NAME: _____   Instructor: Judd Curran

GPS to GIS Tutorial

1. Create a folder on your USB drive titled: **GPS1**
2. Using your GPS receiver, retrieve 10 waypoints using **NAD83** datum and **Geographic Coordinate**

System (latitude and longitude) in "**hddd mm ss.s**" (degrees, minutes, and seconds) format. For each

waypoint, create a numeric name (ID Number) in your GPS and write down the following information

as it corresponds to each waypoint in the table provided below:

a. Give the waypoint a descriptive name.

b. Note whether the waypoint is *West* or *East* of the library (learning resource center).

c. Rate the accuracy of the waypoint as *excellent*, *good*, *fair*, *poor* based on your observations about

the environment in which the waypoint was collected (you can reference the accuracy in feet

reported on the satellite page of the GPS).

d. Record the elevation at the waypoint in feet (found on the compass page).

METADATA (or "attributes")

ID #	Description	Campus Side	Accuracy	Elevation
N,O,I,R	**N, O, I, R**	**N, O, I, R**	**N, O, I, R**	**N, O, I, R**

Circle the **attribute type** for each of these attributes.
N = Nominal,   O = Ordinal,   I = Interval,   R = Ratio

3. **Connect the GPS to the computer:**

   a. First, install the latest USB driver software for the GPS device (Garmin GPSmap 60CSx)

   - Open up a web browser and enter the following web address:

     http://www8.garmin.com/support/download_details.jsp?id=591

   - Click on the "Download" link to download the latest driver software. The driver software allows Windows 7 to communicate with your GPS device.

   - When the box opens, choose "Run".

   - When the "End-User License Agreement" opens, check the box to accept the agreement, then click on "Next". Then, click "Done". Close the web browser.

   b. Next, turn on the GPS receiver and connect the GPS receiver to your desktop computer using the USB cable. (Be sure to **<u>carefully</u>** plug the cable into the back of the GPS receiver.)

4. **Download and view your collected waypoint data within the EasyGPS program:**

   a. First, we need to download and install the EasyGPS program.

      i.   Go to http://www.easygps.com/

      ii.   Click on the "Download EasyGPS" link.

      iii. Click on the "**<u>Download Free</u>**" link. (**<u>Note</u>**: <u>Do not</u> click on the "Download Free Trial").

      iv.   When the File Download box opens, choose, "Run".

      v.   Click "Next" twice. Then, insure that the "Launch Easy GPS" box is checked. Then, click "Finish".

   b. Normally, to open EasyGPS, in Windows you would go to <Start>, then <Programs>, then <EasyGPS>. But, after installing the program, it was automatically launched, and thus should be open, with the Preference box waiting for you to add a GPS.

   c. Click on the "Add GPS" button in the Preferences box.

   d. Choose Garmin on the left column for the Manufacturer of the GPS receiver you are using.

   e. In the right column, select the model of the GPS receiver you are using (**<u>GPSMAP 60CSx</u>**). **<u>Careful</u>**: The model is **<u>NOT</u>** GPSMAP 60Cx, or GPSMAP 60CS.

   f. Click once on the model, then click "Ok".

   g. The next box will ask you how you want to connect the receiver to the computer. We want to "Connect via" USB.   Click "Ok". Then, click "Ok" again. *(see note on next page)*

   Note: To add a device normally when the "Preferences" box is not already open, go to to
<Edit>, <Preferences>, <My GPS Receivers Tab>, <Add GPS>.   Then, follow the same
instructions above.

5. **Transfer data from the GPS to the computer (to the EasyGPS program):**
   a.   In EasyGPS, click on the "Receive" button.
   b.   Select "Waypoints" only. Uncheck any other checked boxes.
   c.   Under *GPS Settings*, choose the appropriate GPS device that the waypoints are on. In this case,
        the GPS receiver is "Garmin GPSMAP 60CSx".
   d.   Select "OK".
   e.   An audible sound will eminate from the GPS receiver and the waypoints you collected will
        appear on the EasyGPS data window.

6. **Save the data in the default EasyGPS format:**
   a.   Verify that your imported GPS coordinates are visible in the EasyGPS map interface. Save this
        data in the default file format (GPS exchange file, .gpx) in your GPS1 folder. Name the file
        GPSpoints.
   b.   Close EasyGPS. Because the data is currently in EasyGPS format, further modification of the
        data is necessary before it can be viewed in ArcMAP.

