

UA Libraries Data Cooperative Unit's

# GIS TUTORIALS

*CREATING A BASIC MAP*

ESRI

SOFTWARE USED

3

TUTORIAL NUMBER



DIFFICULTY LEVEL



LEVEL OF STOKE

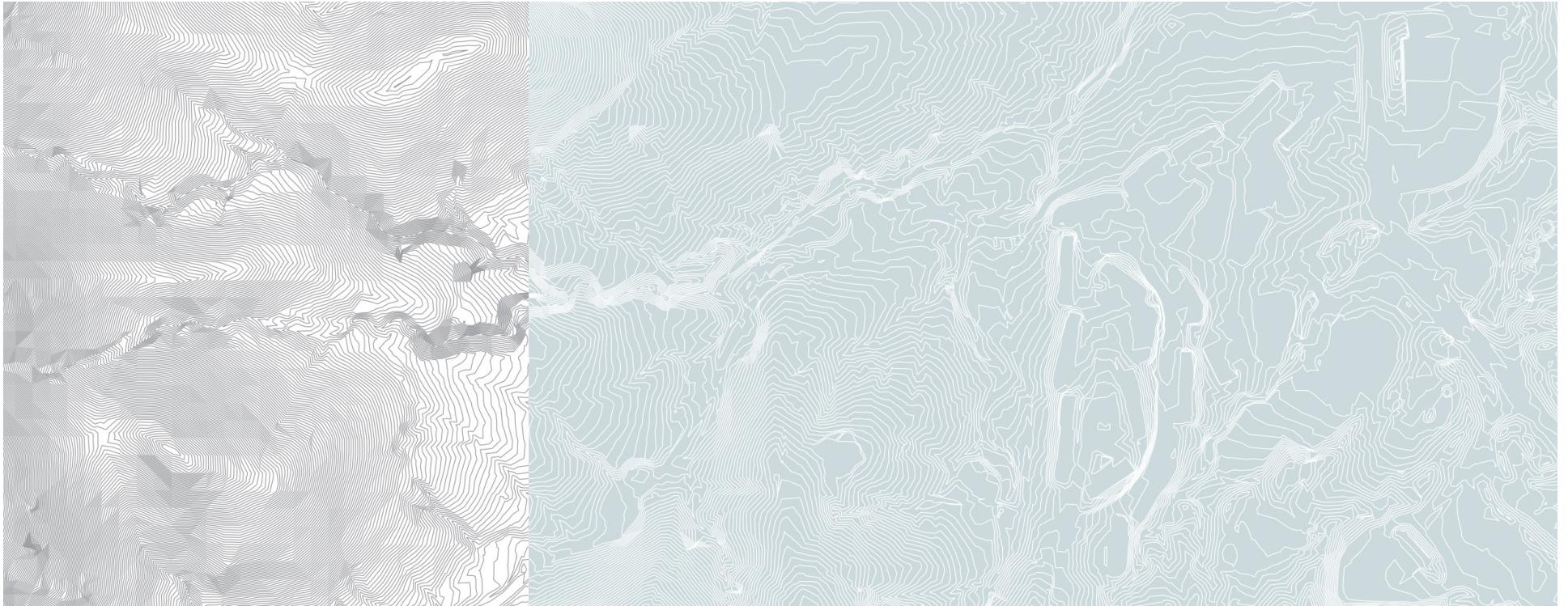


HARDWARE NEEDED:

desktop or laptop computer  
running Windows  
internet connection

SOFTWARE NEEDED:

ESRI ArcGIS Pro



## INTRODUCTION

# 3

The purpose of this tutorial is to teach you how to create a basic map in ArcGIS Pro that contains the necessary cartographic elements. Generally the type of map layout that you will create will be based on where your final map will be used (e.g. publication, in a report, as a stand alone layout, etc...) and this tutorial will serve as a basic guide to get you familiar with creating maps in a general context.

Upon completion of this tutorial, you should be comfortable:

1. Creating multiple maps within the same project.
2. Designing a map layout with all of the proper cartographic elements.
3. Gaining an understanding of all the cartographic elements that are necessary for map layout.

## STARTING A NEW PROJECT

Before opening ArcGIS Pro, download the data that will be used in this tutorial from the following link:

[GIS Mapping.gdb.zip](#)

**Please note:** All of the data used in this tutorial is available on the UA Library's GeoBlacklight Data Portal:

<https://geodata.lib.arizona.edu/>

1. Within the ArcGIS Pro start screen click on Map under New Project.

In the Create A New Project menu click on the folder icon next to the Location field and navigate to a location on your computer that you would like to save your project to.

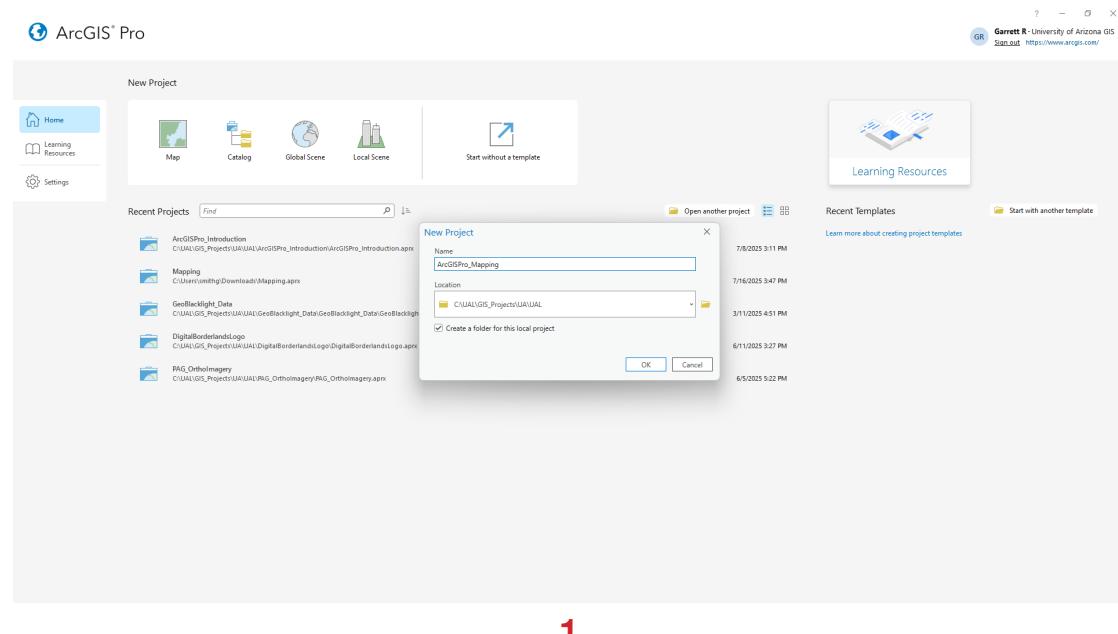
In the Name field enter a name for your project. Please Note: Sometimes Esri does not work well with file names or file paths that contain spaces.

Finally, make sure that there is a check mark next to "Create a new folder for this project".

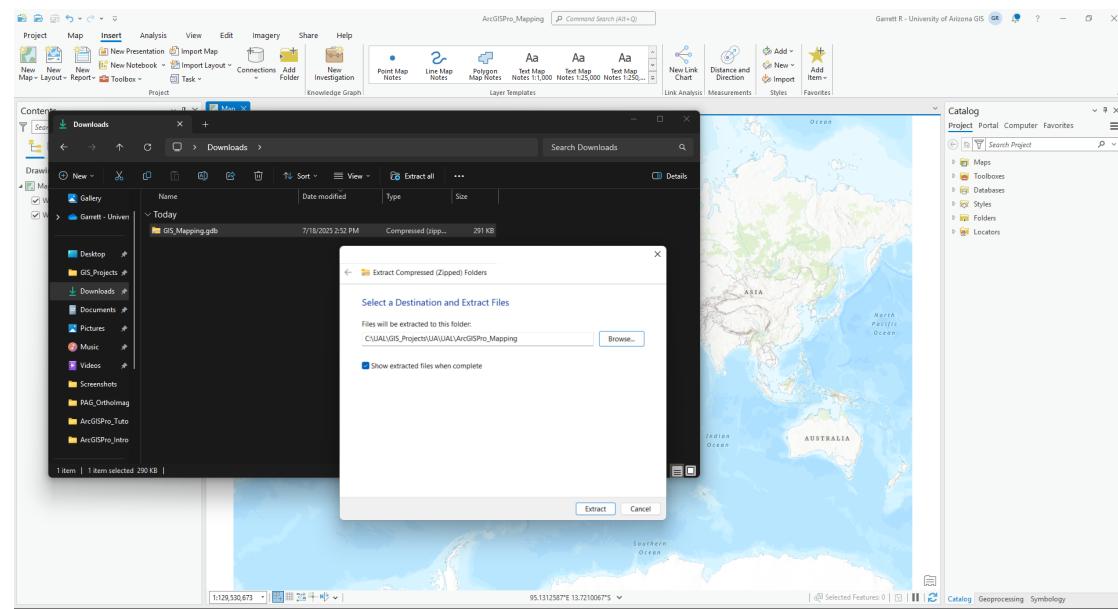
2. Extract the GIS\_Mapping.gdb.zip and place it in the project folder you created above.

### FILE GEODATABASE:

File geodatabases (.gdb) are a container that holds a collection of files in a folder. You can store, query, and manage spatial and nonspatial data within a file geodatabase. File geodatabases are also an efficient means to transfer multiple files.



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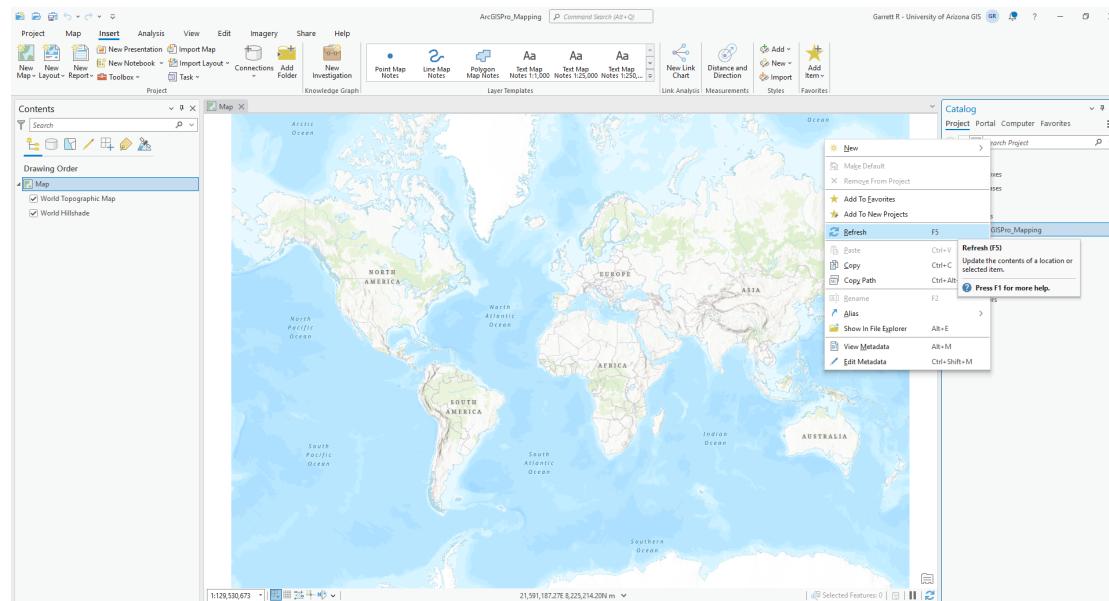
**3.** In the Catalog pane expand your project folder.

If you do not see the GIS\_Mapping.gdb, right-click on the main project folder and select Refresh.

