# Georeferencing in QGIS

Overview:
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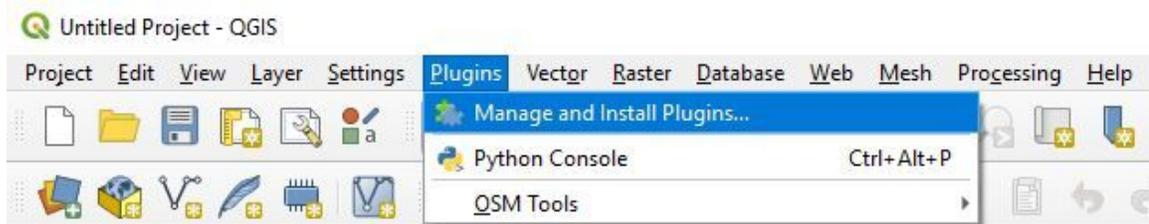4. Georeferencing

## 1. Searching for historical maps

- Search from:
    - Old Maps Online - portal for historical maps from five US and European map libraries, including the David Rumsey Map Collection from Stanford University, the British Library...etc.: https://www.oldmapsonline.org/
    - topoView - current and historical topographic maps from USGS: https://ngmdb.usgs.gov/topoview/viewer/#4/40.01/-100.06
    - ProQuest digital Sanborn fire insurance maps 1867-1970: http://sanborn.umi.com/about.html
