Just the Basics: Introducing i-Tree Tools

ABOUT I-TREE

The i-Tree suite of software tools was developed by the USDA Forest Service and their cooperators to help users assess and manage the structure, function, and value of trees and forests regardless of community size or technical capacity. i-Tree supports effective natural resource management by providing information for advocacy, planning, informed decision-making, and standardization for monitoring. It promotes a better understanding of the ecosystem services provided by trees and forests, and helps justify investment in stewardship, operations, and maintenance.

WHAT DOES I-TREE DO?

i-Tree provides the tools to help you promote strategic, cost-effective forest management and by helping you:

- Determine and understand tree and forest benefits, values and management costs.
- Plan and manage to optimize tree and forest environmental services to benefit people.
- Integrate trees and forests in green infrastructure strategies and resilience planning.
- Identify potential pests, diseases and threats.

i-Tree online tools can be accessed and used directly on the i-Tree website. Desktop applications require installing software and offer instruction manuals and learning resources to plan and complete a project.

I-TREE 2020 DESKTOP APPLICATIONS

• *Eco v6* uses field data from complete inventories or sampled plots with local hourly air pollution and meteorological data to quantify forest structure, environmental effects, and values.***Int'l***
• *Hydro* simulates the effects of changes in tree and impervious cover on hourly stream flow and water quality. Hydro has a user-friendly interface, pre-calculated topographic indexes that eliminate the need for GIS expertise, and applicability for non-watershed areas.
• **Streets** estimates structure and ecosystem services for street trees using a sample or complete inventory option.

I-TREE 2020 ONLINE APPLICATIONS

• *Landscape* allows you to explore geospatial data for an area of interest.
• *Design* assesses how tree species, size, and affect benefits including energy use in nearby structures.
• *Canopy* produces a statistical estimate of tree and other land cover types using Google Maps. *Int'l*
• *MyTree* calculates individual tree benefits on a smartphone or tablet.
• *Species* aids in tree species selection based on desired environmental services and geographic area.
• *Planting* estimates the long-term environmental benefits of tree planting projects.
• *Database* is an online system for international users to submit new location, pollution, precipitation data, and new species for integration into the Eco model. *Int'l*

www.itreetools.org

i-Tree

ABOUT   TOOLS   SUPPORT   NEWS / NOTICIAS   DOWNLOAD

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LEARN ABOUT I-TREE

More than beauty and shade, trees work hard for us all. Explore how trees improve the environment in communities big and small, urban and rural... even in your own backyard!

What benefits do trees provide? ➔

SYSTEM REQUIREMENTS

Requirements for desktop & laptop computers

Minimum hardware:
- 1.6 GHz or faster processor
- 1024 MB of available RAM
- Hard drive with at least 3 GB free space
- Monitor resolution of 1024 x 768 or greater

Software:
- Windows 7 or higher operating system
- Internet Explorer 9 or higher
- Adobe Reader 9.0 or newer
- .NET Framework 4.0 or newer
- Microsoft Access 2010 Database Engine or newer (for Eco v6)
- Microsoft Excel for i-Tree Streets
- Crystal Report 2008 Runtime (included in i-Tree installation)
- For PDA users, Windows Mobile Device Center 6.0 or above (included in i-Tree installation)

*Windows XP is no longer supported by Microsoft and is not compatible with Eco v6 in the i-Tree 2016 installation and beyon*d

Apple Macintosh Users

i-Tree desktop installation is not compatible or supported for use with the Apple Mac operating system. Apple users have run i-Tree successfully using alternate solutions such as dual-booting and Parallel systems allowing Macs to run Windows programs. See the learning video on the i-treetools website "*Options for installing and running i-Tree on a Mac computer*" or refer to "*Apple Mac Support*".

