

Laboratory 0.5: More Fun with Friend Data

1. Ready a new ArcGIS project

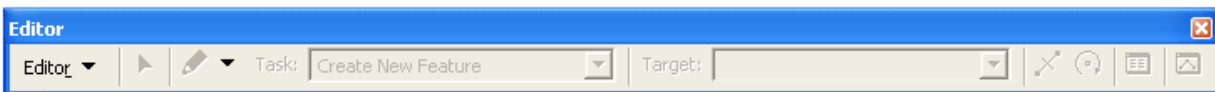
Open up ArcGIS and choose “A new empty map...” Add the “STATES_Projected” layer and your Facebook data to the data frame. If you are given a “Geographic Coordinate Systems Warning”, don’t freak out. Just press the “Close” button for now. The warning is letting you know that the datum used by one layer is different from that of another. While this may cause some important errors in other tasks, our current task is at such a small spatial scale (that of the continental USA) that the datum mismatch won’t affect us significantly. (If you are confused by my use of the word small, please consult http://en.wikipedia.org/wiki/Scale_%28map%29)

Save your project into a new folder called “Lab0p5” in the “GIS” folder on your USB drive by choosing “File->Save” in the main menu bar. Be sure to save your project as frequently as you save any paper you’ve written in Microsoft Word. ArcMap will make you want to cry without “I forgot to save!” problems, so be smart.

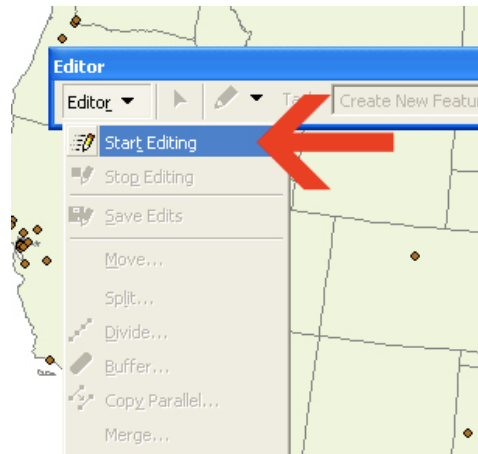
2. Start editing

Unlike any other program I’ve ever seen, ArcGIS has an read-only mode (which is the mode in which you normally work) and an explicit “Edit” mode. One reason they probably do this is that, on the nerdy end of things, the shapefile is not set up for fast and easy editing. Regardless, it’s important to become familiar with this operational dichotomy.

To access “Edit” mode, we’ll first need to activate the “Editor” toolbar. Go to the menu bar and choose “View->Toolbars->Editor”. If “Editor” is already checked, do not select it again; the check means it’s already open. The “Editor” toolbar looks like this (see figure below):



Click on the “Editor” menu in the “Editor” toolbar and choose “Start Editing” (see figure below):



In the resulting dialog, you may be presented with two *directories* and asked which *directory* you wish to edit. A directory is a fancy nerd word for a folder. In ArcGIS, *you can only edit files in one folder (or database) at a time*. Remember what was written in the first lab about ArcGIS being unintuitive? If you are presented with this dialog, choose the folder containing the shapefile with your (or my) Facebook data and click “OK”. Regardless whether or not you got the first window asking about folders, you will get one that warns you about editing in a different coordinate system than that in which the file is stored. Again, the error is not going to be significant for this task. Once you press “OK”, you’ll find that the rest of the “Editor” toolbar is now available for use.

3. Edit attribute data

Go into the attributes table of your Facebook hometown layer (as you did in lab one). Change all the missing values in the “Sex” field into valid “male” or “female” values. You can do this by clicking on each empty cell and entering “male” or “female” into the cell (as you would in Excel). Note that you can’t change attribute values of a shapefile unless you are currently editing the folder in which the shapefile resides. If you used my Facebook data, make up values for every empty “Sex” field. In the “Editor” toolbar under the “Editor” menu, click “Save Edits”.