    - Library of Congress: https://www.loc.gov/maps/collections/
- Download your high-resolution (300dpi or greater) image, in .tiff or .jpeg formats
- If you have multiple images that comprise a single map (such as commonly seen in Sanborn maps), consider stitching together and color correcting in Adobe Photoshop
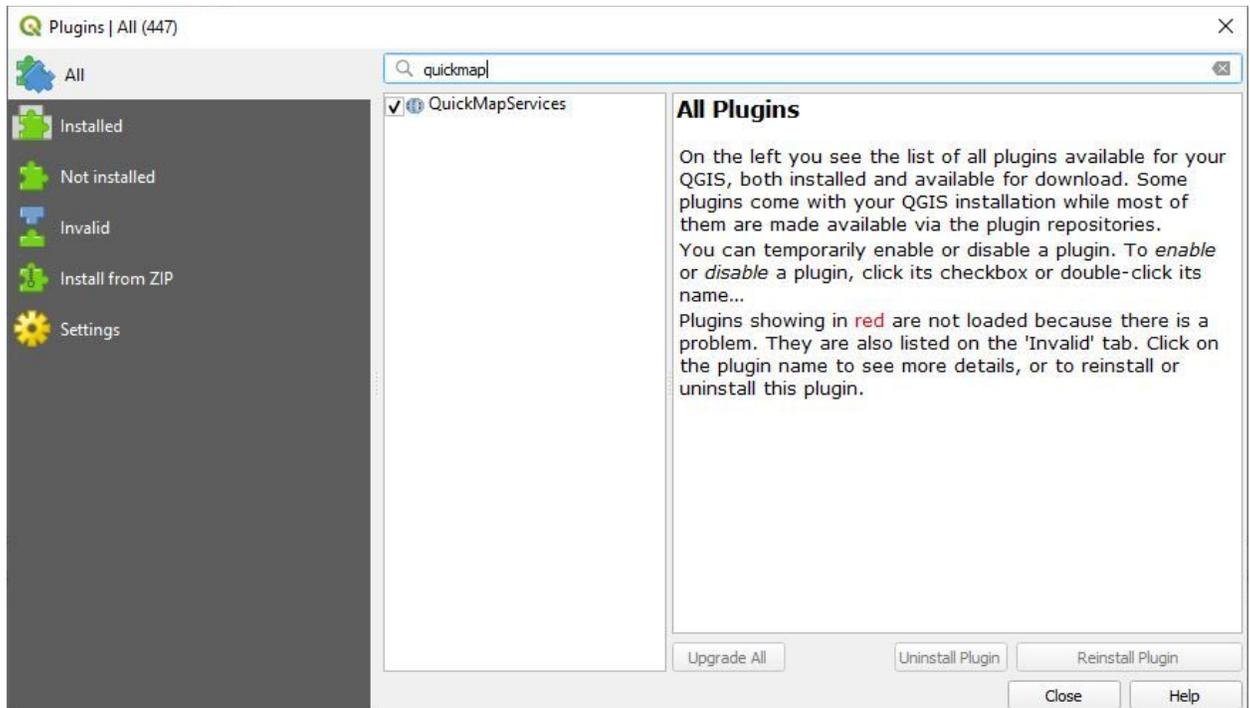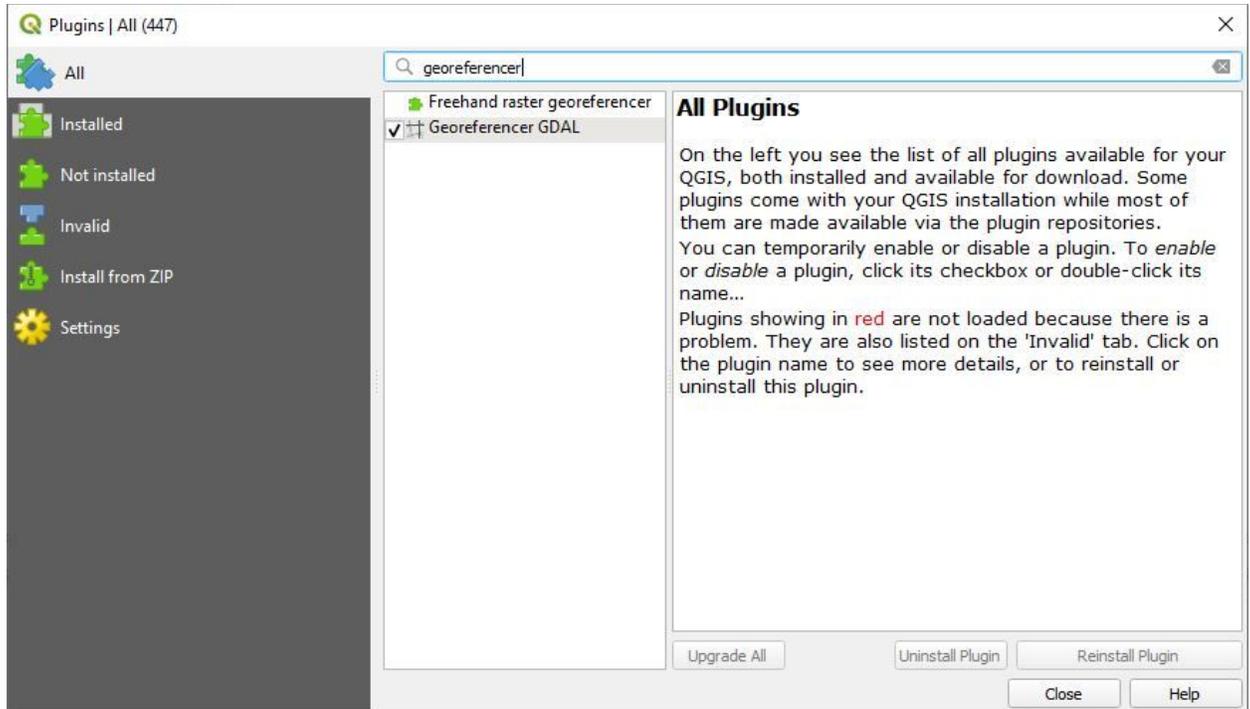
## 2. Installing QGIS

- QGIS is a free and open source GIS software. Download the latest version for your OS here: https://qgis.org/en/site/forusers/download.html. (Current version QGIS 3.10.1 "A Coruña" released 6/12/2019)

