

Tutorial: Python Tools Developed for i-Tree Eco Full Inventory

Acknowledgement

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Project Title

Data Model for GIS Database Management and i-Tree Eco

Project Period

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Project Team

Rama Sivakumar (PI), Senior Research Engineer, Center for GIS, Georgia Tech
Ryan Bowman, Graduate Student
Manasvini Sethuraman, Graduate Student

Overview

Along with the geodatabase model, there are a set of Python scripts that transfer data between the ArcGIS geodatabase and i-Tree Eco software. This enables the users to quickly derive the tree inventory's ecosystem services through the i-Tree Eco model, then spatially display the results in ArcMap. The first script will create an Access database that is in compliance with i-Tree Eco's domains, the second script will copy the data from i-TreeEco feature class to the newly created Microsoft Access database, while the third script will join the results from the i-Tree Eco model to the existing feature class to enable visual representation of the ecosystem services.

1. Setting up the dbtools toolbox

**if you have already downloaded and unzipped the iTreeEco_DB zip file skip step 1.

- 1--> Download the iTreeEco_DB.zip file.
- 1--> Create a folder in some location on the local machine, say C:\iTreeEco_DB. Do not include spaces in the name, as spaces cause errors in ArcGIS.
- 1--> Uncompress iTreeEco_DB.zip by right clicking on the file and choosing the Extract All option.
- 1--> Choose the folder to be extracted as the one created in the previous step. Click Extract.
- 1--> Open the iTreeEco_DB folder and locate the folder called pypyodbc.
- 1--> Inside this folder, find setup.py. Double click on setup.py.

- 2--> Open ArcMap, and choose a blank map.
- 2--> In the ArcCatalog menu, add a folder connection to the folder in which the iTreeEco_DB folder is present.
- 2--> The itree-dbtools toolbox shows up in the catalog when the its parent folder is expanded (Fig. 1.1).
- 2--> Expand the itree-dbtools toolbox. There should be three scripts:

- 1-Create MS Access Database
- 2-Populate MS Access Database
- 3-Get data from iTree for displaying in ArcMap

- 3--> Right click on the first script and choose Properties. A pop-up window appears.
- 3--> Click on the Source tab.
- 3--> Change the location of the script file to *path*\dbtools\1_create_access_db.py (Fig. 2.2).
- 3--> Repeat the previous step for the remaining two scripts:

- The source for the second script is *path*\dbtools\2_load_access_database.py
- The source for the third script is *path*\dbtools\3_getdata.py*

(**note:** if you are running ArcGIS 10.1, the source for the third script is 3_getdata10_1)

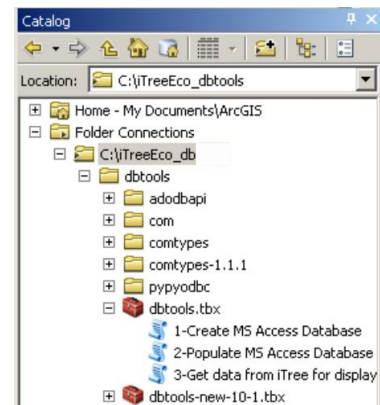


Figure 1.1 Connecting to i-TreeEco DB tools

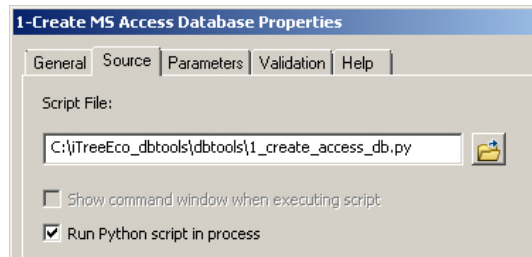


Figure 1.2 Assigning the script for the tools

Now that the tool setup is complete, let's use the tools!

2. Running the Populate MS Access Database script

- 4--> Double click on “1- Create MS Access Database” script. The tool window appears.
- 4--> Click the Open Folder button next to the Folder Name field.
- 4--> Navigate to the folder where you want to create the MS Access database. Click Open.
- 4--> Type **Tutorial_FullInventory** under Database Name. Click OK (Fig. 2.1).
- 4--> If the script runs successfully, the results window should say Succeeded. Close the window.

- 5--> Double click on “2- Populate MS Access Database script”. The tool window appears.

- 5--> Click the Open Folder button next to the MS Access Database field.
- 5--> Navigate to the folder where you created the Tutorial_FullInventory MS Access database in the previous tool. Click Open.

