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### Title

Mapping Political Economies over Time, GIS Exercise 4: Comparing Urban Population Densities in 19th Century China and France

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# Mapping Political Economies over Time

A Primer of Regional Systems Theory and Methods for the Study of Historical Economies, Societies and Polities, and their Integration into the Modern World System

## Exercise 4: Comparing Urban Population Densities in 19th Century China and France

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# Exercise 4:

## Urban Population Densities in 19th Century China and France

### Learning Objectives

1. Compare late 19th Century Urban Population Densities between Agrarian China and France.
2. Create a map layout using consistent scales and symbologies to compare two study areas.

### Files used in this exercise

Datasets referenced in this exercise may be downloaded from the Harvard Dataverse repository at <https://dataverse.harvard.edu/dataverse/mpe>. We suggest that instructors provide a shared directory for students to access these files on their local network. The basemap data layers are accessible through ESRI ArcGIS Online.

<u>File Name</u>	<u>Description</u>
1. Macroregions	Physiographic Macroregions of China
2. rivers	Major Rivers
3. Coast1820	Coastline of China ca. 1820
4. Ch100k	China Urban Population Density Grid
5. 5000City	Towns/Cities of France ca. 1896
6. Franceout	Outline of France
7. MetroAll	Major Cities of France
8. China-Metro	Major Cities of China

### Data sources

This exercise makes use of data developed by G. William Skinner and his research team at the University of California, Davis, including contributions from Lawrence Crissman, Griffith University/ACASIAN, now archived at the Harvard University Center for Geographic Analysis.

Mark Henderson and Merrick Lex Berman, ed.s (2016). Skinner Regional Systems Analysis Dataverse. Cambridge: Harvard University. <https://dataverse.harvard.edu/dataverse/hrs>.

## Getting Started: Start ArcMap 10 and Save an ArcMap Project

This exercise shows examples from ArcMap version 10.5. If you're using a different version, or different GIS software, what you see on your screen may vary. We assume that you're familiar with the basic layout of your GIS software and are ready to try some new techniques.

To begin, start ArcMap and create a new ArcMap project. From the Menu Bar click on File / Save As, and name your ArcMap document **ChinaFrance-Lab4**.

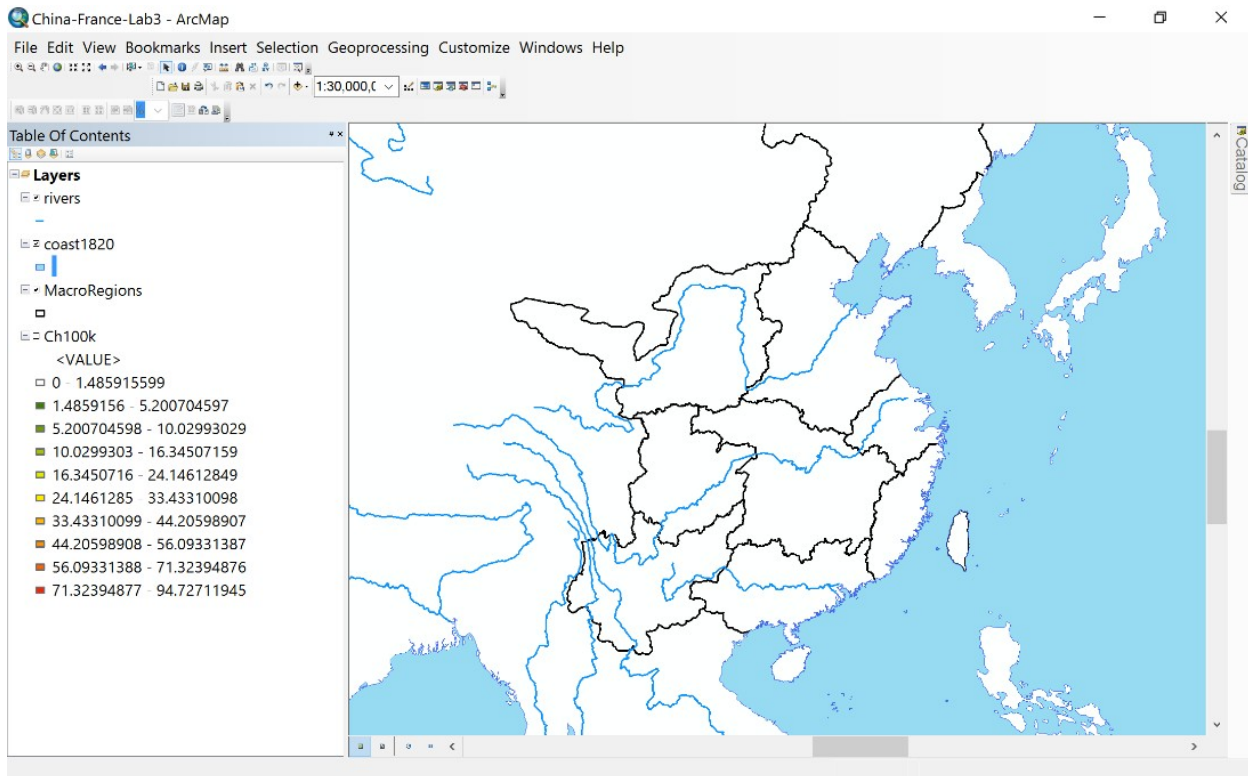
Consult with your instructor to determine the best location to save your .mxd document file. Remember, the .mxd file is only an array of pointers to the actual GIS data files, which must also be present where you save your work for the file to correctly open again later.

# I. Displaying 19<sup>th</sup> Century Urban Population Density in China

Attempts to compare historical aspects of economic development between China and the West are difficult due to the lack of comparable standardized datasets on key variables, such as population and urbanization. In this exercise, we will compare late 19<sup>th</sup> century urban population densities between Agrarian China and France based on the best available historical GIS data.

