Tutorial 6 – GPS/Point Shapefile Creation

The objectives of this tutorial include:

1. Converting GPS field collected point information into a shapefile
2. Creating a shapefile from a simple x,y coordinate text file
3. Learning how to do a point-and-polygon overlay

Before beginning the tutorial, please COPY the Lab6 archive to your server folder and unpack it.

Introduction

Many of the tasks below describe how to create vector data sets. Whereas last week we learned how to create **polygon features** via heads-up digitizing, this week we explore a variety of other methods available to us to create spatial data. The focus this week is **point features** and the tutorial will illustrate how you can produce them via one of two different methods. In addition, part four describes a way to combine point and polygon attribute information. This last part will be critical to this week's exercise.

Part 1: Creating a shapefile from raw X,Y coordinates

On occasion, you may obtain a list of point locations in the form of raw X, Y data from your GIS client and websites, and you wish to plot them on ArcMap. The following are point features distributed around Colgate campus. Your task is to create a point shapefile using these data.

ID	x	y
6	456354	4740774
8	456248	4740744
9	456188	4740680
10	456234	4740588
20	456128	4740607
21	456146	4740488
22	456055	4740545
23	456103	4740722
24	456209	4740919
29	456096	4740841
25	456290	4740946
26	456305	4740975
27	456480	4740853
28	456450	4740587
99	456459	4740762

Question: What coordinate systems do you think these points are recorded in? Why?

Important: when you obtain X,Y data like these, it is critical that you know/learn what coordinate systems the data are recorded in. Without the information, the point data may be wrongly plotted in ArcMap. Imagine what would happen if points recorded in UTM (in thousands of meters) are plotted as geographic coordinate systems (in decimal degrees or DMS). In the above table, the data are in UTM NAD83 Zone 18N.

How does one make a shapefile from such data?

Create a tab-delimited or comma-delimited text file (.csv) in Excel. I usually create three columns: an ID, the X, and the Y coordinate. I place the names of these columns in the first row of the file. You can cut and paste this information, which is in Colgate_xy.rtf in the Lab folder, into Excel if you'd like. Or you can simply re-type the above data in Excel.

Hint: remember that your column IDs must be shorter than ten characters, start with a letter and be alphanumeric (no spaces or symbols).

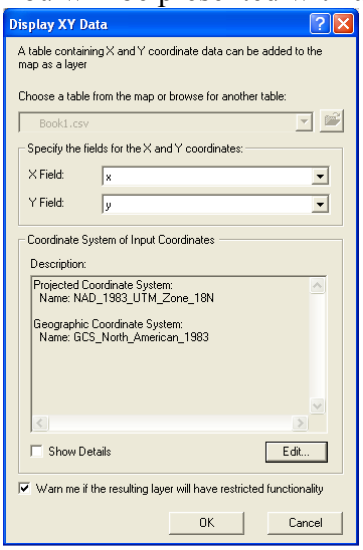
Open a new map document in ArcMap, and add the **c_10981028_24_19200_4bd_2008.jp2** and **c_10981024_24_19200_4bd_2008.jp2** imagery.

Click the Add Data button and navigate to the csv file that contains the x,y data.

Hint: remember that you need to close the file in Excel before adding it to ArcMap.

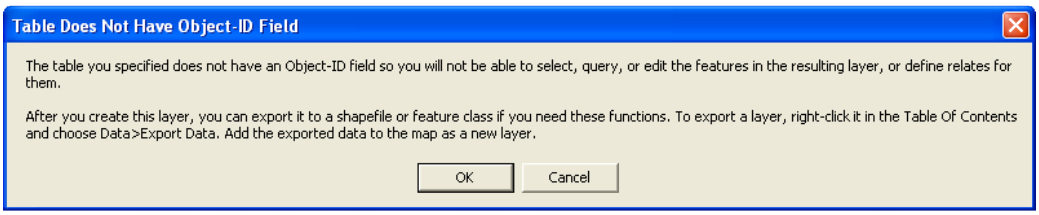
This file will now be displayed in the map legend window. You can look at the data by right-clicking on its name in the legend window and selecting the Open option.

If everything looks good, right-click on its name again and select "Display XY Data." You will be presented with a window similar to that shown below.