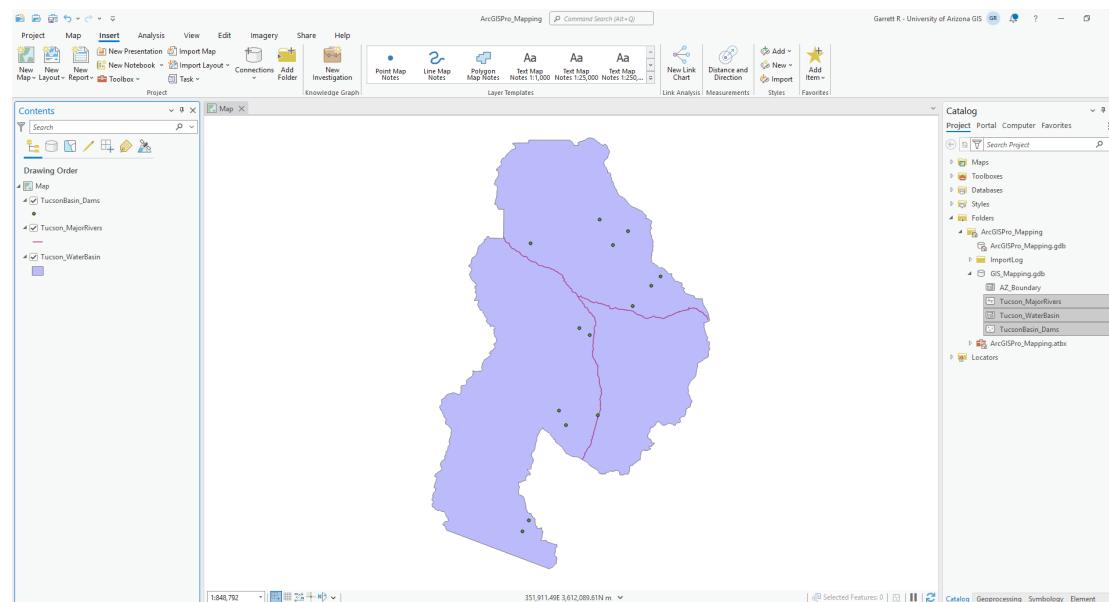
**4.** Add the following shapefiles to your map:

TucsonBasin\_Dams  
Tucson\_MajorRivers  
Tucson\_WaterBasin

Remove the Wold Topographic Map and World Hillshade basemaps from the map by right-clicking on each and selecting Remove.



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## PREPARING TO MAP

For this project you are interested in differentiating the dams in the Tucson water basin based on their Federal Hazard classifications.

1. Right-click on the TucsonBasin\_Dams feature layer and select Symbology.

2. In the Symbology pane, select:

Primary symbology  
Unique Values

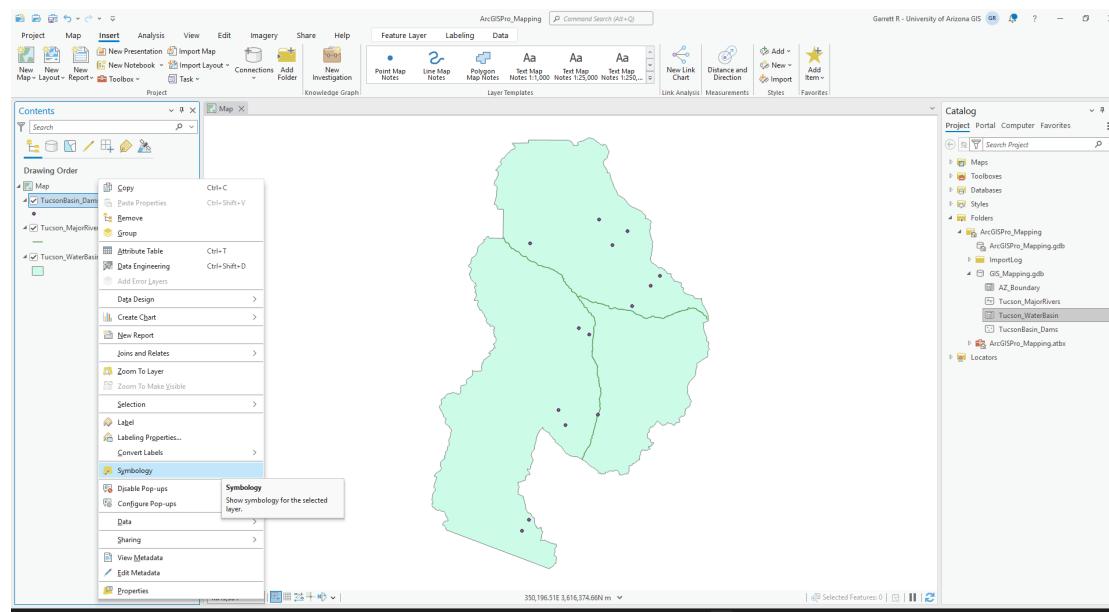
Field1  
HAZARD

Color Scheme

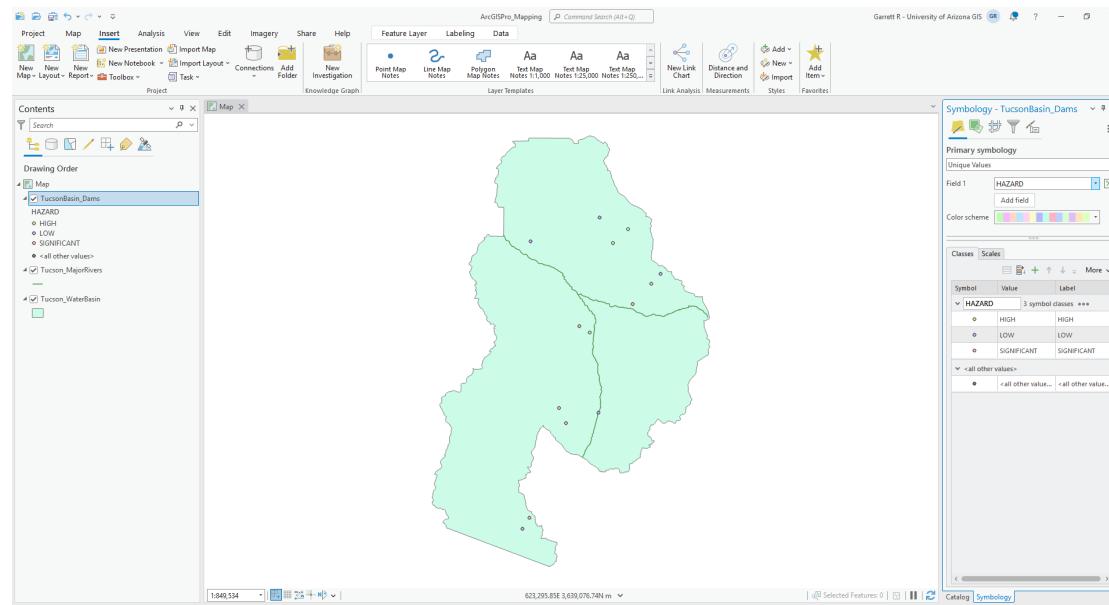
Default, you will choose a color scheme in future steps.

### SYMBOLOGY:

The Symbology pane allows you to change the way that data is displayed on the map based on attributes (characteristics) that are found within the attribute table. You can also control the basic properties of feature layers including fill color, outline color, and outline width. The symbology method you choose will be based on the characteristics of the attributes.



1



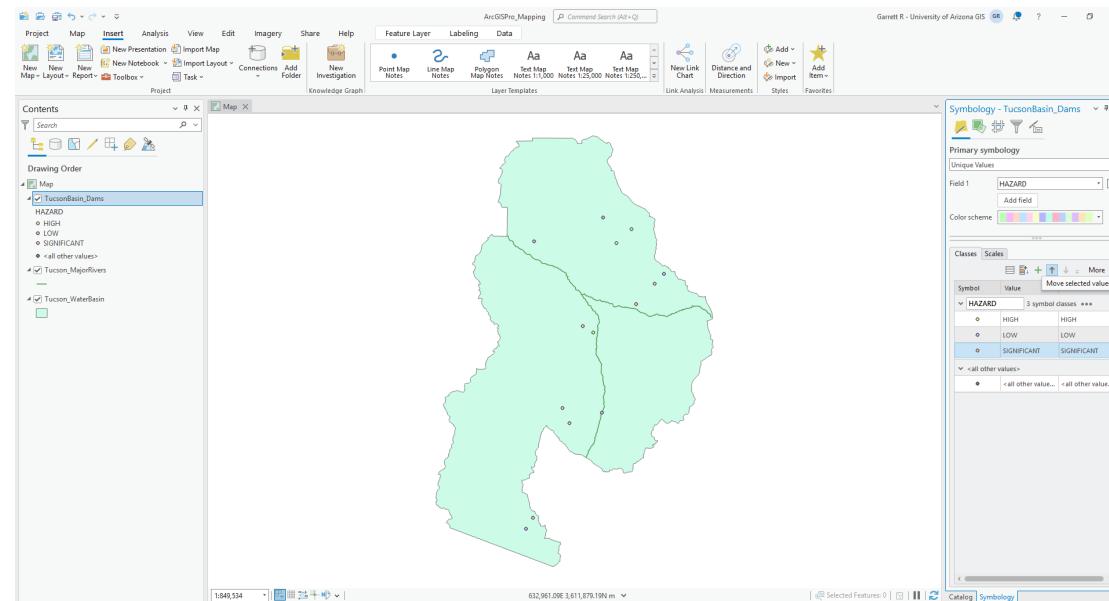
2

3. In the Symbology pane click on SIGNIFICANT and use the up arrow in the Classes tab to move SIGNIFICANT above LOW so that the values are in the correct order of hazard classification levels.

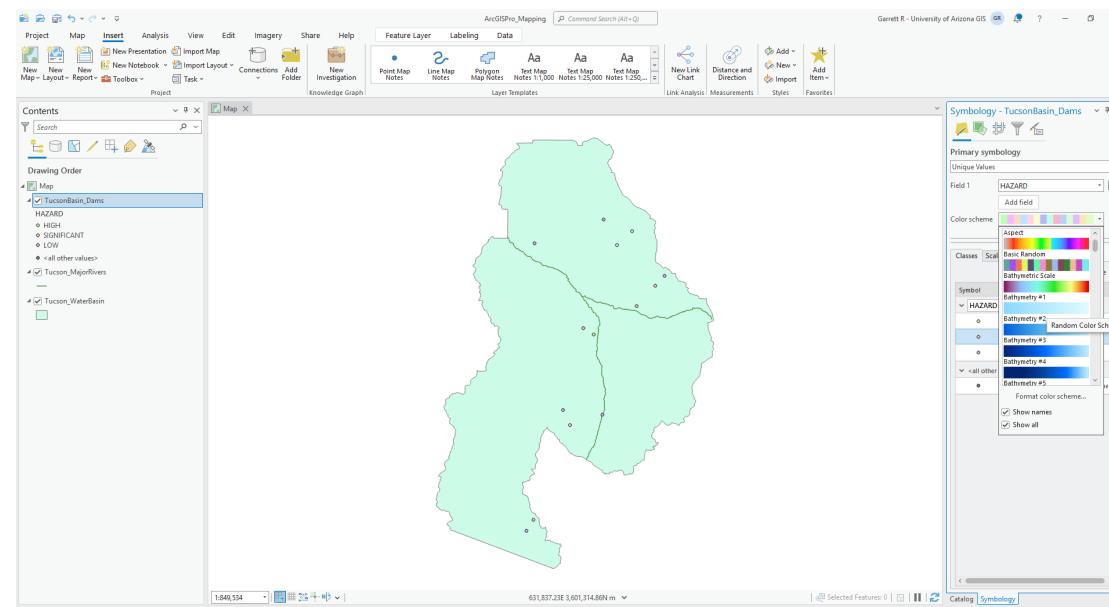
4. In the Symbology pane click on Color scheme to list all of the color choices available.

