TEXAS A&M UNIVERSITY

GEOG 232 Lab 5

Thematic Map Symbols

Learning Objectives

- Symbolize map features
- Create map layouts for presenting spatial data
- Work with legends
- Create your own thematic map

Deliverables: What should be submitted to Canvas

A PDF containing the following:

1. Maps created from parts 1 and 2
2. Answers to questions in part 2

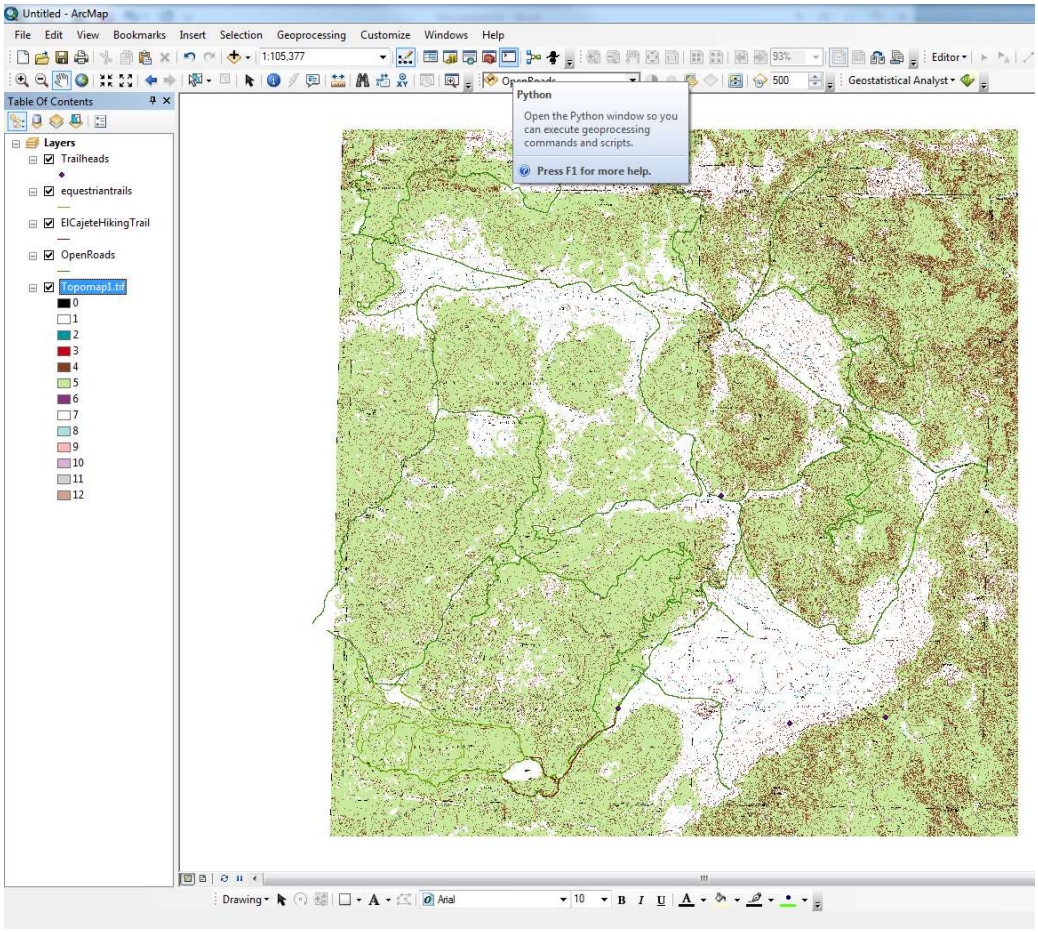
Introduction

In this lab, you will create two maps related to the Valles Caldera Nature Preserve in New Mexico. In Part 1, you will follow instructions to create a map of the El Cajete Hiking Trail to gain familiarity with using some simple symbolization procedures such as how to change the color and size of marker (point) symbols, and how to change the thickness of line symbols. In Part 2, you will symbolize at least five data sets from the Part 2 folder and design your own thematic map. Your map should use symbols that are intuitive to understand. ArcMap provides default symbols designed to handle the most common features on maps as well as 20,000 additional symbols. Things to remember while doing this lab:

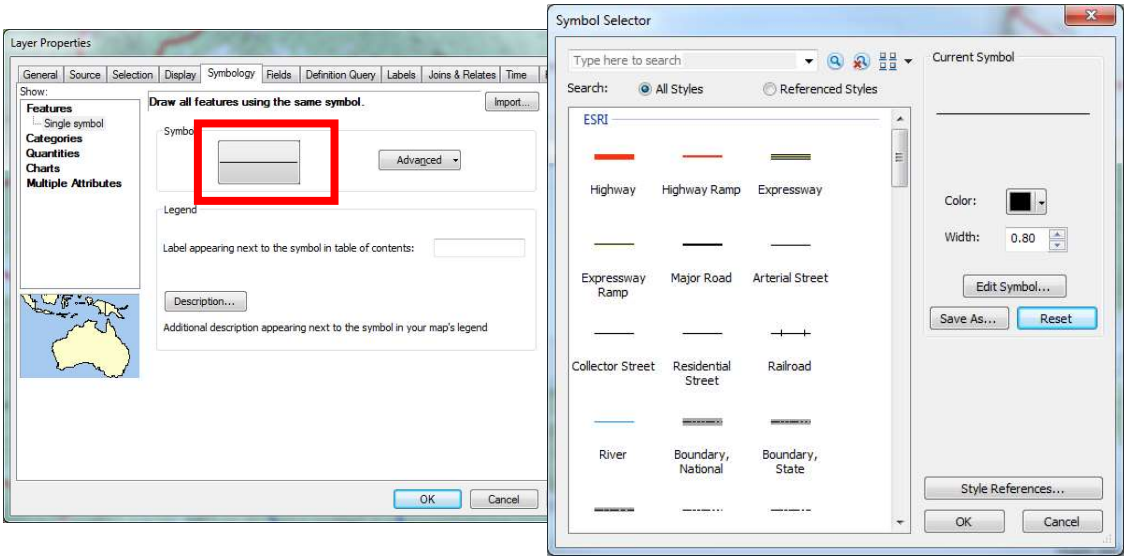
- **Order of data layers:** The order of your layers in the Table of Contents is very important when creating maps. Depending on the order in which you added the data, your states may be "on top" of your counties - you can change this by clicking and dragging data layers "on top" of other data layers.
- **Symbology:** For each layer, you will need to access the symbology tab (right click -> Properties) to change the display. From here, you can decide to display the data as Features (single symbol), Categories (unique values, unique values many fields, or match to symbols in a field), Quantities (graduated colors, graduated symbols, proportional symbols), or Multiple attributes (quantity by category). You can also decide what color(s) and symbol(s) to use to represent the data.

Part 1

1. Open ArcMap.
2. Add the following shapefiles from your **Lab05_Part1** data folder:
   - *Trailheads.shp*
   - *Equestriantrails.shp*
   - *ElCajeteHikingTrail.shp,*
   - *OpenRoads.shp*
   - *Topomap1.tif*



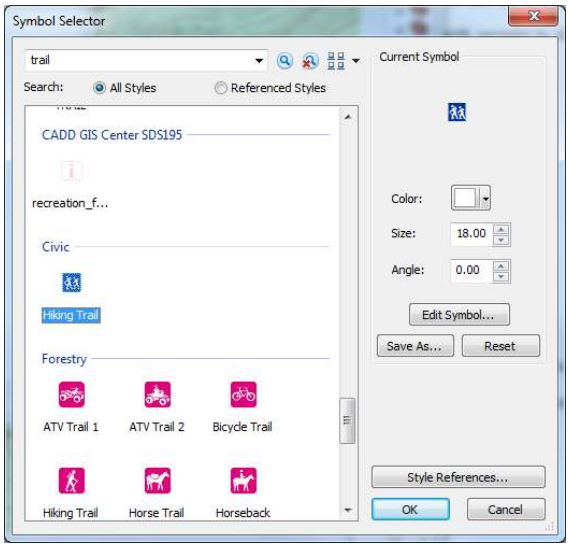
3. Zoom to the *ElCajeteHikingTrail.shp,* so that the data view is more focused on that area.
4. Open the **ElCajeteHikingTrail** layer properties dialog box.
5. Click on the Symbology tab.
   Change the symbology of the trail by clicking on the symbol in the dialog box. The Symbol Selector dialog opens. This dialog allows you to select a different symbol or change the color or size of the current symbol.



- Scroll down until your find the Dashed 4:4 Line option. Select that option.
- Change the color of the symbol to Cretan Blue by clicking on the black **Color:** box. If you hover over the colors with your mouse, their names will appear.
- Change the line width to 3, then click **OK.**

6. Change the symbology of the line features in the **OpenRoads.** Following the same steps as above, change the line symbol to the following.
    - Choose the Highway option.
    - Change the color to Black.
    - Change the line width to 2, then click **OK.**

7. Make sure the Hiking trail layer is above the Open Roads trail.
8. Change the symbology of the line features in the **equestraintrails**.
    - Click on the **Style Reference** button in the bottom right of the window and check the **Forestry** checkbox.
    - Click Ok.
    - Choose the AV2 Manmade Feature option.
    - Change the color to Mars Red.
    - Change the line width to 14, then click **OK.**

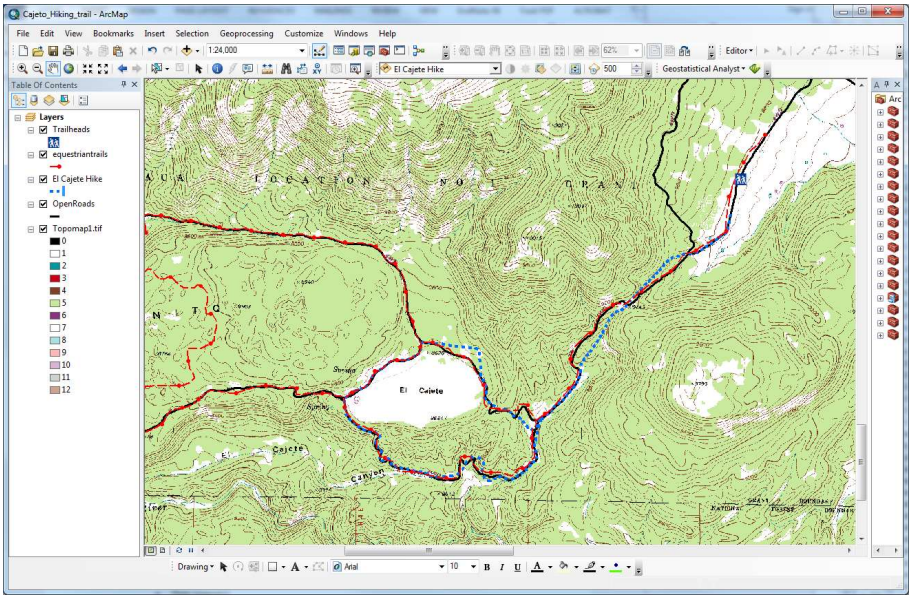


9. Change the symbology of the line features in the **Trailheads.**
    - In the search box, do a search for "Trail."
    - Find the Civic subsection.
    - Select the Hiking Trail symbol.

- Click Ok.

10. The Topomap.tif already has predetermined symbology, continue with the lab.
11. Save your map as Cajeto_Hiking_Trail.mxd

Your data view should now look like this



Presenting Data with Adjusted Symbology

When you make a map in ArcMap, you use the **Layout View** to place map elements on a virtual page for printing or publication, which you should be familiar with.

In the following sections of this unit we illustrate how to create a layout using your Cajeto_Hiking_Trail.mxd that you created in previously.

Switch to Layout View

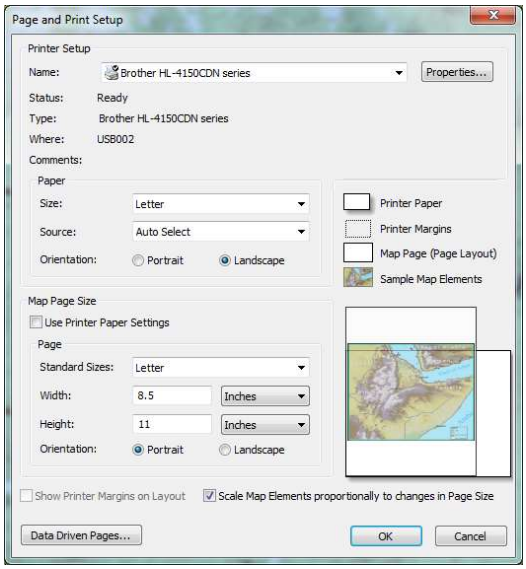
1. Click **View** in the menu bar and then **Layout View**.
2. Alternatively, you can switch to Layout View using the **Layout View** button located in the lower left portion of the view window. A data frame, displaying data from the data view, is automatically added to the new layout.

Set the Layout Page Size and Orientation

The page size can be adjusted at any point in creating a Layout; however, if the page size or orientation is changed after elements have been placed in the layout, they will have to be moved and/or resized. Therefore, the ***first thing*** you should do when creating a layout is to set the page size and orientation! For this map you are going to customize the Page and Print Setup to select settings that are independent of any printer.

1. Go to **File □ Page and Print Setup**
2. Set the **Page Orientation** to **Landscape** (under Map Page Size on the left side of the window). Make sure **Width** is set to 11 inches and **Height** to 8.5 inches.
3. Under the **Map Page Size** make sure the **Use Printer Paper Settings** option is **unchecked** and **Scale Map Elements proportionally to changes in Page Size** is **checked**.

   The **Page and Print Setup** dialog should now look like this□



4. Click **OK**.
5. Notice that the data frame is now placed within a digital representation of the map page. Along the top and left sides of the map are **rulers** showing 11 inches (top) and 8.5 inches (left side).

The Layout Toolbar

The **Layout** toolbar, shown below, is enabled when the layout view is active**.** (If the toolbar appears and is floating it can be docked anywhere along the frame). The **Layout** toolbar affects only the layout and is only enabled in layout view.

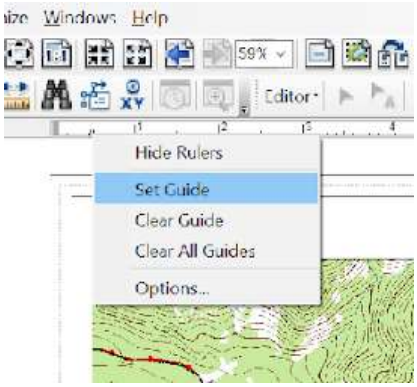
It is important to pay attention to which toolbar you are using. The **Tools** toolbar is always active and can be used in either the data or layout view. If you unintentionally use controls from the **Tools** toolbar to change the map extent in the data frame you can always use the **Go Back To Previous Extent** button to revert back to the desired extent.

Move and Resize a Data Frame in a Layout

1. Insert a Neatline to help guide your layout for your map. Go to Insert□ Neatline.
2. Use the "Place inside margins" option with a gap of 3.
3. Click Ok.
4. Using the **Select Elements** tool  from the **Tools** toolbar, click on the data frame in the layout. The frame is highlighted with a perforated edge with eight square "handles". The handles can be used to resize the map.
5. Resize the map so that it takes up most of the layout and lines up correctly with the Neatline. Leave space at the top for a Title.

6. Use the Pan and Zoom tools in the **Tools** toolbar to re-center the map over the hiking trails.

Using guides to position the data frame and other map elements (optional)



Guides are straight lines that you can use in layout view to align map elements on the page. Although you can see guides on the virtual page in layout view, they won't show up when you print your map. Guides help you to align map elements more precisely. To create a guide, hover the mouse over one of the rulers in the position you want to create a guide. To place a guide, right click on the ruler at the position you would like to create a guide and select Set Guide. To clear a guide, right click on the guide and select Clear Guide.

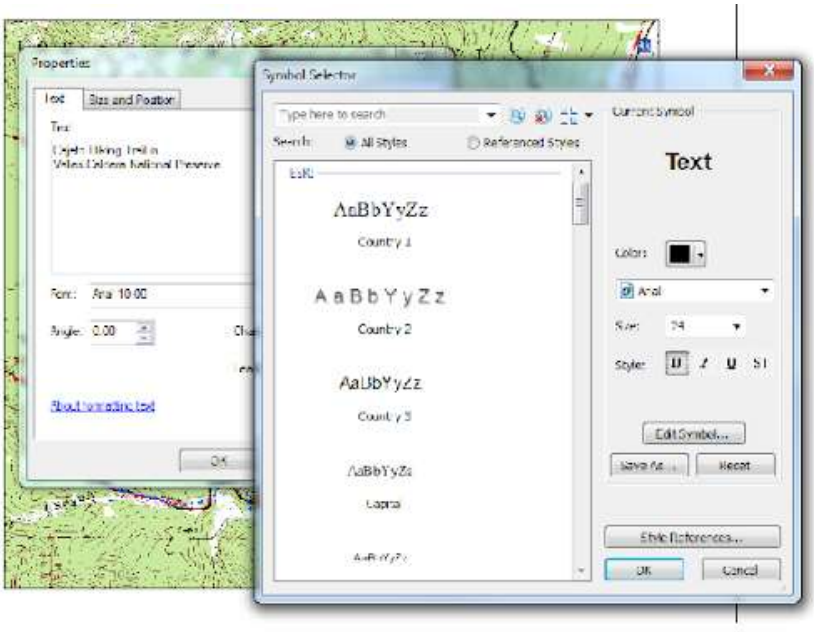
1. If you want, you can create guides to position the data frame within the neatline. The spacing between the neatline and the edge of the data frame is up to you.
2. You can also use guides to position other map elements such as the title, north arrow, scale bar, and legend.

Insert a Title

The **Insert** menu is used to add graphic elements to your layout.

1. Click on the **Insert** menu in the menu bar and select **Text**. A little Text box block will appear in the layout.

   NOTE - Try to avoid using the **Title** option. The text in that box is much harder to customize.



2. Type **El Cajete Hiking Trail in Valles Caldera National Preserve** and click OK.
3. **Double-click** now on the title to open the title **Properties** dialog.
4. Edit the title text to create a two-line title (i.e., place the pointer at the end of the word "in" and press the <Enter> key.)
5. Press the **Change Symbol** button in the dialog window and make the font Arial Narrow, with a font size **24**.

6. Click **OK**.
7. Move it to the approximate location on the layout where you want it. Remember from Lab 1 that you can align thing to the Center using the Align to Margins option.

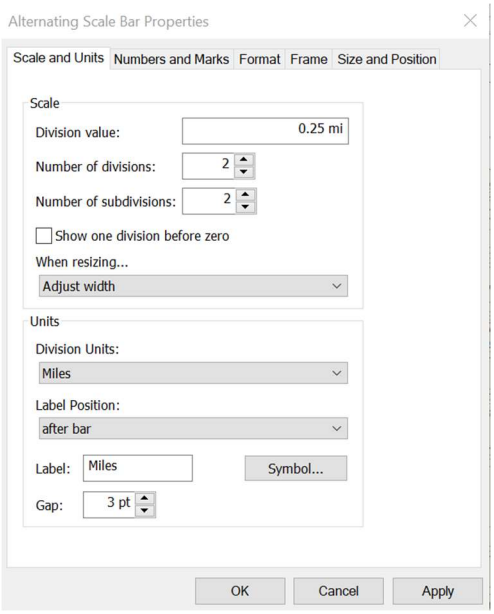
Insert a North Arrow

1. Click on the **Insert** menu item and choose **North Arrow**. The **North Arrow Selector** dialog box appears with a selection of North Arrow styles.
2. Select a North Arrow
3. Click **OK** to add the selected north arrow to your layout.
4. With the North Arrow selected, click and drag the North Arrow graphic to an appropriate location within the layout. If necessary, use the square handles at the corners to resize the graphic. Your north Arrow should never be larger than about 48 pt font on a map this size.

   NOTE - Double clicking on the graphic will open a Properties dialog window with options to type the size, change the color, or select another North Arrow style.

4. Click in the layout margin (i.e., in white space) to unselect elements.

Insert a Scale Bar



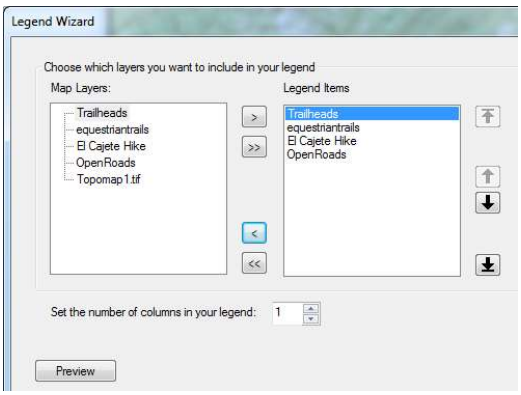
1. From the **Insert** menu choose **Scale Bar**. The **Scale Bar Selector** dialog opens with several Scale Bar styles.
2. Select the **Alternating Scale Bar 1** and click the **Properties** button at the bottom right of the dialog window.
3. In the **Scale Bar** dialog, on the **Scale and Units** tab set the **Number of divisions** to **2** and **Number of subdivisions** to **2**
4. Ensure the **Division Units** is set to **Miles**.
5. Under **When Resizing…** select **Adjust width** and under **Scale** enter **0.25 mi** for **Division value**.

   Now, if you resize the map, the scale bar will preserve both the number of divisions and the 1-mile division value. The default Division Units is meters because the map units for the data frame are meters. Changing the scale bar units to miles does not affect the map units setting.

6. Click **OK**
7. Move the scale bar graphic to an appropriate place in the layout.
8. To set the text font size for the scale bar, double-click on it to open the **Alternating Scale Bar Properties** dialog, select the **Format** tab and select **Arial Narrow** from the **Font** dropdown list.

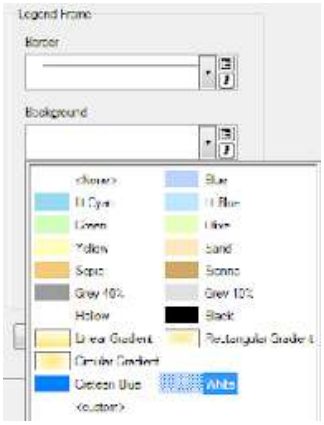
9. Under the Text: area, click on Symbol□Edit Symbol□ Mask.
10. Give the scale bar a 1 pt **Halo**. This will allow the text associated with the scale bar to stand out from the rest of the map.
11. Click **OK** to apply the changes.

Insert a Legend



1. From the **Insert** menu, choose **Legend**.
2. The **Legend Wizard** dialog appears with the option to choose which layers you want to include in your legend. By default, only the layers that are turned on in the data frame are listed under **Legend Items**.
3. Add or Remove layers that you feel should not be included in the legend.

   To add or remove layers, first highlight the layer(s) in the appropriate column, that is **Map Layers** if you want to add a layer(s) to the legend and **Legend Items** if you want to remove a layer(s). Then click on the right arrow button  or left arrow button  respectively, to add or remove those layers from the legend.

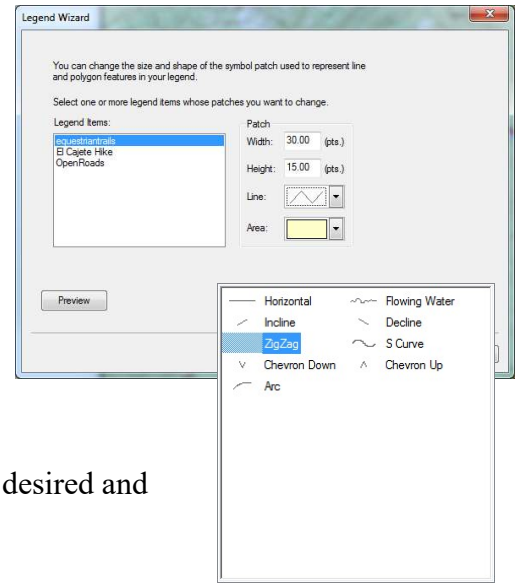


4. Press the **Next** button at the bottom of the dialog to continue to the next step.
5. The **Legend Title** dialog allows you to enter a title for your legend; this dialog also allows you to set **Legend Title font properties** and the **Title Justification**.
6. Leave the default and click on the **Next**.

The **Legend Frame** dialog allows you to add a **Border**, **Background** color or shading, and/or **Drop Shadow** to the legend.

7. Choose the 0.5pt Border, and the White Background options.
8. Set the Gap to 5.
9. Click **Next**.

The next dialog controls the size and shape of the symbols used to represent line and polygon features in the legend.



10. Select the *equestriantrails* and click on the **Line:** and **Area:** dropdown lists.

    Notice that there are other symbols available for the legend patches.

    To select a different legend patch for a layer select the layer on the left under **Legend Items:** and then select the desired legend patch from either the **Line:** or **Area:** dropdown lists.

11. Change legend patches for each of the legend items as desired and click **Next**.

The last dialog in the **Legend Wizard** allows you to control the spacing between parts of the legend. For this legend, accept the default settings.

12. Click **Finish** and the legend will appear in the layout.

Fix up the Legend

If you look at the Legend, you will see that the names match the Headings you have for your layers in your Table of Contents. These should be fixed to help clean up the map.

1. Rename the layers so that they are grammatically correct and are not single words.
2. Resize the legend so that the text is readable.

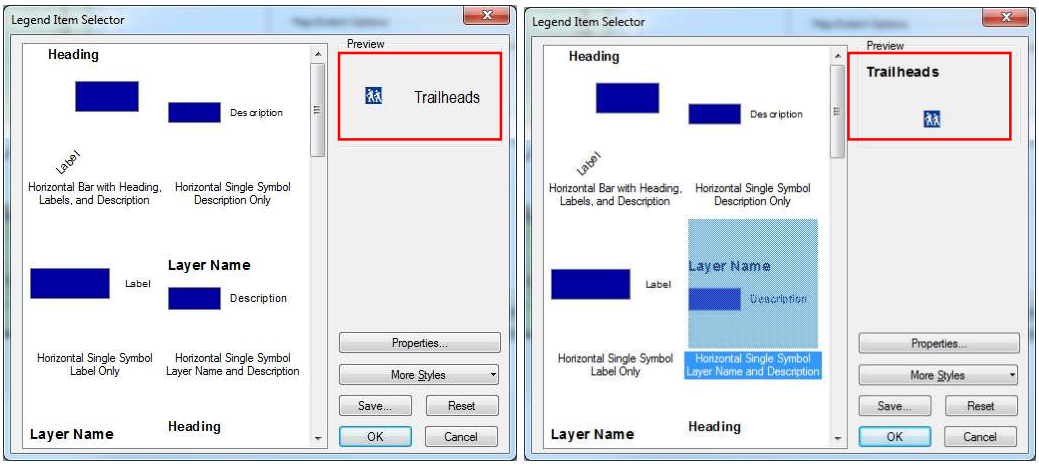
When you have data that has more than one type, you may have to do additional formatting in the legend to make the text look cleaner.

3. In order to do this you would double click on the Legend box.
4. Click on the Items Tab.

    Notice that there is a list of your layers that are included in your legend.

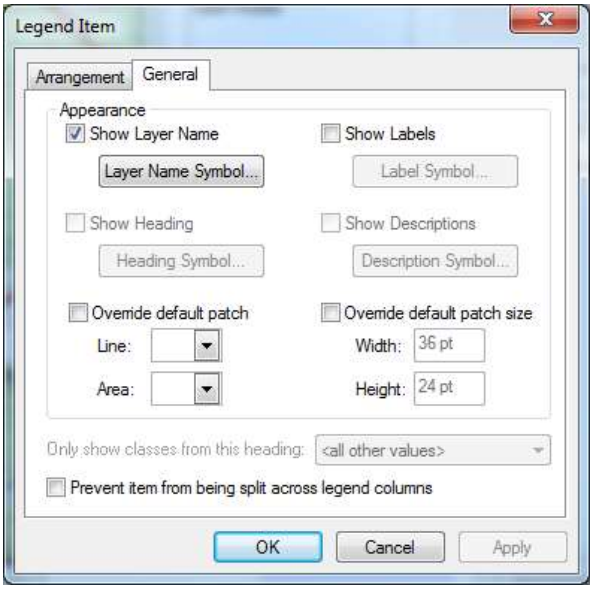
5. Click on Trailheads and then click the Style button below it.

    This brings up a new window called the Legend Item Selector. This is where you can change symbology for the item heading name, layer name or description name.



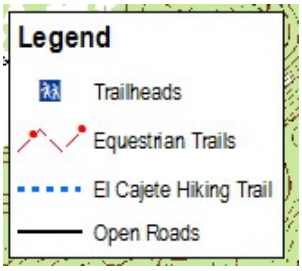
Choosing different description styles will result in different looks for that layer in the legend, as shown in the Preview: section s above. Notice the difference between the two.

6. In order to adjust the Heading or Layer text, you would click on the **Properties** button.



This is where you would change text sizes and formatting for individual layer headings or layer names.

7. Leave all of the defaults for the legend.
8. Click **OK** to close all the Legend dialog boxes.



Your legend should now look something like this □

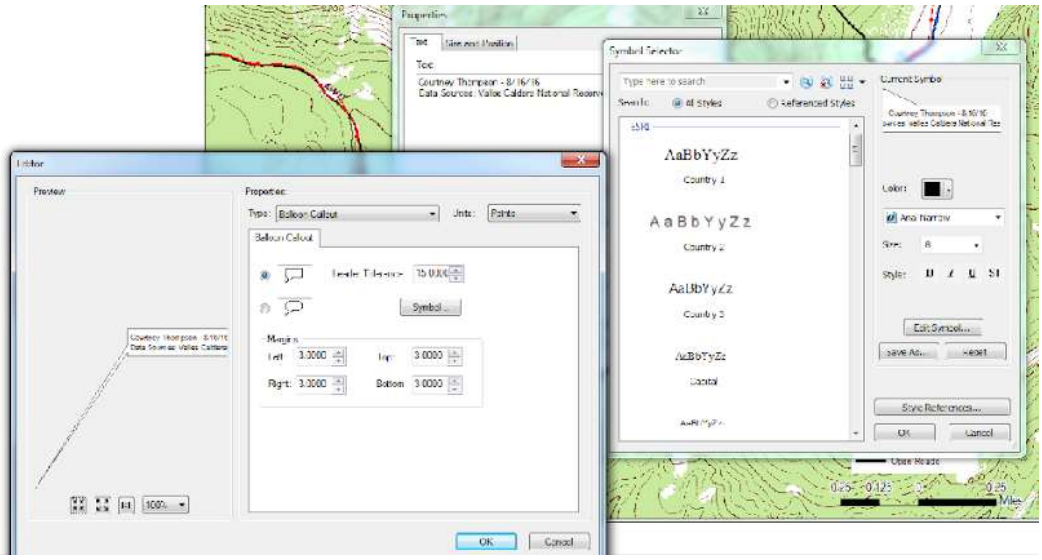
Select the legend graphic and drag it to an appropriate location on your layout. (At this point you may want to take some time to rearrange the various graphic elements that you have added to your layout.)

Insert Text for Authorship Information

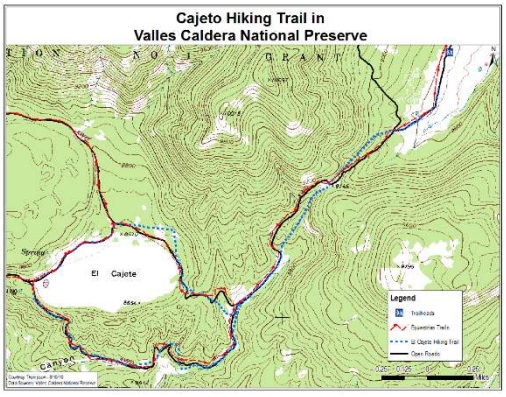
1. From the **Insert** menu choose **Text.**
2. Type in your authorship information.
3. Click Ok.

Due to the topomap background, your authorship information is hard to read.

4. To fix this, double-click on the text box and go to Change Symbol□Edit Symbol□ Advanced Text.
5. Check the Text Background option, then click on Properties.
6. Leave the Balloon Call out default type, and click on Symbol.
7. Change the Fill Color to White, then click OK.
8. Change all of the Margins values to 3.
9. Click Ok.



10. Change the Font type to Arial Narrow, size 8pt
11. Click OK and exit the text properties.
12. Move the textbox to the very bottom right corner.



Export your map (10 pts)

1. Save your map document.

Deliverable:

2. Export your map out as an image (JPG, PNG, BMP, etc.) with a dpi of 300. Insert into a word document.

Part 2

Make your own map with your own symbols (20 pts)

Now you will make a map of your own for the Valles Caldera National Preserve. Using at least 5 data sets from the Valles Caldera Data provided in the Part 2 folder, create a thematic map directed towards a *general audience*. When you create the map, focus on using effective map symbols. Since this is a beginning map, I will not be very strict on font and color, nor do I expect your map to be flawless. Do your best.

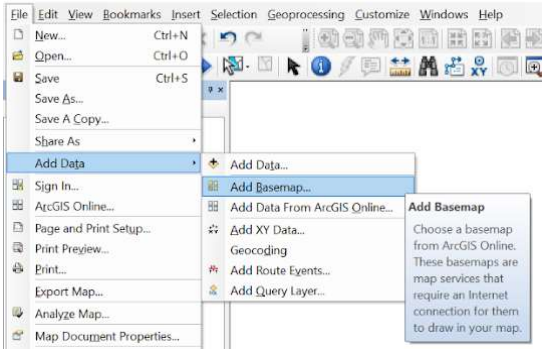
However, your map **must**:

1. Be fairly clean (legend items are adjusted as in Part 1, title and other map elements are placed appropriately, etc.)
2. Have the following map elements: title, legend, scale bar, north arrow, authorship, and neatline.
3. Demonstrate an attempt at creating a visual hierarchy, achieving visual balance, and employing other map design principles as described in Lecture 10 on Map Design. A member of the general public should be able to glance at your map and correctly identify the theme (e.g. "this is a map about recreation" if that is the theme of your map).

A few tips:

Before selecting the theme for your map, explore the attributes associated with the datasets available for mapping and assess whether there are categories that should be symbolized.

Consider using a basemap if it helps make the map easier to read or helps readers understand the area. Use of a basemap does not count towards the required number of datasets.



1. Go to **File**, hover the mouse over **Add Data** and select **Add Basemap**. Choose an appropriate basemap for your theme
2. Depending on the theme of your map, you may want to make the basemap somewhat transparent so that it does not overwhelm the overall visual hierarchy of your map. Go into **Properties** for the basemap, click on the **Display** tab, and adjust the transparency as needed.
3. You do not need to cite the source for ArcGIS basemaps because they are automatically cited in ArcMap.

Consider exploring Style References to find symbols that best meet the needs of your thematic map. Just as was done in Part 1, go into the **Symbol Selector** and click on the **Style Reference** button in the bottom right of the window. You will find a wide array of symbols organized under various themes. Take some time to explore the symbols available under each Style Reference and select the symbols that best suit your theme.

Deliverable:

1. Export your map out as an image (PNG, JPG, BMP, etc.) with a dpi of 300. Insert it into

a Word Document, along with the previous map and answered questions below.

Evaluate the map you made in Part 2 by responding the following questions (20 points):

Respond to the following in the same as the maps Word Document. Make sure maps are labelled. Export the document as a PDF and submit to Canvas.

Write at least 4 sentences evaluating your overall map design. Your response should discuss: (5 points total)

a. What sort of impression your map might make on a member of the general public who is unfamiliar with the area being mapped.
b. Ways your map could be further improved.

2. Evaluate the symbolization decisions you made for each of the 5 data sets you used in your map for Part 2. In your response, please create subheadings for each dataset and answer the following questions about each: (1 point each x 5 data sets = 15 points total).

    a. Where does this layer stand in the intellectual hierarchy for your map? Is it the main topic of the map or a supporting data set to add context?

    b. How did you translate this data set's position in the intellectual hierarchy into a visual hierarchy? Be specific about why you chose the specific symbol types, colors, and sizes.

Part 2: Grading Rubric for Map

The thematic map you created in Part 2 will be graded based on the following criteria.

	Points
Overall Composition Has a visual hierarchy been achieved among the elements? Are the map elements in balance with each (color, position, size, orientation)? Is the neatline of appropriate size and are all elements placed within it?	8
Map symbols Are the map symbols you selected appropriate to the topic? Do the colors and sizes you selected make sense with regard to the topic of the map?	6
Typography Is there consistency among the type in the various elements? Are the font sizes appropriate for the various elements?	2
Legend Is the legend appropriately sized and positioned? Did you rename your layers so that they appear grammatically correct (are not single words)?	2
Other map elements Are the scale bar, north arrow, and authorship information correctly scaled and positioned relative to the main map?	2