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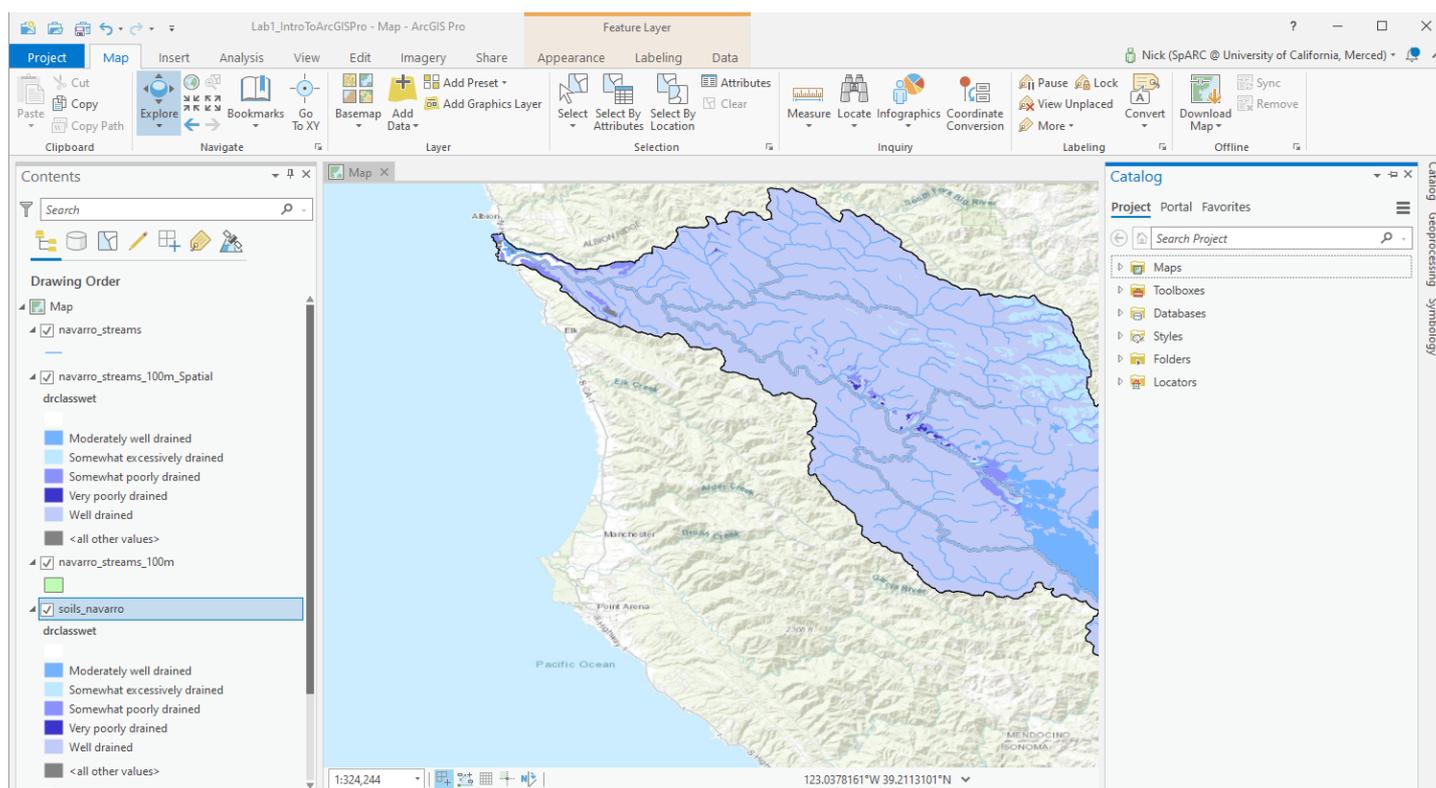
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1. Introduction

We have completed the analysis of the soils and waterways for our map of the Navarro River Watershed and conducted some basic visualization. But now we need to make the map!

In this lab exercise, you will take the map you worked on last time, and turn it into a complete, ready to print or share PDF map. You will add all of the core components of complete maps, including a title, legend, north arrow and scale bar. You will also list your name and the date the map was edited. Finally, you will add an inset map to provide context about the location of the main map, and you will link that inset map to the main map.

Cartography can be a very involved process, but also incredibly rewarding as you see your analysis work become a broadly-usable product!

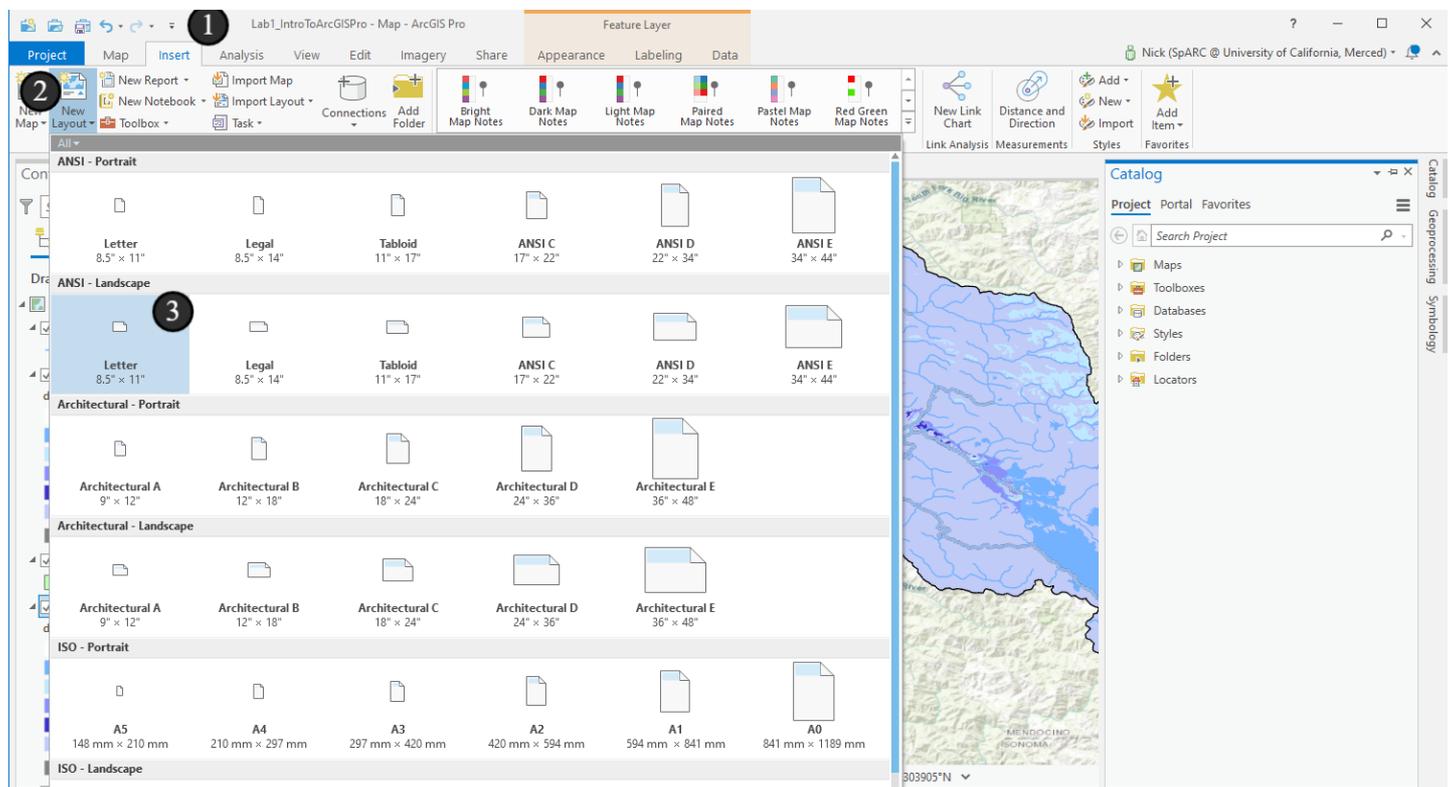


1.1 Insert a New Layout

So far in ArcGIS Pro, we have worked with *Maps* and *Layers*, as well as some of the properties of each (such as symbology). Now it's time for us to add a third item to the project, a *Layout*. If *Maps* are for working with geographic data in the application, *Layouts* are how we can create maps for print or export, sometimes called "paper maps" even though these days they are often used as PDFs that may never be printed. Regardless, they are how we take the display of geographic data on our screen and make it into something complete that can be referenced as a map outside of the software.

To insert the layout

1. Switch to the *Insert* ribbon
2. Click *New Layout*
3. In the *ANSI - Landscape* section, choose the *Letter 8.5" x 11"* sheet. It's possible your screen could show these options differently, so make sure you choose the landscape (wider than it is tall) 8.5" x 11" option, or at least a landscape option.



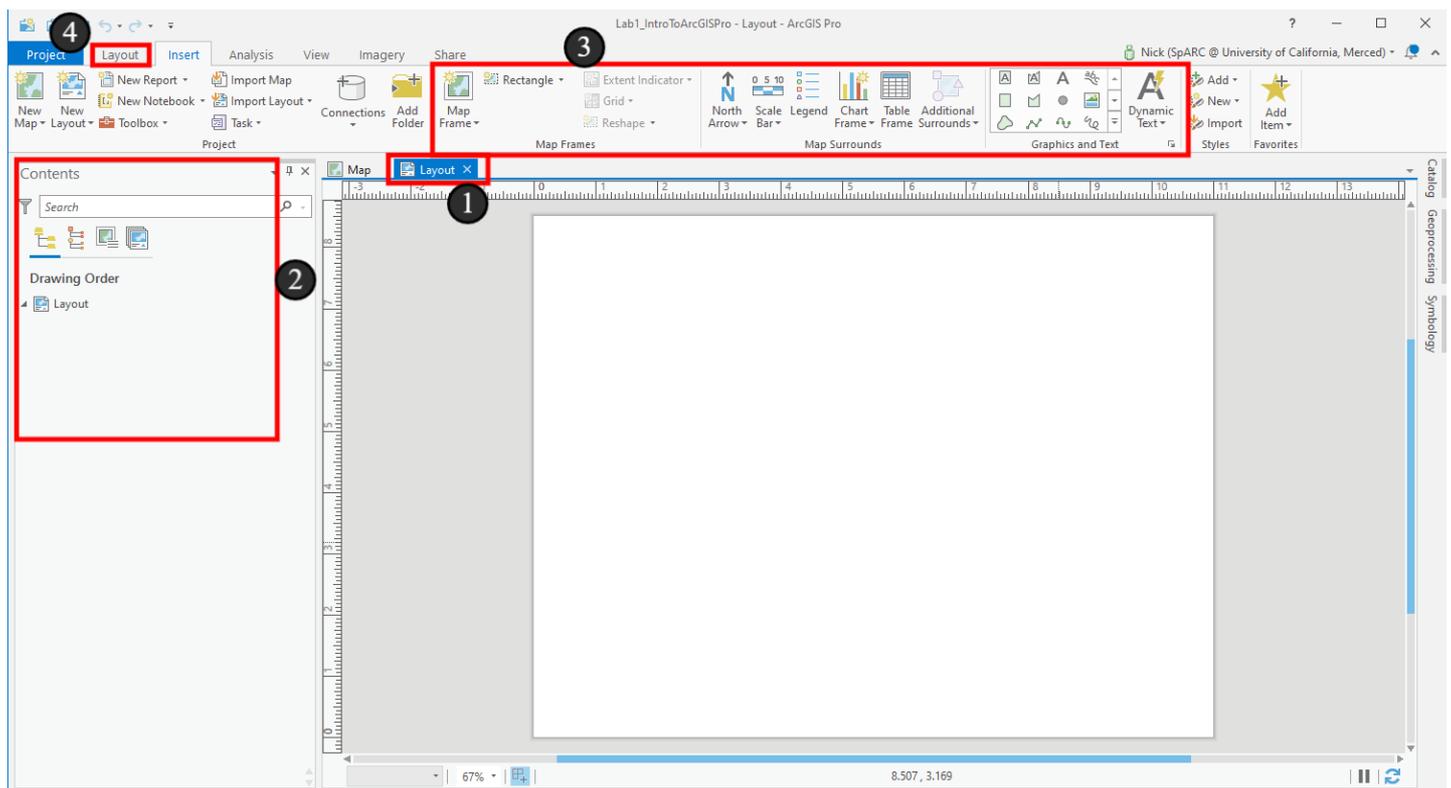
2. Everything changes!

Upon choosing a layout, immediately the application changes significantly in many places.

1. We see a new tab appears next to the *Map* tab that we previously used (but likely paid no attention to), called *Layout*.
2. The Contents pane is now empty (where did everything go? We'll figure that out in a moment) - it also has fewer display options at the top and the *root element* is now *Layout* instead of *Map*.
3. The *Insert* ribbon has changed significantly. Many of the available items for use on *Maps* are gone and replaced by items specifically meant for *Layouts*.
4. We see a new ribbon tab for *Layout*, fully replacing the *Map* tab we saw before.

This is the context sensitivity of ArcGIS in action. When we're looking at layouts, ArcGIS only shows us tools that are relevant for layouts. When we're looking at maps, ArcGIS only shows us tools that are relevant for maps.

At times, this can be frustrating for new users, because the path to find something doesn't seem like it's always visible on your screen, though it is. But it has quite a few benefits - if we can't find a tool we think we're looking for, it typically means we're not looking at the right thing right now. If I want to make a modification to my map, but don't see the *Map* tools that I'm expecting, it means I need to change my context. Once you get used to it, it's very powerful and also prevents you from trying to use tools that aren't applicable.



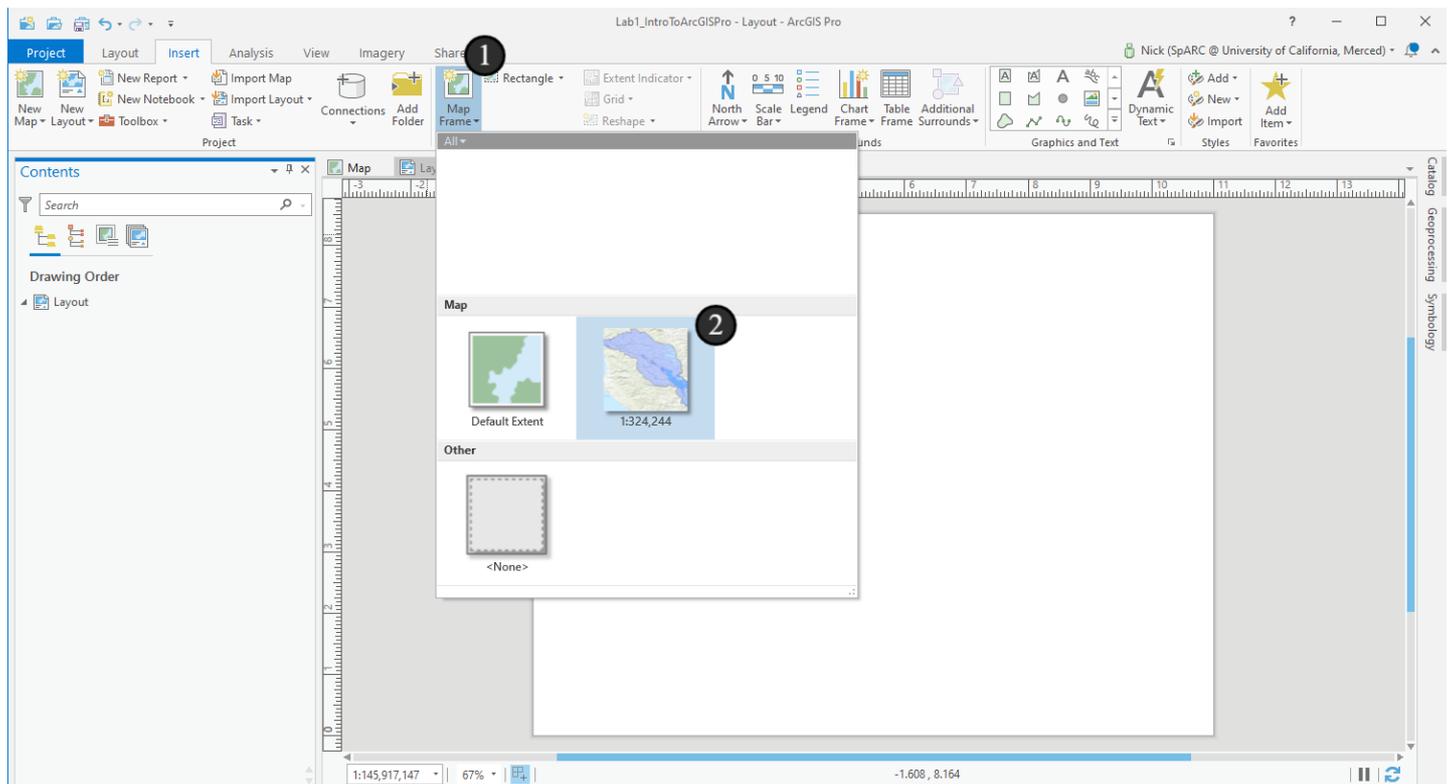
2.1 From a blank page to a map

Right now, we have a blank page in the size we specified, but nothing more, so let's change that by making our page show the data we've worked hard on.

To do that, we'll add a *Map Frame* to the page, which allows us to select one of the maps in this project and display it here. It will be linked to the map, so when we make changes to the map they will show both back in our *Map* view and on this layout.

To add the Map Frame, we'll use one of the new tools on the ribbon.

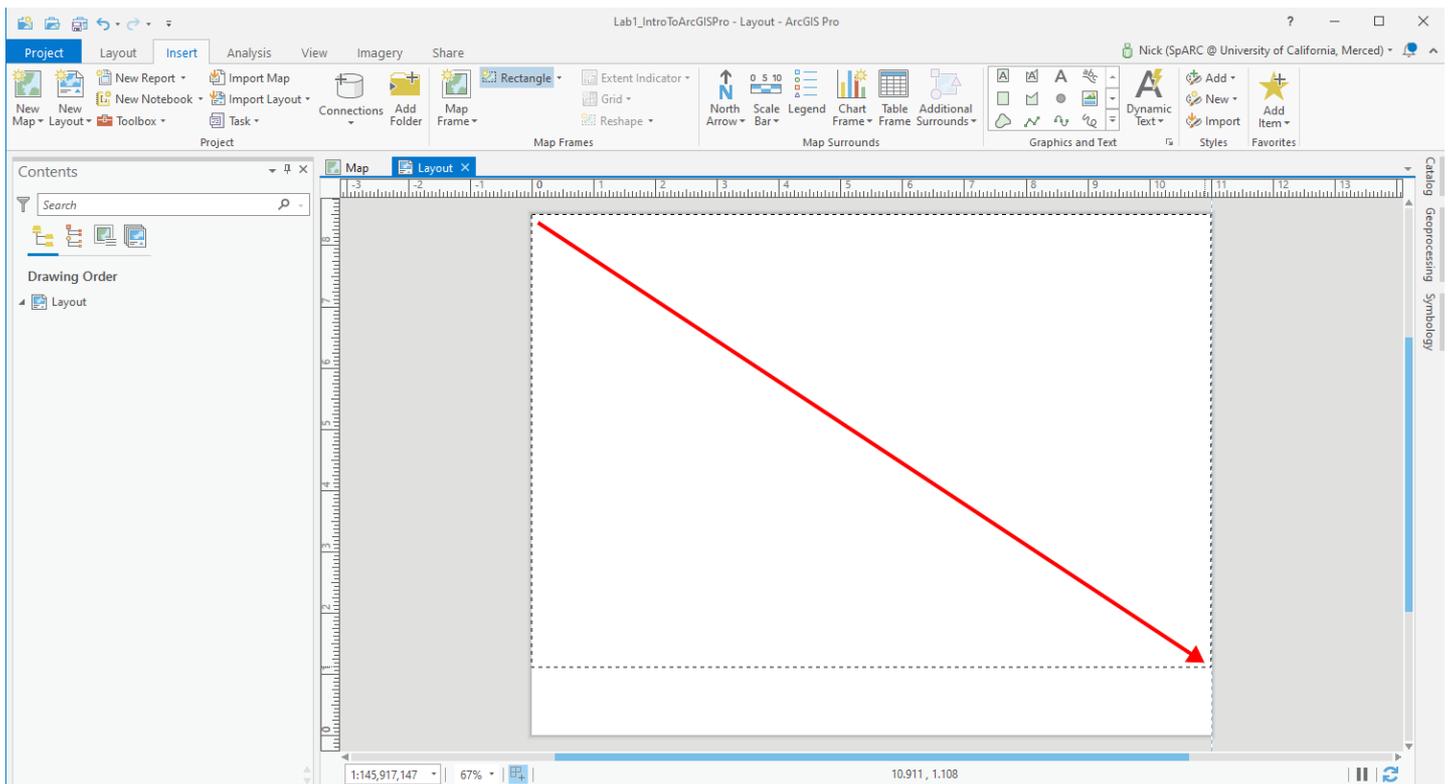
1. Click the *Map Frame* button
2. In the options that appear, click the one that has a set of numbers (a scale) and a preview of the map. ArcGIS Pro tries to give us multiple options for how to add the same map to our document - right now we only have one map, but two options for how to place it - these are mostly equivalent and aren't permanent choices (we can easily change one to behave like the other later), so it's OK to just choose one. For now though, the *Default Extent* option will show the whole world due to our basemap, while the one that shows *1:324,244* will be zoomed to show the data we've added, so we'll choose that one.



2.2 Making the Map Frame

After clicking the option for the map frame, nothing happened. Why?

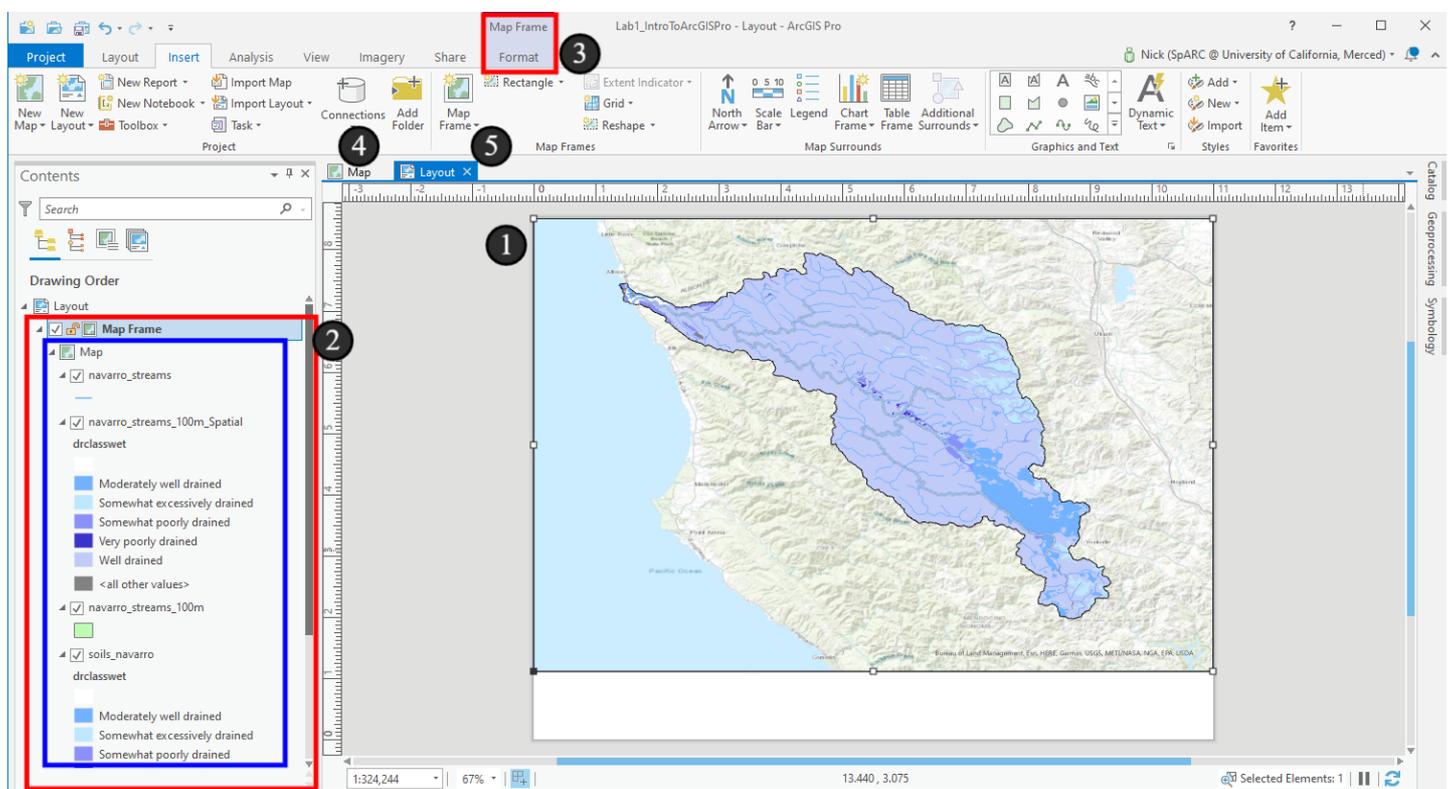
Well, we need to now draw the map frame on the page to indicate the size we want it to be (note the way your cursor changed). To draw the map frame, click and drag your mouse (click, holding the left mouse button down) from the top left of the layout toward the bottom right, leaving about an inch of space in the bottom, but taking the full width. Note the rulers on the left and top for measuring distances on the page here - it's OK if yours isn't exactly the same - close is fine, and we might adjust this later anyway.



2.3 Looking more like a map now

Now our map shows on the page. Progress! Once again, note what has changed in the interface:

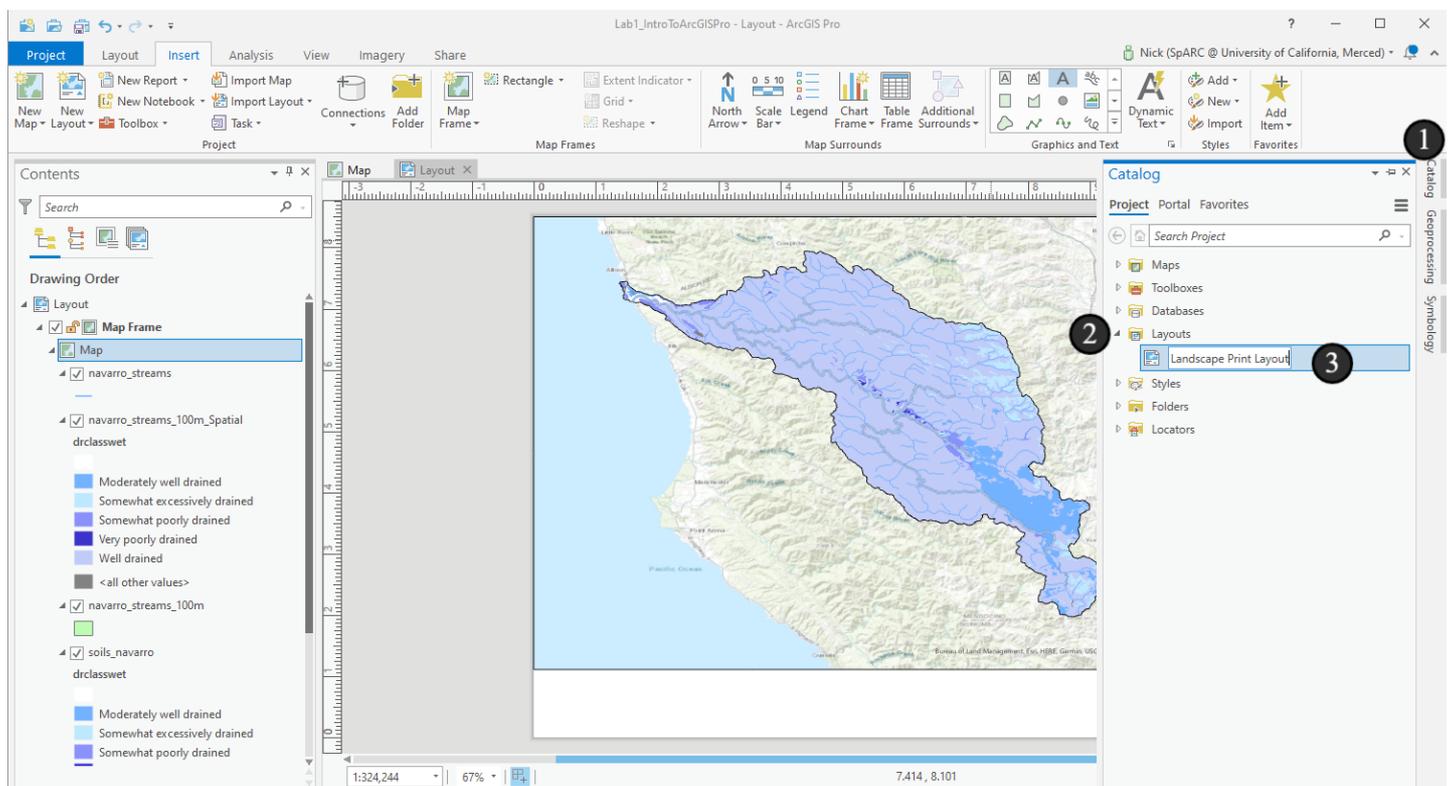
1. The most immediate change is that our map now appears on the page, looking similar to when we last saw it, but with some text in the bottom of the frame.
2. Under the *Layout* element in the Contents pane, we now have a *Map Frame* and then within that we see our map and then all the layers exactly as they were when we were looking at the Map tab. Note the checkbox next to Map Frame that lets us turn the item on and off on the layout, just as items within the map itself can be turned on and off.
3. Note the *Map Frame Format* ribbon tab that appears. We'll see sections of ribbon tabs appear more in the future.
4. Compare the items in the blue box with everything you see when you switch back to the main *Map* tab. Are they the same?
5. Switch back to the *Layout* tab.



3. Let's name things more clearly

You may have noticed things were starting to get confusing - we had the concepts of layouts, layout tabs, and a layout with the not-helpful name "Layout" - same for maps too.

1. Expand the Catalog pane from the righthand side (if it's not there anymore or you accidentally closed it at any point, it's on the *View* ribbon as a button named *Catalog Pane*).
2. Another context-sensitive item! We have a *Layouts* section in the Project tab of the Catalog. This one is slightly different in that it's not sensitive to what we're looking at, but just what's in the project. Until now, we didn't have any layouts in the project, so the *Layouts* section didn't show. Since we now have a layout, we see the section.
3. Click the layout named *Layout* that will be in that section. You can either hit the F2 key on your keyboard, or right click on it and then click *Rename* to start renaming it. Name it *Landscape Print Layout* and then hit the *Enter* key on your keyboard to make the change
- 4.

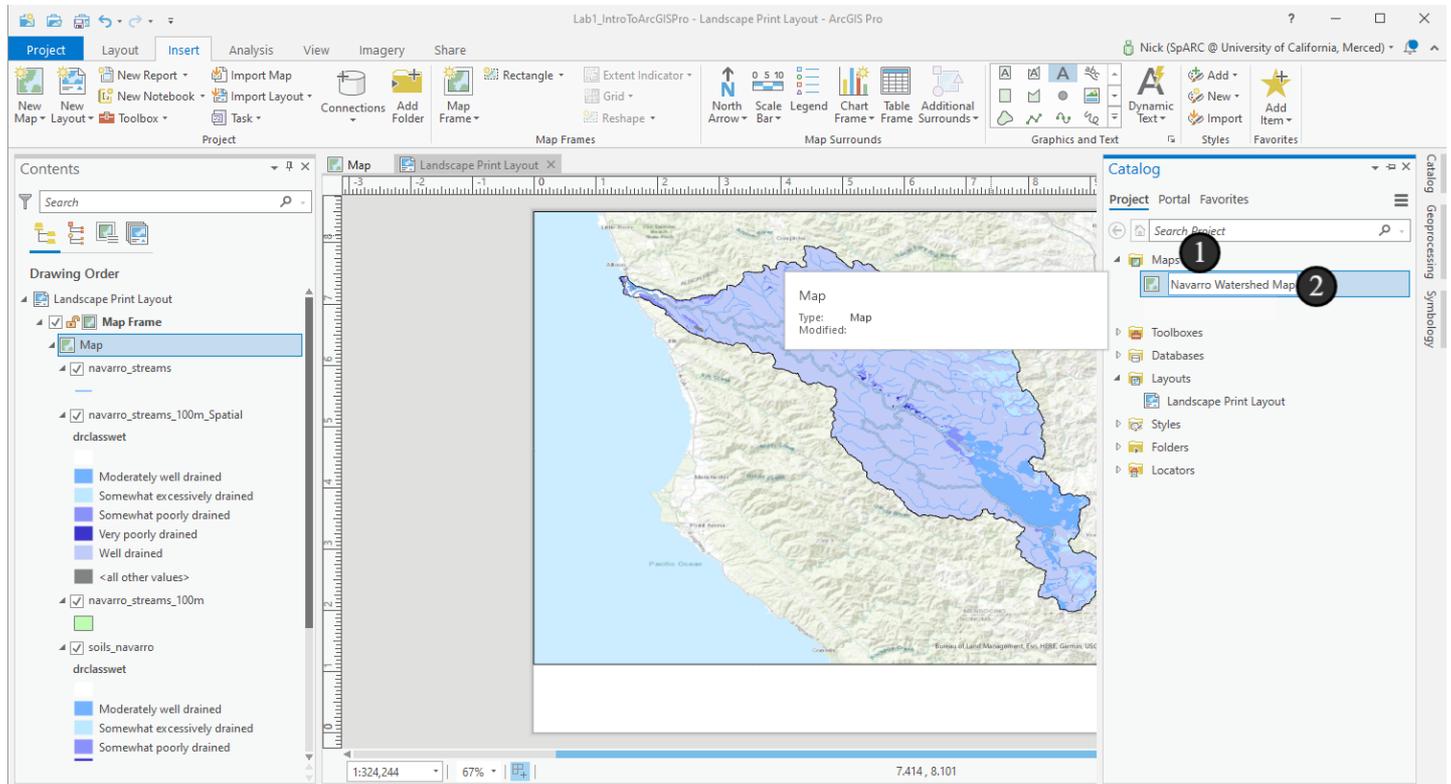


3.1 While we're at it...

While we're naming things, let also change the name of our map.

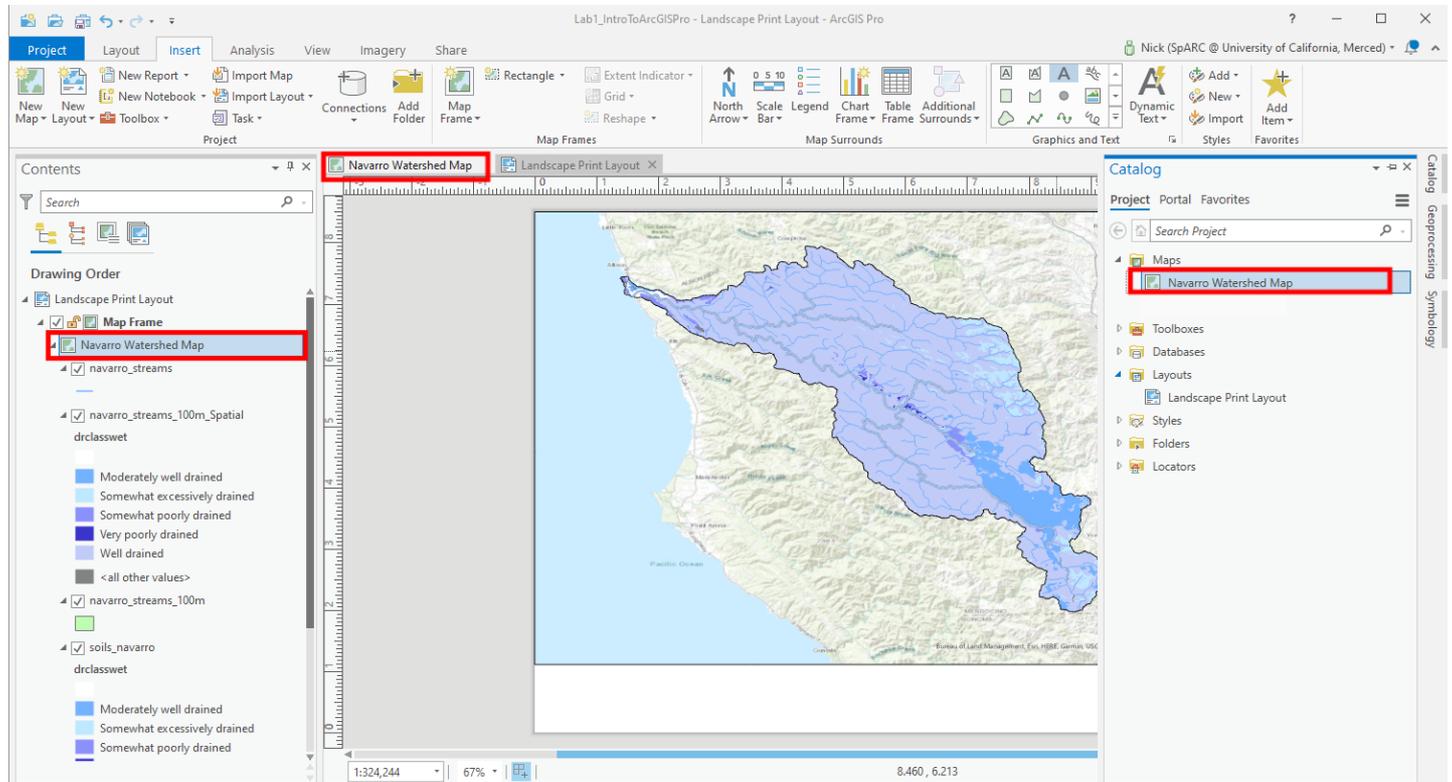
1. Expand the *Maps* section in the Catalog pane
2. Rename the map named *Map* in that section to *Navarro Watershed Map*

Hit *Enter* on your keyboard again to make the change



3.2 Note everywhere it changes!

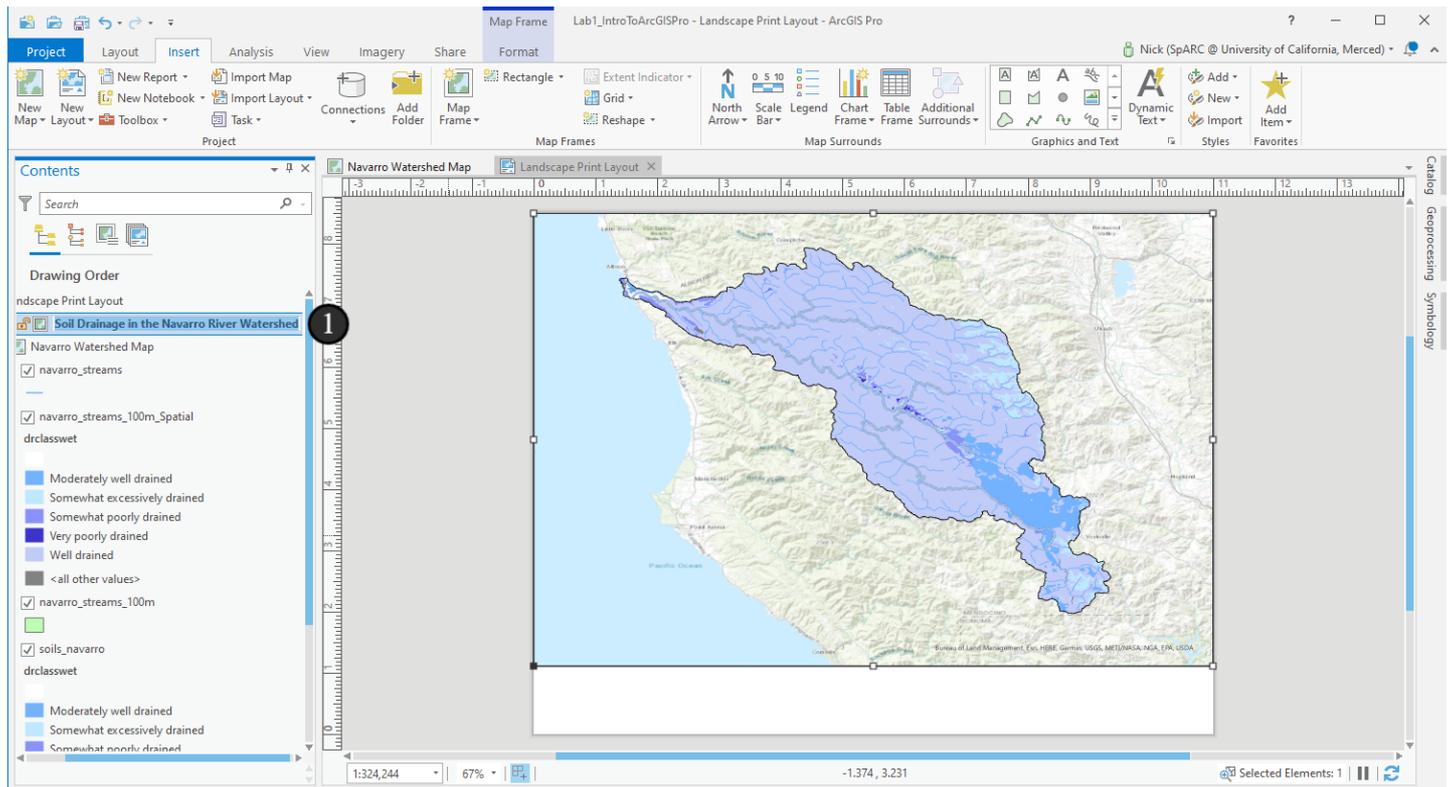
Immediately, this change takes place throughout the application anywhere that used that map - it shows in the Catalog pane, in the tabs at the top of the main view, and even in our Contents pane within the map frame. That should help make things clearer as to which map we're looking at in the future (and make it easier for us to specify instructions).



3.3 Rename the Map Frame too

One more thing to rename - this time, the map frame. It will be useful in just a moment, while also being clearer as we add more items to our layout.

1. Click on the *Map Frame* in the Contents pane and use the F2 key on your keyboard to start renaming it. Then type the name *Soil Drainage in the Navarro River Watershed*. Use the *Enter* key again to make the change.



4. Inserting a title

Now, let's add a title to our map. Looking at this now, it's not clear what we're looking at to anyone who didn't make the map. We'll use *Dynamic Text* for this. Dynamic Text is helpful because it lets us avoid entering things in multiple places, so that if things change or we get feedback, like on the title of our map, we only need to update one place to have it changed everywhere in the project. It makes maintaining a project like this much easier.

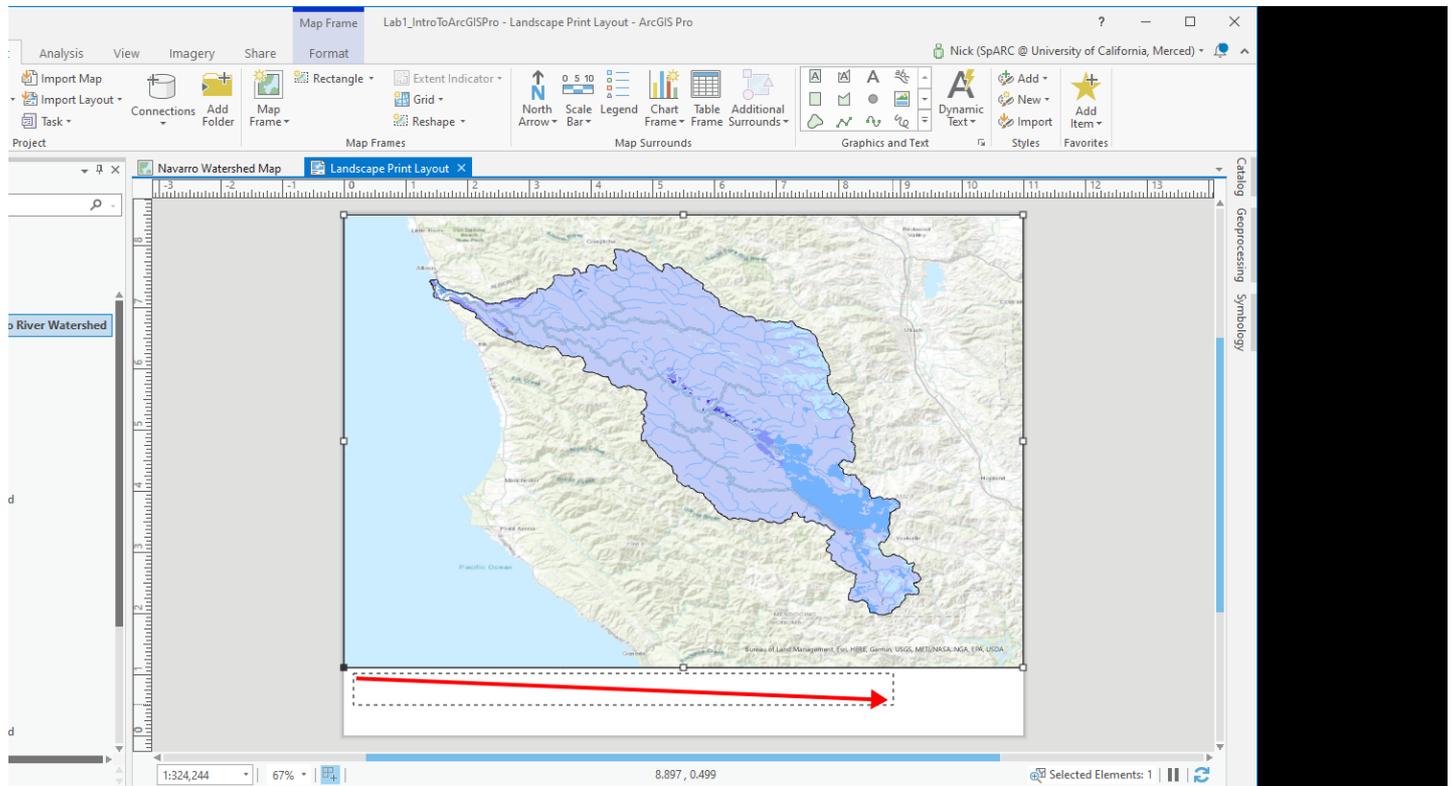
1. Make sure you're in the *Insert* ribbon, then click *Dynamic Text*
2. You'll see an option called *Name* with a preview underneath it that has the same text as the name of our map frame. Click that option.

The screenshot shows the ArcGIS Pro interface with the 'Dynamic Text' dialog box open for a map frame. The map frame is titled 'Navarro Watershed Map' and shows a map of the Navarro River Watershed. The 'Dynamic Text' dialog box is open, showing various properties for the map frame, including Camera, Map Units, Name of Map, Reference Scale, Relative Scale, Relative Scale Metric, Rotation, Spatial Reference, and Map Frame - Time and Coordinates.

Property	Value
Camera	Camera X: 123°28'25"W
Map Units	Degree
Name of Map	Navarro Watershed Map
Reference Scale	1:0
Relative Scale	1 inch equals 5 miles
Relative Scale Metric	1 centimeter equals 3 kilometers
Rotation	0
Spatial Reference	Name: GCS North America...
Map Frame - Time	Start Time, End Time, Current Time
Map Frame - Coordinates	Upper Left, Upper Middle, Upper Right, Middle Left, Center, Middle Right, Lower Left, Lower Middle, Lower Right

4.1 Make a box

Just as with the map frame, click and drag to outline the area where the text will go. In this case, put it in the blank space just below the map and make it relatively large (like a title on a page would be).



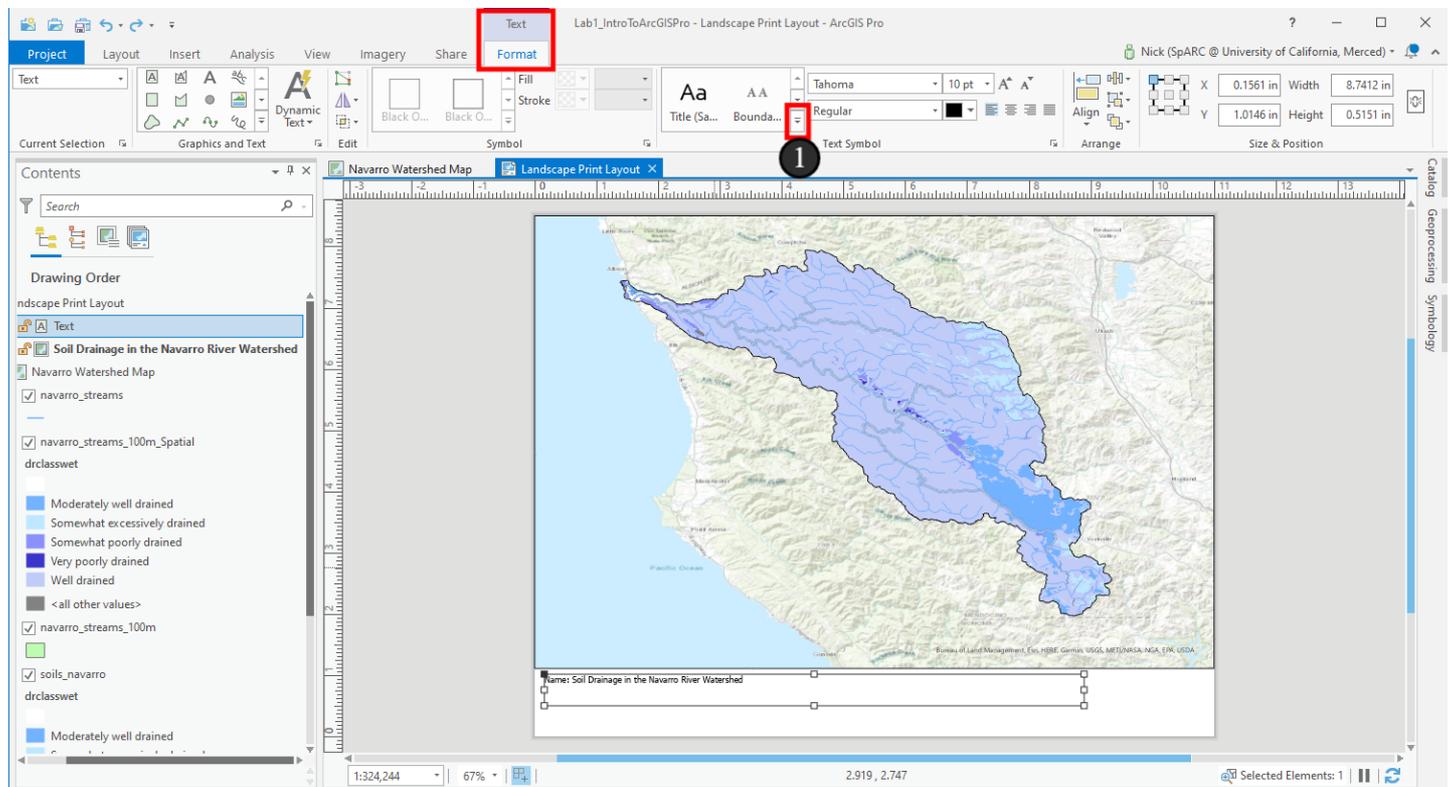
4.2 Small text!

Despite the size of the box we drew, the text is small - it did use the name of our map frame, but it doesn't seem to behave automatically as if it's a title. Let's fix that.

Notice that now that we have a text *element* selected on our layout, ArcGIS Pro automatically adds a ribbon for text formatting and activates it for us. We can switch to other ribbons and back if we want, but this ribbon only shows when a text element is selected on the layout.

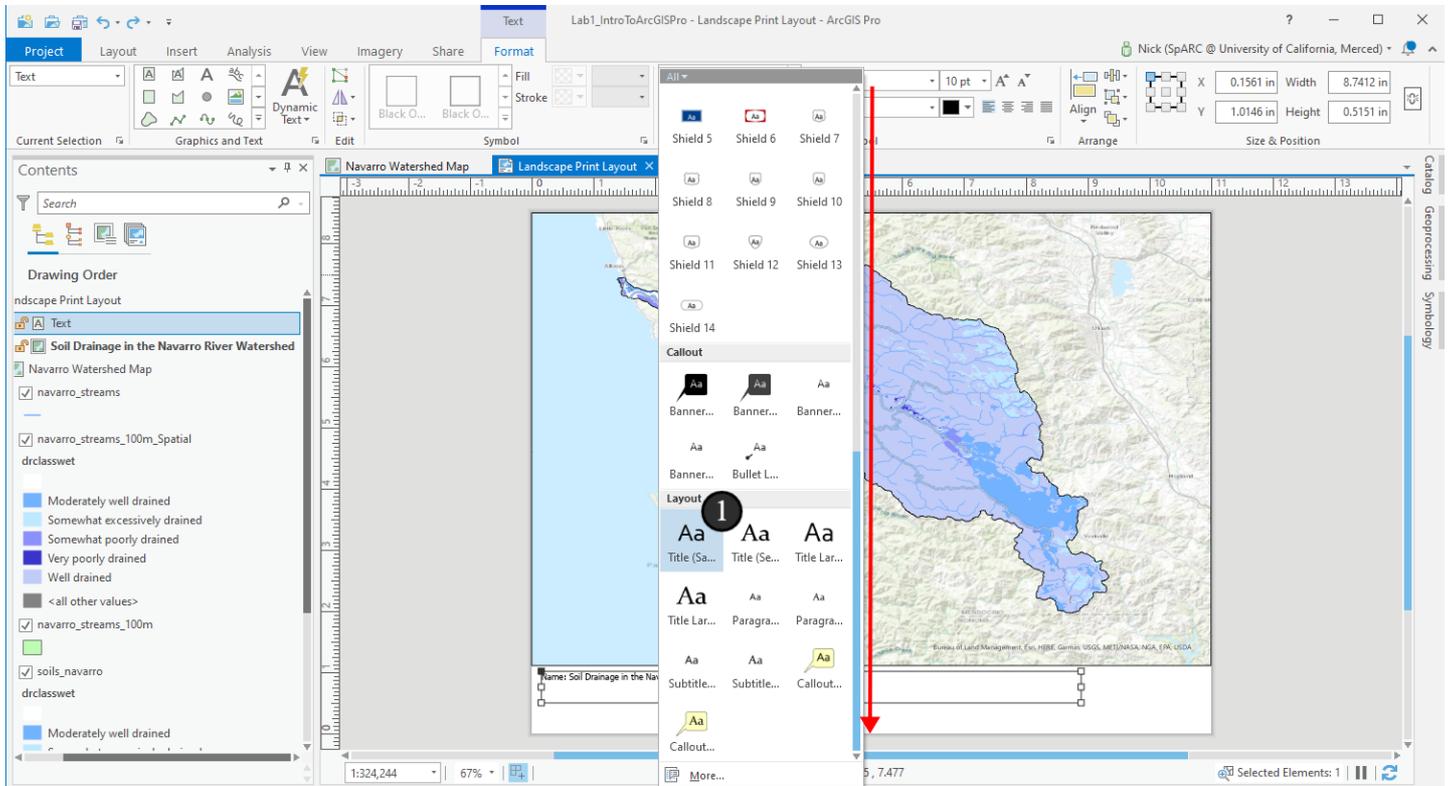
On this ribbon is a *Text Symbol* section, which includes the ability to specify basic properties of text that you'd be familiar with from other applications - font, size, color, justification, etc. But it also comes with premade styles we can use in the lefthand box with the *Text Symbol* section. Let's use one of those.

Click the little down arrow in the bottom right of that box - it indicates that we want to expand it and see additional options since it only has space to show us two right now.



4.3 Apply title formatting

1. Now scroll way down and you'll see a section named *Layout* with an item named *Title*. In fact, many options appear to start with the name *Title* and you can hover your mouse over each one to see their full names. Click on the first option.

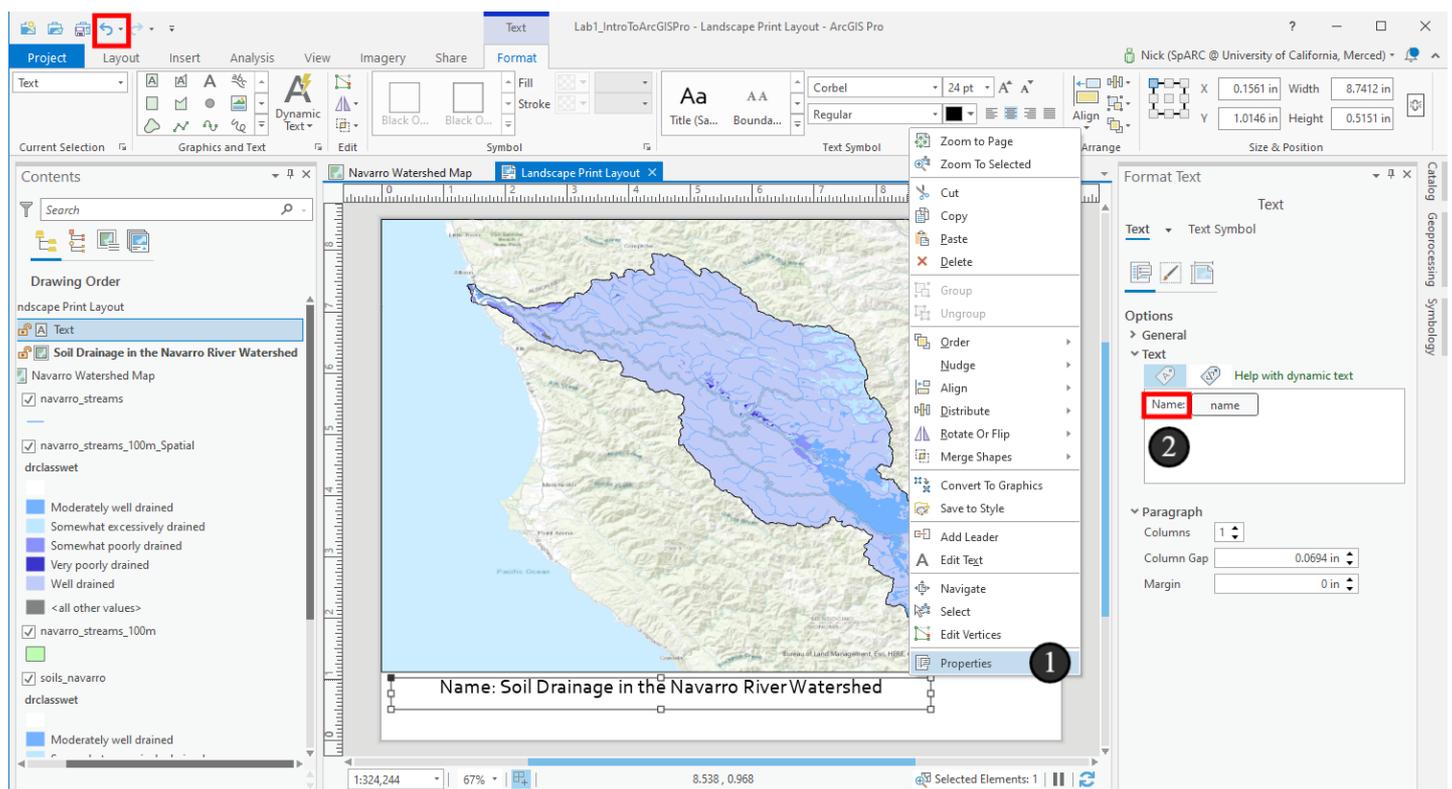


4.4 Fixing the title

Our text is updated to a bigger size more appropriate for a title now, great! You could also continue customizing it with the *Text Symbol* options if you want to.

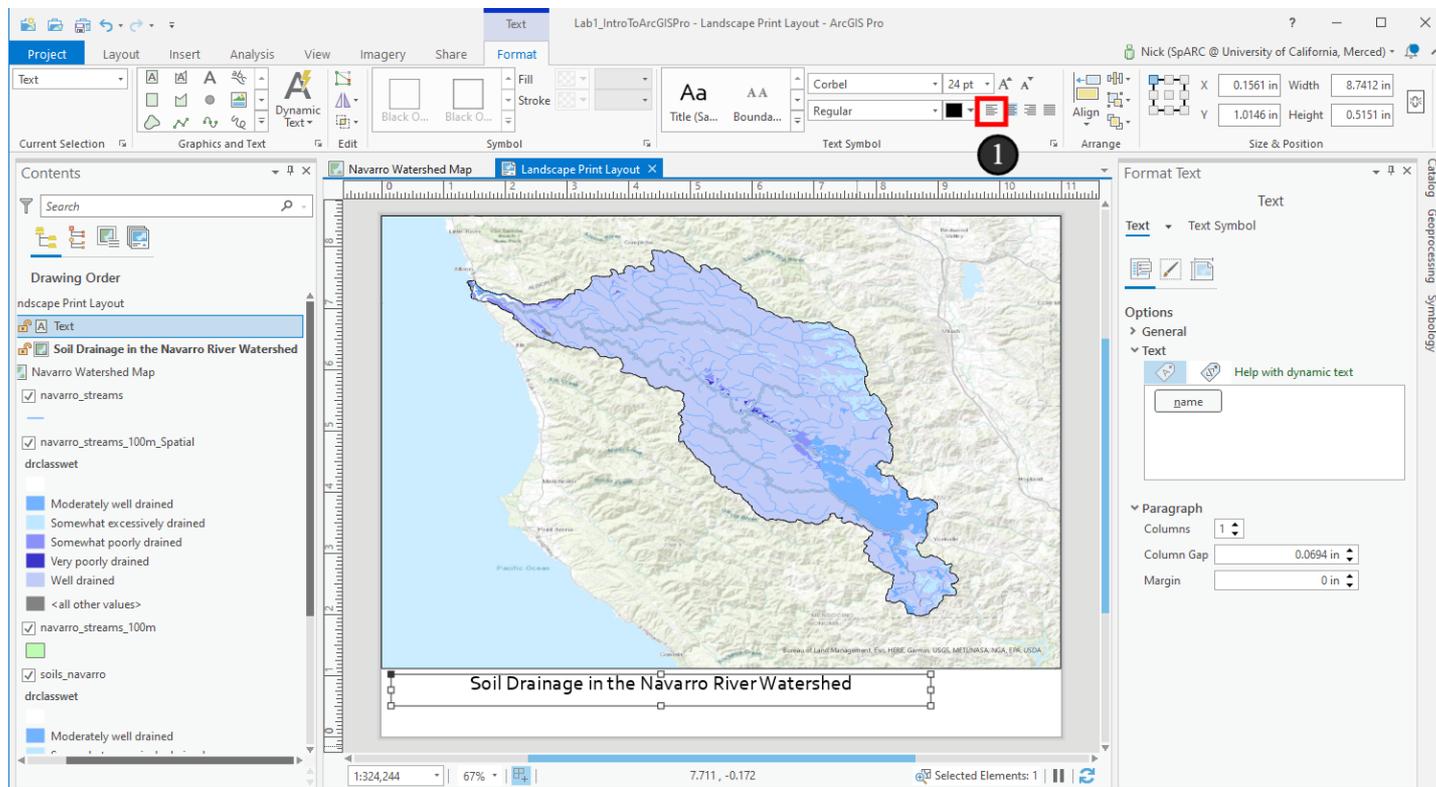
Now that it's big though, I'm wondering if there's any way to get rid of the "Name:" that starts off this dynamic text - it's distracting and unnecessary for us.

1. To explore our options, we'll right click on the text element with the title in it and choose *Properties*. Many items in ArcGIS have properties panes or popup dialogs that will show if you attempt the same process on them - we haven't shown much of it yet, but it's another core piece of the ArcGIS interface and its workflows.
2. A new *Format Text* pane flies out with additional options for us that aren't on the ribbon at the top. Importantly, on its first tab, in a section named *Text* we see "Name: name", with the second "name" in a box. This second item represents the dynamic text that pulls the name of our map frame and places it on the page. But the first part is optional and we can remove it. Place your cursor in the box and delete the text that says "Name:". If you accidentally delete the dynamic text too, use the undo arrow at the top left of the application to revert the deletion. Note that this means you can also put any text you want here, and can even remove the dynamic text and add any title you like directly in this box.



4.5 Updated dynamic text

Great, now our title looks appropriate, and comes from the name of the map frame! One last thing on this title now - instead of centering it in the text box, let's left align it. Click the Left Font Alignment icon in the *Text Symbol* section of the ribbon.

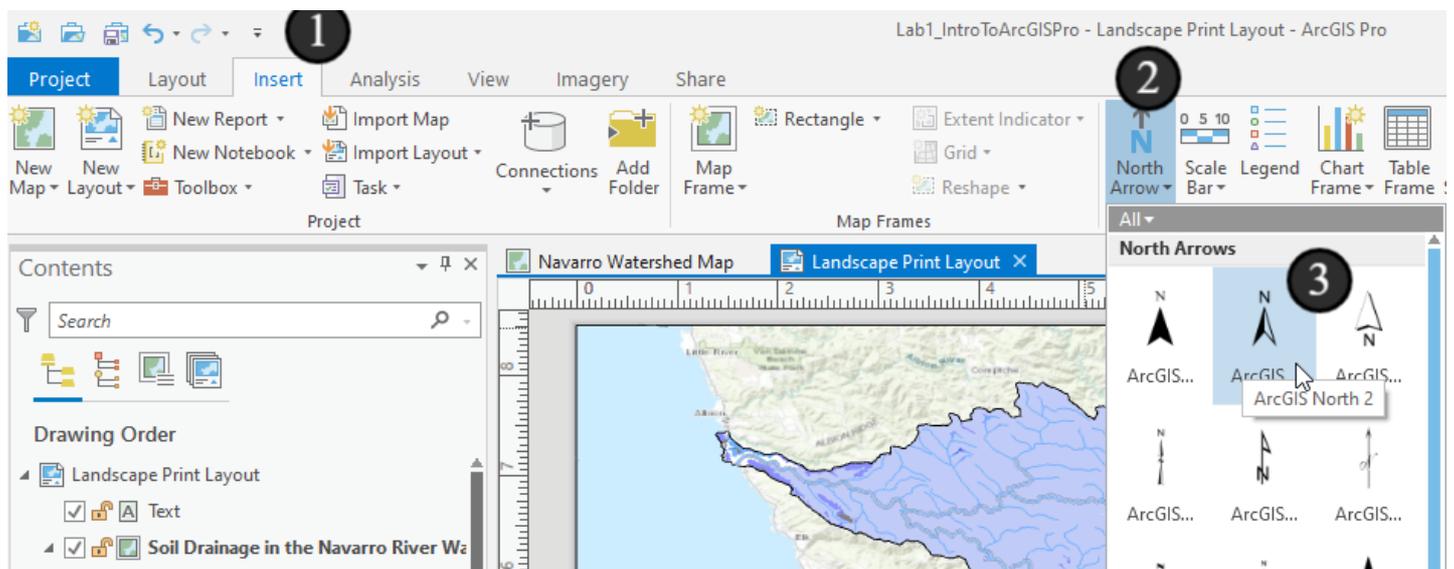


5. Addition Map Elements: North Arrows

Next, we'll add a North Arrow to a map. North arrows help orient the viewer of a map to the rest of the world by showing them where north is located on the map. While they are becoming less necessary on maps where north is at the top since viewers are accustomed to this convention, it's still good practice to include one.

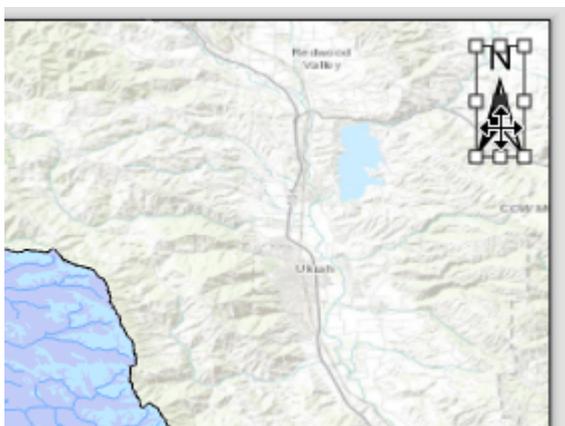
1. On the *Insert* ribbon
2. Click the *North Arrow* button
3. Select any north arrow you like. I chose ArcGIS North 2.

Not shown here is that once you click on it, you'll again need to click and drag to add the north arrow to your map in the size you want. I placed mine in the top right corner.



5.1 Moving it around

If we click on the north arrow after placing it, we can resize it in any direction using the handles, and if we hover the mouse over it now, we get a cursor icon telling us that we can move it by clicking and dragging it.



5.2 Format North Arrow

Even more context sensitivity! The pane on the righthand side that we had open for formatting text changed to *Format North Arrow*. We can now see north arrow specific properties that we can change (and there are more - check for new tabs on the ribbon!). Try switching back and forth between the title text and the north arrow and see the pane change contexts.

The screenshot displays the ArcGIS Pro interface. On the left, a map titled "Landscape Print Layout" shows a topographic map of the Navarro River Watershed, highlighted in blue. A north arrow symbol is visible on the map. Below the map, the text "e in the Navarro River Watershed" is partially visible. The right-hand pane is titled "Format North Arrow" and contains the following settings:

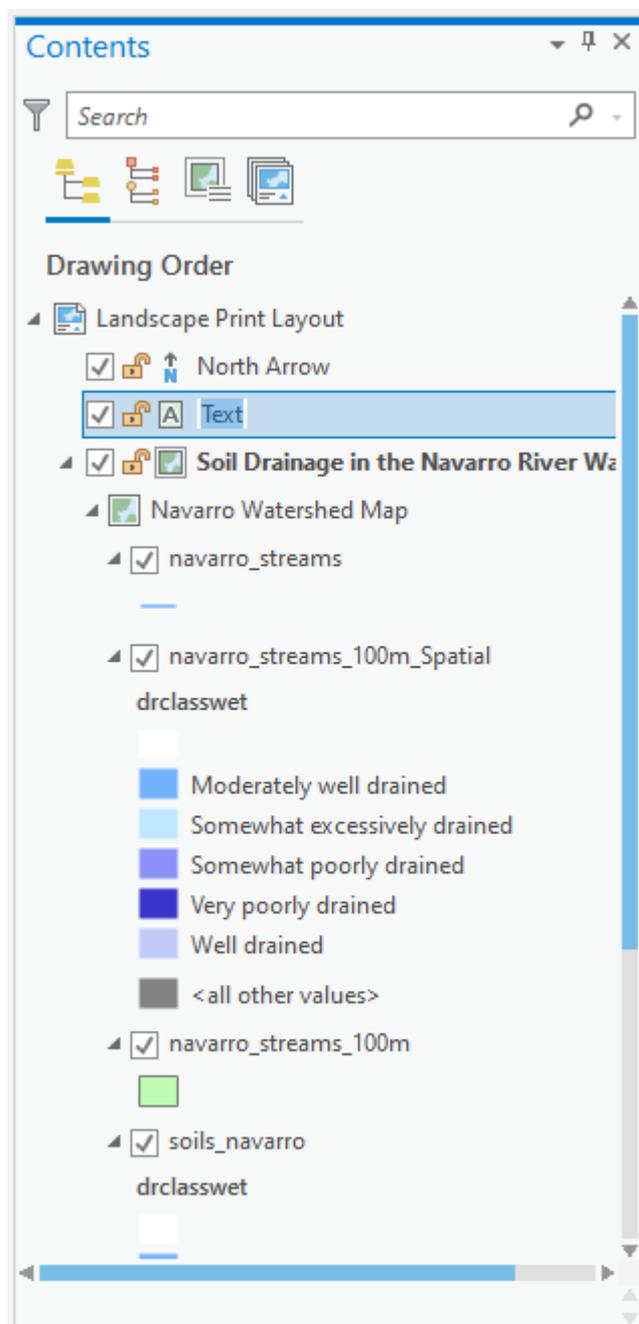
- North Arrow** (selected)
- Options**
 - General**
 - Name: North Arrow
 - Visible
 - Locked
 - North Arrow**
 - Map frame: Soil Drainage in the Navarr
 - Type: True North
 - Calibration Angle: 0°
 - Calculated Angle: 0
- Symbol**: A north arrow symbol pointing upwards.

The bottom status bar shows the coordinates 9.803, 0.304 and "Selected Elements: 1".

6. Contents filling up

Now that we have a few more items on our map, our Contents pane is starting to look different from how the Navarro Watershed Map's Contents pane. We have an item for a north arrow and an item named "Text" for our title. Let's make it clearer that this text element is our title.

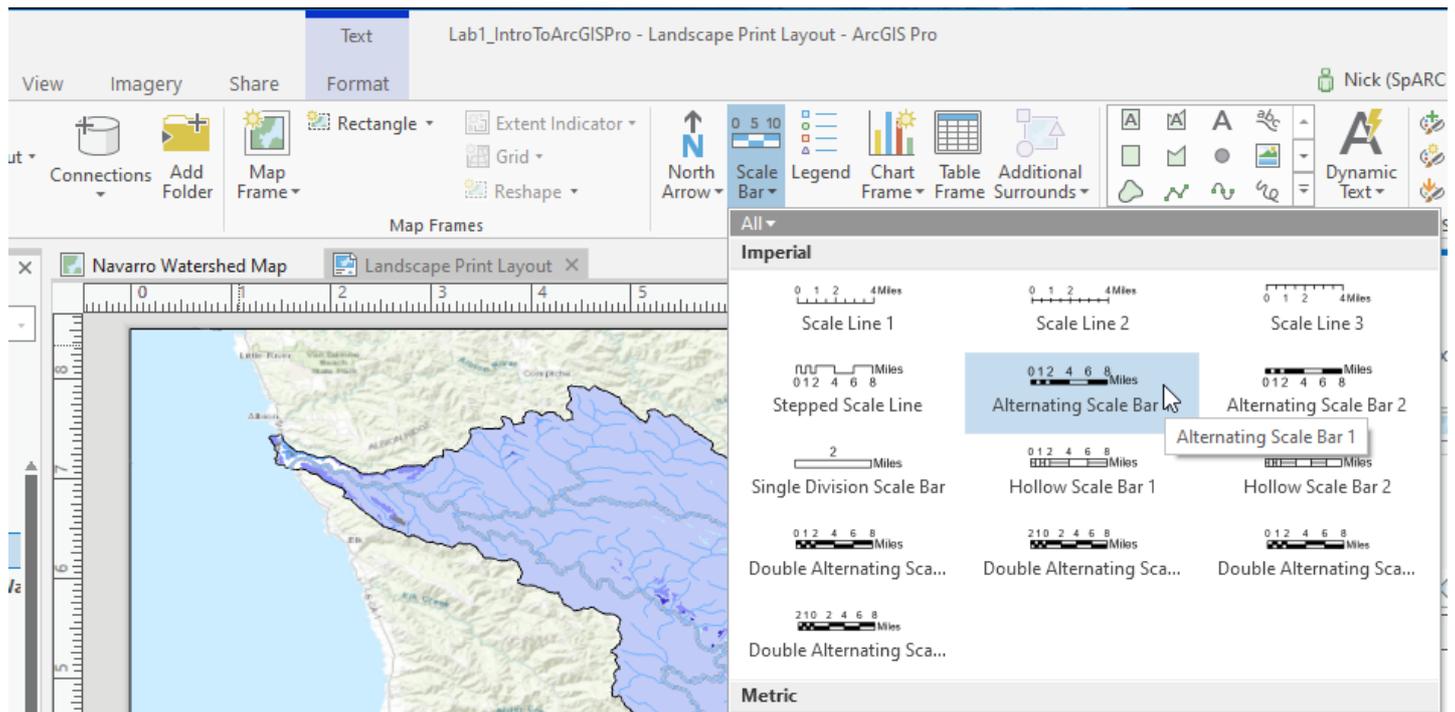
1. Click on the item named "Text" in the Contents, hit the F2 key on your keyboard to start renaming it, and give it a better name, such as "Map Title Text" - that way you'll know looking at your contents which item it refers to. Why might we want to do that? Because these items in the layout are layered too (some draw "above" others on the page and can cover them up if they're in the same spot), just like the items on the map. Try turning items on and off or rearranging the order of them (click and drag in contents to move them) to see what changes on your map.



7. Next Up: Scale Bar

Now, add a scale bar - scale bars tell us how much distance in the real world is represented by each unit of distance on the page, such as 2 centimeters being equivalent to a kilometer on the ground. The process to add the scale bar is exactly the same as with the north arrow - find the one you want and draw it on the page. See if you can do it now without looking at the picture or the rest of the text on this step:

1. On the Insert tab, click the *Scale Bar* button
2. Choose a scale bar - I chose *Alternating Scale Bar 1*
3. Click and drag the box on the page the same way as you did for the other page elements.



7.1 Adjust the scale bar

Once you have the scale bar on the page, again note the context changes (marked in the image), such as the properties pane switching to become *Format Scale Bar*. Again, if you've closed that pane, you can open it up for any element by right clicking on it and clicking *Properties*.

Now, let's change the scale bar we added to kilometers and adjust thh size a bit.

1. In the *Format Scale Bar* pane, click the *Map Units* dropdown and change it to *Kilometers*
2. Make sure the scale bar uses whole numbers without decimals. Hover your mouse over the left or right dot around the edges of the scale bar box until you see the double arrow mouse icon and drag it left or right and release. Repeat until your scale bar has mostly whole numbers

The screenshot displays the ArcGIS Pro interface. The **Scale Bar** tool is highlighted in the ribbon. The **Format Scale Bar** properties pane is open, showing the following settings:

- Scale Bar**: Text Symbol
- Options**
 - General**
 - Name: Scale Bar
 - Visible
 - Locked
 - Scale Bar**
 - Map frame: Soil Drainage in the Navarro Ri
 - Compute at center
 - Map Units**
 - Map Units: **Kilometers** (marked with a circled 1)
 - Label Text: Kilometers
 - Label Position: After bar
 - Offset: 3 pt
 - Symbol**: Aa

In the map view, the scale bar is visible at the bottom left, with a circled 2 pointing to the right edge handle. The map title is "Soil Drainage in the Navarro River Watershed".

8. Add text for your name, data sources, and the date

Now, add some free-form text to the map - every map should include the map author's name, the data sources used, and the date it was produced. We can add your name with a freeform text element and then we can add more dynamic text for the date.

1. Click the *Rectangle Text* option in the *Graphics and Text* section of the *Insert* tab. You can hover your mouse over the icons to see their names.
2. Do the familiar click and drag to make the rectangle for the text. Then put the text "Author: Your Name" in the box (replacing "Your Name" with your actual name). Also include "Data Sources: Rivers - NHDPlus Version 2, Soils - SSURGO"

For the date, you'll handle that on your own - take a look at the dynamic text options for dates - I recommend "Current Time" or "Date Saved" as good options. Feel free to add any other dynamic text you think is appropriate.

(The eagle-eyed among you will notice that I forgot to add the date in the screenshot for this step. It'll show up later in the tutorial - rather than create confusion, I'll just acknowledge it here - it's coming, but I forgot it! Go ahead and add your date now)

Lab1_IntroToArcGISPro - Landscape Print Layout - ArcGIS Pro

1

View Imagery Share

Connections Add Folder Map Frame

Rectangle Extent Indicator Grid Reshape

North Arrow Scale Bar Legend Chart Table Additional Surrounds

Map Frames Map Surrounds Graphics and Text

Navarro Watershed Map Landscape Print Layout

0 2.5 5 10 15 20 Kilometers

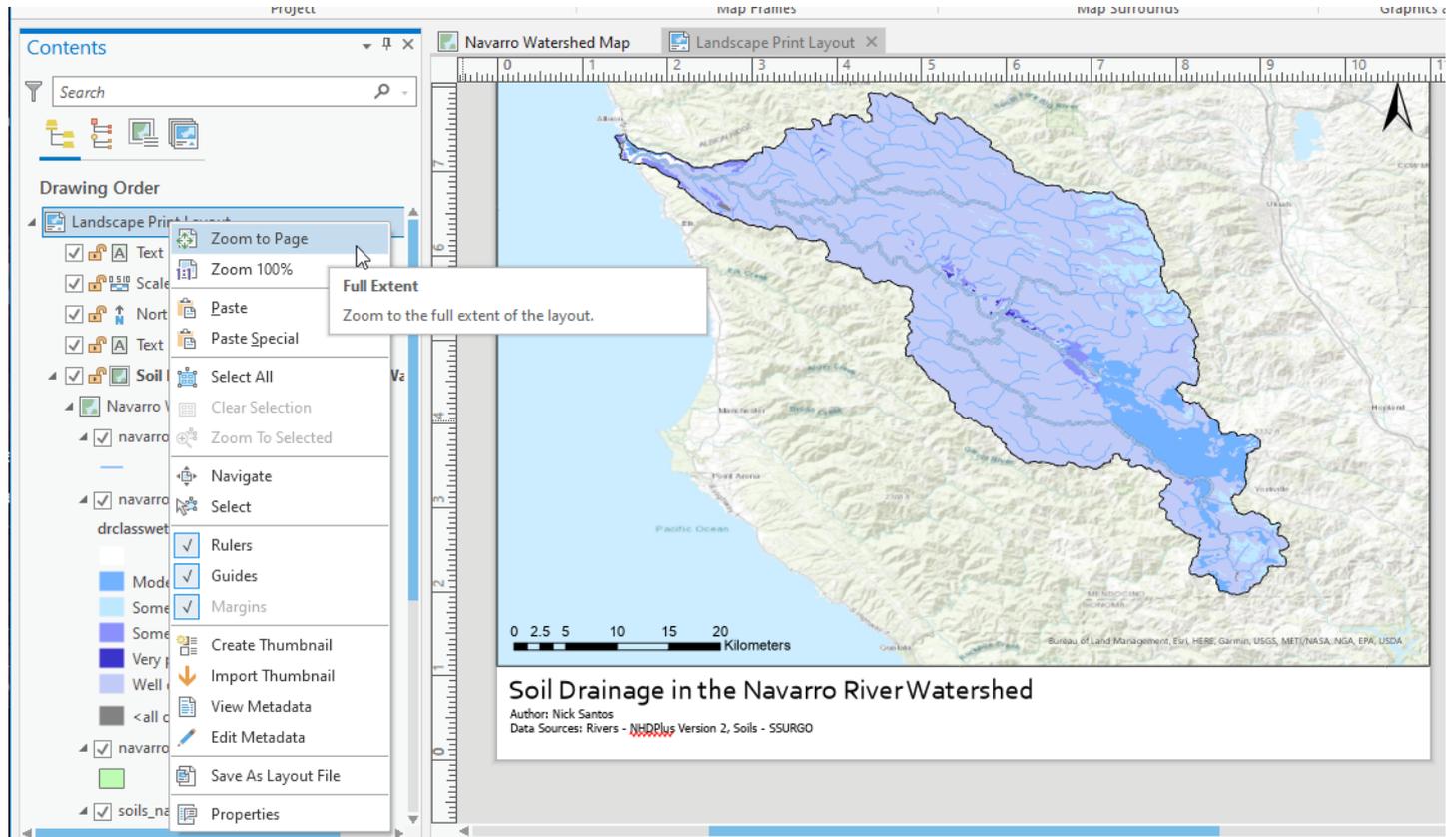
Soil Drainage in the Navarro River Watershed

2

9. Got lost? Zoom to Page!

As a bit of housekeeping, if you've zoomed your page out and in at all and want a reset, like we can do on the map, you can right click on the layout itself in the Contents page and choose *Zoom to Page*.

Also, have you saved recently?

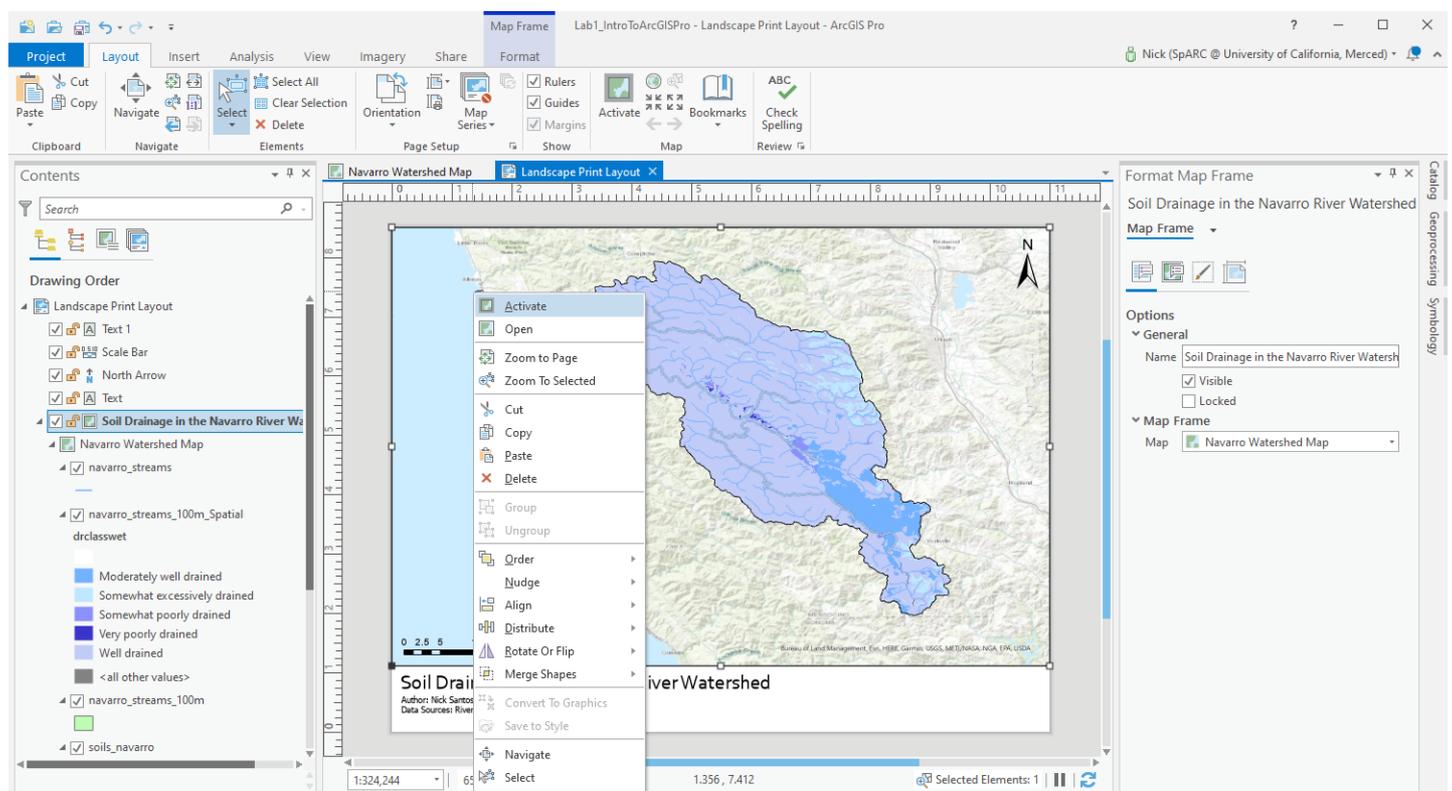


10. Making adjustments to our map

I said earlier that the map and the layout were synchronized. One way they're independent is in their scale and extent. If we were to switch back to the map itself and change our zoom and look around, our layout would be unaffected. This is useful since we can go back and do further analysis and our map's main features won't be affected (though if we add/remove items or change symbology, those will show on the layout).

This map is zoomed out a bit far from the watershed. Let's adjust the scale of the map - to do this, we need to "activate" the map on the layout. Activation puts us into a mode where we're editing the map, almost the same way as if we were on the map tab, but we're adjusting the parameters of the map frame while having access to properties of the map. As before, the context sensitive tools will be our guides in what we can do. To get started, Make sure your map frame is selected (it'll have the dots around the border). Then:

1. Right click on the map frame and choose *Activate* - it is also on the *Layout* ribbon.

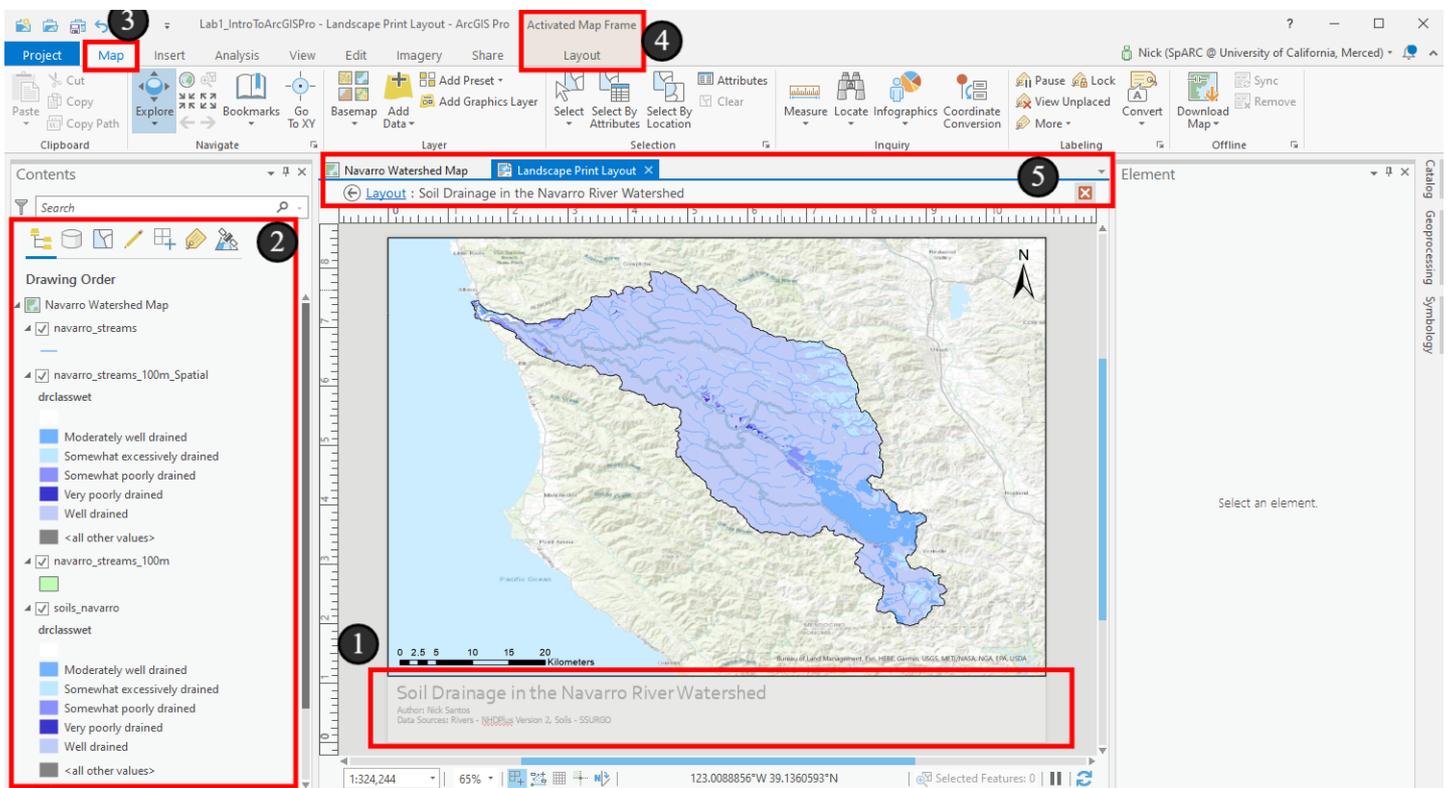


10.1 We're through the looking glass now

This moment is a bit weird, but powerful. Right now, our view is both a map and a layout view! I always think this feels sort of like Alice stepping through the looking glass or Frodo putting on the ring of power (hopefully at least one of those references makes sense!). They're in almost the same world they were before, but everything is both different and the same.

I'll note that this process of activating a map frame to make adjustments and deactivating it is what I've observed as the most commonly frustrating experience for new users of ArcGIS Pro, because it requires remembering a process that isn't used anywhere else. I note this not to color your perception of it, but hopefully to heighten your recollection of these steps so you remember it in the future. It's not complicated, but you'll need to remember how to activate and deactivate map frames.

1. More concretely, the first thing you might notice is that all the elements of the layout that *aren't* the map frame are grayed out. We can't click on them or interact with them in any way. They're temporarily unavailable (more on getting them back in a moment)
2. The Contents pane is back to looking exactly like it does when we're editing the map
3. And the Map tab is back and activated on the ribbon! These two items make it seem like we're working on the map again (in fact, we are!)
4. There's a new context sensitive tab on the ribbon for our activated map frame (that's one place you can deactivate this to return to the layout)
5. And even though we're editing the map, the Layout tab is still active in the main view, because we are still, in fact, editing inside the layout. If we want, we can also deactivate the map frame by clicking the little arrow in the header bar that came up below the tab, or by clicking the red X button on the right side.

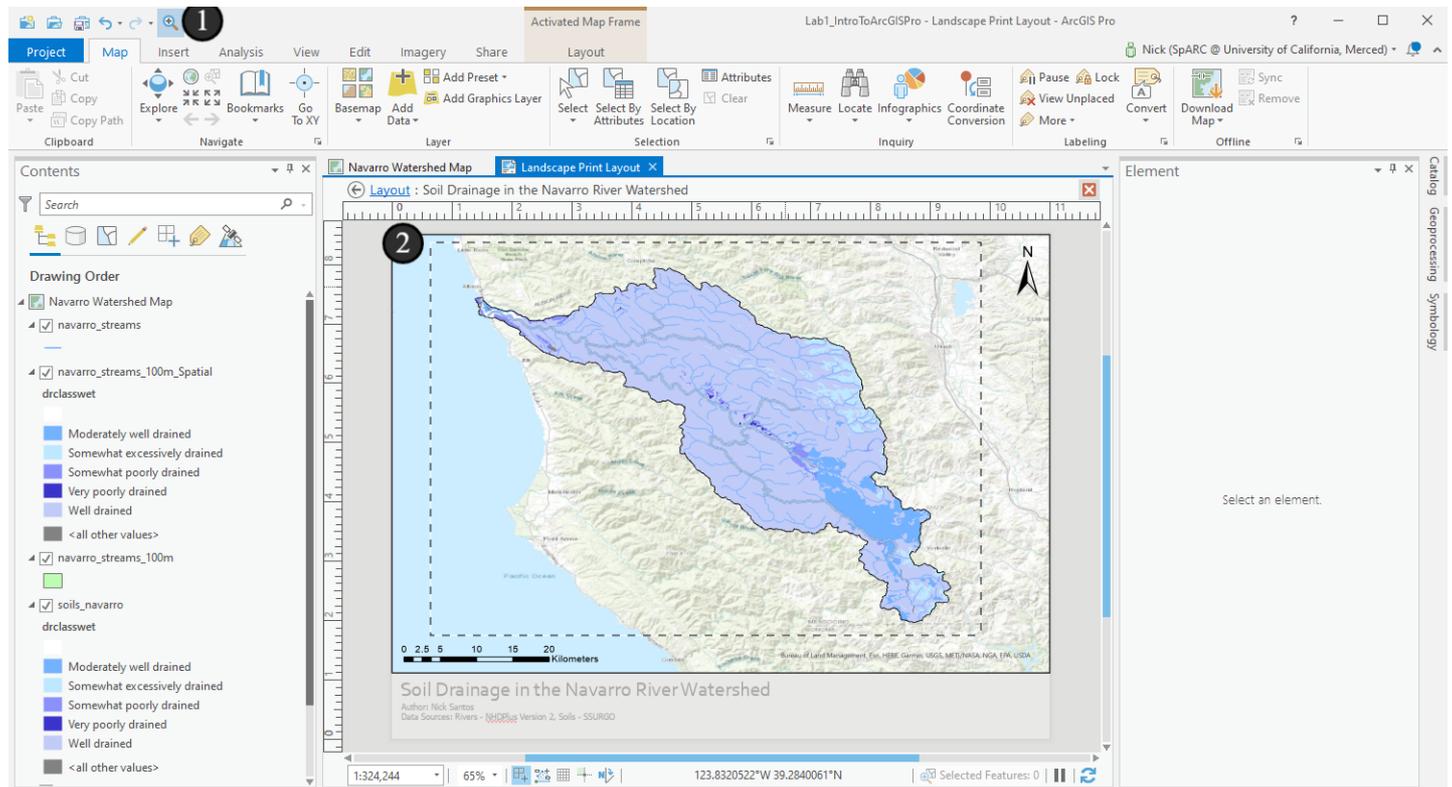


10.2 Adjust the extent

Now, let's make the change we activated the map frame for, adjusting the extent.

1. Activate the *Rectangle Zoom In* tool on the Quick Access Toolbar.
2. Click and drag a box within the map frame to zoom in a bit closer to our data

The map's extent will update. You'll notice later that the scale bar will update after this automatically, which is great - it should always show the correct extent - but we'll now have more decimals. We'll fix that a little later when we're done making these types of modifications.



11. While we're here - update the symbology

So now, while we're here with the map activated, let's make some improvements to the map's symbology. Right now, it's a bit of a jumble. We can display the map a bit better than this without too much trouble!

1. Turn off the `navarro_streams_100m` and `navarro_streams_100m_Spatial` layers. The buffer and spatial join layers might be useful analysis products for our project, but aren't very helpful on a map of this scale
2. Activate the symbology pane on the `navarro_streams` layer (either click it and open the symbology pane on the right, or right click it and choose Symbology from the menu).
3. I personally feel like rivers with a single size for all rivers feel like a missed opportunity. These rivers and streams aren't all the same size, so a map of the rivers should display them at different sizes. Luckily, we already attached data to our streams layer with the stream size. All of this data - the rivers and the joined data come from NHDPlus Version 2 if you wanted to replicate this elsewhere. In the Symbology pane, open the dropdown that currently shows *Single Symbol*
4. Switch to *Graduated Symbols* which lets us set different sizes for features based on their attributes.

The screenshot shows the ArcGIS Pro interface with the following elements:

- Contents Pane (Left):** Shows the layer list. The `navarro_streams` layer is selected and highlighted with a red circle and arrow labeled '2'. A red arrow labeled '1' points to the legend for `navarro_streams`, which lists drainage classes: Moderately well drained, Somewhat excessively drained, Somewhat poorly drained, Very poorly drained, Well drained, and <all other values>.
- Map View (Center):** Displays a map titled "Soil Drainage in the Navarro River Watershed" with a scale bar and north arrow.
- Symbology Pane (Right):** Open for the `navarro_streams` layer. The 'Primary symbology' dropdown is set to 'Single Symbol' (circled '3'). The 'Graduated Symbols' option is highlighted with a red circle and arrow labeled '4'.

11.1 Choose the field to symbolize on

Now the symbology pane will change to give us the options for this type of symbology. The primary option we need to change is the *Field*. For this parameter, what happens is:

- ArcGIS looks into the attribute table of the feature class and determines all of the unique values in the field/column we select here
- It then splits those values into ranges based on their numeric values (there are many ways of doing this, which can dramatically alter interpretation of the map - we'll talk about that elsewhere though)
- It assigns separate symbology to features whose value for the selected field falls into each range of values. In this case, it'll change the size of each range's (called a *Class* here) symbols, but we could have selected *Graduated Colors* instead and it would change the color for each, which makes a common type of map called a *choropleth*.

ArcGIS chose the COMID field by default, but in this case, we'll use the field with the drainage area of each segment as a proxy for its size. This might be a bad choice in fields with braids and branches, in which case you might want to use *DivDASqKM* instead since it represents the Divergence-routed upstream catchment area, so braids have area approximately related to the amount of flow that goes through them.

1. In this case *TotDASqKM* is fine, so we'll use that. Choose it from the *Field* dropdown

The screenshot displays the ArcGIS Pro interface. The main map area shows a topographic map of the Navarro River Watershed with stream segments highlighted in blue. The Symbology pane on the right is open for the 'navarro_streams' layer. The 'Primary symbology' is set to 'Graduated Symbols'. The 'Field' dropdown is currently set to 'COMID', and 'TotDASqKM' is highlighted with a red circle and the number 1. Below the field dropdown, the 'Classes' list shows 'DivDASqKM' and 'drainage_gt_50_sq_km'. The legend on the left shows the symbology for 'navarro_streams' with five classes: 'Moderately well drained', 'Somewhat excessively drained', 'Somewhat poorly drained', 'Very poorly drained', and 'Well drained'. The map includes a scale bar (0 to 18 Kilometers) and a north arrow.

11.2 Updating the template

Now ArcGIS updates the classes in the bottom box, but the color of the symbol makes it hard to see. Let's change the *Template* - the base symbology it uses for all classes, then modifies the sizing for each one.

1. Click on the symbol next to *Template*

The screenshot shows the ArcGIS Pro interface with the Symbology pane open for the 'navarro_streams' layer. The 'Template' dropdown is highlighted with a red circle and the number 1, indicating the step to click on the symbol next to it.

The Symbology pane shows the following settings:

- Primary symbology: Graduated Symbols
- Field: TotDASqKM
- Normalization: <None>
- Method: Natural Breaks (Jenks)
- Classes: 5
- Minimum size: 0.5 pt
- Maximum size: 4 pt
- Template: [Symbol]

The Classes pane shows the following data:

Symbol	Upper value	Label
[Symbol]	≤ 20.3733	0.000000 - 20.37...
[Symbol]	≤ 63.1791	20.373301 - 63.1...
[Symbol]	≤ 124.6896	63.179101 - 124...
[Symbol]	≤ 359.2305	124.689601 - 35...
[Symbol]	≤ 815.9895	359.230501 - 81...

11.3 Change the color back

Now we'll repeat something we did earlier: changing the color to Yogo Blue (or any other blue you like).

1. Switch the symbology pane to the *Properties* tab.
2. Choose a new color from the dropdown. Yogo Blue is the third from the right on the second row (you can hover over patches to see the name).
3. Click *Apply* to update the symbology.

The screenshot displays the ArcGIS Pro interface. The main map area shows a watershed map titled "Soil Drainage in the Navarro River Watershed". The map is overlaid with a blue color representing the drainage class. The Symbology pane on the right is open to the "Properties" tab for the "navarro_streams" layer. The "Color" dropdown is open, showing a color palette with "Yogo Blue" selected. The "Line width" is set to 1.9 pt. The "Apply" button is highlighted with a red circle. The map in the background shows a watershed with various drainage classes. The status bar at the bottom shows the coordinates 123.0750265°W 39.1442861°N and the selected features count as 0.

11.4 Now update the soils colors

Great, the rivers are updated and their sizing looks good, but I have a new problem. In my case, Yogo Blue was also used for one of the soil groups. Let's change the soils colors so we can see everything:

1. Leave the symbology pane open, but switch to the *soils_navarro* layer in the *Contents* pane so that the Symbology pane now applies to it.
2. (Not shown on the picture) You'll see a set of patches to choose from for colors for each soil drainage class. Click the colored box for any that are hard to see on the map or that make the rivers hard to see
3. Switch to the properties tab
4. Choose a new color
5. Apply the color change

The screenshot shows the ArcGIS Pro interface with the following elements:

- Contents Pane (Left):** Shows the layer list. The 'soils_navarro' layer is selected and highlighted with a red circle labeled '1'.
- Main Map Window (Center):** Displays a map of the Navarro River Watershed. A red circle labeled '2' is positioned over the 'Symbology' tab in the top right corner of the map window.
- Symbology Pane (Right):** Shows the 'Format Polygon Symbol' for the 'soils_navarro' layer. The 'Properties' tab is selected, and a red circle labeled '3' is over the 'Properties' sub-tab. A red circle labeled '4' is over the color selection tool. A red circle labeled '5' is over the 'Apply' button.

11.5 Now we can see the rivers!

With the new color on the soil drainage class, we can see the rivers and the soils now. Let's make one more update to the soils appearance while we have it selected. We'll make it semi-transparent so that some of the hillshade in the basemap shows.

1. Switch to the *Appearance* tab in the *Feature Layer* section
2. Adjust the value for *Transparency* in the *Effects* section by typing in 20% or using the slider until it's approximately 20%. Just enough to see the hillshade effect a little bit, but where the colors in the soils layer are still clear.

The screenshot shows the ArcGIS Pro interface with the **Appearance** tab selected in the **Feature Layer** section. The **Transparency** slider is set to 20.0%. The map displays soil drainage classes in various colors over a hillshade basemap. The **Symbology - soils_navarro** pane on the right shows the **drclasswet** field with a color scheme of blue shades.

Contents

- Navarro Watershed Map
 - navarro_streams
 - TotDASqKM
 - 0.000000 - 20.373300
 - 20.373301 - 63.179100
 - 63.179101 - 124.689600
 - 124.689601 - 359.230500
 - 359.230501 - 815.989500
 - navarro_streams_100m_Spatial
 - drclasswet
 - Moderately well drained
 - Somewhat excessively drained
 - Somewhat poorly drained
 - Very poorly drained
 - Well drained
 - <all other values>
 - navarro_streams_100m
 - soils_navarro
 - Moderately well drained
 - Somewhat excessively drained

Symbology - soils_navarro

Primary symbology

Unique Values

Field 1: drclasswet

Color scheme: [Blue gradient]

Symbol	Value	Label
[Light blue]	6 values	
[Light blue]		Moderately well...
[Light blue]		Somewhat exces...
[Light blue]		Somewhat poor...
[Light blue]		Very poorly drai...
[Light blue]		Well drained
[Dark blue]		<all other value...

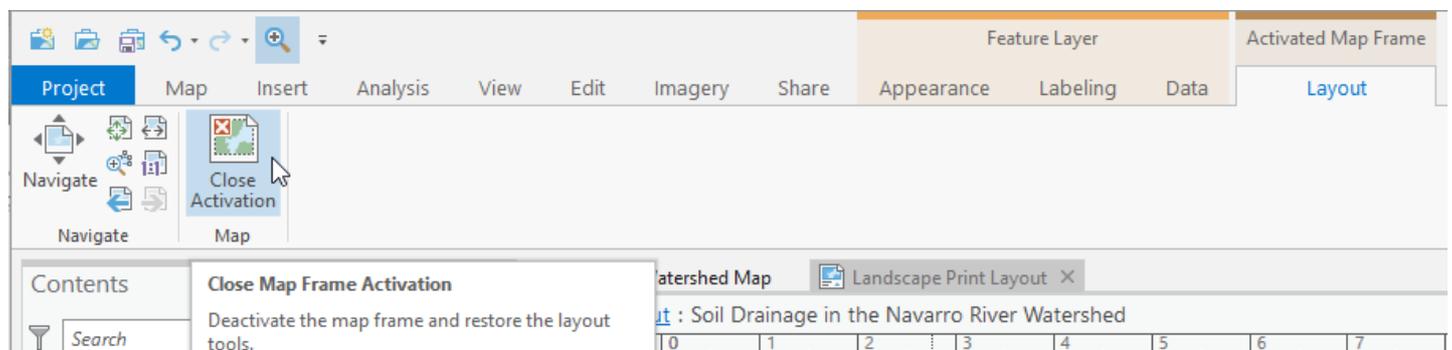
11.6 Back through the looking glass.

Make any other changes you want to the symbology. For example, my version is very blue right now - it'd be clearer if I differentiated the soils colors and the rivers better - see if you can improve yours! Your map need not look the same as this as the tutorial is a demonstration of capabilities. Make it look as good as you can.

When you're ready, let's head back through the looking glass and deactivate the map frame.

1. Switch to the *Layout* ribbon tab in the *Activated Map Frame* section
2. Choose *Close Activation* to switch back to editing the layout.

As a reminder - many of the changes we made to the map in this mode could also have been made by just updated the map on the *Navarro Watershed Map* tab we have open in the main view. The only one we **must** do through the activated map frame is the extent adjustment we want for the layout. Extent adjustments in normal map mode only apply to the view of the map itself, not to map frames.

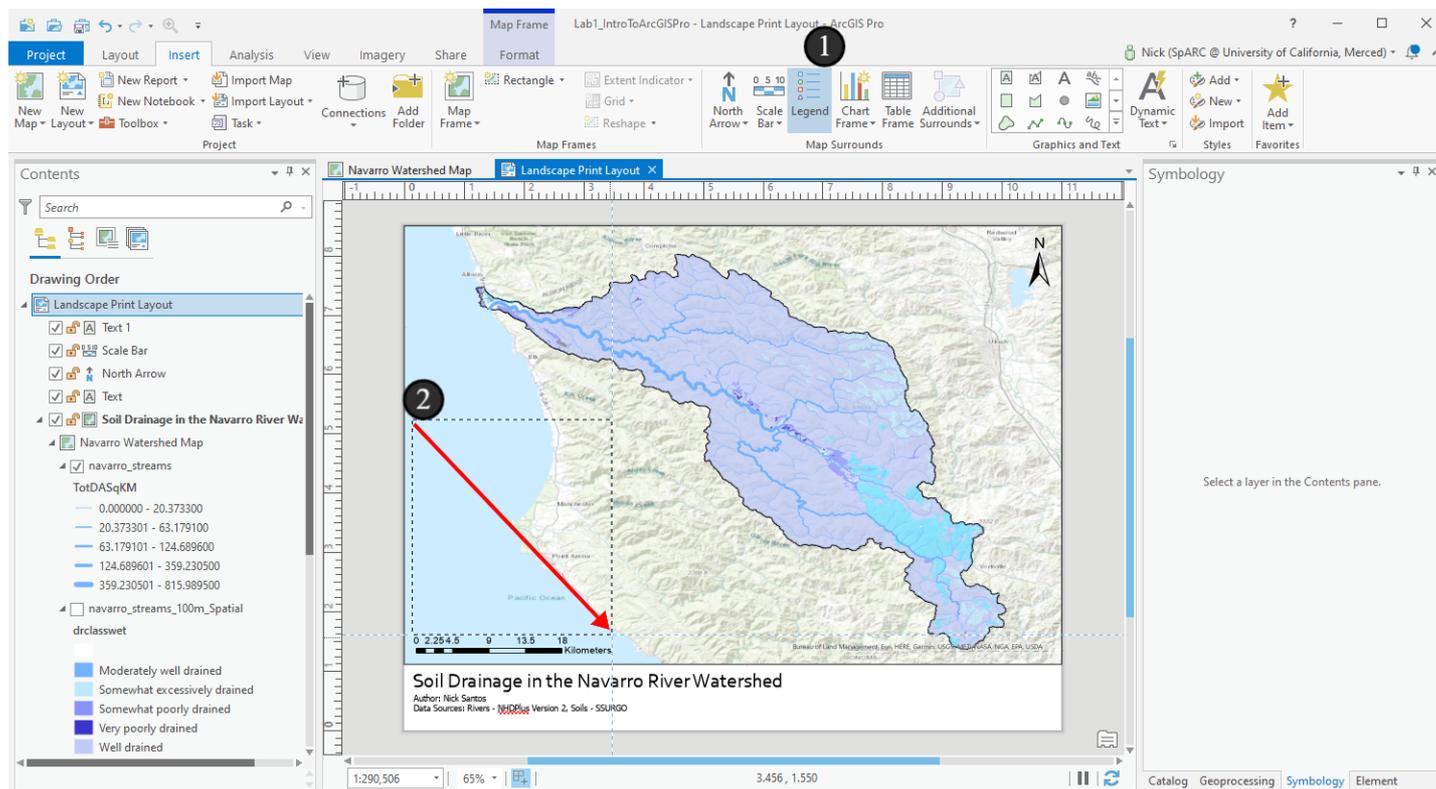


12. Adding the Legend

Now comes the big item, the legend! Legends help viewers to understand the information on the map by defining symbols - it shows symbols that are on the map and then provides the layer name or other details to indicate to the viewer what they are looking at.

To add a legend, we'll follow our now-familiar process:

1. Click the *Legend* button in the *Map Surrounds* section of the *Insert* ribbon
2. Click and drag at the spot on the layout where you wa



12.1 Choosing items in the legend

A legend with lots of information shows up and now we begin the process of cleaning up the legend and making it less confusing.

To start, the legend gives us a checkbox for the visibility of each layer. By default, it's a secondary checkbox - even if the layer is checked in the legend, it won't show if the layer isn't also checked in the map contents pane. But, it can still allow us to turn off layers that are shown on the map (sometimes we don't need to show obvious items in the legend - for example, I wouldn't leave a legend item for rivers if they were just simplified lines).

1. Expand the legend in the contents pane (the little triangle next to it) and uncheck the boxes for the buffered streams layers. This way, if we choose to turn them back on at any point, they won't show up in the legend still.

The screenshot displays the ArcGIS Pro interface with the 'Legend' tab selected. The 'Contents' pane on the left shows the 'Legend' layer expanded, with a red box and a circled '1' highlighting the expand/collapse icon. The legend items are as follows:

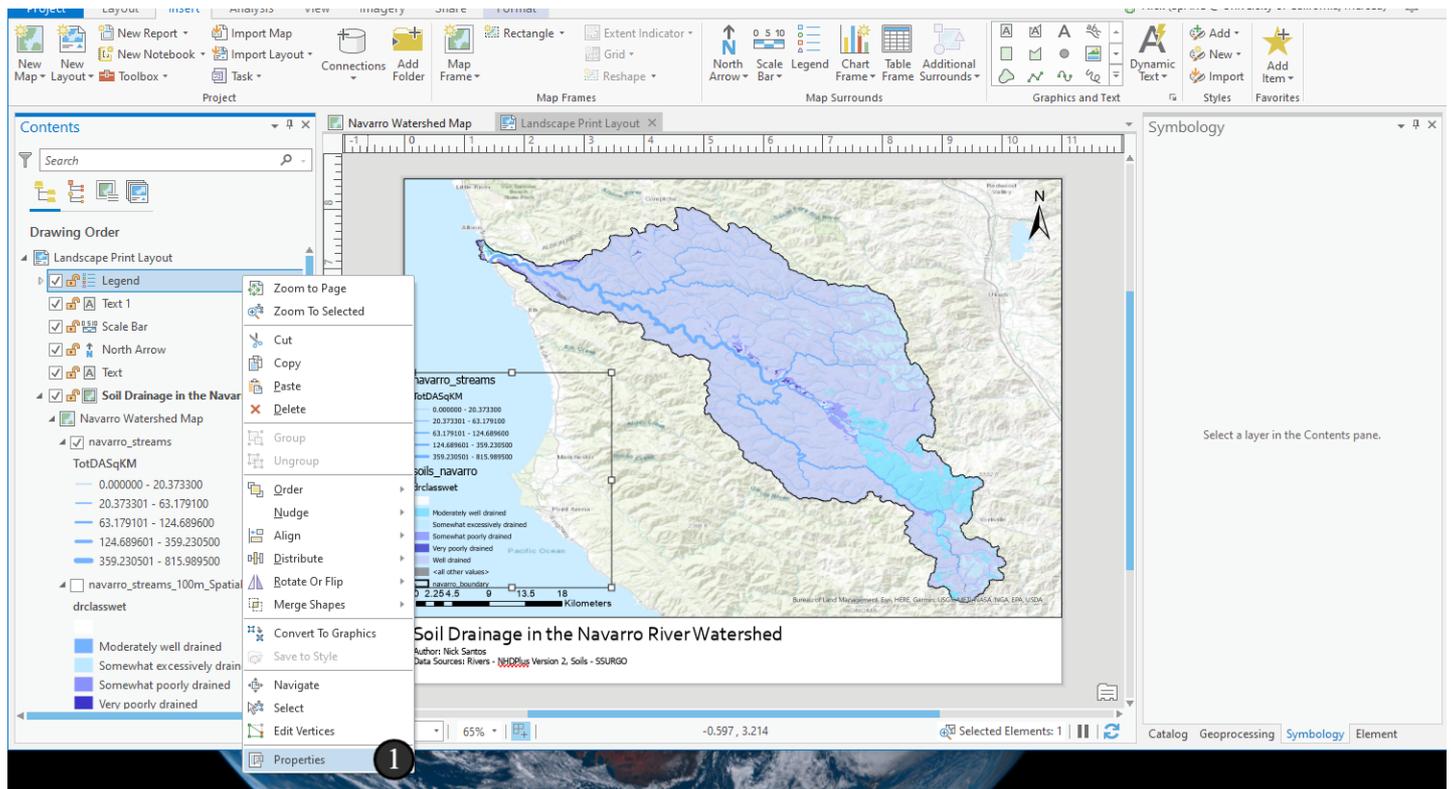
- Legend
 - navarro_streams
 - navarro_streams_100m_Spatial
 - navarro_streams_100m
 - soils_navarro
 - navarro_boundary
 - Text 1
 - Scale Bar
 - North Arrow
 - Text
 - Soil Drainage in the Navarro River Watershed
 - navarro_streams
 - TotDASqKM
 - 0.000000 - 20.373300
 - 20.373301 - 63.179100
 - 63.179101 - 124.689600
 - 124.689601 - 359.230500
 - 359.230501 - 815.989500
 - navarro_streams_100m_Spatial

The 'Format Legend' pane on the right shows the 'Legend' layer selected. The 'Legend' section is expanded, and the 'Legend' checkbox is checked. The 'Legend Items' section is also expanded, showing the 'Show properties...' button. The 'Synchronize with map' section is checked, with 'Layer visibility' selected.