Requirements for field data collection devices
Smartphones, tablets, and other web-enabled mobile devices:
The newer Mobile Data Collection system, available in i-Tree Streets and Eco v5 and v6, is designed to work with newer web-enabled mobile devices. This is not a stand-alone app or program that is loaded directly on a smartphone or device. Most recent browser versions of Chrome, Firefox, and Safari are compatible; IE 9 and 10 have limitations.

Newer iPhones, iPads, Android and other devices are HTML-5 compatible and have data caching capabilities that allow for data collection to continue if internet connectivity is disrupted in the field. Some devices such as Windows Phone 7 smartphones and older devices are limited and will require continuous connectivity to advance through the online web forms.
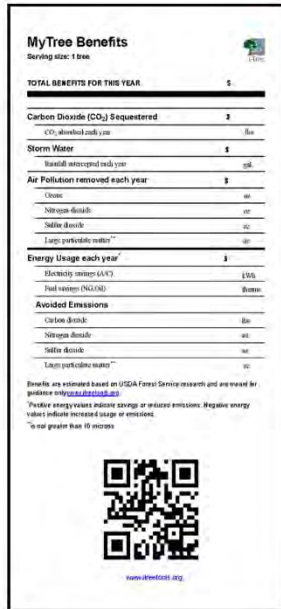
WHAT: Trees in urban areas provide a number of important benefits. They help to clean the air, curb stormwater runoff, raise property values, sequester carbon, and reduce energy costs. The Tree Benefit Calculator allows anyone to make a simple estimation of the benefits individual street-side trees provide.

HOW: With inputs of location, species and tree size, users will get an understanding of the environmental and economic value trees provide on an annual basis.

MyTree is intended to be simple and accessible. As such, this tool should be considered a starting point for understanding trees' value in the community, rather than a scientific accounting of precise values.

MyTree is generally used in the field to deliver quick results on the ecosystem services provided by one or more trees, and as such, is most practically used on a laptop, tablet or smartphone. Tree data is input via the computer or mobile device and the program will provide an easy to understand 'tree nutrition' label which can be saved or printed.

i-TREE DESIGN

WHAT: Design is a simple and accessible starting point for understanding the value of individual trees or a small population of trees to a community. i-Tree Design allows anyone to make a simple estimation of the benefits provided by individual trees.

HOW: With inputs of location, species, tree size, and condition, users will receive an understanding of tree benefits related to greenhouse gas mitigation, air quality improvements, and stormwater interception. With the additional step of drawing a building footprint – and virtually "planting" or placing a tree – tree effects on building energy use can also be evaluated. Multiple trees and buildings can be added to compare benefits or to provide a full accounting of a property's trees.

Tree benefits are estimated for

- Current year
- User-specified forecast year sometime in the future
- Projected total benefits across that future timespan
- Total benefits provided to date (based on estimated tree age)..

i-Tree Design allows you to calculate the approximate benefits that individual trees provide. This tool relies on average species growth equations and other geographic parameters that are generalized from city, county, state, and climate region data. Consequently, i-Tree Design is intended to be a starting point for understanding trees' value in the community rather than a scientific accounting of precise values.

