Tutorial: Development of a Soil Map
Created by Jonathan Zhan

This instructional manual will develop a soil map underlain by a satellite image. Key points that will be covered include:

- Extracting and georeferencing the satellite image
- Downloading the soil map from the Web Soil survey
- Adding the soil names to the soil map attribute table,
- Differentiating the soil polygons based on map unit symbols
- Calculating the area of each soil polygon in acres.
- Labeling the soil polygons with the soil name and polygon area.
- Prepare and present a final map

Tools Used:
- http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
- MapWindow GIS Version: 4.8.6
- Google Earth
- Lab 04 Doc File containing Coordinates for field markers.
- Converter to calculate squared meters to acres.
- Snipping Tool

Step 1: Go to http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Using Google Chrome or Internet Explorer

Step 2: Start the WSS (Web Soil Survey)

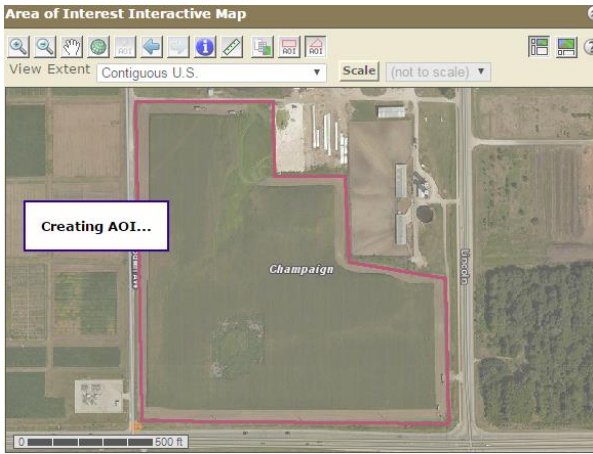**Step 3:** Select "Latitude and Longitude" under Quick Navigation, and input the Local Origin Points provided in the Lab04 Doc File.
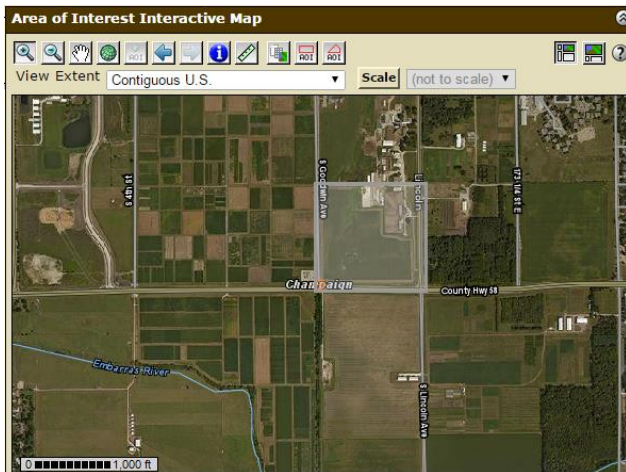
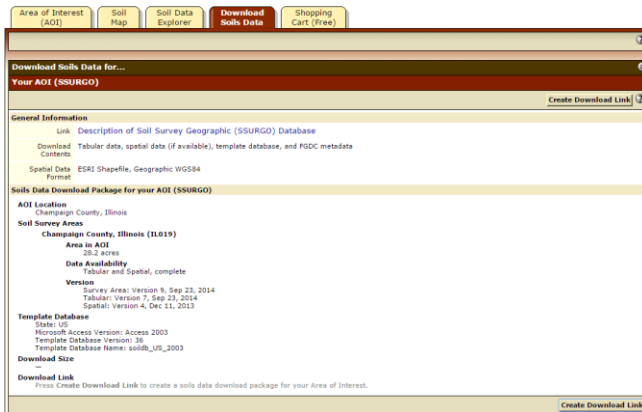**Step 4:** Zoom in to the field generated, to narrow in on the area desired.
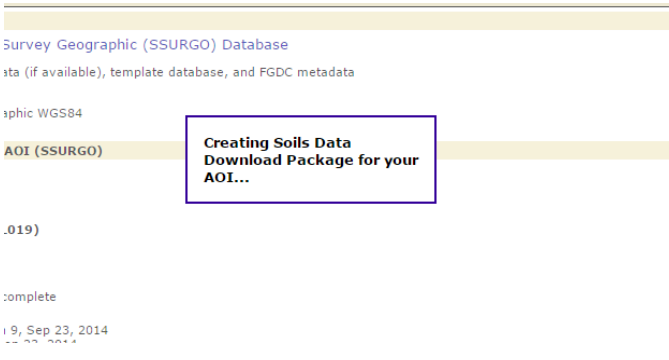
Step 5: Using the AOI Tool (Area of Interest), trace out the general area desired to calculate the total area of.

