P2 / ORGANIZATION
Learn about the supplies, resources and learning goals in this section. Planning for your learning lab activities is outlined in this component.

P3/ ACTIVITIES
This section provides an overview of the steps necessary to successfully complete a survey of your school ground trees.

P4 / TREE CANOPY
In this section, discover the importance of the tree canopy, and learn how to distinguish the tree canopy layer from the other layers of vegetation.

P5 / DATA PROCESSING
This section provides instruction on how to use the online *i-Tree Canopy* software to analyze data and produce reports.

Learning Lab

Learning About Tree Benefits Using i-Tree Canopy

STUDENT GUIDE 082015 Ver 4.0

The i-Tree Learning Lab is an exercise that will help you discover the benefits of the urban forest around you by learning how to survey the trees growing in your school yard or other study area. You, and your lab partners, will enter your study area data into an online calculator to determine the value and benefit that the trees provide. This exercise will show you how identifying types of landcover can be used to calculate the benefits of your school's trees. This activity is based on the *i-Tree Canopy* software, which Urban Foresters and many other professionals use to assess the benefits associated with urban trees.

The software was developed by the U.S. Forest Service and its partners. By using *i-Tree Canopy*, you will be able to quantify the dollar value associated with the air quality improvements provided by the trees, as well as learn about the tree cover in the study area.

Without trees the air would be dirtier, the waterways would be more polluted, your house and school would be hotter in the summer and your neighborhood would not be environmentally sustainable. The trees help to keep the ecosystem in balance and ensure that the urban forest will keep providing benefits to you for many years to com. Have fun, and enjoy this adventure into your 'urban forest'.

This Learning Lab exercise is one of a series of *i-Tree* classroom and field exercises that can be used to help you learn about the urban forest in your community.

What You Will Be Doing

GETTING READY

Choose a study area for this exercise, such as your school yard or a local park. It would be a great idea to go outside and travel to the location so that you can see some of the natural elements of the landscape, such as tree, grass, shrubs, water and other features. Take photographs, notes and write down other things that come to mind as you explore the area.

LAUNCH I-TREE CANOPY

Refer to the *i-Tree Canopy* section (pages 5-11). Start your exploration by navigating to the website *www.itreetools.org* to access *i-Tree Canopy,* where you can locate your study area on a map/air photo and analyze random points in order to estimate the landcover in the area.Once the landcover is estimated, you can view information on the air quality improvement and other benefits provided by the trees.

PERFORM ANALYSIS

Once the value and benefits of the trees in the study area are established, write down your thoughts and briefly analyze and discuss why this information is valuable, from an environmental and practical perspective. Prepare a summary of your work, including the analysis and information you were able to calculate using *i-Tree Canopy*. This report should be short and simple, yet it should provide readers with a good understanding of the trees in your study area.

OTHER ACTIVITIES

To improve your school yard, you might consider planting one or more new trees that will help establish a sustainable tree canopy on the school grounds. Use of native trees is preferred. To find out which trees would be best for the location, contact your state forester or extension agent, or utilize web resources. *i-Tree Species (www.itreetools.org/species)* may also be used for advanced tree species selection.

RESOURCES

Many web-based resources are available that will help you realize the most learning from this hands-on exercise, as well as explore the fundamentals of urban forests and the value of trees in our cities. Please refer to *www.itreetools.edu* and Appendix A for a list of valuable online resources.

Examining a Community's Tree Cover and it's Value

Urban tree canopy (UTC) is the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. (See Appendix B for a detailed diagram.) In urban areas, the UTC provides an important stormwater management function by intercepting rainfall that would otherwise run off of paved surfaces and be transported into local

Determining the tree canopy cover in your community will help you to establish goals to make your city or town more sustainable and healthier for residents.

waters though the storm drainage system, picking up various pollutants along the way. UTC also reduces the urban heat island effect, reduces heating/cooling costs, lowers air temperatures, reduces air pollution, increases property values, produces wildlife habitat, and provides aesthetic and community benefits such as improved quality of life.

i-Tree Canopy: Your Community in Perspective

Today, many communities are looking to become more sustainable and livable. Improving a city's tree canopy can have numerous benefits, from reducing summer peak temperatures to improving social ties among neighbors. These factors can help a community attract businesses and residents.

Researchers estimate that tree canopy cover in urban and metropolitan areas across the US averages only 27% and 33% respectively Additionally, the trees that are present are subject to a wide variety of stressors, which significantly shortens their lifespan. As such, it is important for urban communities to take steps to protect and enhance their urban forests through UTC goal setting processes. How does your community compare with the national averages?

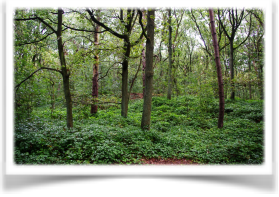
FOREST STRUCTURE

OVERSTORY
This layer consists of trees that are taller than the main canopy of the forest

CANOPY
The top complete layer of the forest is the canopy.

UNDERSTORY
The understory is comprised of saplings and other small trees that do not reach the canopy.

SHRUB LAYER
This layer consists of small bushes and other large woody vegetation.



FLOOR LAYER
Low-growing vegetation, such as ferns and clover, can be found in this layer.

Using *i-Tree Canopy*

OVERVIEW

i-Tree Canopy allows anyone to make a simple estimation of the value of air quality improvements provided by the trees in a city or neighborhood. By inputting information about your location and by analyzing the landcover located at points that are generated randomly within your location, users will gain an understanding of the positive relationship between tree canopy and air quality.

i-Tree Canopy will provide a dollar value for the air quality improvement benefits for your study area, including decreases in carbon monoxide,nitrogen dioxide, ozone, particulate matter, and sulfur dioxide, and increases in carbon dioxide sequestration and storage.