4. Add new data points

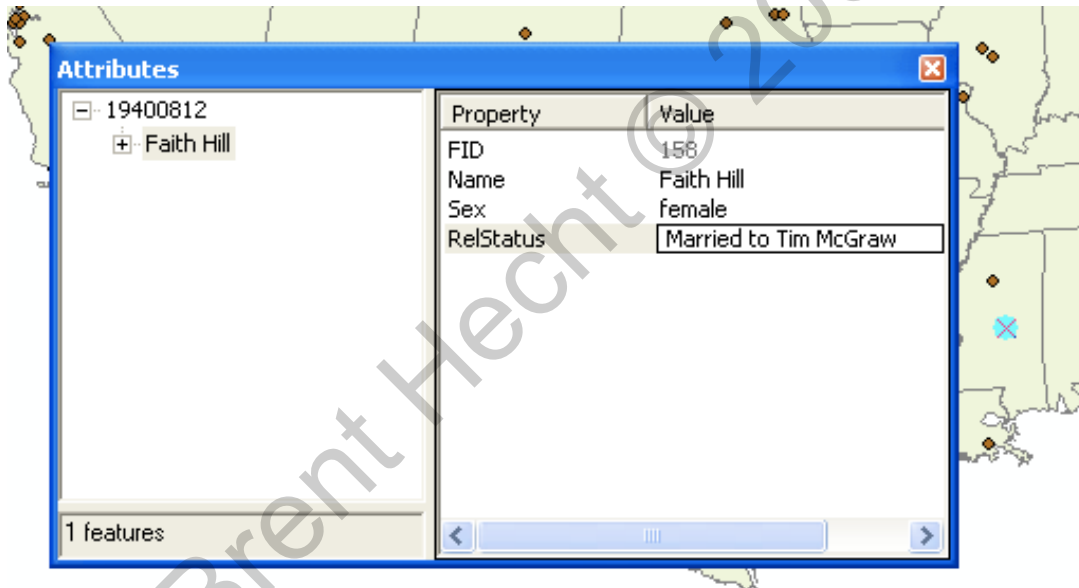
Many of your friends are likely either not on Facebook or did not enter a hometown location on Facebook. If you want to make a complete map of your friends’ hometowns, you’ll need to add the missing values manually. This is, of course, a *very* common task with any spatial data set. For now, let’s just add at least 5 friends. If you’re using my data set, make data for imaginary friends.

In the “Editor” toolbar, make sure “Create New Feature” is selected under the “Task” pop-up menu. Also, open the “Attribute Editor” by clicking the “Attribute” button on the far right of the toolbar (see figure below). Note that the “Attribute” editor from the

“Editor” toolbar is different than the attribute table with which you are already familiar. They accomplish similar tasks, but are optimized for different situations; one is for one-by-one editing, the other for massive editing. Finally, click “Sketch Tool” (see figure below), which is located to the left of the “Task” pop-up menu.



Using the “Sketch Tool” click a location on the map where you have a friend that is not in your data set. You have now created a new point! To edit the attributes of that point, use the “Attribute Editor” window and enter the appropriate values (see figure below). Don’t worry about the “RelStatus” field; just enter a “Sex” value of either “male” or “female”. IMPORTANT: make sure that you keep both lowercase. You’ll see why in a bit. If you’re using your own data, be sure to enter names, too!



If you mess up, you can always change the attributes values in the main attributes table as you did in step three, or select a point using “Edit Tool” (find it on the “Editor” toolbar next to the “Sketch” tool) and change the attribute values.

Be sure to do this for at least five data points. Write down the five or more locations you added in your Word file (**Question 1.1: 10 points**)

Finally, choose “Stop Editing” from the “Editor” toolbar. Be absolutely sure to choose “Save Edits” in the resulting dialog box.

5. Split California

Judging by the amount of “NorCal” and “SoCal” paraphernalia I see walking around campus, I know most of you consider Northern California and its southern counterpart to be distinctly different regions. While you probably know your political energies are best spent elsewhere, for the moment we’re going to indulge in the universal California fantasy: splitting it in two.

In the Editor toolbar, choose “Start Editing” and choose the folder that contains the “STATES_Projected” shapefile (if necessary). Regardless, make sure the “Target” in the “Editor” toolbar is set to “STATES_Projected”. Also, change the “Task” pop-up menu to “Cut Polygon Features” (see figure below).



Now, click on California. It will be selected. Zoom in on California so you can make your very important split with greater precision. The best way to do this is to choose the “Zoom In” button from the “Standard” toolbar and draw a *bounding box* around California. The view will then be matched so that the view *extent* matches the *bounding box*.

Choose the “Sketch Tool” from the “Editor” toolbar as you did previously. Each time you click using this tool, a new *vertex* will be made in a *polyline* that will be used to split the state in half (see below figure). Be sure to start in the Pacific Ocean and end clear into Nevada. You must make sure that all parts of the California polygon appear on one side of the line or the other. When you are done with your line, double-click on the last vertex and the California polygon will be split in half. Once you’re sure you’re clear on the process, go ahead and split the state! Hint: If you mess up with a vertex or the entire split, you can always use the “Edit->Undo” functions. It will let you “take back” a vertex or even the entire split. Becoming familiar with the Undo command in every program (especially ArcGIS) is a great idea.



Examine at the attribute values of the new Californias by clicking on the “Edit” tool in the “Editor” toolbar, selecting each state, and looking in the “Attribute Editor” window. The “Edit” tool is the button to the left of the “Sketch” tool. Note that both polygons still have “California” in the “STATE_NAME” attribute. Using the “Attribute Editor” window, give each of these new states a creative name.