Step 6: After tracing out the shape, double click the starting position and the AOI will be generated
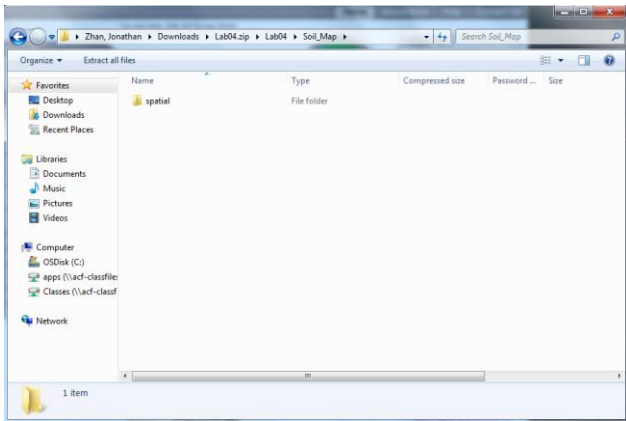

Step 7: Switch to the "Download Soils Data" and click on the Create Download Link at the bottom right hand corner
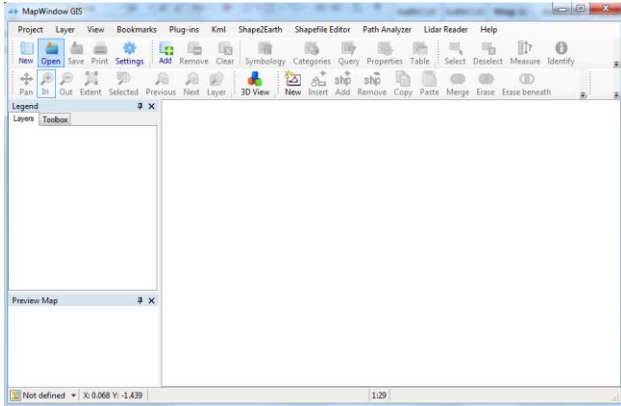

Step 8: A Download Link will be created. Right Click the file, Select "Save Target As", then save as a Zip File.
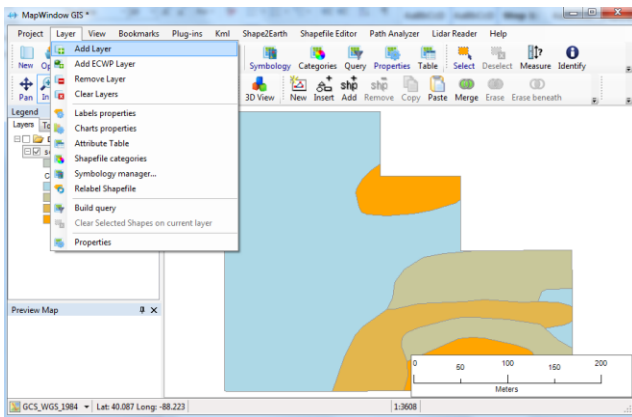
Step 9: Extract the Zip File
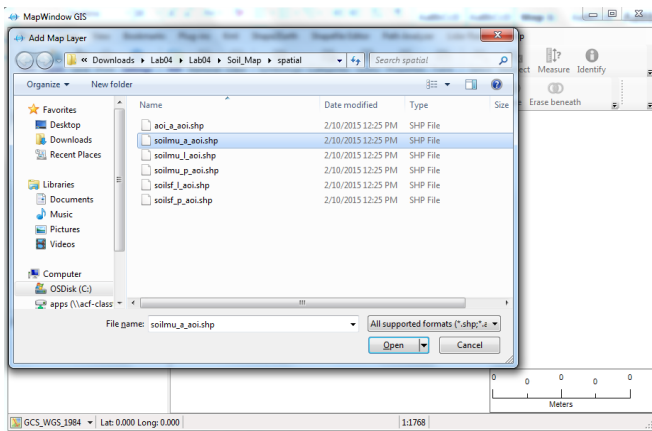
Step 10: Open up MapWindow GIS Version: 4.8.6

Step 11: Select "Layer" on the menu bar, and choose to "Add a Layer".