- 5--> Click the Open Folder button next to the Geodataset field.
- 5--> Navigate to the folder where the downloaded iTreeEco.gdb is located.
- 5--> Choose the the feature class that contains your full tree inventory, i.e. C:\iTreeEco_DB\Tutorial_iTreeE-
co.gdb\FullInventory_Tutorial, and click Add.
- 5--> Make sure the “Populate MS Access Database” window looks like Figure 2.2, then click Ok.
- 5--> If the script runs successfully, the results window should say Succeeded (Fig 2.3). Close the window.

- 6--> In the ArcCatalog menu, right click the Tutorial folder and click Refresh.
- 6--> Notice the error_log_Tutorial_FullInventory.csv that is added to the Tutorial folder.
- 6--> Drag the error_log_Tutorial_FullInventory file to the Table of Contents.
- 6--> Right-click and choose Open to examine the Attribute Table.
- 6--> Examine the fields in this error log, then close the table and remove it from the Table of Contents.

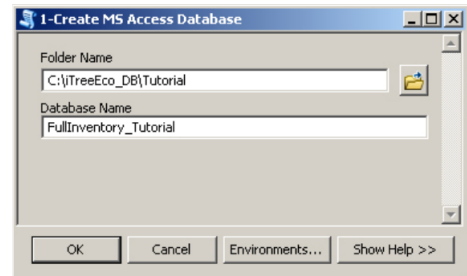


Figure 2.1 Create MS Access Database tool window

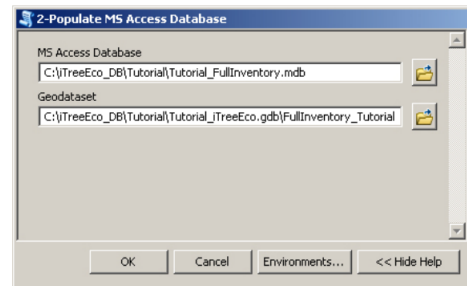


Figure 2.2 Populate MS Access DB tool window

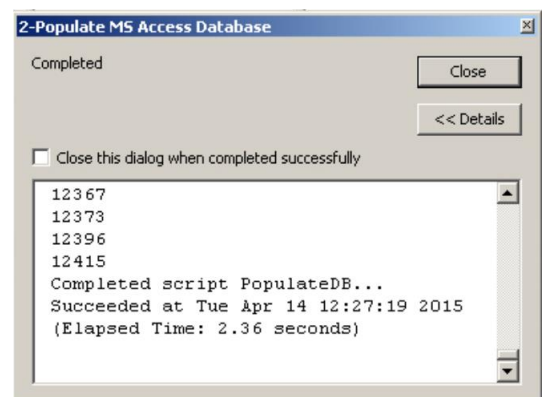


Figure 2.3 Successful Results from Populate Access DB tool

The script performs validation, the results of which are stored in a .csv file in the same folder as the MS Access Database. The error log gives a short description and a brief explanation of the error. The records which produce errors will not be added to the MS Access database. However, the user can always correct the errors, and execute this step again in order to include the previously erroneous records.

3. Working in i-Tree Eco

- 7--> Download and install the i-Tree Eco software.
- 7--> Go to Start Menu > All Programs > i-Tree > Eco.
- 7--> In i-Tree Eco, navigate to File > New Project.
- 7--> Navigate to the folder where this project is stored. Most preferably, store this project in the same folder where your Tutorial_iTreeEco.gdb is, i.e. in the Tutorial folder.
- 7--> Name your project **Tutorial**, and click Save.
- 7--> For Input database, choose Create.
- 7--> In the Save As window that pops up, name the input database **Tutorial_input**.
- 7--> For Report database, choose Create.
- 7--> In the Save As window that pops up, name the input database **Tutorial_result**.

The previous steps created stock databases where the input and results for the i-Tree Eco analysis will be stored. Now we will configure what type of inventory will be fed into these databases. This is an important step as the type of inventory is unique to the iTree Eco geodatabase developed.

- 8--> Now click Configure input.
- 8--> Location Name type **Georgia Tech**.
- 8--> State field navigate the drop-down to Georgia.
- 8--> County navigate to DeKalb.
- 8--> Place navigate to Atlanta.
- 8--> For the Weather Station ID field click “Select”.
- 8--> Choose the weather station pin in the middle of the map. The weather station ID should be 722190-13874, then press OK (Fig. 3.1).
- 9--> In the Series name field type **Tutorial_1**.
- 9--> Next to sampling, select the “Inventory- 100% census” oval
- 9--> In the Year type 2015.
- 9--> Next to Data units: field, select the “English (inches, feet, acres)” oval
- 9--> Under Project Options, **uncheck** the boxes “Pest Detection” and “Energy Included”.
- 9--> Do not edit any information in the Plot Info or Data Collections sections.
- 9--> Make sure the Creating/Configuring inventories window looks like Figure 3.2, click Add to Database.
- 9--> Once we have configured the input, click Exit.
- 9--> In the create new project window click OK.