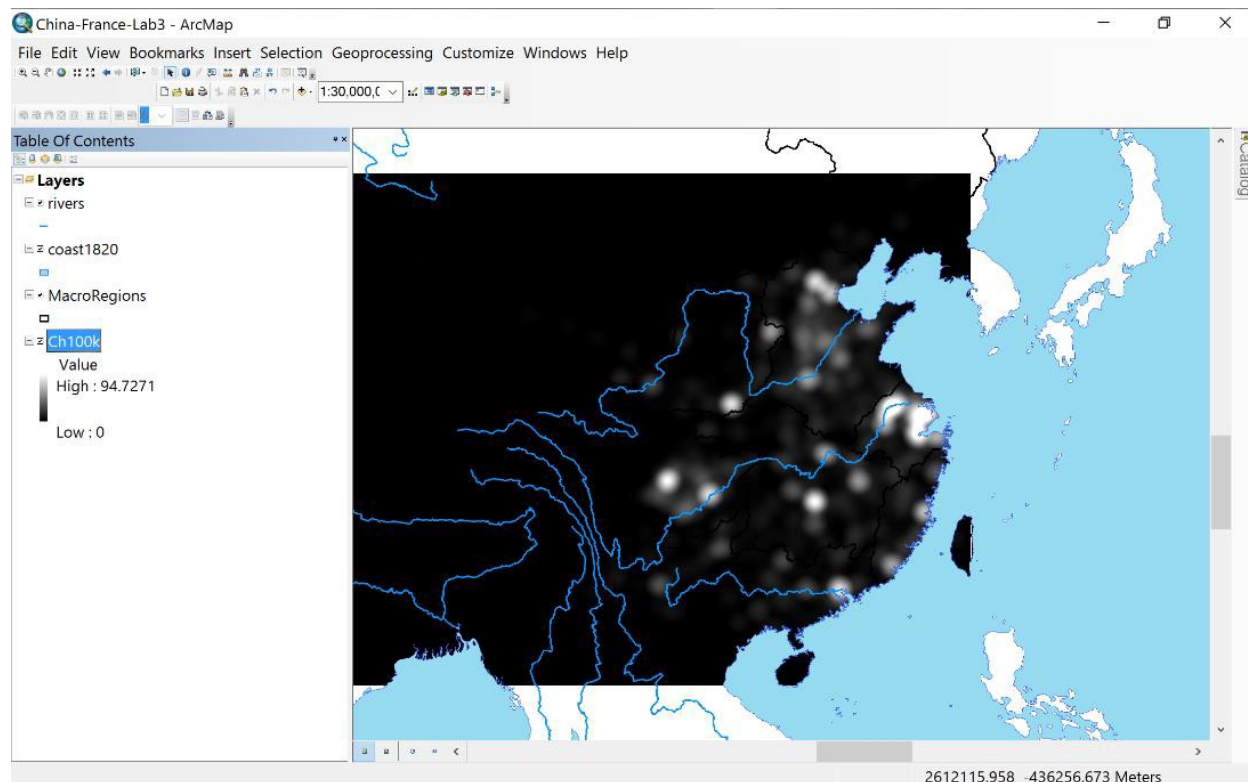
## Step 1. Add the Coastline of China, the Major Rivers, and the Macroregions

Add the shapefiles coast1820, rivers, and physiographic macroregions of China. Your map should look like this:



## Step 2. Open the Kernel Density Grid of the Urban Populations (circa 1893)

Open the Ch100k grid you created in the previous lab on China. This file may be in a Geodatabase.gdb folder. It will likely look like this un-symbolized grid below, with values ranging from 0 to 94.7.