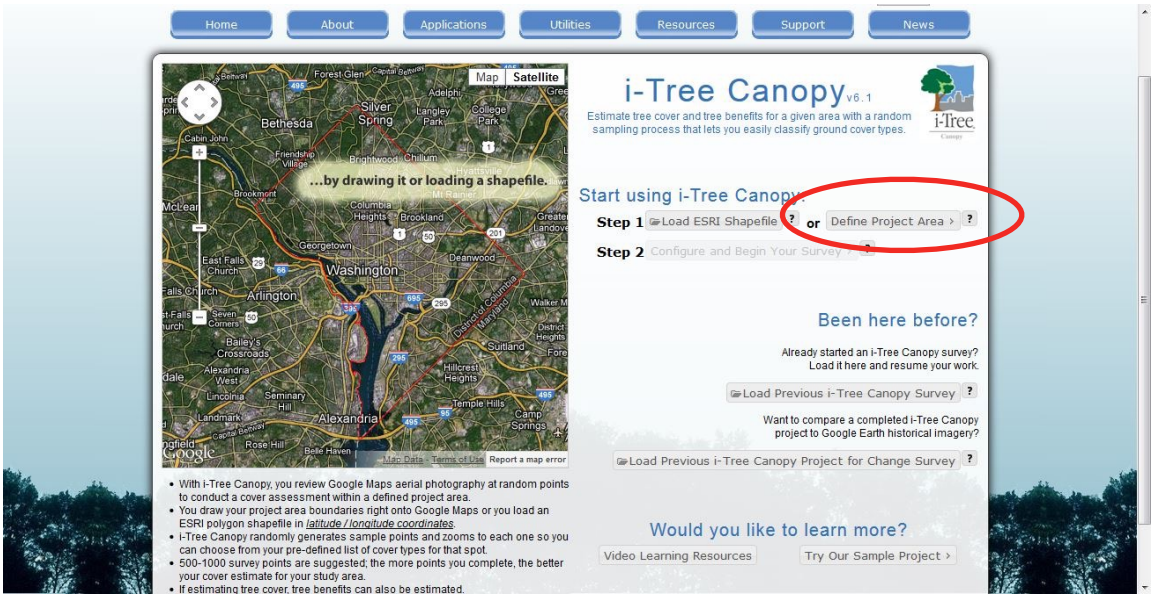
This tool is intended as a simple and accessible starting pint for understanding the value of trees in a community or even on a larger scale, such as a city.

PROCEDURE

On a computer, navigate to www.itreetools.org. Click on the “Applications” tab on the main page, and select i-Tree Canopy from the drop-down menu.

Step 1:

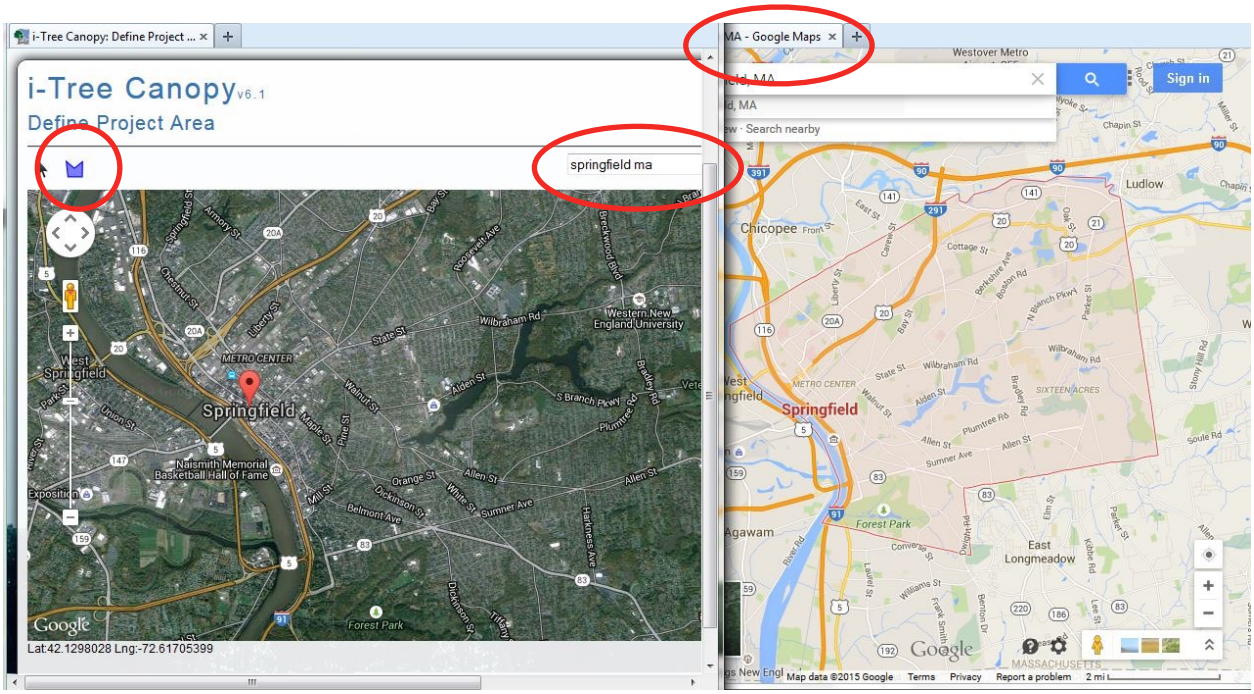
There are two options in the i-Tree Canopy Step 1: “Load ESRI Shapefile” or “Define Project Area.” Choose the option “Define Project Area.” This option allows you to select the area you wish to use for the tree canopy survey. When you select this option, a dialog box appears; click “Accept” to continue.*



