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**.
Building USNG Polygons

Create Fishnet

Output Feature Class:
S:\USP\USNG\600w_GRID_Test.shp

Template Extent (optional)

Top
Left
Right
Bottom

Fishnet Origin Coordinate
X Coordinate
Y Coordinate
509000285400

Y-Value Coordinate
X Coordinate
Y Coordinate
509000285490

Cell Size Width
1000

Cell Size Height
2000

Number of Rows
47

Number of Columns
55

Opposite corner of Fishnet (optional)
X Coordinate
Y Coordinate

Create Label Points (optional)

Geometry Type (optional)
POLYGON

Template Extent (optional)
Specify the extent of the fishnet. The extent can be entered by specifying the coordinates or using a template dataset.

- Left—XMin value
- Right—XMax value
- Bottom—YMin value
- Top—YMax value
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 \texttt{X\_LWRLFT} and \texttt{Y\_LWRLFT} values as follows…

\texttt{1000m Grid - [XCOORD] - 500}
\texttt{100m Grid - [XCOORD] - 50}

\texttt{[YCOORD] - 500}
\texttt{[YCOORD] - 50}

12. After these calculations, the \texttt{XCOORD} and \texttt{YCOORD} fields may be deleted by right-clicking on each field and selecting \textbf{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](http://www.floridadisaster.org/gis/USNG).

Do this for all tiles in the grid.

14. Calculate field **GRID100M** 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 **LABEL** field as follows…

\[
1000m \text{ Grid} - [\text{GRID100K}] + "" + \text{Mid} ([X_{LWRLFT}], 2, 2) + \text{Mid} ([Y_{LWRLFT}], 3, 2)
\]

\[
100m \text{ Grid} - [\text{GRID100K}] + "" + \text{Mid} ([X_{LWRLFT}], 2, 3) + \text{Mid} ([Y_{LWRLFT}], 3, 3)
\]

Your Attribute Table should look as follows…

16. Create metadata, zip, and ship!