

Importing GPS Coordinates

In this Chapter you will learn

- How to add an Excel spreadsheet with XY coordinates to your map
- How to convert Degrees-Minutes-Seconds into Decimal Degrees inside ArcMap

ISTC Topic:

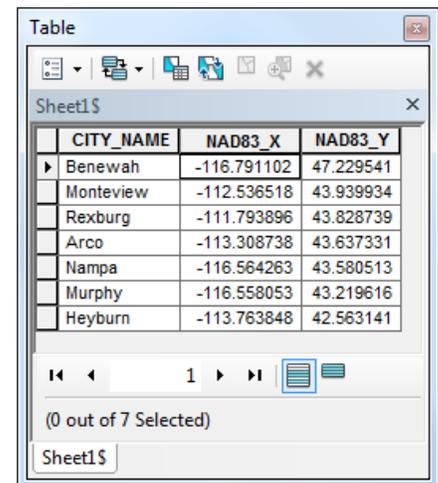
10.3

1. Importing XY Coordinates

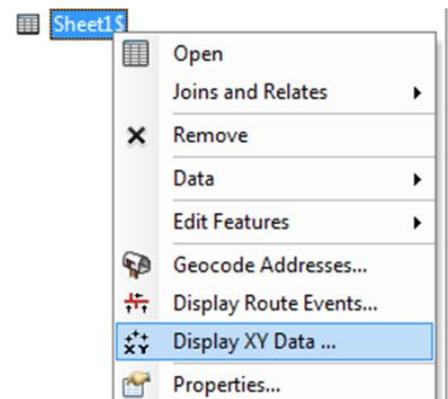
While many Global Positioning Systems (GPS) have cables that will automate the process of importing coordinate data, you may still be faced with a table displaying coordinates and the associated attributes. This chapter will show how to bring in those tables and display the data on your map in the correct location.

Exercise 1: Importing an excel spreadsheet with decimal degree coordinates

1. Open ArcMap and start a new map document. Add the Counties shapefile from the Topic10.3 folder.
2. Click the Add Data button again and browse to the Topic10_3 folder. Double click on the Decimal_Degrees.xls spreadsheet to expose the three worksheets in this Excel file. Then click once on Sheet1\$ and click "Add".
3. Open the spreadsheet (right-click and then choose open). You can see this table contains 7 cities in Idaho along with their coordinates in decimal degrees. Notice that NAD83_X is a negative number because we are on the western hemisphere. The coordinates are given in latitude and longitude so we know we are dealing with a Geographic Coordinate System (as opposed to a Projected Coordinate System). The heading of the fields let us know that the NAD83 datum is used.
4. Close the table. Then right-click on the spreadsheet again and choose "Display XY Data ..." as shown on the right.



CITY_NAME	NAD83_X	NAD83_Y
Benewah	-116.791102	47.229541
Montevieu	-112.536518	43.939934
Rexburg	-111.793896	43.828739
Arco	-113.308738	43.637331
Nampa	-116.564263	43.580513
Murphy	-116.558053	43.219616
Heyburn	-113.763848	42.563141



5. Follow the directions below to add the data to your map as events.

1. Set X Field to NAD83_X

2. Set Y Field to NAD83_Y

3. This is the wrong coordinate system. Click "Edit"

4. Double-click on "Geographic Coordinate System"

5. Double-click on "North America"

6. Click on NAD 1983.prj

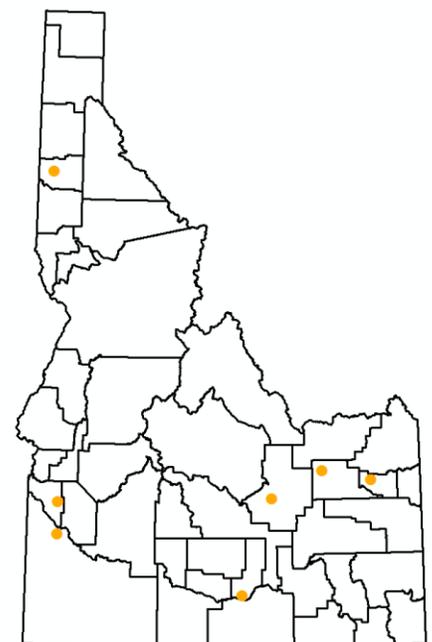
7. Click "OK"