i-TREE CANOPY
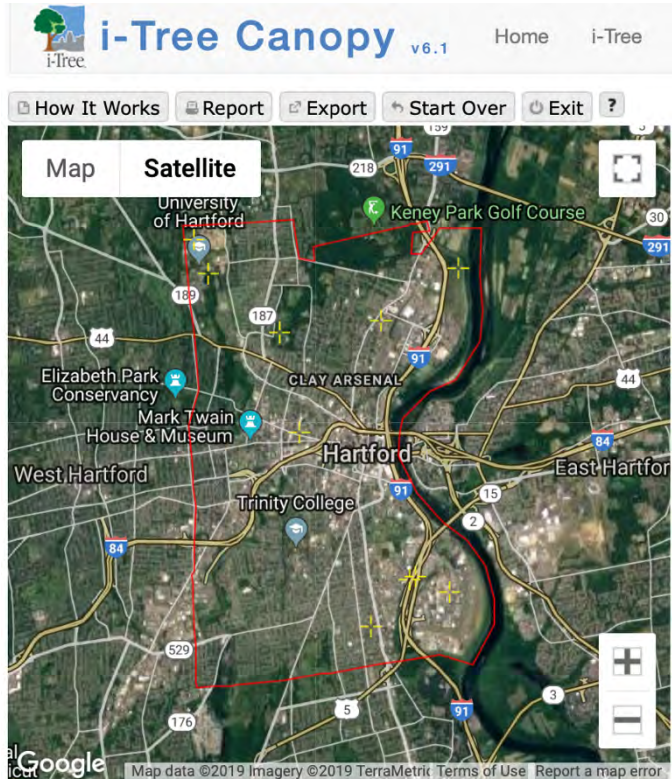
WHAT: Estimate tree cover and tree benefits for a given area with a random sampling process that lets you easily classify ground cover types.

With i-Tree Canopy, you are able to review Google Maps at random points to conduct a cover assessment within a defined project area. Draw your project area boundaries right onto Google Maps or you load an ESRI polygon shapefile in latitude / longitude coordinates. Canopy randomly generates sample points and zooms to each one so you can choose from your pre-defined list of cover types for that spot. The more points you input into the program, the better your cover estimate for your study area. If estimating tree cover, tree benefits can also be estimated.

HOW:
This tool is designed to allow users to easily and accurately estimate tree and other cover classes (e.g., grass, building, roads, etc.) within their city or any area they like. This tool randomly lays points (number determined by the user) onto Google Earth imagery and the user then classifies what cover class each point falls upon. The user can define any cover classes that they like and the program will show estimation results throughout the interpretation process. Point data and results can be exported for use in other programs if desired.

i-TREE ECO
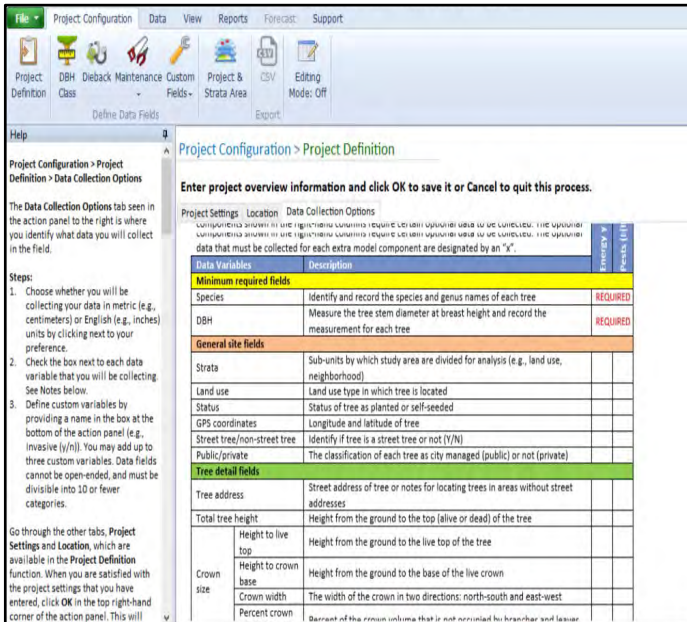
WHAT: i-Tree Eco is a flexible software application designed to use data collected in the field from single trees, complete inventories, or randomly located plots throughout a study area along with local hourly air pollution and meteorological data to quantify forest structure, environmental effects, and value to communities.