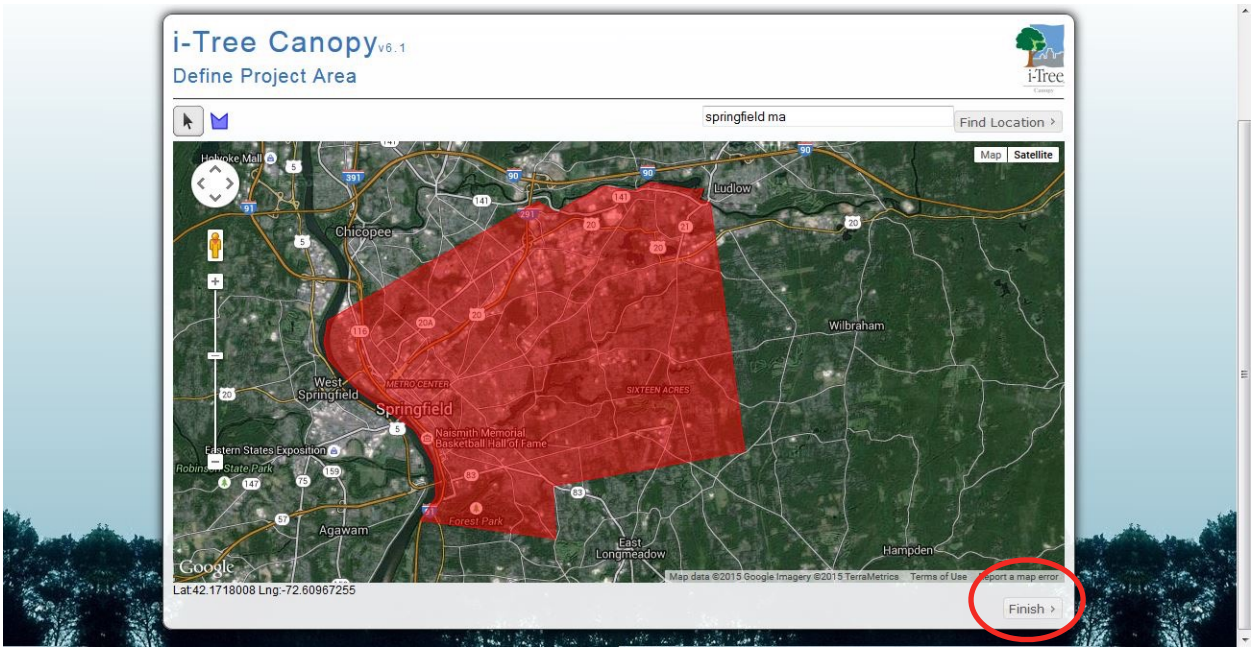
*If you cannot click the “Define Project Area” because the area is already defined, continue to Step 2 “Configure and Begin Your Survey.” If the study area is incorrect, and you wish to change it, you can change your location by deleting the previous information once you click on Step 2. At the top of the Step 2 page, you can delete your information by clicking on the “Start Over” icon. **Note**: If you have already saved this data on your computer, it will not erase the file from your computer; it only erases files stored on i-Tree Canopy.

Step 1 (Continued):

To define a project area, zoom to the location on the map or search for the location using the search bar above the map. To draw the boundaries of the study area, use the little blue icon in the top left corner of the map. (When you hover over the icon, it says “Add Polygon.”) This icon allows you to draw the boundaries of the your study area on the map. **Helpful Hint**: It is a good idea to open Google Maps at this point as well, search for the location you wish to define, and keep both application windows visible in order to help you define the boundaries for your study area (i.e. community).

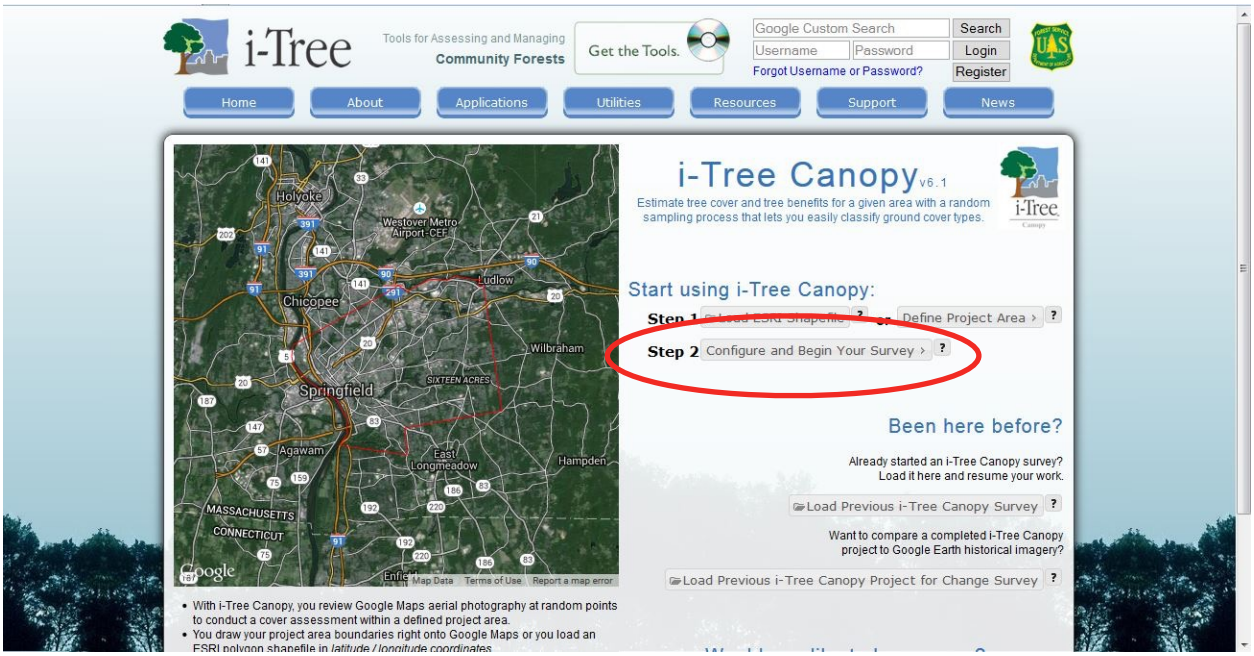


In i-Tree Canopy, use the polygon tool to trace the outline of your study area, and end your drawing by clicking on your first point again. After you have drawn the boundary of the location, click the “Finish” icon at the bottom right of the