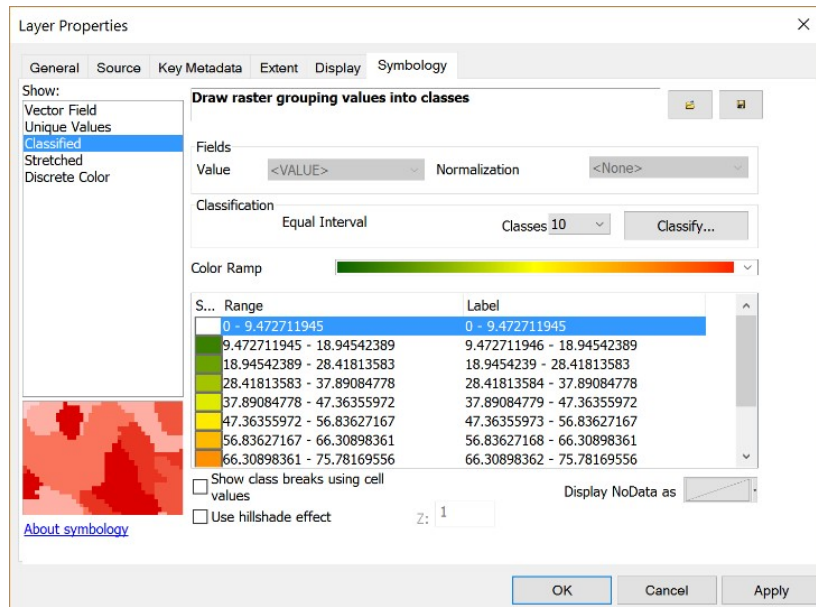


## Step 3. Symbolize the 1893 Urban Population Grid into 10 Zones

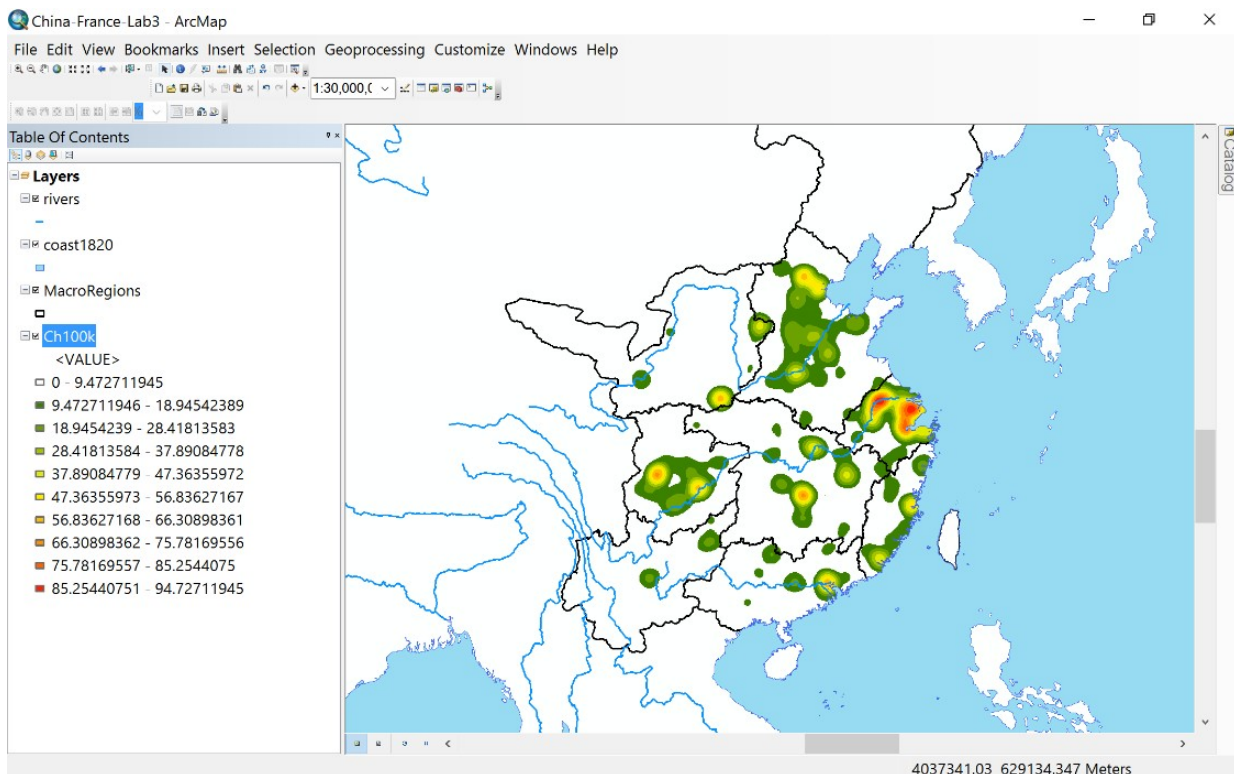
In the previous exercise, we classified this grid into 9 core-periphery zones, but this time let's symbolize to show 10 zones so it will be easier to conceptualize the levels and compare with France in later steps.

Right-click on the Ch100k grid and open the Properties window, then click on the Symbology tab. Choose Classified, select 10 Classes, and under Classify choose Equal Interval as the classification method. Then choose a logical color ramp to show the peripheral to core density values. Set the lowest periphery zone to 'No Color' to make the map clearer.

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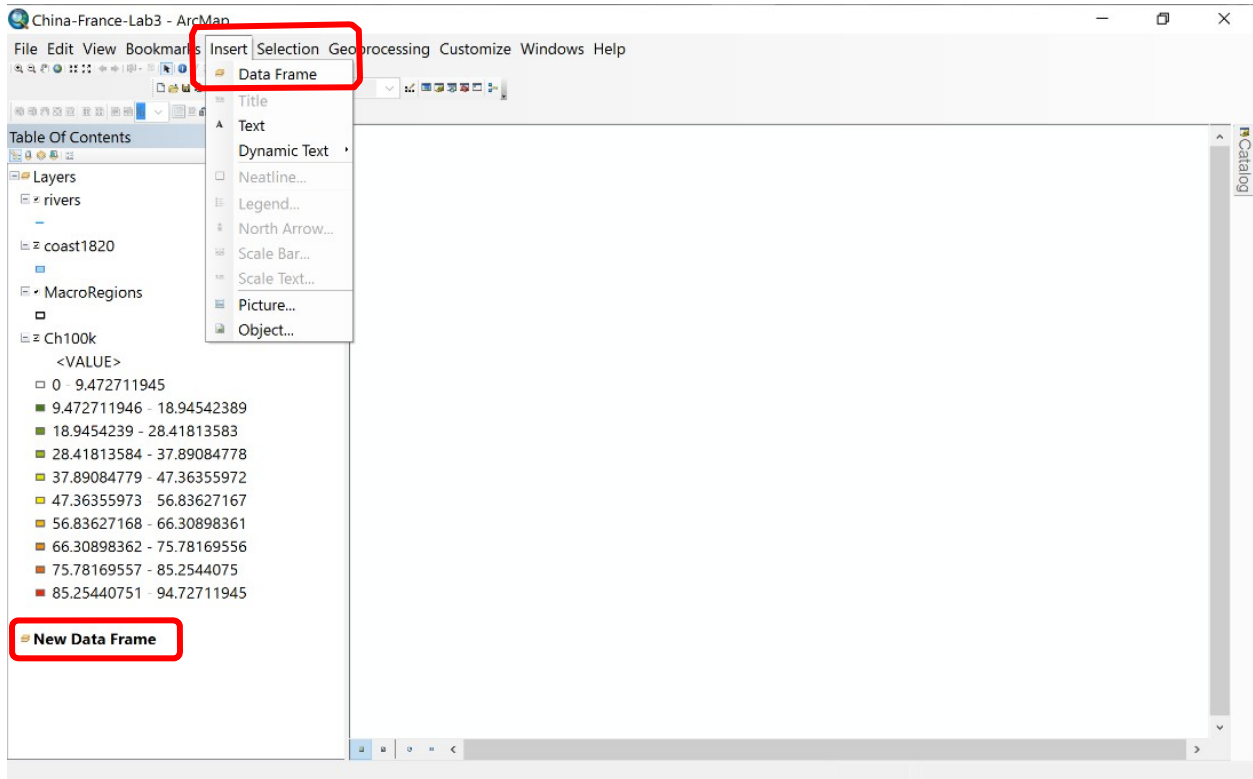
Now your map should look like this. For now we will not adjust the density ranges; let's wait until we see what sort of comparable urban population densities there are for France according to the same Equal Interval classification in 10 ranges.



