

METHODS FOR GEOREFERENCING ADDRESSES ON SCANNED MAPS

by Kim Ness, updated 27 July 2013.

Files Needed for Georeferencing:

- **Scanned map** to georeference (as TIF or JPEG)
- **Boundary shapefile** (Fond du Lac county for example) with spatial attributes in Universal Transverse Mercator (UTM) projection (this file already has geographic coordinates; you will extract coordinates of your scanned map from this spatial layer).
- **Point shapefile** to record your new geographic points. These points will be the georeferenced x's from your scanned map, which now will have geographic coordinates.

Steps for Georeferencing

1. Scan the map you want to georeference (e.g. to extract geographic coordinates for an x on a map for example) as a picture file (not PDF), preferably as GIFF or JPEG. (TIF records more detail than a JPEG). Save this file to a location easily remembered and accessed to add in ArcMap.

2. Open ArcMap and add all three files listed above.
 - a. When you add your scanned map you will receive a warning that says UNKNOWN SPATIAL REFERENCE (Figure 1). This is because your scanned map does not yet have coordinates (aka "a spatial reference") yet. This is what you'll be assigning to it.

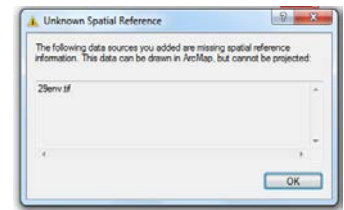


Figure 1: Error messages for unknown spatial reference.

- b. ArcMap may also ask you "Would you like to create pyramids?" Select NO, since you will be adding new coordinate information to this dataset (Figure 2).

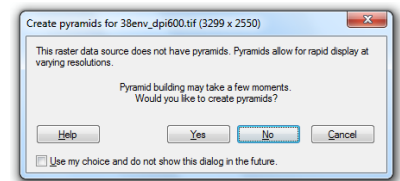


Figure 2: Option to build pyramids.

3. Open the Georeferencing toolbar to view your scanned map.
 - a. Go to the interface heading and open CUSTOMIZE-> EXTENSIONS...
 - b. Ensure that SPATIAL ANALYST is checked. If so, then open CUSTOMIZE->TOOLBARS->GEOREFERENCING. A toolbar will appear labeled Georeferencing with a header "Layer..."
 - c. Ensure that your scanned map is listed in this toolbar window (see screenshot 2) and click on the Georeferencing toolbar and select FIT TO DISPLAY (Figure 3). This will make the scanned map fit to your window display about the same size as your boundary file.

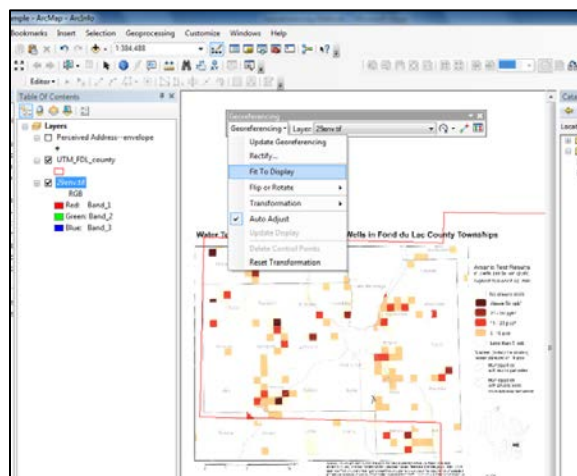


Figure 3: Showing georeferencing toolbar & "Fit to Display".

4. Assign control points to corners of scanned maps and connect to Fond du Lac county border.
 - a. Use the cursor (it looks now like a large “+”) and zoom in to your scanned map 1st to a corner (see screenshot 3). When you click on the corner, a light green “+” will appear on this location as seen in the purple circle (Figure 4).

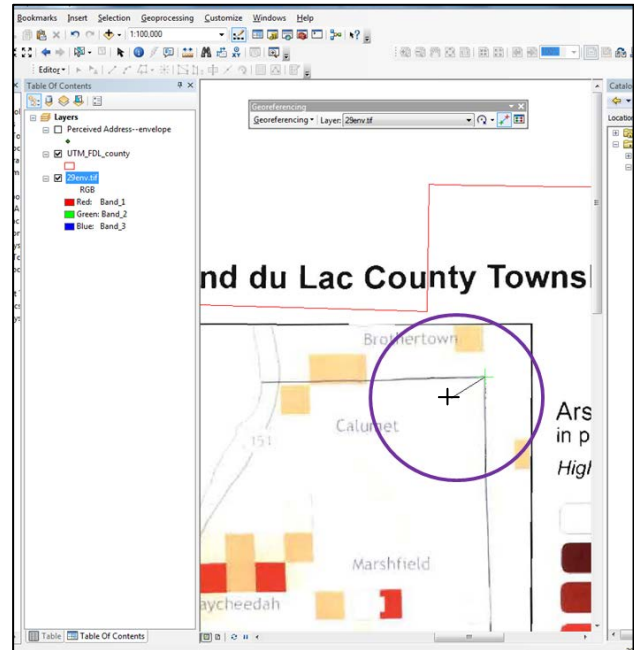


Figure 4: Assigning control points at each corner of map.

- b. Use the cursor again to click on the corner of Fond du Lac’s county border in your scanned map 2nd. This will automatically bring your scanned map and Fond du Lac county border map closer together. Repeat this method with each corner of your scanned map and Fond du Lac county border (Figure 5).