13. Legend Properties and Styling

Now let's bring up the legend properties so we can do some styling. At the moment, it's not very readable with small text hovering over the water and with so many layers and extra text. We can make this look a bit more professional without doing anything too fancy.

1. Right click on *Legend* in the Contents pane and choose *Properties*. If your *Element* pane is already up, then these properties will have already been showing.

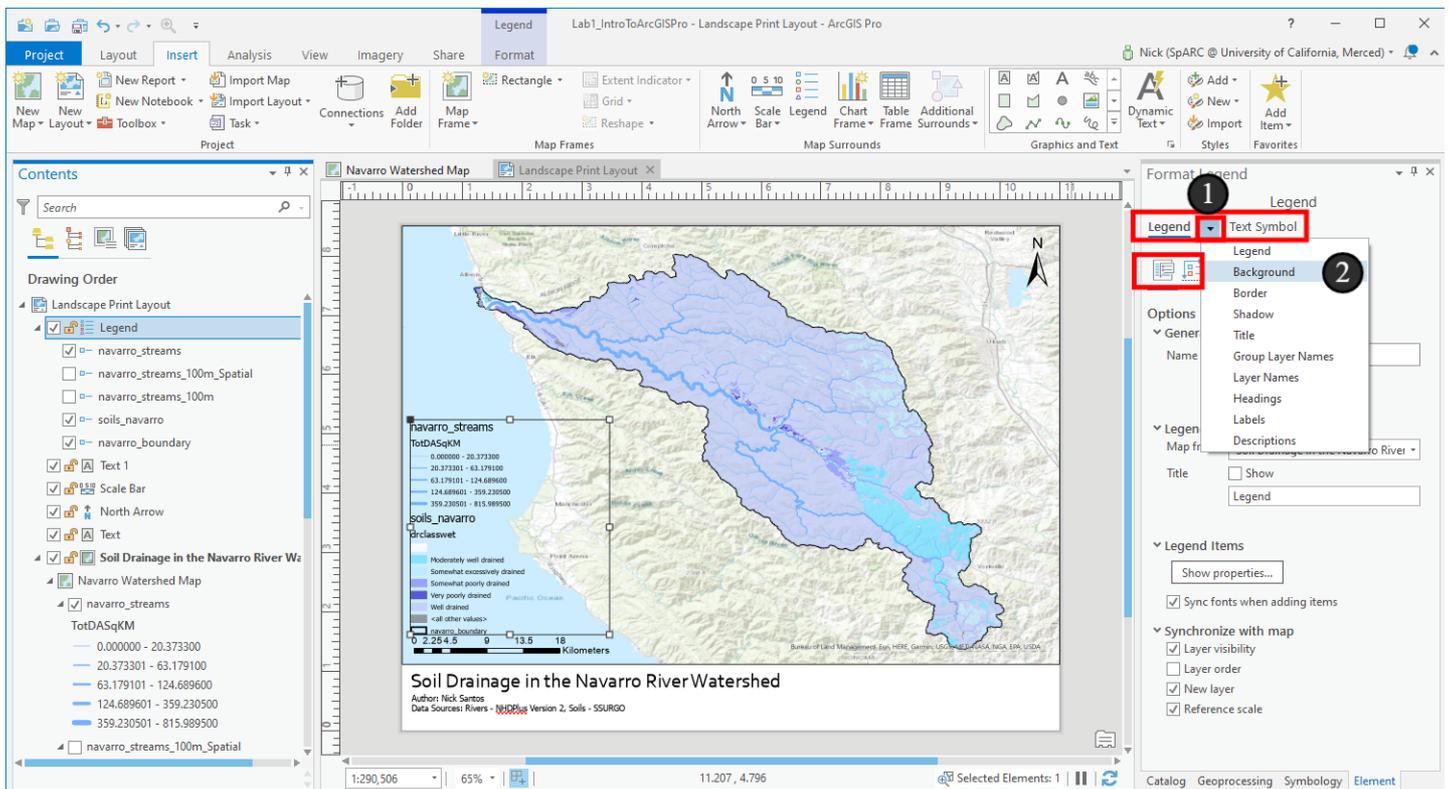


13.1 Styling the legend

To start, we'll style the background so that we can see the text a bit better.

This is where ArcGIS starts to have *many* hidden menus and an interface that can become intuitive elsewhere stops being intuitive, which is unfortunate. I think ArcGIS Pro did a good job of rethinking the user interface of old versions of ArcGIS and making a unifying set of concepts that, once you got used to them, make the software fast and easy to use. You'll notice that the *Format Legend/Element* pane has three separate types of menus, each with their own expandable subitems. It has the text-based tabs at the top, the icon-based tabs below it, and then the dropdown tabs for the text-based tabs at the top. I've been using ArcGIS Pro since it was in beta and I still haven't figured out the rhyme or reason for what goes where in these menus even when the rest of the software makes sense. Plan to look through all of these for items when you want to do formatting and note that some of them are in multiple places - we'll see that in a moment.

1. For now, to change the background of the legend, click the triangle for the dropdown next to the *Legend* tab at the top of the pane,
2. Then click the *Background* option.



13.2 Add a legend background

This pane will be familiar - it's similar to symbology selection (back to some consistency, at least!)

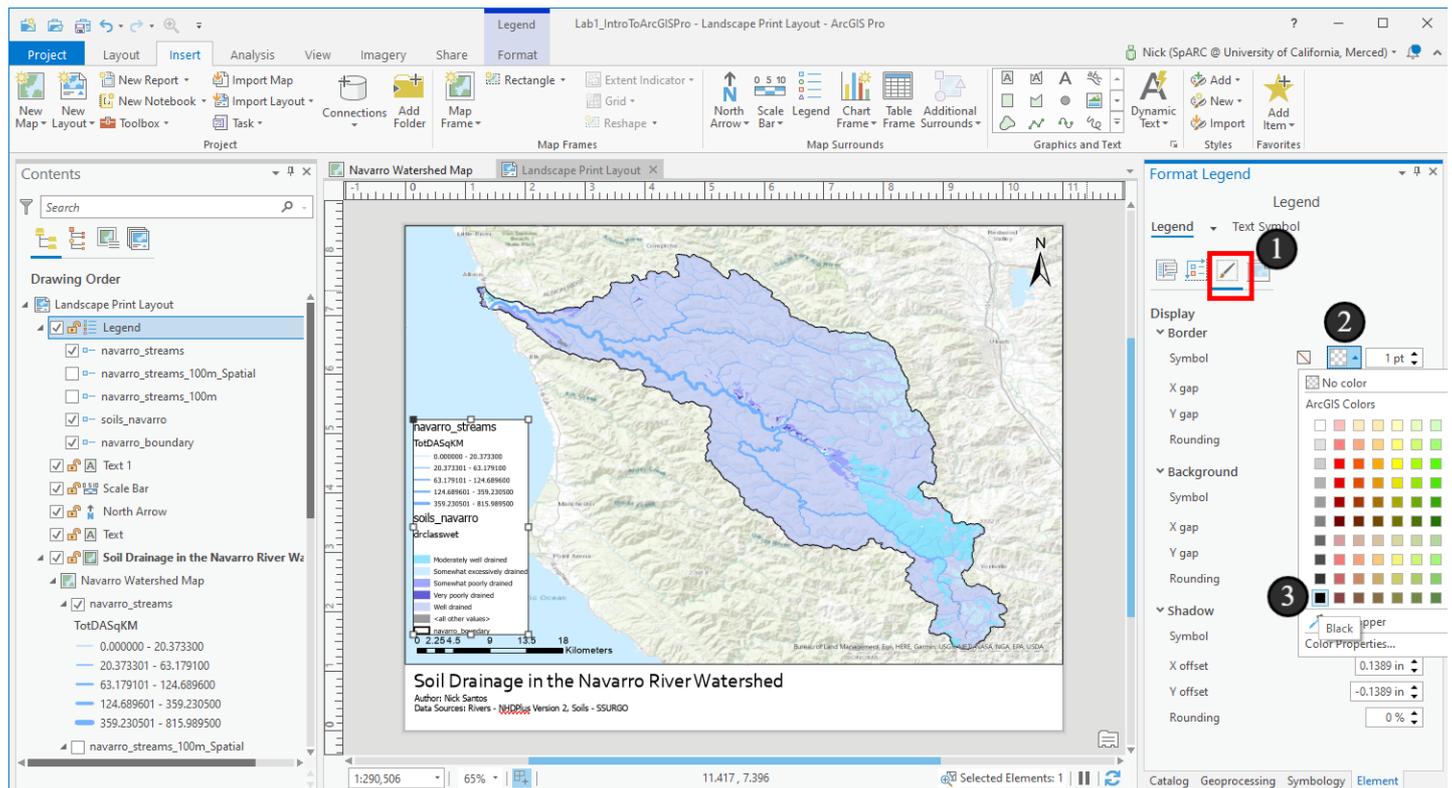
1. Click the color selection box
2. Choose the white patch in the top left.
3. Click Apply to make the change
4. Click the back arrow in the top left of the pane to return to the main *Legend* properties pane.

The screenshot shows the ArcGIS Pro interface with the Legend pane open. The main map area displays a watershed map titled "Soil Drainage in the Navarro River Watershed" with a legend overlay. The Legend pane on the right is in the "Format Legend" view, showing the "Background" section. A color selection box (1) is open, and the white patch in the top left (2) is selected. The "Apply" button (3) is visible at the bottom of the color selection box. The "Back" arrow (4) is in the top left of the Legend pane. The map shows a watershed boundary and stream network, with a legend for "navarro_streams" and "soils_navarro".

13.3 Add a legend border

Now let's add a border to give the legend some definition from the map behind it. Border properties are on the third icon tab (hover text *Display*) - and in fact, you can see the background properties here too, though we get less detail than in the location we changed it.

1. Change to the *Display* tab
2. Click the icon patch for the Border symbol (expand the Border section if necessary)
3. Choose *Black* in the bottom left of the patches.



13.4 Add some padding

Getting better, but text all the way to the edge of a box rarely looks good - let's add some padding, which is space between the border and the content of the box. On the same tab as we were on before, we'll now adjust the "gaps":

1. Change the *X gap* and *Y gap* in the *Border* section to 0.1 inches
2. Change the *X gap* and *Y gap* in the *Background* section to 0.1 inches as well.

If you forget to do both of these and only set one, the box can end up looking a little silly (such as with the border floating away from the background of the box), but it can be nice to have this amount of configurability.

(It's another good time for a reminder to save your work!)

The screenshot shows the ArcGIS Pro interface with the 'Format Legend' panel open. The 'Legend' section is selected, and the 'Text Symbol' is being formatted. The 'Display' section is expanded to show 'Border' and 'Background' settings. The 'X gap' and 'Y gap' for both sections are set to 0.1 in. The 'Rounding' is set to 0% for both. The 'Shadow' section is also visible with 'X offset' at 0.1389 in and 'Y offset' at -0.1389 in. The main map area shows a watershed map with a legend box overlaid. The legend box has a blue border and a white background. The map title is 'Soil Drainage in the Navarro River Watershed'.

14. Changing the names of items

Now let's fix those names in the legend. While *navarro_streams* might be interpretable to someone, it's not particularly useful, and *drclasswet* is not helpful at all. We should give these layers more descriptive names. One way to do this would be to rename the layers in our Contents pane - the Legend would update with the new layer names and we get the benefit of our document being more descriptive. I personally like my layers, in most cases, to indicate the name of the actual dataset, though I think that's becoming increasingly old-school and less useful. But following that, let's change what's displayed another, similar way by adjusting the text ArcGIS places for us that describes the field it's using to symbolize layers. This ends up being a multi-step process to get right - we'll need to change the text in one place, then change what the legend chooses to display in another.

1. To change the text, we use the Contents pane. Just below *navarro_streams* you'll see *TotDASqKm* since it's the field being used to create the *symbol classes*. Click on that text and hit your F2 key to rename it. Make the name something like "Total Drainage Area (Sq Km)" and then hit Enter on your keyboard to make the change.

The screenshot displays the ArcGIS Pro interface. The top ribbon includes tabs for Project, Layout, Insert, Analysis, View, Imagery, Share, Appearance, Labeling, and Data. The Contents pane on the left shows the Drawing Order for the 'Landscape Print Layout'. Under the 'Soil Drainage in the Navarro River Watershed' group, the 'navarro_streams' layer is expanded, and the 'Total Drainage Area (Sq Km)' sub-layer is selected, indicated by a red circle with the number '1'. The map area shows a watershed map with a legend and a scale bar. The legend includes categories for 'navarro_streams' and 'soils_navarro drclasswet'. The status bar at the bottom shows the map's extent and scale.

14.1 Turn off the layer name

Now that we have useful text attached to the layer somewhere, let's go make sure ArcGIS Pro uses it in the legend.

1. Find the Legend in the Contents pane and expand its items (if not already expanded). Click on *navarro_streams* within those items and either click the *Element* pane open on the right side, or right click on *navarro_streams* instead and choose Properties to bring the *Element* pane up.
2. By default, we'll see the options for display of this item that we need. The very top has a section called *Show* for enabling or disabling parts of the layer. Try turning each of them on and off to see what happens. When you're done make sure *Layer name* is unchecked and *Headings* (the item we changed to have descriptive text) and *Label* are checked.

Now our streams legend makes more sense!

The screenshot shows the ArcGIS Pro interface with the Legend pane on the left and the Format Legend Item pane on the right. The Legend pane shows the 'navarro_streams' layer selected, with a circled '1' next to it. The Format Legend Item pane shows the 'navarro_streams' layer selected, with a circled '2' next to the 'Layer name' checkbox, which is unchecked. The 'Headings' and 'Label' checkboxes are checked. The map in the center shows the Navarro River Watershed with a legend for 'Soil Drainage in the Navarro River Watershed' and 'Total Drainage Area (Sq Km)'. The legend for 'Total Drainage Area (Sq Km)' has five categories with corresponding colors and line styles. The legend for 'Soil Drainage in the Navarro River Watershed' has five categories with corresponding colors and line styles. The map also shows a scale bar, a north arrow, and a title 'Soil Drainage in the Navarro River Watershed'.

14.2 Next up, soil drainage

Now we'll follow the same process for the soil drainage.

1. This time, rename the *drclasswet* label "Soil Drainage Class (Wet)". Note that this renaming doesn't change anything in the attribute table or how the symbology matches to fields - just how it displays that. Make sure that you perform the rename on the *soils_navarro* layer, and not on the buffered streams with the spatial join.

The screenshot shows the ArcGIS Pro interface with a map layout titled "Soil Drainage in the Navarro River Watershed". The map displays a watershed area with various soil drainage classes color-coded from light blue to dark purple. A legend in the bottom-left corner of the map area lists the drainage classes and their corresponding colors. The "Contents" pane on the left shows the layer hierarchy, with "Soil Drainage Class (Wet)" selected under the "soils_navarro" layer. A red circle with the number "1" highlights this selected layer. The "Drawing Order" pane on the right shows the current order of layers in the map. The map includes a scale bar, a north arrow, and a title block with author information.

14.3 Turn off the layer name

And once again, turn off the Layer Name in the legend for the layer

1. Select *soils_navarro* in the Legend section of the Contents pane
2. Use the *Element* pane to turn off the *Layer name* in the Show section.

The screenshot displays the ArcGIS Pro interface with the 'Legend' tab selected. The 'Contents' pane on the left shows the 'soils_navarro' layer selected, indicated by a circled '1'. The 'Format Legend Item' pane on the right shows the 'Layer name' checkbox under the 'Show' section, which is currently checked and circled with a '2'. The map area shows a watershed map with a legend titled 'Soil Drainage in the Navarro River Watershed' and a scale bar. The status bar at the bottom indicates 'Selected Elements: 1'.

15. Legend Updates: Cleaning up multi-item legends

OK, this legend is vastly improved, but I see a few more obvious issues:

- There's a weird gap between the Soil Drainage Class heading and the categories
- We don't need to display *<all other values>* for Soil Drainage Class (we don't have any)
- The spacing between items isn't good - *navarro_boundary* ends up looking like it's part of soil drainage class
- There are too many decimal places on the streams data.

So, let's work on each of these, starting with the gap between the drainage class heading and the items below it. This is being caused by a semi-unique situation with the data (there will always be these types of problems though!) where I happened to set features with no drainage class specified to use the color white, so that spot is showing a white square, on a white background, with no text.

1. Bring up the Symbology pane for the *soils_navarro* layer.

This is also the same thing we would do if we wanted to reduce the number of decimal places in the rivers layer's drainage area - edit the Label field in the symbology. I won't do that here in the tutorial, but encourage you to.

The screenshot shows the ArcGIS Pro interface with the Symbology pane open for the 'soils_navarro' layer. The map displays the Navarro River Watershed with various soil drainage classes. The Symbology pane shows the legend for 'Soil Drainage Class (Wet)' with 6 values. The legend items are: Unknown, Moderately well drained, Somewhat excessively drained, Somewhat poorly drained, Very poorly drained, and Well drained. The 'Unknown' item is highlighted with a red circle and the number 1. The map also shows a legend for 'Total Drainage Area (Sq Km)' and 'navarro_boundary'.

Symbol	Value	Label
[White square]	Unknown	Unknown
[Light blue square]	Moderately well drained	Moderately well...
[Medium blue square]	Somewhat excessively drained	Somewhat exces...
[Dark blue square]	Somewhat poorly drained	Somewhat poor...
[Very dark blue square]	Very poorly drained	Very poorly drai...
[Lightest blue square]	Well drained	Well drained
[Black square]	<all other values>	<all other value...

15.1 Turn off All Other Values

Now let's get rid of that *All other values* patch too.

1. Make sure you're editing symbology for *soils_navarro*
2. In the *Classes* tab, in the top right, there's a *More* menu. Click on it
3. Click *Show all other values* to uncheck it and disable it. You'll see the *all other values* patch disappear from the *Classes* box and the legend.

The screenshot shows the ArcGIS Pro interface with the Symbology pane open for the 'navarro_streams_100m' layer. The 'Classes' tab is selected, and the 'More' menu is open, highlighting the 'Show all other values' option. The map displays a watershed with various soil drainage classes. A legend in the map area lists the classes and their corresponding colors. The Symbology pane shows a list of classes with a 'More' menu icon in the top right corner. The 'More' menu is open, and the 'Show all other values' option is highlighted with a red box. The 'Classes' tab is also highlighted with a red box.

Symbol	Value	Label
Unknown	6 values	Unknown
Moderately well...	Moderately well...	Moderately well...
Somewhat exces...	Somewhat exces...	Somewhat exces...
Somewhat poor...	Somewhat poor...	Somewhat poor...
Very poorly drai...	Very poorly drai...	Very poorly drai...
Well drained	Well drained	Well drained
<all other values>	<all other value...>	<all other value...>

15.2 A few more legend fixes

OK, on to a few more fixes. First a simple one.

1. Rename the navarro_boundary layer to *Watershed Boundary*

The screenshot displays the ArcGIS Pro interface with a map layout titled "Soil Drainage in the Navarro River Watershed". The map shows a watershed boundary and soil drainage classes. The "Contents" pane on the left lists the layers, with "Watershed Boundary" highlighted and a circled "1" next to it. The "Symbology" pane on the right shows the properties for the "navarro_boundary" layer, which is currently set to "Single Symbol".

Contents Pane (Drawing Order):

- 359.230501 - 815.989500
- navarro_streams_100m_Spatial drclasswet
 - Unknown
 - Moderately well drained
 - Somewhat excessively drained
 - Somewhat poorly drained
 - Very poorly drained
 - Well drained
- navarro_streams_100m
- soils_navarro
 - Soil Drainage Class (Wet)
 - Unknown
 - Moderately well drained
 - Somewhat excessively drained
 - Somewhat poorly drained
 - Very poorly drained
 - Well drained
- Watershed Boundary** (1)
- World Topographic Map

Symbology - navarro_boundary:

- Primary symbology: Single Symbol
- Symbol: [Symbol]
- Label: [Text Box]
- Description: [Text Box]

Map Legend:

- Total Drainage Area (Sq Km)
 - 0.00000 - 20.373300
 - 20.373301 - 63.179100
 - 63.179101 - 124.689600
 - 124.689601 - 359.230500
 - 359.230501 - 815.989500
- Soil Drainage Class (Wet)
 - Unknown
 - Moderately well drained
 - Somewhat excessively drained
 - Somewhat poorly drained
 - Very poorly drained
 - Well drained
 - navarro_boundary

Map Title: Soil Drainage in the Navarro River Watershed
 Author: Nick Santos
 Data Sources: Rivers - NHDPlus Version 2, Soils - SSURGO

15.3 Change the spacing between items

Now let's change the spacing between items in the legend so that each one is separated nicely. A decent rule of thumb for headers is that they should be about one full line of text away from the item that preceded them, so let's make a change that looks like that.

1. Bring up the *Element* pane for the Legend
2. Switch to the second icon tab (*Legend Arrangement Options*)
3. Expand the *Spacing* section if needed and change the spacing value for *Items* to 20pt.

You'll see the spacing between items in the legend update. Feel free to adjust any other values you like to improve the legend display.

The screenshot shows the ArcGIS Pro interface with the 'Format Legend' pane open. The 'Legend' element is selected, and the 'Arrangement' section is expanded. The 'Spacing' section is also expanded, and the 'Items' spacing is set to 20 pt. The legend in the map shows the updated spacing between items.