Copyright 2011 Author Name

Step 12: Select the Soil_Map file downloaded earlier from the Web Soil Survey site, and choose "soilmu_a_aoi.shp".

Note: Path: Lab04/Soil_Map/spatial
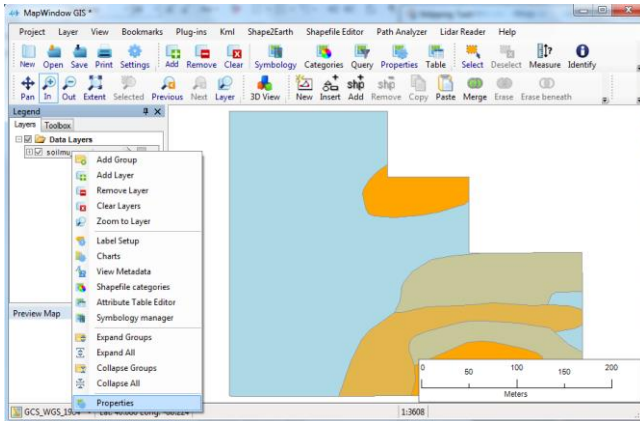
Step 13: Now that "soilmu_a_aoi.shp" is added to the legend, select it in the Data Layers Menu, by right clicking and selecting "Properties".
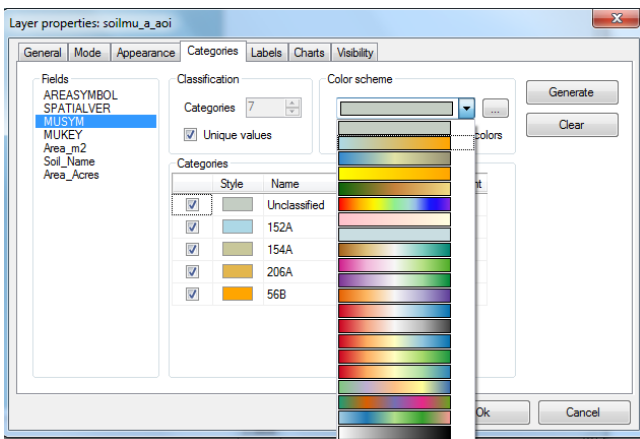
Step 14: Switch over to the categories tab. Select "MUSYM" as the field. Make sure "Unique Values" is ticked. Then proceed to change the colour scheme followed by pressing "Generate".

Step 15: Make sure to Apply Changes, and press "OK".

Step 16: Switch tabs on the Legend over to "ToolBox", and choose to "Calculate Polygon Areas"

Copyright 2011 Author Name

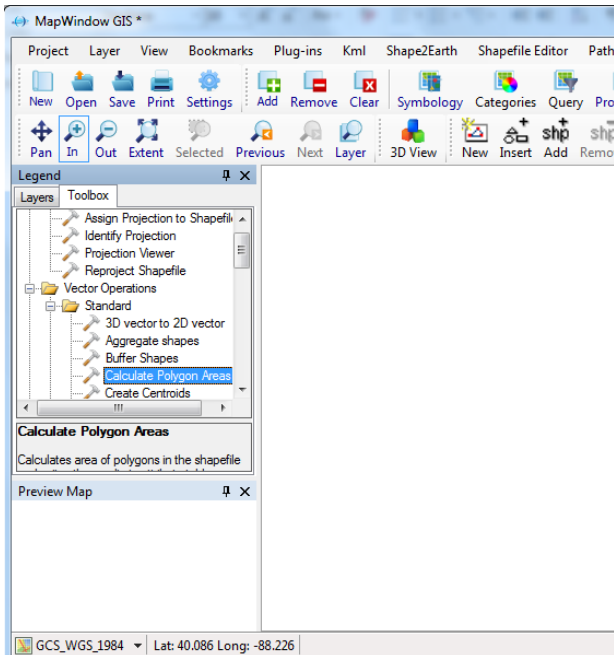**Step 17:** Name the New Field as "Area_m2" and then click "Calculate".