For the full list of color options place a check mark next to Show name and Show all.

Choose a color scheme that you believe is relevant to your dam feature layer and the representation of hazard levels of those dams.

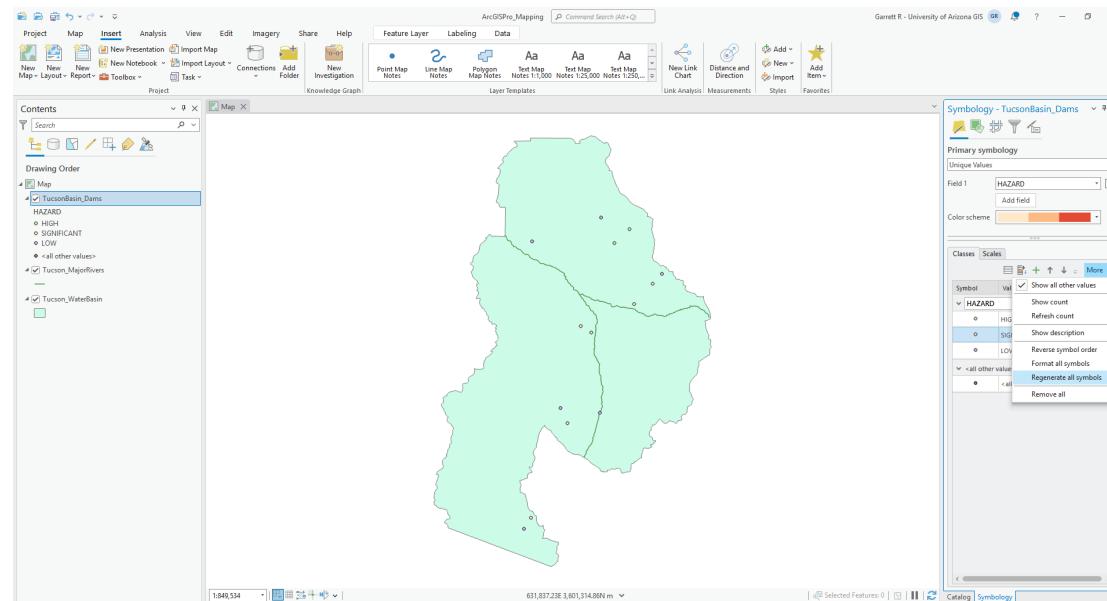


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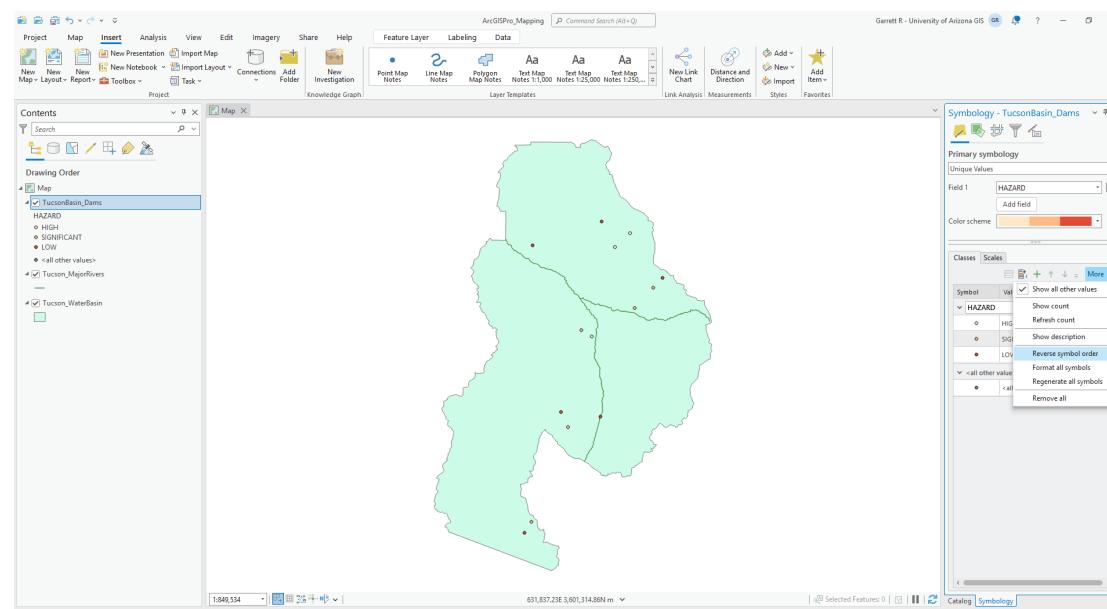


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5. After selecting your color scheme in the Symbology pane, in the Classes tab, click on More than Regenerate all symbols.
6. If your color scheme does not properly represent the attribute you are trying to display (in this example the highest level of dam hazard is lighter than the lowest level) you can click on More and then Reverse symbol order to reverse the color scheme.



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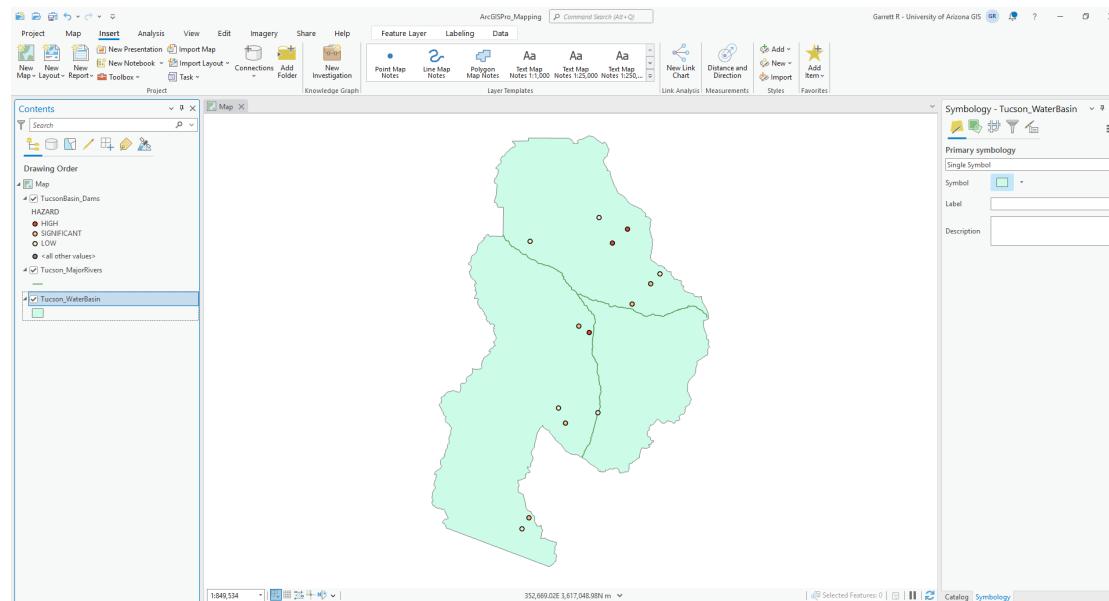
7. Highlight the Tucson\_WaterBasin feature layer in the Contents pane.

The Symbology pane should still be open. If not, you can either choose the Symbology tab or right-click on the feature layer and choose Symbology.

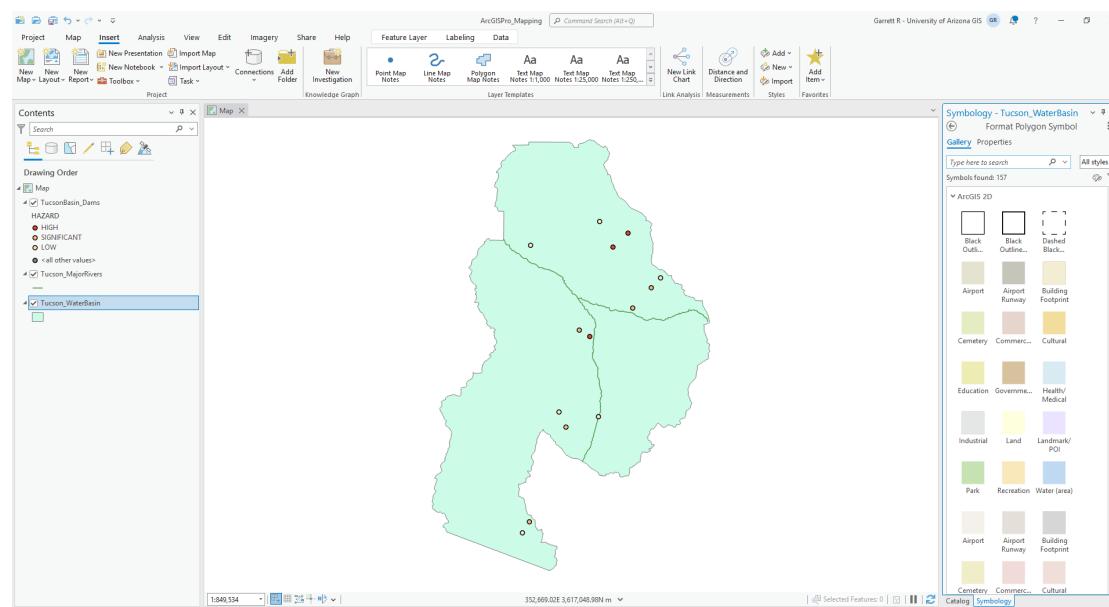
Click on the colored box next to Symbol.

8. In the Format Polygon Symbol pane you have two options to change the symbology of the feature layer.

The Gallery tab contains a number of templates that Esri has developed based on different feature types.



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9. In the Format Polygon Symbol pane you have two options to change the symbology of the feature layer.

The Properties tab allows you to choose your own fill and outline colors. You can also control the outline width of the feature layer.

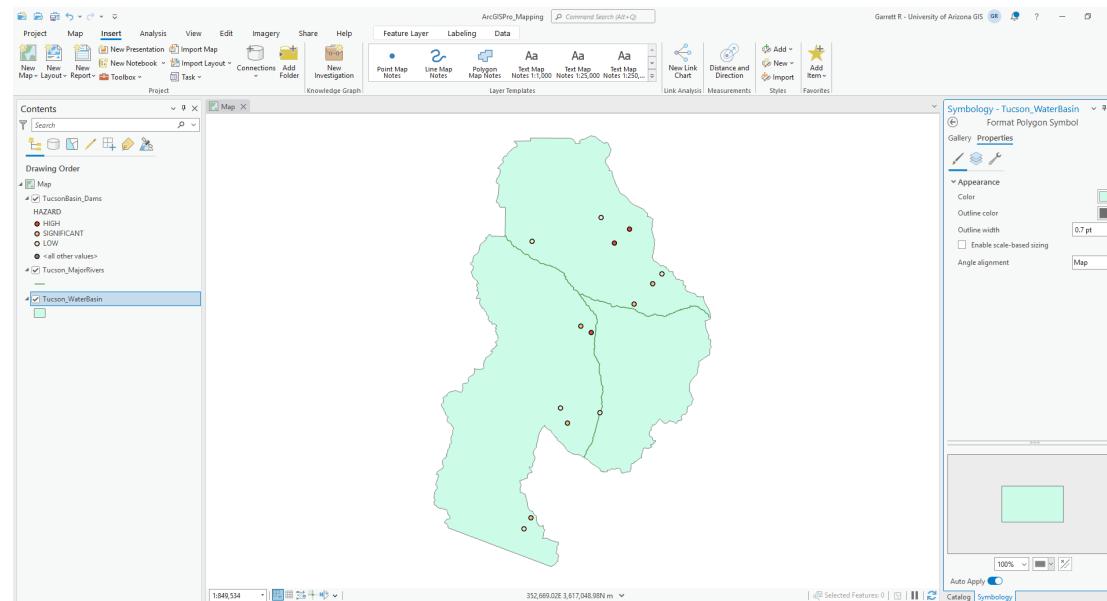
Change the color of the Tucson\_WaterBasin feature layer to any color that you feel is appropriate.

