

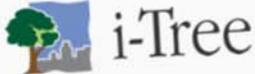
# i-Tree Design: A Quick Review

## Understanding This Tool:

i-Tree Design (beta) allows anyone to make a simple estimation of the benefits individual trees provide. With inputs of location, species, tree size and condition, users will get an understanding of the benefits that trees provide related to greenhouse gas mitigation, air quality improvements and storm water interception. With the added step of drawing a house or building footprint—and virtually "planting" a tree—trees' effects on building energy use can be evaluated.

This tool is intended to be a simple and accessible starting point for understanding individual trees' value to the homeowner and their community. For more detailed information on urban and community forest assessments, please explore the rest of the [i-Tree](#) website.

# About Design



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Community Trees:  
A Living Investment

COMMUNITY TREES:  
A LIVING INVESTMENT

Featured i-Tree Project:  
Chicago's Urban Forest

Who's Using i-Tree?

## What is i-Tree?

i-Tree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools. The i-Tree Tools help communities of all sizes to strengthen their urban forest management and advocacy efforts by quantifying the structure of community trees and the environmental services that trees provide.

Since the initial release of the i-Tree Tools in August 2006, numerous communities, non-profit organizations, consultants, volunteers and students have used i-Tree to report on individual trees, parcels, neighborhoods, cities, and even entire states. By understanding the local, tangible ecosystem services that trees provide, i-Tree users can link urban forest management activities with environmental quality and community livability. Whether your interest is a single tree or an entire forest, i-Tree provides baseline data that you can use to demonstrate value and set priorities for more effective decision-making.

i-Tree Tools are in the public domain and are freely accessible. We invite you to explore this site to learn more about how i-Tree can make a difference in your community.

Follow i-Tree on Twitter

## What's New?

**i-Tree v4.0 now available!**  
[Learn more about i-Tree v4 >>](#)

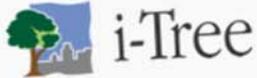
**i-Tree v4 Online Seminar Series**  
(4) April - May online sessions focusing on v4 i-Tree tools >>

**IPED Pest Detection Training**  
April & May online sessions focusing on the IPED pest evaluation and detection tool

**Putting a Value on the Urban Forest- i-Tree featured in Leaves of Change**  
[USFS Urban Forestry South >>](#)

**Sustaining Americas Urban Trees and Forests**  
[US Forest Service Report >>](#)

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Chicago's Urban Forest

Chicago's Urban Forest

Who's Using i-Tree?

## What's i-Tree?

Applications

- i-Tree Eco
- i-Tree Streets
- i-Tree Hydro (beta)
- i-Tree Vue
- i-Tree Design (beta)**
- i-Tree Canopy

i-Tree is a comprehensive software suite from the USDA Forest Service that provides forestry analysis and benefits assessment tools for communities of all sizes to strengthen their urban forests. i-Tree Design (beta) is a new tool that allows users to visualize their efforts by quantifying the structure of their urban forest and the environmental services that trees provide.

Since the initial release of the i-Tree Tools in August 2006, numerous communities, non-profit organizations, consultants, volunteers and students have used i-Tree to report on individual trees, parcels, neighborhoods, cities, and even entire states. By understanding the local, tangible ecosystem services that trees provide, i-Tree users can link urban forest management activities with environmental quality and community livability. Whether your interest is a single tree or an entire forest, i-Tree provides baseline data that you can use to demonstrate value and set priorities for more effective decision-making.

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## i-Tree Design *Beta*

—A National Tree Benefits Calculator—

### Understanding This Tool:

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This tool is intended to be a simple and accessible starting point for understanding individual trees' value to the homeowner and their community. For more detailed information on urban and community forest assessments, please explore the rest of the [i-Tree](#) website.

Thank you for choosing i-Tree Design to calculate the economic and ecological benefits of your tree.

To get started enter your address below:

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- Stormwater
- Air Quality
- CO2
- Cooling
- Heating



Breakdown of your tree's benefits

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- Stormwater
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Breakdown of your tree's benefits

# Choosing Your Location

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Submit

# Choosing Your Location

i-Tree Design *Beta*

452 Armory St, Springfield, MA 01104, USA

Get started with these easy steps:

Enter your tree's species:

Maple, Sugar

Note: If you're looking for a Willow Oak, it's listed as "Oak, Willow". If your tree isn't listed, use the general "Other" listings.