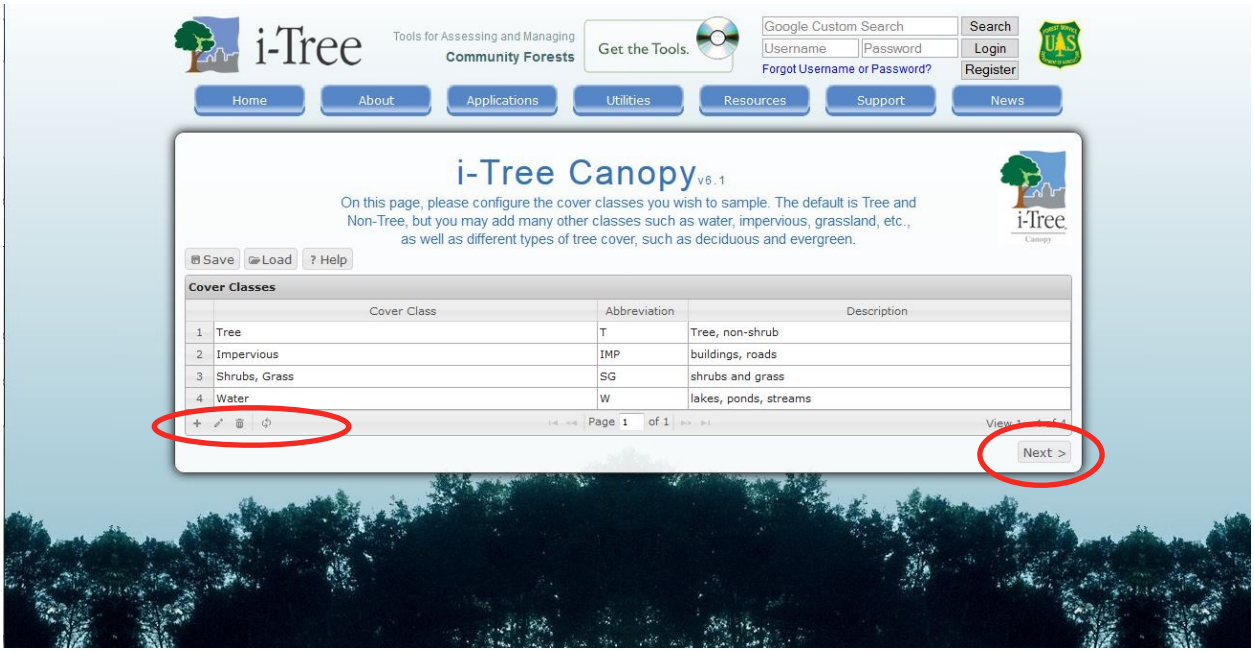


Step 2:

Click on “Configure and Begin Your Survey” in Step Two. This step allows you to define categories of land cover in your tree canopy survey.

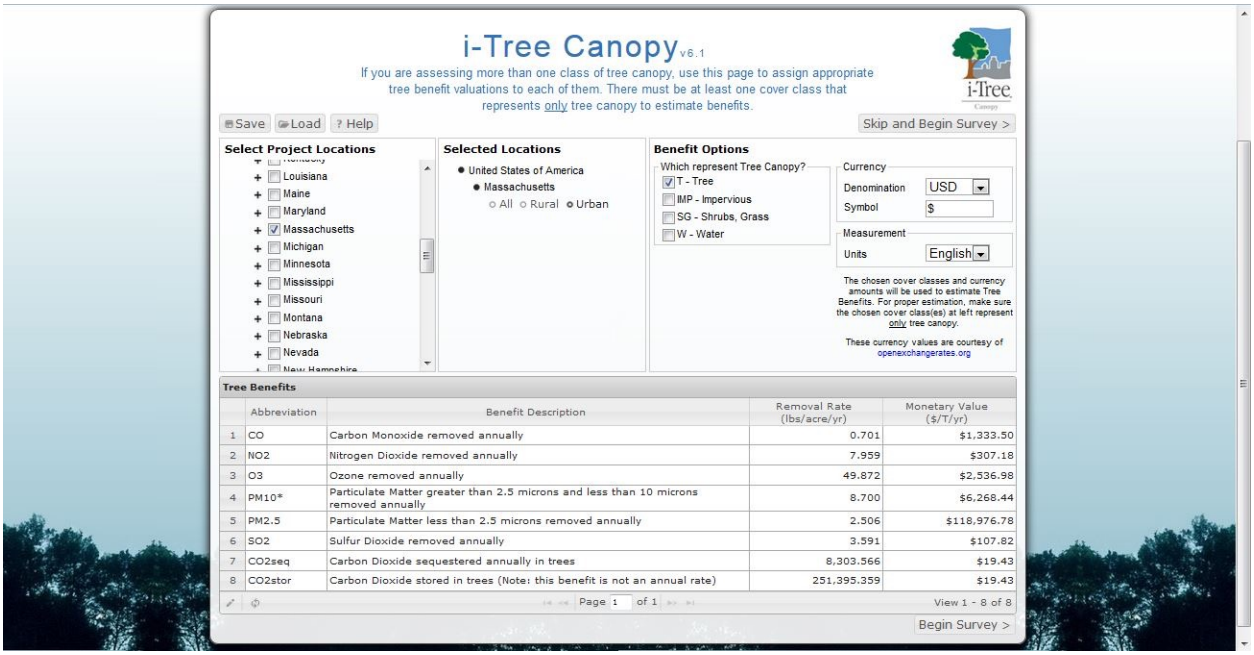


The default categories provided are “Tree” and “Non-Tree.” You may edit the descriptions of these categories or add more categories using the icons at the bottom of the table. Some recommended categories are “Impervious” for buildings and roads; “Shrubs/Grass” for natural land cover excluding trees; and “Water” for lakes, ponds, and streams in your study area. See Appendix C. (**Note**: Depending on your location, you may not need to use some of these example categories.) After choosing your categories, click “Next.”



