

Forest Carbon & Climate Program

FCCP i-Tree Design Activity

Introduction

Carbon can be modeled across scales depending on the question and application proposed. Understanding the scale at which each specific carbon tool operates, and knowing the necessary prior data needed can be a challenge. A variety of tools exists to understand the carbon benefits of trees from the individual tree level to the regional/continental level. However, being able to model trees at the plot level in urban areas provides unique opportunities to understand carbon benefits of urban trees. Additionally, estimating the monetary benefits of trees in urban setting can be useful to a variety of people and a diversity of applications.

i-Tree Design is one application in the i-Tree software suite that allows users to model the benefits of multiple trees surrounding a building at the same time. The user simply needs a few tree measurements to calculate both carbon and monetary benefits of these trees. Users may also project those benefits into the future by modeling tree growth over a specified time period to estimate future benefits of tree growth. For more information about the tool, visit the [About i-Tree Design webpage](#).


Objectives

1. Understand the scale at which i-Tree Design can be useful in urban settings.
2. Demonstrate familiarity with the web interface of i-Tree Design.
3. **Produce a report of all the trees' carbon benefits, energy benefits, and future benefits.**
4. Apply knowledge of i-Tree Design in both personal and professional settings.

Part I: i-Tree Design v7.0 example exercise

1. Go to the [i-Tree Design web interface](#)
2. Enter 3955 E Price Rd, St Johns, MI 48879, click “Go!”

Step 1: Draw Structure

3. Click yes for the question “would you like to calculate the impact of trees on your cooling and heating utility bill?” Demonstrate familiarity with the web interface of i-Tree Design.
4. This Icon  is used to draw a polygon shape on the map. Follow the instructions on how to draw a polygon around the boundary of the structure. (seen in Fig. 1, note: participants may need to zoom in a little to better view the building boundaries)
5. Once the polygon is finished, in the pop-up box provided, select 1950-1980 from the drop-down menu for when the structure was built. Be sure that both the boxes are checked next to the questions “Is the structure heated?” and “Is the structure air-conditioned?” Then click, OK.

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Step 2: Place Trees and model growth

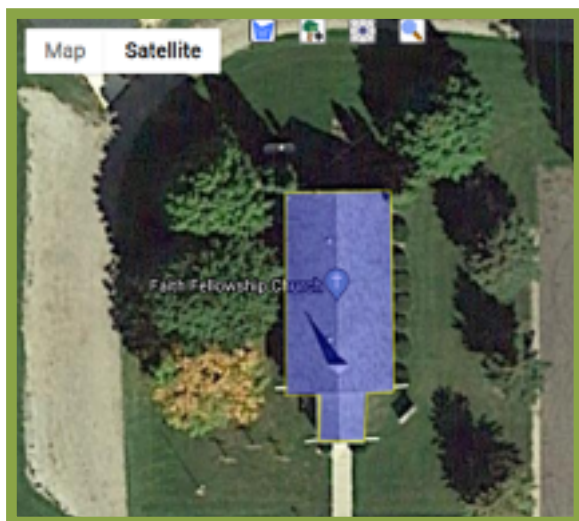



Fig. 1. Place of building polygon







Fig. 2. Placement of Trees around building with Tree ID

Tree ID	Tree Species	Tree diameter	Tree condition	Tree exposure to sunlight
T1	Maple, Sugar (<i>Acer Saccharum</i>)	6.6 in	Fair	Full Sun
T2	Maple, Sugar (<i>Acer Saccharum</i>)	12.1 in	Excellent	Full Sun
T3	Maple, Sugar (<i>Acer Saccharum</i>)	8.3 in	Good	Full Sun
T4	Cedar, Northern White (<i>Thuja occidentalis</i>)	3.9 in	Excellent	Partial Sun
T5	Cedar, Northern White (<i>Thuja occidentalis</i>)	4.1 in	Excellent	Partial Sun
T6	Oak, Northern Red (<i>Quercus rubra</i>)	7.1 in	Good	Full Sun
T7	Spruce, Norway (<i>Picea abies</i>)	7.2 in	Good	Full Sun
T8	Spruce, Norway (<i>Picea abies</i>)	6.8 in	Good	Full Sun
T9	Spruce, Norway (<i>Picea abies</i>)	7.3 in	Good	Full Sun

Table 1: Individual Tree Measurements

- Fig. 2 shows the placement of the trees with the corresponding Tree IDs as seen in Table 1. This table also shows all the correct measurements and characteristics needed for each tree.
- Click into the “2. Place Trees” tab to begin. For the first tree T1 select the appropriate species (for this example it would be Maple, Sugar) from the dropdown menu. Then enter the correct diameter provided in Table 1. Afterwards select the correct tree condition and tree exposure to sunlight. Once you enter in the correct tree description you will now place that tree. To place the tree, click this icon  and place the tree accordingly from Fig. 2 above. A confirmation box will appear once you place each tree.