Enter how wide (diameter) your tree is at  
4.5 feet above the ground:  inches.

Note: This measurement is what foresters call "diameter at breast height".

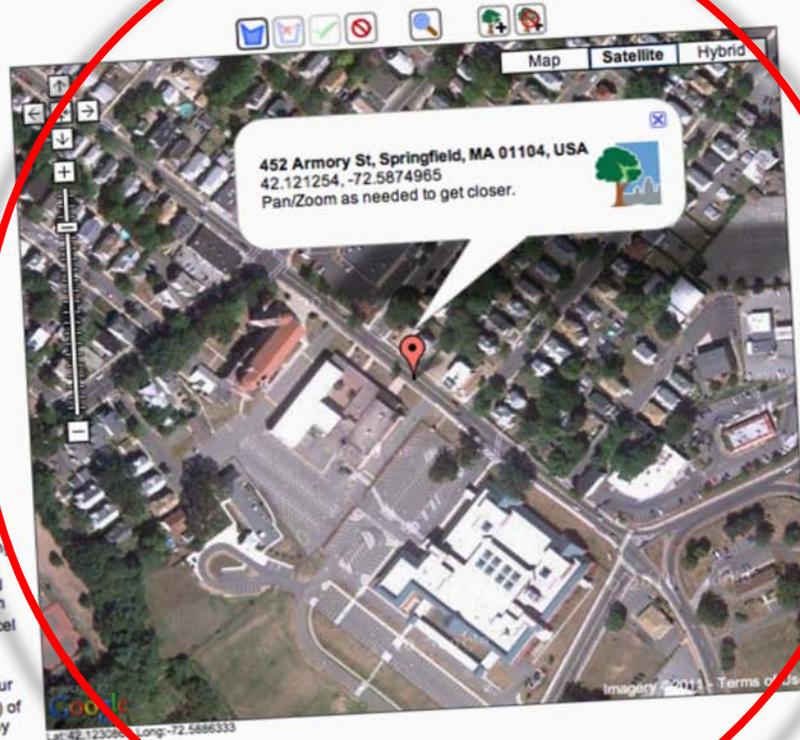
Enter what type of condition best describes  
your tree: ExcellentCheck here if you would like to evaluate  
energy effects: 

**Draw your structure & locate your tree:**  
Use the drawing tool  above the map to outline your house or building. Be sure to outline "conditioned" living area only; garages and other unheated or uncooled spaces should not be included. When you are finished outlining your building, click on the  button. You can also use  to delete your last point or use  to cancel the entire drawing.

Now, use the tree tool  above the map to locate your tree. Place the marker as close to the base (or center) of the tree as possible. You cancel the tree placement by clicking .

Indicate when your structure was built:  
pre-1950

Calculate Benefits



# Data Input Screen



# i-Tree

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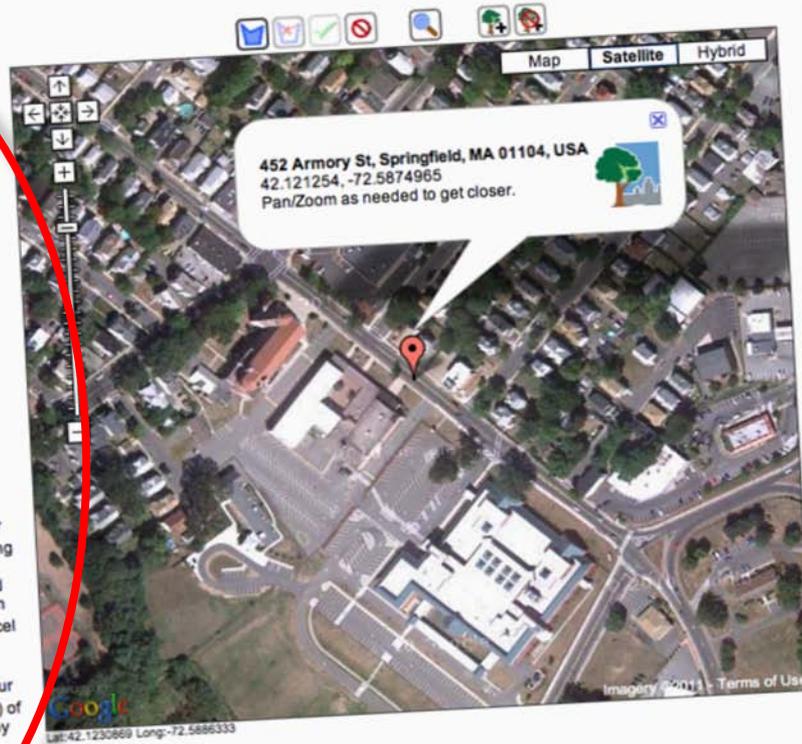
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# Data Input Screen

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### Enter how wide (diameter) your tree is at 4.5 feet above the ground: 22 inches.

