Guidelines for Building US National Grid Polygons with ArcGIS 10.2.2

These guidelines assume a basic understanding of using ArcGIS, including opening attribute tables, removing and adding fields, and calculating geometry. These guidelines also only work when building polygons that are wholly contained within one UTM zone! If creating polygons that span UTM zones, please see http://www.floridadisaster.org/gis/USNG/Documents/Creating_USNG%20Polygons.pdf.

1. Prior to building USNG polygons, tools are required to build identical sized grids and calculate X,Y coordinates for center points of polygons.

   Numerous tools are available to accomplish these tasks – like XTools, Military Analyst, and other extensions to ArcGIS. The following tool and calculation can be performed directly in ArcMap 10.2.2.

   **Create Fishnet** - Toolboxes\System Toolboxes\Data Management Tools.tbx\Feature Class\Create Fishnet
   **Calculate Geometry** – calculation performed in attribute table for X & Y Coordinates

2. Open ArcGIS, load some boundary data, i.e. County or City boundaries and zoom to your area of interest.

3. Click View, pull down and select **Data Frame Properties**, click the **Coordinate System** tab, under **Select a coordinate system**: click on **Predefined**, navigate through the folders to **Project Coordinate Systems, UTM, NAD 1983**, and select the appropriate UTM Zone.
4. Determine boundary extent to add into **Create Fishnet** tool. Write down your findings. Place the cursor on the lower, left corner of a bounding polygon for which you would like to create a grid. Note the coordinates displayed in the lower, right corner of the ArcMap window…in this example, to create a 1,000 meter grid, 509671.15 meters should be rounded **DOWN** to 509000 and 2869417.46 meters should be rounded **DOWN** to 2869000.

5. Also place the cursor on the upper, right corner of a bounding polygon for which you would like to create a grid, and make a note of these coordinates… in this example, to create a 1,000 meter grid, 593213.51 meters should be rounded **UP** 594000 and 2915058.18 meters should be rounded **UP** to 2916000.
6. Subtract the lower, left coordinates from the upper, right coordinates, and divide by the units of your proposed grid to determine the number of rows and columns required for the grid.

<table>
<thead>
<tr>
<th>Columns</th>
<th>Rows</th>
</tr>
</thead>
<tbody>
<tr>
<td>594000</td>
<td>2916000</td>
</tr>
<tr>
<td>- 509000</td>
<td>- 2869000</td>
</tr>
<tr>
<td>85000/1000 = 85</td>
<td>47000/1000 = 47</td>
</tr>
</tbody>
</table>

7. Open **Create Fishnet** tool located here: Toolboxes\System Toolboxes\Data Management Tools.tbx\Feature Class\Create Fishnet or simply use the Search button and type in Fishnet to find the tool.

8. Specify the output shapefile name. Enter the X and Y coordinates for the lower, left corner as the Fishnet Origin Coordinate. Copy the same Fishnet Origin Coordinate in for the Y-Axis Coordinate, but add 10 to the Y Coordinate. Specify the size of each grid cell. Enter the number of rows and columns based on your calculations. Select Polygon geometry type. Click **OK**.
9. Open the Attribute Table for the new grid, and add the following fields…

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>LENGTH</th>
<th>PRECISION</th>
<th>SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>X_LWRLFT</td>
<td>Double</td>
<td>18</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Y_LWRLFT</td>
<td>Double</td>
<td>18</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>GRID100K</td>
<td>Text</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRID1000M*</td>
<td>Text</td>
<td>5**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LABEL</td>
<td>Text</td>
<td>7***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X_COORD</td>
<td>Double</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Y_COORD</td>
<td>Double</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

* Change field name to match your particular grid, like GRID100M for 100 meter.
** Add 2 more spaces if creating 100 meter grid.
*** Add 3 more spaces if creating 10 meter grid.

For the Id field, simply delete the field once you have added in the above fields. The resulting table should look as follows…
10. Calculate the **X_COORD** and **Y_COORD** fields. In the Attribute Table, right click on the **X_COORD** field and select **Calculate Geometry**. For **Property**, select **X Coordinate of Centroid**. For **Units**, select **Meters**. Make sure your coordinate system is correct for the UTM Zone where your grid is located. Repeat this step for the **Y_COORD** field where **Property** is **Y Coordinate of Centroid** and **Units** is **Meters**.

Your Attribute Table should look as follows…
11. Calculate \( X_{LWRLFT} \) and \( Y_{LWRLFT} \) values as follows…

1000m Grid - \([XCOORD]\) - 500
100m Grid - \([XCOORD]\) - 50

12. After these calculations, the XCOORD and YCOORD fields may be deleted by right-clicking on each field and selecting Delete Field.
13. Calculate field GRID100K performing a selection using the 100,000 meter statewide grid can be downloaded at http://www.floridadisaster.org/gis/USNG.

Do this for all tiles in the grid.

14. Calculate field GRID1000M or GRID100M as follows…

1000m Grid - Mid ([X_LWRLFT], 2, 2) + " " + Mid ([Y_LWRLFT], 3, 2)

100m Grid - Mid ([X_LWRLFT], 2, 3) + " " + Mid ([Y_LWRLFT], 3, 3)
15. Calculate \textbf{LABEL} field as follows…

\begin{align*}
1000\text{m Grid} & : [\text{GRID100K}] + " " + \text{Mid}(\text{[X\_LWRLFT]}, 2, 2) + \text{Mid}(\text{[Y\_LWRLFT]}, 3, 2) \\
100\text{m Grid} & : [\text{GRID100K}] + " " + \text{Mid}(\text{[X\_LWRLFT]}, 2, 3) + \text{Mid}(\text{[Y\_LWRLFT]}, 3, 3)
\end{align*}

Your Attribute Table should look as follows…

16. Create metadata, zip, and ship!

Please submit grids you construct, and send corrections, questions, or comments to:

Richard Butgereit  
richard.butgereit@em.myflorida.com  
850-413-9907