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8. Next, you will need to alter the description of the tree to correspond with the second tree or **T2**. In this case, you will leave the species the same, but change the tree diameter and tree condition. Once you have done that, again click the  icon and place the tree according to **Fig. 2** above.
9. Continue to do this for each subsequent tree. Remember to first change the tree description to the proper values, and then, click the  icon on the map.
10. Feel free to click this icon  toggle on and off the “Tree benefit zones”. This provides colored zone that illustrate the relative monetary value of energy savings that the tree would provide in each zone. Hover your mouse icon over any zone to see energy benefits displayed near your mouse icon.
11. Lastly, click the Model Crown Growth to simulate the size of each tree crown on the image. Click pause  when you’ve adequately represented each tree crown’s spatial footprint. If you accidentally pass what you like, you can either let the time bar reset or use the fast forward and rewind icons manually.

Step 3: Estimate Benefits

12. Click the Estimate Benefits tab and enter 30 in the box for number of years to track tree growth and benefits.
13. Click the Calculate icon to see the results (note: this may take a minute to process the data).

Step 4: Results

Once the results page has generated (this may take a few moments to minutes), refer to Fig. 3 to understand the different aspects of the page.

1. **Display results for:** This drop-down menu allows users to view the results for all of the trees as well as individual trees.
2. Additionally, the results page will have 5 tabs horizontally for:
 - Overall Benefits
 - Stormwater
 - Energy
 - Air Quality
 - Carbon Dioxide
3. There are also 4 vertically aligned tabs:
 - Current Year (2020)
 - Future Year (2050)
 - Total (2020-2050)
 - Total to Date

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Before answering the questions below, familiarize yourself with these tabs by clicking through each one and mixing and matching different tabs together. Remember to try displaying the results for all trees and individual trees to get a better idea how much each tree provides in benefits.



Fig. 3. Screenshot of results page

Part I: Questions

1. What is the dollar amount of overall benefits provided in the current year?
2. To date, how many pounds of carbon in COR2R equivalent has been stored?
3. In the year 2050, how many gallons of rainfall with the trees intercept and how many gallons of stormwater runoff with the trees help avoid?
4. To date, how many Kilowatt-hours of electricity has the T2 Maple, Sugar tree conserved?
5. From 2020-2050, what will the total dollar amount of overall benefits provided by all the trees be if they are cared for?

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Part II: Activity (optional)

Now that you have familiarized yourself with i-Tree design, select a group of trees near or around your place of business or your home. You will take the same measurements as above for all of these trees, input the data into i-Tree design and calculate benefits. Once completed, review the report to learn about the benefits of the trees in your immediate surroundings.

Part II: Activity Materials

1. Soft tape measure, Diameter at Breast Height (DBH) tape, calipers, or yard stick
2. Measuring tape at least 50ft in length
3. Tree ID guide/book

Here we've provided some useful tools for identifying trees specific to temperate North America. Please let us know if you need help identifying your tree. i-Tree can be used outside of the United States as well; however, the amount of information and species is limited.

- [Arbor Day Foundation: What Tree is That?](#)
- [Identifying Trees of Michigan](#)

Part II: Methods

Using a soft measuring tape (or DBH tape if you have one), measure the trees circumference at the appropriate height, 4.5 feet off the ground. If using a DBH tape, simply record the number because the tape automatically converts to diameter (not circumference). If using a measuring tape, converting your measurement to diameter is not necessary because the MyTree software package allows you to input either diameter or circumference. Other alternatives with lower accuracy are using calipers if available or even a yard stick. Below, we have provided the equation (**eq. 1**) for circumference to diameter if you feel inclined to do so.

(1) $d=C/\pi$ where C=circumference, $\pi=3.1416$, and d=diameter