*Note: This measurement is what foresters call "diameter at breast height".*

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# Data Input Screen



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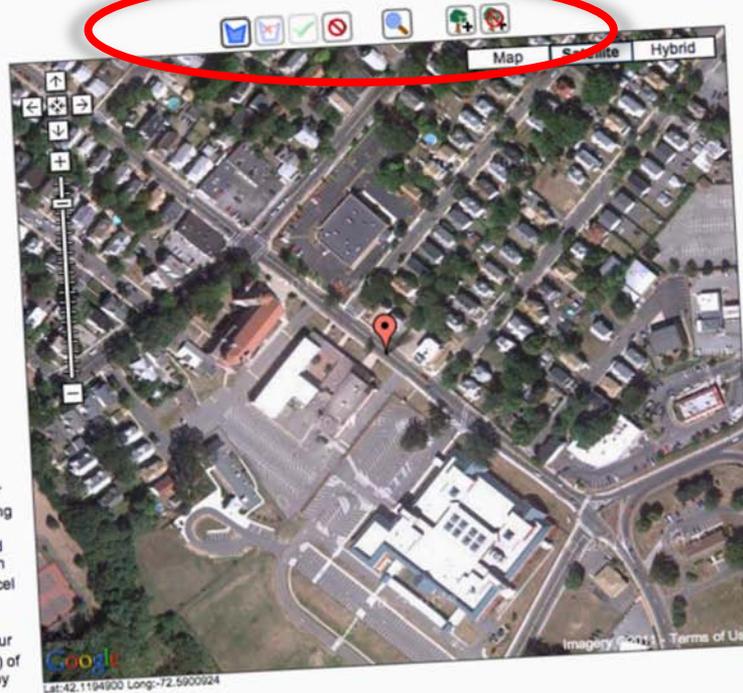
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Calculate Benefits



# Energy Analysis Input Screen



# Energy Analysis Input Tools



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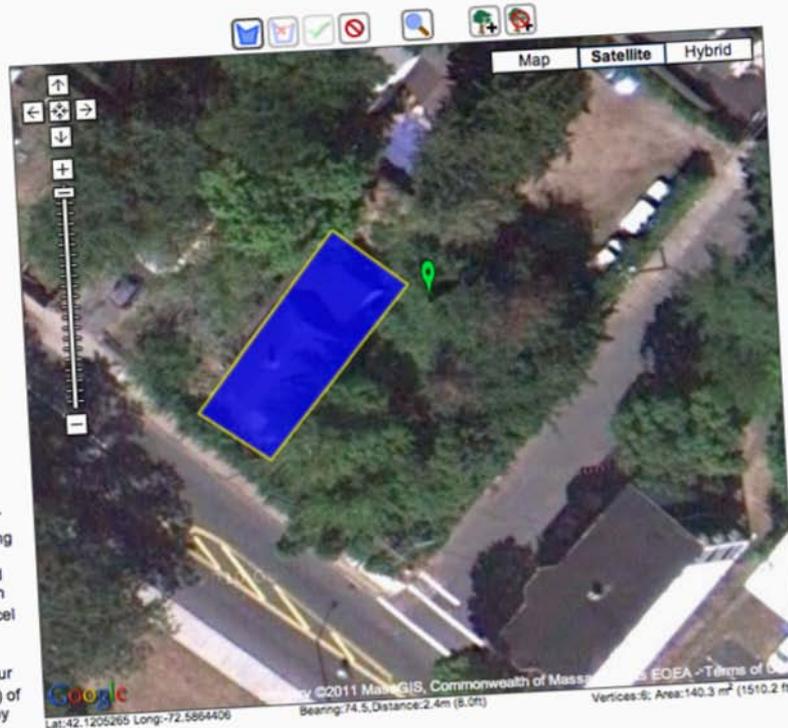
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# Energy Analysis Input Screen



## i-Tree Design *Beta*

452 Armory St, Springfield, MA 01104, USA

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Overall Benefit

Storm Water

Energy

Air Quality

CO2

About Model



### Breakdown of your tree's benefits

Click on one of the tabs above for more detail

**This 22 inch Sugar maple provides overall benefits of: \$190 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 to better understand the environmental and economic value associated with trees and their placement.