8. Click OK

9. Ignore the warning about the Object_ID field because we will export data to a shapefile later on. Click OK

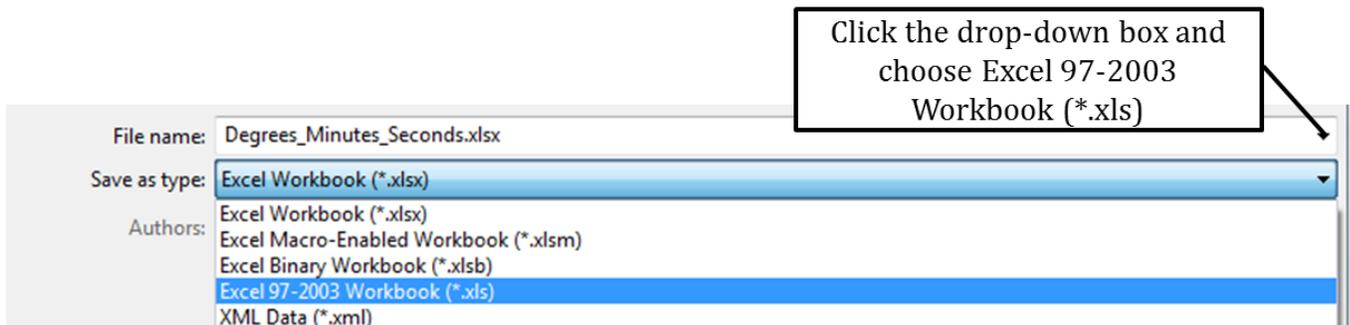
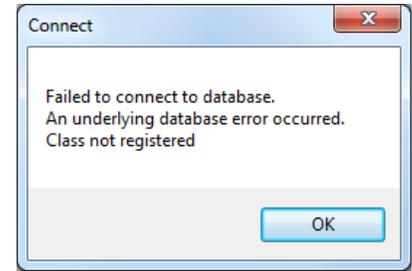
6. Sheet1\$ Events have now been added to the table of contents in your map. If all went well the points representing the various cities in the excel table should now appear in their correct locations on the map.

7. **Events** only exist within this map document. To preserve this data and make it available for use in other map documents it is wise to export the events into a shapefile. Right-click on Sheet1\$ Events in your table of contents and click Data > Export data. Save all features in a new shapefile called "Decimal_Degrees" in the Topic10_3 folder.



Exercise 2: Converting Degrees-Minutes-Seconds into decimal degrees

1. Open a new map. Click the Add Data button and open the Degrees_Minutes_Seconds excel spreadsheet. You will see the error on the right because this excel file is in the .xlsx format. Hopefully in future releases of ArcGIS you can import .xlsx files, but for now we need to convert it in .xls.
2. Close ArcMap and open Degrees_Minutes_Seconds.xlsx in Microsoft Excel. Take a look at the formatting of the coordinates in this table. You can see that the X and Y coordinates have been separated into degrees, minutes and seconds. In addition the X coordinate is not a negative number, instead the table includes a column called "X_DIR" to indicate that the location is in the western hemisphere.
3. Click File > Save As shown below. Then close MS Excel.



4. Start ArcMap again and open a new map document. Bring in the Counties shapefile as well as Sheet1\$ of the Degrees_Minutes_Seconds.xls you just saved. You should not get any error messages this time.
5. Open the Sheet1\$ in ArcMap. Unfortunately, the coordinates are not in a format you can import. So, we will compute the decimal degrees and then import those. First we need to export the table to DBF format and then create two new fields in the table, one for the X coordinate in decimal degrees, and the other for Y coordinates. Finally we need to compute the decimal degrees from the information we have.

6. Use the instructions below to export the excel table to .dbf format.

1. Click drop-down box and choose Export

2. Export all records

3. Click on the folder icon

4. Browse to Intermediate folder

5. Name table "Degrees_Minutes_Seconds"

6. Use drop-down box to save as dBASE Table

7. Click "Save"

8. Click OK

7. When prompted add the new .dbf table to your map. Right-click on the Excel spreadsheet and click remove. Open the dbf table and use the instructions on the next page to add two new fields.