## 3. Enabling Plugins

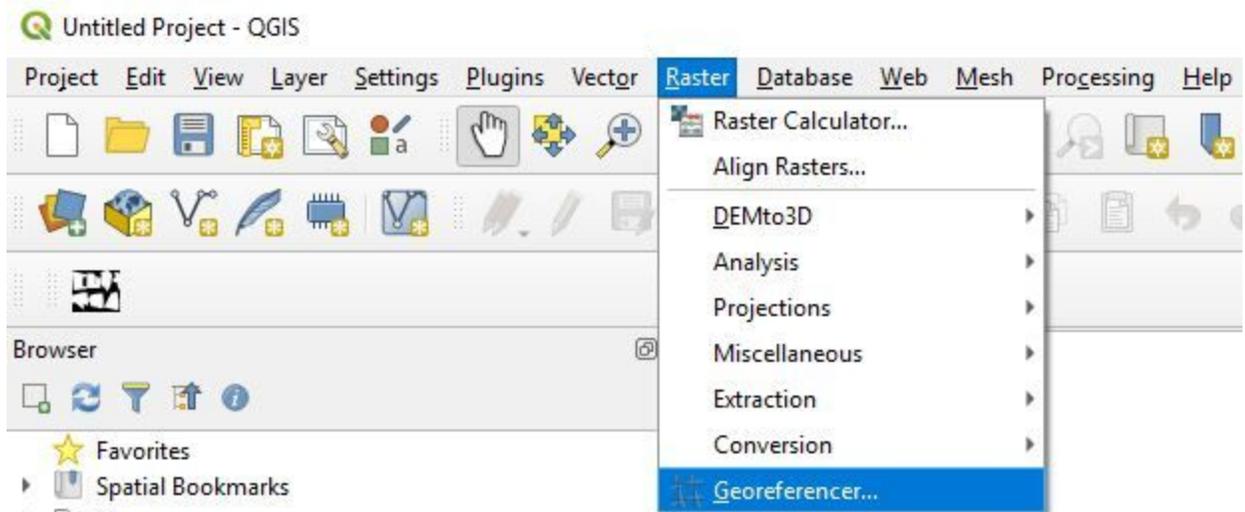- In QGIS, in the top bar *Plugins >> Manage and Install Plugins*



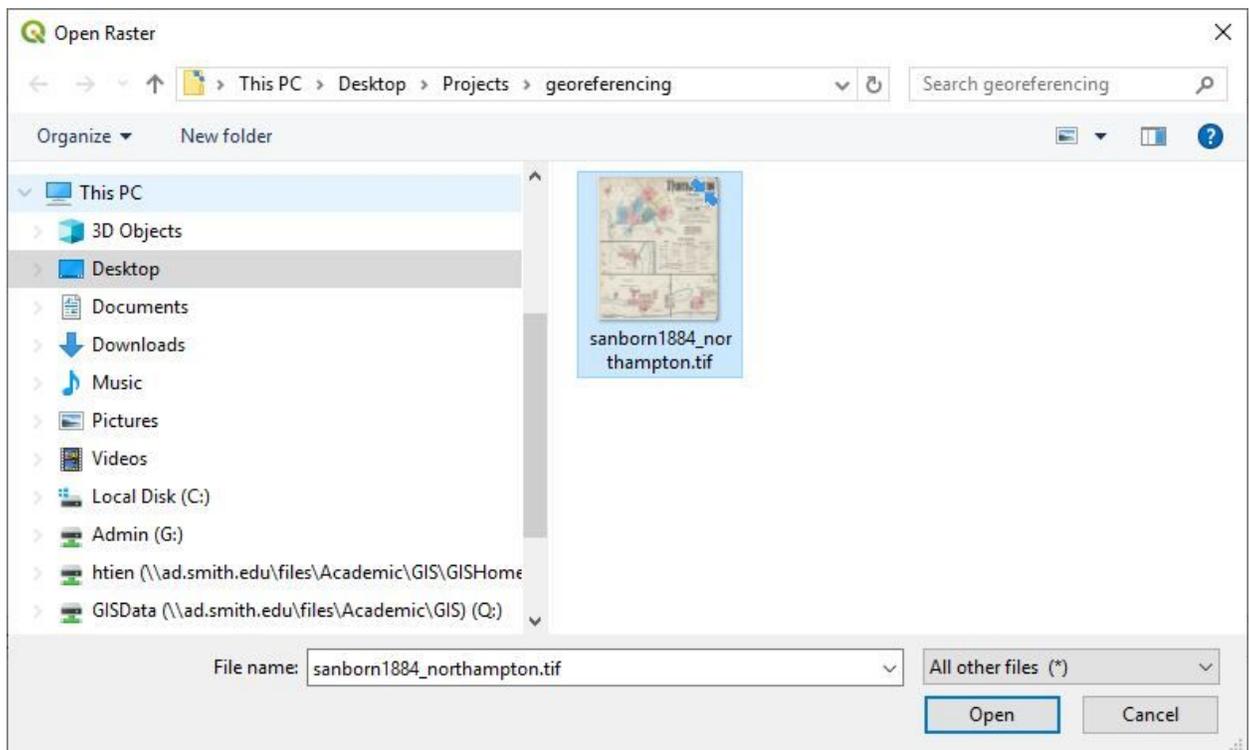- In the *Plugins* window, search and enable (check) **Georeferencer GDAL** and **QuickMapServices**
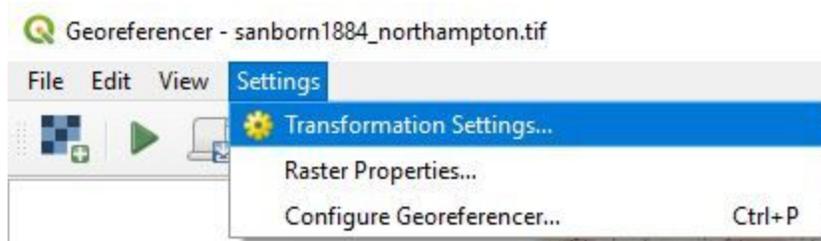
## 4. Georeferencing

