

Georeferencing with ESRI ArcMap Instructions

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This notebook contains instructions for how to georeference an image. These instructions are intended for those who have access to ESRI ArcMap.

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Introduction

This notebook is intended to demonstrate how to transform geospatial data from an image to a digital file that can be used in maps. This demo will use ESRI ArcMap.

Learning Goals:

- Georeference an image using reference data

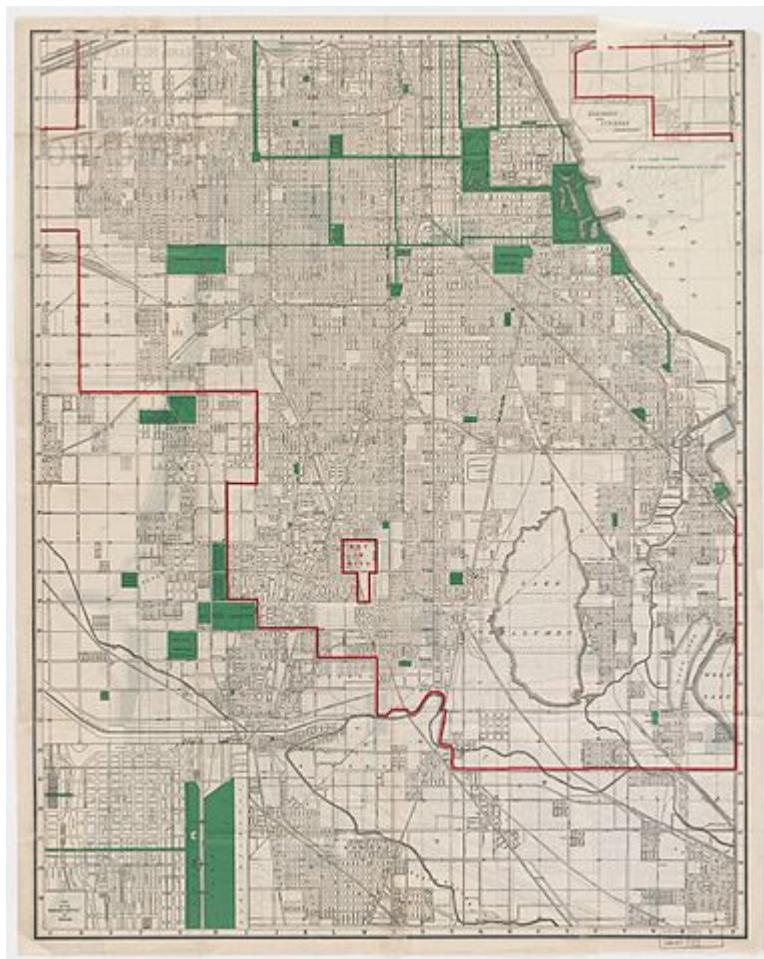
Gather Initial Data for Georeferencing

We will need to start with two datasets:

1. The map image that we wish to collect data from
2. A reference data set to give spatial information to the map

The Map

The map image we will work with is Rand McNally & Co.'s new street number guide map of Chicago (1916) from the Harvard Map Collection. You can download the map from Wikipedia [here](#) (https://commons.wikimedia.org/wiki/File:1916_Chicago_map_-_South.jpg) (make sure to download the full version) or use the map that has been uploaded to the root folder of this tutorial (1916_Chicago_map_-_South.jpg).



The reference data

We also will need data that has geospatial information included to use as a reference when we add geospatial information to the map. This dataset needs to include features that we can find the location of in both the data set and the map. It is slightly difficult because the map is from 1916 and the reference data is current, however many of the modern major roads and railroads are in the same place as they were in 1916 and can be used to reference the map.