10. Click on the Left arrow at the top of the Format Polygon Symbol pane.

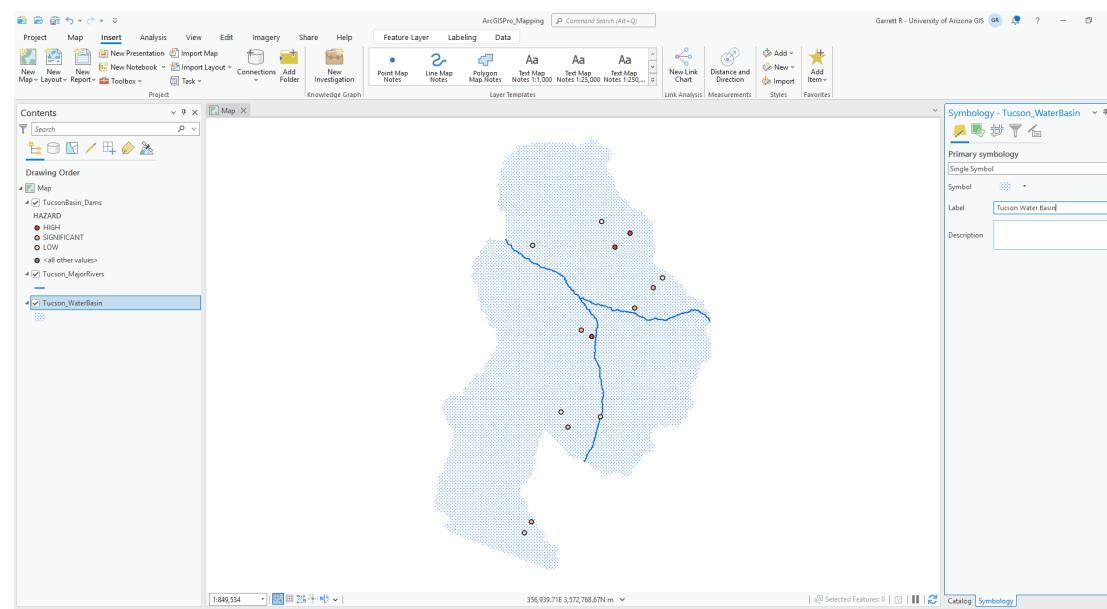
In the Label field type in a description of the feature layer.

### FEATURE LAYER LABELING:

By default, when you make a map in ArcGIS Pro, the legend will contain the name of the feature layer unless you give it a more appropriate name. In this example the legend would label the feature layer as Tucson\_WaterBasin which might not make sense to people. If you populate the Label field the legend will contain the name that you provide that should make more sense to people that are viewing the map.

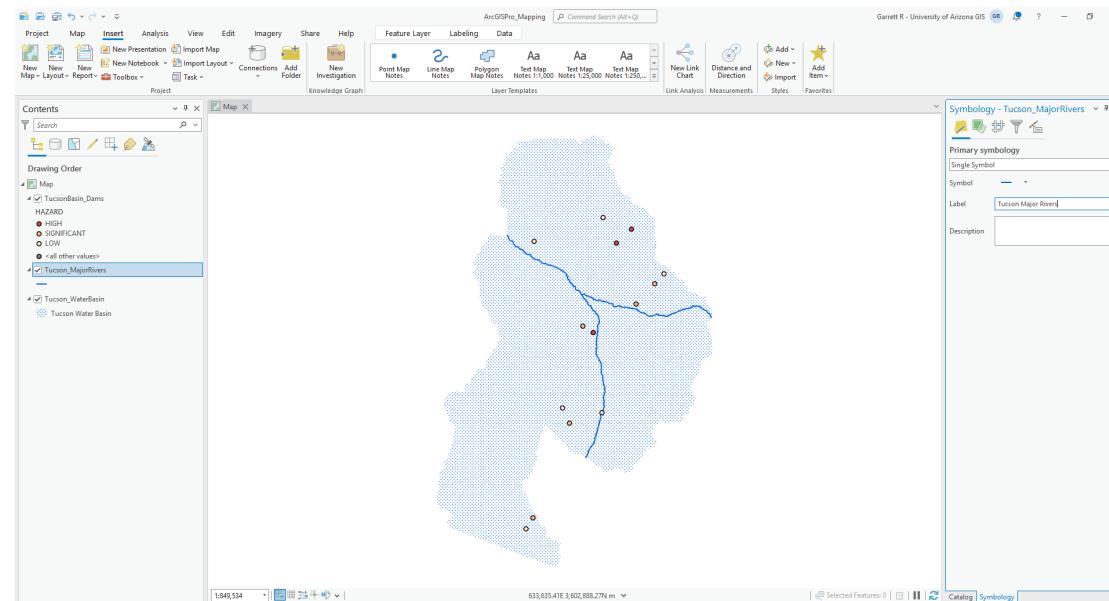


9

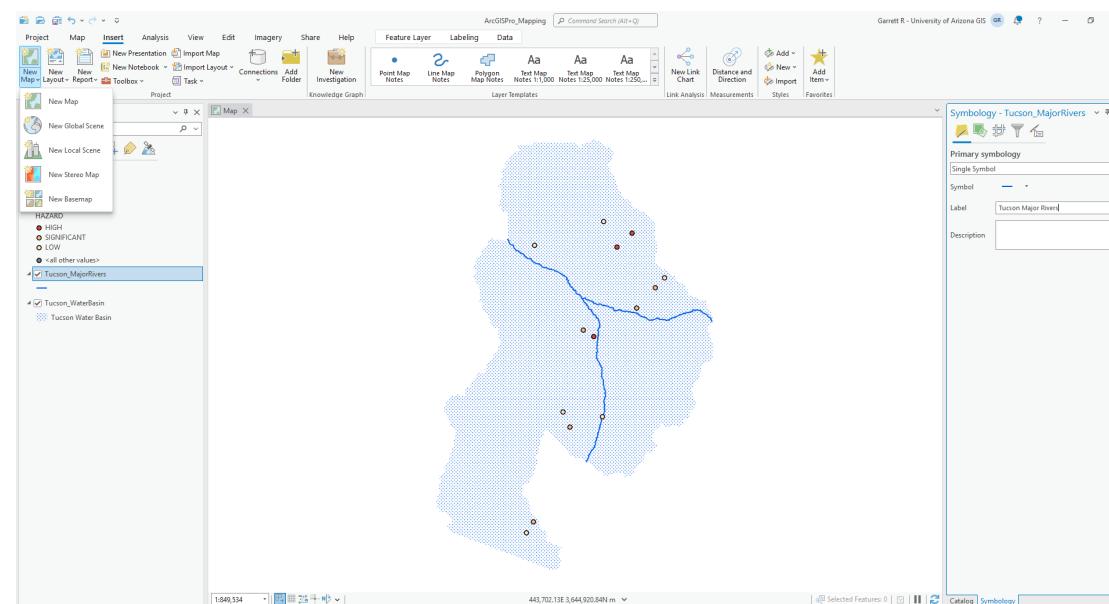


10

11. Change the color and provide a label for the Tucson\_MajorRivers feature layer.
12. In the Insert tab located within the ribbon select New Map.



11



12

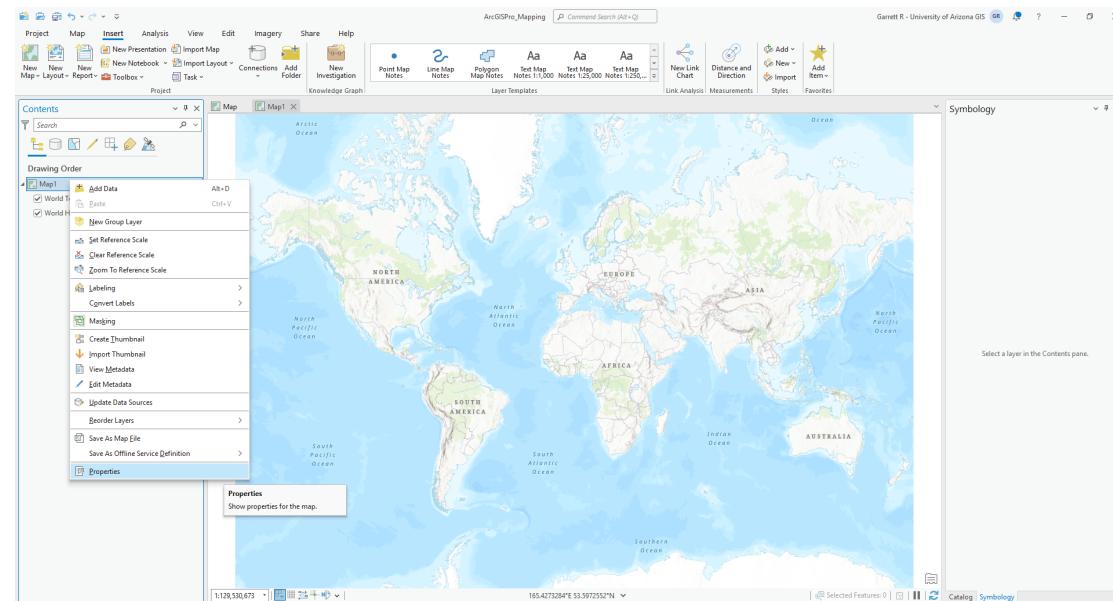
13. In the Contents pane right-click on Map1 map frame and select Properties.

14. In the Map Properties window change the Name to Inset Map.

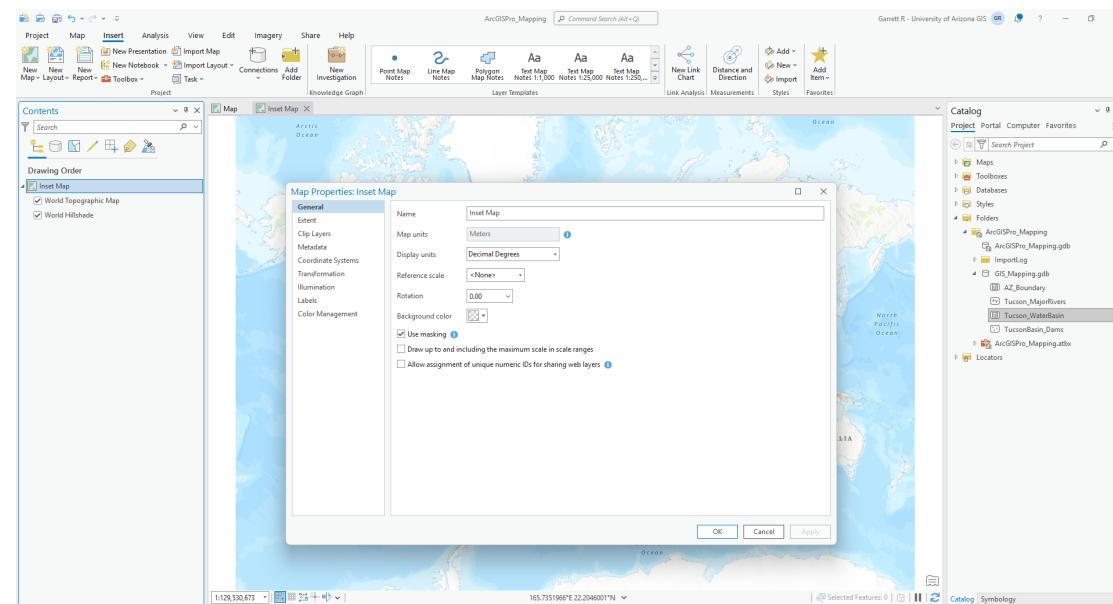
You can also change the name of the first map you created.

#### HELPFUL HINT:

When you are working with multiple map tabs, especially when you are going to be designing map layouts with multiple maps, it is a good idea to name your maps so that you can keep track of each the maps that you create. You can start all of your GIS mapping projects with this step to keep your project more organized.