HOW: i-Tree Eco provides extensive forest and individual tree analyses including the following:

- Pollution removal and human health impacts
- Carbon sequestration and storage
- Hydrology effects (avoided run-off, interception, transpiration)
- Building energy effects
- Tree bio-emissions
- Wildlife suitability (plot-based projects; limited to 9 bird species)
- Ultraviolet radiation (UV) tree effects
- Species condition and distribution
- Leaf area and biomass
- Species importance values
- Diversity indices and relative performance
- Tree planting inputs
- Pest risk analysis
- User defined optional fields
- Cost benefit analysis

i-TREE MOBILE DATA COLLECTION (MDC)
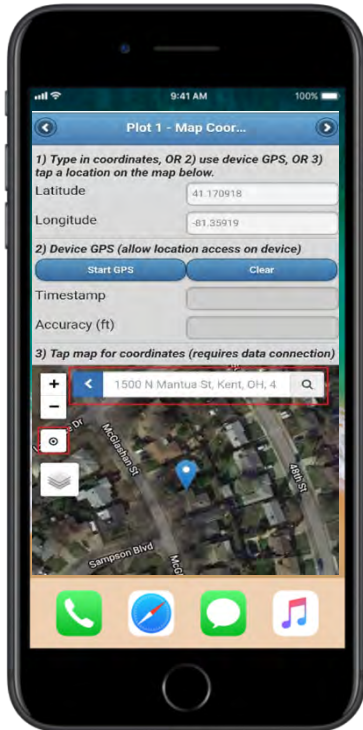
WHAT: The mobile data collection system, available in i-Tree Streets and Eco, is designed to work with newer web-enabled mobile devices. This is not an app or program that is loaded on a smartphone or tablet. The mobile web form system runs on a device's web browser and relies on internet connectivity, web browser functionality and data caching capability.

HOW: As you collect data, it is stored temporarily within your Internet browser's cache. The amount of storage available there varies significantly based on the device, browser, and setting. You can increase the amount of storage available by clearing your browser history and data. If your storage is full, from browsing history or other data, your data may be limited to relatively few records. With cleared history and data, you will likely be able to store hundreds of records.

A web browser with HTML-5 compatibility is required (most recent versions of Chrome, Firefox, and Safari are compatible; Internet Explorer 9 and 10 have limitations and are not recommended. Newer iPhones, iPads, Android phones and other devices are typically HTML-5 compatible and have data caching capabilities that allow for data collection to continue if internet connectivity is disrupted. Some devices such as Windows Phone 7 smartphones and older devices are limited and will require continuous connectivity to advance through the online web forms.

Annually **Oshkosh** public street trees provide[1]...

STORMWATER RUNOFF REDUCTION
$92,722

PROPERTY VALUE INCREASE
$109,762

$335,268 per year TOTAL BENEFITS

CO2 REDUCTION
$13,269

AIR QUALITY IMPROVEMENT
$16,332

ENERGY SAVINGS
$103,183

|	
24%	Norway Maple
22%	Crabapple species
9%	Green Ash
7%	Freeman Maple Cultivar
4%	Honeylocust

Top 5 Street Tree Species

WHAT: i-Tree Streets is used to study street tree populations. It is an analysis tool for urban forest managers that uses tree inventory data to quantify the dollar value of annual environmental and aesthetic benefits: energy conservation, air quality improvement, CO_2 reduction, stormwater control, and property value increase.

HOW: It is an easy-to-use, computer-based program that allows any community to conduct and analyze a street tree inventory. Baseline data can be used to effectively manage the resource, develop policy and set priorities. Using a sample or an existing inventory of street trees, this software allows managers to evaluate current benefits, costs, and management needs.

Communities have successfully used Streets to achieve the following:
- Improve the return on your investment dollar by determining which trees maximize canopy cover.
- Determine the management needs of street tree resources to foster a healthy municipal forest.
- Leverage investment from partners for such things as carbon credits or energy conservation.
- Gain public support by demonstrating the value of trees to the quality of life in your community.
- Perform economic evaluations of tree performance using annual budget and expenditure data.