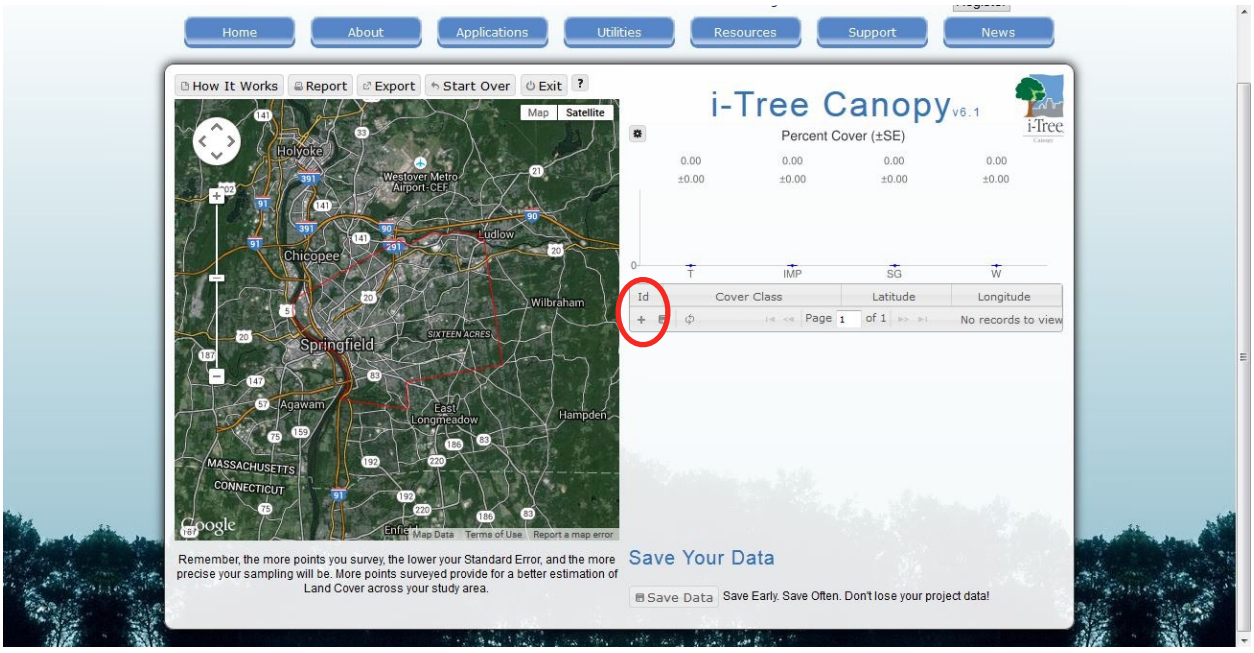
Step 2 (Continued):

The next page allows you to select the location for your survey, as well as select whether it is urban, rural, or both. The categories that represent tree cover can also be selected (most likely, this will be the category “Trees”). There is also an option to change the currency and measurement units. The “Tree Benefits” chart is an informational chart that changes according to your location. Once you have selected your project location and benefit options, proceed to the next step by clicking the “Begin Survey” icon at the bottom right of the page.



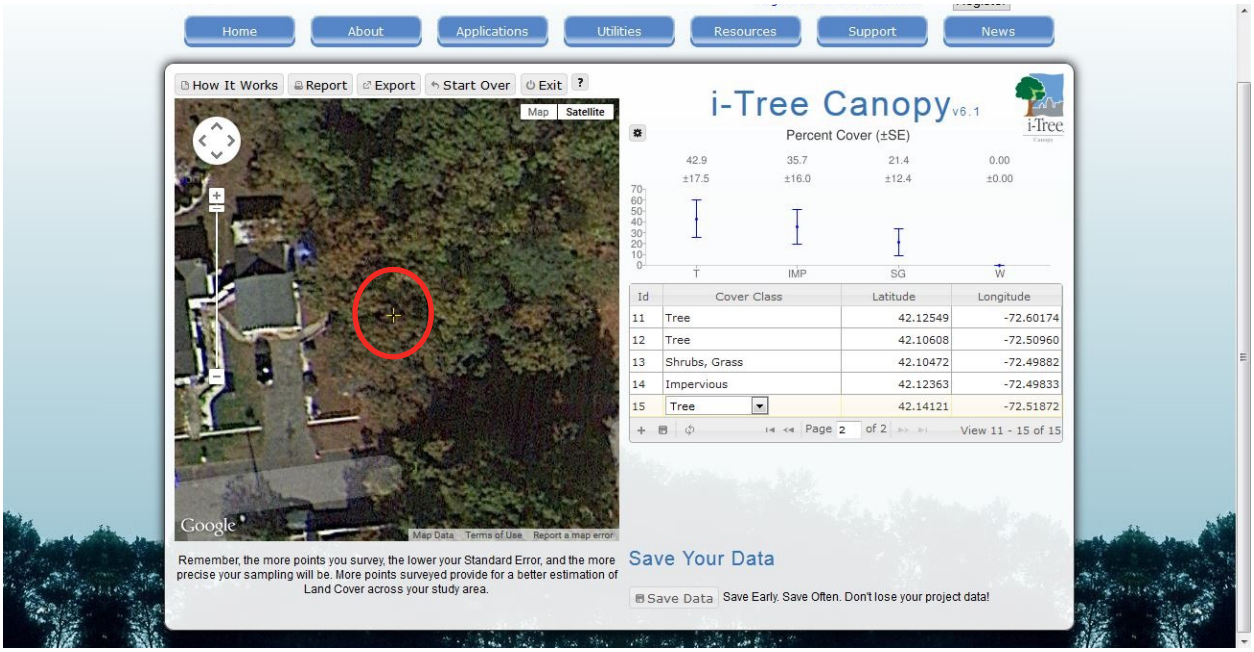
Step 3:

Choose the “New Point” icon (+) on the right side of the screen in the column “Id.”