Step 18: Afterwards, choose "Table" on the Toolbar on top.
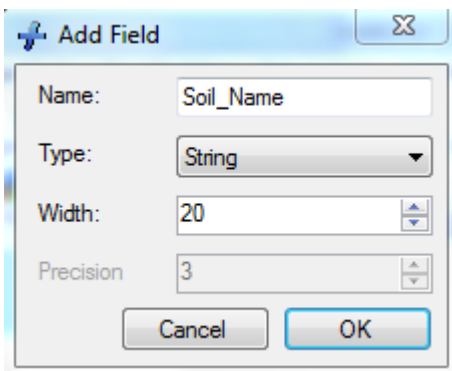
Step 19: With the Attribute Table Editor open, Select "Edit" then "Add Field". A new window should popup and then proceed to fill out the boxes as described:

Name: Soil_Name
Type: String
Width: 20

Attribute Table Editor - soilmu_a_aoi.shp

Edit View Selection Tools

SHAPE__ID	AREASYMB	SPATIALVER	MUSYM	MUKEY	Area_m2	Soil_Name
0	IL019	4	154A	242965	12246.89802	Flanagan
1	IL019	4	206A	243007	11617.04652	Thorp
2	IL019	4	152A	242963	66959.53782	Drummer
3	IL019	4	154A	242965	8846.822692	Flanagan
4	IL019	4	56B	242969	7660.049726	Flanagan
5	IL019	4	56B	242969	5538.154477	Dana
6	IL019	4	152A	242963	654.8221655	Dana
7	IL019	4	152A	242963	559.3485130	Drummer

Apply

0 of 8 Selected

Step 20: Proceed back to the WebSoilSurvey Site, and switch over to the "Soil Map" tab. Proceed to compare the Map Unit Symbols and input the proper soil names back into the Attribute Table Editor.

Apply Changes.

Add Field

Name: Area_Acres

Type: Double

Width: 10

Precision: 3

Cancel   OK

Step 21: Next, select "Edit" and "Add Field" again, but this time the new field will be added as described:

Name: Area_Acres
Type: Double
Width: 10

Acres To Square Meters Conversion

How many square meters in an acre?

Acres to square meters area units conversion factor is 4046.85642. To find out how many square meters in acres, multiply by the factor or instead, use the converter below.

1 Acre = 4046.85642 Square Meters

Acre is an imperial, US customary area unit. Mostly used for measuring land, in agriculture and forestry. The abbreviation is "ac".

Square meter (metre in british english) is a metric system area unit. The abbreviation is m² or "sq m".

For sq meter to acre conversion, please go to sq meter to acre
For other units of area conversion, please go to area conversion

Step 22: Next, calculate how many squared meters are in an acre, to help with completing the Area_Acres Field.

Attribute Table Editor - soilmu_a_aoi.shp

Edit View Sele

Field Calculator

Table Fields:
AREASYMBOL
SPATIALVER
MUSYM
MUKEY
Area_m2
Soil_Name
Area_Acres

Functions: Help!
Operators
Booleans
Maths
Angles
Statistics
Time
Other
Constants

+ - * /

Destination Table Field:
Area_Acres   =   Switch to String (Textual) Calculator...

[Area_m2]/4046.86

Calculate

Close

SHAPE__ID		Area_Acres
0		3.026
1		2.871
2		16.546
3		2.186
4		1.893
5		1.369
6		0.162
7		0.138

Close

0 of 8 Selected

Step 23: Next, select "Tools" in the Attribute Table Editor, and choose "Field Calculator Tool" The "Destination Table Field:" should be switched to "Area_Acres".

The expression input should be:
[Area_m2]/4046.86

Step 24: Press calculate after inputting the correct function for Area in Acres
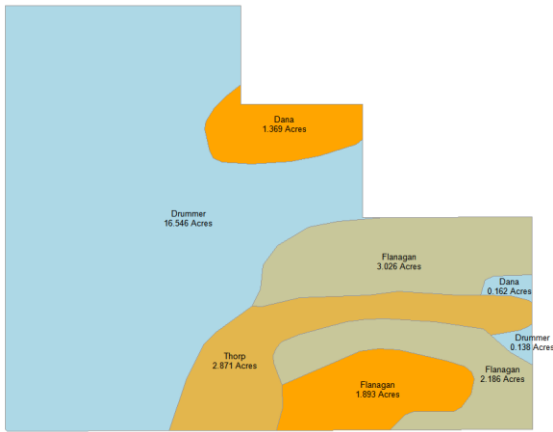