Make sure the X Field is set on the name of your x coordinates and that the Y Field is set on the y coordinates. Click the edit button to set the projection to UTM NAD83 18N using the standard procedures. Click the OK button.

You may get an error message like the one below. This is not a problem, click ok.



A new file, called an Events Theme, is added to your legend and the points are displayed in the map window.

Question: what is an events layer? Be sure to use the help menu to learn about their use. If you don't understand make sure to ask your lab instructor.

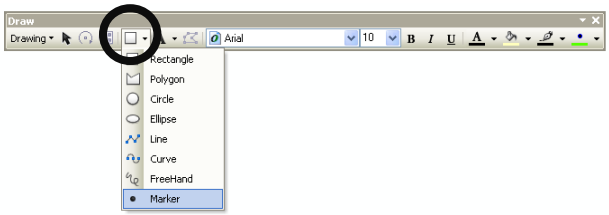
You can save this map as an official shapefile by right-clicking on the events name in the legend, selecting the data option, and then choosing export data. By saving it as a shapefile, you will be able to execute various ArcMap analysis tools.

Provide a name for this new shapefile and click OK. You will be asked whether you want to display the shapefile. Select yes. You should now see all of the points. The ID field is the point number.

Part 2: Creating a shapefile from graphic elements

Every so often, someone calls me over to their computer and says: "I would like to create a new shapefile showing a few points that I can see on this map. Is there an easy way?" There is a new feature to ArcMap that makes this possible.

Add the "draw" toolbar to your map. This toolbar enables you to both perform cartography (as we have previously done) and add graphic elements to a map. If you click on the rectangle tool (circled below) you will see the other graphic elements that can be added.

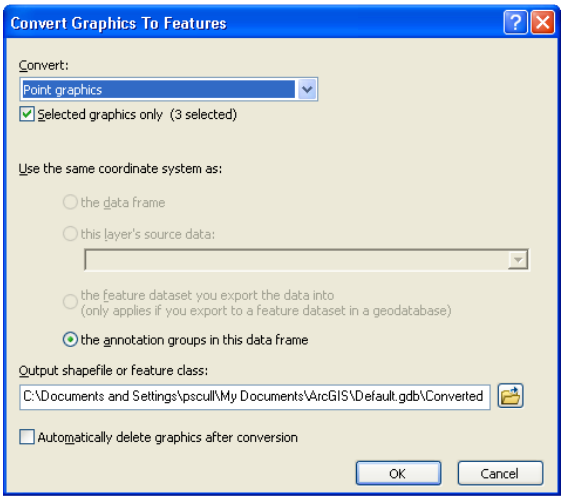


Make sure the air photos are open in your map view. Look around the map and find 5 or 6 interesting points that you want to place in their own shapefile. Using the marker drawing tool, place points at these locations.

Note that these are added as simple graphics. In my example below I have added points for all the parking lots on campus.

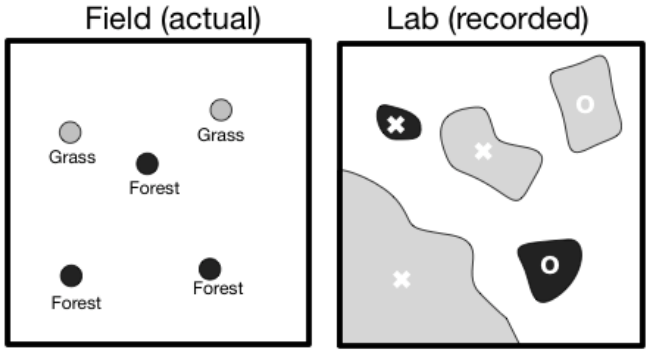
Once you have created the graphics you'd like to convert to features, select them (use shift-click or a selection box) and then right click on the title of the dataframe in the table of contents (likely entitled 'Layers' unless you have changed it. You will see an option for convert graphics to features.

A window similar to the one below will appear. Take notice of the various options that exist when using this tool (e.g. using only selected graphics, coordinate system options, and my favorite, 'delete graphics after conversion').



Part 3 - Point-and-polygon overlay operations.

Sometimes it can be useful to know the attribute data for one polygon shapefile (or feature class) at specific locations defined by the points of a second shapefile (or feature class). This is a called a 'point-and-polygon' overlay operation. For instance, if we were performing an accuracy assessment of a classification we would collect field data (the truth) and we could convert those data into a shapefile (e.g. similar to Part 1 above), but we would also need to know our classified map values at the same points. Having both field-determined and lab-determined values then would enable us to build an error matrix (as discussed in class).