7. **Open the data in Microsoft Excel:**
   a.   To format the data in preparation for input into ArcMAP, Microsoft Excel will be used. Open
        Microsoft Excel (*Start, All Programs, Microsoft Office, Microsoft Excel 2010*).
   b.   In the top left corner, click on [File icon] . Then, choose "*Open*".
   c.   In the drop-down box to the right of the File Name box, select "All Files" in order to find the
        .gpx file of interest.
   d.   Open the *GPSpoints.gpx* file you created previously.
   e.   A dialog box will open that asks, "……*Do you want to open the file now*?" Select <Yes>.
   f.   Select "*As an XML table*" from the popup window. Then, click <Ok>,

g. Another dialog box will open that asks, "…..*Do you want to continue adding this schema to your workbook*?" Select <Yes>. Then, choose <Ok>.

8. **Format the data in Microsoft Excel:**

a. The latitude and longitude coordinates of your waypoints are stored in this spreadsheet (scroll to the right to see them). The very top set of coordinates (in the first row) represent the range of latitude and longitude that all of your coordinates fall within. Ignore this first row. Your coordinates start with the second row.

b. Notice that in addition to latitude and longitude columns (lat, lon), there is also a column for elevation (ele), date and time (time), and the name of the waypoint (name). Because the .gpx format is not well formatted, we need to copy only the data we need from this file and paste it into a new clean excel spreadsheet (see below).

- With the data open in Excel (from the last step) open another new empty Excel spreadsheet. To do this, click on , then "*New*", then double-click on "*Blank Workbook*".

- In the new empty Excel spreadsheet, create a field header (name) titled "LAT" in cell B1 and "LONG" in cell C1.

- Copy the latitude and longitude coordinate columns with the coordinate data and paste them into the new empty Excel spreadsheet under the appropriate LAT and LONG columns.

- In cell A1, create a field heading titled, "FID". Copy the column in the .gpx file with the waypoint names "*name*" data and paste it into the new empty Excel spreadsheet under the FID column.

- In addition, create additional field headings for each of the attributes that you recorded in the table on page #1 (name them: DESCR, CAMPUS_SIDE, RATING, ELEV).

- Proceed to next page….

- Add in the attribute data within these fields as it corresponds to each waypoint. See the following example:

	A	B	C	D	E	F	G	H
1	FID	LAT	LONG	DESCR	CAMPUS_SIDE	RATING	ELEV	
2	1	32 27 12.32467	-117 56 2.29911	Native Plant Garden	East	E	710	
3	2	32 27 13.21434	-117 56 2.29912	Pine Tree	East	G	721	
4	3	32 27 12.32222	-117 56 2.29913	M Bathroom	West	E	702	
5	4	32 27 12.31231	-117 56 2.29914	Cafeteria	West	G	712	
6	5	32 27 12.37566	-117 56 2.29915	Handicapp Parking	East	F	733	
7	6	32 27 12.38878	-117 56 2.29916	Library Entrance	West	F	740	
8	7	32 27 12.32000	-117 56 2.29917	Quad	West	P	709	
9	8	32 27 12.29887	-117 56 2.29918	W Bathroom	West	P	699	
10	9	32 27 12.31090	-117 56 2.29919	Coke Machine	East	P	714	
11	10	32 27 12.32221	-117 56 2.29920	Newspaper Stand	West	F	717	
12								

9. **Save the newly created Excel spreadsheet in comma-delimited format (.csv):**

   a. Click on , then "Save As", then "Other Formats".

   b. Navigate to your GPS1 folder.

   c. In the "Save As Type" drop-down menu, select "**CSV (Comma-delimited) (*.csv)**" format.

   d. Name the file *GPSpoints*. Click <Save>.

   e. A warning message will be given. Click "OK" on the first warning message.

   f. A second warning message will pop up. Click "YES" on the second warning message.

   g. Close Excel. (***Note***: *when closing Excel you will be asked if you want to save the file yet again. Select "**No**")*

10. **Convert the CSV file into a text file (.txt) in Windows Explorer:**

    a. Open Windows Explorer (either <*Start, All Programs, Accessories, Windows Explorer*> or from the desktop icon, or right-click on and choose Open Windows *Explorer*).

    b. Find the *GPSpoints.csv* file in your GPS1 folder.

    c. To change the file type to a text file, the csv file extension must be visible. If you see "***GPSpoints.csv***", then proceed to step "d." If, however, you see "***GPSpoints***" without the ".csv" extension, then perform the following steps before proceeding….