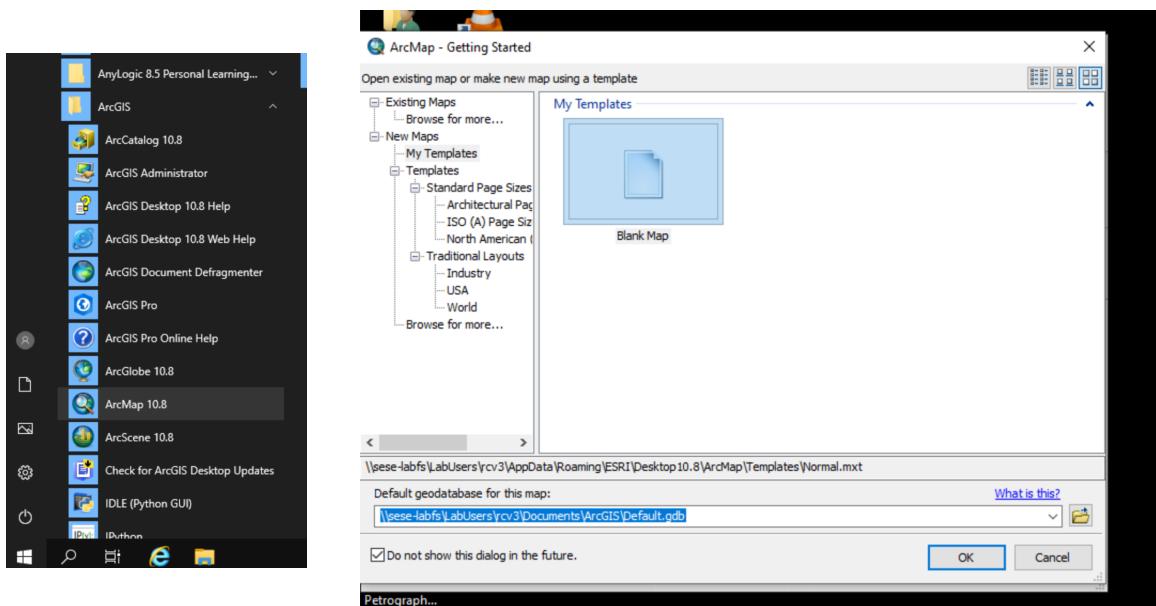
The City of Chicago has a nice data portal [here \(<https://data.cityofchicago.org/browse?tags=shapefiles>\)](https://data.cityofchicago.org/browse?tags=shapefiles) (use the `gis` tag and the `shapefiles` tag). From this portal we can download the [Major Streets dataset \(<https://data.cityofchicago.org/Transportation/Major-Streets/ueqs-5wr6>\)](https://data.cityofchicago.org/Transportation/Major-Streets/ueqs-5wr6) by going to this link and selecting Download . For convenience, this dataset is also available in the `Chicago_Major_Streets` folder.

Prepare to work with the data

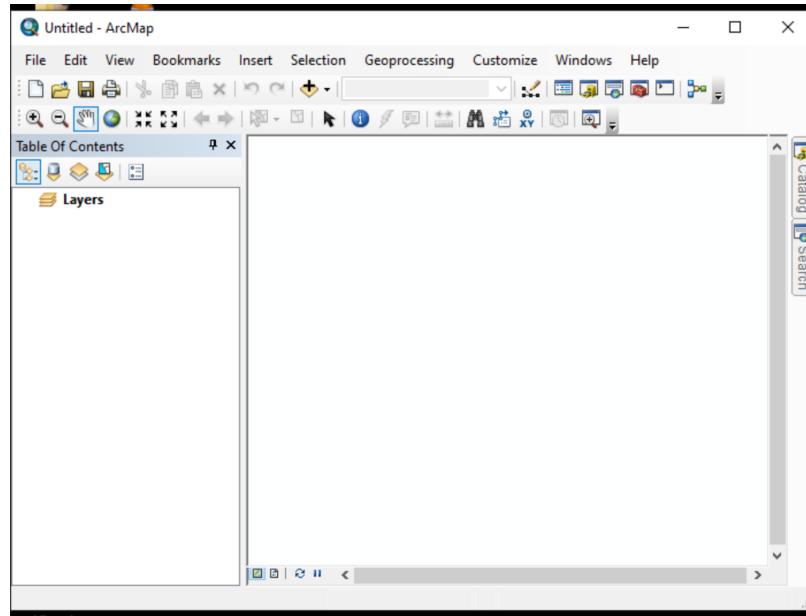
Now that you have the data we will start working in ArcMap. If you are accessing ArcMap using a remote desktop, you will first need to transfer your files to the remote desktop.