Step 25: Close out the Attribute Table Editor. Next select "Layer" in the toolbar, then proceed to choosing "Label Style"
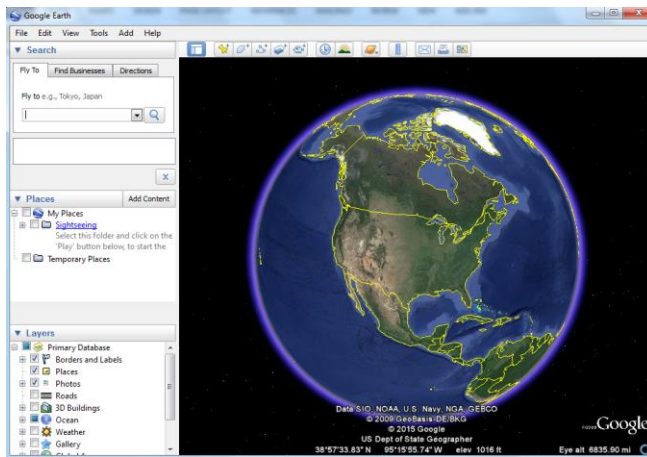
To customize the labs, the "Expression" should be inputted as:
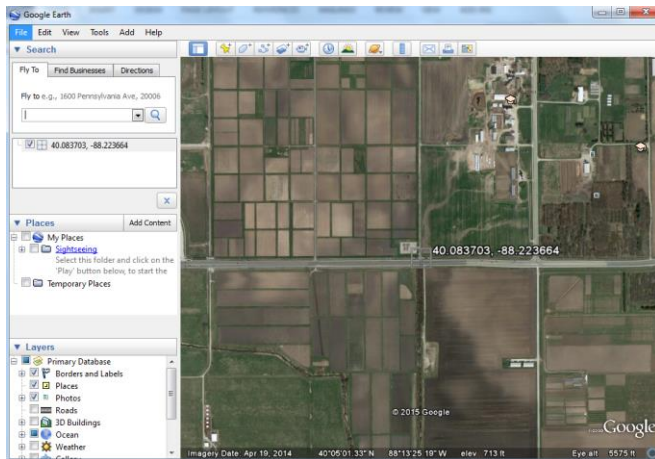[Soil_Name] +
[Area_Acres] + " " + "Acres"
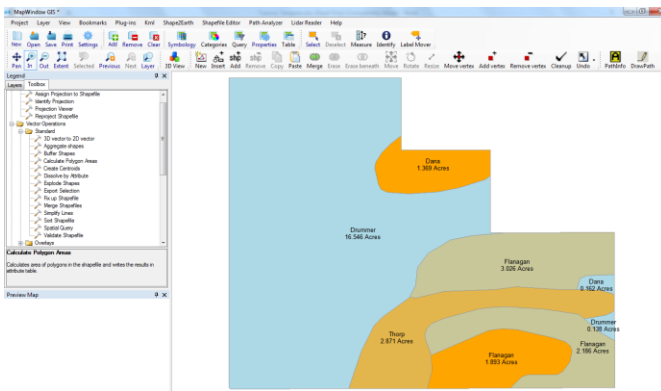
Step 26: After applying and pressing "Ok", the Soil Map should now contain labels.

Step 27: The labels can be rearranged to fix alignment issues, but choosing the "Label Mover" in the toolbar, and proceeding to move the labels accordingly.
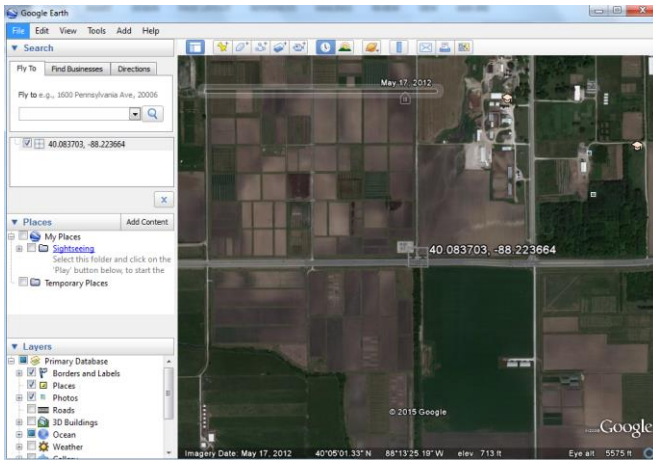