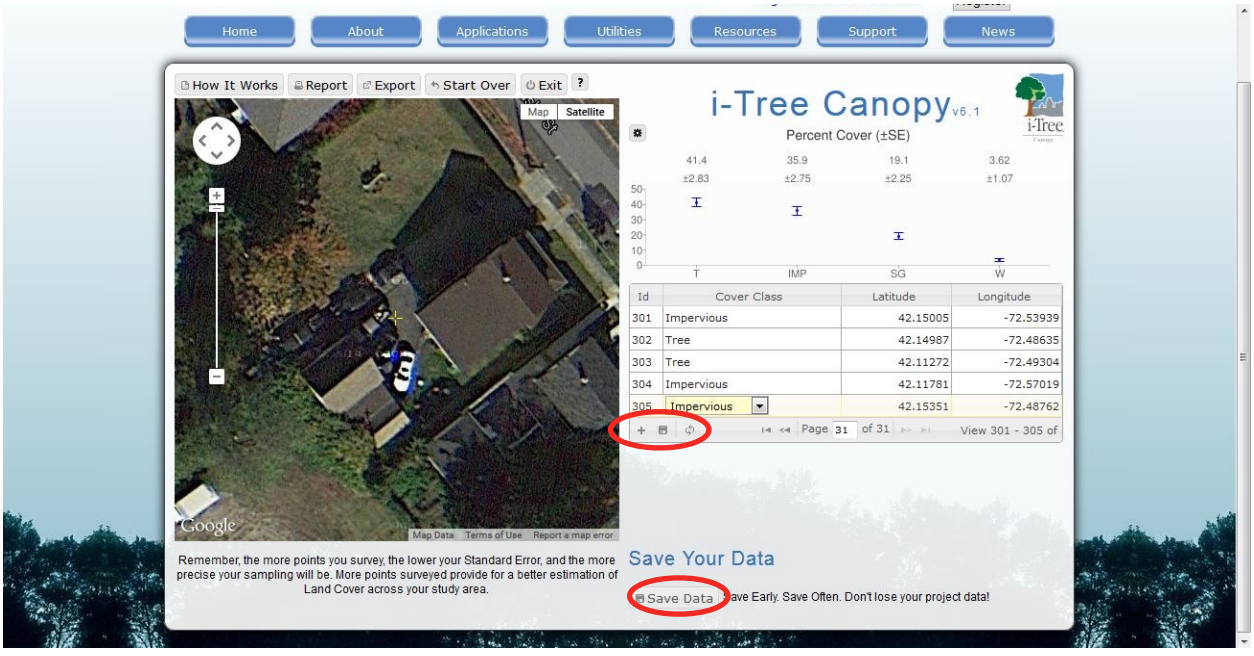


Step 3 (Continued):

The “New Point” icon zooms to a random location within your study area on the map, creating a small plus sign in the middle of the map. In the second column of the table on the right, labeled “Cover Class,” choose the category of land cover that best represents what is located at the plus sign. **Note**: You are ONLY concerned about the type of landcover that is situated at the plus sign, NOT the other surrounding landcover.

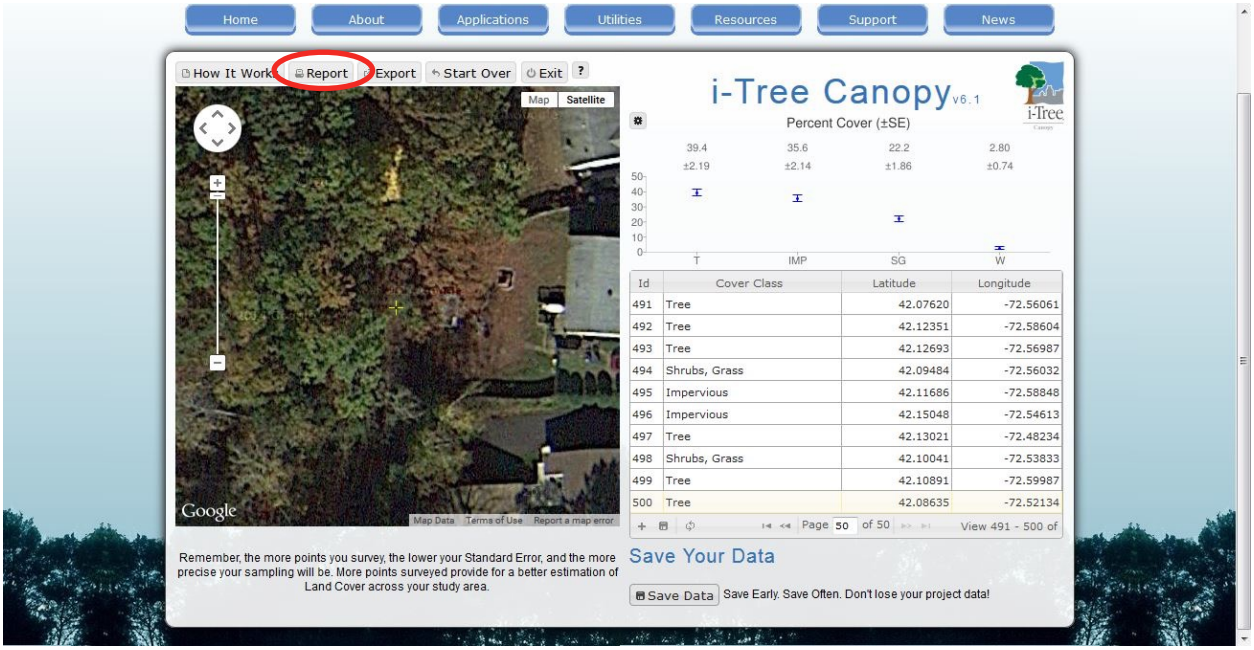


There are three icons on the bottom left of the “Cover Class” table. The three icons are the “New Point,” the “Save Row Edits,” and the “Reload Grid” icons, from left to to right, respectively. If you need to change the cover class for a point, click on its row, and select the correct cover class from the drop-down menu. Be sure to save your data often. There is a button to save data at the bottom of the screen.



