

GIS and Habitat Management (ACBA 7005)

Biodiversity on Degraded Landscapes

Aim

In this lab we will be continuing GIS tasks using raster files to explore how we can potentially improve the biodiversity of degraded landscapes. For these activities we will be using and interpreting historic maps. We will build our skills in the following areas:

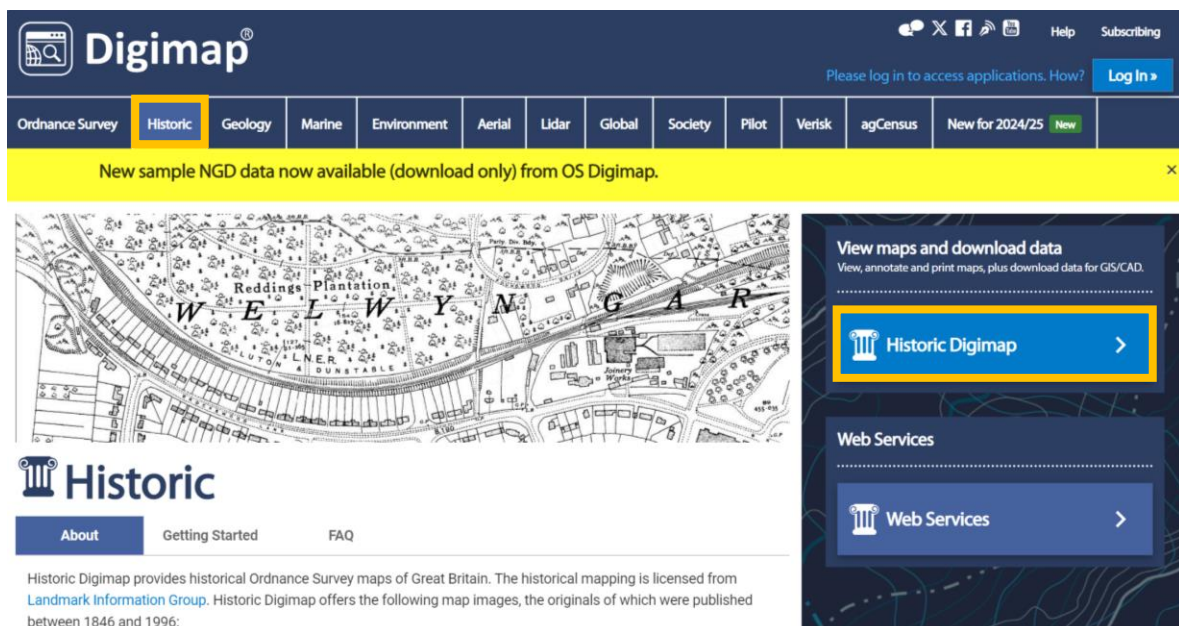
- Georeferencing historic maps
- Symbology and visualisation of complex data
- Map output

Activity 1 – Download historic maps

In this activity we will be importing historic maps. For this first activity we will be exploring the historic maps available for our site of interest. We will be exploring Digimap and extracting historic maps for our area of interest.

Instructions:

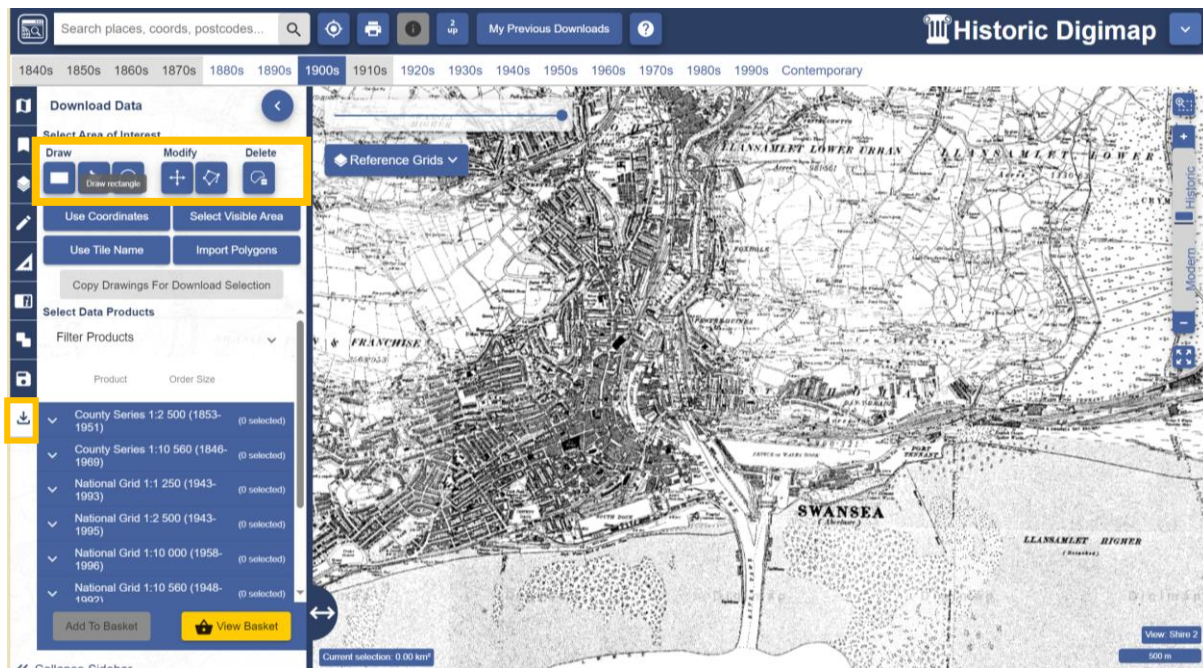
- 1) Click on: [Digimap \(edina.ac.uk\)](http://Digimap.edina.ac.uk). Navigate to historic imagery.



The screenshot shows the Digimap website interface. The top navigation bar includes links for Ordnance Survey, **Historic**, Geology, Marine, Environment, Aerial, Lidar, Global, Society, Pilot, Vertsk, agCensus, and New for 2024/25. A yellow banner below the navigation bar states: "New sample NGD data now available (download only) from OS Digimap." The main content area displays a historical map of Reddings Plantation. On the right side, there is a sidebar titled "View maps and download data" which includes a button for "Historic Digimap" and a "Web Services" section. The bottom of the page features a "Historic" logo and a brief description of the service.

- 2) Click on the dates to see what historic maps are available for your area of interest. Next, click on the Download icon on the left of your screen (shown in the

image below). Select a Region of interest (ROI) by drawing a rectangle at your site. You are then able to draw a rectangle for your area of interest.



- 3) A series of available maps will appear (these are shown as tiles).
- 4) You will be downloading these files for your habitat site. In Digimap there are two download options, you can download historic imagery that has been pre-georeferenced to OS Grid (great!), or you can also download the original sheets. In the next exercise we will be georeferencing an original sheet.

Activity 2 – Georeferencing a Map

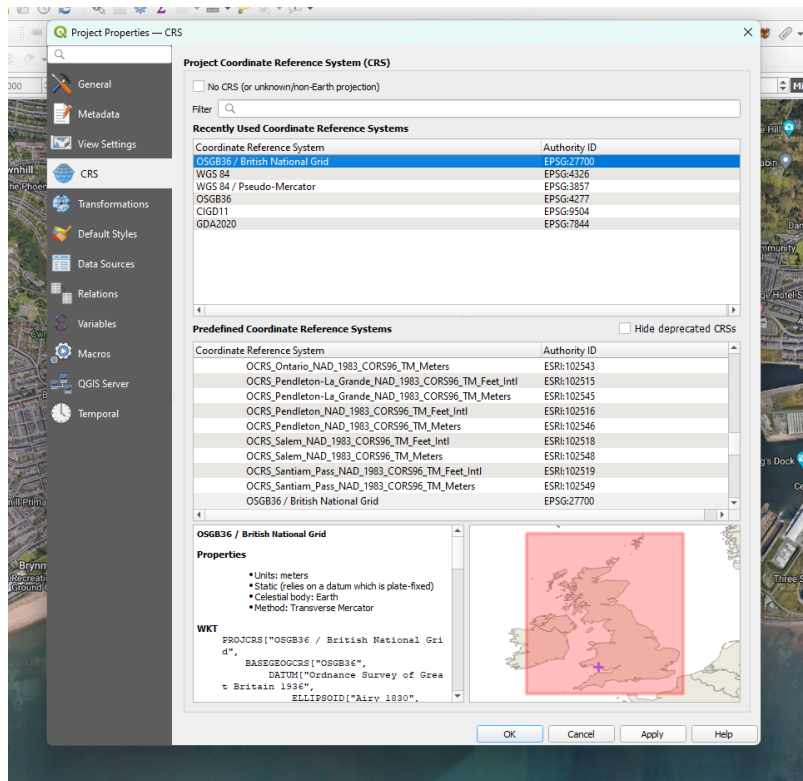
Sometimes we have access to historical maps as images. These maps can be added to GIS software and georeferenced. In this second activity we will be learning how to use the Georeferencer tool in QGIS. The data for this activity are a series of sheet maps of Swansea. These are located in a Zipped file here:

<https://moodle.uwtsd.ac.uk/mod/resource/view.php?id=573130>

Download this dataset and save it to your OneDrive.

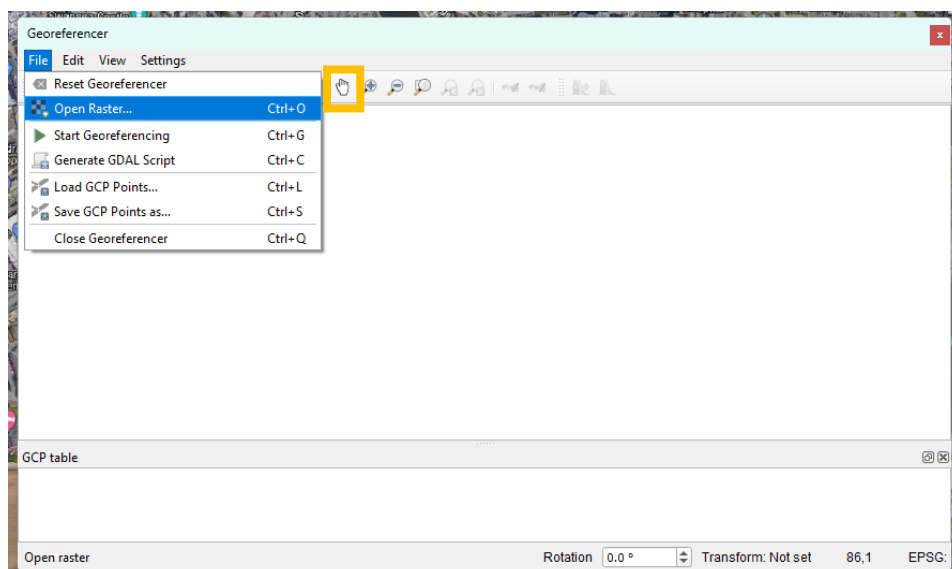
Instructions:

- 1) Open QGIS and set the project's CRS to **OSBG36/ British National Grid** in **Project ► Properties ► CRS**, which is a popular Coordinate reference system (CRS) in UK.



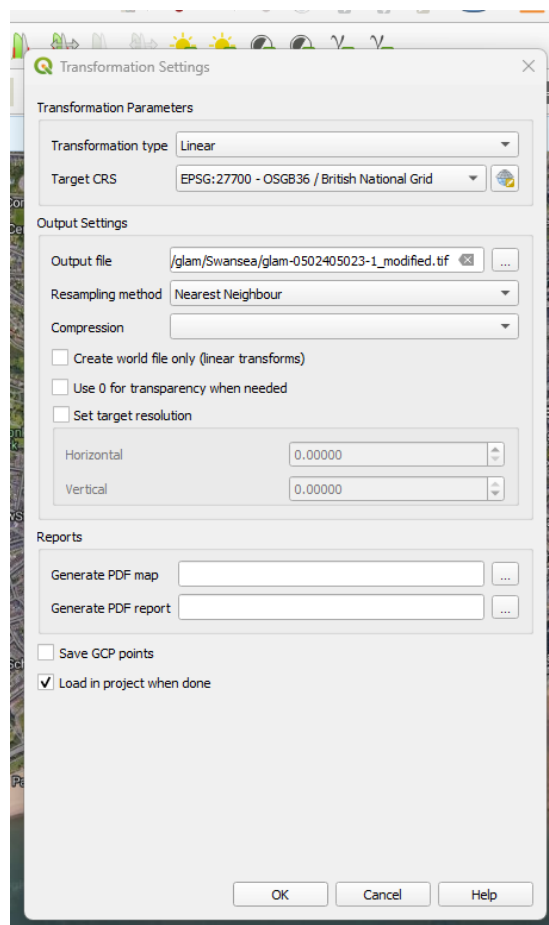
2) Save the QGIS project.
You will use the georeferencing tool from QGIS named **Georeferencer**. To georeference the map:

- 3) Open the georeference tool, **Layer ► Georeferencer...**.
- 4) Navigate to the OneDrive to your files. You will add one of these to your Georeferencer tool. Add the map image file as the image to georeference, **File ► Open raster**.
- 5) Click **OK**.



You should now see the historical image loaded in the Georeferencer window. You can use the Hand tool circled above, as well as the '+' and '-' to explore your historic map. Next you need to define the transformation settings for georeferencing the map.

- 6) Open **Settings ► Transformation settings**.
- 7) Set the **Transformation type** to **Linear** and the **Resampling method** to **Nearest neighbour**.
- 8) Press the  button next to the **Target SRS** option and select the **EPSG:27700 / OSGB36 / British National Grid** CRS. *Please note, if you are working in a different projection for your work, you would modify this to the projection of your QGIS project (e.g. WGS84).*
- 9) Click the icon next to the **Output raster** box, go to the folder and create a folder or select an appropriate location to save your output file and give it a name.
- 10) Check  **Load in QGIS when done**
- 11) Leave the rest of parameters as default (shown below).

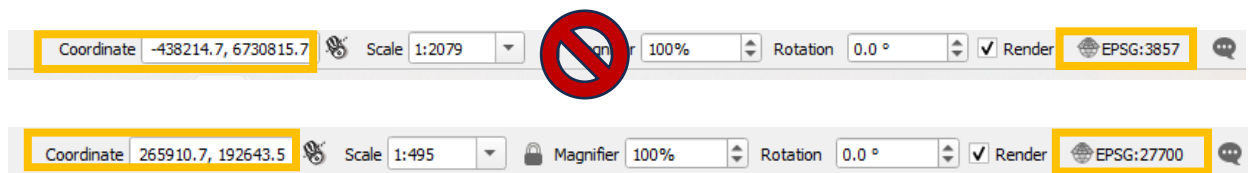


- 12) Click **OK**.

Creating Ground Control Points (GCP)

This next step involves finding locations on the historic map that line up with the modern map. You will need to gather the coordinates for these locations in your QGIS project. They will be shown as Eastings and Northings at the bottom of your screen (shown below). These coordinates adjust when you move your cursor in the QGIS program.

Warning: Check your projection. The bottom example is the correct projection needed here (EPSG:27700). Note how the coordinate systems look different.

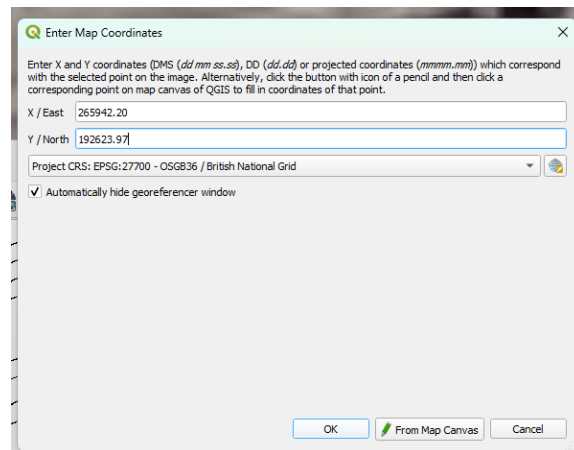


You can use the zooming and panning tools as you usually do in QGIS to inspect the image in the Georeferencer window and within the QGIS main window. You will need to identify at least 3 points and copy the coordinates for these points. You can do this in Excel, by creating a unique Shapefile, taking a picture, or just jotting them down on pen and paper.

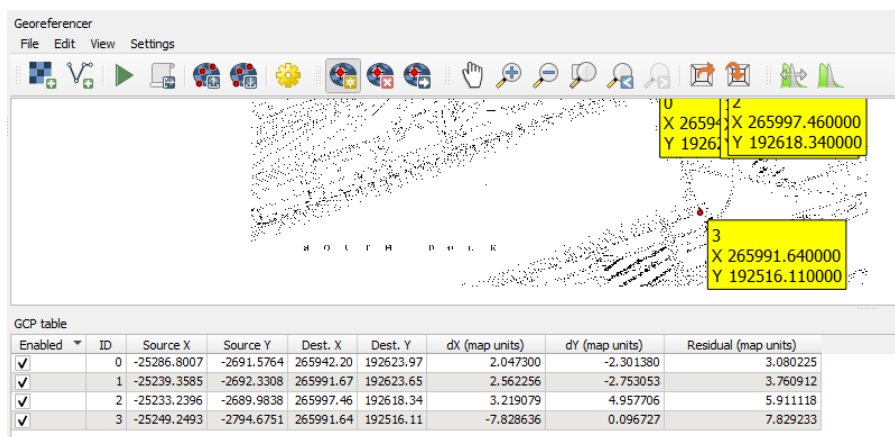
- 13) Select the **Add point** tool and click in location of your first GCP (pan and zoom as needed).



- 14) In the **Enter map coordinates** dialogue write the coordinates that appear in the map (X: 000000.0 and Y:000000.0) and their CRS (EPSG:27700 / OSGB36 / British National Grid). You will replace the red numbers with your coordinates.
- 15) Click OK and repeat this step with additional GCP.



16) Digitize at least three more ground control points in the same way you did the first one. You should end up with something similar to this:

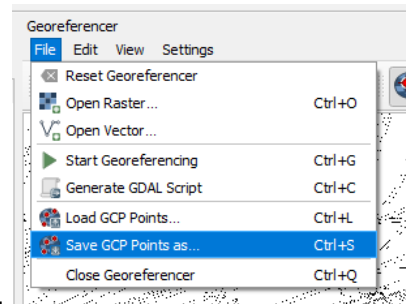


With already three digitized ground control points you will be able to see the georeferencing error as a red line coming out of the points. The error in pixels can be seen also in the **GCP table** in the **dX[pixels]** and **dY[pixels]** columns. The error in pixels should not be higher than 10 pixels. If it is, you should review the points you have digitized and the coordinates you have entered to find what the problem is.

Once you are happy with your control points, you can save them for later use:

17) Go to **File ► Save GCP points as...**.

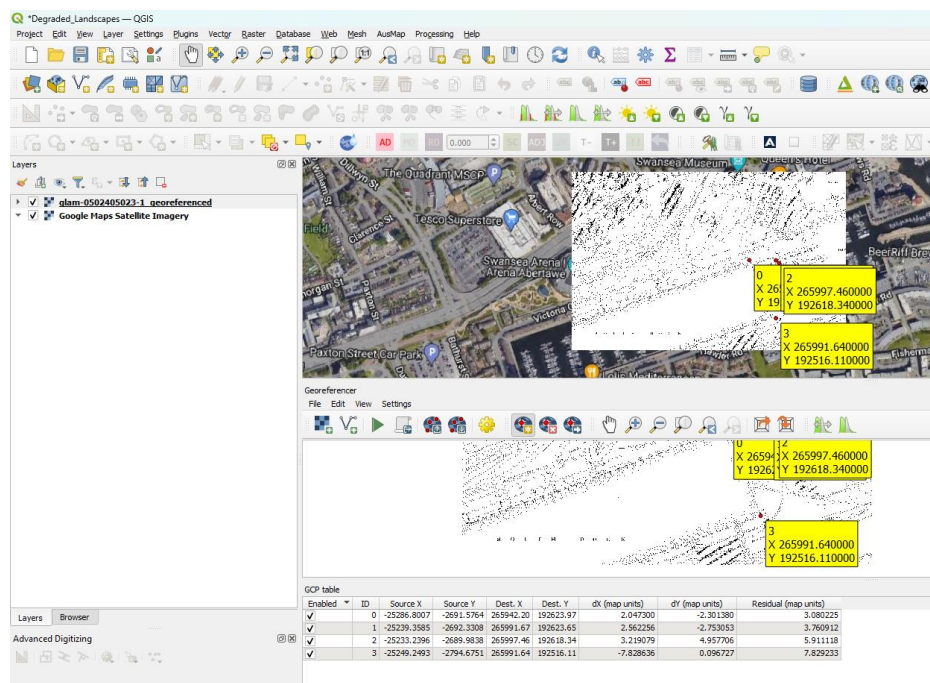
18) Navigate to your OneDrive and name it something memorable.



