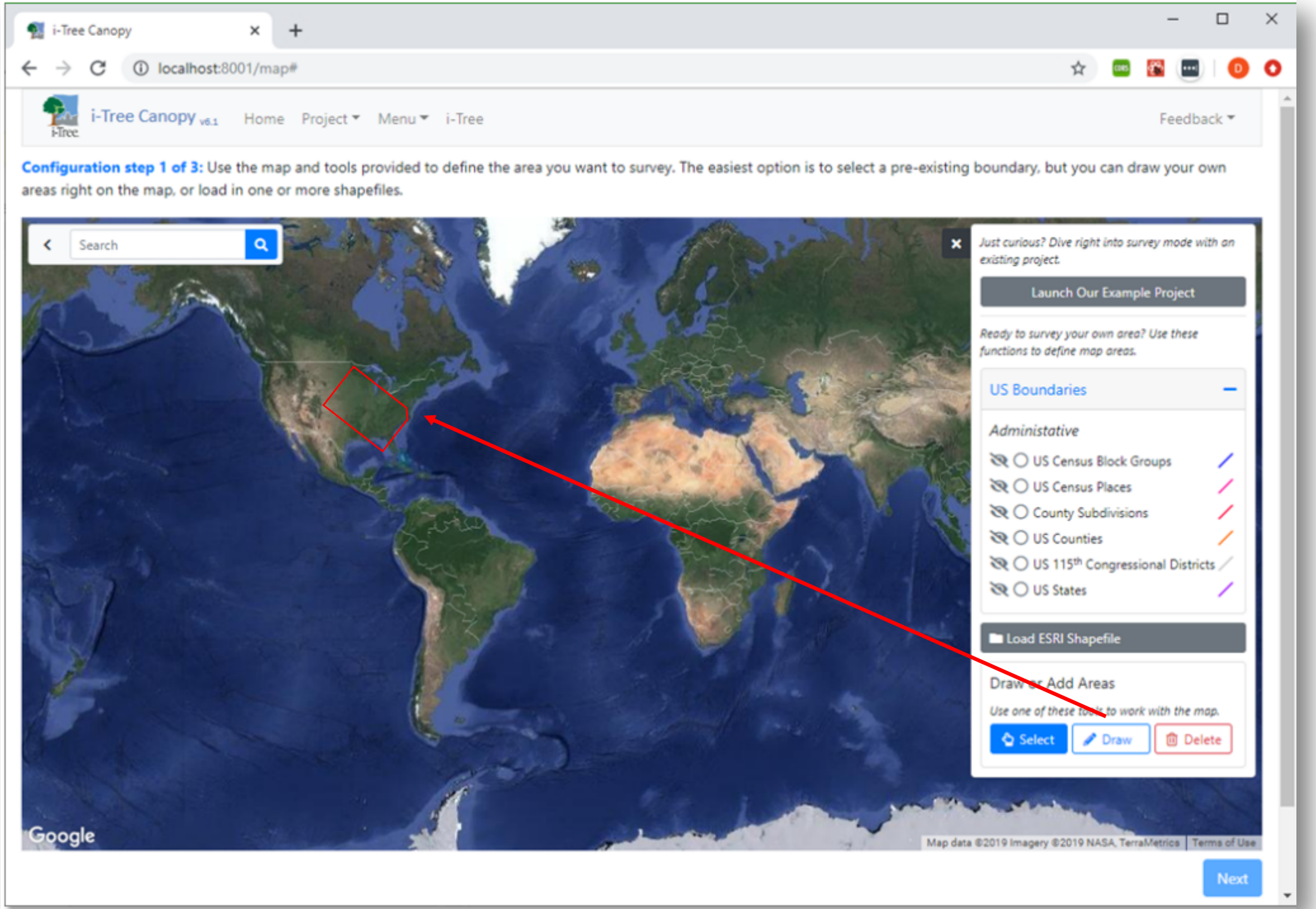
Cover Class	Description	Abbr.	Points	% Cover
Tree	Tree, non-shrub	T	11	18.3 ±5.0
Non-Tree	All other surfaces	NT	49	81.7 ±5.0

