

## Creating a New Project and Map Layout

ArcGIS Pro allows you to assemble all the resources required to complete a project in one place. A project contains maps, layouts, tasks, and connections to servers, databases, toolboxes, folders, styles, and so on. It can also incorporate your content from ArcGIS Online.

In previous lessons, you've been given a project to start with that has all the maps and data required for the activity. In this lesson, we'll be starting from scratch, creating a new project and map layout. The use of definition queries and various symbology options will help in displaying your data for a map layout.

Estimated time: 1 hour

### Skills

Create new Pro project	Insert New Map and rename
Add Database to Databases folder and make default	Create Definition Query
Change layer symbology: Unique Values, Graduated Colors and Graduated Symbols	Insert graphic elements into layout: Title, legend, north arrow, and scale bar
Set default map for map layout	Layout Activate button
Insert New Layout	Export Layout

### Setup

- 1) **Download the project and data from the lesson page at <http://spatialstudies.redlands.edu/resources/gtkpro-03>**
- 2) **Create a folder named *GTKPro* on your C: Drive**
- 3) **Extract (unzip) the contents of the zip file to your new folder at C:\GTKPro.**  
This is simply a recommended location for the data for this activity. You may unzip the data to any folder you would like, but the steps in this activity will refer to this location.

### Creating a New Project

- 1) **Open ArcGIS Pro and login with your account**
- 2) **Select Blank from the list of templates under *Create a new project*.** A dialog will appear prompting you for a location to save the project. These are templates that are installed with ArcGIS Pro and you can create your own and share them with others.
- 3) **Setup your new project:**
  - **Name your project *firstnamelastname\_MakingMaps*.**
  - **Browse to your C:\GTKPro**
  - **Confirm that *Create a new folder for this project* is checked**
  - **Click OK**

This will create a new folder in your C:\GTKPro folder with the name you gave it along with some default items including a new geodatabase, a toolbox, and a map with the Topographic

basemap turned on. We won't be using many of these items but they are included in the Blank template.

- 4) **Expand *Databases* in the Project pane.** *\*Please note that if the Project pane is ever hidden for any reason, you can turn it back on by clicking the Project button on the VIEW ribbon.*  
Notice that there is a database named the same as your project here. This was included as part of the template to help organize your project data, but we won't be using it in this activity. We'll add a connection to the geodatabase you copied to your C:\GTKPro folder earlier.
- 5) **Right-click *Databases* in the Project pane and select *Add Database*.**
- 6) **Browse to the *USA.gdb* geodatabase you downloaded earlier to your C:\GTKPro folder and click *Select*.** The geodatabase now shows up in the Databases list.  
Connecting to a geodatabase makes it easier to access the data in it by creating a shortcut in the Databases list in the Project pane. *It does not copy the geodatabase into your project folder.* This is very helpful when you have layers that you want to access in multiple locations on your computer or network.
- 7) **Right-click *USA.gdb* and select *Make Default*.** This moves it to the top of the list and will use this location as the default in future dialogs for this project. Be patient, this may not change immediately.
- 8) **Insert a new map and name it *USA*.** Recall that you can do this from the INSERT ribbon. A new map is added to the project with the Topographic map by default.

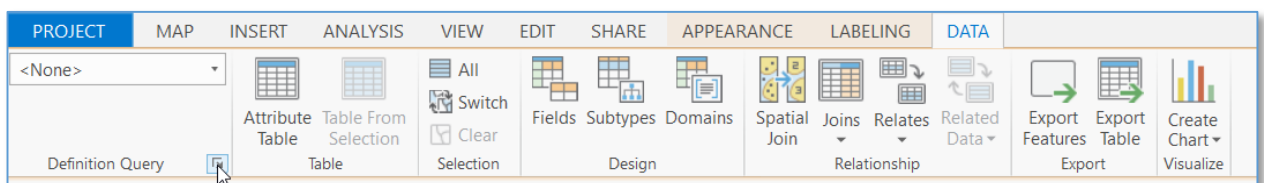
## Using a Definition Expression to Filter Layer Features

When you draw a dataset as a layer, you often only want to draw some of the features. In these situations, you can define a query expression to select a subset of features for the layer to display. This is referred to as a definition query.