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 27 inches, it will provide \$201 in annual benefits.**



Sugar maple  
*Acer saccharum*

# Overall Benefits



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Overall Benefit

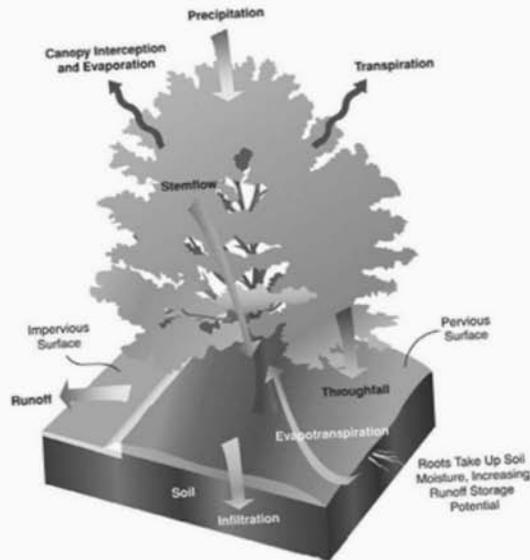
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**Your 22 inch Sugar maple will intercept 2,774 gallons of stormwater this year.**

Urban stormwater runoff (or "non-point source pollution") washes chemicals (oil, gasoline, salts, etc.) and litter from surfaces such as roadways and parking lots into streams, wetlands, rivers and oceans. The more impervious the surface (e.g., concrete, asphalt, rooftops), the more quickly pollutants are washed into our community waterways. Drinking water, aquatic life and the health of our entire ecosystem can be adversely affected by this process.

Trees act as mini-reservoirs, controlling runoff at the source. Trees reduce runoff by:

- Intercepting and holding rain on leaves, branches and bark
- Increasing infiltration and storage of rainwater through the tree's root system
- Reducing soil erosion by slowing rainfall before it strikes the soil

For more information see the USDA Forest Service's [Community Tree Guide](#) series.

# Stormwater Benefits



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## i-Tree Design *Beta* 452 Armory St, Springfield, MA 01104, USA

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**Your 22 inch Sugar maple will conserve 138 Kilowatt-hours of electricity and reduce consumption of heating fuel by 9 therm(s).**

Trees modify climate and conserve building energy use in three principal ways:

- Shading reduces the amount of heat absorbed and stored by buildings.
- Evapotranspiration converts liquid water to water vapor and cools the air by using solar energy that would otherwise result in heating of the air.
- Tree canopies slow down winds thereby reducing the amount of heat lost from a home, especially where conductivity is high (e.g., glass windows).

Strategically placed trees can increase home energy efficiency. In summer, trees shading east and west walls keep buildings cooler. In winter, allowing the sun to strike the southern side of a building can warm interior spaces. If southern walls are shaded by dense evergreen trees there may be a resultant increase in winter heating costs.

For more information see the USDA Forest Service's [Community Tree Guide](#) series.

# Energy Benefits



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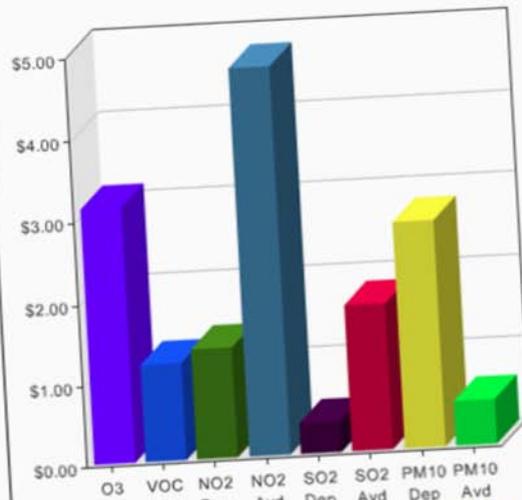


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**Air quality benefits of your 22 inch Sugar maple are shown in the graph at left.**

Air pollution is a serious health threat that causes asthma, coughing, headaches, respiratory and heart disease, and cancer. Over 150 million people live in areas where ozone levels violate federal air quality standards; more than 100 million people are impacted when dust and other particulate levels are considered "unhealthy". We now know that the urban forest can mitigate the health effects of pollution by:

- Absorbing pollutants like ozone, nitrogen dioxide and sulfur dioxide through leaves
- Intercepting particulate matter like dust, ash and smoke
- Releasing oxygen through photosynthesis
- Lowering air temperatures which reduces the production of ozone
- Reducing energy use and subsequent pollutant emissions from power plants

It should be noted that trees themselves emit biogenic volatile organic compounds (BVOCs) which can contribute to ground-level ozone production. This may negate the positive impact the tree has on ozone mitigation for some high emitting species (e.g. Willow Oak or Sweetgum). However, the sum total of the tree's environmental benefits always trumps this negative.