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

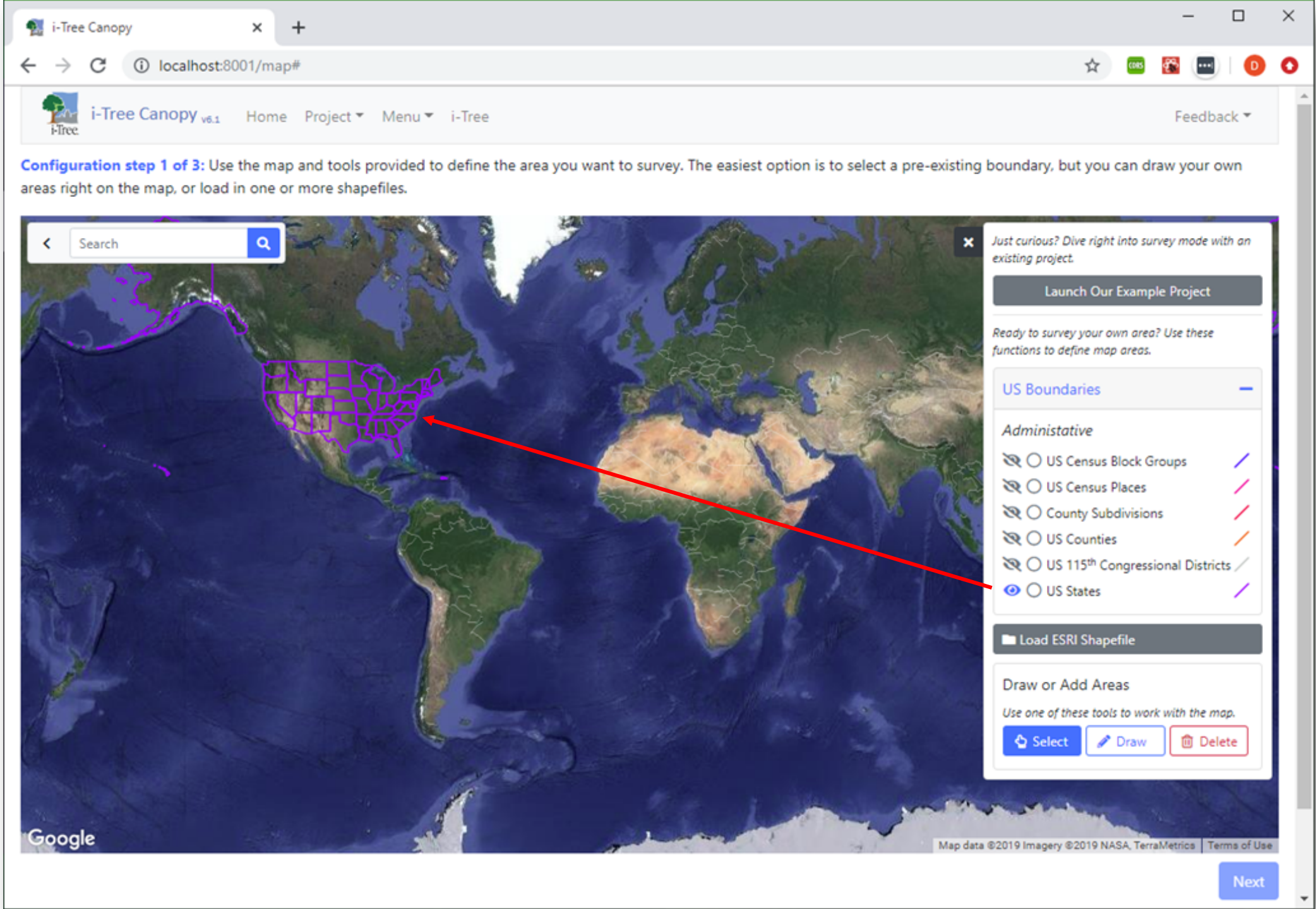
i-Tree Canopy *preview*



i-Tree Canopy *preview*



i-Tree Canopy *preview*



i-Tree Canopy preview

i-Tree Canopy

localhost:8001/survey

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

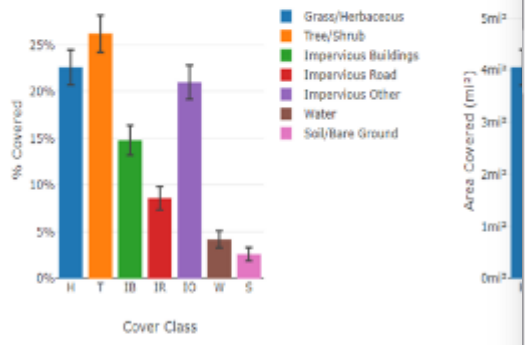
i-Tree Canopy *preview*

i-Tree Canopy v6.1

Cover Assessment and Tree Benefits Report

Estimated using random sampling statistics on 11/14/19

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
Total		

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	3.78 ± 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
Stored in trees (Note: not an annual rate)	103,711.91	±7,784

