Exercise 5 – Sampling Design and Uploading Data

Session Objectives - At the conclusion of this session you will be able to:

- ❑ Create systematic and random sampling designs to inventory wildlife populations and their habitats.
- ❑ Upload point, lines and polygon shapefiles into the Garmin Map76CSx.

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Revision:

Software: GME, DNRGPS 6.15, ArcGIS 10, SP5

Directory Path: CSP7101\Exercise5

Datasets: Park_Units.shp, Buildings.shp

MXD: Sample_Design.mxd

Imagery: NAIP_2010.sid (UTM 17, NAD83)

SECTION 1 – Creating Sampling Points, Plots and Transects

You will be asked to generate sampling points, plots or transects across a study area at some time in your career. With the help of ArcGIS and GME (Geospatial Modeling Environment) you can easily create sampling a design for a wide array of inventory and monitoring applications. Best yet, you can then upload this data into your Garmin unit and laydown the sampling design in the field.

All data are located in the Exercise5 folder unless otherwise stated.

TASK 1: Create a Stratified Random Sample of Points

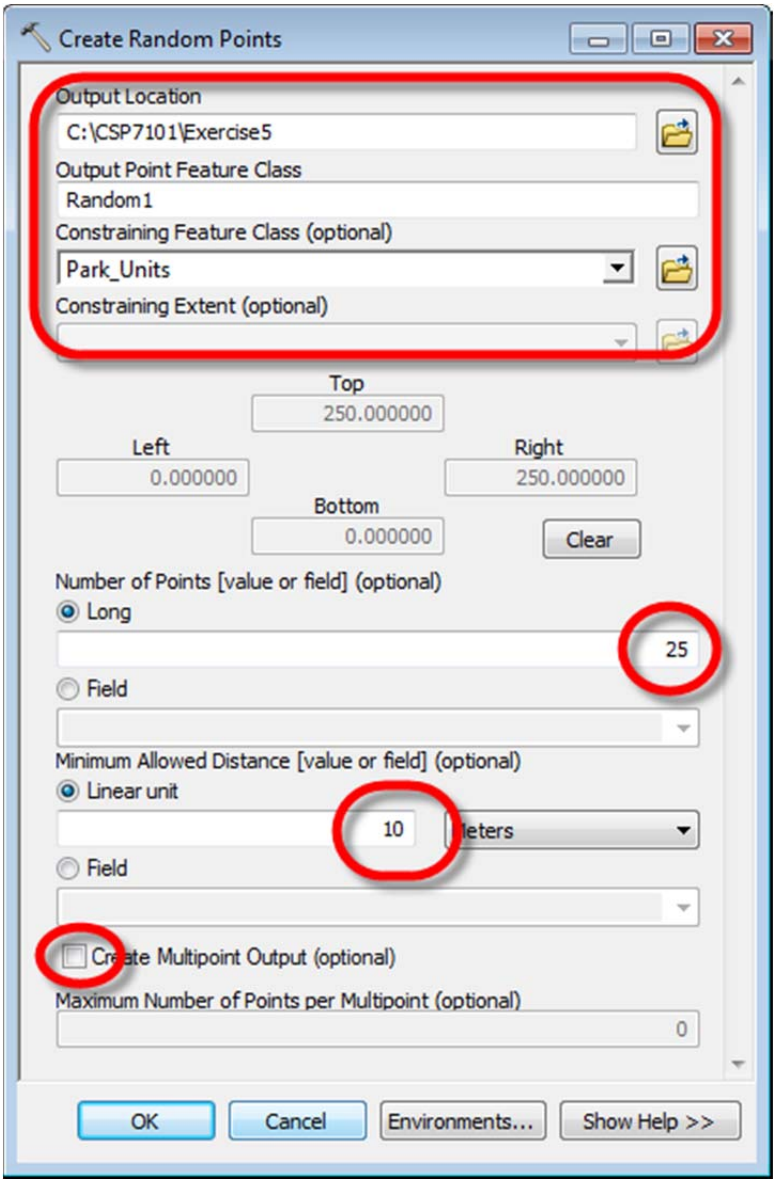
1. Launch ArcMap and open the **Sampling_Design.mxd** map document.

2. Create a stratified random sample of points within the park management units.

   - From ArcToolbox on the side bar open the Create Random Points tool (Data Management Tools > Feature Class). Fill in the fields as shown here and click OK.

   - The **Random1** shapefile will automatically appear in your Table of Contents (TOC).