"Dep" stands for deposition. This is your tree absorbing or intercepting pollutants. "Avd" stands for avoided. This is your tree lessening the need for creation of these pollutants in the first place by reducing energy production needs.

For more information see the USDA Forest Service's [Community Tree Guide](#) series.

# Air Quality Benefits



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Overall Benefit

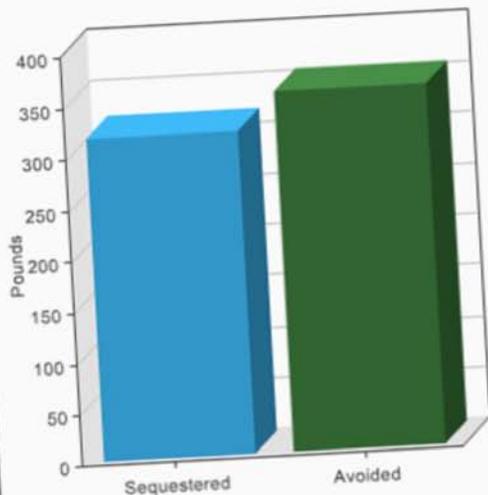
Storm Water

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**This year your 22 inch Sugar maple tree will reduce atmospheric carbon dioxide by 672 pounds.**

How significant is this number? Most car owners of an "average" car (mid-sized sedan) drive 12,000 miles generating about 11,000 pounds of CO<sub>2</sub> every year. A flight from New York to Los Angeles adds 1,400 pounds of CO<sub>2</sub> per passenger. Trees can have an impact by reducing atmospheric carbon in two primary ways (see figure at left):

- They sequester ("lock up") CO<sub>2</sub> in their roots, trunks, stems and leaves while they grow, and in wood products after they are harvested.
- Trees near buildings can reduce heating and air conditioning demands, thereby reducing emissions associated with power production.

Combating climate change will take a worldwide, multifaceted approach, but by planting a tree in a strategic location, driving fewer miles, or replacing business trips with conference calls, it's easy to see how we can each reduce our individual carbon "footprints."

For more information see the USDA Forest Service's [Community Tree Guide](#) series.

# Carbon Analysis



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## i-Tree Design Beta 452 Armory St, Springfield, MA 01104, USA

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i-Tree Design (beta) allows you to calculate the approximate benefits individual trees provide. The carbon, air quality and stormwater calculations are based on methods and models derived from the [i-Tree Streets](#) application. As such, this tool relies on average species growth and geographic parameters for [16 national climate zones](#) and, consequently, should be considered a starting point for understanding trees' value in the community rather than a scientific accounting of precise values.

Tree effects on energy use are calculated using the methods detailed in the USDA Forest Service's publication, "Carbon Dioxide Reduction Through Urban Forestry: Guidelines for Professional and Volunteer Tree Planters (PSW-GTR-171)." Trees' energy effects on buildings from shade, evapotranspiration and wind speed reduction (windbreak) are calculated using an applied reduction factor based on tree type, height, azimuth and distance from the home. Shade and evapotranspiration effects are set to zero when trees are beyond 18 meters [approx. 60 feet] from defined building footprints. Windbreak effects on energy use are set to zero when trees are at a distance from the building equaling 35 times the tree height or greater (see: Heisler, G.M. and D.R. Dewalle. 1988. Effects of Windbreak Structure on Wind Flow. Agriculture, Ecosystems and Environment. 22/23:41-69).