i-TREE LANDSCAPE
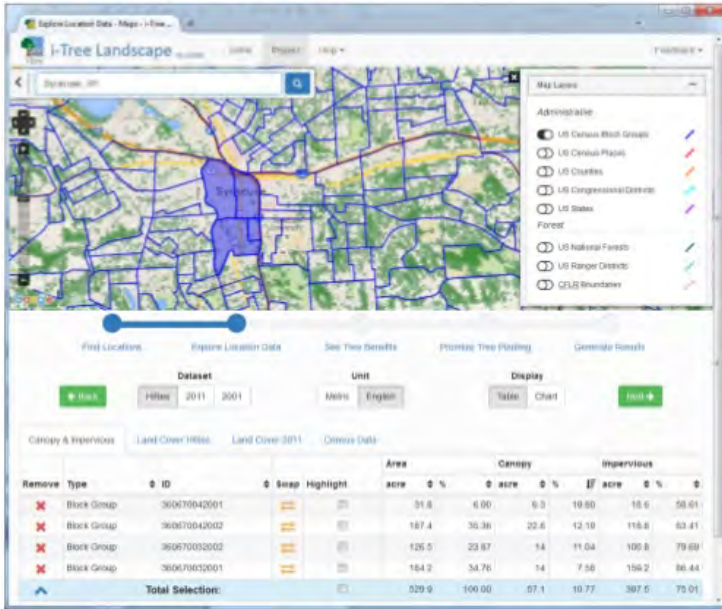
WHAT: Identify the locations that would most benefit from the planting of trees using environmental and demographic data.

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.
By removing carbon dioxide, trees help mitigate climate change.

HOW: -Tree Landscape is a web browser application that uses tree cover maps and other data to spatially estimate ecosystem services of trees. It can help map optimal locations to plant or protect trees in order to sustain these services based on user-specified parameters related to forest and tree stocking and Census data.

STEPS: Each i-Tree Landscape project is broken into the 5 simple steps.
1. Find Locations
2. Explore Location Data
3. See Tree Benefits
4. Prioritize Tree Planting
5. Generate Results

Trees Recommended by i-Tree Species

This is a list of the top 10% of tree species based on the following functions.

Generated: 9/28/2019
Location: Springfield, Massachusetts, United States of America
Hardiness: 6
Constraints:
- Minimum Height: 20 feet
- Maximum Height: 40 feet

Air Pollutant Removal (0-10 Importance)
- Overall: 4

Other Functions (0-10 Importance)
- Low VOC: 3
- Carbon Storage: 6
- Wind Reduction: 4
- Air Temperature Reduction: 5
- UV Radiation Reduction: 7
- Building Energy Reduction: 4
- Streamflow Reduction: 7
- Low Allergenicity: 3

S = Sensitive I = Intermediate S/I = Indeterminate

| Species | | | | Sensitivity | | | Pest Risk |
Scientific Name	Common Name	Hardiness Zone	Invasive	Ozone (O3)	Nitrogen Dioxide (NO2)	Sulfur Dioxide (SO2)	Possible Pests
BETULA UBER	VIRGINIA ROUNDLEAF BIRCH	6 ~ 6			S		Asian Longhorned Beetle, Large Aspen Tortrix, Winter Moth
PINUS RADIATA	MONTEREY PINE	3 ~ 11		S			Pine Shoot Beetle, Sirex Wood Wasp, Southern Pine Beetle
CARPINUS BETULUS	EUROPEAN HORNBEAM	5 ~ 7					
SASSAFRAS ALBIDUM	SASSAFRAS	4 ~ 8		S			Laurel Wilt
ACER NEGUNDO	BOXELDER	3 ~ 8		I	I		Asian Longhorned Beetle, Winter Moth, Polyphagous Shot Hole Borer
MAGNOLIA TRIPETALA	UMBRELLA MAGNOLIA	5 ~ 8					
AESCULUS X CARNEA	RED HORSECHESTNUT	5 ~ 7					Asian Longhorned Beetle
BETULA FONTINALIS OCCIDENT.	WATER BIRCH	3 ~ 6			S/I		
BETULA NIGRA	RIVER BIRCH	4 ~ 9			S		Asian Longhorned Beetle, Gypsy Moth, Large Aspen Tortrix, Winter Moth
BROUSSONETIA PAPYRIFERA	PAPER MULBERRY	6 ~ 11					
PINUS PARVIFLORA	JAPANESE WHITE PINE	5 ~ 7					Pine Shoot Beetle, Sirex Wood Wasp, Southern Pine Beetle