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 lbs/acre/yr @ $/T/yr CO 2,178 @ $622.27 | NO2 5,308 @ $240.88 | O3 38,960 @ $1,342.88 | PM2.5 1,688 @ $54,670.16 | SO2 1,030 @ $78.22 | PM10 5,284 @ $2,377.52. 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/in/ft²/yr: AVRO 4.64 | E 47.5 | I 47.6 | T 78.8 | PE 395.9 | PET 290.8 . Hydrological Value is based on amount of Avoided Runoff at $0.936.60/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 J. 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 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.

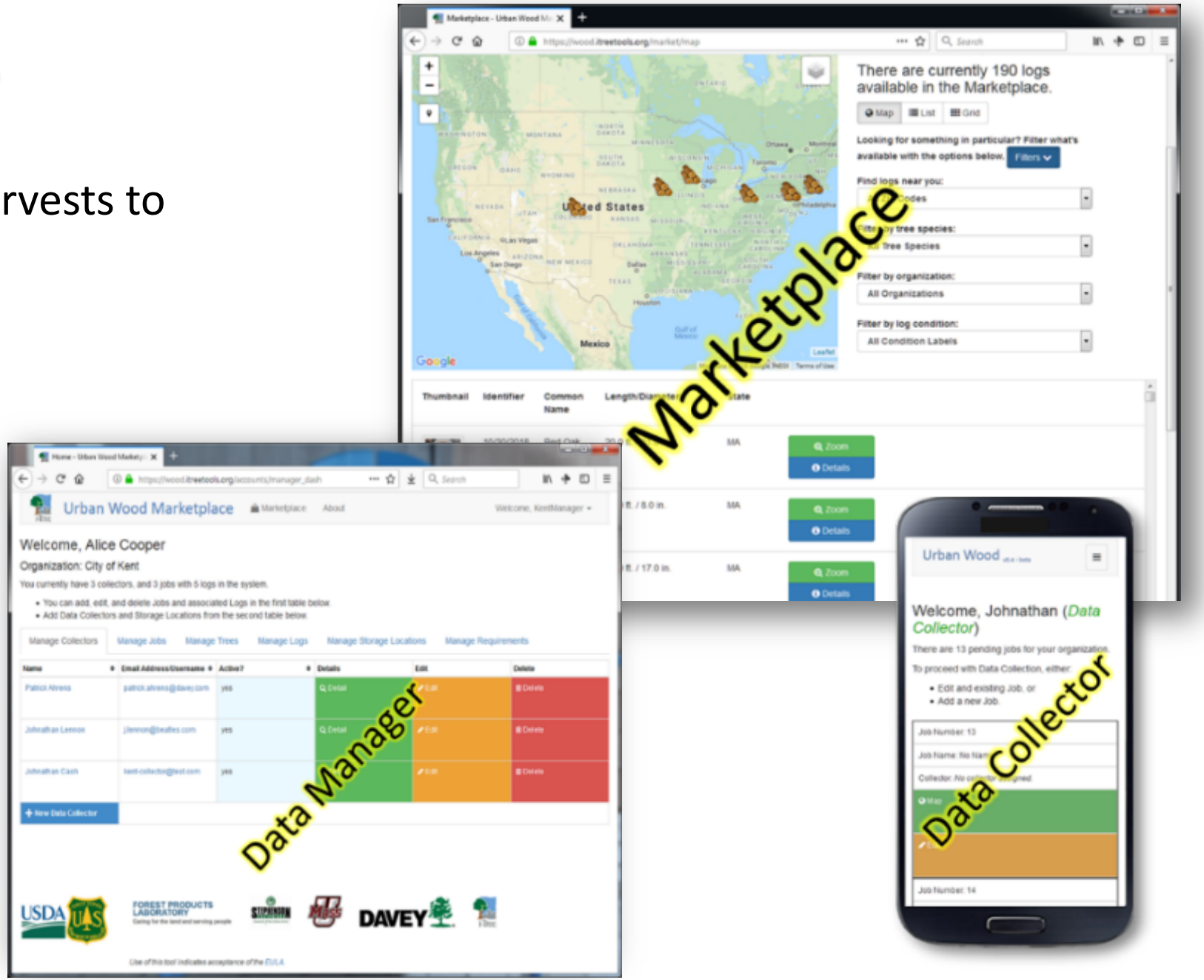
Use of this tool indicates acceptance of the EULA.