Recorded \ Actual	Forest	Grass
Forest	1	1
Grass	2	1

Add the shapefile "Stress" to your map. This is a polygon shapefile of the relative degree of stress present in the air around campus. These data have been haphazardly gathered in a completely unscientific manner over the course of the past 6 years as I have walked here and there going about my daily business. Areas identified as zone 5 are extremely stressful, whereas areas identified as 1 are low-stress. We can easily determine the stress zone of your 5 or 6 points you created in Part 2.

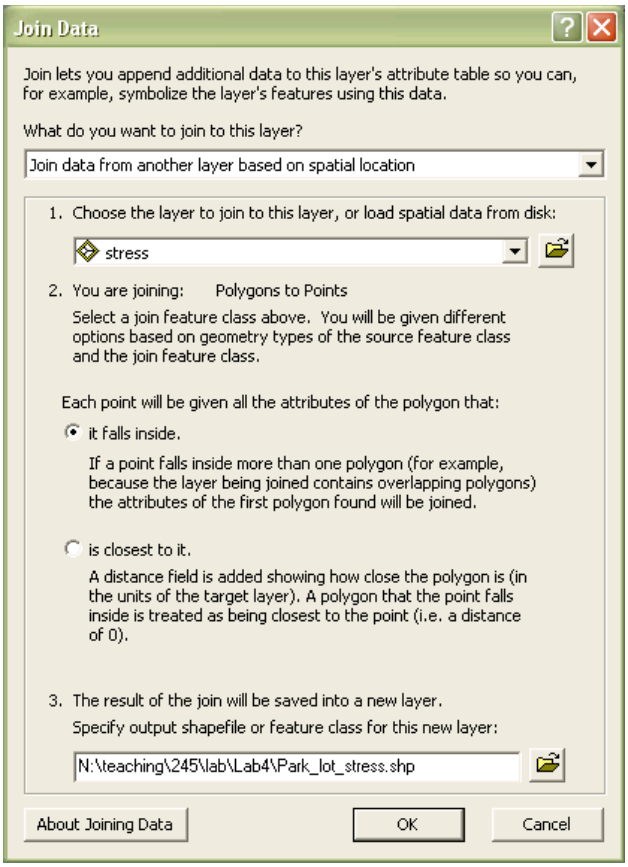
Make sure you symbolize the layer appropriately to view the data.

Question: where is the most stressful place on campus? What areas are less stressful?

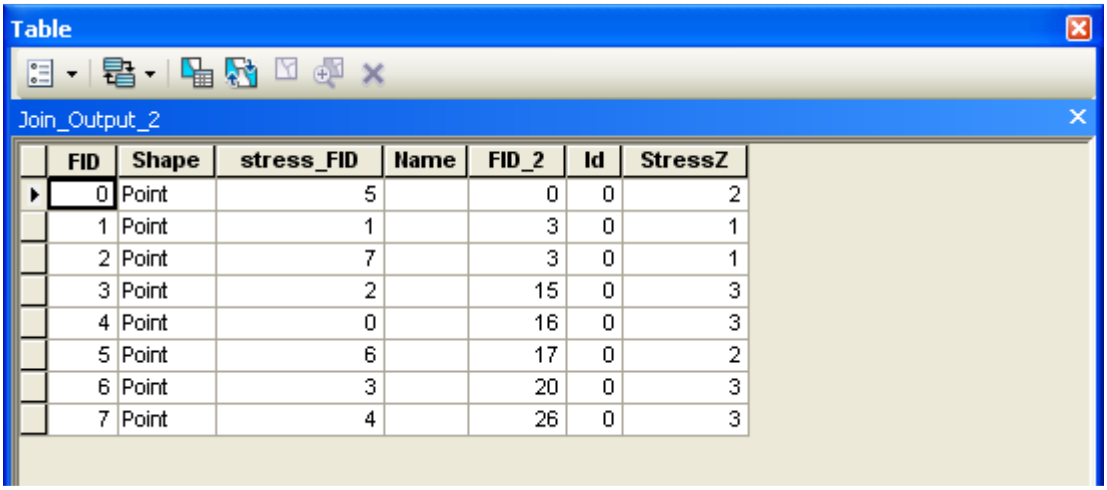
In the table of contents right click on the point shapefile you created in Part 2 and select joins and relates -> join. At the top of the dialog window select 'Join data from another layer based on spatial location'. This will enable you to join the attributes from a polygon layer to a point layer.