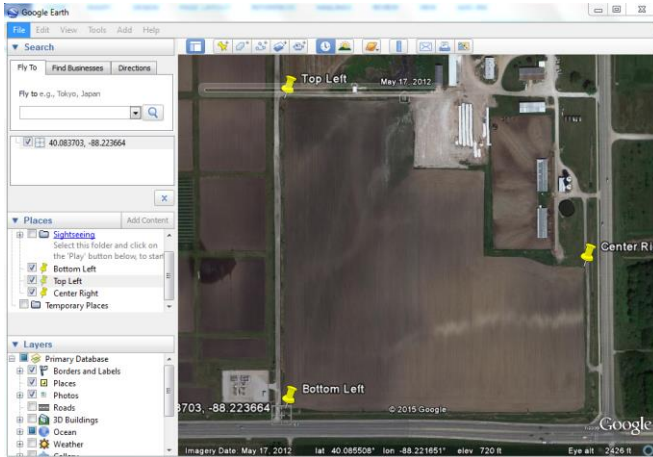**Step 28:** Next, Google Earth program should be opened

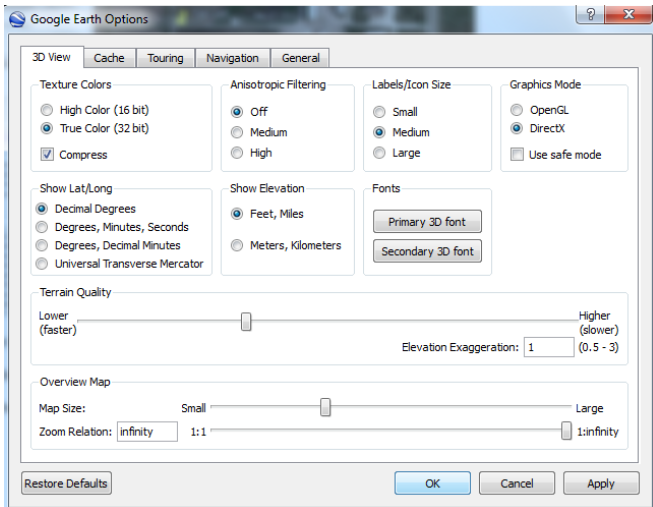**Step 29:** Input "Fly to" location as Local Origin points provided in the Lab 04 Doc file.

Step 30: Proceed by selecting the clock icon on the toolbar, which allows for different time points to be selected. Select the one that displays the most accurate depiction of the field.
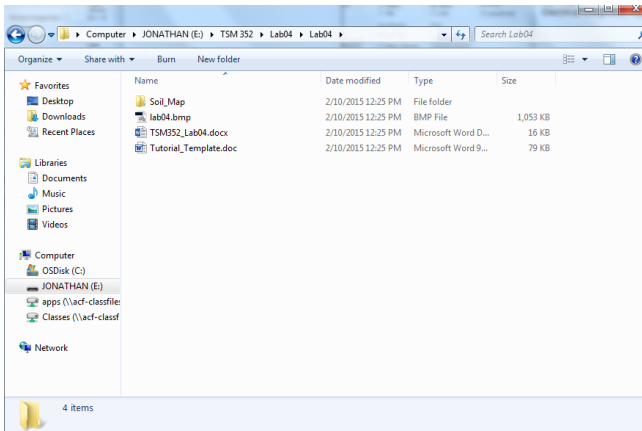

Step 31: To take note of the coordinates, add 3 pinpoints to the map. Label each pin point accordingly.


Step 32: The original coordinates were given in Decimal, Minutes, Seconds. To change Decimal, Degrees; select "Tools" on the menubar, followed by "Options. Then select to Show Lat/Long in Decimal Degrees. Apply and press "Ok"
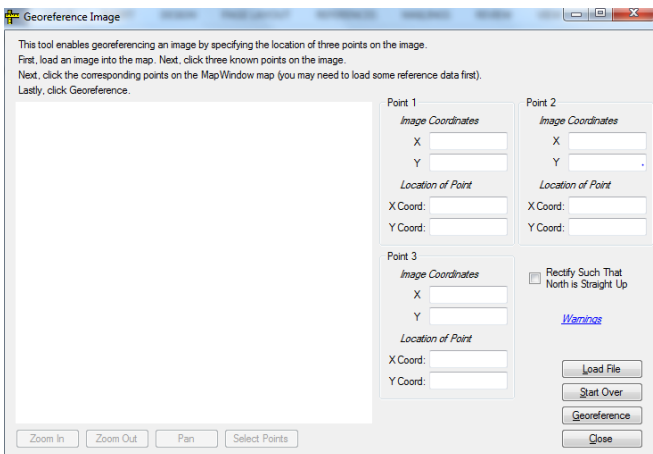
Copyright 2011 Author Name