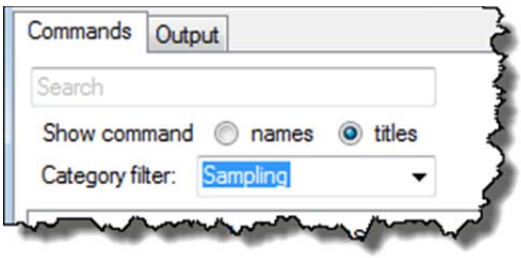
   - Notice how the data were automatically stratified within each park unit/polygon. If you wanted only 25 sampling points throughout the entire park, how would you do this?



3. Repeat the process and create a second layer, but this time change the number of random points and spacing to something different. Name the shapefile **Random2**. NOTE: you will get an error message if the inter-point spacing (i.e., minimum allowed distance) is too large for the number of random points you want.

4. Next, add in the Building shapefile. Let's use the Building polygon layer to restrict where the random samples can occur. We don't want to place random samples on locations that are unsuitable.

   - Launch GME (Geospatial Modeling Environment) from the desktop. Select the <u>titles</u> radio button and change the Category filter to **Sampling**.

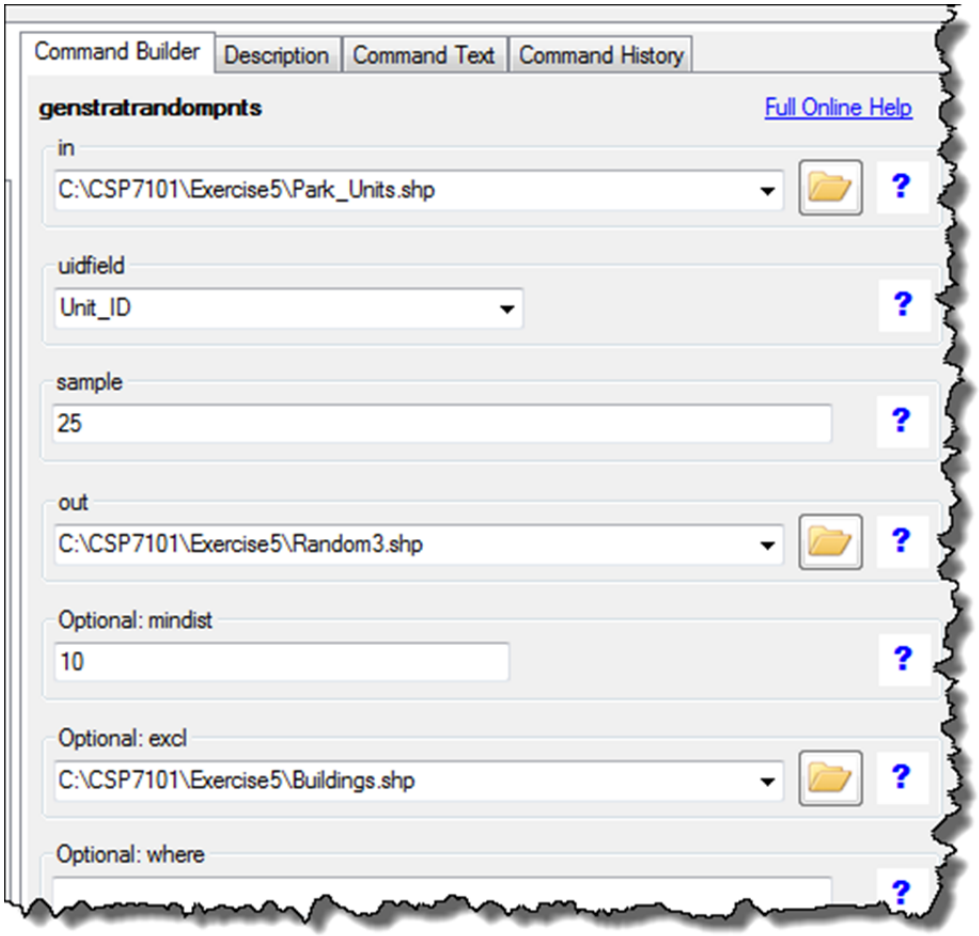


   - Let's create another stratified random sample of points, but this time exclude the locations where the buildings occur. Select the **Generate Stratified Random Points** command. NOTE: the Generate Random Points command does not stratify. So if you want the points to be randomly distributed throughout the park as a whole, then this is the command to use.

   - Fill-in the fields as shown below. Make sure to include the Building shapefile in the **Optional:excl** field. Name the new file **Random3**.

   - The layer will not appear automatically in the TOC. You will need to open ArcCatalog on the side bar, right-click on the Home folder and select Refresh to see the new shapefile. Now, simply drag and drop the layer onto the map to view the random points.

   - Examine the distribution of your **Random3** points. Did any overlay the buildings?