Open ArcMap

To open ArcMap, click on the Start Menu , click on the ArcGIS folder, and then select ArcMap 10.8 . A new ArcMap Getting Started window will open. Select Blank Map .

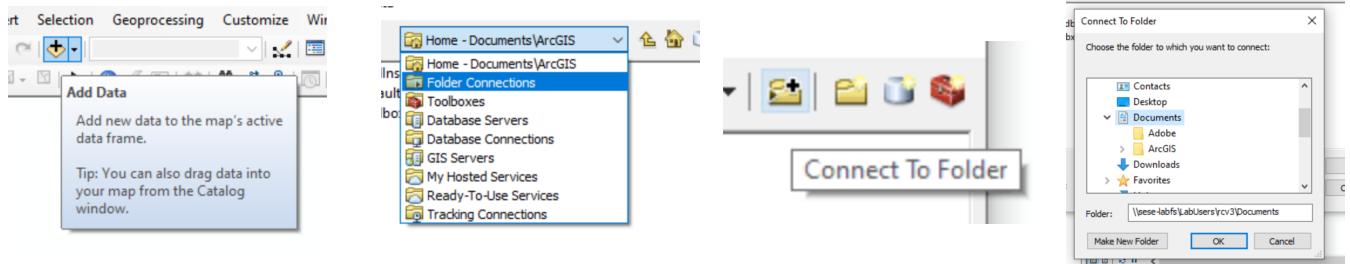


A new ArcMap project window will open:

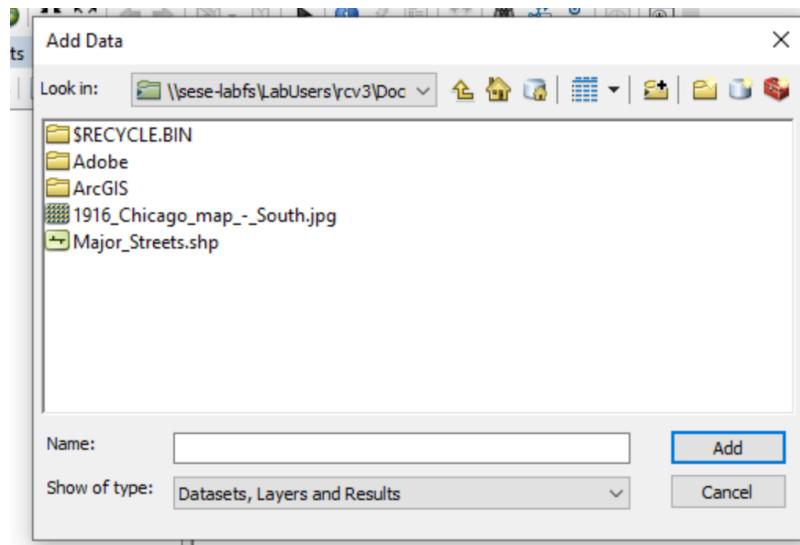


Load the Major Streets Dataset

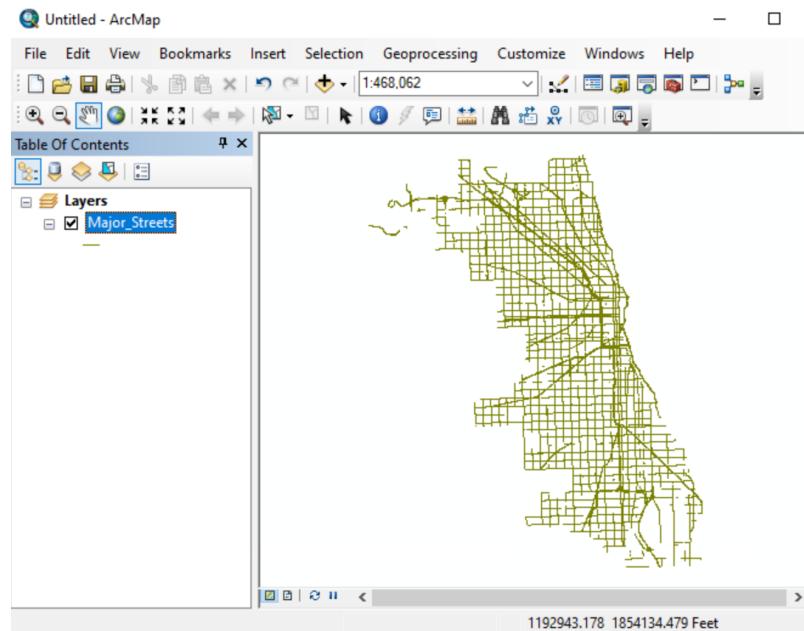
First you need to add data. Select the Add Data button. This will open the Add Data window. In the Add Data window some folder options will be displayed, however if the folder you have stored your data in is not one of the drop down options, select the Connect to Folder button and then navigate to folder holding your data and select OK .



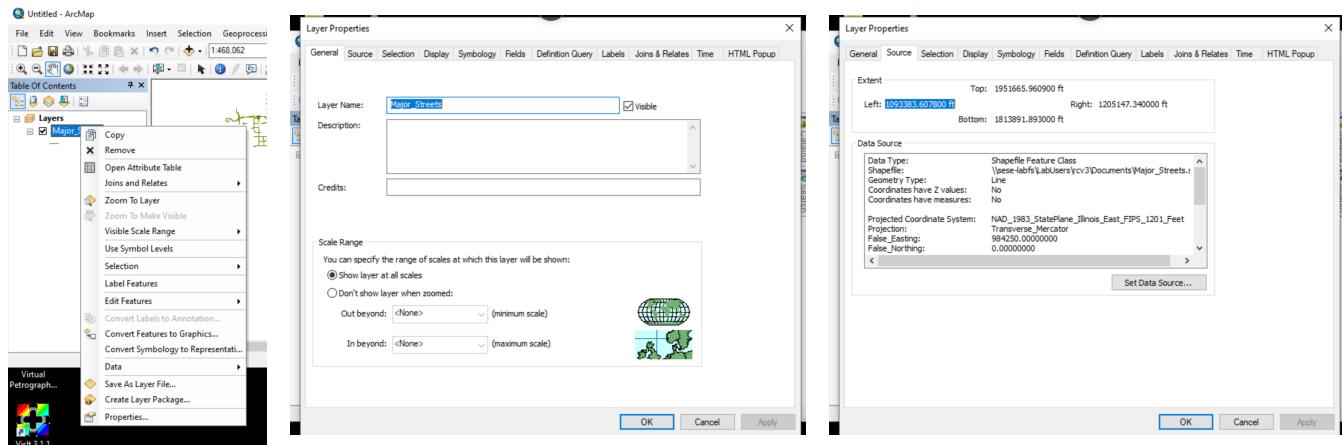
After connecting to the folder with your data you will see the data files you have uploaded. Select ONLY Major_Streets.shp and click Add .



You will now see `Major_Streets` loaded into your project. The initial display color is random. Now would be a good time to save your ArcMap file by selecting `File -> Save`.