In lab four we used this feature, but selected 'Join attributes from a table'. Your window should look similar to the one below. Change the output filename to something meaningful and click okay.

Hint: you always right click on the layer that you want to join things to when using the join feature



This tool creates a new shapefile that will be added to your map. Open up the attribute table for the new shapefile. You should see the attributes from stress in your new point shapefile.



FID	Shape	stress_FID	Name	FID_2	Id	StressZ
0	Point	5		0	0	2
1	Point	1		3	0	1
2	Point	7		3	0	1
3	Point	2		15	0	3
4	Point	0		16	0	3
5	Point	6		17	0	2
6	Point	3		20	0	3
7	Point	4		26	0	3

1. Appendix - Transferring your GPS information to the computer

Should you end up using Geography's GPS units for your final project the following instructions describe how to download the data you collect. This information is for future reference.

A special GPS serial communication cable and a program called *GPS Utility* are used to transfer data from the GPS unit to the computer. Using the serial cable, connect the GPS to the computer and turn on the GPS. Push the MENU button and scroll to Setup and push ENTER. Move to the NMEA option and make sure it is OFF. Also, check the baud rate and set it for 4800. These settings control the way in which the GPS communicates with the computer.

Each computer in the lab contains a program called *GPS Utility*. When you launch this program, you will see a screen similar to Fig. 1.

FIG 1

Under the GPS menu, select setup. Make sure your settings match those shown in Fig. 2. The key settings are the GPS make/interface model, type/family, and baud rate. Click OK

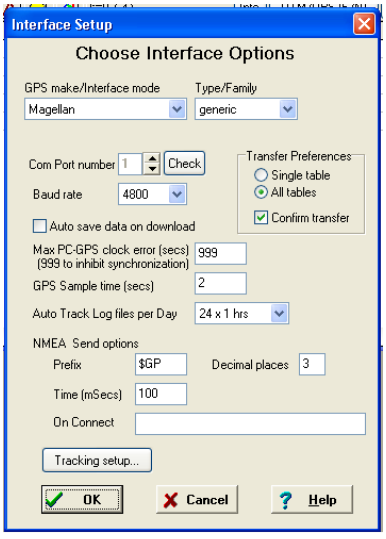


FIG 2

Under the GPS menu, select Connect.

Finally, select 'download all' under the GPS menu. You will be given a confirm download window in which you should check the waypoints box (Fig. 3). Click OK. If all goes well, the points will be listed in a window similar to Fig. 4.

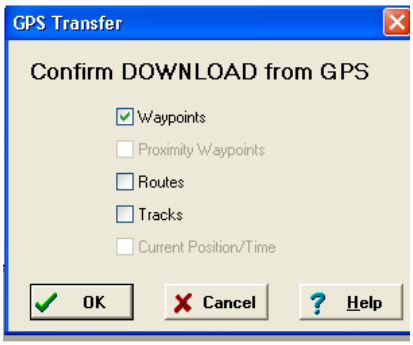


FIG 3

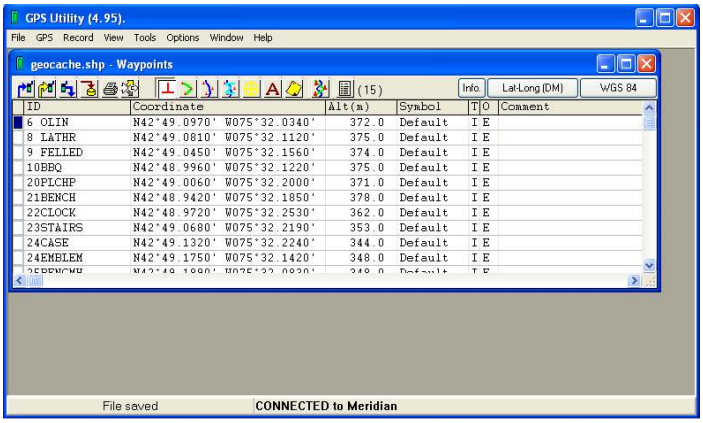


FIG 4

The GPS Utility software has the capacity to display your x and y locations in a variety of coordinate systems. You can do this by clicking on the button in the upper right of the table (see Figure 5).