<u>TASK 2</u>: Create a Sampling Grid

1. Remove the Building and random point layers from the TOC.

2. Create a 100 meter x 100 meter square grid.

   - Minimize ArcMap, and re-open GME. Select **Generate Regular Points in Polygon**.

   - Select the Park_Units polygon for the “in” field, and use 100 meters for both the “xdist” and “ydist” fields.

   - Name the output **Grid100**.

   - Add the **Grid100** to the TOC from ArcCatalog. Remember to right-click and select Refresh on the home folder to see any new layers!

- Notice how the points only reside within the Park_Units polygon.

3. Create another 100 meter square grid, but this time make sure the **FALSE** radio button is checked in the "Optional:random" field. This will align the grid to the upper left corner. Name the shapefile **Grid100False.**

4. Compare the results. Which randomization method generated more points in the polygons, TRUE (default) or FALSE method?

EXTRA: If you have time, generate another 100m square point grid using the Create Fishnet Tool in ArcToolbox (Data Management > Feature Class) and compare the results to the GME generated grids. Tip: make sure you have the create label points box checked, or else no points will be generated.

TASK 3: Create Sampling Plots

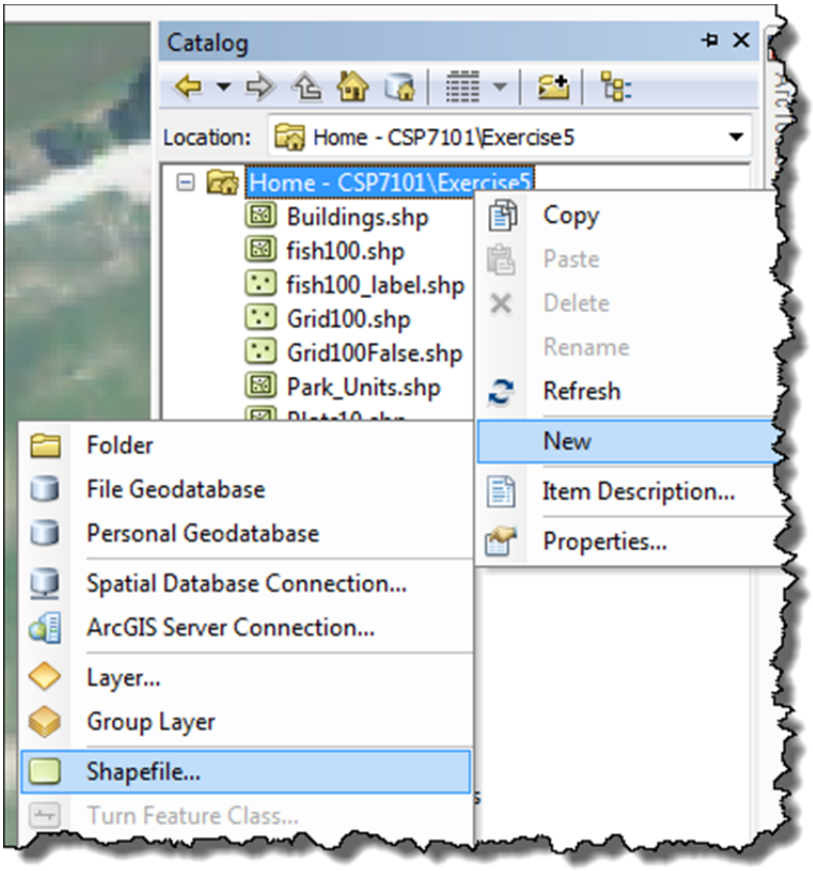
Once you created your random points or point grid, it's common that the sampling strategy requires an area to be sampled at those point locations. Estimating percent cover of plant species, for example, is commonly done within a square frame known as a quadrat. These quadrats are small, ½ to 1 meter square, and although we can easily create them using the Generate Shapes command in GME, it would be rather pointless to upload such small quadrats into our Gamin unit for field use. Just bring the real quadrat out to the field and navigate to the sampling points.

However, when you want to create a large plot with a specific dimension and sample within the plot, then GIS and GPS can help. Why take the tape measure in the field when you have the plots and sample points uploaded into the Garmin unit?

1. We're going to create a 100 x 100 meter square plot in ArcMap using common editing techniques. First, let's start with a clean slate. Select all the layers in the TOC except the NAIP_2010.sid imagery, right-click and select remove.

