TeachOSM

TECHNIQUES IN GEOGRAPHIC SCIENCE

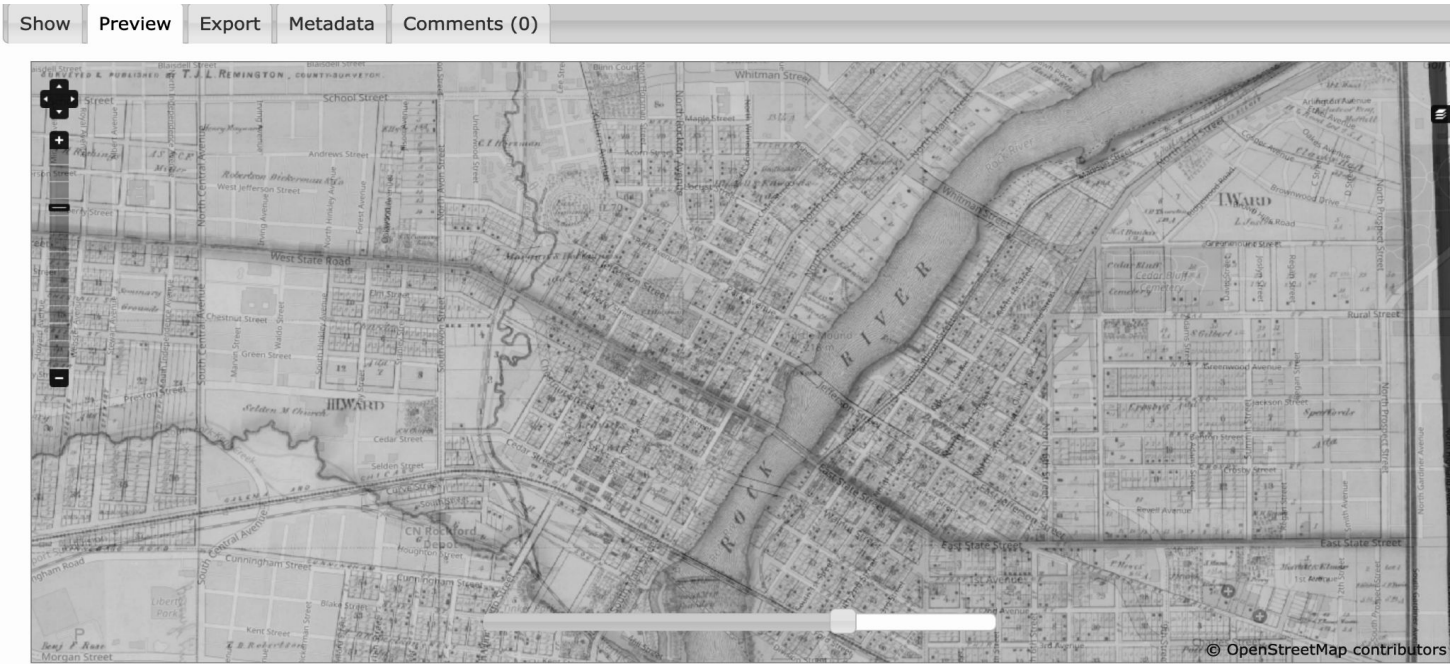
Georeferencing Historical Maps Using Map Warper

Recommended Ages/Grades

High School
College/University
Vocational learners

Course Time Needed

Preparation: ½ hour
Execution: 1 hour



Materials Needed

For the educator:
Computer w/ Internet
Computer mouse
Web Browser
OSM Account

For the student(s):
Same as for the educator

Have questions or comments?
Reach out to us through email info@teachosm.org or tweet @TeachOSM

Learning Objectives

After completing this lesson, students will be able to:

1) Understand the concept of *georeferencing*
2) Use old & historical maps as a data source
3) Manage georectified maps using MapWarper
4) Use historical maps to contribute to OpenHistoricalMap

This Lesson Meets:

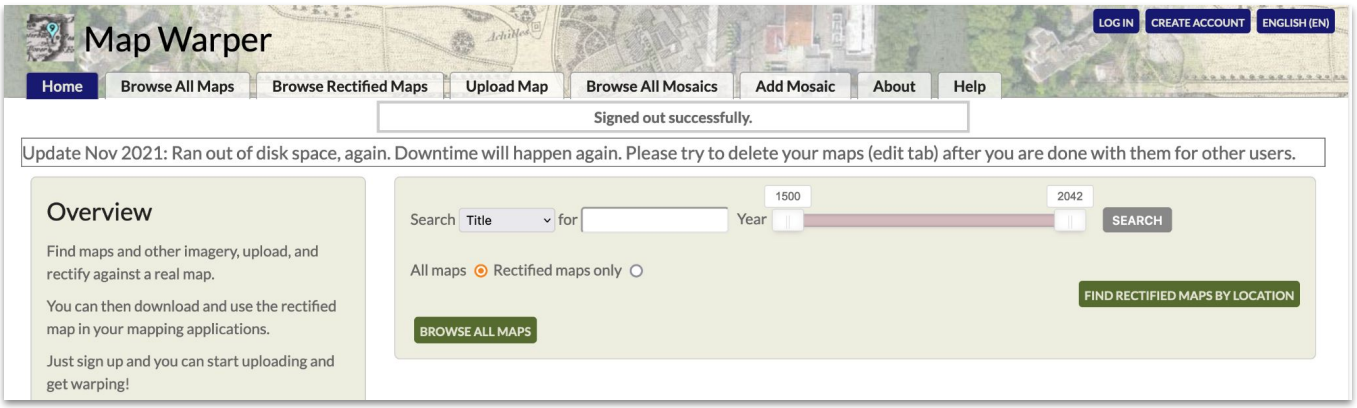
National Geography Standards

Geography Standard 1
How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information

Geography Standard 17: How to apply geography to interpret the past

Advanced Placement – Human Geography

Unit 3 – Cultural Patterns & Processes, Skills 4: Source Analysis



Overview

What is 'Georeferencing'?

- It is a technique to use scanned, old maps as secondary sources of data.
- It is a technique to align a raw map image in proper geographic space.
- It uses corresponding control points to register points on the source map image with known points on a target map.

Many old maps have been digitized & are hosted in digital libraries and free for download.
You can use your georeferenced maps in OpenHistoricalMap as a base to trace from making them excellent sources of historical data.

What can I do using georeferencing?

You can compare what a place was like at two different times. There are a lot of old paper maps that can be used to understand geographic processes through history. Many old maps are available in digital format and available for use in a GIS. Old maps can be found online through ***digital libraries***, such as the Library of Congress Map Collection (https://loc.gov/maps) as well as many state and private online collections

To compare images of old maps with a modern reference map, we need to '**rubbersheet**' the historic map *with* the modern map and put it in geographic space. In other words, we need to align the old map image with an up-to-date reference map. That is, you must register points on the old map with known points on the reference map. This process is known as **georeferencing.** As a reference map, MapWarper (https://mapwarper.net) uses OpenStreetMap.

This tutorial shows you how to add pairs of control points, and use MapWarper to align the old map with the reference map. Three points are the minimum, but most maps will benefit from many (dozens!) of control points.

Preparation & Prerequisites

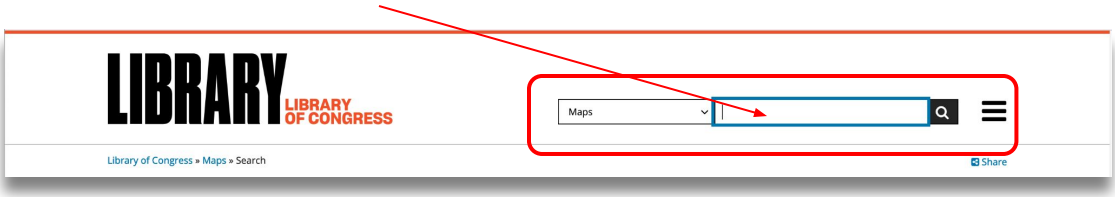
- Computer & mouse, internet connection
- Downloaded map & metadata (instructions below)
- OpenStreetMap account for login (not strictly necessary but useful for many other mapping sites, as well as MapWarper.)

Activity: Find & download your historical map

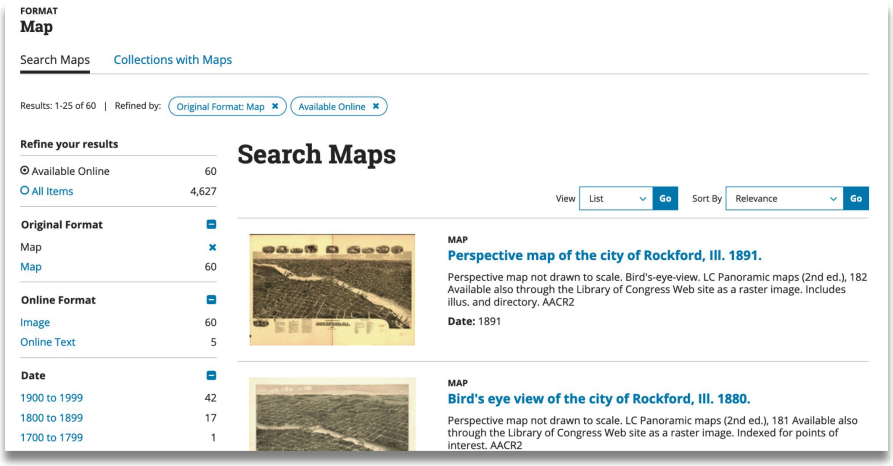
Part 1: Download a historical map

There are many digital collections from which to download historical maps, but in this exercise, we'll fetch a map from the Library of Congress.

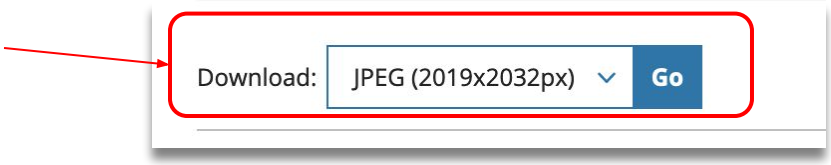
1. Point your browser to the Library of Congress Map collection: https://loc.gov/maps
2. In the search box, shown below, enter a placename, e.g 'Peoria' or 'Kalamazoo' and click the search icon.



3. Scroll through the search results and find a map suitable for georeferencing, as shown in the example here.



4. Once you find a map, use the dropdown menu, shown here, to select the highest resolution image for download. Then download the map.



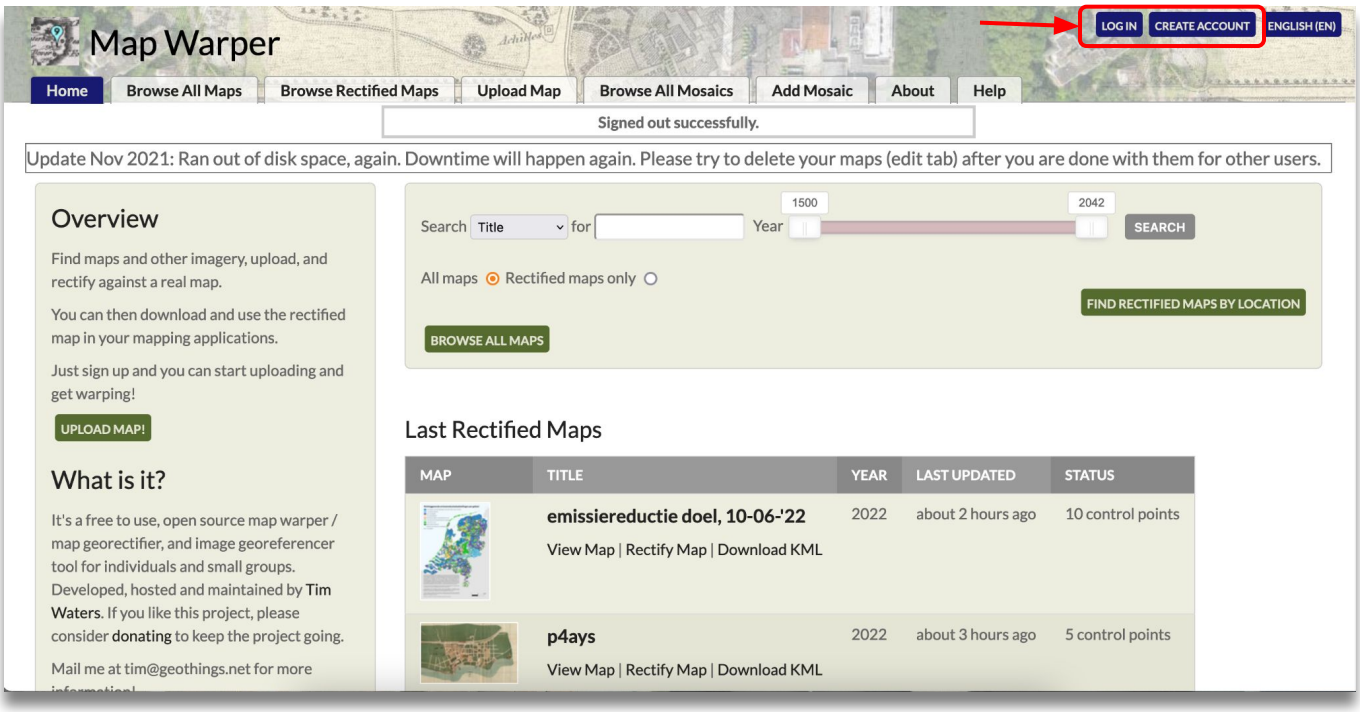
5. ***Tip:** Keep this tab open as you'll need it for the next steps where you add the *metadata*.

Activity: Rectifying Your Map with MapWarper

Part 2: Set up your MapWarper Environment

Step 1: Create an account to manage your maps

1. Point your browser to **https://mapwarper.net** You'll see the MapWarper landing page, as shown below.



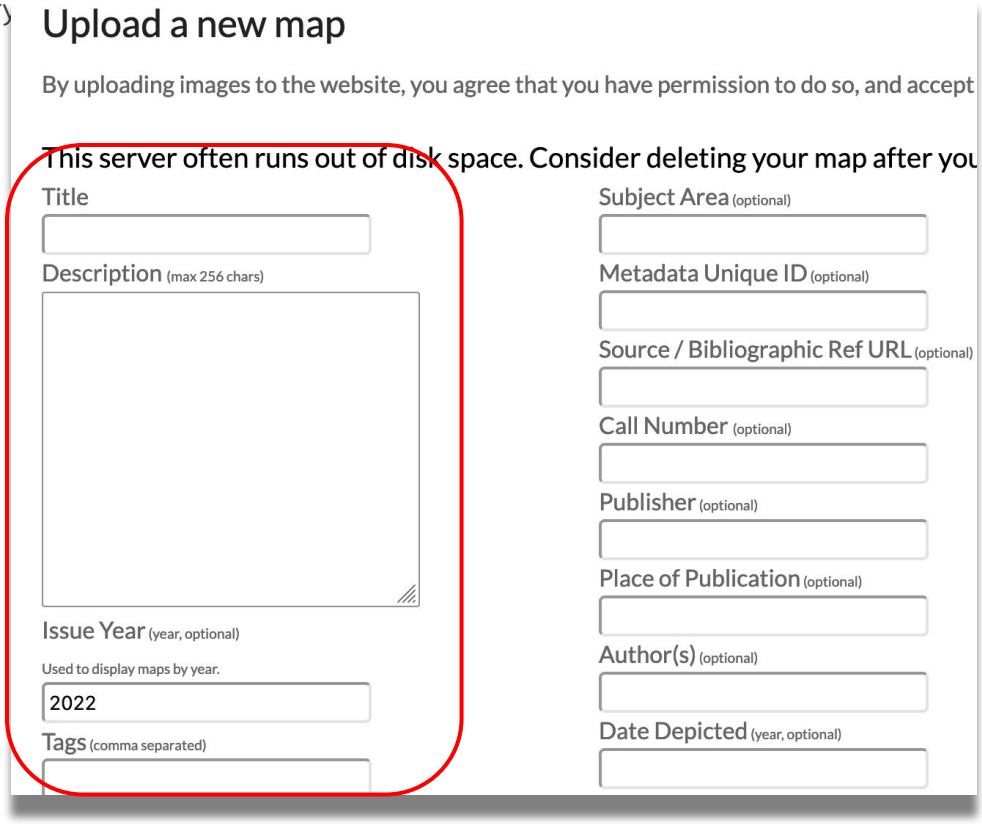
2. Log in with your OpenStreetMap account, if you have one. If you do not, you can create an account on MapWaper by simply clicking the 'Create Account' button.
3. Once you're logged in, you can upload and save maps.

Activity: Rectifying Your Map with MapWarper

Part 2: Upload the Historical Map to MapWarper

Step 1: Click on the 'Upload' tab

The image below shows the Upload page. Copy the *metadata* from the Library website into the corresponding fields on the Upload page. The Title, Description, Issue Year are mandatory. The other fields are very helpful. *Note: there may not be a one-to-one correspondence between MapWarper and the Library

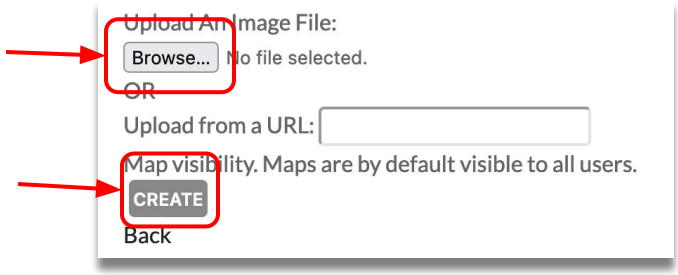


Step 3: Click 'Browse...' and locate your saved map image.

You may have saved it to your desktop. Locate it and select it.

Step 4: Lastly, Click 'Create' to finish uploading

The 'Create' button finalizes the upload to MapWarper.

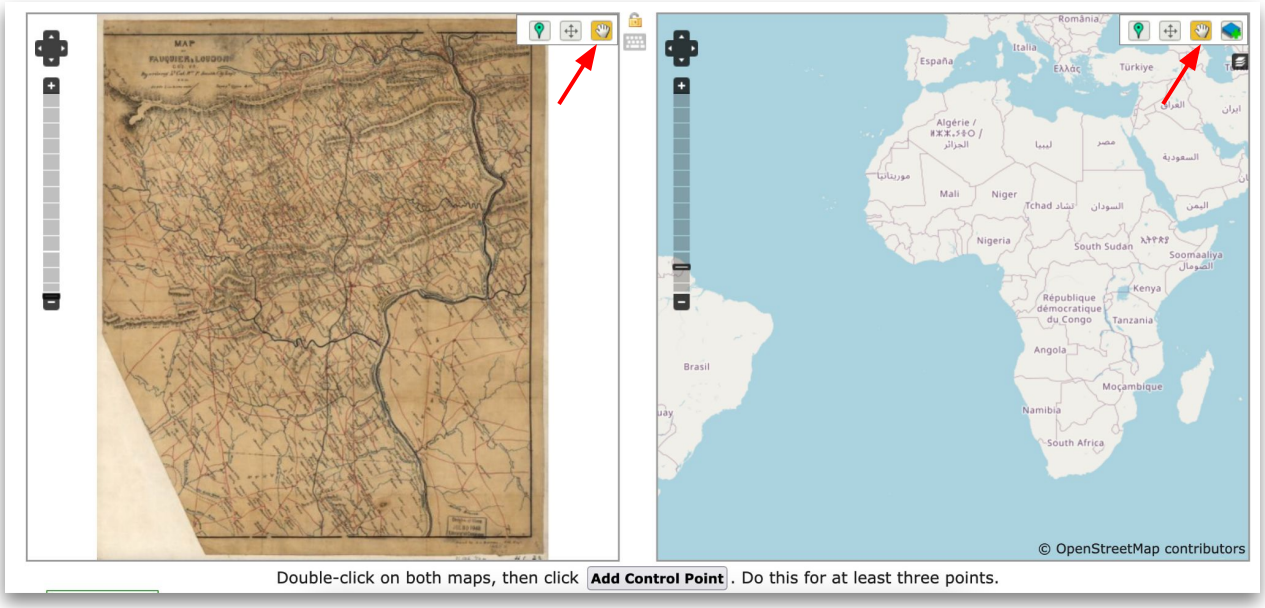


Activity: Rectifying Your Map with MapWarper

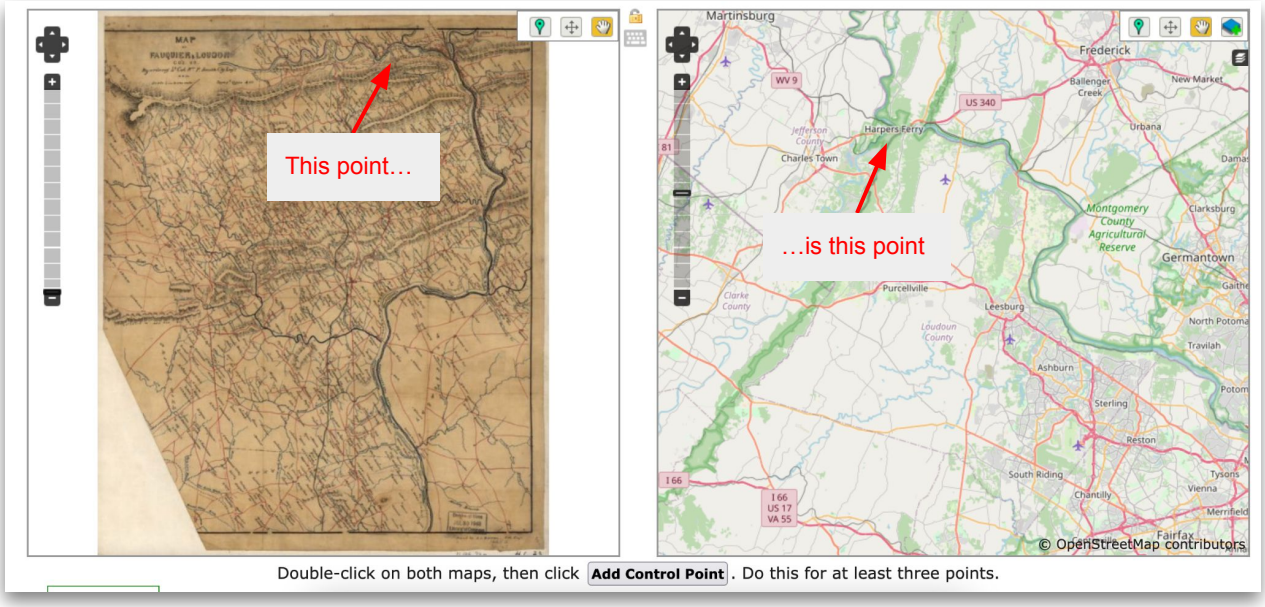
Part 3: Rectify your map

Now begin aligning the historical map with the current map.

Step 1: Click the 'Rectify' tab. Your map is shown side-by-side with OpenStreetMap, as shown in the example below. Use the pan tool, highlighted below, to position and center the maps.



In the right-hand pane, pan to the general location of your historical map as shown in the example below. Zoom in until you can recognize and equate the same features on both maps.

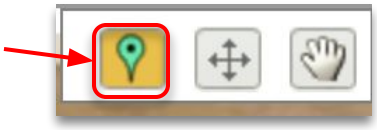


Activity: Rectifying Your Map with MapWarper

Step 3: Rectify your map (cont'd)

Now begin aligning the historical map with the current map.

Step 2: Add control points. From the control bar, click the map marker symbol as shown below:

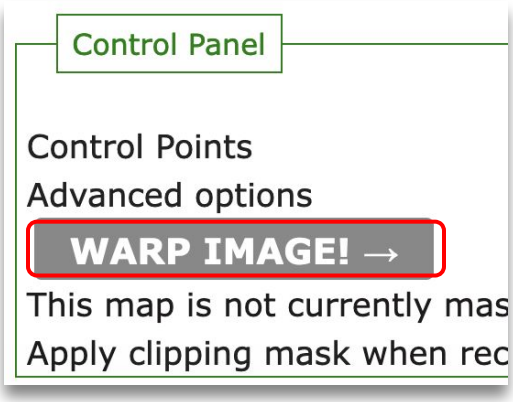


Step 2a: After you've identified a position common to both maps, click once on the historical map *exactly where you want to drop the point.*

Step 2b: Then click on the reference map on the point corresponding *exactly* to your historical map.

Step 2c: Lastly, click, 'Add Control Point'. Do this for at least 3 points on your map. The more points you add, the better the registration of the maps.

Step 3: Once you've added several (at least 3!) control points, click the 'Warp Image!' button, as shown below.



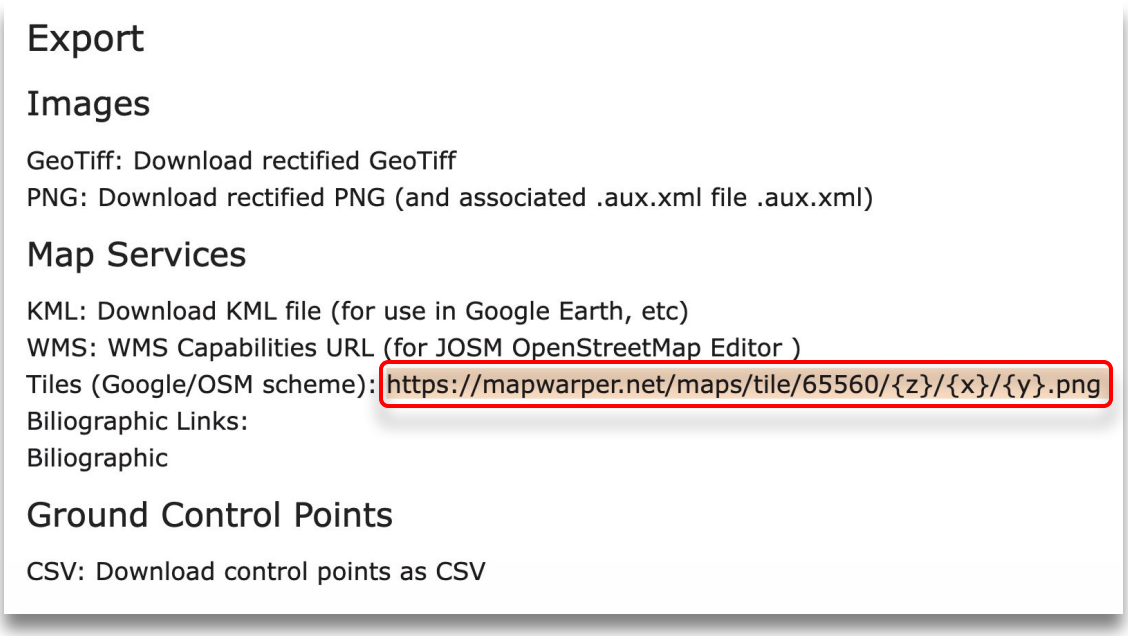
Activity: Rectifying Your Map with MapWarper

Part 4: Download your map & metadata

Once your map is rectified to your satisfaction, you can export the finished map and metadata to use elsewhere, such as OpenHistoricalMap.

Click the **'Export'** tab.
Select the **image type** (GeoTIFF or PNG) and **download** to your computer.

For use in OpenHistoricalMap, copy the link for the tiles schema, as highlighted below. Then, paste this into your imagery options in OpenHistoricalMap. Your map is now available for you to use to recreate the historical environs in OpenHistoricalMap.

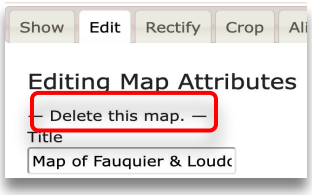


To export the metadata, click the **'Metadata'** tab. This exposes the metadata saved during upload. Highlight and copy the text from here to another application. *Note: you can always update the metadata for more accuracy and greater detail.

Part 5: Delete your rectified map from MapWarper

As of this writing, MapWarper has an extremely limited amount of space available for your maps. Please be considerate of the community and delete your map so that others can use the service.

To delete your map, click the 'Edit' tab. Click the text, 'Delete this map' as shown at right, and you're finished!



Activity: Rectifying Your Map with MapWarper

Tips and Techniques for Georeferencing

Here is the simplified workflow as a guideline.

1. Download source map & metadata
2. Upload source map to MapWarper
3. Fill in metadata fields when uploading
4. Rectify the map by adding pairs of control points and clicking 'Warp the Map'
5. Iteratively add control points, warping until you are satisfied with the alignment
6. Export the final warped image + metadata
7. When finished, Delete your map from MapWarper to save space!

Tips for Georeferencing Old Maps:

1. More control points = better alignment.
2. Distribute control points all around the map.
3. Start with a minimum of 10 control points
4. Do your best on metadata; fields won't always match up.
5. Large scale maps (e.g. city) tend to align better than small scale maps (e.g. state, country).

Discussion Questions:

1. How did you select your control points?
2. What effect did adding control points have on the warped map?
3. Why add metadata? What do you think is the value of metadata information?

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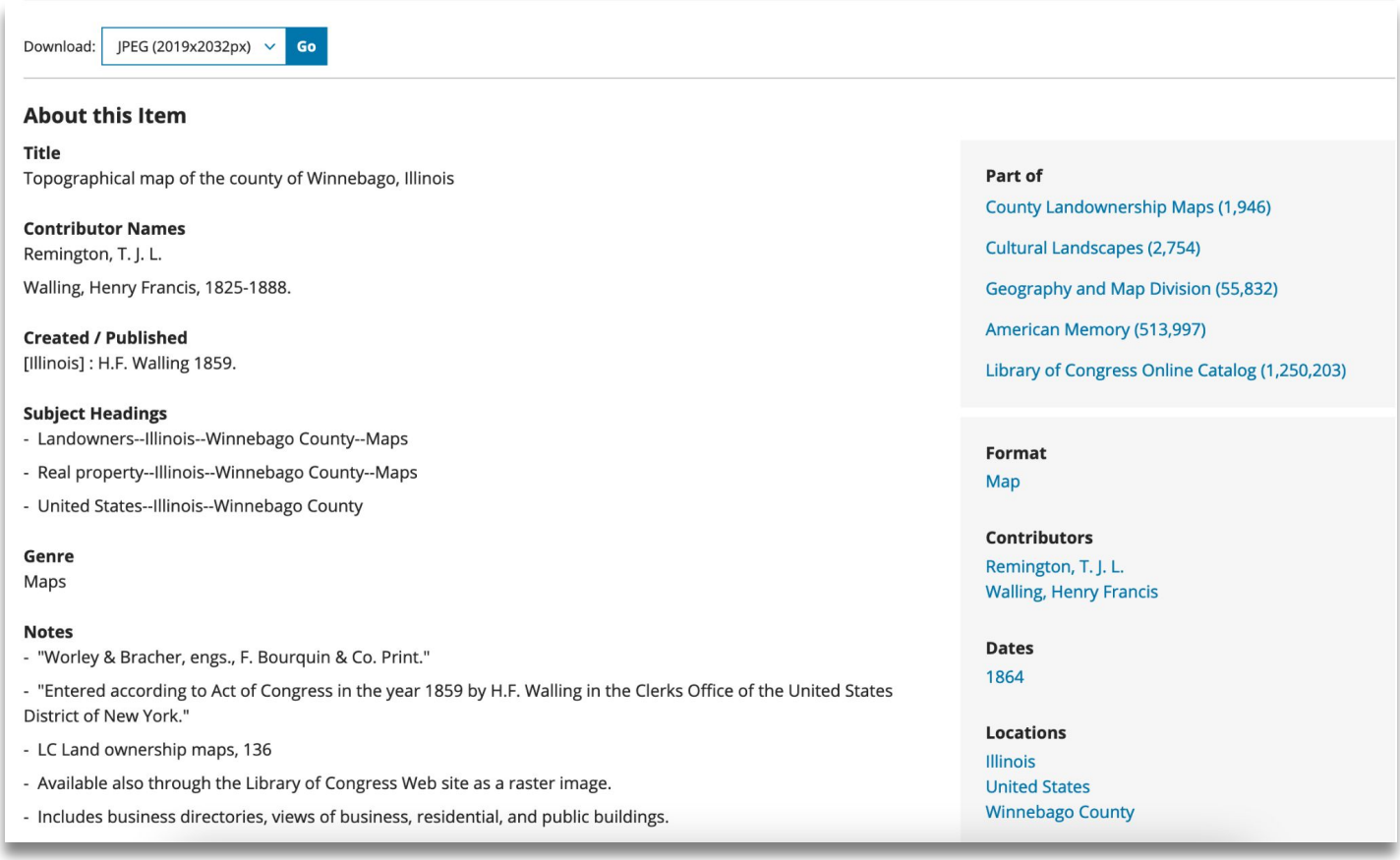
Continue to
Other Geographic Techniques

Appendix A: Map Metadata Example

Map metadata is the way you give context and meaning to maps. It helps other users determine whether the map will suit their purposes. Shown below is an example of map metadata. This example comes from the Library of Congress (https://loc.gov/maps) Note that terms vary slightly between MapWarper and some online digital libraries, so you may have to find the best match for each field.



Download: JPEG (2019x2032px) Go

About this Item

Title
Topographical map of the county of Winnebago, Illinois

Contributor Names
Remington, T. J. L.

Walling, Henry Francis, 1825-1888.

Created / Published
[Illinois] : H.F. Walling 1859.

Subject Headings
- Landowners--Illinois--Winnebago County--Maps
- Real property--Illinois--Winnebago County--Maps
- United States--Illinois--Winnebago County

Genre
Maps

Notes
- "Worley & Bracher, engs., F. Bourquin & Co. Print."
- "Entered according to Act of Congress in the year 1859 by H.F. Walling in the Clerks Office of the United States District of New York."
- LC Land ownership maps, 136
- Available also through the Library of Congress Web site as a raster image.
- Includes business directories, views of business, residential, and public buildings.

Part of
County Landownership Maps (1,946)
Cultural Landscapes (2,754)
Geography and Map Division (55,832)
American Memory (513,997)
Library of Congress Online Catalog (1,250,203)

Format
Map

Contributors
Remington, T. J. L.
Walling, Henry Francis

Dates
1864

Locations
Illinois
United States
Winnebago County

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