## II. Replicating the Urban Population Density Analysis for 19<sup>th</sup> Century France

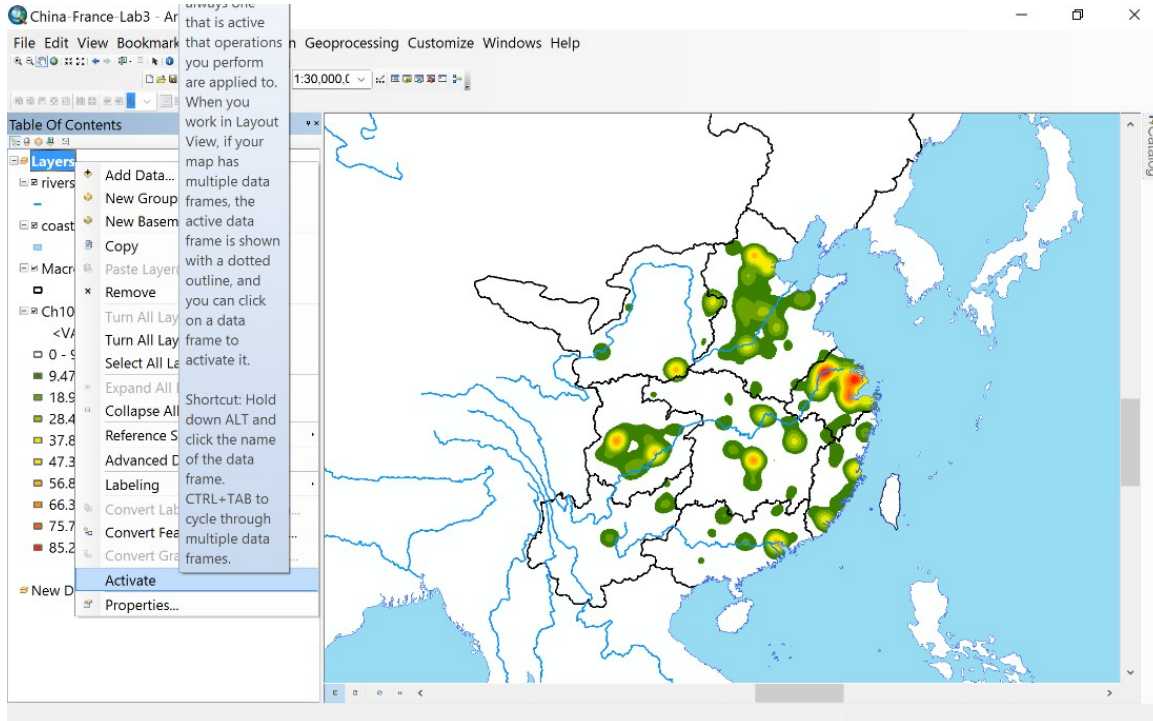
### Step 4. Insert a New Data Frame for France

Click on Insert, then choose Data Frame, a New Data Frame should appear below your current China 'Layers' Frame.

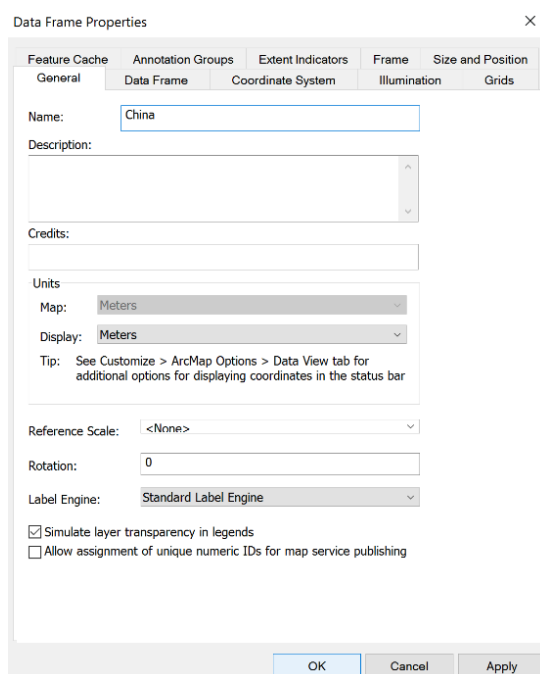


## Step 5. Activate Different Data Frames and Give Them Names

Your new Data Frame created in Step 5 should now be active (but blank), Right-Click on your existing China Data Frame (it may be simply named “Layers” unless you named it already), and choose “Activate”. Now your China Data Frame should appear again as shown below:

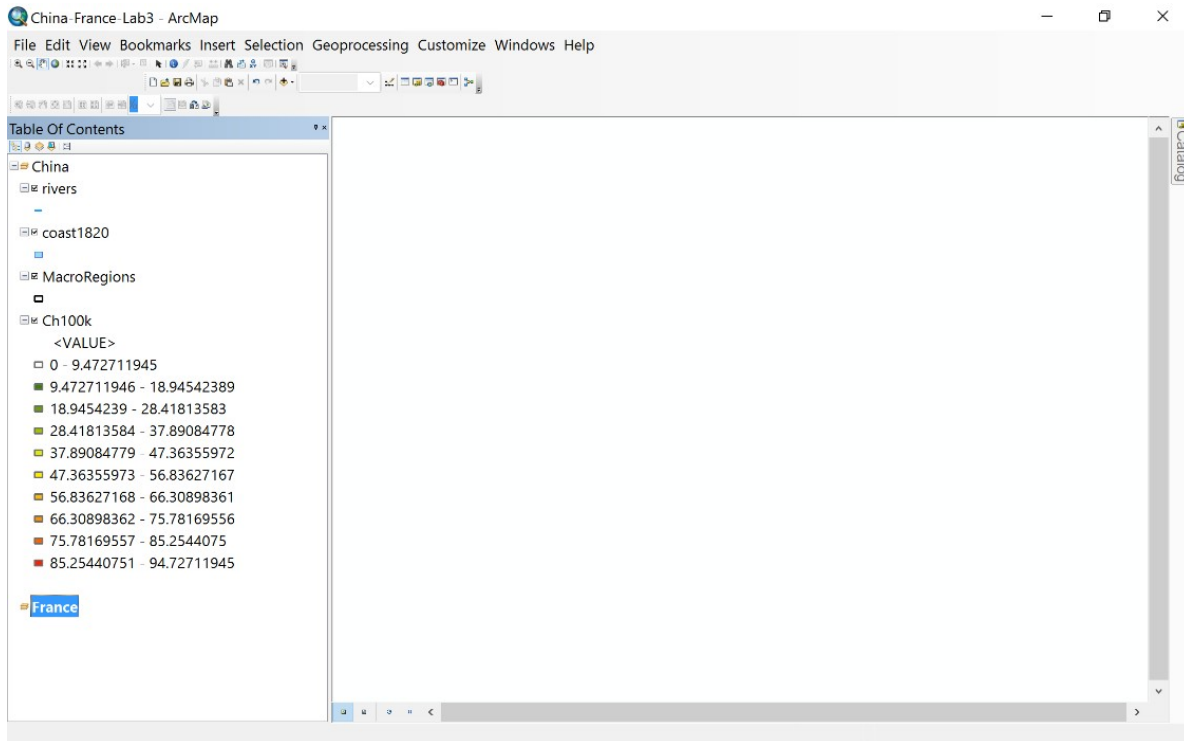


To name your China data frame, Right-Click on ‘Layers’ and go to Data Frame Properties; under the General Tab, you can then enter in a name. Or click once on ‘Layers,’ pause, then click again; you should see a cursor that you can use to type a new name for the data frame. Type **China**.



