

Scale

ISTC Topic:

1.17

In this Chapter you will learn

- How to define scale
- How to zoom your map to a given scale
- How to set layers so they are only visible at predetermined scales

1. What is a large scale map?

This question is fairly confusing. For example, does a large scale map show a large area, for example all of the United States, or a smaller area such as a single neighborhood? Or is a large scale map one that is drawn at a large scale where features in the real world are drawn in large polygons on your map? This is why ISTC tutorials typically use terms like “zoomed in” or “zoomed out” instead of smaller or larger scales to avoid any of this confusion. But, let’s set the terminology straight anyway.

Scale is determined by how a given distance on your map, for example one inch, relates to that same distance in the real world. A scale of 1:1,000 indicates that 1 inch on the map corresponds to 1,000 inches in the real world. Notice that you do not need to include a unit with a scale: 1 foot on your map corresponds to 1,000 feet in the real world and 1 cm on your map corresponds to 1,000 cm in the real world.

Frequently a scale is given as a division such as 1:1,000. Solving this division will tell you if a scale is large or small. For example $1:1,000$ (one divided by one thousand) = 0.001. Compared to a scale of $1:100,000$ (one divided by one hundred thousand) = 0.00001, the 1:1,000 scale is larger than the 1:100,000. A comparison of a small and large scale is shown in table 1.1.

Scale	Large are small Scale?	Geographic Extent
1:24,000	Large Scale	Smaller
1:100,000	Small Scale	Larger

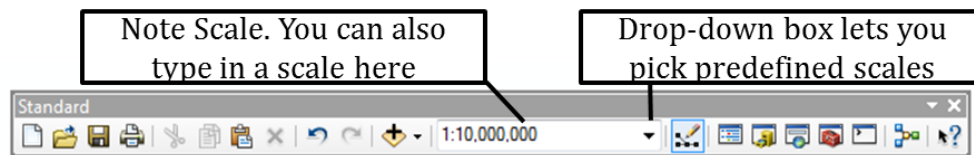
Table 1.1. Comparison between a 1:24,000 scale and 1:100,000 scale



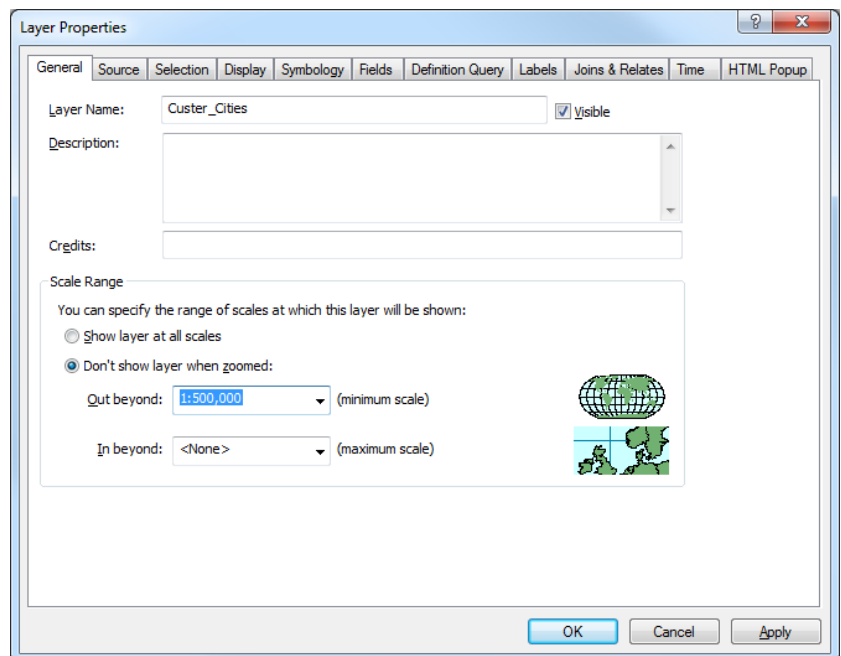
1.17: Setting the scale and Scale Range

Exercise 1: Noting and setting Scales

1. Start ArcMap and open Exercise1.mxd
2. What is the scale of your map? 1: _____
3. When you zoom to a scale of 1:500,000 do counties appear larger or smaller on your map? (Try answering this question before actually changing the scale in ArcMap) _____



4. Use the drop-down box and click on the predefined scale of 1:500,000 to see if you answered the previous question correctly. Zoom to 1:1,000,000 and use the Pan Tool to center Custer County in the middle of your map.
5. Turn on the Custer_Cities layer. You will see a number of cities displayed along with their large labels. This layer is better viewed at larger scales. Therefore, we will set the visibility of the Custer_Cities layer so that you can only view it when you are zoomed in closer than 1:500,000.
6. Right-click on Custer_Cities in the table of contents and select Properties. Go to the "General Tab". Set the Scale Range as shown on the right so that ArcMap does not show the layer when it is zoomed out beyond 1:500,000.
7. Click OK to accept the setting and close the Layer Properties dialog box. Then zoom in and out of your map to test the new setting.



Side Note about scale

Scale is sometimes deceiving. It is easy to look on a paper map and find the scale – typically located in a corner somewhere and displayed as something like 1:24,000. What does that mean? Well, as we just discussed, it means 1 inch on the map corresponds to 24,000 inches in real life. However, it also has another meaning. It gives us a sense of the scale that a map is supposed to be viewed at. Maps with a large scale (i.e. zoomed in, for example a scale of 1:100) show more detail and are more accurate while maps with a small scale (zoomed out, for example 1:1 million) show a large area but are not as accurate. For example, if you were to look at a 1:100 scale map of the Oregon coast you may get a very intricately drawn coastline showing different small inlets as well as areas where the land juts in the sea. If you were looking at a map of the entire United States, but then zoom into the Oregon coast a lot of the detail has been replaced by a couple of straight lines.

With this in mind, ask yourself: what is the scale of a GIS map? Many will answer that the scale varies, or is infinite since you can actually zoom to a scale of 1:1 where your map is drawn in the same size as the real world. But, is that the intended scale it was to be used at? The scale of GIS data is typically determined by how data was collected and the scale the publisher had in mind when the data was produced. You can find this scale by reading the metadata associated with a dataset – assuming that the producer of the data went through the trouble to actually compile and write the metadata.

2. Accuracy and Precision

Accuracy is a measure of how close the location on a map is to that same location in the real world. Imagine a map showing the location of fire hydrants in your town. You decide to use the coordinates displayed on this map, along with a highly accurate GPS unit to see where in the real world those coordinates are located. If you used a highly accurate map you may be mere inches away from the actual fire hydrant while a map with a lower accuracy may put you somewhere within 10-20 feet of the hydrant.

Precision indicates how finely coordinates are measured. For example a coordinate of 116 degrees west and 42 degrees north is less precise than 116.32 West and 42.05 North.

Note that precision and accuracy is not the same thing. To get back to the fire hydrant example, you may be given a very precise set of coordinates that very precisely indicates a location 30 feet away from the fire hydrant!