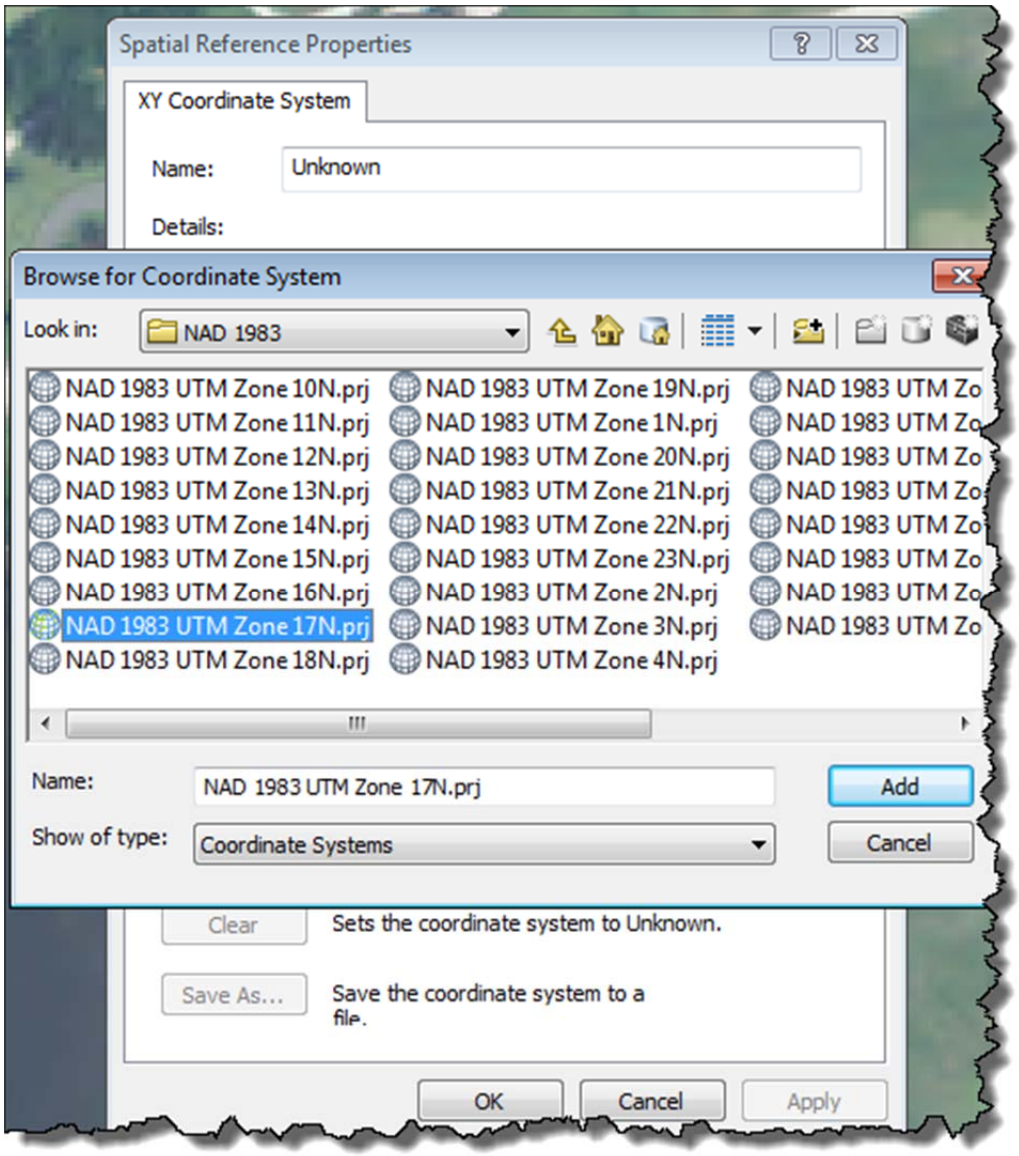
2. Next, create a new polygon shapefile.

   - Open ArcCatalog from the sidebar. Right-click on the Home folder and select **New > Shapefile**.



- Name the shapefile **Sampling_Frame** and change the Feature Type to Polygon.

- <u>This is a very important step!</u> Click the [Edit...] button and then the [Select...] button to browse through the projected coordinate system list to select the appropriate projected coordinate system. Click **Add**, **OK** and **OK** when done.