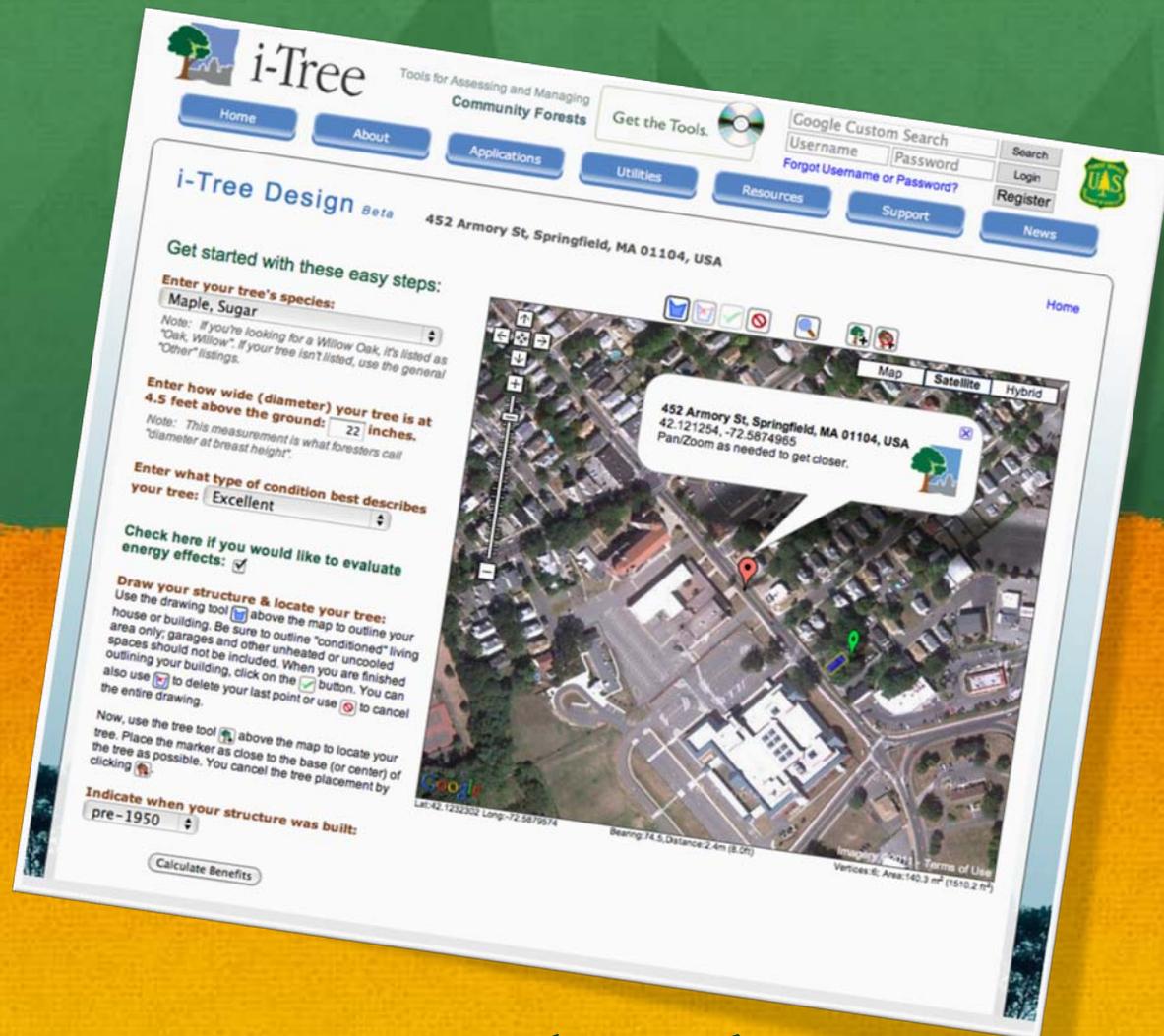
For more detailed information on urban and community forest assessments, please continue exploring the [i-Tree](#) website.

### Credits:

- This tool's predecessor, the "National Tree Benefit Calculator", was originally conceived and developed by [Casey Trees](#) and [Davey Tree Expert Co.](#) With i-Tree Design (beta), the i-Tree [Cooperators](#) have taken the Calculator to the next level by providing dynamic, site-specific energy use calculations and a long-term platform for technical support and further development.
- Significant text and graphical content was originally published by the USDA Forest Service's Center for Urban Forest Research through their [Tree Guide](#) series of publications. We credit the authors of these publications for the content and guidance in its presentation.
- Facts about personal carbon production based on driving and flying courtesy of [Conservation International](#)

For technical questions about this tool, contact [i-Tree support](#).

# Reference & Support Page



i-Tree Design: That's it.