- In Windows Explorer, choose "*Tools*", then "*Folder Options*".
- Select the "*View*" tab.
- Under "*Advanced Settings*", **un-check** the box next to, "*Hide extensions for known file types*."
- Click <Ok>. Then, proceed to step "d."

d. Single left click on the *GPSpoints.csv* file once to highlight it.

e. Then, single left click on the file a second time. The name will be highlighted so that you can change it.

f. Type over the **.csv** part of the file name, replacing it with "**.txt**".

g. Single left click on the file once again.

h. A notice will ask you if you are sure you want to change it. Choose <Yes>.

i. Your GPS waypoints, now saved in the GPSpoints.txt file, are ready to be displayed in ArcGIS along with other reference data.

11. **Open ArcMap and add in freeway and county data:**

a. Open ArcMap and double-click on "Blank Map".

b. Download the County Boundary Shapefile and the Freeways Shapefile from the Sandag website (www.sandag.org) and save them in your GPS1 folder. (Note: The County data is under the "Jurisdiction" category and the Freeway data is under the "Transportation" category.)

c. Unzip these downloaded files in Windows Explorer.

d. In ArcMap, click on the <Add Data> button and add both the freeways and county shapefiles to the map.

12. **Add the GPSpoints data to ArcMAP:**

a. Because the GPSpoints.txt data file you created is a **text** file (and not an ArcGIS shapefile), it cannot be added into the map in the same way that the freeway and county data was added. Text files are treated as "XY data". Thus, click on "*File*", then "*Add Data*". Choose, "*Add XY Data.*"

b. In the "*Add XY Data*" window, select the GPSpoints.txt file in the "*Choose a table from the map or browse....*" box.

c. Assign LONG to the "*X Field*" and LAT to the "*Y Field*".

d. Also, because this data is not in shapefile format, the spatial information (the metadata about the projection, coordinate system, etc) is not inherently stored within the file. Thus, it is required that the spatial reference information be specified. Select the "*Edit*" button to choose a spatial reference for the input coordinates.

e. In the Spatial Reference Properties box, click on the "*Select*" button.

f. Choose the ***Geographic Coordinate Systems*** folder.

g. Choose the ***North America*** folder.

h. Scroll to and select the datum that you collected the waypoints in *(hint: if you can't remember, see step 2).*

i. Click "*Add*".

j. Then, click "*OK*" three times to finalize the coordinate input. (Yahooooooo!)

13. **Convert your XY points into a point Shapefile:**

a. In the Table of Contents, bring up the context menu for "*GPSpoints.txt Events*".

b. Select "*Data*", then "*Export Data*".

c. Export "*All Features*". Use the same coordinate system as "*this layer's source data*".

d. Under "*Output Feature Class*", navigate to your GPS1 folder.

e. Name the file "*GPSpoints*".

f. Under "*Save as Type*", choose, "*Shapefile*".

g. Click *<Save>*.

h. Click *<Ok>*.

i. When asked, "*Do you want to add the exported data to the map as a layer?*", click *<Yes>*.

j. Notice that in the Table of Contents, you now have two point layers (the <u>GPSpoints.txt Events</u> XY data and the <u>GPSpoints</u> shapefile.)

k. Remove the XY data by right-clicking on it in the Table of Contents and choosing "*Remove*".

14. **Explore the data:**

a. Right-Click on your GPSpoints data layer in the table of contents menu and select Properties.

b. Investigate different ways of labeling and symbolizing your GPS data, the freeway data, and the county data to better visualize the data in combination.

   c. Note that you lose any reference between your points and the other data when zoomed-in up close (at the campus-scale). To fix this problem, imagery can be added into the map. To add in imagery, perform the following steps.

- Click on "*File*", then "*Add Data*", then "*Add Basemap*".
- Select "*Imagery*". Then, click "*Add*".
- Change the symbology of the County layer to "Hollow" so that you can view the imagery in combination with the other data.

   d. Is the location of your points reasonable when compared to their locations on the image?

   e. Use some of the different tools that you have learned about to view and query your data.

   f. Has any new information become available through the visualization and query of your data points in combination with other data in ArcMAP that was not apparent while collecting the data outside?

NOTES: