Guide to Making Maps in ArcGIS Pro

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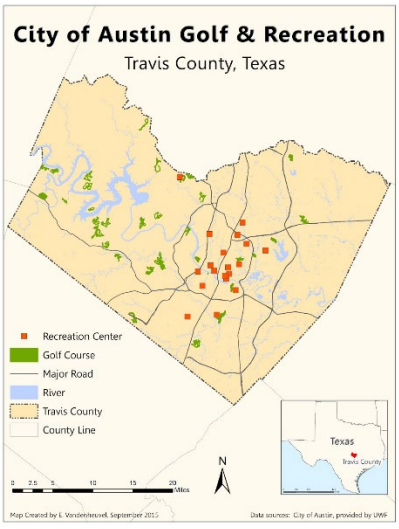
Symbolize Data

Changing your data symbology is done through the Symbology (right-click your layer's name in the Contents pane → Symbology), or by clicking on the patch under its name in the Contents pane.



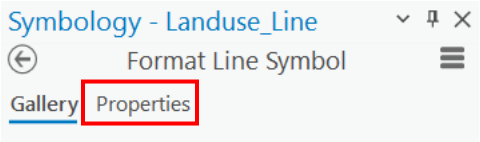
Generally, we want to follow the **figure-ground principle** when symbolizing data. The most important thing you are trying to map (your data) should be the most noticeable thing. Other data or cartographic layers should fade into the background. See the example at right, where the City of Austin is clearly in the foreground. You can achieve this by making your other data layers have less saturated colors, or slight transparency.

Vector Data

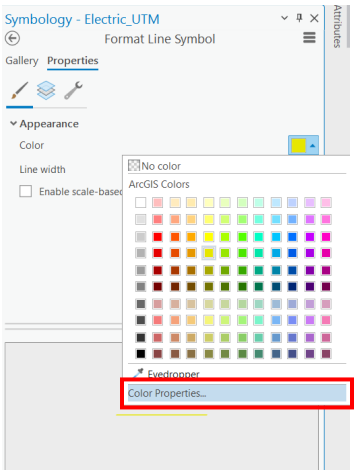
The following will only work for vector data- points, lines, and polygons. These should show up with point, line, or polygon patches in the Content pane (screenshot at right).

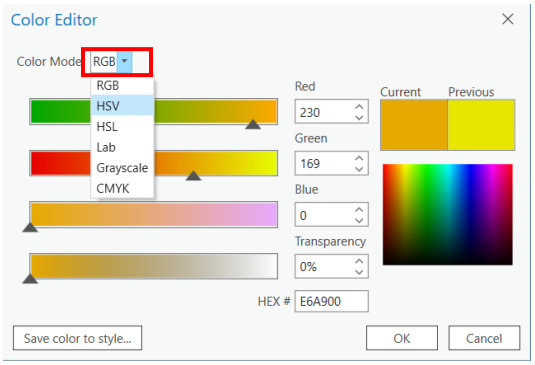
Single Symbols

a. If your data is vector (points, lines, or polygons) and you want to change it to be one uniform color, click on the little icon under its name in the Contents pane, then in the Symbology pane that opens at right, go to the Properties tab and change the color and linewidth.

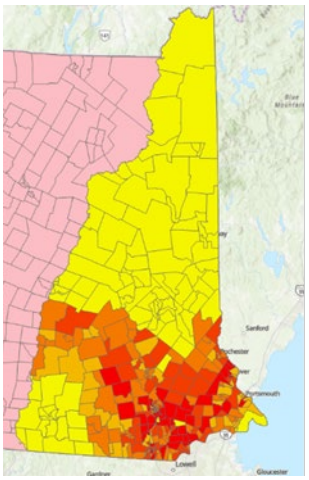


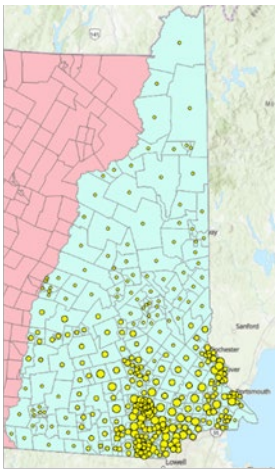
b. For better color choices, click on Color Properties from the dropdown palette options (screenshot at right). You can change the colors more gradually using these slides, or switch color mode from RGB to something else if you need more options (e.g. HSV for Hue, Saturation, and Lightness, etc.)





Quantitative Data





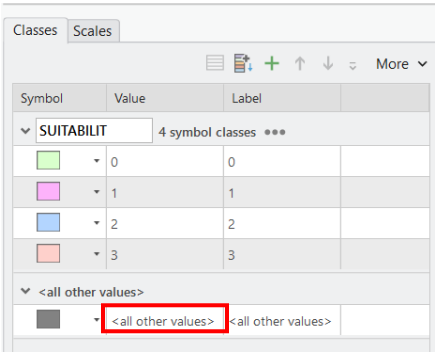
Quantitative data can be shown either **as graduated/proportional symbols**, or single symbols with varying sizes or widths (screenshot at right), or as **choropleth/graduated colors**, with the symbol filled in with various colors representing different quantities.

c. If you want to show data as **graduated/proportional symbols**, change the dropdown list under Primary Symbology from Single Symbol to **Proportional Symbols** (click the back button if you don't see this). This will show the symbol as a size proportional to its value. Set the field to the name of the column in your attribute table that you want to symbolize by (must be quantitative, or it will

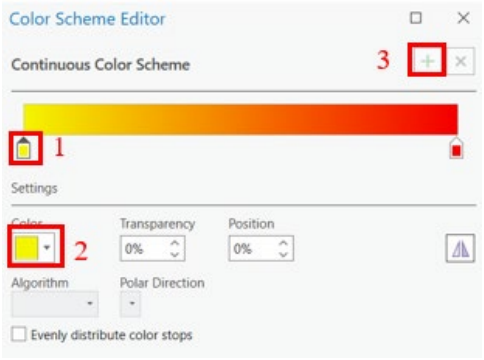
not show up!). You can leave the number of classes and method as default, or change as needed, and change the color by clicking on the symbol icon next to Template. Be careful- it can be hard for people to visually tell the difference between symbols based on their size. You may need to change the dropdown to **Graduated Symbols** instead and exaggerate the minimum and maximum sizes for the changes to be noticeable.

d. If you want to show the data as **choropleth or graduated colors**, change the dropdown from Single Symbol to Graduated Colors. Next to Field, specify the field of interest (whatever attribute you want to map). Pick some color scheme. For simple quantitative data, we often use a single-color ramp going from light to dark colors. Viewers usually associate darker colors with higher values, so you might use this intuitive pairing. You can click the 'Invert' button to switch directions of the color ramp.

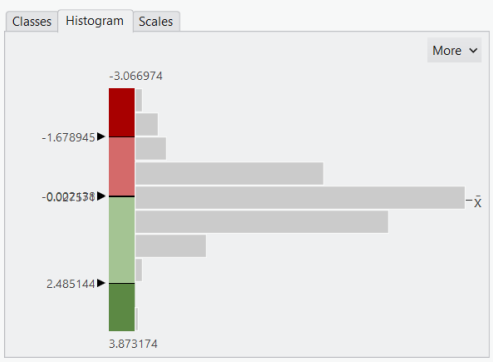
e. For more control over which values are assigned which colors, change the dropdown from Graduated Colors to Unique Values and specify the field (be careful- it will be annoying to do this if you have hundreds of different values!). To change the colors being used for each type, you will need to click on the colored rectangle next to each value's name in the table and change individually. To remove the 'all other values' option, right-click '<all other values>' and select Remove (screenshot at right).



f. If you want to show the data as a **diverging color ramp centered around 0**, you can open the dropdown menu next to 'Color scheme' and select 'Format color scheme'. Click on the little color tag under the color ramp (1 in screenshot), then update its color below (2). Do the same for the other side of the ramp. If you want to add another color in the middle of the ramp around 0, click on the green plus button (3) and change its color to something relatively neutral. Click OK to apply the color ramp.



g. To set 0 as the value for this neutral color in the middle of the ramp, click on the Histogram tab within the Symbology pane. There is currently no perfect way to do this in ArcGIS Pro, but you can click and drag the middle value arrows to be closer to 0. You can also double-click on the values to the left of the arrows to manually change their numbers.



Qualitative or Categorical Data

Data that is not numerical or does not have hierarchy (qualitative) should be given unique colors to distinguish differences.

h. In the Symbology pane, change the dropdown under Primary Symbology to **Unique Values** and specify the name of the field you want to use ((be careful- it will be annoying to do this if you have hundreds of different values!). You can change the color scheme bar, or for more control, you can click on the colored rectangle next to each value's name in the table and change individually (screenshot above). To remove the 'all other values' option, right-click '<all other values>' and select Remove.

Raster Data

If your raster data are categorical, you can change the symbology to Unique Values similar to categorical vector data.

i. Quantitative raster data is most often shown as **Stretch** (symbology → change dropdown to Stretch) with the stretch type Minimum-Maximum. You can edit the min/max values to be higher or lower depending on what you want to show.

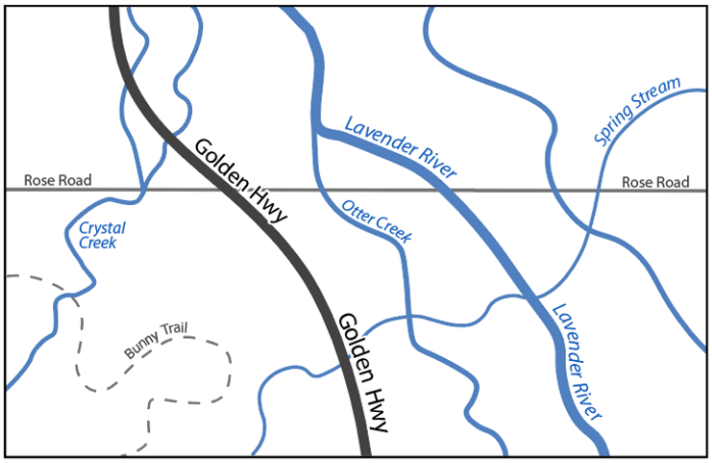
j. To show a **diverging color scheme**, change your raster layer's symbology to Stretch and choose the stretch type Minimum-Maximum. Check the box next to 'Edit min/max values' and change the min and max values to be the same value, but + / - (e.g. +100 to -100). Use an appropriate color ramp, probably one with a neutral or transparent color in the middle for "no change" and distinct colors at the positive and negative ends of the range. Remember that you can edit the color ramp to be centered on zero by going to the Advanced Labeling tab, changing the number of intervals to 2, Apply, and edit the center value to be 0. It is typical to show areas of gain in green and loss in red, though that may not be the most colorblind safe option.

Labeling Data

Labels are often used to add geographic context or additional information to a map. Labeling is primarily done with **vector data**- for raster data, it is more common to add points or text in the layout rather than on the map. Likewise, you can add points and text directly in the layout if your data does not have the information you need or you want to save time in looking for a dataset.

Conventions for labeling:

- Ultimate goal is readability
- Land labels should stay on land; water labels should stay in the water
- Hydrological features are typically labeled in *Blue italic serif font*
- Line features such as rivers and roads are usually labeled so that text follows the features
- Areal features are typically labeled with uppercase letters, often with spacing to stretch across area
- Labels have ideal positions around a point symbol- choosing one depends on if it will overlap important features, etc.
- Avoid overlapping features with text when possible; use a white halo or mask around the text if necessary



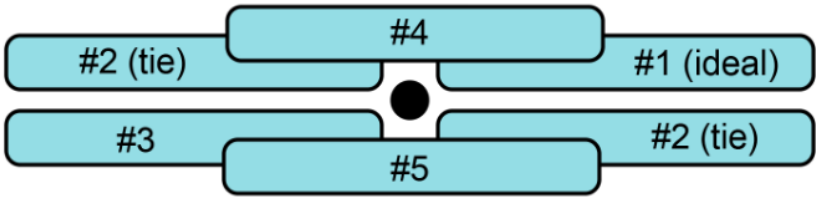
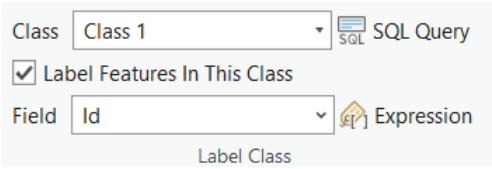


Figure 2.4.1 Ranked locations for placing point symbols.

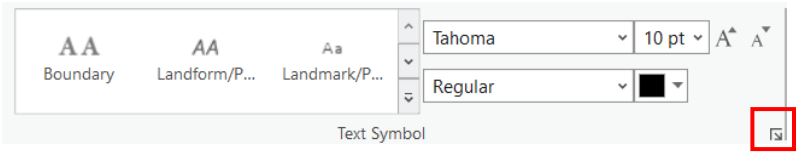
Credit: Cary Anderson, Penn State University. Rankings adapted from (Brewer, 2015; Field, 2018).

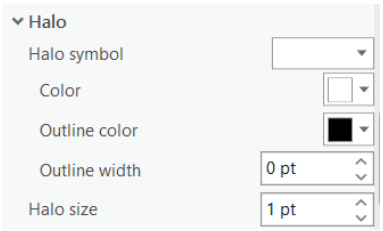
- For contour lines, labels should face uphill (American standard)
- For other features, labels should be easy for viewers to read without straining the neck

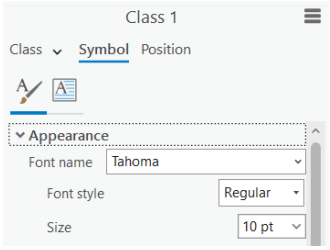
a. If you want to label your data (and it has a field in the attribute table that you can use to label), click on its name in your Contents pane, then you should see several new tabs appear in the upper ribbon. Click on the Labeling tab. In the Label Class group, make sure the Field is set to the name of the column you want labeled (can right-click on data and Open Attribute Table to look if not sure). Click on the big Label button to turn on labels.



b. Click on the small arrow at the bottom right corner of the Text Symbol group to open the Label Class pane. Make sure you are on the Symbol tab, then expand the heading for Appearance. Change the font name and size. If you want to add a halo of white so the labels stand out against the background, scroll down and expand the Halo heading. Change the Halo symbol from no polygon symbol to a white





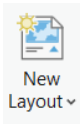


polygon, and change the Halo size to something like 1. Click Apply to see your labels update.

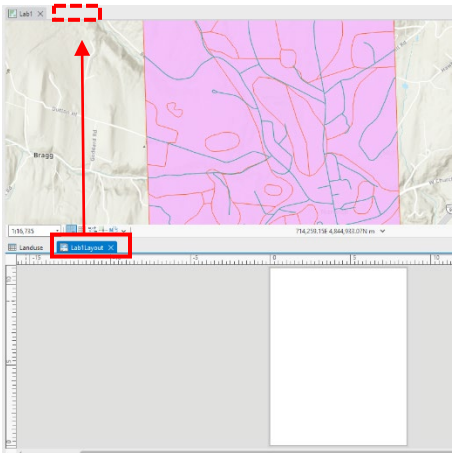
Creating a Map

In order to export a map, you need to first create a layout. If you try to just export from the Map view, your project will likely crash as the extent will be too large.

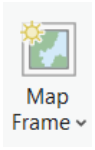
a. Go to the Insert tab, then click on New Layout. You will see a large dropdown with different paper sizes. The most commonly used sizes are Letter 8.5 x 11 in. (better for papers) or 11 x 17 (better for screen size). There are portrait and landscape orientations of both- pick one that best suits the shape of your study area. You will usually want your map to fill up as much space as possible on the layout. Click on your choice of portrait/landscape to open a new layout.



b. If your layout shows up underneath your map like the screenshot at right, click and drag the layout tab and dock it next to your map tab. This will give you more space to work.



c. Add your map by clicking on **Map Frame**, then select the image of the map that shows your data. Notice that your cursor has turned into a dot with crosshairs: you need to click and drag to place your map, similar to a textbox. Place your map on the page, then adjust the size by clicking and dragging the diagonal corners. You will want your map to take up nearly all the room on the paper. Make sure the margin space is relatively even on all sides.



d. If the study area does not work well with a rectangular map frame, you can test out **Circular or Ellipsoid map frames** by clicking on 'Rectangle' next to the map frame button and changing the dropdown.

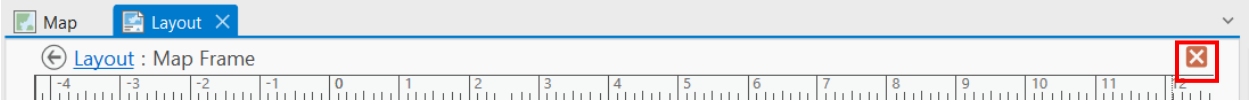
Adjust the Fit of the Map

e. To change your map's zoom, right-click on your most important data layer name in the Contents pane and select Zoom to Layer. Your map should adjust to fill.

f. For more control over the zoom/map placement in the frame, right-click on the map frame and select Activate. This opens a portal into your map frame, where you can click and drag the map around the page. You can zoom in and out this way by scrolling up or down with your mouse, or make finer adjustments to scale by typing in different numbers to the scale bar at the bottom of the page. You will need to think:

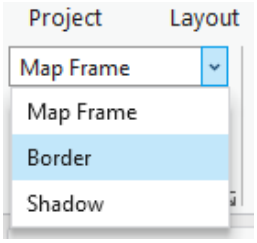
does making the second number of the ratio bigger increase or decrease the scale of your map?

g. You will need to close the portal to continue editing the map: towards the top of the layout, click the red X that has appeared.