i-Tree Wood Marketplace

Wood Marketplace

"Connecting urban wood harvests to the creative community."

- Municipalities
- Tree Care Companies
- Artisans
- Woodworkers
- Furniture Makers
- Individuals



USDA FOREST PRODUCTS LABORATORY
Caring for the land and serving people
United States Department of Agriculture

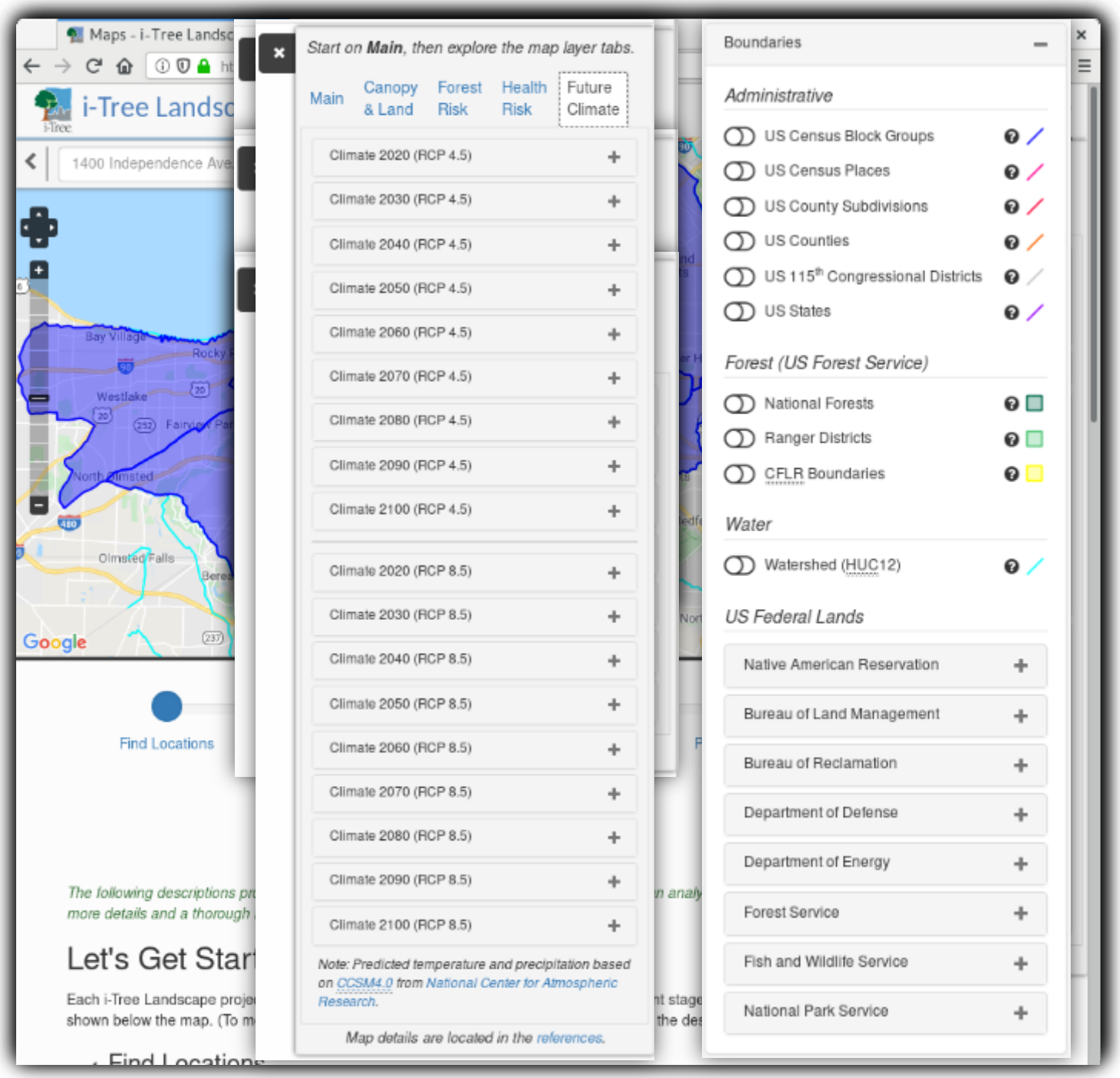
i-Tree

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



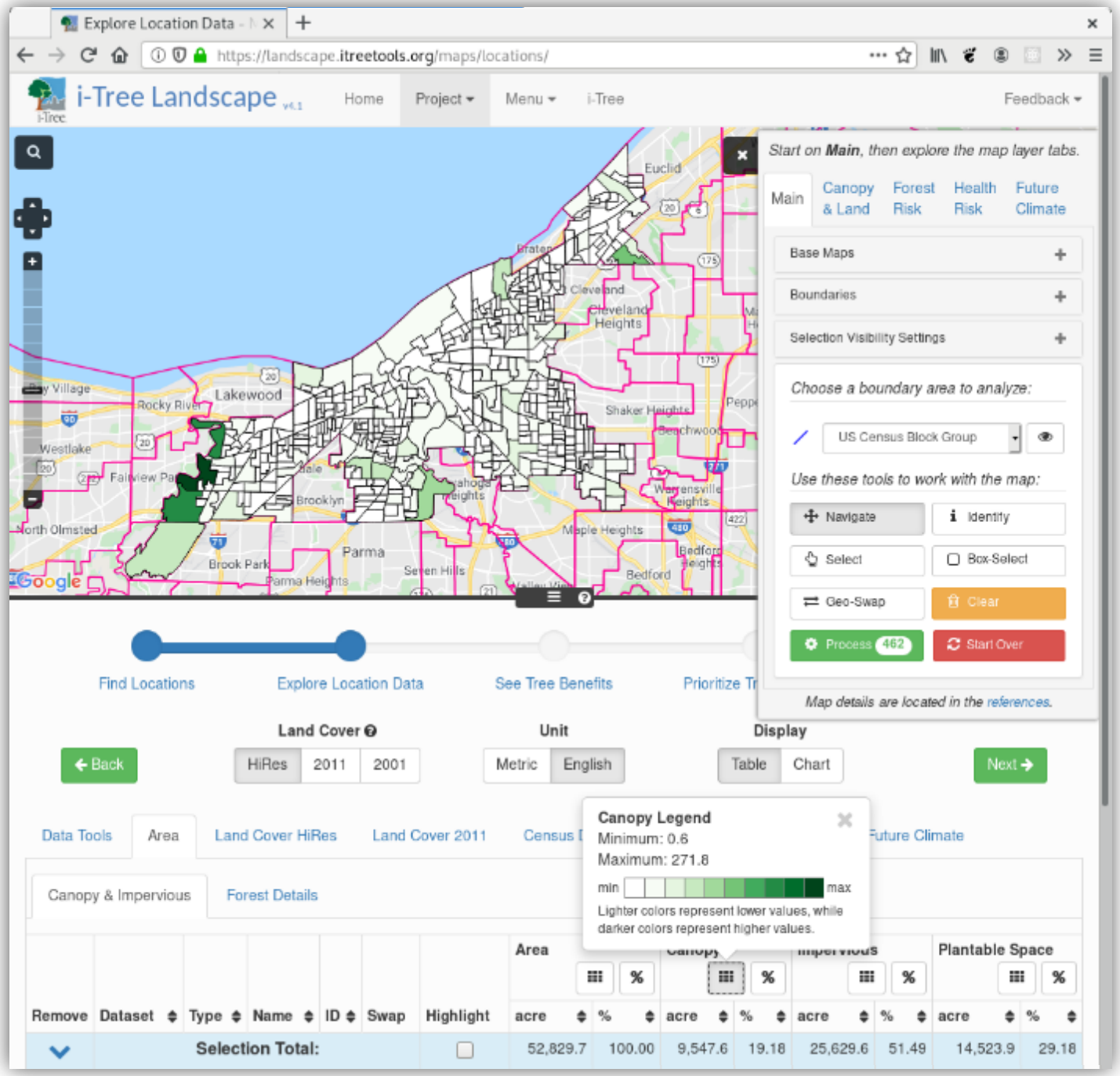