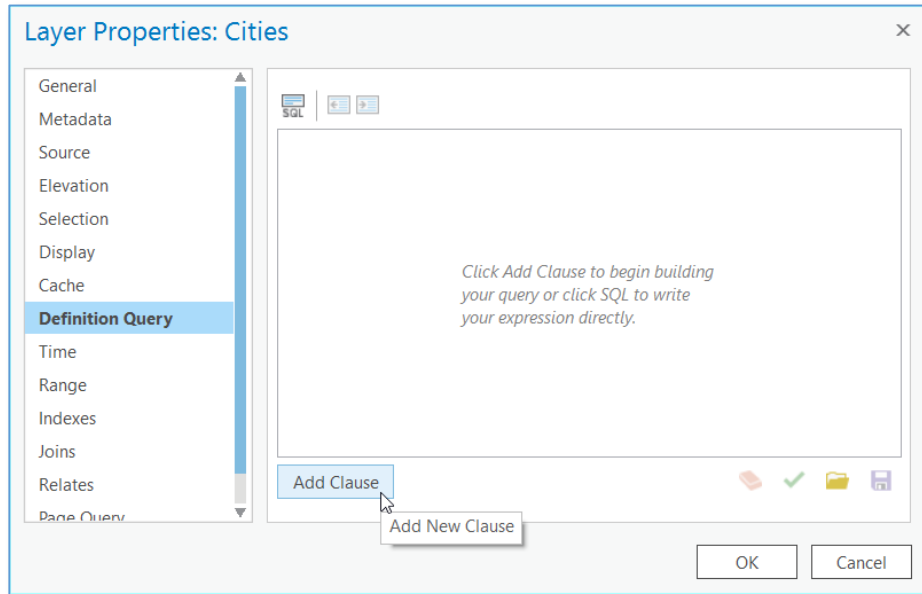
For example, you might want to do the following:

- Display only cities with a population above a certain threshold.
- Define map layers for each class of roads independent of the other features.
- Work with only a subset of data from a very large database.

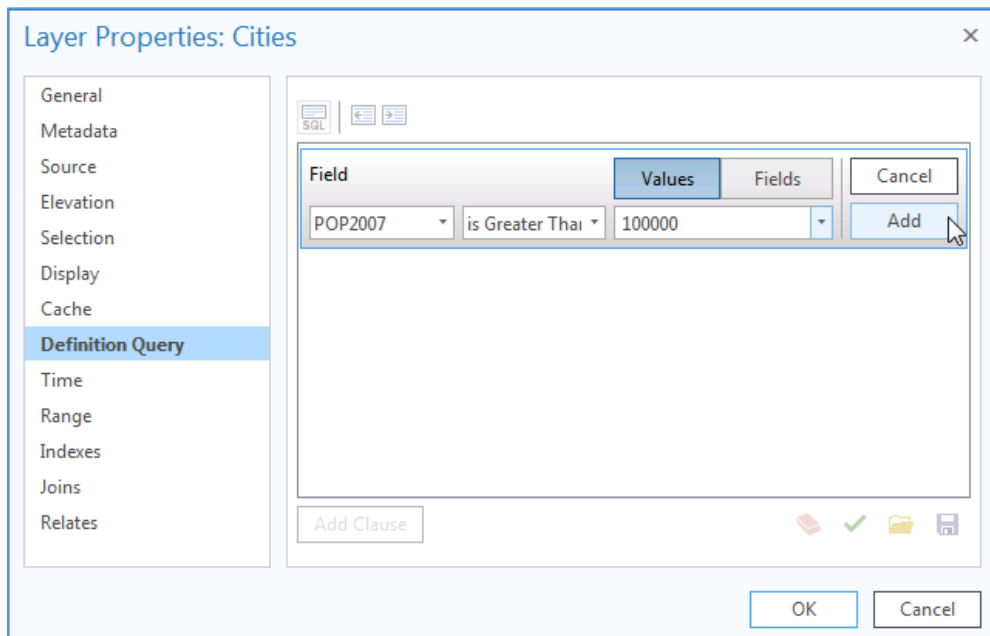
- 1) **Add *Cities* from the *USA* geodatabase.** Points that represent all of the cities in the US are added to the map. This makes for a very cluttered map so we'll start by filtering the points to display using a *Definition Query*.
- 2) **From the *DATA* ribbon, click the *Build definition query* button in the far left *Definition Query* group.** Definition queries are expressions that filter which features to display on the map. This is often done for either cartographic or performance reasons.



- 3) **Click the *Add Clause* button.**



- 4) Using the dropdowns, build a clause that filters features where: *POP2007 is Greater Than or Equal to 100000* and click Add.



- 5) Click OK. This filter significantly reduces the number of city points drawn on the map.

## Displaying Quantitative Data with Symbology


In the [Interacting With Data](#) lesson we created a new map that showed locations and changed symbology to make the maps more descriptive by giving the layers colors and marker symbols (icons). In this activity we will explore how to use symbology to present quantitative data.