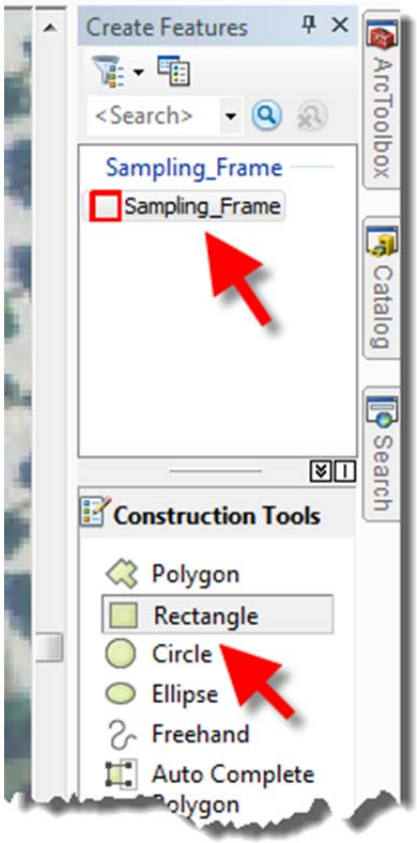


- The Sampling_Frame layer will automatically be added to the TOC. Change the symbology to no color, increase the line size to 2 and change the color to red.

3. Start an editing session by selecting the drop-down arrow on the **Editor Toolbar** and select **Start Editing**. The Create Features dialog will appear on the right-hand side to the screen.

- Zoom into the main field in Riverside Park.

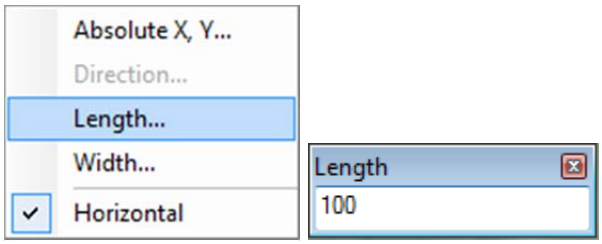
- Select **Sampling_Frame** in the Create Features dialog to initiate editing, and then select the Rectangle Construction Tool.



- Hover over the map with your mouse. You should now see that your arrow has turned into a "+" symbol with a small box in the bottom right corner.

- Left-mouse click on the map to create the first corner of the plot. Move your mouse down, <u>right-mouse</u> click and select Horizontal.

- Right-mouse click again, and select Length. Type in 100 and hit the enter key.



- Right-mouse click one more time, and select Width. Type in 100 and hit the enter key. You should now have a 100 meter square plot.

- If you wanted to move the plot, make sure the plot is still selected (i.e., highlighted in light blue) and simply use the Editor Tool arrow on the Editor Toolbar to select the plot. Hold down the left-mouse button and drag the plot to another location.

- To complete the plot and save it, simply select the drop-down arrow on the Editor Toolbar and select **Stop Editing** and **Yes** to save your edits.

4. Use GME to create 20 random points within the new **Sampling_Frame** polygon. Have the points be least 10 meters apart from each other. Name the output **Sample_Sites**.

5. Finally, add labels to the **Sample_Sites** point layer.

   - Add the **Sample_Sites** layer to the TOC. Right-click on the layer and select Label Features. We need to point to the right field in our attribute table to get the correct labels.

   - Right-click on the **Sample_Sites** layer and select Properties all the way at the bottom of the menu. Click on the Labels tab and change the Label Field to **PNTID**. When we upload this layer into our Garmin Unit (Section 2), these labels will carry over.

   - Your screen should look similar to the one below.

<u>TASK 4</u>: Create Sampling Transects

In this last section were going to create another shapefile from scratch. We'll then digitize 100 meter long polylines (i.e., transects) and generate systematic points along these transects. This sampling design is often used for bird point count transects and point-line-intercept vegetation surveys.

1. To create a new <u>polyline</u> shapefile in the Exercise5 folder (the Home folder) and name it **Transect100**. NOTE: A polyline is a line with 2 or more points/vertices.

   - Click the **Edit** button to assign a datum and coordinate system.

   - Select the [Import...] button and browse to the **Exercise5** folder. Select **Sampling_Frame.shp** and click [Add] and **OK**.

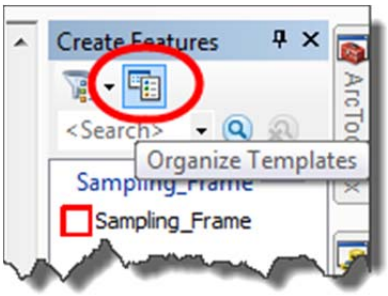
- Click **OK** to finish the process. **Transect100** will appear in the TOC automatically.

2. Change the symbology of the line to better see the line as it's digitized on the Bing map. I chose the Highway Ramp symbol.

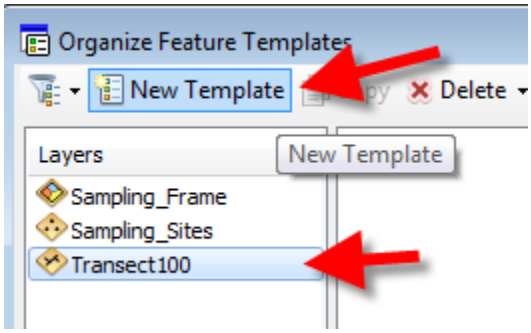
3. Start an editing session from in the Editor Toolbar.