Look at the attribute table again. Now that we’ve split California in two, there is a huge problem with most of the values in the table for the two California rows. What is this problem? (**Question 1.2: 10 points**)

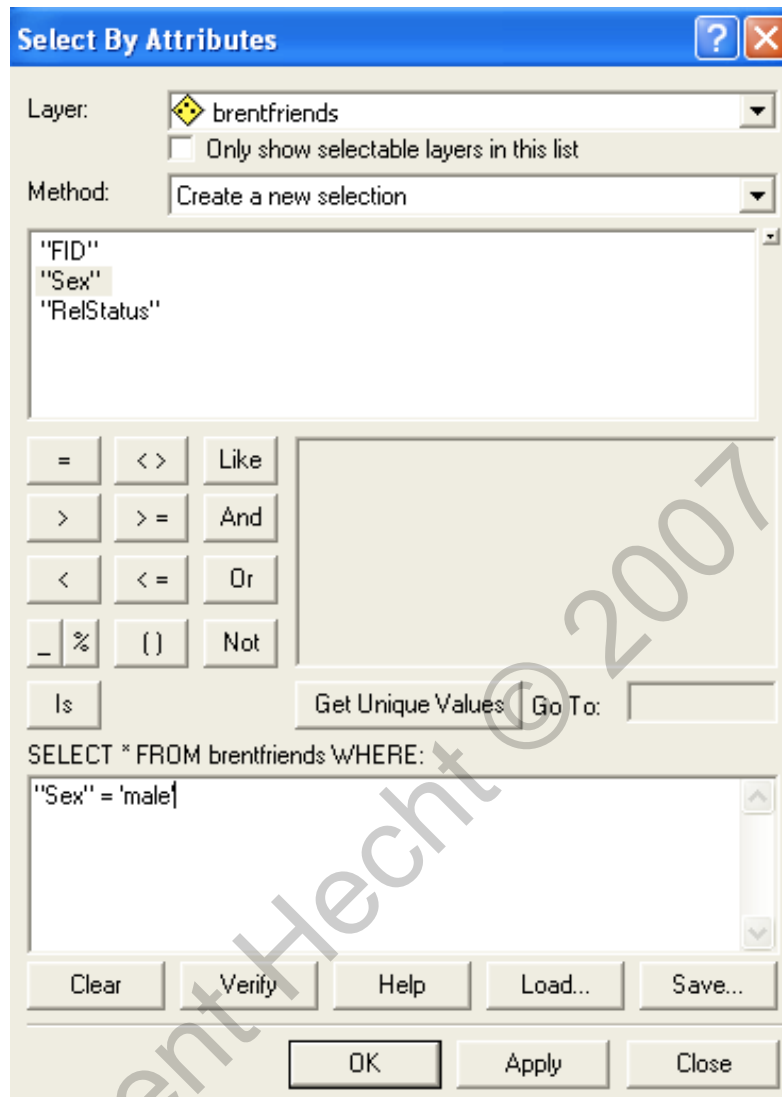
Save your edits and stop editing.

6. Make separate “male” and “female” layers

Note the “Selection” menu in the main menu bar. This menu lets you select different spatial features based either on their spatial location or their attribute values. This is very useful because, once selected, you can perform operations on a subset of a spatial data set. For now, we’re going to just deal with the attribute-based capabilities. Choose “Selection->Select by Attribute...” from the main menu bar. Enter this *code* into the big text box at the bottom.

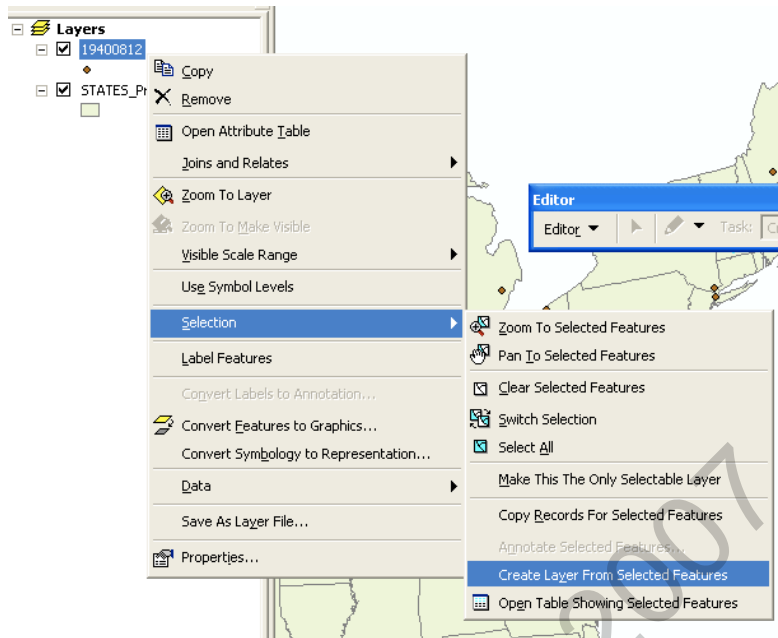
```
"Sex" = 'male'
```

This field is *case-sensitive*. This means that you have to be sure to make certain that the case of every letter is exactly as appears below. (Little do you know, you’ve just entered your first structured query language (SQL) command). Make sure the window looks exactly as follows:

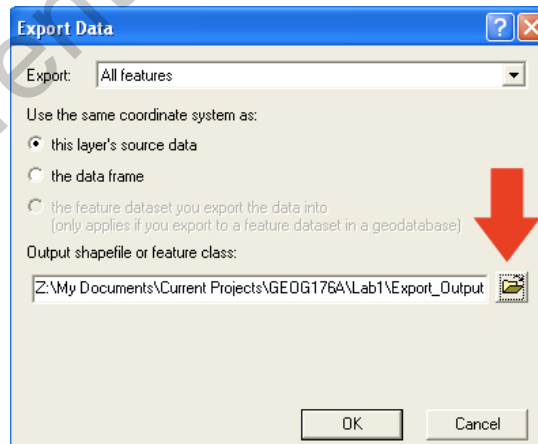


Look at the other attributes of the table. What is another query you could make that does not use the “Sex” attribute? (**Question 1.3: 5 points**)

Hit “OK” and note that all of your (or my) male friends are highlighted. Right click on your Facebook data layer in the “Table of Contents” (a.k.a. “Legend”) pane. Choose the “Selection” submenu and click on “Create Layer From Selected Features” (see figure below).



Note that this operation *does not* make a shapefile of the selected data. It creates an imaginary one that references all the data from the original shapefile. This can be convenient for ephemeral analyses, but for now, we want something more stable (plus, we’re learning about spatial data storage!). To create a real shapefile from this imaginary one, right-click on the layer you just created and this time choose “Data->Export Data...”. In the subsequent window, be sure to save the exported data to your “Lab2” folder and name it “male_friends.shp” by clicking on the “Browse” button as shown (see figure below). Hit “OK” when you are finished.



Finally, remove the original selected layer (the layer should have the name “[YOUR FACEBOOK USER ID NUMBER] selected”) by right-clicking on the layer and choosing “Remove”.

Now, repeat the process (minus answering the question) for your female friends and create a layer called “female_friends.shp”.

When you are done, go to the main menu and choose “Selection->Clear Selected Features”.

7. Use Spatial Joins to Create Friend Aggregate Data Sets

Now, we’re going to do a point-to-polygon spatial join (actually, two of them). Although not technically required by the file format, 99.99999 percent of all shapefiles contain a single shape type. In nearly all cases the type is point, polyline, or polygon. Which of the layers in your current data frame are point layers and which are polygon layers? Can you think of an example of a polyline (i.e. line-based) feature? Hint: Google Maps is full of them! What is the difference between a line and a polyline? **(Question 1.4: 5 points)**

Right-click on the “STATES_Projected” layer and choose “Joins and Relates->Join...”. In the first pop-up menu, select “Join data from another layer based on spatial location”. In step one, choose “female_friends”. Finally, click on the browse button (looks the same as it did in the step four) and save the file as “female_friends_aggregated_by_state.shp” in your “Lab2” folder. You can ignore the rest of the settings; you’ll learn about those in other GIS labs. Press “OK”.

A new layer called “female_friends_aggregated_by_state” should be added to your data frame. This layer has all the same spatial features and attributes of “STATES_Projected”, except a “Count_” field should be added. This attribute field contains the number of points that fell within each polygon of “STATES_Projected”. In other words, it has a count of your female friend hometown locations. Note that both your northern and your southern Californias each have *their own* count!

Repeat the above for the file containing *all* of your friends (the original shapefile that you edited). Make a choropleth map of the resulting generated shapefile and export it to PDF. Remember all of the steps we performed in lab 1. You’ll be turning in this map, so name it “map1.pdf”. This map will be worth 20 points **(Map 1: 20 points)**.

Extra credit: Make more California regions and redo the aggregation. Hint: try making a Central California region and a Mojave region. Be sure to zoom in on California in your resulting map, as that’s what the focus of this map is. **(Map 1x: 5 points)**

8. Think about what you just did

It’s always important to put every task you do in these labs in context. In other words, always ask, “What’s the big picture here?”. To help you practice doing this, categorize steps 3 -7 into the two sub-objectives for part one of the lab, as listed at the beginning of the lab. **(Question 1.5: 10 points)**