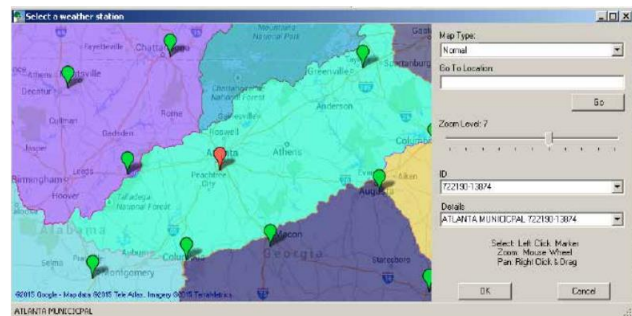


Figure 3.1 Selecting Weather Station in new i-Tree Eco Project

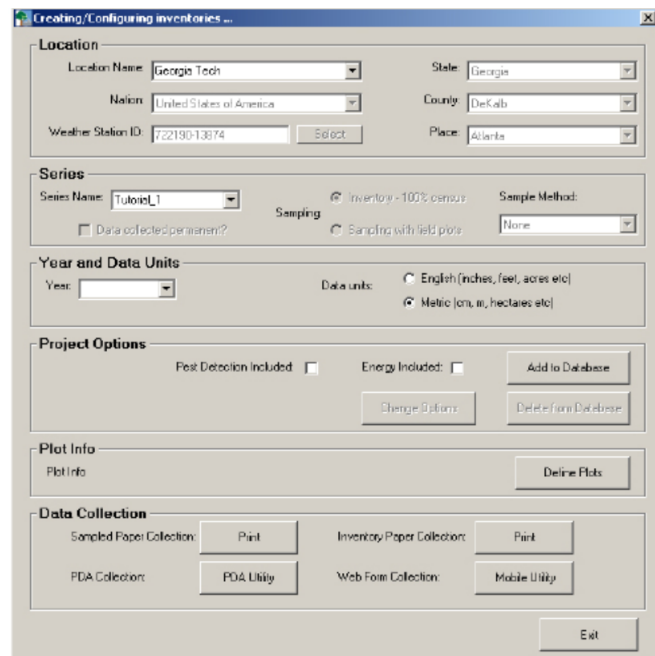


Figure 3.2 Creating new i-Tree Eco Project

Importing the data into i-Tree Eco

Now that the data is in MS Access database and the i-Tree Eco project has been created, it is possible to import the data to i-Tree Eco and submit it to the remote server for processing.

- 10--> In i-Tree Eco, navigate to File > Import Data Inventory, an Importing pop-up window will appear.
- 10--> Click Browse in the top of the screen.
- 10--> Navigate to the FullInventoryTrees.mdb you created when using the 1- Create MS Access Database tool in ArcMap, i.e. C:/iTree_EcoDB/Tutorial/Tutorial_FullInventory.mdb Press Open (Fig. 3.3).
- 10--> Click Import at the top of the screen. This may take a while, please be patient.
- 10--> The Result tab should be highlighted. This displays the results from the import process (Fig 3.4).
- 10--> Close the Importing window.

Now that the tree inventory has been successfully imported into i-Tree Eco, we can submit the data to the remote server, which will process the data, deriving eco-system services for the tree inventory.



Figure 3.3 Importing tree inventory to i-Tree Eco

- 11--> Go to Tools > Submit Data for processing.
- 11--> Give the appropriate Contact Information.
- 11--> Press Ok to verify your contact information.
- 11--> Press Yes to confirm that at least 50% of the study area is within the boundary of the city.
- 11--> Press Ok to the pop-up window that informs you that the data will be processed.

Importing Results	
New Entered Trees	1474
Overwritten Trees	0
Skipped Trees	0
Total Imported Trees	1474

Figure 3.4 Results from loading tree inventory

The data has been submitted for processing. The processing normally does not take longer than 1 hour. Once the processing is finished, an email will be sent that links to your results.