### Unique Values Renderer

The Unique values renderer is used to apply symbols to different attribute values. The drawing of the layer is based on an attribute that stores names or categories, such as habitat types, planning zones, voting preferences, or soil classifications.

- 1) **Add the *States* feature class from the USA geodatabase.** The layer will be added with a random color and the map will automatically zoom to the full extent of that layer.
- 2) **Select the new layer by clicking it in the Contents pane.**
- 3) **Click Symbology from the APPEARANCE ribbon.**
- 4) **From the *Symbology* dropdown, select *Unique Values*.**
- 5) **From the *Field1* dropdown under *Value field*, select *STATE\_NAME*.**

The Values table at the bottom of the pane displays the list of values and their assigned symbol. You can add these one at a time or add all of the unique attribute values in the field you set in the dropdown (*STATE\_NAME* in this case).

- 6) **Click the *Add all values* button  at the top of the Values table.** This adds all the unique values in the field and gives a random color from the assigned *color scheme*.
- 7) **Change the *color scheme* by clicking the *Color scheme* dropdown.** A few color schemes are displayed by default but there are many more and you can create your own if you would like to create a custom color scheme.
- 8) **Click the *Show names* and *Show all* checkboxes at the bottom of the dropdown. Experiment with some of the color schemes to find one that you like.**  
You can change an individual symbol for a value by clicking the symbol in the Values table and setting the individual properties for it.
- 9) **Rename the layer *States by name* when you are satisfied with the layer.**

### Graduated Colors

Graduated colors is used to show a quantitative difference between the features mapped. In thematic mapping, particularly for the design of choropleth maps, this symbology is applied, but it also has a wider utility for displaying any quantitative differences between data.

- 1) **Turn off *States by name* (that you made in the previous step)**
- 2) **Add the *States* feature class from the USA geodatabase (yes, a second time).** Multiple layers in a single map that all draw from the same feature class is a very common practice.
- 3) **Select the new layer by clicking it in the Contents pane.**
- 4) **Click Symbology from the APPEARANCE ribbon.**
- 5) **Select *Graduated Colors* from the Symbology dropdown.** The layer immediately changes to display a color scheme using the *POP2010* field because this is the first numeric field in the layer. Natural Breaks (Jenks) is also set by default, along with 5 classes, and a default color scheme.
- 6) **Change the Field to *POP2013***

- 7) **Experiment with the various classification methods using the *Method* dropdown and changing the number of classes.**

We will be discussing various classification methods in class. Notice that you have to make decisions about how to classify or “bin” this data into a set number of classes.

- 8) **Change the color scheme using the Color scheme dropdown (as we did with the Unique Values renderer).**
- 9) **Leave the normalization dropdown as <none> for now.**
- 10) **Rename the layer *States by Population* when you are satisfied with the layer.**

Next we will make a copy of the population layer we just made and normalize the populations by the associated state’s area to show population density.

- 11) **Copy the *States by Population* layer by right-clicking it and selecting Copy.**
- 12) **Paste the layer into the same map by right-clicking the name of the map (*USA*) and selecting Paste.**
- 13) **Rename the pasted layer *States by Population Density***
- 14) **Turn off the *States by Population* layer.**
- 15) **Select the new layer and return to the Symbology pane.**
- 16) **Using the Normalization dropdown, select SQMI (one of the last items in the list).** This attribute represents the area of the state in square miles. Notice that the map changes along with the values in the Class Breaks list. These values now represent the state’s population per square mile, this is often referred to as “population density”.
- 17) **Experiment with the classification methods, number of breaks, and color scheme.**

## Graduated Symbols

Graduated symbols are used to show a quantitative difference between mapped features by varying the size of symbols. Data is classified into ranges that are each then assigned a symbol size to represent the range. For instance, if your classification scheme has five classes, five different symbol sizes are assigned. The color of the symbols stays the same.

Symbol size is an effective way to represent differences in magnitude of a phenomenon because larger symbols are naturally associated with meaning more. Using graduated symbols gives you a good degree of control over the size of each symbol, because they are not related directly to data values as they are with proportional symbols. This means you can design a set of symbols that have sufficient variation in the size that represents each class of data to make them distinguishable from one another.

- 1) **Select *Cities* and open the attribute table.**
  - a. **Sort the POP2007 field to determine range of values.**
  - b. **Close table**
- 2) **Go to the Symbology pane for *Cities*.**
- 3) **Select Graduated Symbols from the Symbology dropdown.**
- 4) **Change the Field to *POP2007***
- 5) **Change the Method to Manual Interval**
- 6) **Remove the top two class breaks by right-clicking and selecting Remove Break(s)**

- 7) Set upper value on top class break to 200000
  - a. Change label to 100,000 to 200,000
- 8) Set next to 300000
  - a. Change label to 200,001 to 300,000
- 9) Change label on last class break to > 300,000
- 10) Change colors of each symbol as you see fit.