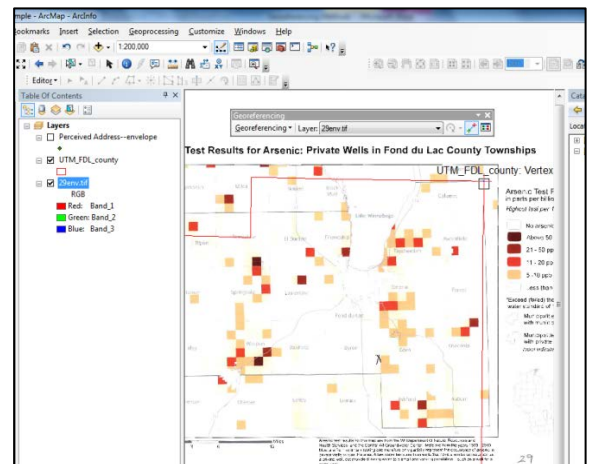


Figure 5: Linking your scanned map to the georeferenced map.

- c. Finally, open the control point file upon the “View Link Table” icon in the Georeferencing toolbar (Figure 6). This table opens and you can view how much error is in your measurements. The RMS Error value is the sum of distances between the *georeferenced* control point from the *mapped point*. When there are 3 control points the RMS Error values are always zero. Error is shown in the purple circle under “Total RMS Error” (this represents the sum of mis-measured points between the scanned map and Fond du Lac border). You want the lowest possible RMS error, anything below 25 for 4 points considered okay.
 - d. Open georeferencing toolbar->UPDATE GEOREFERENCING. This saves the georeferenced coordinates for the scanned map.

Link	X Source	Y Source	X Map	Y Map	Residual
1	8.325867	6.946022	406769.583100	4865611.308100	5.66156
2	0.687902	2.315301	347859.109000	4832890.550900	8.46869
3	0.642209	6.176640	348540.938200	4861959.307800	8.51683
4	8.460704	1.127205	406214.581300	4821761.435000	5.61342

Total RMS Error: 7.20796

Figure 6: Viewing the control point table (“link table”).

5. Create point for X on map.
 - a. Click on point shapefile and check this layer on. Enable the EDITOR toolbar: open interface header CUSTOMIZE->TOOLBARS->EDITOR. A toolbar will appear labeled Editor. Click on this and select EDITOR->START EDITING.
 - b. Zoom into the X on the map. A map scale of between 1:60,000 to 1:25,000 is best (see purple arrow) (Figure 7).

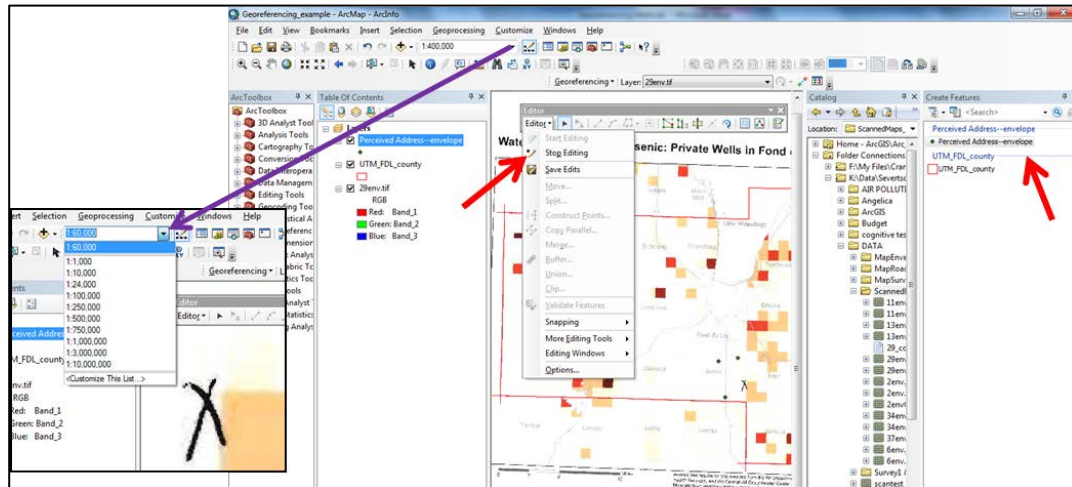






Figure 7: Screenshot of how to collect the center point of the X on georeferenced maps.

- c. Use your cursor to click a point in the middle of the X. Go to EDITOR->SAVE EDITS. (The other green points are other address locations. You can ignore those.)
- d. Below shows examples of the X's as scanned with different levels of dpi all shown at the same scale (1:25,000). It is suggested to zoom out to a scale where you can clearly see a center despite how pixelated the X may appear. With these comparisons in dpi, you can see that depending on how thick the respondent drew the X, the actual center of the X is almost the same with both dpi levels.

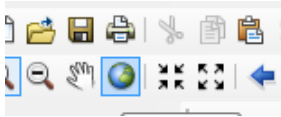
Table 1: Comparison of dots per inch (dpi) for scanned and georeferenced X-location maps.

Scanned X Image	300 dpi	400 dpi
Example X #1		
Example X #2		

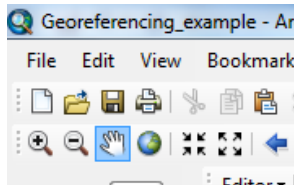
- e. Open attribute table and enter surveyID number into table in highlighted row. In this table, if you have any comments about the X, enter them in Comments column.
 - i. If you want to change this location, right-click the highlighted point and delete. Enter another point on the map; re-enter the surveyID in the table then.
 - f. EDITOR->STOP EDITING.
6. Remove the scanned map and add another map to repeat this procedure.

Quick Arcmap 10.0 Tips

- **Zoom to Layer:** in table of contents, right-click on the layer you want to zoom into and click ZOOM TO LAYER
- **Open Attribute Table:** in table of contents, right-click on the layer you want to view, and click OPEN ATTRIBUTE TABLE
- **Zoom out to full extent:** click the earth button



- **Move the frame within the interface**



- **Identify a specific point/shape/file**