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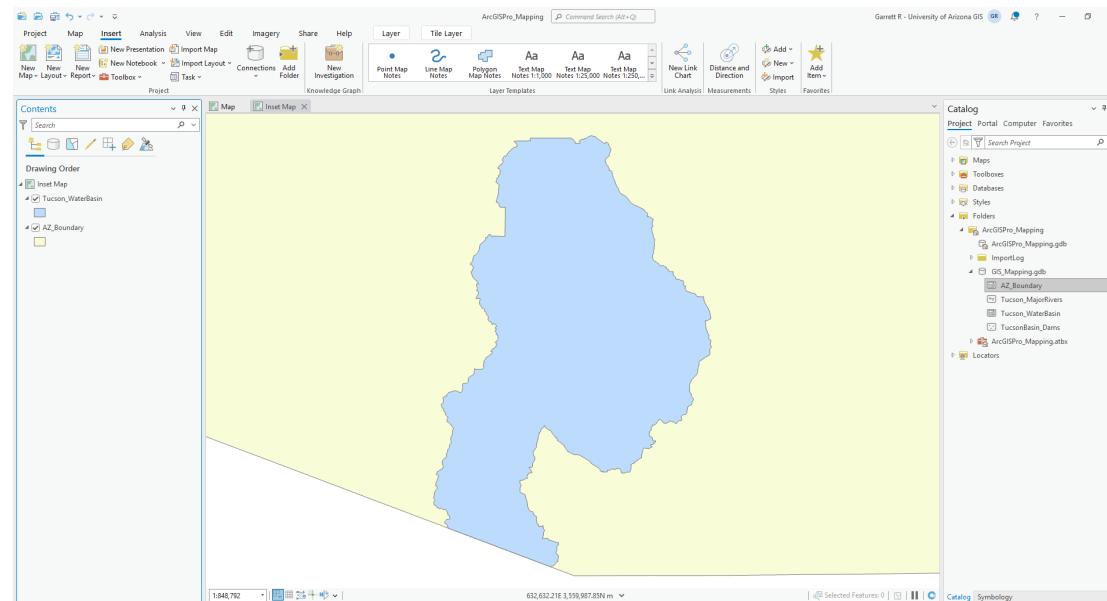
- 15.** Add the following shapefiles to your new map in the following order:

1. Tucson\_WaterBasins
2. AZ\_Boundary

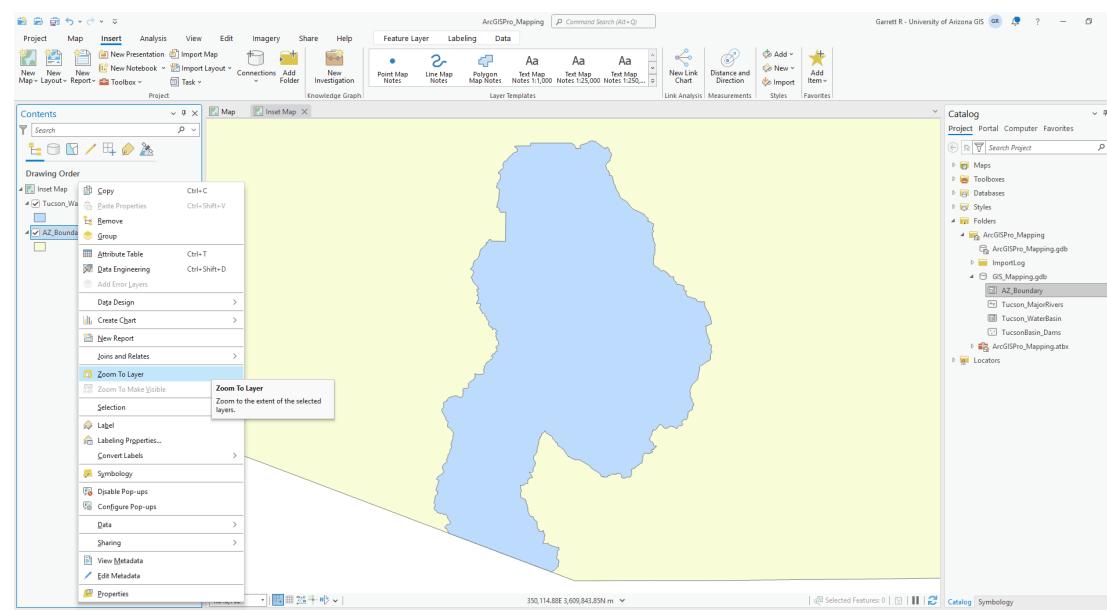
- 16.** In the Contents pane right-click on the AZ\_Boundary feature layer and choose Zoom To Layer.

### PROJECTION ON THE FLY:

In this tutorial you are going to create a map layout that contains two different map frames and these maps need to have the same projected coordinate system so that the feature layers are not skewed. In ArcGIS Pro maps are assigned the coordinate system of the first feature layer that is added to it and each subsequent feature layer will be projected to the map's spatial reference (on the fly) within the map and not change the projection of the feature layer itself.

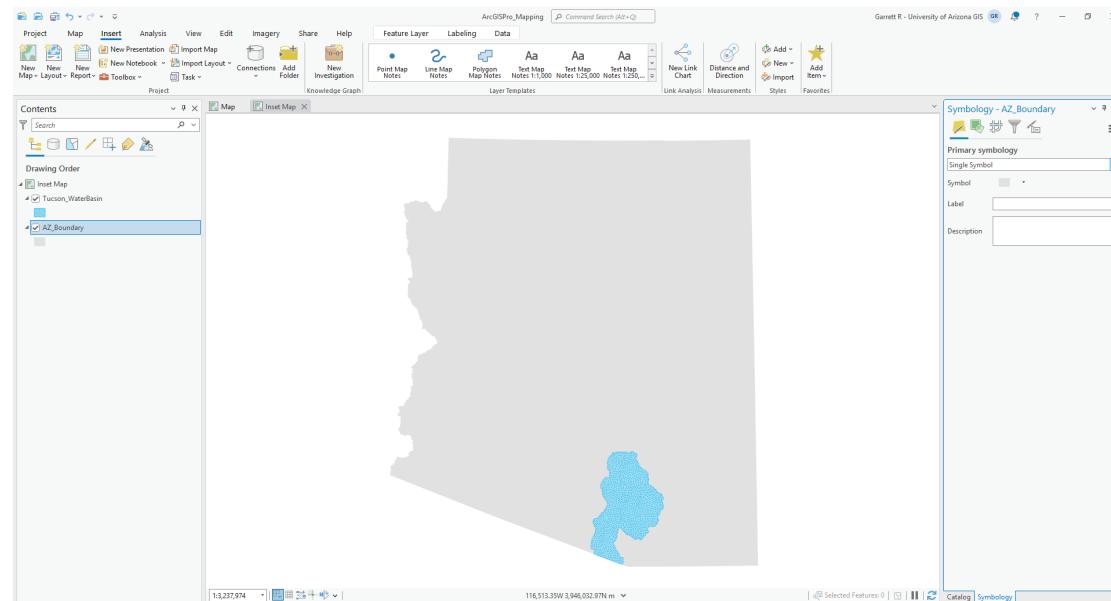


15



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17. Change the colors of the Tucson\_WaterBasin and AZ\_Boundary feature layers.



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## MAP LAYOUT

1. In the Insert tab located within the ribbon select New Layout, expanding the page size options and choose:

Landscape Letter 8.5" x 11"

2. In the Layout tab right-click on the top ruler and select Add Guides.

In the Add Guides window select:

Both  
Placement:  
Offset from edge  
Margin: 0.25

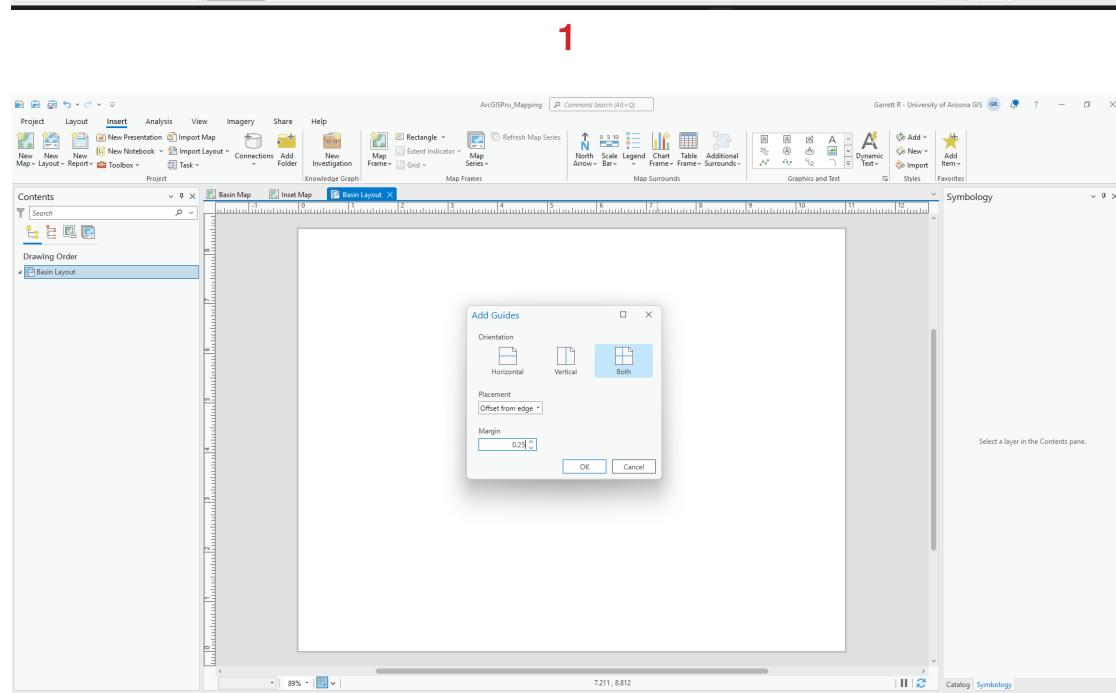
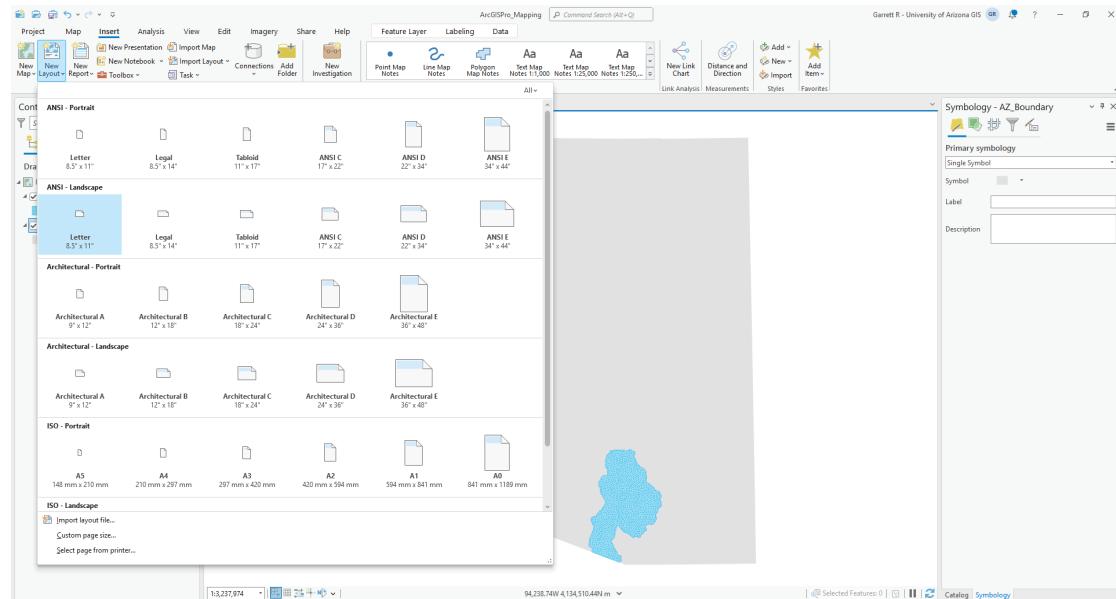
Add additional horizontal guides:

Horizontal  
Placement:  
Offset from edge  
Margin: 1.0 and 7.5

Manually add guides by right-clicking on the top ruler at the 8.00" and 8.25" marks. You can also drag the guides by clicking on the triangles in the ruler.

