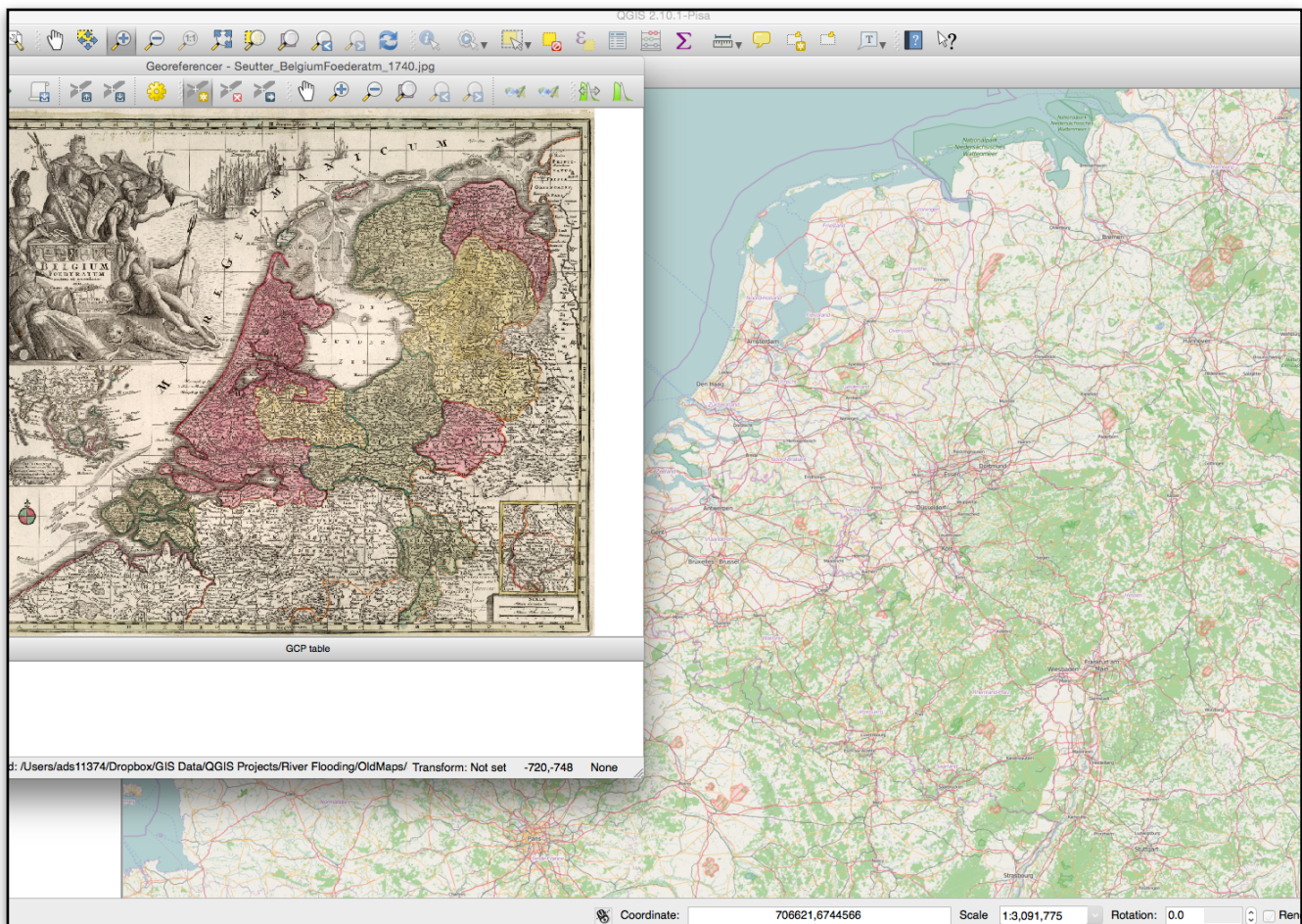


# Georeferencing in QGIS



## Introduction

Georeferencing is one of the most useful tools for historians. Historic cartographic data can be digitized (scanned, downloaded) and assigned coordinate data on a modern map projection using both web and desktop applications. Once the historical map is assigned “control” points that pin the map to a modern base map, the historical information embedded in the original map can be overlaid making comparison between historical maps and current maps more legible. This “raster” (image) layer will be warped and transformed in a process called “rubber sheeting” to fit to the control points you have assigned. Some knowledge of the history and environment of a region is necessary to assign accurate control points.