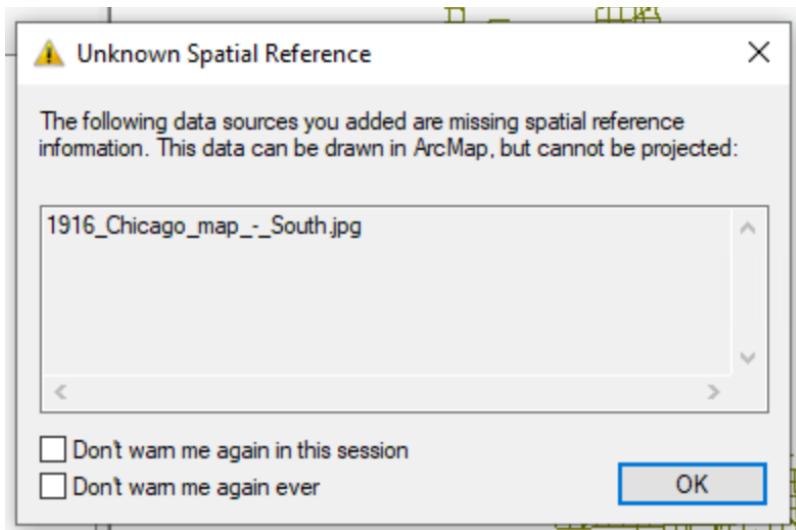


Now you can check the properties of Major_Streets . Right Click on Major_Streets in the Table of Contents pane and select Properties... at the bottom of the pop up menu. This will open the Layer Properties window to the General tab. Select the Source tab and look at the source information. Note that there is information under Projected Coordinate System . This indicates that this data file has been projected, which means that the coordinates indicate locations on a flat surface instead of raw latitude and longitude values. This information will be used to add spatial information to the Chicago map.