### HELPFUL HINT:

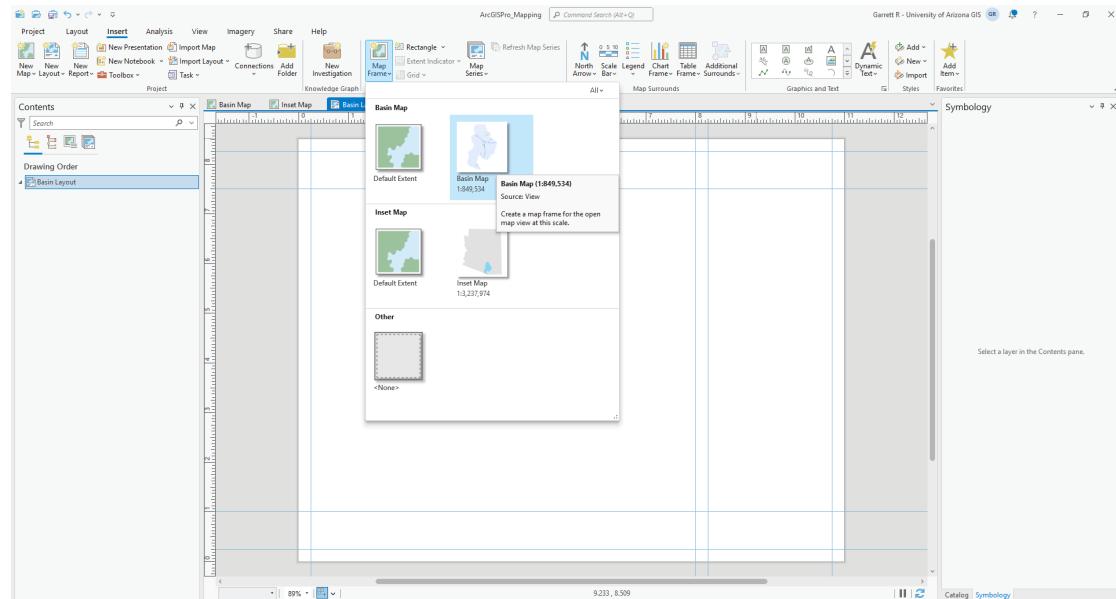
Guides allow you to set up page margins and position and size elements on the page. Guides, like in most graphical design programs, are for visual reference and are not included when the layout is exported or printed.



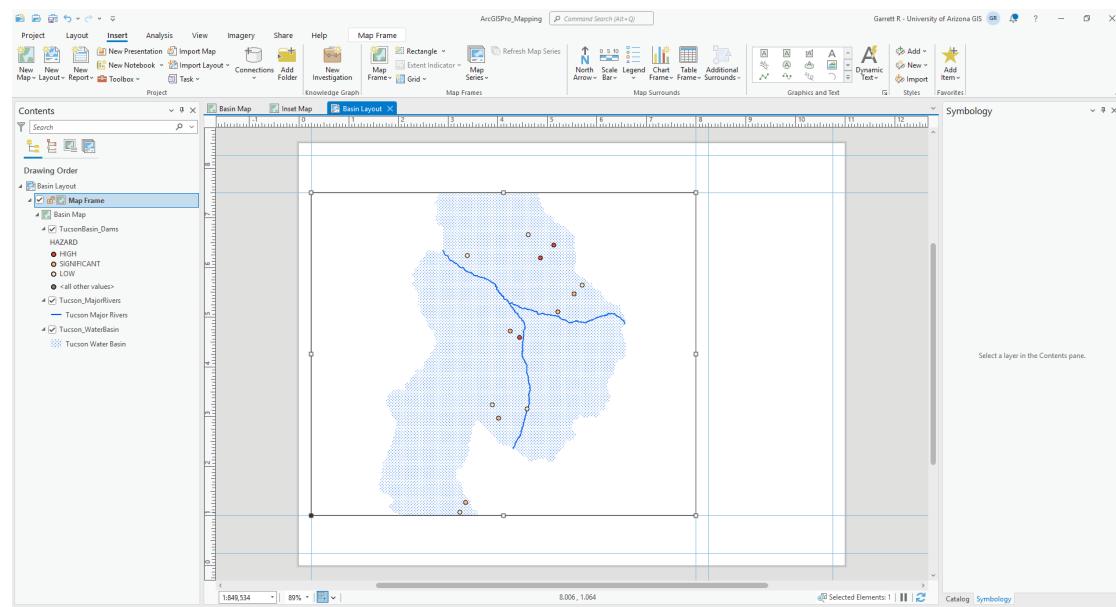
3. In the Insert tab located within the ribbon select Map Frame and choose the Main Map (in this case mine is called Basin Map).
4. In the Layout tab, use your mouse to drag the frame from the top left corner of guides to the bottom.

### MAP FRAMES:

Map frames point to any map that is open within the project. You can edit the map (add layers or remove feature layers, change symbology, etc...) and the map frame in the layout window will automatically update to include these changes. The extent of the map frame is unique to the layout tab and will not impact the map view.



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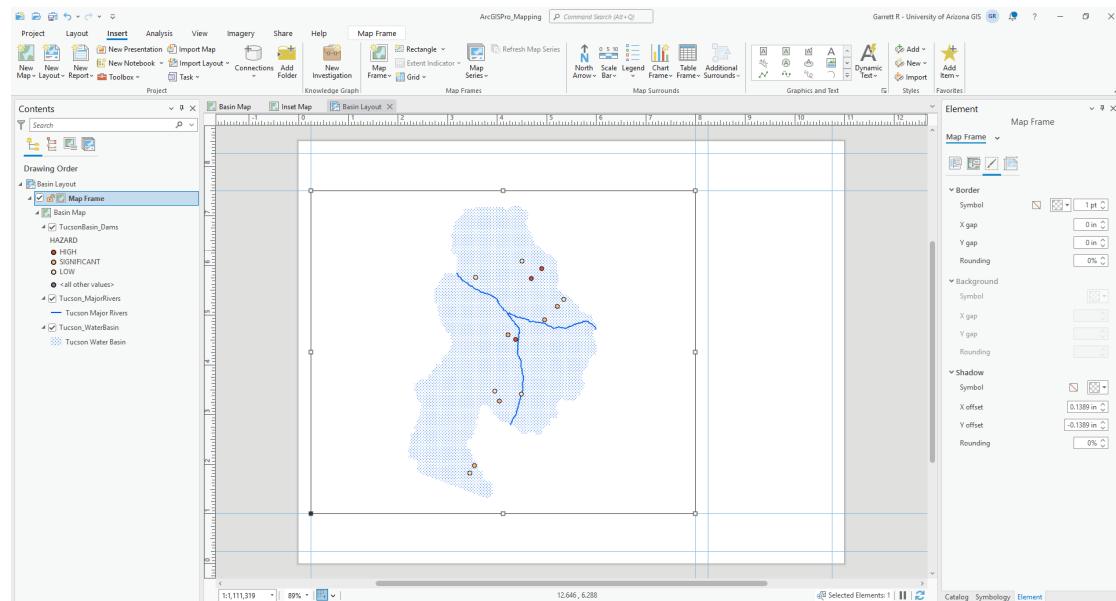
4

5. In the Contents pane right-click on the Tucson\_WaterBasin and select Zoom to Layer.

Right-click on the Map Frame and select Properties. Change the border color to none.

### MAP FRAMES:

Map frames point to any map that is open within the project. You can edit the map (add layers or remove feature layers, change symbology, etc...) and the map frame in the layout window will automatically update to include these changes. The extent of the map frame is unique to the layout tab and will not impact the map view.



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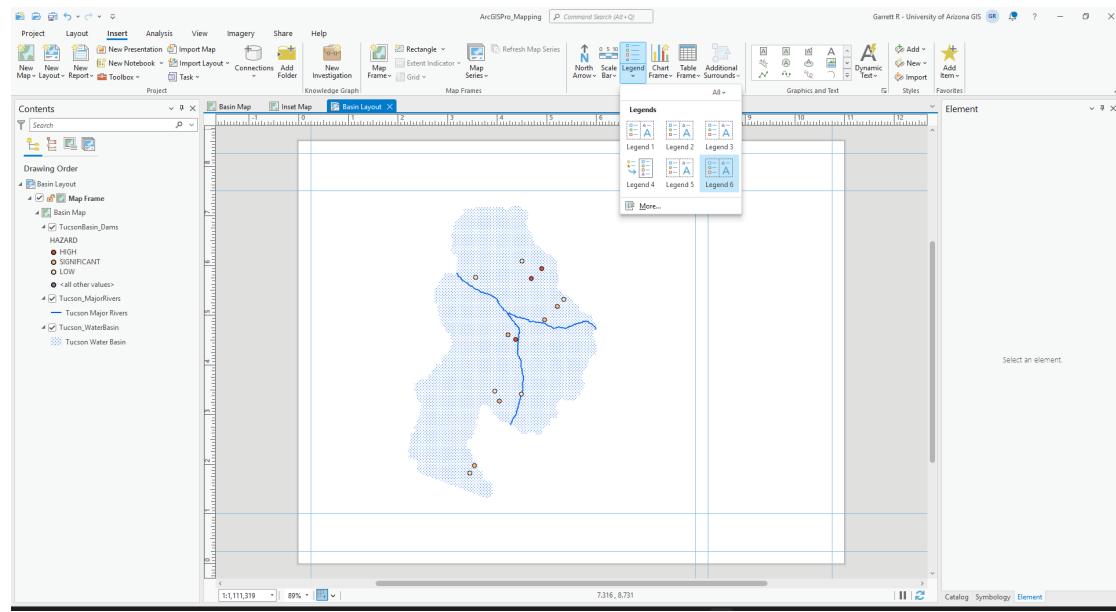
## CARTOGRAPHIC ELEMENTS

All maps contain cartographic elements that provide viewers with context about what is happening on the map.

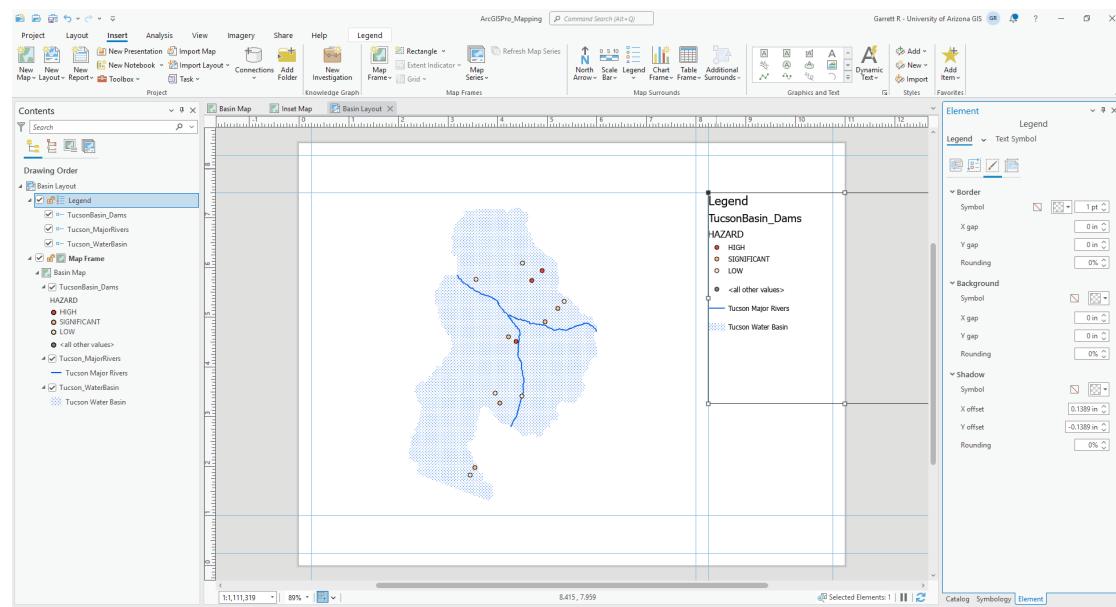
1. In the Insert tab located within the ribbon select Legend expanding the legend options and choose any of the legend options.
2. In the right-hand margin, between 8.25" and 10.75" double-click your mouse to insert the legend into the layout.