WHAT: i-Tree Species is designed to help urban foresters select the most appropriate tree species based on the species potential environmental services and geographic area. Users select and rank the importance (0-10) of each environmental service desired from trees. The program then calculates the best tree species based on the user-provided weighting of environmental benefits of tree species at maturity.
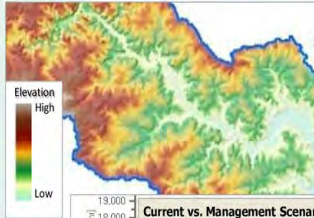
HOW: Species are selected based on three types of information:
- Hardiness – as determined by state and city.
- Mature height – user specified minimum and maximum heights.
- Environmental factors – ranked from 0 to 10:
- Air pollution removal
- Air temperature reduction
- Ultraviolet radiation reduction
- Carbon storage
- Pollen allergenicity
- Building energy conservation
- Wind reduction
- Stream flow reduction (storm water management) estimation results throughout the interpretation process.
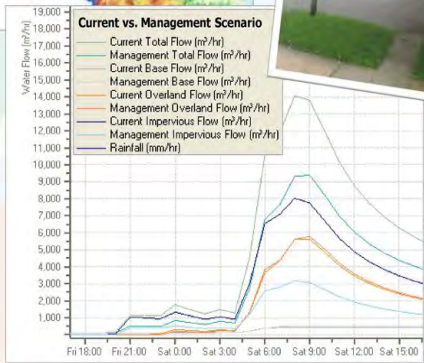
i-Tree Hydro

www.itreetools.org

i-Tree Hydro

Quantifies effects of:
- Tree cover
- Impervious cover

on:
- Stream flow
- Water quality

Current vs. Management Scenario
- Current Total Flow (m³/hr)
- Management Total Flow (m³/hr)
- Current Base Flow (m³/hr)
- Management Base Flow (m³/hr)
- Current Overland Flow (m³/hr)
- Management Overland Flow (m³/hr)
- Current Impervious Flow (m³/hr)
- Management Impervious Flow (m³/hr)
- Rainfall (mm/hr)

i-Tree is a Cooperative Initiative among these partners

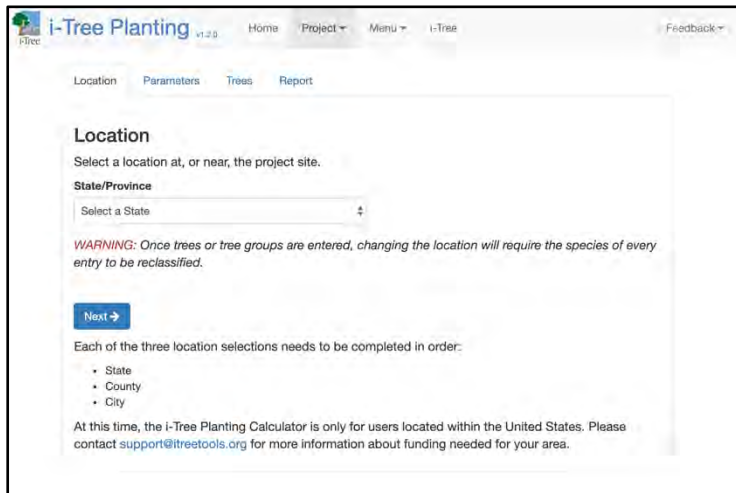DAVEY   Arbor Day Foundation   sma   ISA   CaseyTrees   ESF

WHAT: Hydro is a stand-alone desktop application designed to simulate the effects of changes in urban tree cover and impervious surfaces on the hydrological cycle, including streamflow and water quality, for watershed and non-watershed areas. It is the first vegetation-specific urban hydrology model, developed to model urban vegetation effects so natural resource managers and urban planners can quantify the impacts of changes in tree and impervious cover on local hydrology to aid in management and planning decisions.