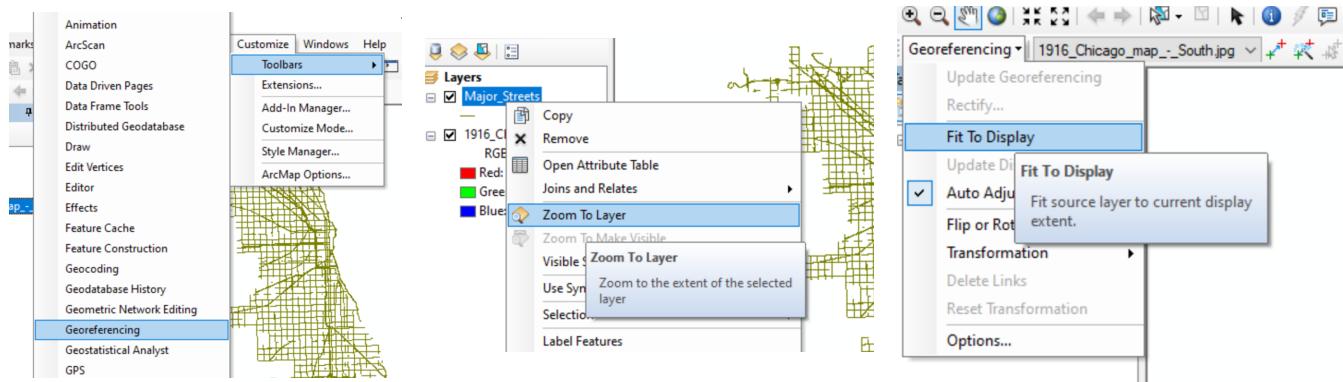


Load the Chicago Map

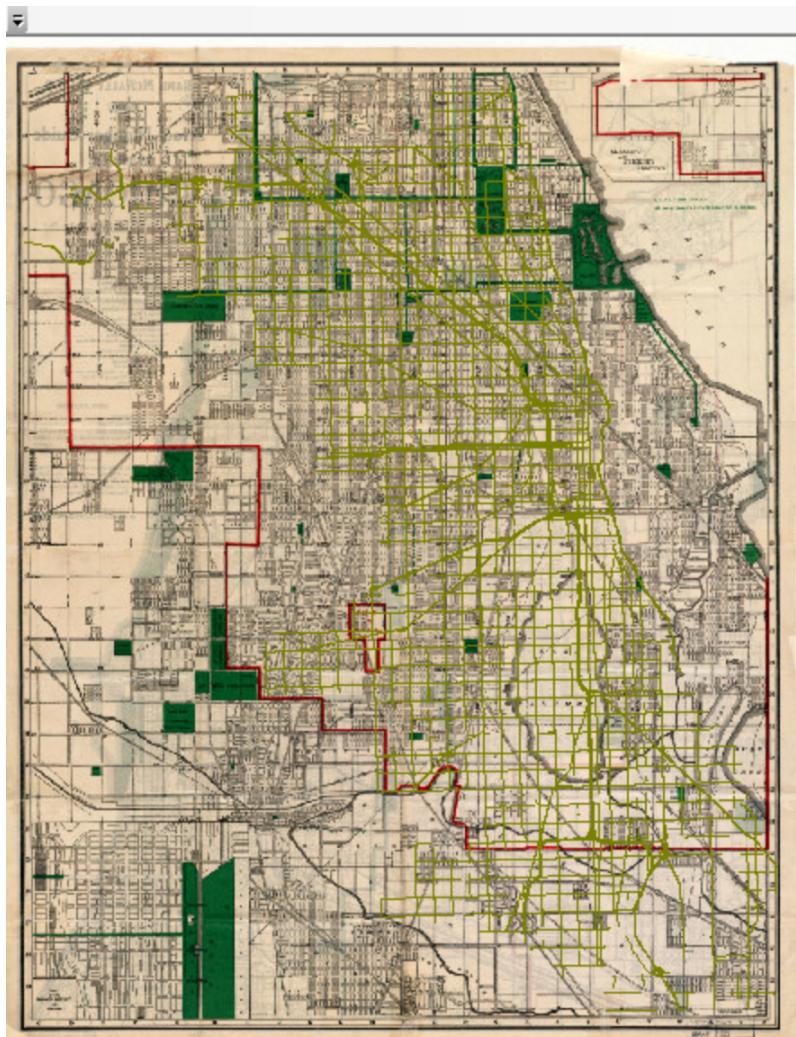
Select the Add Data button again to load the Chicago Map. A dialog box will say that the spatial reference is unknown. Select OK .



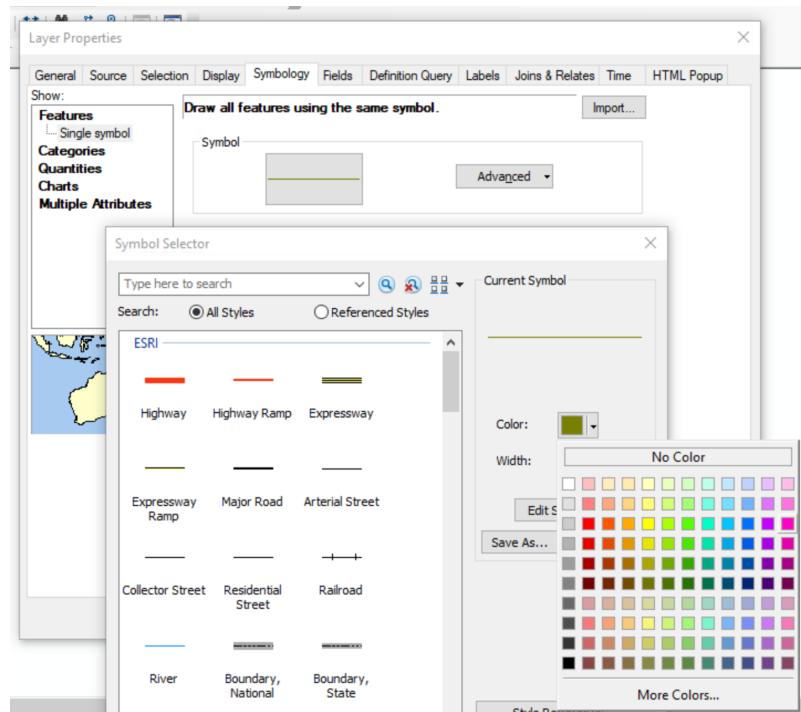
Next we will need to display the Georeferencing toolbar. In the top menu bar select Customize → Toolbars → Georeferencing . You can drag the Georeferencing toolbar and dock it on the bottom of the menu bars. Now right click Major_Streets and select Zoom to Layer . Next, on the Georeferencing toolbar select Fit to Display .



