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FCCP i-Tree Canopy Activity

Introduction

Estimating the individual benefits of trees can be useful. However, being able to quantify the benefits of entire forest stands or regions can be beneficial to natural resource professionals and landowners. Quantifying carbon at the landscape scale is quite expensive and time-consuming using field measurements. Utilizing satellite imagery allows for us to quantify benefits of entire forests or canopies across a larger region quickly and efficiently.

i-Tree Canopy v7.0 is a useful web tool that allows users to estimate tree cover and ecosystem benefits at a larger scale such as a city or other urban forest landscapes. To generate accurate estimates, the user must "train" the software by identifying survey points across the area of interest. These points are used to extrapolate what cover types are present across the entire area. For example, the user can select whether a survey point is a tree, bare soil, a road, or a building. The software then records the specific spectral signature of that cover type and uses that information to estimate the same cover type for other areas with a similar signature. Additionally, users are able to select a specific region of the U.S. to analyze, allowing for a more accurate estimate of the monetary benefits trees provide specific to that region.

Visit the i-Tree Canopy Technical Notes document for more information about how i-Tree Canopy calculates the percent cover of each cover type and standard error measurements.

Objectives

1. Understand the scale at which i-Tree Canopy can be useful in urban forests.
2. Demonstrate familiarity with the of i-Tree Canopy interface.
3. **Produce a report of tree cover types, carbon sequestration, and other canopy data for a chosen area of interest.**
4. Apply knowledge of i-Tree Canopy in both personal and professional settings.

Part I: i-Tree Canopy Example Exercise

For this exercise, the user will use satellite imagery to identify, label, and characterize sample points from a pre-defined list of cover types. While 500-1000 survey points are suggested to reduce the error of estimates, we will only be using 100 points in this exercise to simplify the activity. In Part I, we will provide the necessary files (**table 1**) for completing the exercise. In Part II, users have the opportunity to use and create their own data for use in i-Tree Canopy. The shapefile provided is the northern half of Michigan State University's (MSU) campus.

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File Name	File Type	About
MSU_Campus_North.shp	ESRI Shapefile	Common GIS file format compatible with most GIS software comprised of points, lines, and polygons. Oftentimes used for buildings, lakes, roads, etc.
MSU_Campus_CoverType.file	ESRI Shapefile	Generic file extension utilized by web applications.

Table 1: Files provided for Part I

1. Before beginning, download the "MSU_Campus_North.shp" shapefile and the "MSU_ Campus CoverType.file" file. Save these files to a place you will be able to find later.
2. To start, go to the i-Tree Canopy web interface.
3. Click "Get Started" on the right side of the screen.

Configuration step 1 of 3

4. This will start the configuration step 1 of 3. On the right side of the screen, click "Load Shapefile Boundary." Click browse under Shapefile (*.shp). Navigate to your saved file MSU_Campus_North.shp and click open. Now click "OK"
• Note: You do not need to select a projection because this shapefile already has the correct projection.
5. You should now see a red polygon cover the north half of Michigan State's campus. Click "Next" on the right side of the screen.

Configuration step 2 of 3

6. View the Cover Classes table, which displays the default cover types available in i-Tree.
7. Click "load" and then select Browse. Navigate to where you saved the "MSU_Campus_ CoverType.file". Select the file and click "Open". Click "OK". This imports a preset table of cover types to choose from. **Table 1** below has the complete list of cover types, abbreviations, and descriptions. Familiarize yourself with the cover types because you will be choosing between these cover types with the sample data.
8. Click "Next".

Cover Type	Abbreviation	Descriptions
Tree	T	Tree, non-shrub
Impermeable Surface	IS	Any surface that is impermeable to water (i.e., buildings, roads, sidewalks, solar panels, etc.)
Grass/Agriculture	GA	Grass or agricultural field that is non-tree. Depending on the season, fields can be slightly brown.
Bare Soil	BS	Soil, non-tree, non-grass/crops, non-surface
Water	W	Water, non-vegetation

Table 2: Cover types represented, abbreviations of cover types, and cover type descriptions

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Configuration step 3 of 3

9. Under **Available Locations** unselect the "United States of America" box. Click the + sign next the United States of America. Scroll down to "Michigan" and click the + sign again. Now, scroll down and select "Ingham".
10. Ensure "All" is selected under **Selected Locations**
11. Ensure that **USD** and **English** are selected for the Currency Denomination and Measurement Units respectively.
12. At the bottom of the page, click "Next".
13. Now that we've selected all the correct data inputs, it's time to start surveying our training data. Remember the more points survey, the better estimation of land cover/ benefits across the area of interest.
14. Look to the right of the screen, underneath the "ID" column, select the "+" sign to start surveying the area of interest. The image generated by Google imagery will update with a zoomed in image with a yellow crosshair in the middle.
15. From the drop-down bar underneath Cover Class select which category best describes what the crosshair is directly on top of. Once you have selected the correct Cover Class, click "Save & Create New" to continue to generate new data points.
16. For time, we suggest you complete 100 survey points; however, it is recommended that you do more than 500 to increase your accuracy. You'll notice that as you continue surveying points, the graph above title "Percent Cover (±SE) will continue to update allowing you to see what the percentage of each cover type is with an error estimate. The more survey points conducted, the smaller the error estimate will become.