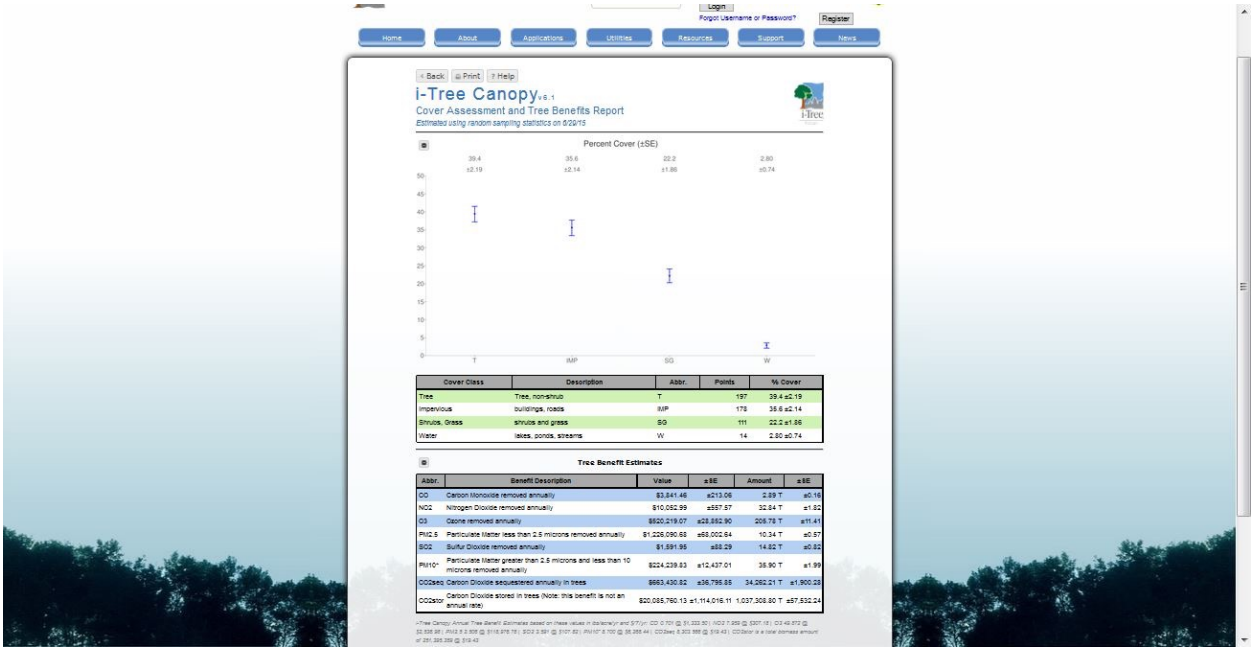
Step 3 (Continued):

Continue adding points by clicking on the “New Point” icon. You should have at least 500 points. (**Note**: The more points you add, the greater the accuracy; usually 500 to 1,000 points is a good sample size.) To view the results from the survey, click the “Report” icon above the map.



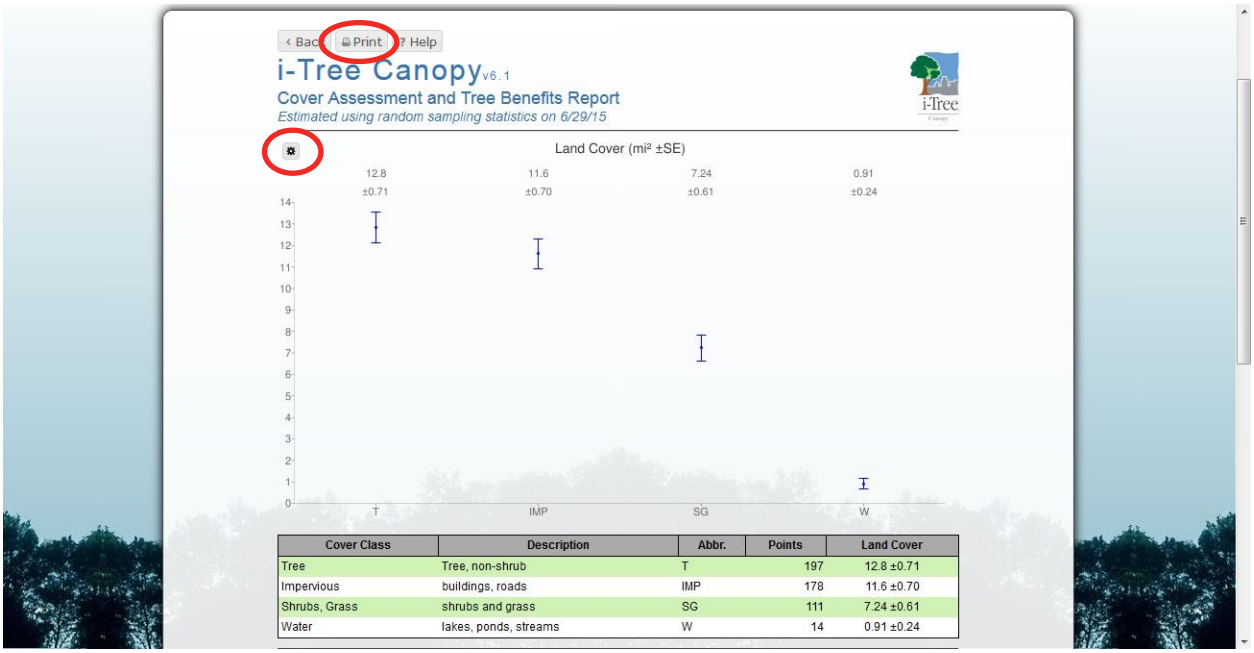
Step 4:

This report provides a graph and a corresponding table showing the percentage of landcover in each category, as well as the value of the air quality benefits provided by the trees in the study area.



Step 4 (Continued):

You may also look at a graph of the area covered by each category (rather than the percent cover) by clicking the gear icon at the top left of the percentage cover graph. This icon allows you to change the graph to show the area covered by each category, rather than the percentage. (**Note**: The vertical lines intersecting the data points on the graph represent the standard error for each cover class.) Print your report using the "Print" icon at the top of the page, or export it as a PDF file.