Now your Chicago Map should appear under your Major_Streets data.

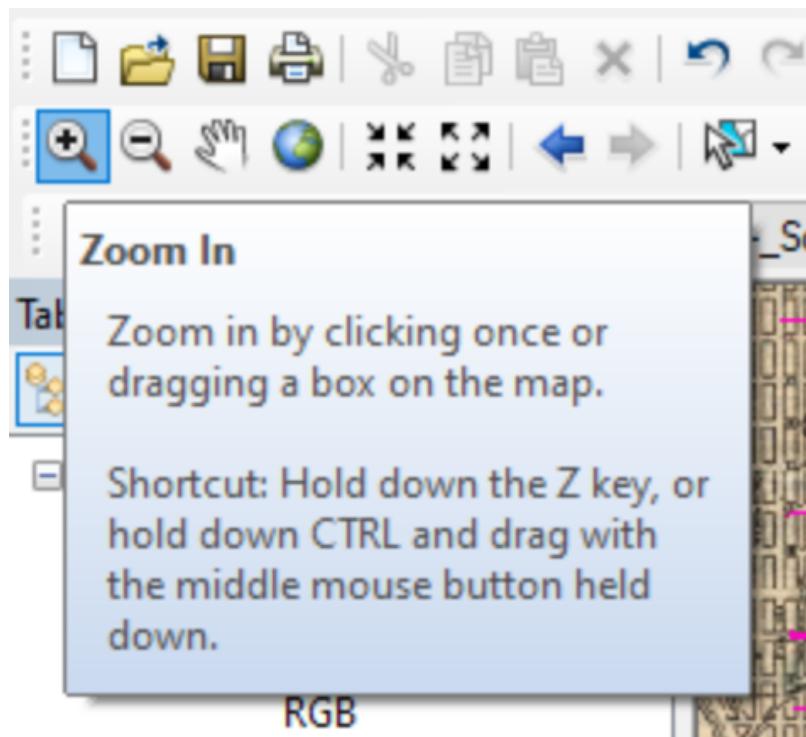


It can be hard to see the `Major_Streets` data if the color does not stand out from the map as in this example. You can change the color used for the `Major_Streets` data by right clicking on `Major_Streets` in the Table of Contents pane and selecting `Properties...` at the bottom of the pop up menu. This will open the Layer Properties window to the General tab. Select the Symbology tab. Click on the `Symbol` line in the `Symbol` box to open the Symbol Selector dialog box. Then you can change the color to a color that is easier to see.



Navigating

In order to georeference you will need to shift the view of the data on the screen. The navigation controls are placed in the second toolbar row by default. Click on the magnifying glass with the plus sign to zoom in, Click on the magnifying glass with the minus sign to zoom out, click on the hand to pan, and click on the globe to return to the full extent (show all the data).



Using the Identify Tool

A key action needed for georeferencing is figuring out what the features that you are trying to match are. For this you can use the `Identify` tool. Click on the `Identify` tool which looks like a blue circle

Preparing to Georeference