Imagery Identification Tips/Help:

Use your best judgement knowing that it is okay to not be 100% correct and still get accurate estimates. With a large enough sample size, you are able to reduce your error even with mistakes. A quick tip is to go with your initial guess and move on. Additionally, there are **appendices** included at the end of this exercise with example images of each category to ease in identification.

17. Once you have completed at least 100 survey points, click "report" to see your results. Feel free to save your data to return to this to conduct more survey points.

Part I: Questions

1. What is the percentage of tree canopy cover and standard error across the area of interest?
2. What is the total amount of carbon stored in the urban forest on MSU's campus?
3. What is the removal rate (lbs/acre/yr) of Ozone removed annually?
4. What is the Value (USD) of Carbon Dioxide sequestered annually in trees?
5. What is the Value (USD) of Particulate Matter less than 2.5 microns removed annually?

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Part II: Activity (optional)

Select an area of interest to you, draw a polygon around that area of interest. Upload our predefined cover types or create your own. Survey at least 500 points to get an accurate estimation of cover types and benefits. View the report and learn about your urban landscape.

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Appendix 1: Example Images of Trees

Appendix 1: Continued

Appendix 1.2: Example Images of Impermeable Surfaces

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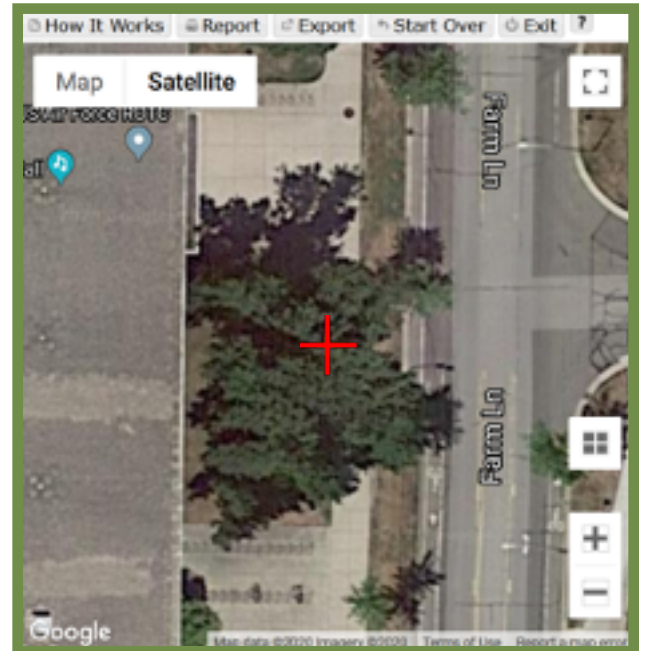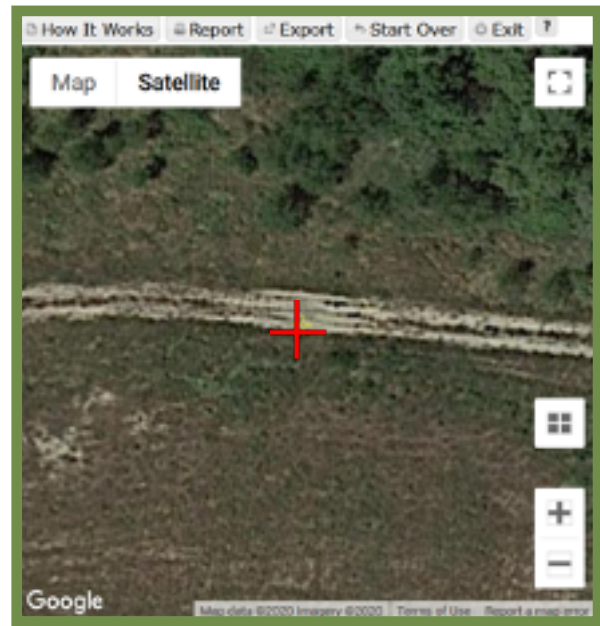
Appendix 1.3: Example Images of Grass/Agriculture

Appendix 1.3: Continued

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Appendix 1.4: Example Images of Bare Soil

Appendix 1.5: Example Images of Water