Removing the Map Frame Border

The map frame is typically added with a thick black border. This is rarely useful and adds unnecessary weight to your map, making it look less professional. It is usually a good idea to remove this border.



h. Click once on your map frame, then click on the new tab Map Frame in the upper ribbon.

i. Change the dropdown menu at left to say Border instead of Map Frame.

j. In the border group, either change the width to be 0 pt or change the stroke to be transparent.

Inset Maps

Inset maps are small maps (maps in maps!) often used to give additional geographic context at a smaller scale than the main map. These are usually not necessary for something like a lab map, but might be nice in a final project or research.

k. Click on Map Frame in the upper toolbar (any shape), then click and drag to draw a smaller map on the layout page. You can resize and fit into a good location (usually a corner).

l. Make sure that the map is legible. If your existing map looks too chaotic at a smaller scale, you might create a new map (Insert tab → New Map) and add just a basemap or polygon boundary datasets.

Map Titles

Map titles should be informative, succinct, and capture the purpose of your map (essentially, the what, where, and when). Do not need to include all units of analysis, etc. (e.g.; Total Population Per Census Block Group in 2020). Can include that information in the legend. Should be reasonably interesting- a hook to make someone want to look at the map

a. Add a title to the map by clicking on the Insert tab, then in the Graphics and Text group, click on A. Your cursors should turn into crosshairs again, indicating you need to click and drag to place the textbox. Once placed, click on the new tab Text in the upper ribbon. Change the

size to something reasonable (sometimes it defaults to very large), then type in a title. You can also change the font within the Text tab. Try to pick something appropriate for the theme of the map.

b. You may need to break up the title into two lines, or include a **main title and subtitle**. Try to keep it concise and choose a relatively natural place to break it. The subtitle will often give more detailed information about years or location, while the main title gives the theme of the map.

Author Credit

Should you add your name? If it is a standalone map (not within a document that already has authors' names e.g.; lab assignment document or project poster), sure. Please do not include "Map by", "Created by", etc. This should be relatively small and discrete, usually at bottom right or left corner. Your name is not the most important part!

Fonts

Please **pick an interesting font that is not just default ArcGIS Pro** (Tahoma). The GIS community is awash with maps using Tahoma and they don't look that good You can choose any font and size that you want, but here are some good common options:

- Serif fonts (with little hats): Times New Roman (sparingly!), Garamond, Elephant, Baskerville Old Face, Bell MT, Bodoni MT, Cooper Black
- Sans-serif fonts (without little hats): Arial, Avenir, Franklin Gothic Book, Gill Sans MT, Century Gothic, National 2 (Dartmouth's font)

You can use different fonts in the same map, but best to not go wild. Usually good to have legend, scale bar, and north arrow all in same font. Title might have more weight or hierarchy.

Scale Bars and North Arrows

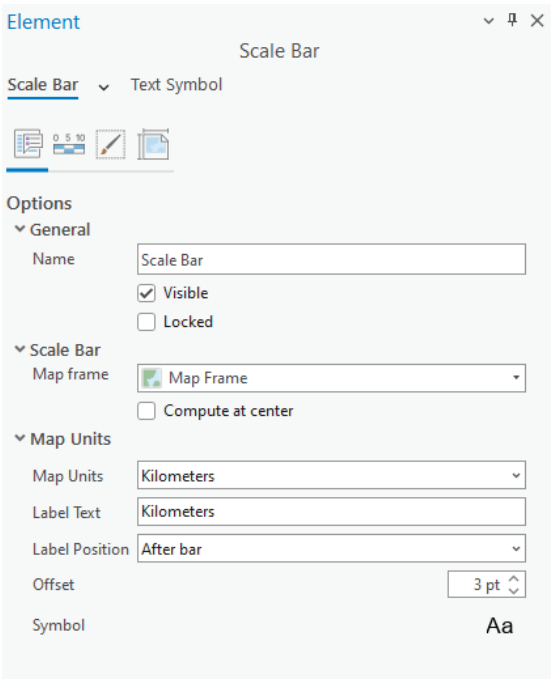
a. If your map is small scale (the whole world), we recommend NOT adding a scale bar, since scale is usually inconsistent across the map.