- Scanned historical maps and images often don't have any spatial reference — georeferencing is the process of defining the geographic location of these maps by anchoring locations in the historical images with map coordinates.
- In QGIS, *Raster* >> *Georeferencer*, prompts the Georeferencer window
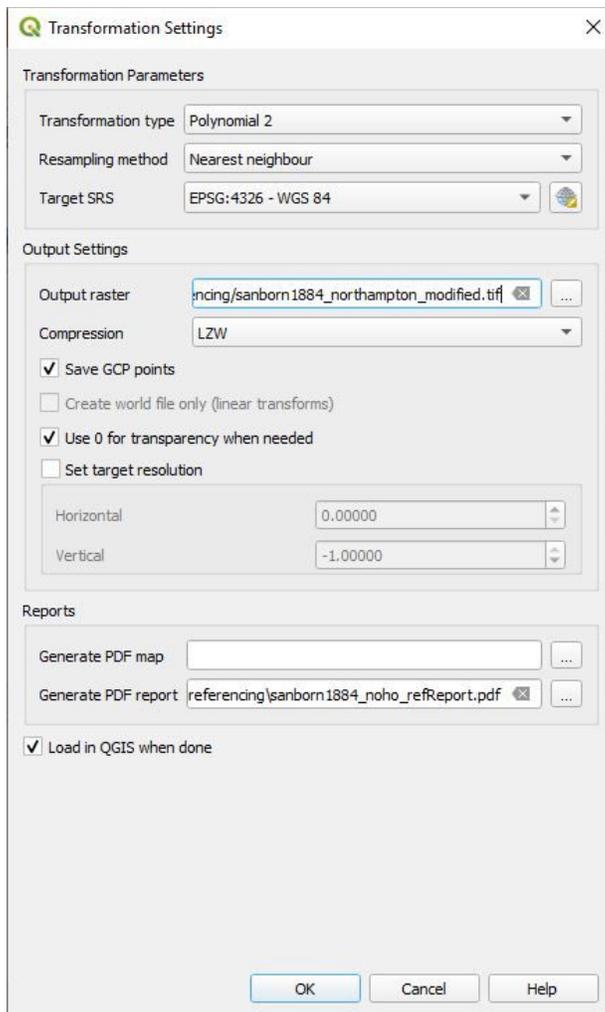
- In the *Georeferencer* window, click **Open Raster** . Then select your historical map.