4. Notice that the Transect100 layer is not available for editing in the Create Features dialog. We need to add the new layer to our Create Features template.

- To do this, simply select the Organize Templates button.



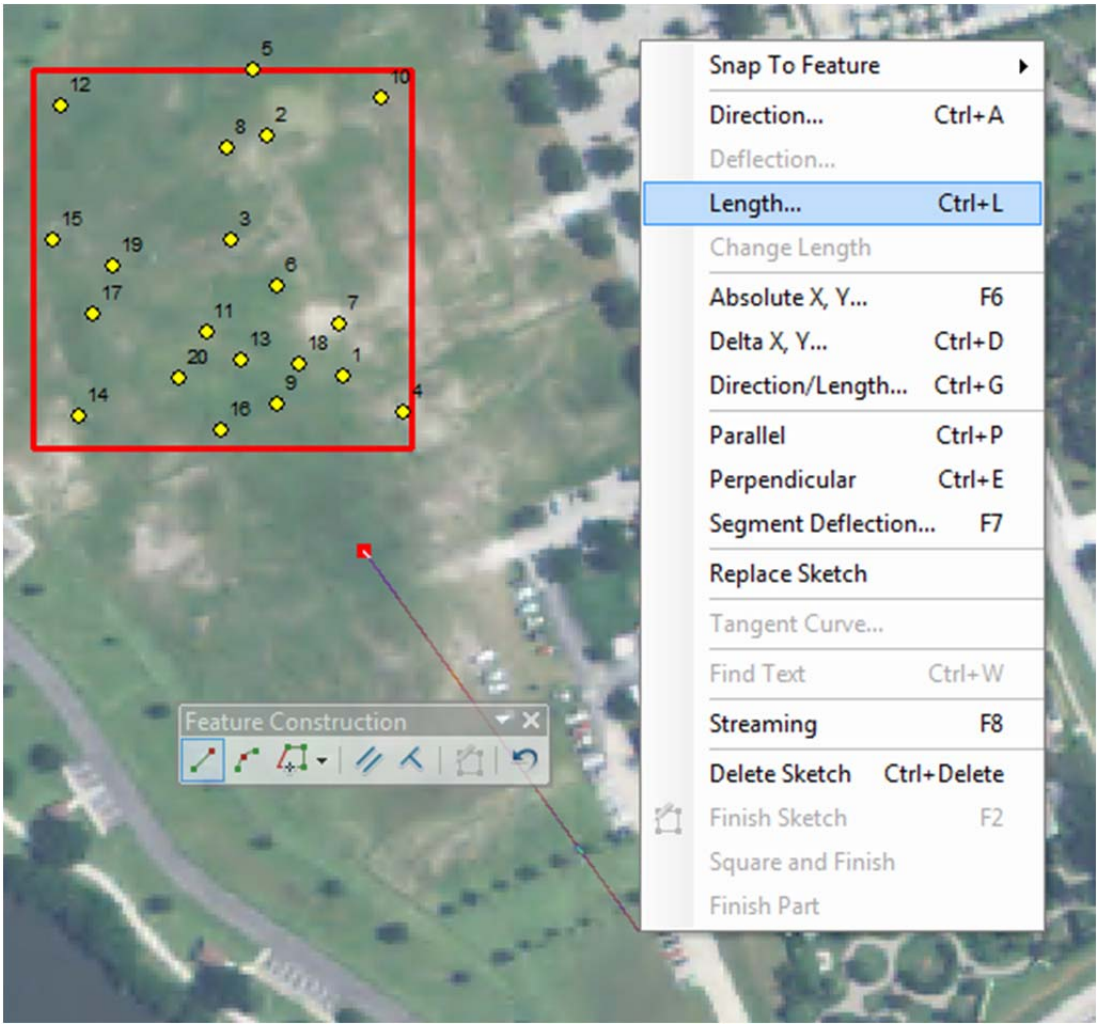
- Next, select the **Transect100** layer and click New Template, and Finish.



5. OK, lets create a 100 meter long transect.

- Select the **Transect100** layer in the new template and left mouse click on the map to start the polyline.