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## Instructions

1. Your first step is to obtain an appropriate historical image you would like to georeference. There are a number of sources you could obtain these from (see Mapping Resources on course blog). For the purpose of this exercise, choose an image from [www.davidrumsey.com](http://www.davidrumsey.com). The map image can be of a region of your choice provided you are familiar with the local environment (knowing relative location is critical for effective georeferencing, especially with older maps).

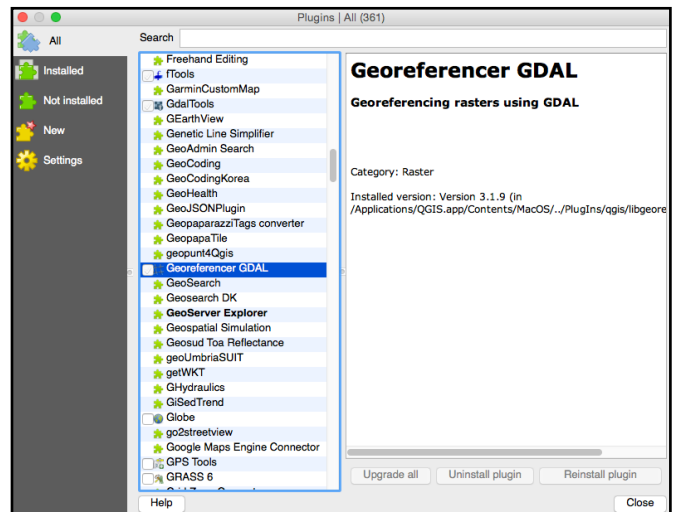
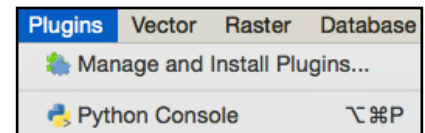
2. Download the highest resolution image possible. The higher the resolution, the more detail you will be able to harness (something particularly useful when georeferencing control points).

3. Do NOT save this image to your desktop or leave it in your downloads folder. Save this image in the google drive folder you installed to your hard drive or another clearly identified directory of your choosing. For instance ...HIS317/ Week4/ It will be useful for you to maintain a clear organization as we produce more and more projects. Stay organized!

4. Open QGIS.

5. You will need to add a base map with a projection in order to assign coordinates to your downloaded map (raster) file. To do this, we will have to activate the “georeferencer” plugin. On the toolbar, click on Plugins - Manage and install plugins

6. In the plugin manager window, find the Georeference GDAL option and click the box. If there is no box, click it so that it is highlighted in blue, then click "install plugin." Then, find the “HCMGIS” option and install it. This will allow you to use openstreetmaps, google and bing maps, as well as several other open source base maps.



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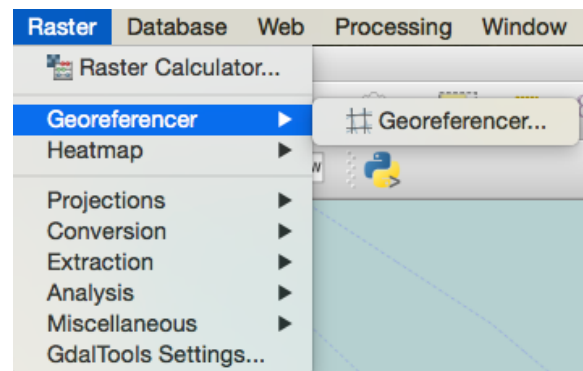
7. Your plugins are now installed. You should be able to see a "Georeferencer" option available now if you click "Raster" on the top toolbar. You should also see a new option on the top toolbar that says "HCMGIS."

8. In more recent versions of QGIS, "georeferencer" comes preinstalled. It is available under "layer" on the top menu. If you do not see either. Shut QGIS down and restart (in fact, after you save a project, this should ALWAYS be your first step to solve an issue if I'm not around).

9. On the toolbar, beneath "HCMGIS" select "Basemap" and "Google Maps." This will bring up the Google Map global base map.

Zoom to the area on the base map that corresponds to the area of your downloaded historical map.

10. Click "raster" (or "layer") and select "georeferencer." This should bring up a new window. From this window, you should be able to import your downloaded map image.



11. In the georeferencer window, click on the checkered square. In QGIS, this symbol refers to "raster" (or image) files. These can be imported in the GIS.