i-Tree Landscape

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…

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



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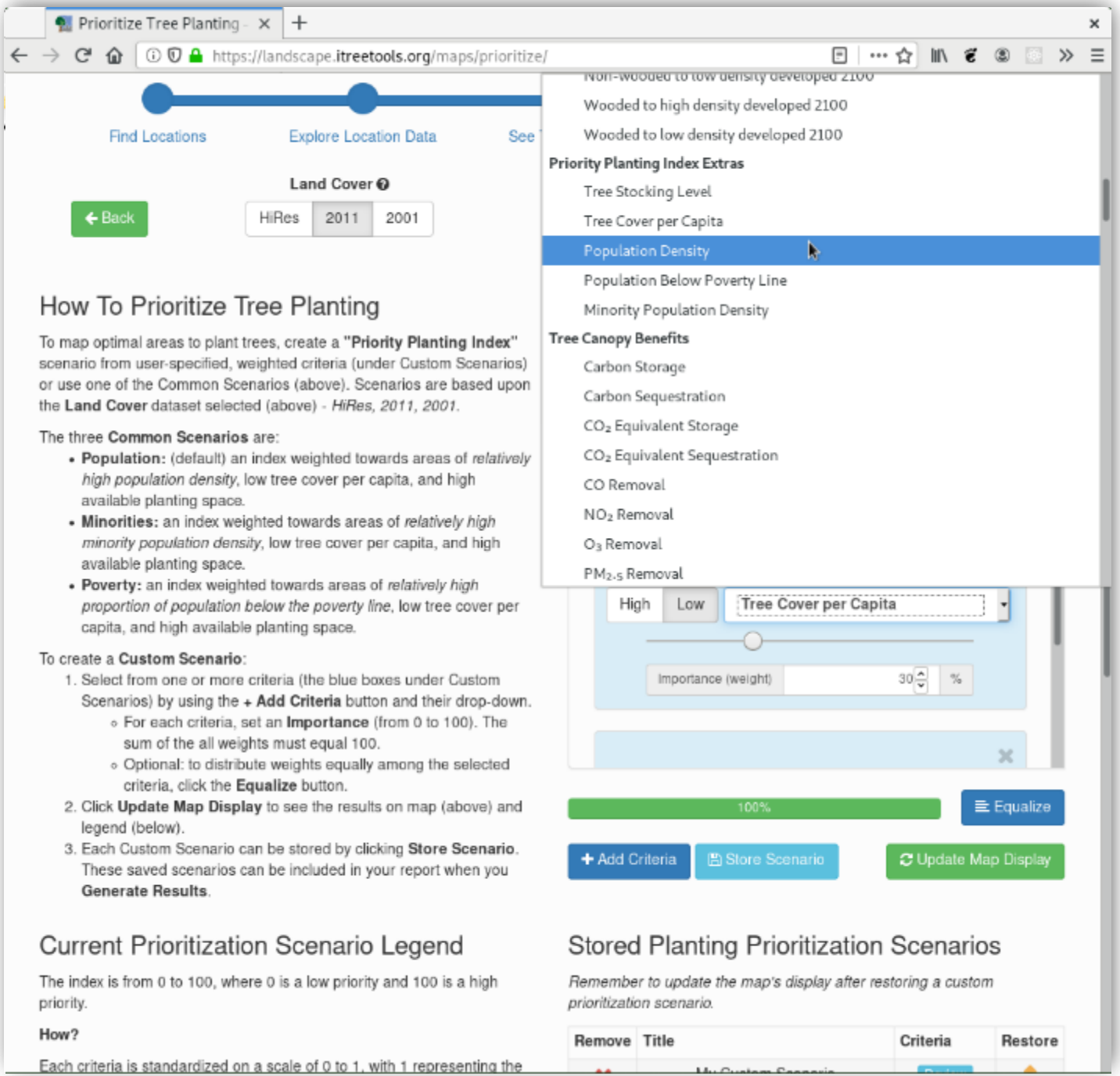
A quick tour of…