### LEGENDS:

Legends allow viewers of the map to understand the meaning of the symbols used to represent features on the map. If there are multiple feature layers they are represented in the legend as individual legend items. By default legends are dynamic and will update show the feature layers that are visible in the current map frame's extent if new feature layers are added or removed.



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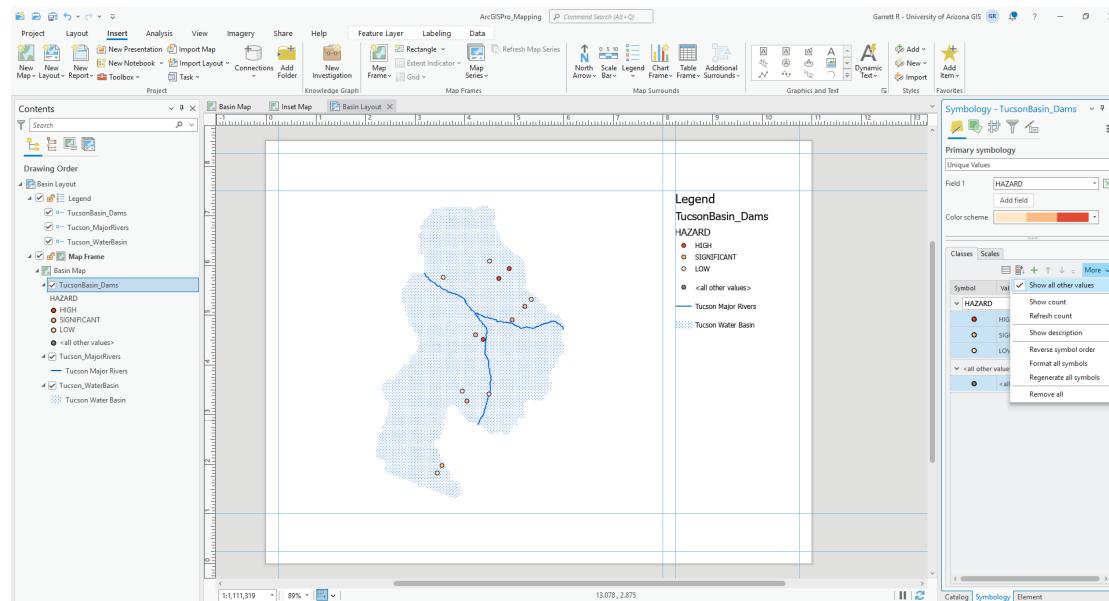
3. Notice in the Legend that there is a point for <all other values>. To get rid of this open up the Symbology pane for the TucsonBasin\_Dams feature layer.

Click on More and uncheck Show all other values.

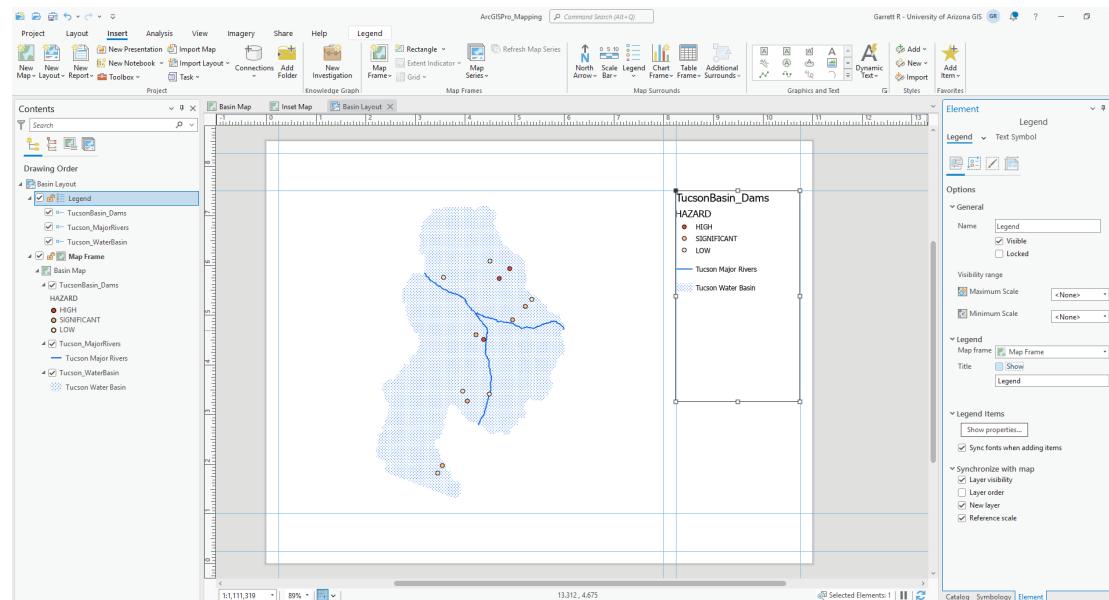
4. In the Contents pane, right-click Legend and select Properties to open the Elements Legend pane to display the editing options for the legend.

In the Legend window uncheck Show next to Title.

Click on Show Properties.



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5. In the Multiple Items pane uncheck Layer Name under Show.

6. In the Insert tab located within the ribbon select North Arrow expanding the north arrow options and choose a north arrow.

Click your mouse at the bottom left-hand corner of the layout to place the North Arrow.

In the Insert tab located within the ribbon select Scale Bar expanding the scale bar options and choose a scale bar.

Click your mouse at the bottom of the layout next to the north arrow to place the scale bar.

In the Insert tab located within the ribbon select Rectangle Text from the Graphics and Text group.

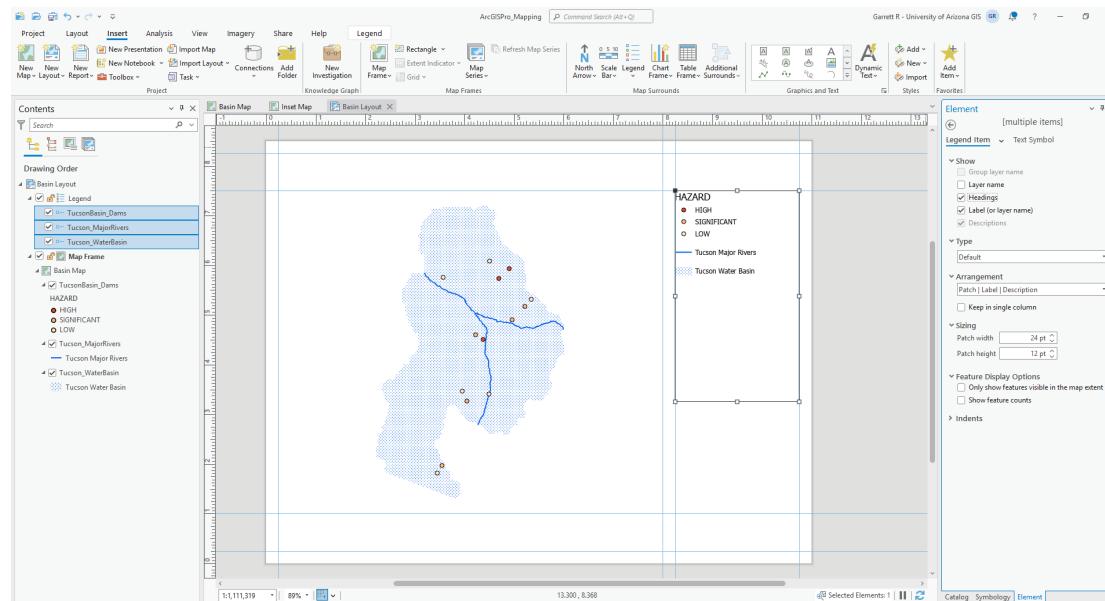
Draw a rectangle at the top of the layout and give your layout a title. You can click on the Text to open up the Text Element pane and change the size and color of the text if you would like.

### NORTH ARROW:

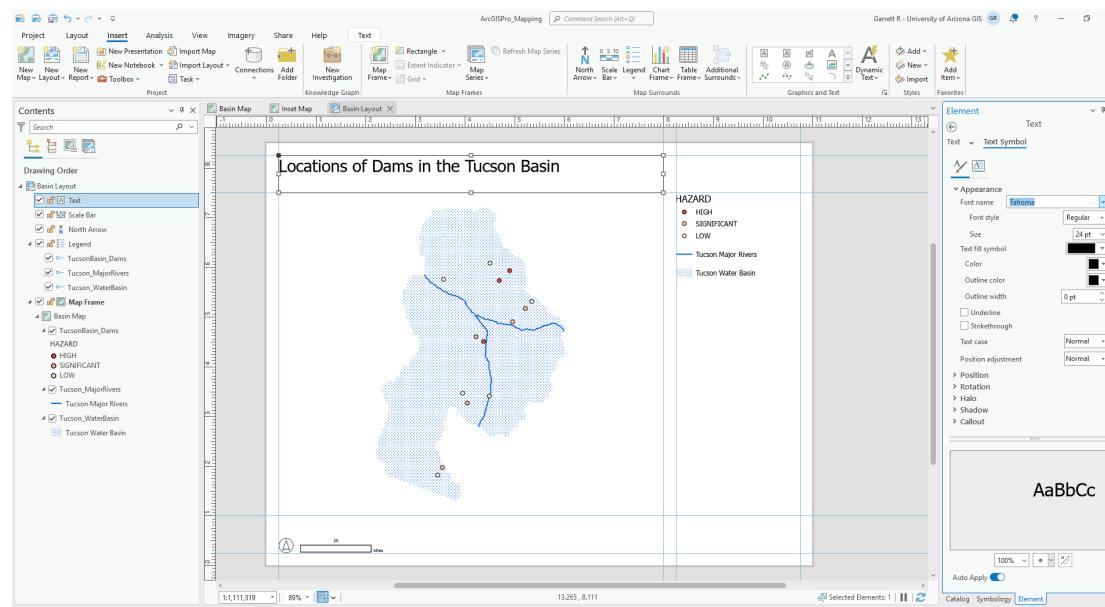
The north arrow indicates the orientation of the map and when placed on the map is automatically associated with the default map frame.

### SCALE BAR:

The scale bar are used to visually identify the distance and feature layer sizes on the map. The scale bar is dynamically linked to the default map frame and if that map's extent changes the scale bar will automatically update to represent these changes. Scale bars should be displayed in measures that are appropriate for the scale of the analysis.



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7. Add an additional text box under the legend and type in some descriptive text about your map.

In the Insert tab located within the ribbon select Dynamic Text. Notice that there are no Credits available within the data used to make the map.