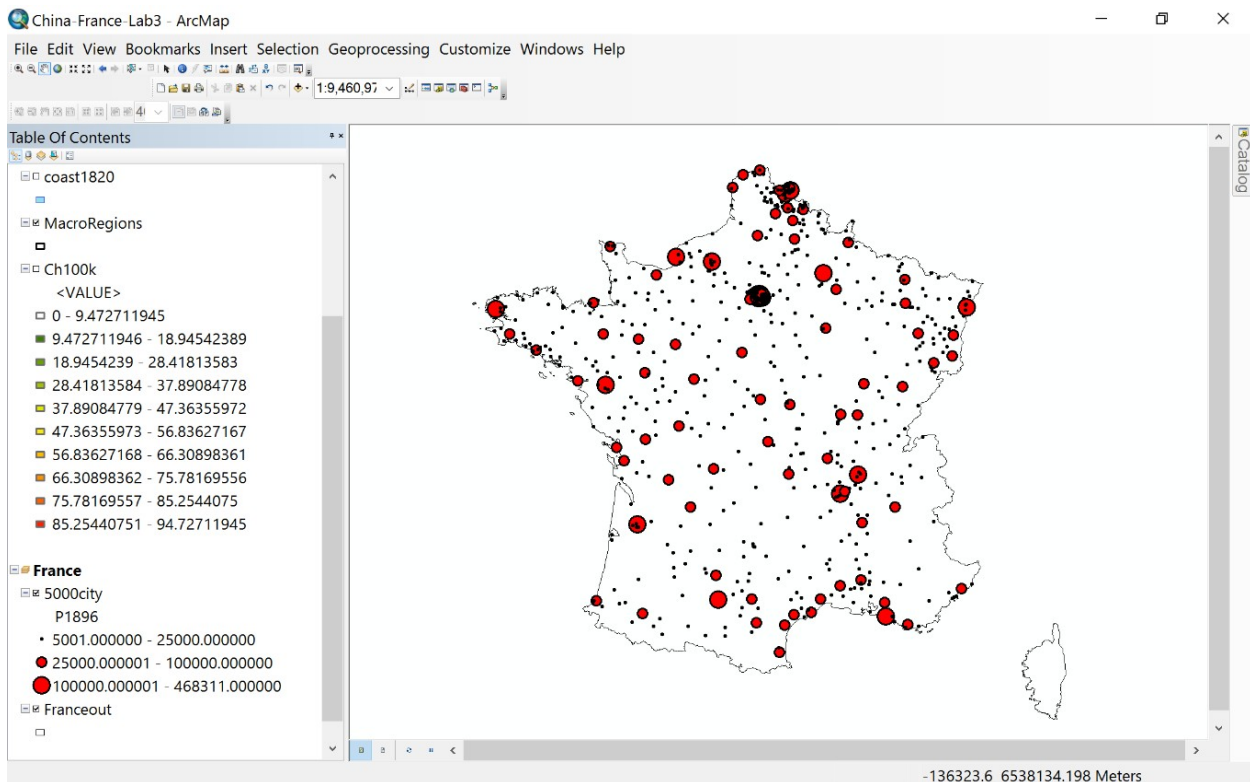


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 Repeat this process for the other (new) data frame to name it **France**.



## Step 6. Open the Towns and Cities of France in 1896

From your active France Data Frame, open 5000City (places with 5000 or more persons in 1896), and Franceout (the Outline of France) for reference. Symbolize the towns and cities, such as shown below in 3 classes:



## Step 7. Make a Kernel Density Map of the Urban Population of France

Open Arc Toolbox, then choose Spatial Analysis Tools / Density / Kernel Density. Double-click on the Kernel Density tool. When the box opens, choose 5000city as the Input points. Under Population Field, choose P1896. For Output Raster, click on the small folder box to the right, and choose the icon to make a New File Geodatabase. The Output raster must be saved in a Geodatabase.gdb folder or it may not work. Also, the name of the Output raster cannot be more than 8 spaces, choose Fr100k for your output raster file name, then click Save.

Next, backspace over the Output cell size and enter **1000** (for 1000 m or 1 km).

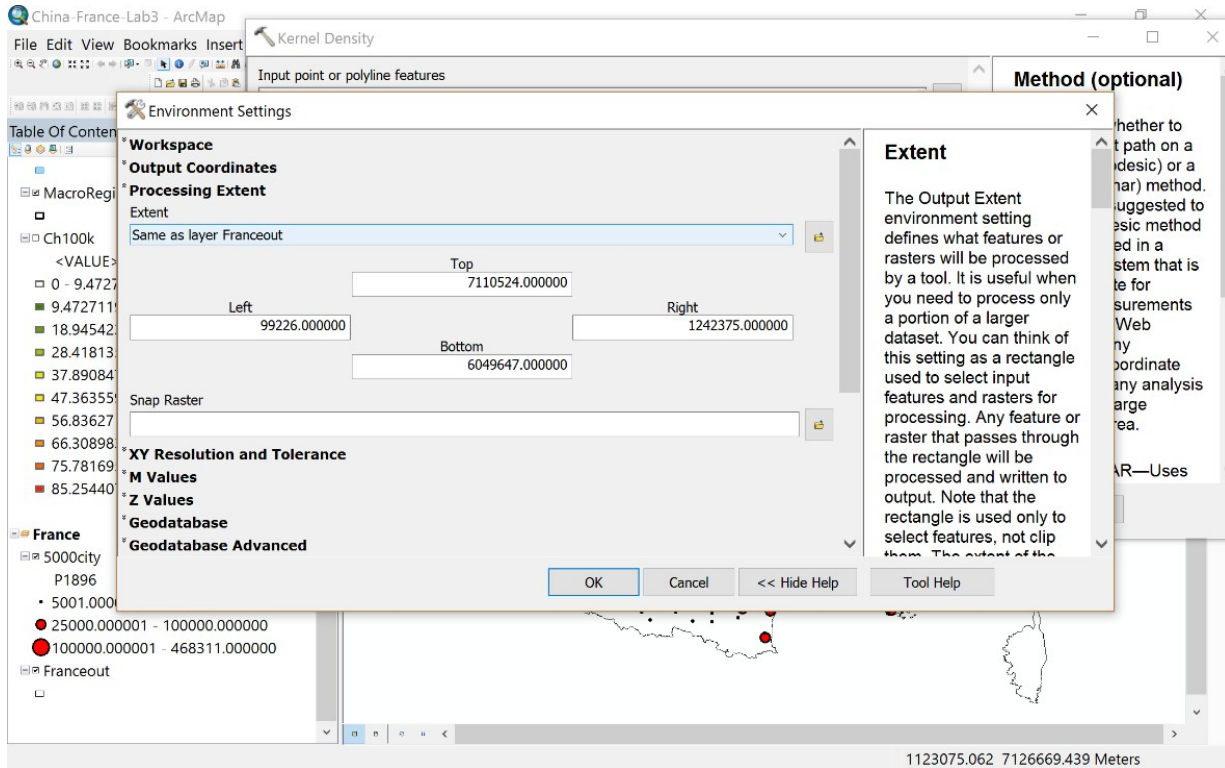
Enter **100000** (100,000 m or 100 km) for the Search radius.