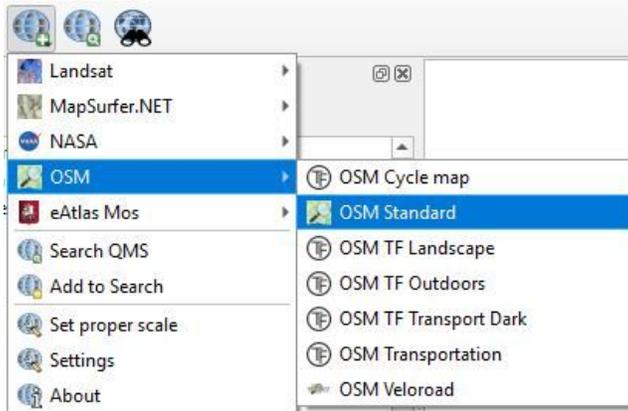
- The next window is the *Coordinate Reference System Selector*, where you will be prompted to enter the coordinate reference system (CRS). Our source image doesn't have any spatial reference, so click **Cancel**.
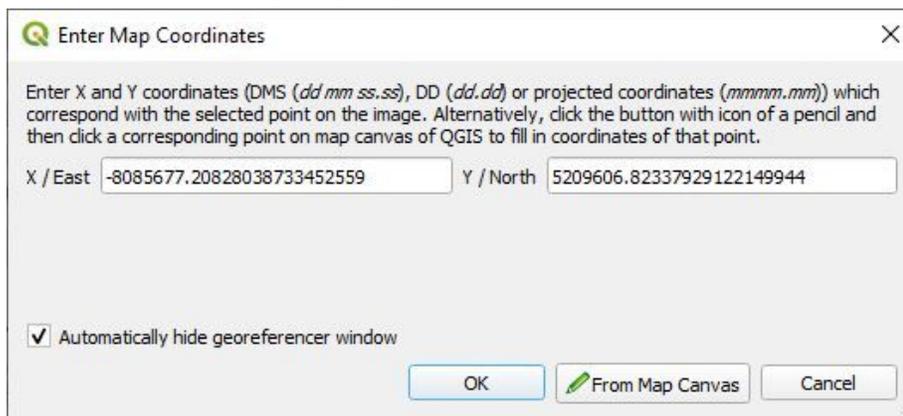
- The image is loaded in the top section of the Georeferencer window, you can zoom/pan to explore



- Define the transformation settings under *Settings >> Transformation Settings*

- ◆ Set the following parameters (learn more about each here: https://docs.qgis.org/testing/en/docs/user_manual/plugins/core_plugins/plugins_georeferencer.html#defining-the-transformation-settings)
  - ○ *Transformation Parameters*:
    - ▸ Transformation type: Polynomial 2
    - ▸ Resampling method: Nearest neighbour
    - ▸ Target SRS: EPSG:4326 - WGS 84
  - ○ *Output Settings*:
    - ▸ Compression: LZW
  - ○ Check **Save GCP Points** and **Load in QGIS when done**

- In the main QGIS window, click on **QuickMapServices** to add a basemap from OpenStreetMap (https://www.openstreetmap.org/about). Pan/Zoom to your contemporary map area.



- Criteria for choosing GCPs:
    - Right angles or places of known and identifiable immobile features, such as: street corners, road intersections (right angle more accurate than acute), edges of buildings
    - Polynomial 2 transformation requires at least 6 points
    - Distribute points across the entire image, with focus on points closer to the corners of the image to minimize distortion. However, if one area of the map is more important to you, privilege placing points there and accept distortion in other areas.

- Add Ground Control Points (GCPs) with   . When you add a point, the *Enter Map Coordinates* window will pop-up, click on **From Map Canvas**. Then add the corresponding location in the contemporary map.



    - In the *GCP Table*, each GCP has dX, dY, and Residual error values. Verify if there are unusually high Residual values, in which case, delete and re-add a point.

    - When you finished adding GCPs, start the georeferencing process 
- When the process is finished, the georeferenced image will load in the main QGIS window.