1. Click drop-down box and choose Add Field...

2. Name the new field "DEC_X"

3. Set Data Type to Double with a Precision of 12 and a scale of 8

4. Click OK

8. Repeat the instructions above to create second field called "DEC_Y" that is also a Double with a Precision of 12 and a Scale of 8.

9. Use the instructions on the right to use the field calculator to compute X in decimal degrees.

1. Right-click on DEC_X and choose Field Calculator

2. Construct equation: $[X_DEGREES] + [X_MINS]/60 + [X_SECS]/3600$

3. Click OK

10. Also use the field calculator to compute $DEC_Y = [Y_DEGREES] + [Y_MINS]/60 + [Y_SECS]/3600$
11. Look at the results in your table. Notice that all the DEC_X coordinates have a positive value. If you add those coordinates in this format they will land somewhere in China. Right-click on DEC_X again and open the field calculator. Compute $DEC_X = -[DEC_X]$ to make all the longitudes negative, and thus located on the western hemisphere.
12. Right-click on Degrees_Minutes_Seconds.dbf in your table of content and choose Display XY data. Make sure you set the coordinate system to Geographic Coordinate System > North America > NAD 1983.prj.
13. Export the events as a shapefile called "Degrees_Minutes_Seconds.shp" in your Topic10.3 folder.

Exercise 3: Bringing in Mystery Coordinates

1. Open a new map document in ArcMap and add the Counties shapefile. Then add Sheet1\$ of the City_Coordinates.xls excel spreadsheet.
2. Open the excel table and notice the X and Y attributes. To import this data you need to know what coordinate system the data is projected in. If this data was collected by a GPS unit, then you would look at the setting on this GPS unit to find out what coordinate system was used to generate the coordinates. Sometimes, especially if the data was collected by someone other than yourself, you simply do not know. That is when you use trial and error to find out. Table 1 below lists some common coordinate systems used in Idaho.

Name	Where Used	Units	Path to Projection
NAD 1983 Idaho TM	State Agencies	Meters	Projected Coordinate Systems > State Systems > NAD 1983 Idaho TM (Meters)
NAD 1983 StatePlane Idaho East	Eastern Idaho	Feet	Projected Coordinate Systems > State Plane > NAD 1983 (US Feet)
NAD 1983 StatePlane Idaho Central	Central Idaho	Feet	Projected Coordinate Systems > State Plane > NAD 1983 (US Feet)
NAD 1983 StatePlane Idaho West	Western Idaho	Feet	Projected Coordinate Systems > State Plane > NAD 1983 (US Feet)
UTM Zone 11	Western Idaho	Meters	Projected Coordinate Systems > UTM > NAD 1983
UTM Zone 12	Eastern Idaho	Meters	Projected Coordinate Systems > UTM > NAD 1983
Geographic Coordinate System (Latitudes and Longitudes)	North America	Degrees	Geographic Coordinate Systems > North America > NAD 83

Table 1. Most commonly used projections in Idaho.

3. The data in your excel table is collected in one of three following coordinate systems:
 - UTM Zone 11
 - NAD 1983 Idaho TM
 - NAD 1983 StatePlane Idaho Central
4. The challenge for you is to find out which of those three coordinate systems is the correct one. Use trial and error to find out: when adding XY data, set the coordinate system to one of three listed above and see whether your cities “fall” in the correct location inside Idaho.
5. After you find the correct coordinate system export the data as City_Coordinates.shp in your Final folder.

2. Common reasons why you are unable to import an Excel table

There are two common reasons why you may not be able to import an Excel file. The first one, as we have seen in exercise 2, is that the Excel file is in a newer version and has an .xlsx extension. You solved this problem by opening the spreadsheet in Excel and saving it as an Excel 97-2003 Workbook (*.xls).

Cities	In	Idaho	
	CITY_NAME	X	Y
1	Benewah	2288722	1784676
2			1416466
3			1405441
4			1382049
5	Nampa	2292966	1378702
6	Murphy	2292237	1338604
7	Heyburn	2519384	1262555

Attribute name can not be blank

You can only have one row with headers

The second reason is a not-properly formatted Excel table. Two common formatting errors are shown in the figure on the left. Correct those errors in Excel and then try adding the table to ArcMap again.