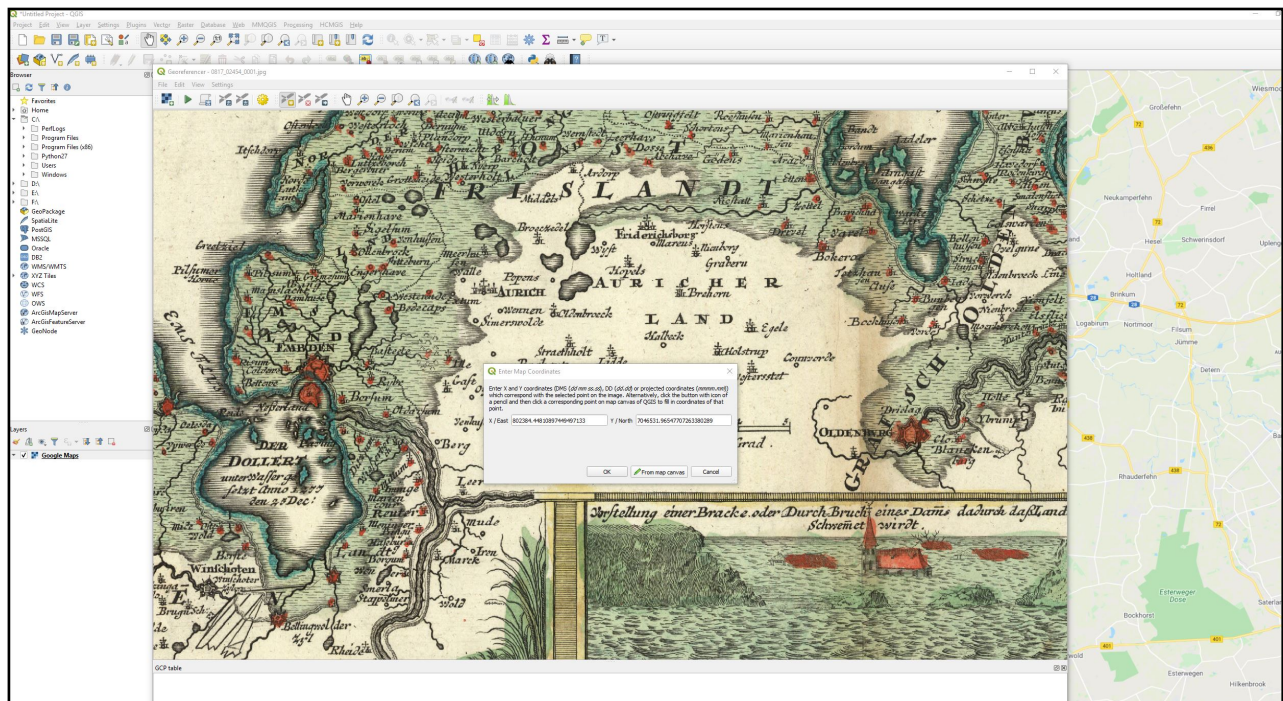
12. In the new "open raster" window, find the image you downloaded from [davidrumsey.com](http://davidrumsey.com) and double click it.

13. Now, the raster file of your downloaded map should appear in the georeferencer window. You will have to assign "control points" to this image of a map that correspond to the same spot on the base map. To make sure your georeferencing is as accurate as possible, zoom into a known location on your historic map and click the yellow "add point" button. (Point refers to control points). If you hover over any icon, its title will appear. Find the exact same location on both the image and the basemap. Click that spot on the image first.

14. A new window will appear where you can either add map coordinates (see instructions in window) or an option at the lower left to match your selected point with a point "from map canvas." If you don't know the coordinates of your location (which I imagine you don't), select the latter.

15. Your georeferencer window will minimize. Click on the **exact same** location on your base map. When you do, your original georeferencer image will reappear and the "Enter

"Map Coordinates" box will be populated with the modern map coordinates for that place you selected on your historic map. Click Ok. You've now added your first control point.