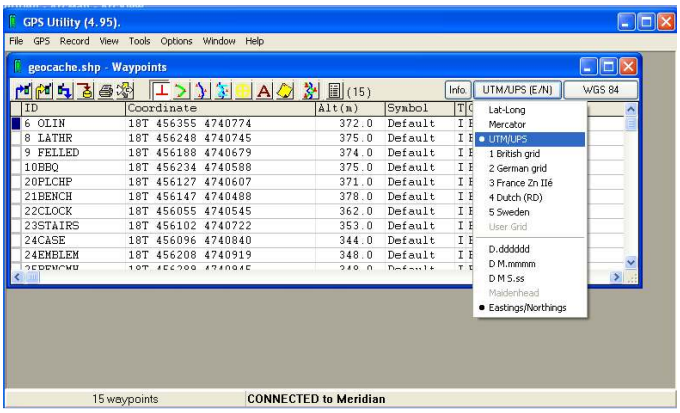


FIG 5

If you simply want to save this information as a text file that can be opened and edited in Excel, select Save As under the file menu. However, there is a way to save the waypoints as a shapefile using the Save/Export Options (FIG 6). When finished, you will need to define the projection using the Arc Tools.

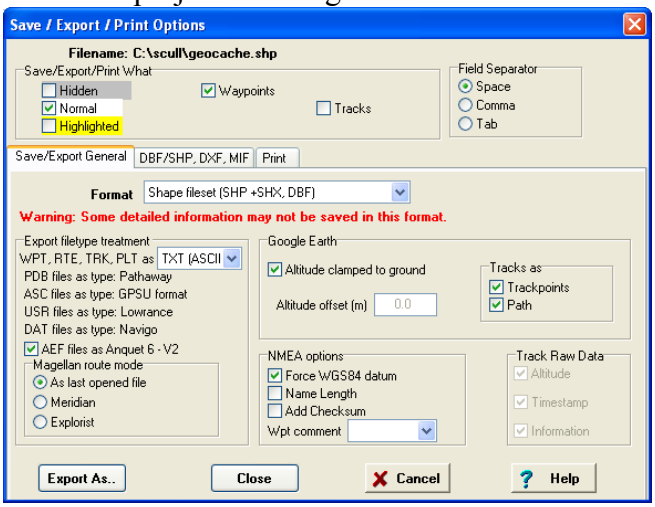


FIG 6

Make sure you have the Shapefile fileset selected. Also, deselect the “Tracks” box. If the ‘Waypoints’ option isn’t available at the top, you may need to navigate to the ‘dfb/shp, dvf, mif’ tab (see circle below) and select points in the lower left in order to turn on the option to select waypoints. Click off polylines and polygons. Your window should look like Figure 7 below.

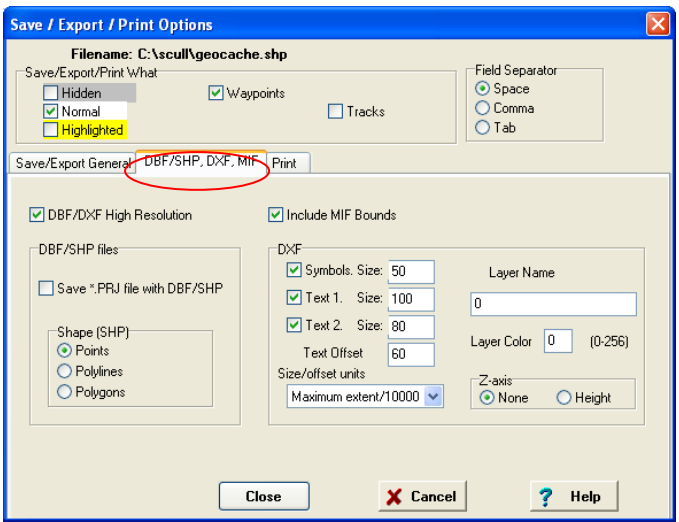


FIG 7

Everything else should be fine. Click the Export As… button and provide a file name and location.