Choose Square Kilometers for the Area units, and Densities for the Output values, and Geodesic for the Method, but **do not** click OK yet.

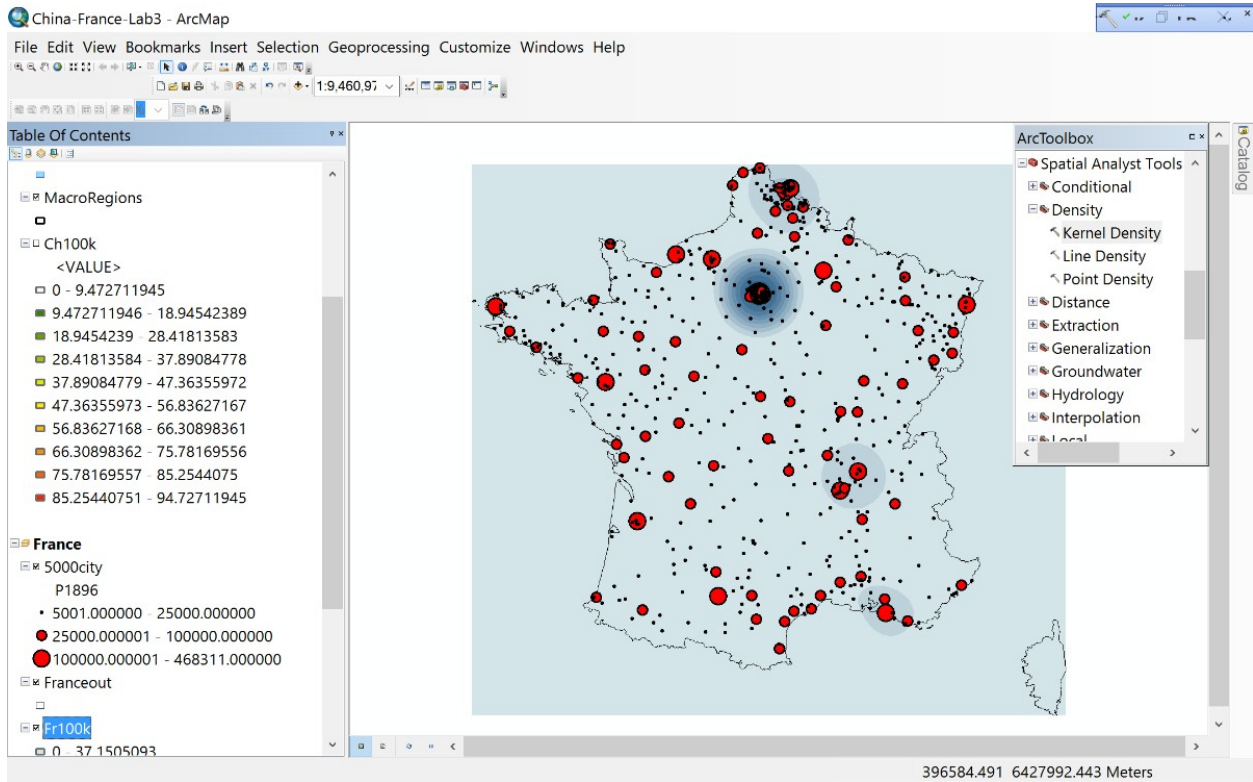
Geoprocessing tool that calculates density from point or polyline features using a kernel function. 1137538.121 6684989.873 Meters

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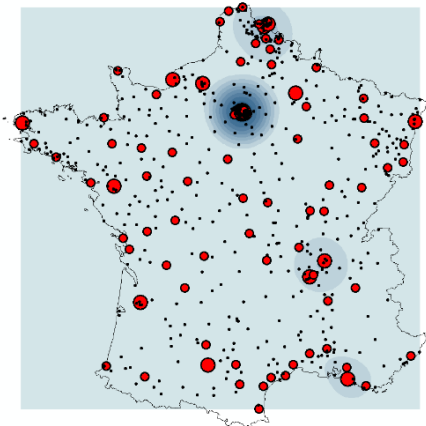
Click on the Environments Tab at the bottom of the Kernel Density window. Under Extent, select 'Same as layer Franceout' then click OK. Then click OK again back in the Kernel Density window.



Your resulting Grid should look like this:



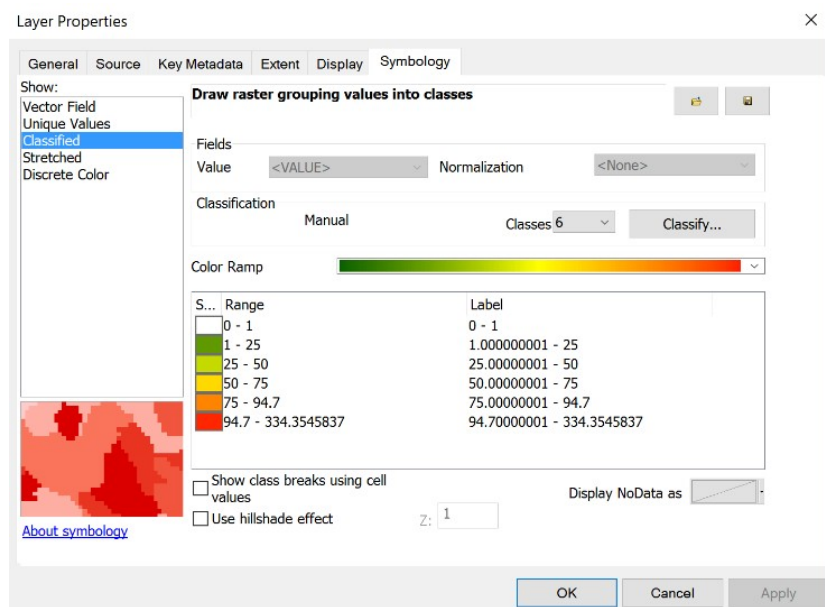
*Note: if you did not select a suitable Processing Extent, the Kernel Density Grid would default to the extent of the Input points, but as you can see in this map below, such a default extent would not cover the total territory of mainland France:*