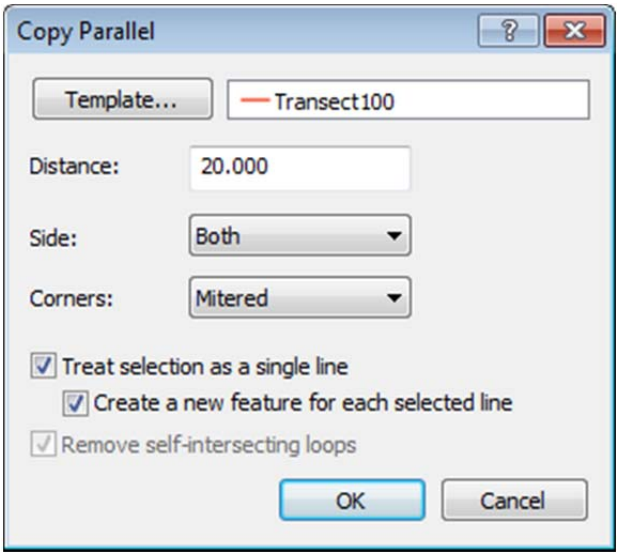
- Drag the mouse down and right-mouse click. Select Length in the pop-up menu. Type 100 and hit Enter on the keyboard.



- Drag the mouse in the direction you want the transect follow and left-mouse click to create the second point. Click the Finish Sketch button on the Feature Construction Toolbar, and you're done.

6. Make two more 100 meter transects that run parallel to the first using the Editor Toolbar.

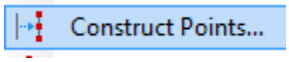
   - Click on the Editor button on the Editor Toolbar and select Copy Parallel.
   - Use a 20 meter distance shown below and click OK. You should now have 3 transects, each one paralleling the other at a 20 meter distance.



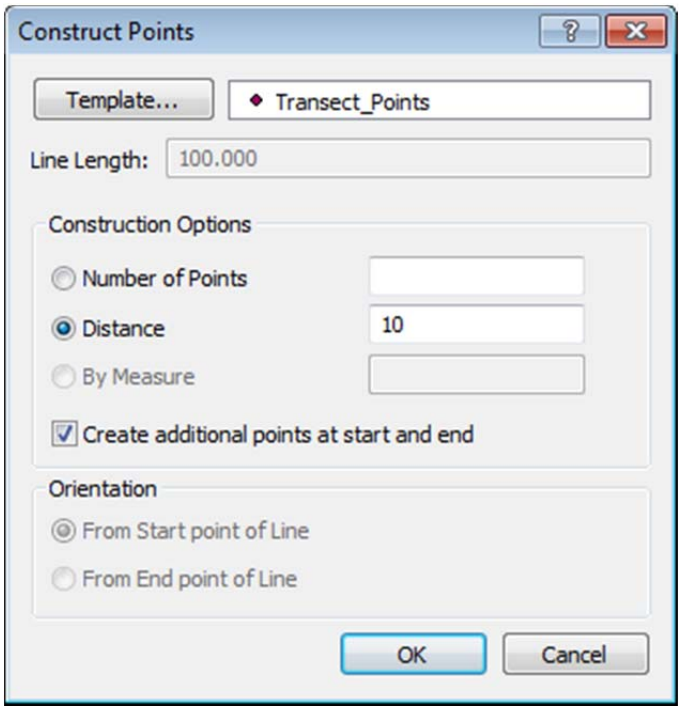
   - Stop editing and save edits.

7. Finally, we're going to add sampling points at regular intervals along each transect.

   - First, create another new point shapefile and name it **Transect_Points**.
   - Start a new editing session.
   - Create a new template so the **Transect_Points** layer appears in the Create Features dialog, like we did in step 4 above.
   - Use the Editor Tool arrow to select one of the transects.
   - Click on the Editor button and select **Construct Points**.



- Create a point every 10 meters, starting from the beginning of the transect. See the example below.



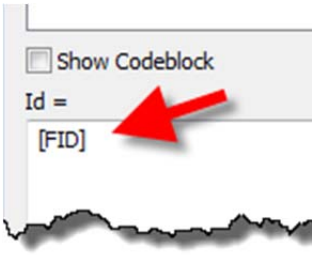
- Repeat this process for the other two transects.

8. Add labels to the **Transect_Points** layer. Notice that all the labels are 0, this is because the **Id** field in the attribute table is all zeros. Let's change this to sequential numbers.

- Right-click on the layer in the TOC and open the Attribute table.

- Right-click on the **Id** field header and select Field Calculator.

- Next, double click on the FID field to add it to the code below and click OK.