Legend

Legend

Legend Arrangement Options

Arrangement

Fitting Strategy

Adjust columns and font size

Minimum font size 6 pt

Equal column widths

Word wrapping

Labels 2 in

Descriptions 2 in

Spacing

Gaps Between	Value
Categories	5 pt
Classes	5 pt
Columns	5 pt
Group layers and items below	5 pt
Headings and classes	5 pt
Items	20 pt
Labels and descriptions	5 pt
Layer names and items below	5 pt
Patches and text	5 pt
Title and items	5 pt

Soil Drainage in the Navarro River Watershed

Author: Nick Santos
Data Sources: Rivers - NHDPlus Version 2, Soils - SSURGO

15.4 Resize the legend

Now, we're done modifying the legend. As a matter of housekeeping, I recommend resizing it to match its approximate size better - the boundary box for mine, when selected, was now different than the actual size of the legend. It won't affect the legend's display (it will take all the space it needs), but will help other items to correctly snap to the legend's position as you move them around.

The screenshot displays the ArcGIS Pro interface for a map layout titled "Landscape Print Layout". The main map area shows a watershed map of the Navarro River with a legend overlaid. The legend is titled "Soil Drainage in the Navarro River Watershed" and includes two tables:

Total Drainage Area (Sq Km)	
0.000000 - 20.373300	20.373301 - 63.179100
63.179101 - 124.689600	124.689601 - 359.230500
359.230501 - 815.989500	

Soil Drainage Class (Wet)	
Unknown	
Moderately well drained	
Somewhat excessively drained	
Somewhat poorly drained	
Very poorly drained	
Well drained	
Watershed boundary	

The legend also includes a scale bar (0 to 18 Kilometers) and a north arrow. The "Format Legend" pane on the right shows the legend's properties, including its name "Legend", visibility settings, and synchronization options. The map's drawing order in the Contents pane shows the legend is positioned above the map layers.

16. Clean up the layout a bit

Now, let's clean up the layout a bit. I decided that for this map I wanted to move the scale bar and north arrow to the bottom bar since there was going to be a lot of blank space there otherwise and moving them there keeps more parts of the map visible. Adjust your layout as you see fit!

The screenshot shows the ArcGIS Pro interface with a map layout titled "Soil Drainage in the Navarro River Watershed". The map frame contains a legend, a scale bar, a north arrow, and a title block. The scale bar and north arrow have been moved to the bottom of the map frame. The Contents pane on the left shows the drawing order, and the Format Map Frame pane on the right shows the properties for the map frame.

Contents

- Drawing Order
- Landscape Print Layout
 - Legend
 - navarro_streams
 - navarro_streams_100m_Spatial
 - navarro_streams_100m
 - soils_navarro
 - Watershed Boundary
 - Text 1
 - Scale Bar
 - North Arrow
 - Text
 - Soil Drainage in the Navarro River Wa
 - Navarro Watershed Map
 - navarro_streams
 - Total Drainage Area (Sq Km)
 - 0.000000 - 20.373300
 - 20.373301 - 63.179100
 - 63.179101 - 124.689600
 - 124.689601 - 359.230500
 - 359.230501 - 815.989500
 - navarro_streams_100m_Spatial

Format Map Frame

Soil Drainage in the Navarro River Watershed

Map Frame

Options

- General
 - Name: Soil Drainage in the Navarro River Watershed
 - Visible
 - Locked
- Map Frame
 - Map: Navarro Watershed Map

Map Legend

Total Drainage Area (Sq Km)

- 0.000000 - 20.373300
- 20.373301 - 63.179100
- 63.179101 - 124.689600
- 124.689601 - 359.230500
- 359.230501 - 815.989500

Soil Drainage Class (Wet)

- Unknown
- Widely well drained
- Somewhat excessively drained
- Somewhat poorly drained
- Very poorly drained
- Well drained
- Watershed Boundary

Soil Drainage in the Navarro River Watershed

Authors: Nick Santos
Data Sources: Rivers - NHDPlus Version 2, Soils - SSURGO

0 2.25 4.5 9 13.5 18 Kilometers

1:290,506 | 65% | 7,558, 8,688 | Selected Elements: 1

16.1 Service Layer Credits

One item for cleanup when using Basemaps is the *Service Layer Credits* - It's text that automatically draws on top of the basemap that shows where basemap data came from. We need to show it, but it's often in an inconvenient place that draws on top of our data. And there seems to be no way to delete or move it - at least, you can't click on it and get a box to move.

It turns out you **can** relocate it, but you'll need to use Dynamic Text again.

1. Switch to the *Insert* tab
2. Click *Dynamic Text*
3. Find *Service Layer Credits* in the set of options and click on it.

The screenshot shows the ArcGIS Pro interface with the following elements:

- Ribbon:** The **Insert** tab is active, with the **Dynamic Text** button highlighted (circled 2).
- Contents Pane:** The **Soil Drainage in the Navarro River Watershed** layer is selected (circled 1).
- Map View:** A map of the Navarro River Watershed with a legend and scale bar. A red box highlights the **Service Layer Credits** text in the bottom right corner (circled 3).
- Properties Pane:** The **Service Layer Credits** properties are displayed, including:
 - Name:** Landscape Print Layout
 - Project:** C:\GIS\Lab1_IntroToArcGISPro
 - Default Folder:** C:\GIS\Lab1_IntroToArcGISPro
 - Default Geodatabase:** C:\GIS\Lab1_IntroToArcGISPro
 - Default Toc:** C:\GIS\Lab1_IntroToArcGISPro
 - Folder:** C:\GIS\Lab1_IntroToArcGISPro
 - Name:** Lab1_IntroToArcGISPro
 - Path:** C:\GIS\Lab1_IntroToArcGISPro
 - Date Saved:** 2/13/2021 3:59 PM
 - Table Attribute:** Value: Show the values separated by delimiter.
 - Table Statistics:**

Count	Null Count	Minimum
Show the number of rows.	Show the number of rows that have null values.	Show the minimum value.
Maximum	Mean	Median
Show the maximum value.	Show the mean of the values. The mean is the average of the values.	Show the median value.
Range	Sum	Standard D
Show the value range. The range is the difference between the maximum and minimum values.	Show the sum of the values.	Show the standard deviation of the values.
Kurtosis	Skewness	Lower Quartile
Show the kurtosis of the values. The kurtosis is a measure of the "tailedness" of the distribution of values.	Show the skewness of the values. The skewness is a measure of the asymmetry of the distribution of values.	Show the lower quartile of the values.

16.2 Choose a new spot for them

1. As with other items, click and drag in a new place to create the text box - I put mine below my *Data Sources* text.

2. Then bring up the *Element* pane for this item (right click on it and choose *Properties* if you can't find it). Edit the text before the dynamic text to say "Basemap Credits:"

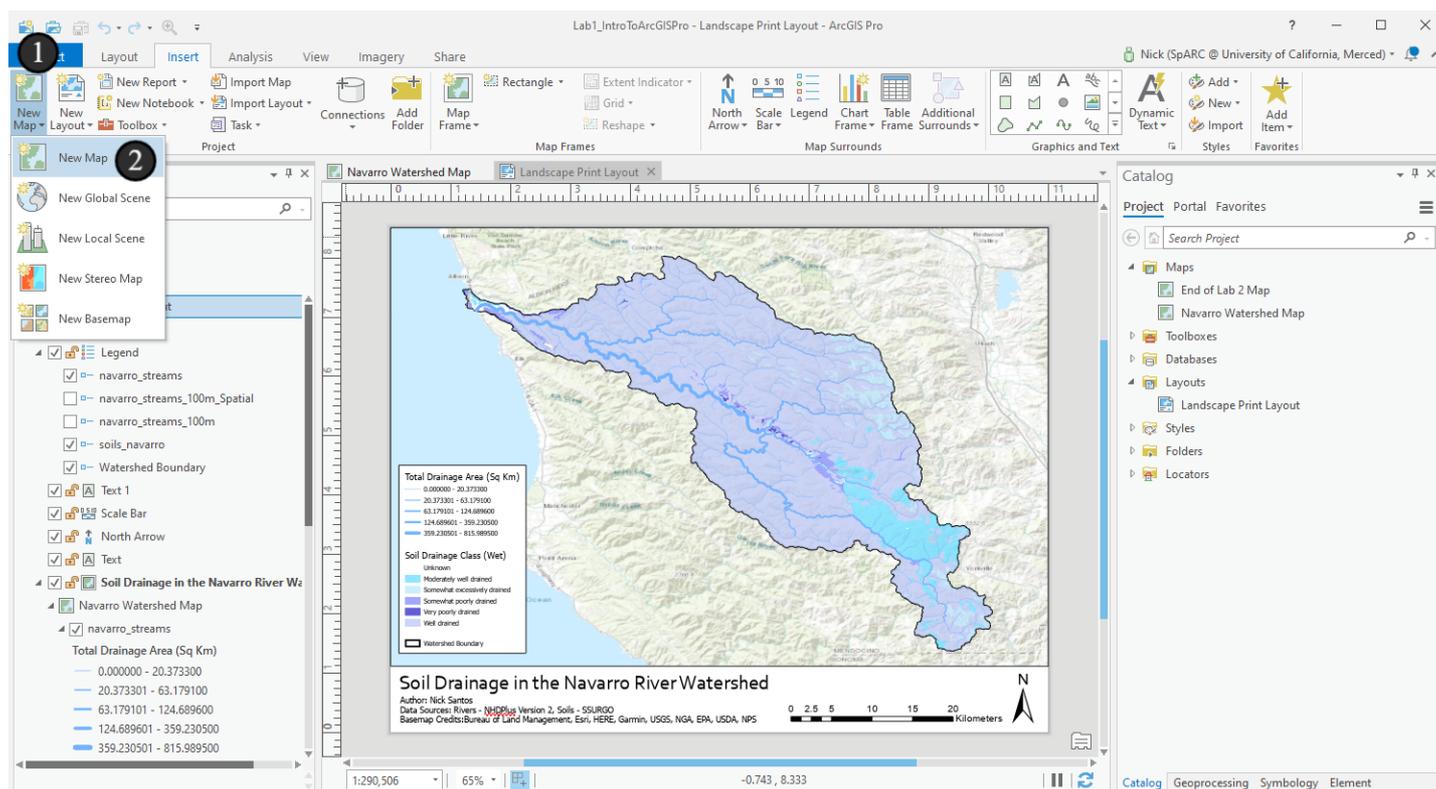
Now the service layer credits have been removed from the map frame and are in a more appropriate place.

The screenshot shows the ArcGIS Pro interface with a map layout titled "Landscape Print Layout". The map displays a watershed map of the Navarro River with various layers like "navarro_streams", "soils_navarro", and "Watershed Boundary". A text box is placed on the map, containing the text "Basemap Credits: serviceLayerCredits". The "Format Text" pane is open on the right, showing the text content and formatting options. The text content is "Basemap Credits: serviceLayerCredits". The "Paragraph" section shows "Columns" set to 1, "Column Gap" set to 0.0694 in, and "Margin" set to 0 in. A red circle with the number 2 is placed over the text box in the map view.

17. Adding the inset map

This map is really starting to shape up, but one important item is still missing: an inset map that shows people context who may not be familiar with what area they're looking at. For now, we'll assume the people who will view this map inside and outside our organization generally know California, but might need some context on where in California this watershed is.

1. To add an inset map, the first thing we need is a new map! It can be done with this map too, but that's an advanced technique and a bit beyond the scope of this tutorial. To get started, switch to the *Insert* ribbon and click *New Map*
2. If you clicked the dropdown arrow, make sure to choose the normal *New Map* option.

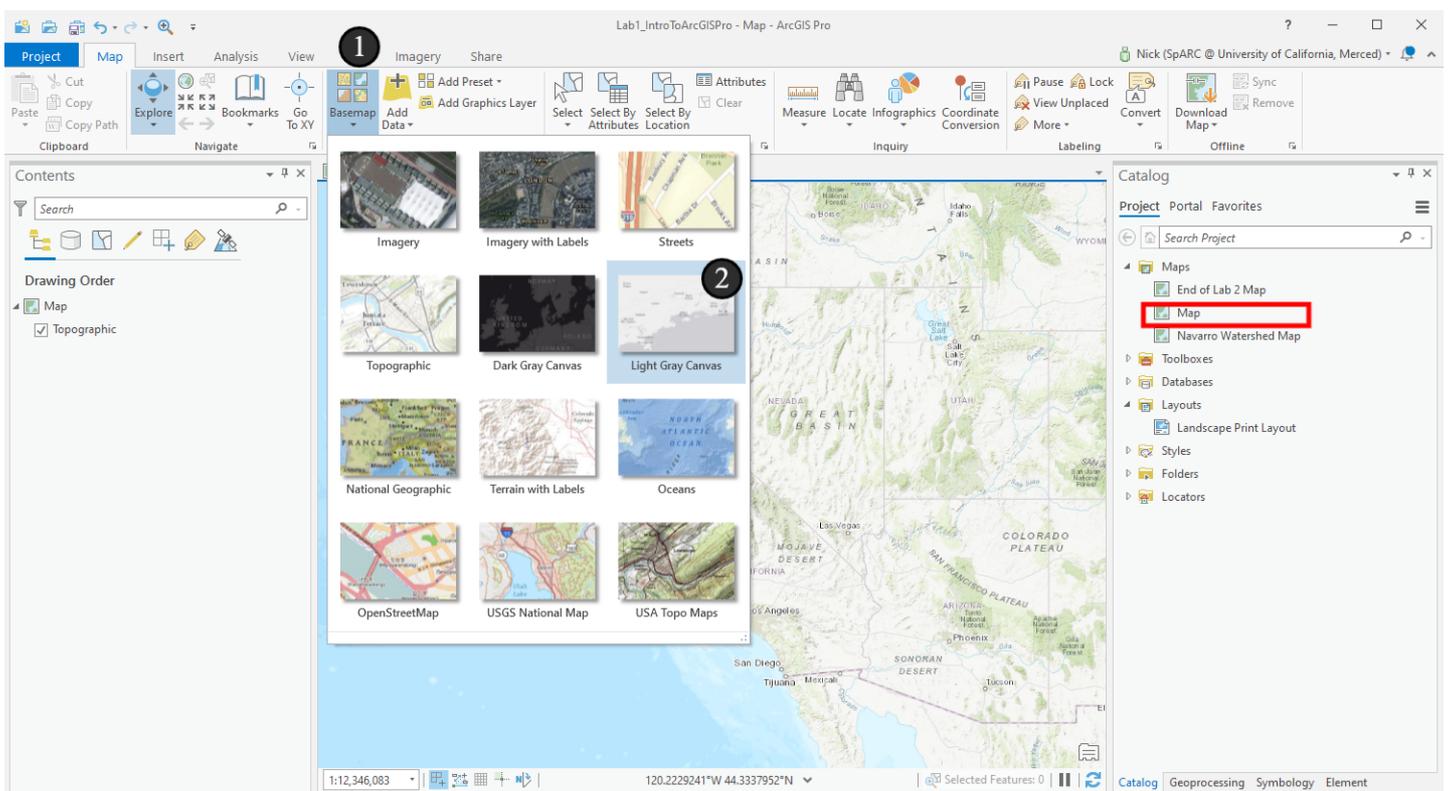


17.1 Change the basemap

A brand new map shows up as a tab in the main pane and in catalog. Once again, the application switches contexts for us since we're now editing a map and not a layout. Note that in the Catalog pane, we have another map in the maps section too (I have one more than you will have because I saved a copy of my main map at one point)

The only thing we'll do to this map is switch the basemap. We'll have the basemap provide our context. Some are better at this use than others, and much of it will be personal preference. For now, we'll use the *Light Gray Canvas* basemap since it's very general and fades to the background nicely.

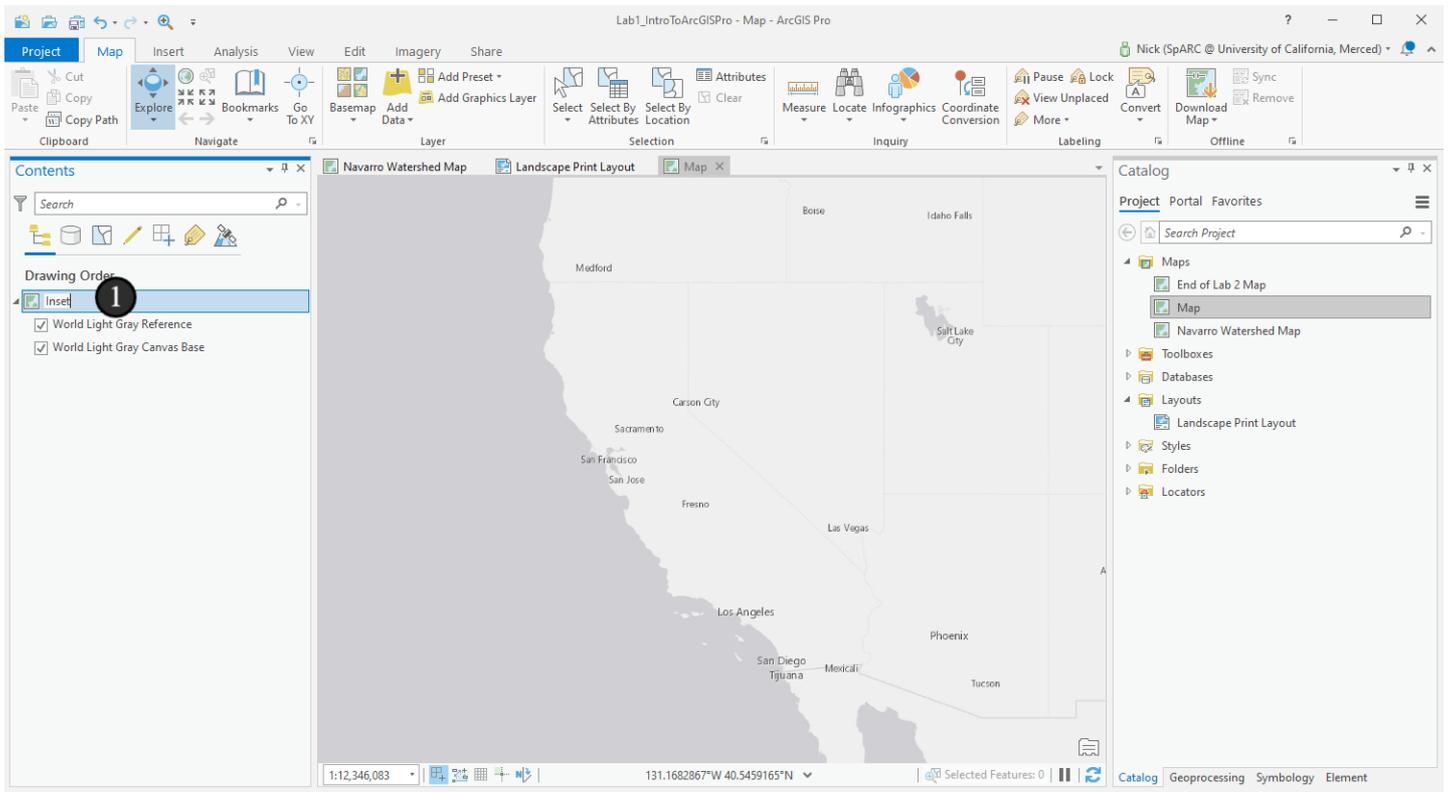
1. On the *Map* ribbon, click the *Basemap* button
2. Then click *Light Gray Canvas*



17.2 Rename the Inset Map

Now, for some housekeeping rename the inset map.

1. Click on *Map* in the Contents pane and rename it "Inset" (that shortcut key is F2, as a reminder)



18. Back to our layout

Now, let's go back to our layout again

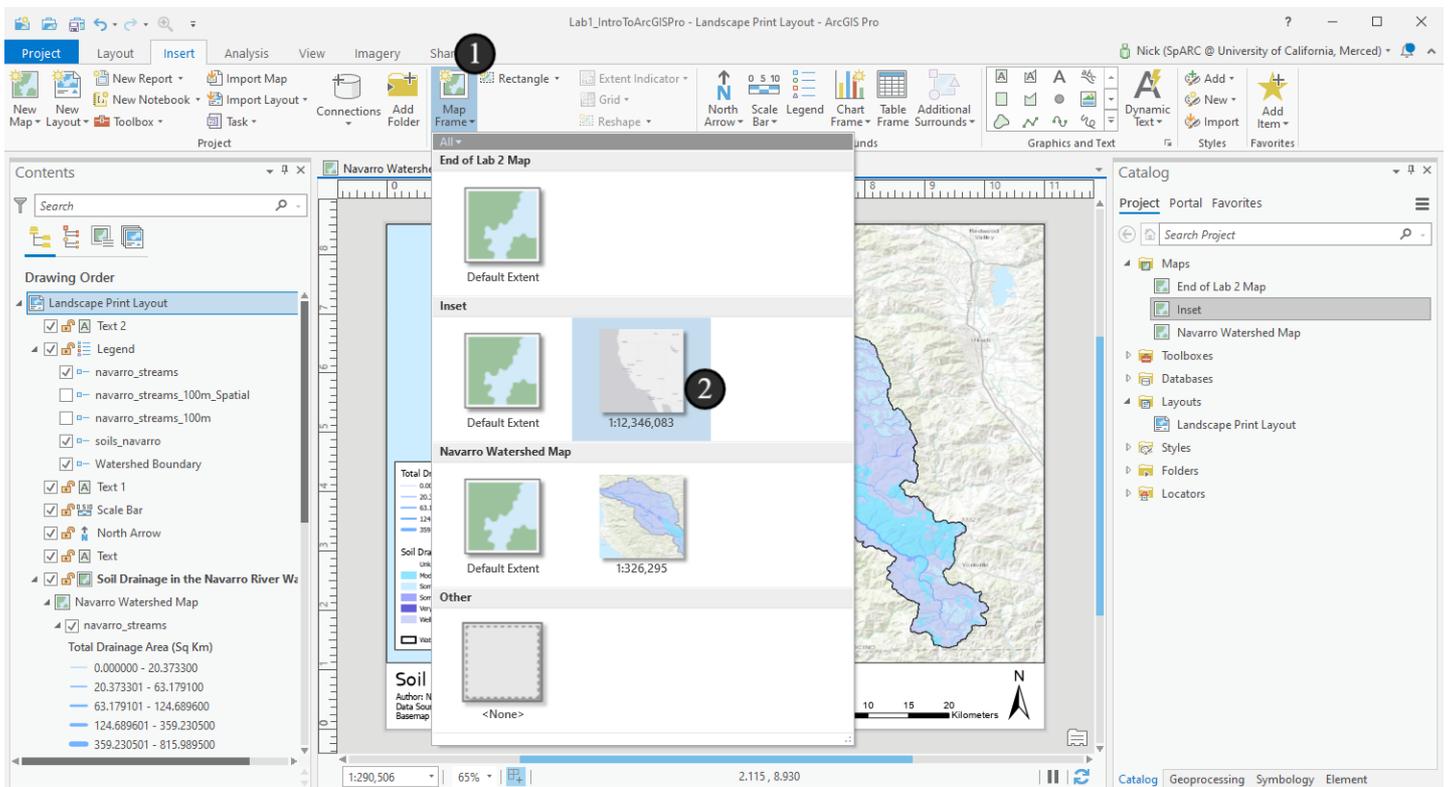
1. Switch tabs in the main pane to *Landscape Print Layout*

The screenshot shows the ArcGIS Pro interface with the 'Landscape Print Layout' tab selected in the main pane. The ribbon at the top includes tabs for Project, Layout, Insert, Analysis, View, Imagery, and Share. The Contents pane on the left shows the 'Drawing Order' for the 'Landscape Print Layout', including elements like Text 2, Legend, navarro_streams, navarro_streams_100m_Spatial, navarro_streams_100m, soils_navarro, Watershed Boundary, Text 1, Scale Bar, North Arrow, Text, and Soil Drainage in the Navarro River Watershed. The main map area displays a map of the Navarro River Watershed with a legend for 'Total Drainage Area (Sq Km)' and 'Soil Drainage Class (Wet)'. The Catalog pane on the right shows the project structure, with the 'Inset' map frame highlighted in a red box.