Step 33: Next, use the snipping tool to capture a picture of the Google Earth Satellite Image. Save the picture file as .bmp into the Lab 04 folder.
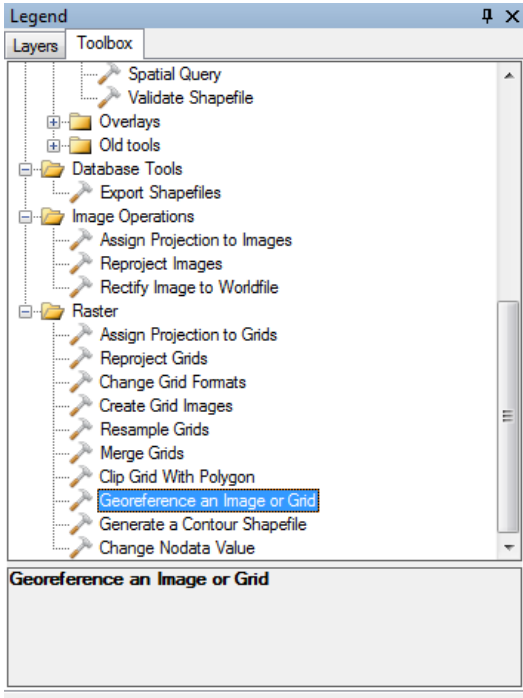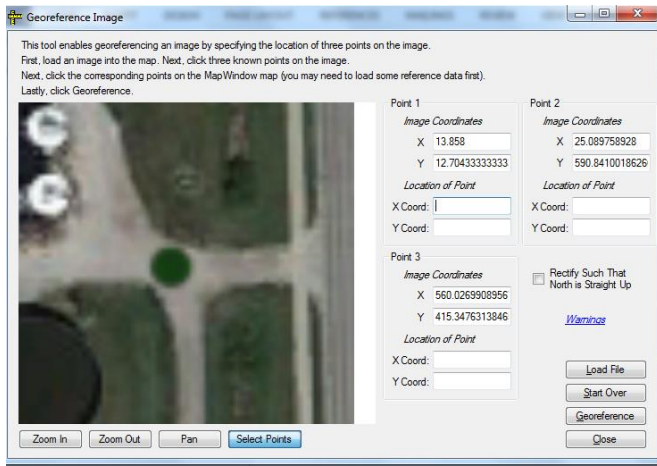
Step 34: Switch back to MapWindows, and in the "Toolbox" tab of the legend, Select "Georeference an Image or Grid"
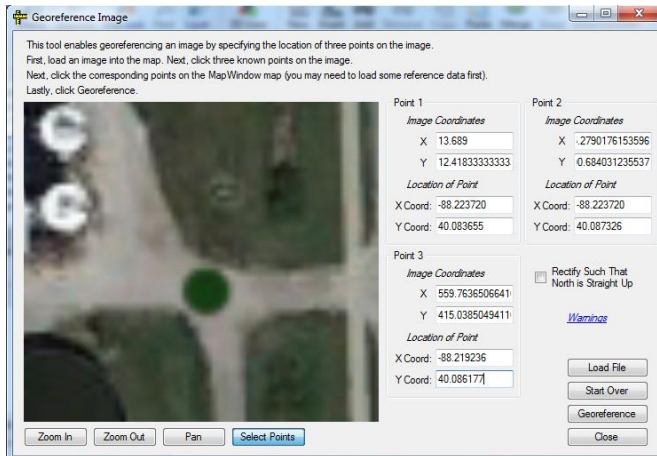
**Step 35:** Make sure to un-tick "Rectify such that north is Straight Up.

Step 36: Select "Load File", and load the BMP file saved earlier using Snipping Tool. Then proceed to zoom in to the 3 data points defined earlier on Google Earth. Selecting the center as the Image Coordinate Point
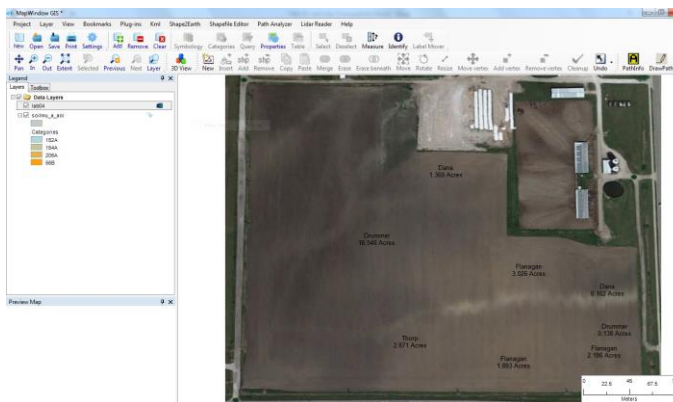

Step 37: Next, Input the X and Y Coordinates, based on the Lab 04 Doc File.