HOW: Hydro is a combination of two modules. A base module designed to simulate hourly changes in stream flow due to changes in urban tree and impervious cover characteristics and a water quality module that uses outputs from the base program to simulate changes in water quality.

Ease of use guides development of i-Tree Hydro. Data requirements can be satisfied using preloaded and freely available data sets, and model flexibility allows for both watershed and non-watershed areas to be assessed. Navigating through project setup is simplified with clear steps, integrated help text within a user-friendly interface, and additional help text online. Understanding and making use of project results is made easier with an Executive Summary, various reporting options, and the ability to export outputs.

i-TREE GHG PLANTING CALCULATOR

WHAT: 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 energy conserved, air pollutants captured and avoided, stormwater filtered, and tree aboveground biomass is also calculated.

HOW: Users enter the following information via an online input interface in order to establish the study parameters.

- 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)
- Tree aboveground biomass

I-TREE COUNTY BENEFITS
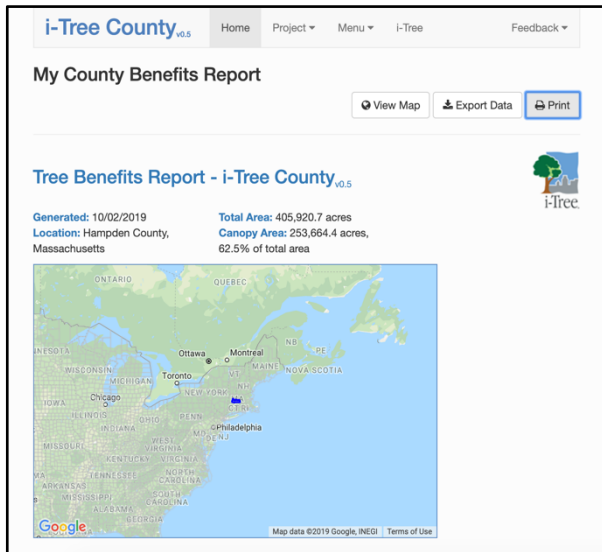
WHAT: i-Tree County Benefits enables users to quickly learn the numerous benefits that trees provide within a U.S. county. You can assess the benefits for an area within the county or for the entire county.

HOW: The following tree benefits can be accessed for one or more counties:

- 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)

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i-TREE HARVEST CARBON CALCULATOR

WHAT: The i-Tree Harvest Carbon Calculator allows land managers and landowners to estimate the amount of carbon stored in harvested wood products. Carbon estimates are based on harvest volume, geographic region, and wood type. Including harvested wood products in carbon accounting and carbon credits, exploring the carbon impacts of changing the amounts of longer- and shorter-lived wood products for a given forest stand.

HOW: A Stand Details report that gives estimates of carbon storage in tons per hectare for total carbon storage after 100 years (C100) and average annual carbon storage (CAvg). Estimates are given for five different storage categories.