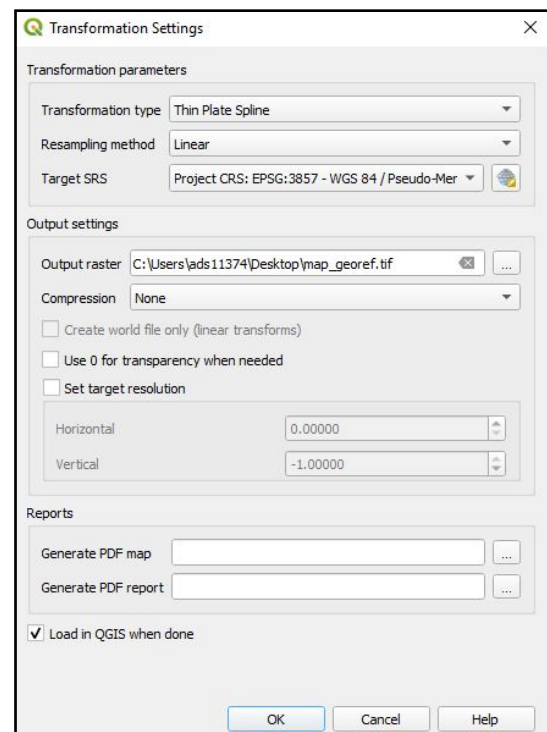


16. Add seven more control points. Use the zoom icons and the pan icon (looks like a hand) to navigate around your historical and modern maps.



17. When you are finished, click the green "play" button in the georeferencer window. It will bring up an information box to "Please set output file name." This means it wants you to tell it where to save your new georeferenced historical map image. Click "ok." Select "thin plate spline" from the dropdown menu beside transformation type, "linear" resampling (if available), and make sure the "target SRS" (or CRS) is EPSG: 3857 "pseudo Mercator." We'll talk more about what this all means later.

18. **THIS IS IMPORTANT** - Under "output raster," click the ellipses (...), **navigate to the folder you're saving this project in on our computer**, and give the new georeferenced map a



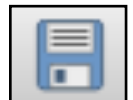
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filename. If you don't save it to a permanent folder on your hard drive, it won't work. It is good practice to add \_georef following the name of your map to differentiate your georeferenced images from others. Make sure "load in project when done" is selected and click ok. The window will minimize.

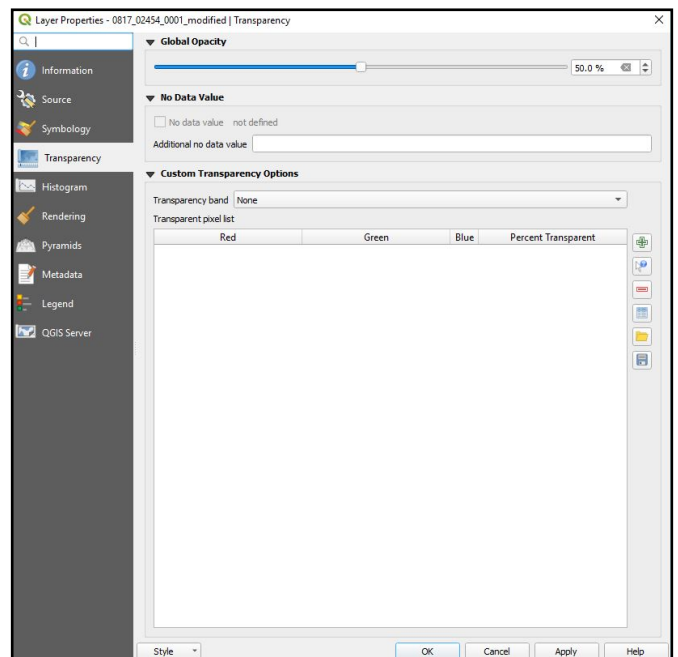


19. Click the green "play" button to georeference your image and load it as a layer on top of your basemap. Do not exit the georeferencer window. If you are unsatisfied with your control points (perhaps some throw off the rubber sheeting more than others, go back to the georeferencer window and either add more control points, or delete others using the world icon that has a red "x" button.

20. When you are finished, make sure to save your control points and save the QGIS map to your project folder for the week. Click the disc icon on the main screen.



21. Finally, in order to compare your georeferenced historical raster image with the base map information, you will need to alter the transparency. Under the "layers panel" on the main screen (lower left) double click the raster image you just made. Select "transparency" from the left hand bar and set "global opacity to 50%". Click ok.



22. **FOR BLOG:** When you are done, look at the differences between the OpenLayers map background and the georeferenced image you just overlaid. Write two paragraphs to answer the following two questions.

1. *How might you use this georeferenced image to uncover new information about the history of the region you just mapped.*
2. *What are some weaknesses to this approach? Are there inaccuracies? Do some places map better than others? Why?*

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## Georeferencing Tips

- To avoid unnecessary warping and to maintain accuracy, zoom in to specific area on both maps and try to place the points in identical areas as precisely as possible
- Try not to georeference political boundaries, large cities or variable environmental features (i.e. county borders/rivers). Instead, choose features that are geographically discrete and have not likely changed. (smaller towns generally function well)
- Place a **control point** in all of the major regions of the historical map