19. Add a second map frame

Now, we want to make that map show up on our layout too. We'll add a second map frame for this.

1. On the *Insert* ribbon, click *Map Frame*
2. Under the *Inset* header, choose the one that has a scale below it and a preview again.



19.1 Draw the map frame

Draw the map frame again - I put mine in the upper right corner

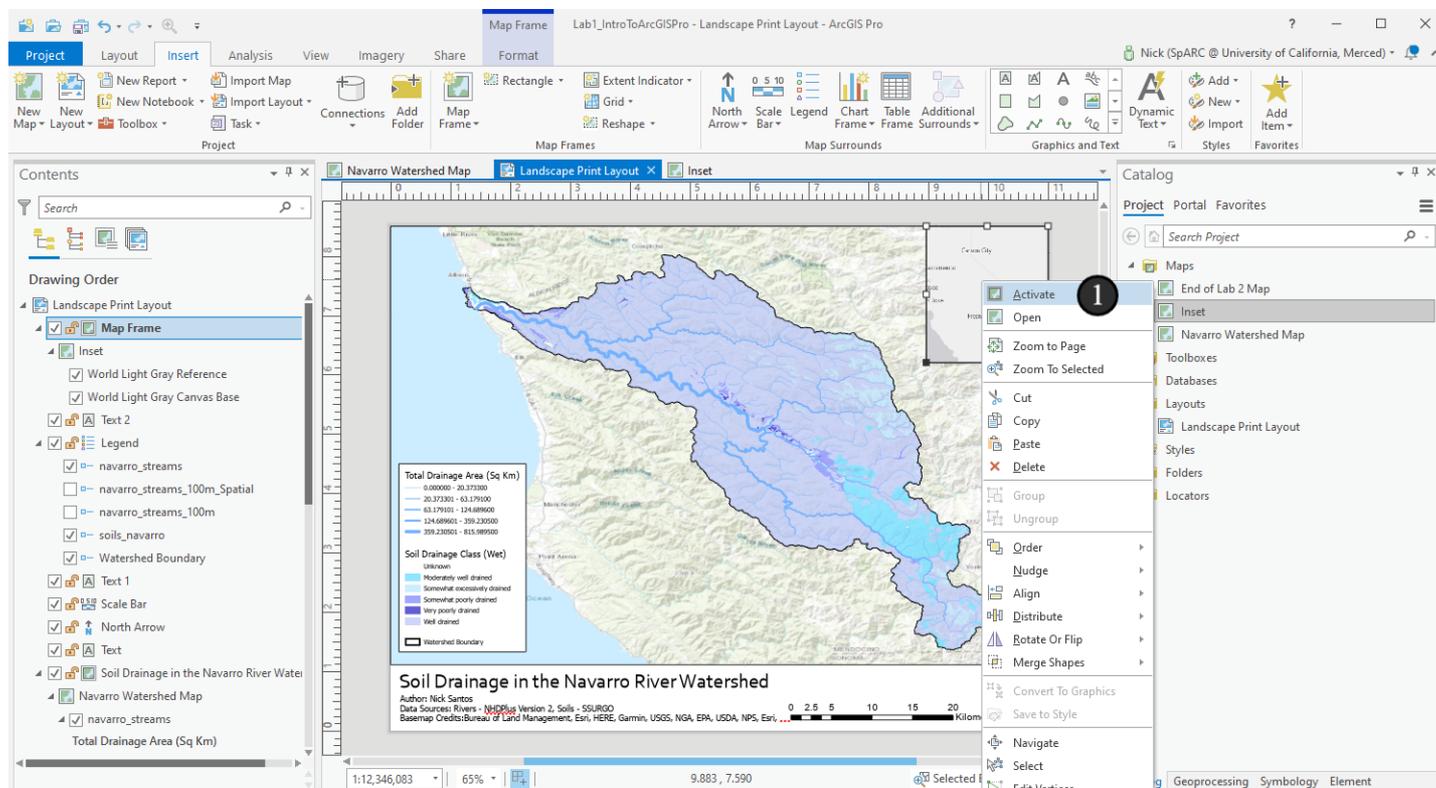
The screenshot shows the ArcGIS Pro interface with the following components:

- Ribbon:** Project, Layout, Insert, Analysis, View, Imagery, Share. The 'Map Frames' group is active, showing tools like Rectangle, Extent Indicator, Grid, Reshape, North Arrow, Scale Bar, Legend, Chart Frame, Table Frame, and Additional Surrounds.
- Contents Pane (Left):** Shows the drawing order for the 'Landscape Print Layout'. The map frame is positioned at the top. Below it are elements like Text 2, Legend, Scale Bar, North Arrow, and Text. The map data includes 'Soil Drainage in the Navarro River Watershed' and 'Navarro Watershed Map'.
- Map View (Center):** Displays a map of the Navarro River Watershed with a blue map frame in the upper right corner. A red arrow points to the frame. The map includes a legend for 'Total Drainage Area (Sq Km)' and 'Soil Drainage Class (Wet)', a scale bar, and a north arrow.
- Catalog Pane (Right):** Shows the project structure, including 'Maps', 'Toolboxes', 'Databases', 'Layouts', 'Styles', 'Folders', and 'Locators'. The 'Landscape Print Layout' is selected.

19.2 Adjust the Inset

Now, let's adjust the new map frame to show the area our current map is in. To do so, we'll need to activate it (back through the looking glass everyone!)

1. Right click on the inset map and click *Activate*



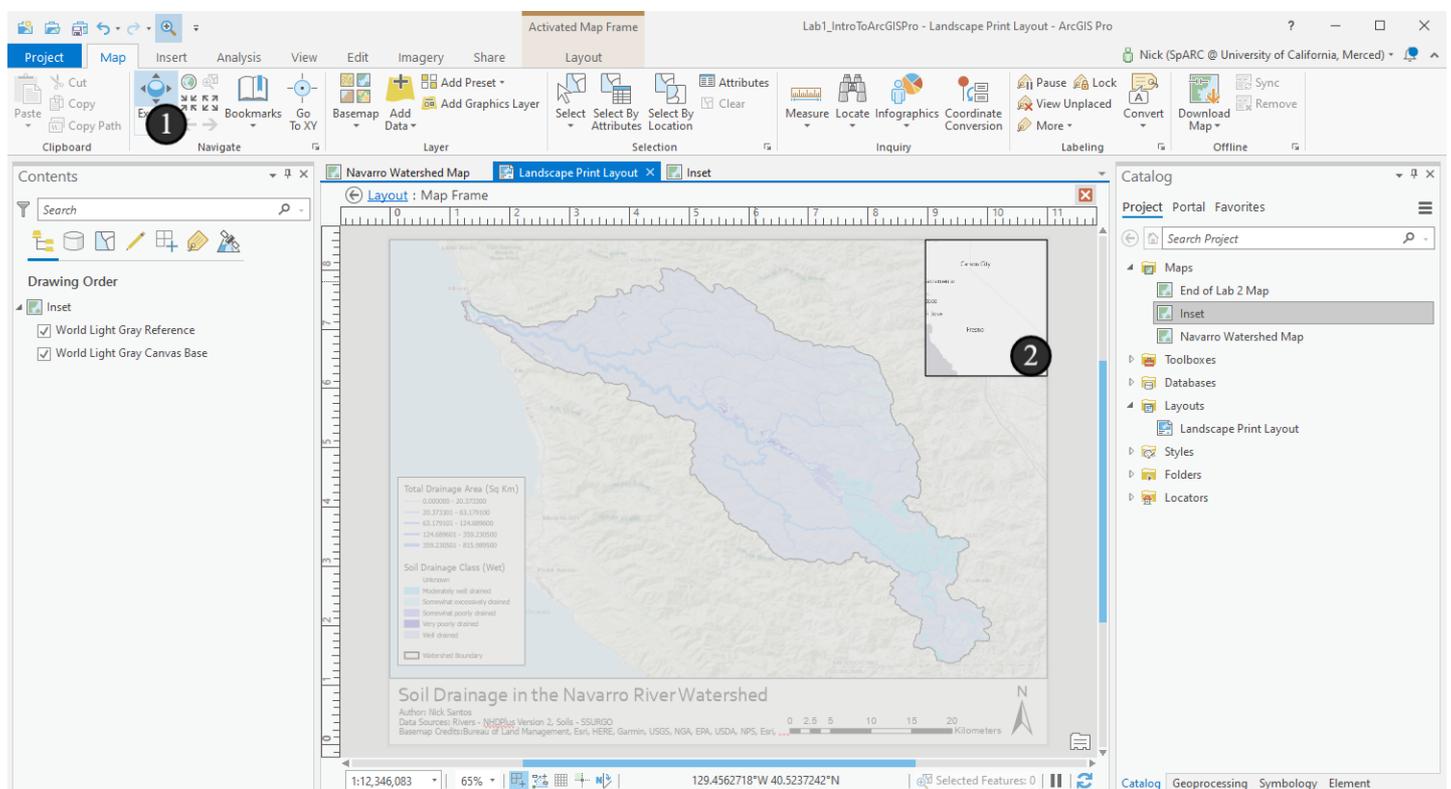
19.3 Use the Explore Tool to Move it

Now, we need to set the map extent to something that shows the same area as our main map, but also a lot of area around it. This watershed is a few hours north of San Francisco, so we'll want to make sure that we can at least see the label for San Francisco on the basemap, and possible more.

To adjust the map's zoom and extent:

1. Activate the *Explore* tool
2. Click and drag in the inset frame to move it around - scroll in or out to zoom as you like
3. (Not shown) - Deactivate the map frame (Layout tab on the ribbon)

I ended up showing most of the state, with San Francisco in the middle of the frame and even Los Angeles showing at the bottom. I zoomed out about one step and panned northwest of where my map was by default (see next step for how mine looks). If we wanted to make this more precise, we could have added the watershed boundary to this inset map too and then zoomed to it to get the location, then zoomed out. For now, this is fine.

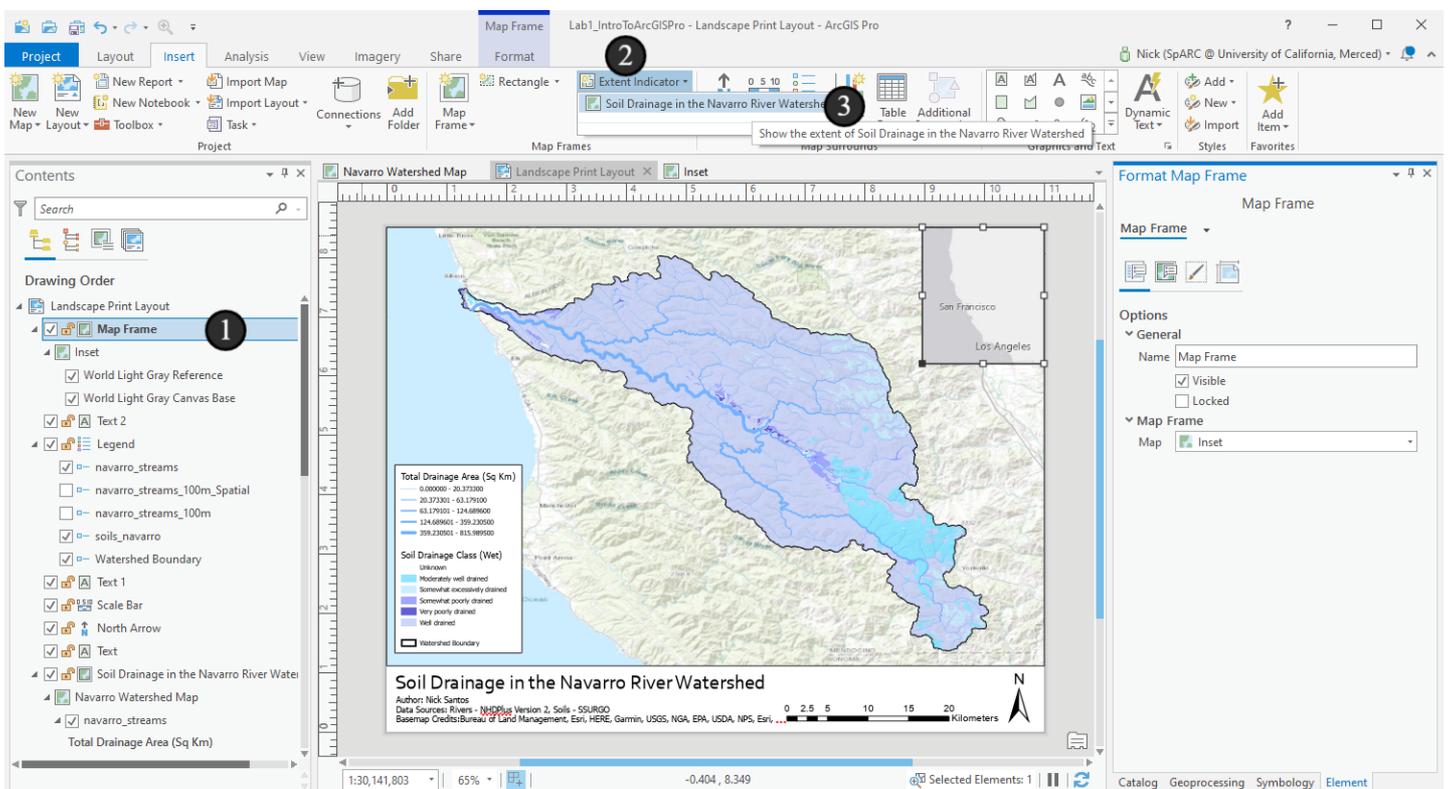


19.4 Add the extent indicators

That map is fine now, but it's not yet useful at indicating where the main map is located. To do that, we'll need to add *Extent Indicators*. These are some kind of outline (typically) that shows on the inset map that shows where the data in the main map is.

Now, I always forget how to do this in ArcGIS Pro and have to look it up! I usually think it should be in the element properties of the map frame, but it's not. It's an item we *Insert*.

1. Select the Map Frame that has the map named *Inset* in the Contents pane (don't select the inset map itself). This is the map we want to add the extent indicators to/
2. On the *Insert* ribbon, click the button named *Extent Indicator* in the *Map Frames* section
3. Choose the only other map frame listed there named "Soil Drainage in the Navarro River Watershed" - we want to add an indicator of the extent of this map frame to the inset map.



19.5 Adjust the extent indicator to make it more visible

1. Now, we'll see a new item within the map frame in the Contents pane called *Extent Indicators* with a subitem named "Extent of Soil Drainage in the Navarro River Watershed" - click on that and bring up the Element pane in order to style it.
2. Change the outline color to red
3. Then change the width to 2pt.

It's possible that after seeing where the extent indicator is, you might want to adjust the map extent again, in which case you'll need to activate the map and use the explore tool. That's up to you - I'll leave mine as it is.

The screenshot shows the ArcGIS Pro interface with the 'Format Extent Indicator' pane open. The map displays the Navarro River Watershed with soil drainage classes. The 'Format Extent Indicator' pane is open, showing the 'Appearance' section where the 'Outline color' is set to red and the 'Outline width' is set to 2 pt. The 'Contents' pane on the left shows the 'Extent of Soil Drainage in the Navarro River Watershed' item selected. The map frame shows the watershed boundary and soil drainage classes.

Contents Pane:

- Drawing Order
- Print Layout
- Map Frame
- Extent Indicators
 - Extent of Soil Drainage in the Navarro River Watershed
- World Light Gray Reference
- World Light Gray Canvas Base
- Text 2
- Legend
- navarro_streams
- navarro_streams_100m_Spatial
- navarro_streams_100m
- soils_navarro
- Watershed Boundary
- Text 1
- Scale Bar
- North Arrow
- Text
- Soil Drainage in the Navarro River Watershed
- Navarro River Watershed Map

Format Extent Indicator Pane:

- Extent of Soil Drainage in the Navarro River Watershed
- Appearance
 - Color
 - Outline color: Red
 - Outline width: 2 pt

Map Frame:

Soil Drainage in the Navarro River Watershed

Legend:

- Total Drainage Area (Sq Km)
 - 0-20,373,301 - 63,179,000
 - 63,179,001 - 124,489,000
 - 124,489,001 - 205,120,500
 - 205,120,501 - 415,989,500
- Soil Drainage Class (Wet)
 - Upland
 - Moderately well drained
 - Somewhat excessively drained
 - Somewhat poorly drained
 - Very poorly drained
 - Well drained
- Watershed Boundary

Scale: 1:30,141,803 | 65% | 9,415, 4,409

20. Clean up and export

Now we have a complete map - do some quick checks and cleanup - make sure that your scale bar still looks good after extent adjustments and you like how everything is positioned, etc. Once you've done that, we're ready to export our map to share. Before we do, save your map one more time.

1. Click on the tab for the *Share* ribbon
2. Then click the button named *Layout* in the *Export* section.

The screenshot shows the ArcGIS Pro interface with the 'Share' ribbon selected. Callout 1 points to the 'Share' ribbon tab, and callout 2 points to the 'Layout' button in the 'Export' section. The main map area displays a watershed map of the Navarro River with a legend, scale bar, and north arrow. The legend includes 'Total Drainage Area (Sq Km)' and 'Soil Drainage Class (Wet)'. The 'Contents' pane on the left shows the drawing order of the map elements.

Total Drainage Area (Sq Km)

0.000000 - 20.573300
20.573301 - 63.179100
63.179101 - 124.889500
124.889501 - 209.230000
209.230001 - 815.989500

Soil Drainage Class (Wet)

Unknown
Moderately well drained
Somewhat excessively drained
Somewhat poorly drained
Very poorly drained
Well drained

Soil Drainage in the Navarro River Watershed
 Author: Nick Santos Date: 2/13/2021
 Data Sources: Rivers - NHDPlus Version 2, Soils - SSURGO
 Basemap Credits: Bureau of Land Management, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, Esri, HERE

21. Set export settings

The *Export Layout* pane will come up. There are lots of options, so it's important to look around:

1. Select the file type to export under the *Save as type* options. We'll use a PNG in the demonstration since they're images that are viewable without special software, but you could also use a PDF since exporting a PDF file allows us to share with a broad audience. We choose this first because our choice of file type determines what options are available.
2. Choose the path and name you want to use for export
3. We want the output map to be high quality and ready to print. While the default resolution of 96 dpi (dots per inch) is fine for displaying on a screen, printers need higher resolution files. Change the *Resolution* setting to 300 dpi by typing 300 in the box.
4. Click the Export button to initiate the export of your map.

The screenshot shows the ArcGIS Pro interface with the *Export Layout* pane open. The pane is titled "Export Layout" and "Landscape Print Layout". The *Properties* section is expanded to show the following settings:

- File Type:** PNG (indicated by a circled 1)
- Name:** C:\Users\dax\Documents\IntroToArcGISProMap (indicated by a circled 2)
- Resolution:** 300 DPI (indicated by a circled 3)
- PNG Settings:** Color depth: 32-bit with Alpha
- Color Management:** Embed color profile (checkbox is unchecked)
- Export button:** A blue button labeled "Export" (indicated by a circled 4)

The main map area displays the "Soil Drainage in the Navarro River Watershed" map. The legend includes:

- Total Drainage Area (Sq Km):**
 - 0.000000 - 20.373300
 - 20.373300 - 63.179100
 - 63.179100 - 124.689600
 - 124.689600 - 309.230700
 - 309.230700 - 835.989500
- Soil Drainage Class (Wet):**
 - Unknown
 - Slightly well drained
 - Somewhat excessively drained
 - Somewhat poorly drained
 - Very poorly drained
 - Well drained
- Watershed Boundary**

The map also includes a scale bar (0 to 20 Kilometers), a north arrow, and a metadata box with the following information:

Author: Nick Santos Date: 2/13/2021
 Data Sources: Rivers - NHDPlus Version 2, Soils - SSURGO
 Basemap Credits: Bureau of Land Management, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, Esri, HERE

22. Export complete!

When it's done, you'll see a green box that says "Export Completed" - click the link to view the exported file to open it up and inspect it!

This exercise is now complete. Though other tutorials will still take place in this region, we won't continue from here. It's still a good idea to save your work in case you want to return to this point.

In this series of three tutorials, we looked at how to use ArcGIS for data exploration by adding data, querying it, and creating selections. We subset a larger dataset, changed styling, and did some geoprocessing to buffer and attach new information to data via tabular and spatial joins. Finally, we made a map and learned just how context sensitive ArcGIS Pro is, utilizing the many tools for putting together a quality print map.

The screenshot shows the ArcGIS Pro interface with the 'Export Layout' dialog box open. The dialog is titled 'Export Layout' and 'Landscape Print Layout'. It includes the following sections:

- File:** File Type is set to PNG. Name is 'C:\Users\dsc\Documents\IntroToArcGISProMap.png'. There are checkboxes for 'Clip to graphics extent' and 'Transparent background'.
- Resolution:** Resolution is set to 300 DPI. Height is 2550 and Width is 3300.
- PNG Settings:** Color depth is set to 32-bit with Alpha.
- Color Management:** A section for color management settings.

An 'Export' button is visible at the bottom right of the dialog. A green notification box at the bottom of the main window reads 'Export Completed' with a 'View exported file' link.

The main map window shows a map titled 'Soil Drainage in the Navarro River Watershed'. The map includes a legend with the following categories:

- Total Drainage Area (Sq Km):**
 - 0.000000 - 20.373300
 - 20.373301 - 63.179100
 - 63.179101 - 124.889000
 - 124.889001 - 209.238000
 - 209.238001 - 358.285000
- Soil Drainage Class (Wet):**
 - Unknown
 - Moderately well drained
 - Somewhat excessively drained
 - Somewhat poorly drained
 - Very poorly drained
 - Well drained

The map also includes a scale bar (0 to 20 Kilometers), a north arrow, and a metadata box with the following information:

Soil Drainage in the Navarro River Watershed
 Author: Nick Santos Date: 2/13/2021
 Data Sources: Rivers - NHDPlus Version 2, Soils - SSURGO
 Basemap Credits: Bureau of Land Management, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS, Esri, HERE

23. Bonus Exercise: Labeling

There's one more thing we left off here that you might be interested in trying out for a print map: Labeling. Labeling tools let us have ArcGIS place text on the map for features based on information in the attribute table.

If you want something to try independently that tests skills you learned here, try to enable labeling for the rivers layer. Here are a few hints about it:

1. You can turn on labeling for a layer in its right click menu.
2. Labeling is another context sensitive option - when it's selected, there's a labeling tab (and an associated labeling properties pane).
3. You'll want to use the GNIS_NAME field for your rivers labels - ArcGIS will probably detect it by default (it automatically uses fields that have "Name" somewhere in their name, if such a field exists)
4. Labeling is a **deep** concept that is easy to start, but requires lots of time to learn and finesse. Play with the options to see if you can improve the default labeling style a bit.