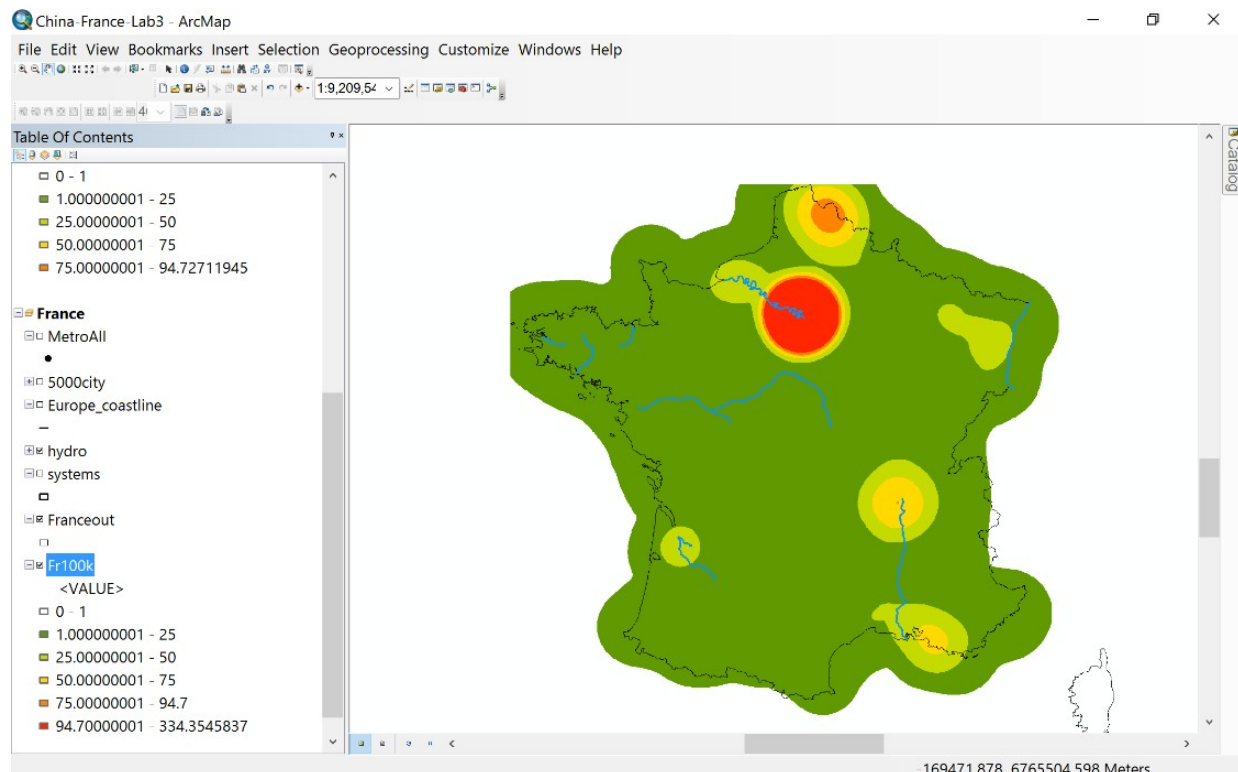
*Tip: You may close the Toolbox window because we will not use it again for now.*

## Step 8. Symbolize the Kernel Density Map of France

Right-Click on Fr100k and choose Layer Properties. Select Classified, and then choose 6 classes. Click on the Classify option, and then manually set your break levels to 1, 25, 50, 75, 94.7 (the highest value for China), and then 334.3 as the highest value for France will be automatically listed as your ending break level. Click on the color box for the lowest range of 0 – 1 and choose ‘no color’ so your map will be clearer.



Your resulting map should look like this:



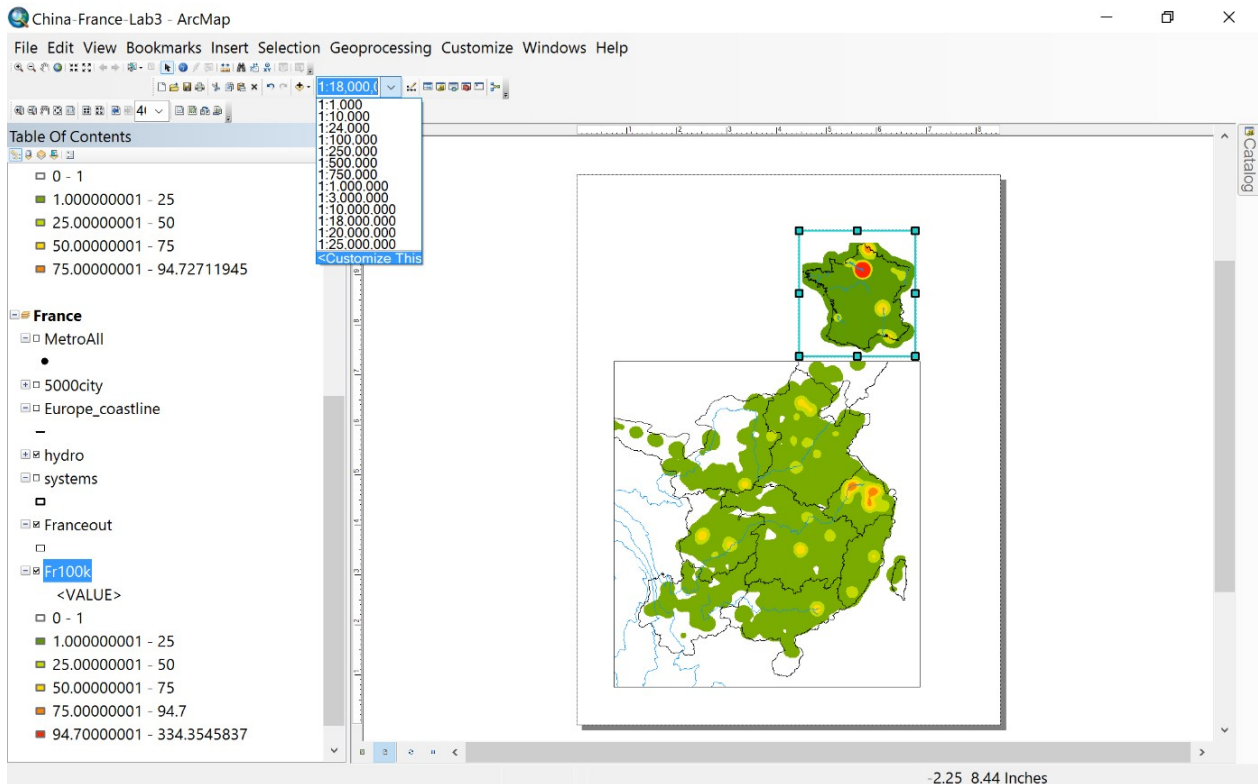
### III. Presenting a Comparison of China and France