## Map Layouts

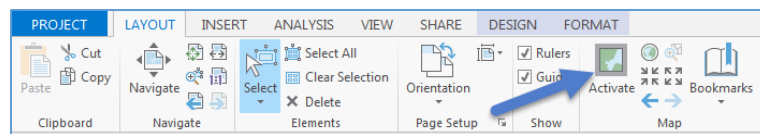
Layouts allow you to create pages to be presented as a printed hardcopy, image, or pdf. Layouts can contain multiple maps and surround elements such as north arrows, a scale bar, legends, and text.

- 1) Turn on the States By Population layer and turn off the rest of the layers we made in the last exercise.
- 2) Create a new layout by clicking New Layout from the INSERT ribbon and select the landscape Letter-sized template. This creates a new blank layout. Notice that with a layout active, the ribbon changes significantly.

Maps are added to the layout in the form of map frames. Think of map frames as containers for the maps on your page that can point to any map or scene within your project. The extent of the map inside a map frame is unique and independent of any other map view that may be open in the project. While the extent of the frame is independent, the contents of the map are not. Layers and their properties cannot be set per view. For example, if you select a layer, it will be selected in all open views, including inside of the map frame. Likewise, if you turn a layer off in one view, it turns off in all views.

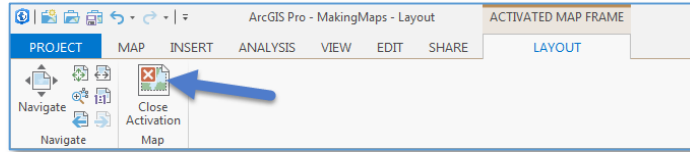
- 3) With the layout active, click the dropdown under *Map Frame* from the INSERT ribbon and select USA > Default. Your USA map is added to the layout with any layers that were visible and at the map's default extent (the world in this case). If we had created multiple maps in our project, the other maps would be listed in this dropdown as well.
- 4) Try zooming in on the map using the scroll wheel. Notice that you're now zooming in on the page, not the map itself. We'll look at how to navigate the map in the layout next.

- 5) From the LAYOUT ribbon, click the *Activate* button in the Map group.



Notice that the ribbon changes again and you are now manipulating the map, as it pertains to this layout.

- 6) Zoom in to the continental United States.
- 7) Go back to editing the Layout by opening the LAYOUT ribbon and clicking *Close Activation*



The ribbon resets for Layout manipulation.

#### Add a Title

- 8) **With the layout open, click *Text* from the INSERT ribbon.**
- 9) **Click at the top of the layout to position the title.** A new Element pane appears to the right where you can type the title in the large text box.
- 10) **Type *State Populations* in the *Text* textbox in the Element pane and click *Apply*.**
- 11) **Open the *FORMAT* ribbon and change the font and size to your liking.**
- 12) **Position the title by dragging the text element on the layout.**

#### Add a legend

A legend tells the map reader the meaning of the symbols used to represent features on the map. When a layer is added to a legend, it becomes a legend item with a patch showing an example of the map symbols and explanatory text.

- 13) **With the layout open, click *Legend* from the INSERT ribbon.**
- 14) **Drag a rectangle on the layout of where you want the legend to be placed.** The legend will be added to the layout with the visible layers displayed. Experiment with this by expanding the *USA Map* in the *Contents* pane and toggling which layers are visible.

\*For more on formatting legends, see the ArcGIS Pro Help website topic here:  
<http://pro.arcgis.com/en/pro-app/help/layouts/work-with-a-legend.htm>

#### Add a North Arrow and Scale Bar

- 15) **Add a north arrow to the layout by visiting the ArcGIS Pro Help topic on it here:**  
<http://pro.arcgis.com/en/pro-app/help/layouts/north-arrows.htm>
- 16) **Add a scale bar to the layout by visiting the ArcGIS Pro Help topic on it here:**  
<http://pro.arcgis.com/en/pro-app/help/layouts/scale-bars.htm>

#### Export your Layout as a jpeg

- 17) **With the Layout active, open the *SHARE* ribbon and click *Export Layout* (far right button).**
- 18) **From the dialog, browse to a location to save the exported file, name it *firstname\_lastname\_StatePopulations*, select *jpeg* from the *Save as type* dropdown, and click the *Export* button.**