- Tree Benefits
  - Carbon (CO^2), air pollution, hydrology
- Planting Prioritization
  - Weighted prioritizations
    - Custom scenarios
  - Maintenance vs new planting
    - (vs highest priority; i.e. both)



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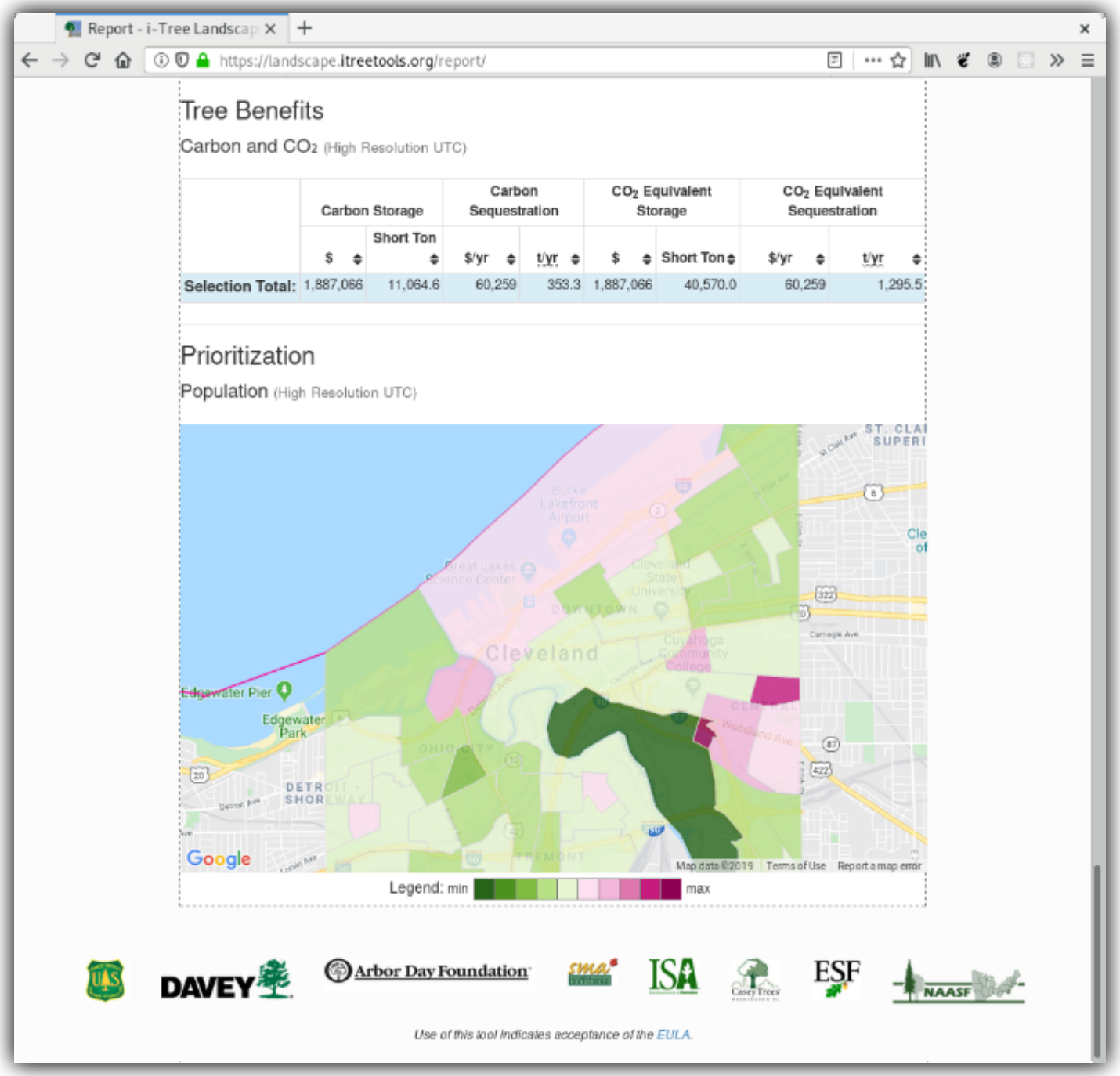
A quick tour of…

- Reporting
  - Title and description
  - Example tables
  - Example thematic map
  - Example prioritization map

landscape.itreetools.org



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