Insert the following credit text:

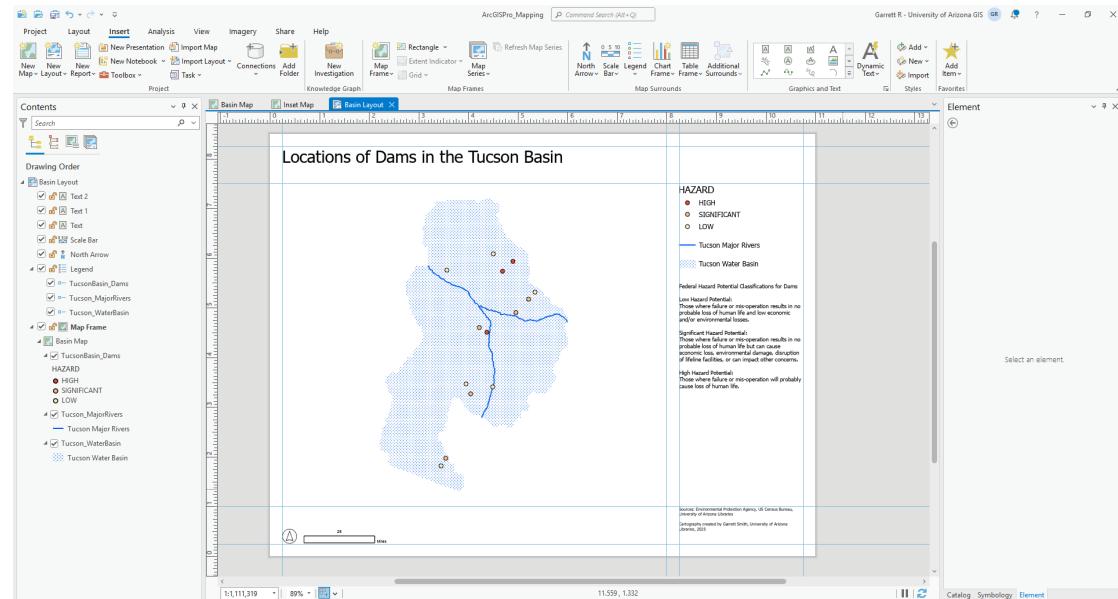
Source: Environmental Protection Agency,  
US Census Bureau, and University of Arizona  
Libraries.

Cartography created by your first and last name, organization, and year

#### TEXT:

Map titles need to be concise and descriptive generally mentioning the location of the analysis. If needed, descriptive text can provide additional context for the attributes that are being mapped. Finally, you want to give and receive attribution for the map.

In addition, the text on your map should follow some sort of hierarchical format moving from the largest text (title) to the smallest text (sources).



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## INSET MAP

1. In the Insert tab located within the ribbon select the second map frame (in this case mine is called Inset Map).

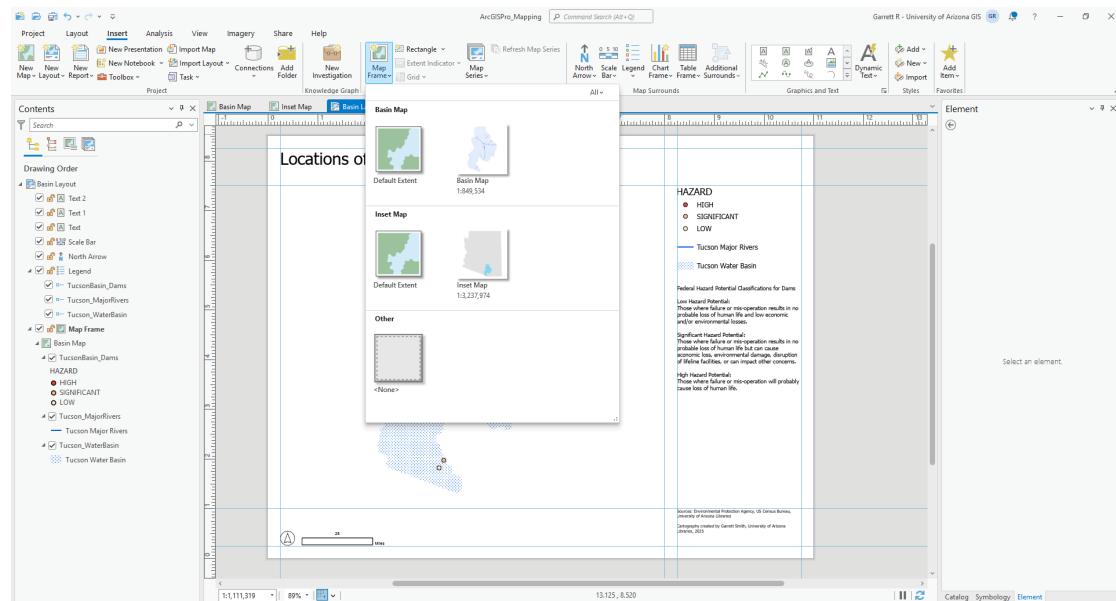
Use your mouse to create a small rectangle somewhere on the layout.

Zoom to the full extent of the inset (small) map by right-clicking on the AZ\_Boundary feature layer and selecting Zoom to Layer.

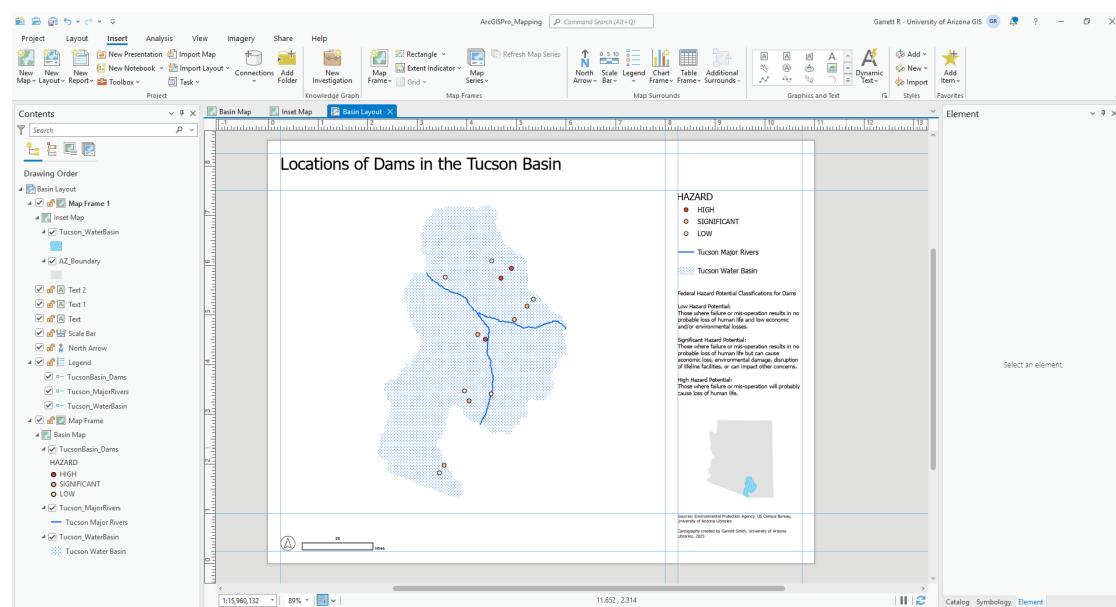
2. Place the inset map someplace on the layout that you think is logical.

### INSET MAP:

Inset maps are used to show the extent of one map frame within another map frame. Oftentimes inset maps are used to show the location of the map in a larger context giving the viewer an idea of where the main map is located. The inset map should be smaller than the main map.



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## EXPORTING MAP

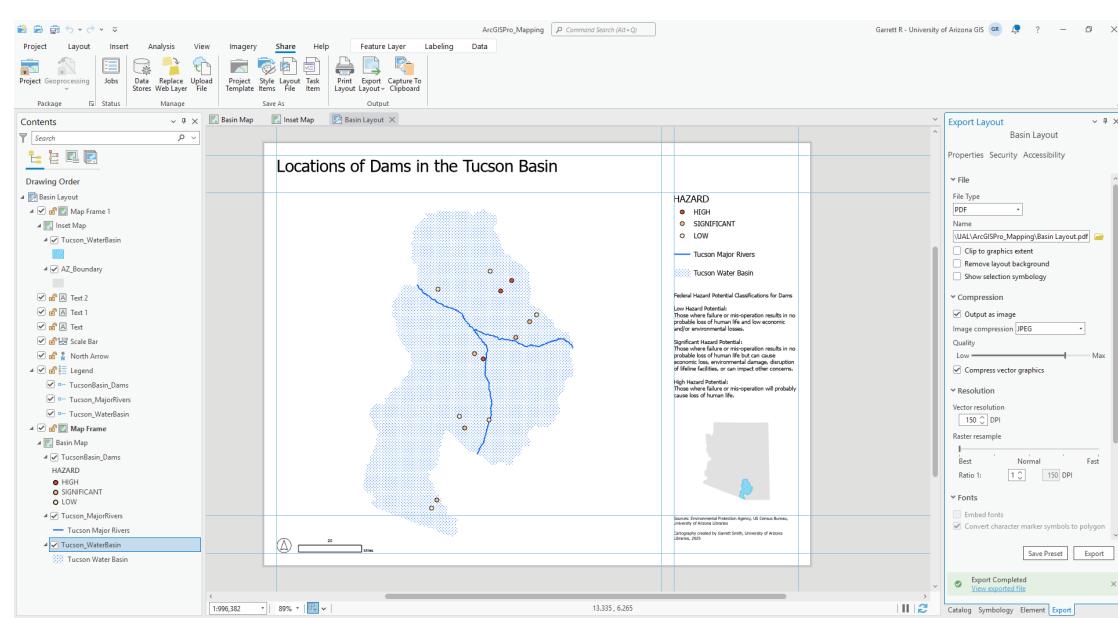
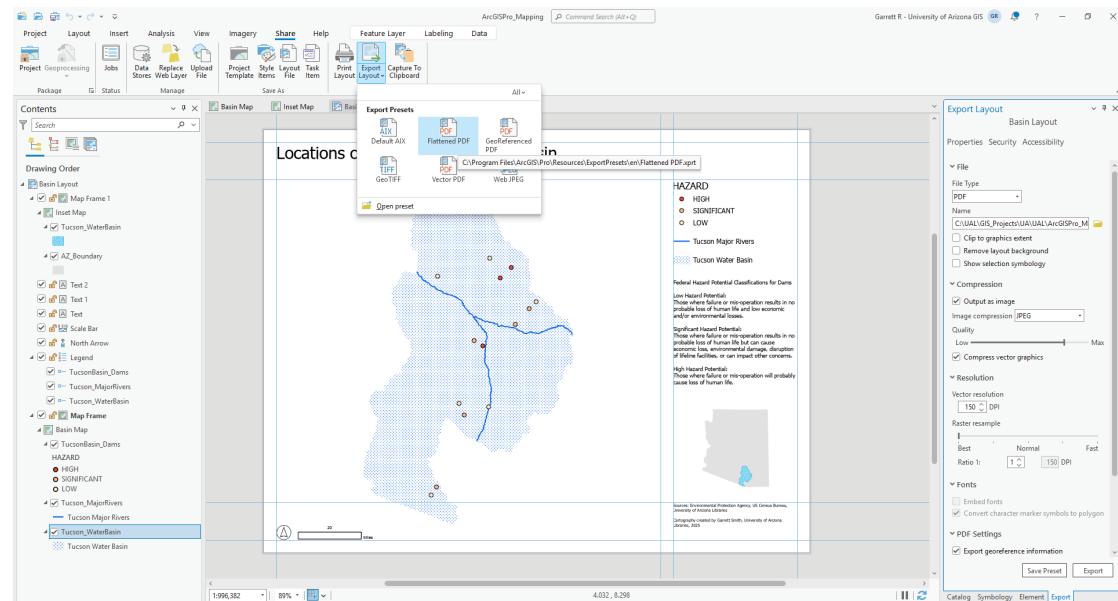
1. In the Share tab located within the ribbon select Export Layout.

Choose Flattened PDF.

2. In the Export Layout pane adjust the setting that are appropriate for the type of file that you would like to export.

### EXPORTING MAPS:

The type of map that you will export will be based on how your map layout will be used. There are a number of different options for exporting maps and each has its own utility.



**END**