#### Step 9. Make a Map Layout for China and France

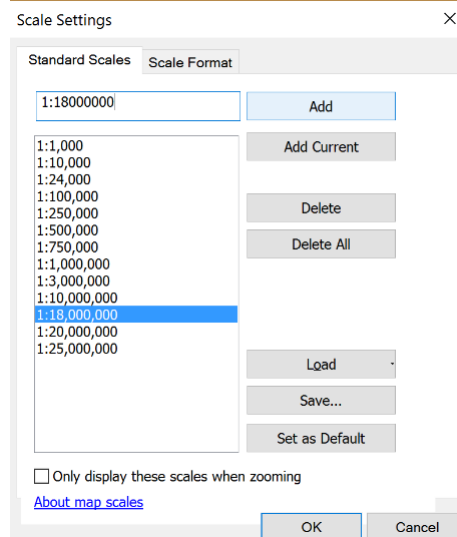
Under View, choose Layout View, then manually move your map boxes to fit as shown below. You will also have to choose the hand-pan tool and manually move your maps into position as shown below.

*Tip: Turn off the China Coast1820 polygon file until you finalize your map if it appears to take too long to draw.*

When each map box is highlighted, choose 1:18 Million as the scale: you may need to click on 'Customize This' and then manually enter **1:18,000,000** (see further directions below).

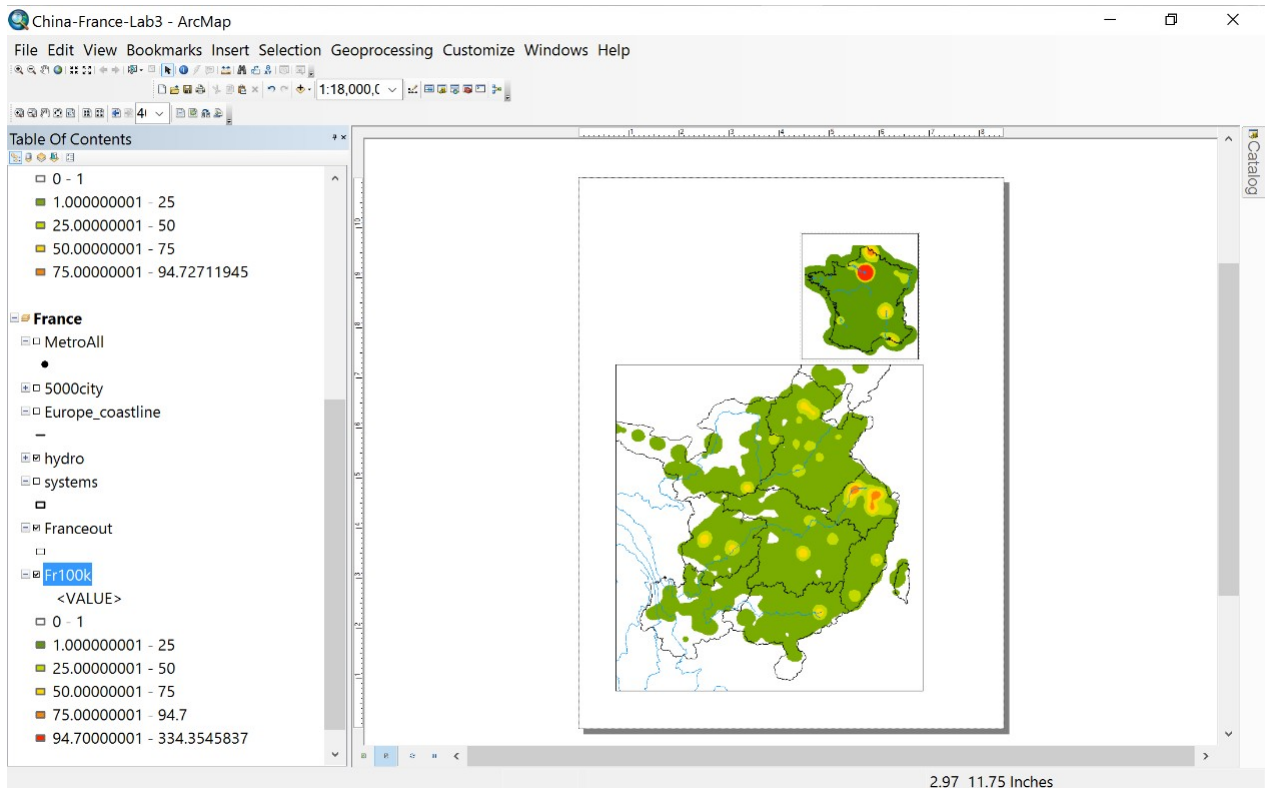


After you enter 1:18,000,000, click 'Add' and then you may select it as your scale for both maps.



Now, based on the urban population densities for France, change the Symbology of your China map based on the method just followed in Step 9 but choose 5 levels with breaks at 1, 25, 50, and 75; leave the maximum value at 94.7.

Your final map draft should look like this:



## Step 10. Finalize your Map Layout for China and France

Add a Title, Neatline, Legend, Scale and Place Names to your final Map Layout based on the steps you learned in making a population density map of France in Exercise 1. You may want to adjust the placement of your maps on the page, and the position of the map extent within each frame.