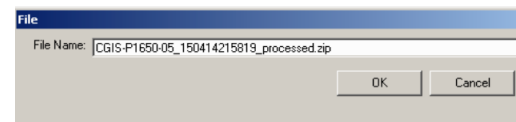


Figure 3.5 Loading processed data into i-Tree Eco

- 12--> When the results are ready, an email will be sent with a zip file name.
- 12--> In i-Tree Eco, go to Tools > Load Results.
- 12--> Open the email that was sent to you informing that the i-Tree Eco data has been processed and is ready for download.
- 12--> Highlight the .zip file name (will be within the quotes).
- 12--> Copy and paste the file name into the pop-up window in i-Tree Eco.
- 12--> Press OK. Once the results are loaded, a pop-up window will appear. Press OK.
- 12--> Close i-Tree Eco. All of the data is now in the Tutorial_results database, which we can access using scripts in ArcMap.

4. Running the Get data from iTree for displaying in ArcMap script

Now the processed inventory data is in the Tutorial_results.gdb, we can use the final tool to bring these results back into ArcGIS to join the results with the original tree inventory shapefile.

13--> Open ArcGIS if it was closed. Bring the FullInventory_Tutorial shapefile from the Tutorial_iTreeEco.gdb into the Table of Contents.

13--> In the itree-dbtools.tbx, double click the script “3-Get data from iTree for displaying in ArcMap”.



13--> Click the Open Folder button next for the Results database field.

13--> Navigate to the folder where Tutorial_results.mdb is located. This is the database you created when making the i-Tree Eco Project.



13--> Click the Open Folder button next to the Feature filename field.

13--> Navigate to the folder where the Tutorial_iTreeEco.gdb is located. Choose FullInventory_Tutorial the feature class.

13--> Make sure the “Get data from iTree for displaying in ArcMap” window looks like Figure 4.2, then click Ok. This script takes a little while to run.

13--> If the script runs successfully, the results window should say Succeeded (Fig 2.5). Close the window.

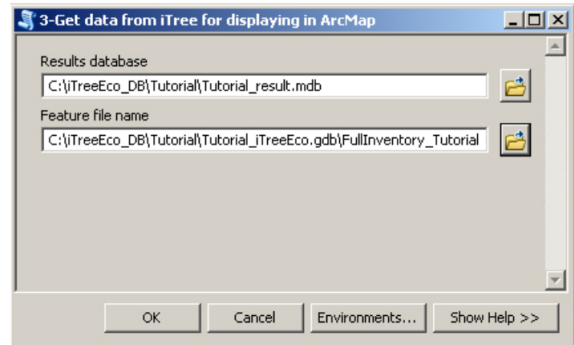


Figure 4.1 Get data from iTree tool window

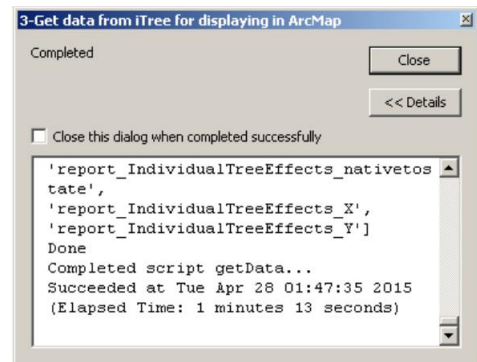


Figure 4.2 Successful Results from Get data from iTree

If the script runs successfully, three geodatasets are produced:

- FullInventory_Tutorial_IndividualtreeEffects;
- FullInventory_Tutorial_IndividualTreePollutionEffects;
- and FullInventory_Tutorial_IndividualtreeOtherEffects.

The feature classes contain data from the i-Tree Eco results, and are produced in the Tutorial_FullInventory geodatabase (Fig. 4.3).

Displaying Results in ArcMap



14--> Add one of the newly created feature classes to the Table of Contents.

14--> To view the calculated values, right click on the added layer in the Table of Contents and open the Attribute Table.

note: The results calculated by iTree appear as additional columns in the geodataset.

To see example of the results in ArcMap, open the visualization pdfs in the Instructions folder.

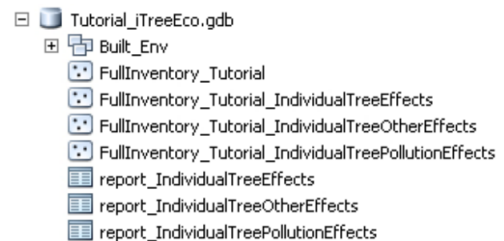


Figure 4.2 Successful Results from Get data from iTree