b. If your map is large scale (a state, city, local area), add a scale bar by going to the Insert tab, clicking on the scale bar button and selecting an option (scale bars should not be too fancy and distracting from the rest of the map). Match the units with whatever units of analysis are used by the project. Click and drag to place it where it won't be the center of attention. Adjust the scale bar size by clicking and dragging the diagonal corners to make the numbers easy to read and with logical breaks (e.g., 10 miles rather than 13.482 miles).

c. If your map is positioned with north pointing up, **<u>you do not need a north arrow</u>**. If you would like to add one anyway, go to the Insert tab and click on the big North Arrow button. Pick an appropriate arrow from the dropdown list (north arrows should be minimalist and not detract from the main focus of your map). Add it to the layout by clicking and dragging like a textbox. It is good to keep these discrete and to put them near the scale bar or towards the bottom of the map.

d. If your map is covering the polar region or somewhere else where north is not necessarily one direction, do not add a north arrow.

e. You can change details about north arrow/scale bar (units, sizing, line width, fonts) by right-clicking in Contents and opening Properties. The Text Symbol tab has fonts, while the icon of a scale bar lets you pick scale sizing and line weight.



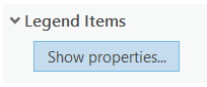
Legends

Legend conventions:

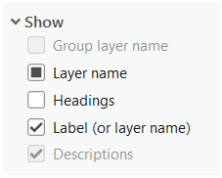
- Generally, do not include 'Legend' as a title unless it is deliberate thematic choice
- Only include relevant information- remove any redundant subheadings or headings
- Rename data layers so that they make sense to non-GIS viewers and are easy to read (e.g.; rename 'LU_TYPE' to 'Land Use Type').
- Include units of measurement (%, $, etc.)
- Remove any data layers from the legend that are not the focus of your map (water, roads, perhaps boundary lines, etc.). Viewers will typically interpret these layers without needing explanation.
- Only include abbreviations if you explain what they mean elsewhere in the project or map, or if they are universally understood

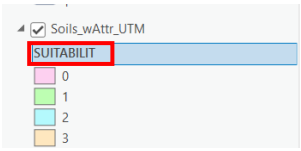
a. Still within the Insert tab, click the Legend button, then select an option (doesn't really matter which). Click and drag to draw the legend on the page. It will automatically populate with information about your layers, but may look a little messy. In your Contents, right-click on Legend and open its Properties. Uncheck the box for 'Show' next to title to remove the 'Legend' title: assume your viewers can interpret what a legend is for themselves!

b. In the Contents pane, expand the arrow to the left of Legend to see all the items inside. You should not include items in the legend that are obvious to a viewer: usually cartographic layers such as roads, rivers, etc. You can change the colors on these to be obvious (rivers = blue, etc.). You will also want to rename the layers so they make sense to the audience and don't have any abbreviations or underscores that aren't explained in a paper. Scroll down to where the dataset name is listed within your map (not within the legend) and double-click on its name to open the Properties. In the box under Name, name it something simple.

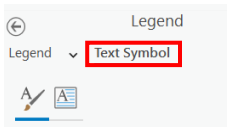


c. If you have redundant subheadings that you want to remove, open the legend properties again, then click the box 'Show properties…'. Uncheck the box for Headings to remove it. (If this is not an option, uncheck the box next to Layer name, then in the Contents pane under Map Frame, single-click twice on the subheading name (not double-click- more slowly) until it becomes editable and rename it.





d. Your legend should now be clear and understandable. If you want to change the order of items in the legend, you can click and drag layer names up and down in the Contents pane under the heading 'Legend'. You can also update the font family and size of the legend within the Legend Properties by clicking on the Text Symbol tab and making changes there.



e. Arrange your legend on the page so that it feels balanced and doesn't cover important information. If you need to change the orientation of your layout from Portrait to Landscape or vice versa to better fit everything, in the Contents pane, right-click on Layout at the top, open Properties, and change Orientation or Sizing.

Exporting a Map

a. Go to the Share tab, then click on Export Layout. You might see dropdown options for presets- you don't want those, so click on the actual page icon instead of the dropdown caret. This should open an Export Layout window on the right of your screen. Change the file type to PDF (or an image file with high resolution of 300 DPI or more), and make sure it is being into a location you can find it with an informative name. Leave the rest as default and Export.