U.S. Forest Service Natural Inquirer Science Education Journal:
The Natural Inquirer is a middle-school science education journal that brings Forest Service research to life. There are numerous editions of NI, with many articles related to tree benefits topics. Natural Inquirers can be downloaded from the Web site, or limited copies of printed journals can be ordered free from the program.
http://www.naturalinquirer.org

Examples:
Urban Forest Edition: Don't Be So Fuelish: How Much Fuel is Saved When Cars Are Parked in the Shade? Energy, transportation
http://www.naturalinquirer.org/How-Much-Fuel-is-Saved-When-Cars-Are-Parked-in-the-Shade.-a-59.html

Facts to the Future Edition: Articles on fresh water, trees, fish
http://www.naturalinquirer.org/Facts-to-the-Future-i-7.html

Urban Forest Edition: I've Got You Covered: The Amount of Pavement Covered by Street Trees
http://www.naturalinquirer.org/The-Amount-of-Pavement-Covered-by-Street-Trees-a-55.html

Others:

Carbon cycle poster:
http://www.fs.fed.us/climatechange/documents/carbon.pdf

U.S. Forest Service Climate Change Home Page:
http://www.fs.fed.us/climatechange/

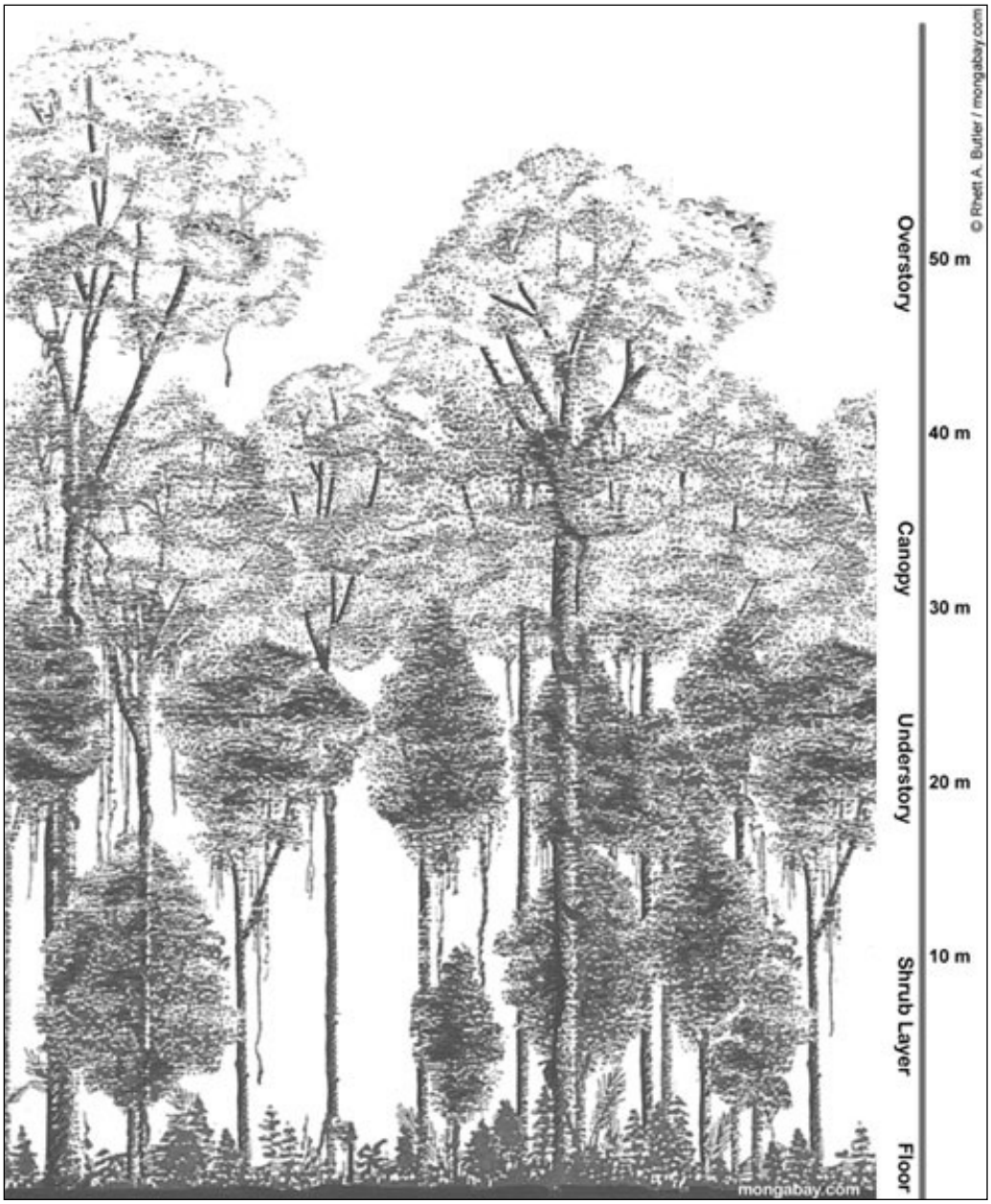
National Wildlife Federation's certified wildlife habitat program info:
http://www.nwf.org/gardenforwildlife/

EPA greenhouse gas equivalent calculator:
http://www.epa.gov/cleanenergy/energy-resources/calculator.html

EPA waste education resources:
http://www.epa.gov/epawaste/education/index.htm

Download Woodsy Owl's Activity Guide (elementary): Activities on water, recycling, energy
http://symbols.gov/woodsy/toolbox/teachers/activity-guide/activity-guide.shtml

APPENDIX B



Your urban forest consists of several different layers: overstory, canopy, understory, the shrub layer, and the floor layer. These layers are differentiated according to height and position in relation to the canopy layer.

APPENDIX C

LAND COVER CLASSES

The following illustrations and descriptions are suggested land cover classes that may be appropriate for conducting an i-Tree Canopy analysis in your community.

Tree: This classification is used to define any area that clearly shows the overstory or canopy layer of trees in the air photo.

Grass/Groundcover: This classification is used to define any area that is covered in grass or ground cover.

Impervious - Building: This classification is used to define any rooftop that is visible in the air photo.

Impervious - Paved: This classification is used to define any road, street, driveway, sidewalk, parking area or other paved surface.

Shrub: This classification is used to define any small vegetation that is found in the air photo.

Water/Other: This classification is used to define any area that contains water or other classification. i.e.: stream, river, pond, pool. etc.