Point 1: Bottom Left Marker
Point 2: Top Left Marker
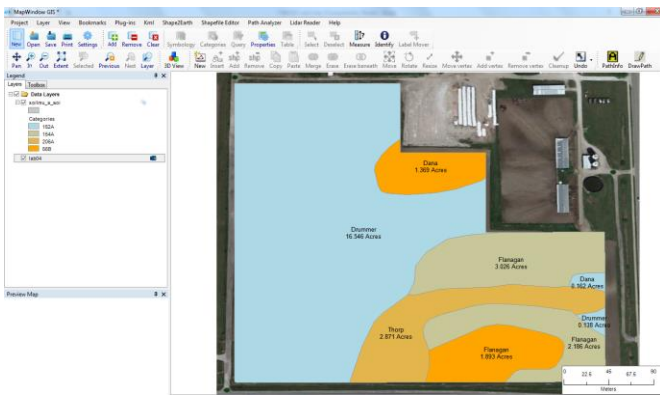Point 3: Middle Right Marker
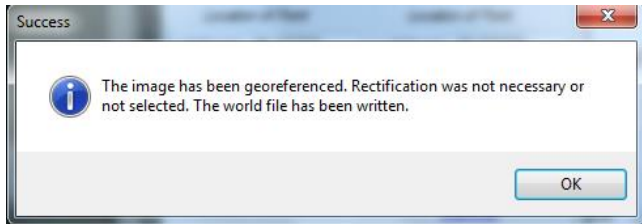
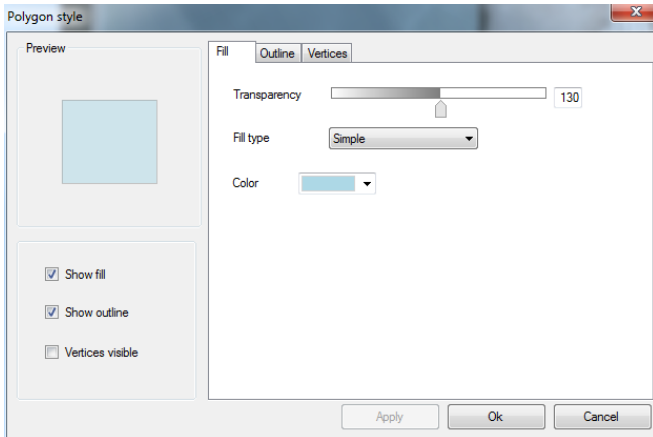**Step 38:** After all coordinates are inputted, Press Georeference, and "Ok" to the Success Window.

Step 39: Next, select "Layer" from the toolbar menu, followed by "Add Layer". Add the Georeferenced BMP file that is located in Lab 04.
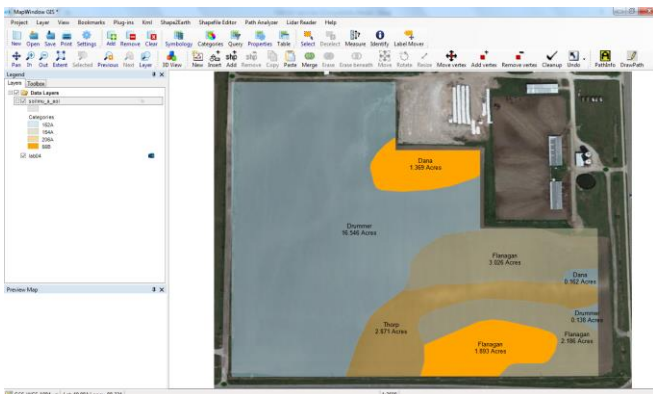
Step 40: In the legend, rearrange the order of the layers so that the newly inputted "lab04" file is after the original "soilmu_a_aoi.shp" file

Step 41: Click each of the colours under "soilmu_a_aoi", under the legend adjust the transparency of all 4 colours.

Step 42: Finally, once each colour transparency is adjusted, the underlying georeferenced satellite image can be seen through the soil map.

The final image should display a satellite image, with a transparent soil map overlaying it. The soil map should display proper acreage, and appropriate soil type.