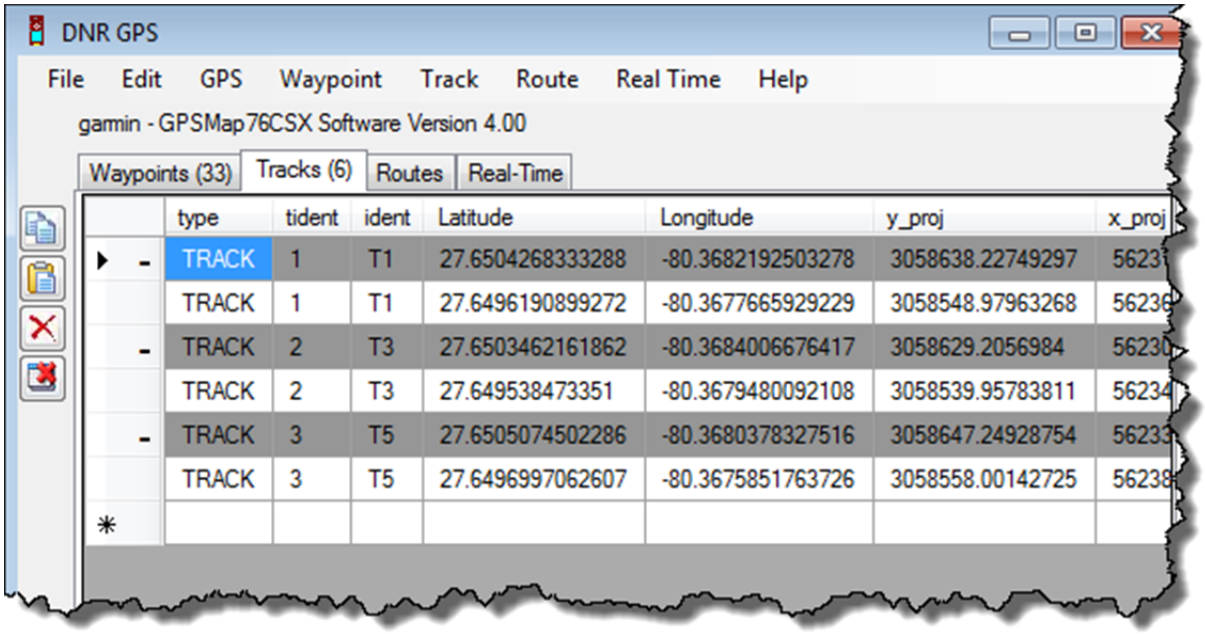
- Close the attributes table. Stop editing and Save edits.

9. Save the map document (MXD) and close ArcMap.

SECTION 2 – Uploading the Data into the Garmin Map76CSx

In this section you will be using DNRGPS to upload the last two shapefiles you just created and saved in the Exercise5 folder (**Transect100** and **Transect_Points**).

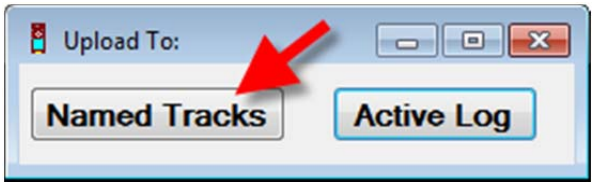
1. Delete all the data on your GPS unit first before you upload any new data.
    - Turn on your GPS unit and go to the Altimeter Page from the Main Menu.
    - Select the Menu button once to bring-up the page specific menu.
    - Select Reset on the list, then scroll down to Select All, then scroll down and hit Apply. This will remove all waypoints and tracks in once fell-swoop.
2. Attach you're Garmin unit to the computer via the USB cable.
3. Launch DNRGPS from the desktop.
4. Load both shapefiles at once by Selecting File > Load From > File from the main menu.
    - Browse to the Exercise5 folder, select both shapefiles and click OPEN.
    - Click OK to accept Id as the IDENT field for both files. You screen should look similar to the one below.



type	tident	ident	Latitude	Longitude	y_proj	x_proj
TRACK	1	T1	27.6504268333288	-80.3682192503278	3058638.22749297	5623
TRACK	1	T1	27.6496190899272	-80.3677665929229	3058548.97963268	5623
TRACK	2	T3	27.6503462161862	-80.3684006676417	3058629.2056984	5623
TRACK	2	T3	27.649538473351	-80.3679480092108	3058539.95783811	5623
TRACK	3	T5	27.6505074502286	-80.3680378327516	3058647.24928754	5623
TRACK	3	T5	27.6496997062607	-80.3675851763726	3058558.00142725	5623

5. Next, select GPS on the main menu and click **Upload All**.

    - Select Named Tracks and OK. You could go either way, but it would be better to have the tracks saved separately for easier access.



6. Go to the Map Page on the GPS unit to view your data. This is always a good idea before you head-out into the field. Make sure your data is on the GPS unit, and in a way that you expected it to be. Garmin loves to connect uploaded polygons because it treats lines and polygons as tracks.