Also, County creates a 10- year report which shows carbon storage calculations in 10-year increments for each of the five storage categories. Calculations can be exported to Excel.

i-Tree Storm: Form 4A

POST-Storm Field Data Collection Sheet (Populated Areas)

Community Name[1]:		
ON Street:		Plot Number[1]:
FROM Street:	TO Street:	
Date:	Plot Length (ft/mi):	
ROW Width (feet):	Collected by:	

Start of plot description:

End of plot description:

ROW Trees ONLY								ROW + 50' Trees[2]		
Tree Removals				Tree Pruning				Debris Estimate[3]		
DBH Class	Tally Number of Removal Trees	Total All Removal Trees	Time Per Tree (hours)	Total Hours for Removal (total trees × time per tree)	Tally Hazard Prune Trees	Total All Hazard Prune Trees	Time Per Tree (hours)	Total Hours Haz Prune (total trees × time per tree)	Rate in 100-Foot Segments	CROWN LOSS[4]	CUBIC YARDS
6-12			3.2				0.75		0-100		
13-18			5.1				1.0		101-200		
19-24			7.7				1.5		201-300		
25-30			10.2				2.0		301-400		
31-36			12.5				3.0		401-500		
37-42			20.4				4.0		501-600		
43+			28.0				5.0		601-700		
Totals									701-800		
									Extra[5]		
									Total CL		
									Average[6]		
									Total CY		

[1] If plot information was recorded during set up, just fill in name and plot number.
[2] Rate all trees as a group that fall within 50 feet of the edge of the right-of-way.
[3] Choose either Crown Loss or Cubic Yards for the whole plot.
[4] Estimate Crown Loss with one of these values: 12.5 (0-25%), 37.5 (26-50%), 62.5 (51-75%), or 87.5 (76-100%).
[5] For plots longer than 800 feet, report average (Crown Loss) or total (Cubic Yards) of the remainder of the plot beyond 800 feet in the correct column here.
[6] Average = Total ÷ number of 100-foot segments examined.

WHAT: i-Tree Storm establishes a standard method to assess widespread damage immediately after a severe storm in a simple, credible, and efficient manner. This assessment method is adaptable to various community types and sizes, and it provides information on the time and funds needed to mitigate storm damage. A Hurricane Adaptation of the utility is also available for i-Tree Storm users.

HOW: Using sample street segments which are randomly chosen in a community, a survey is performed, and time and cost estimates are made. The protocol includes an optional pre-storm stage that evaluates a community's street-side and adjacent trees, and estimates the amount of cleanup that might be needed after a severe storm. The advantages of this pre-storm work are to create the critical random sample before an emergency, and to provide reliable cleanup numbers that are useful in persuading community officials of the seriousness of the potential event.

Once a storm has passed with community-wide damage, the same sample plots are re-surveyed; if pre-storm work was not done, random sample plots are created and surveyed. A qualified damage assessor evaluates the amount of debris and tree damage in each plot.

i-TREE SUPPORT FORUM

WHAT: The i-Tree Support Forum is a moderated discussion forum whose purpose is to help, support and share with others. By joining it, you agree to abide by the Forum rules as described below, and you understand that violations will be dealt with as needed by Forum Moderators. Members are strongly urged to make an effort to become a positive member of our community.

HOW: Please make sure that you are posting for the good of the i-Tree community, and keep in mind that the community encompasses a broad range of interests and abilities.
Display a positive, friendly attitude, and be respectful of others' opinions. Please try to "give" back to our community. For each time you find help or answers here, try to help someone else out in return. You may find that what goes around comes around.

Navigation is based on these subdivisions. Generally, a user will start at the Forum Index. The Forum Index shows a list of forums. If you click on one of the forums, you will be shown the View Forum page, which is a listing of the topics in the forum. By default they are sorted in chronological order by the most recent post in each topic. If you click on a topic, you will be shown the View Topic page, which is a listing of the posts in that topic. The posts in a topic are organized chronologically, with the oldest post first.

The goal of the i-Tree Support Team is to provide you with an official response to any i-Tree question within two business days. Please use the following to contact the Team.

Email
If you would like to ask us a question via email, send a message to: info@itreetools.org

Voice Mail System
Please leave a voice mail if you would like an i-Tree Team member to contact you by phone. Voice mail is monitored, and calls are typically returned throughout the day as our schedule permits.
Call toll free at (877) 574-8733 to leave a voice mail.

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