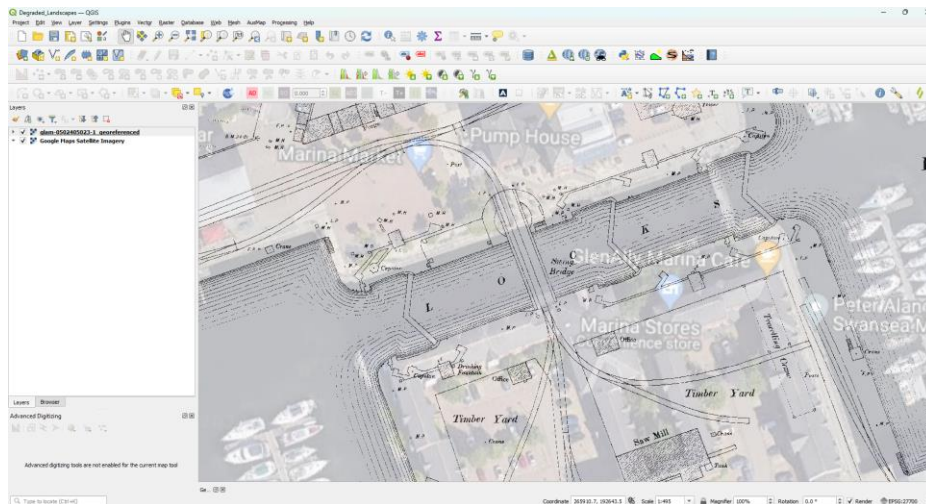
Finally, georeference your map:

19) Go to **File ► Start georeferencing**.

20) Note that you named the file already when you edited the Georeferencer settings. Now you can see the map in QGIS project as a georeferenced raster.



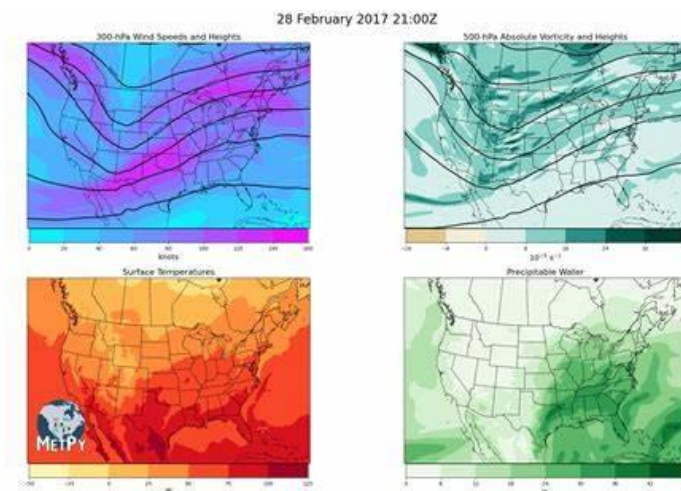
21) To check that your data is properly georeferenced, your map and this image should match quite well: set the map transparency to 50% and compare it to the underlying Google Map imagery.



- 22) Hint: To improve your final map output you can download an aerial image of your location from Edina Digimap and use that as a baselayer instead of GoogleMaps.
- 23) Repeat these steps with an additional historic map. You can choose a different site of a different year for the same site. If you are using different year, you will navigate to EdinaDigimap and download a new file as a its original sheet. You may also be able to find additional digital maps online. Please do not pay for any historic maps for this course! We have plenty for free!

Activity 3 – Design and digitise a panel map to illustrate site changes through time.

For a site of your choosing, design a panel map that uses historical maps to highlight site changes through time. You may have evidence of site degradation through time, or legacy environmental impacts that you need to manage or mitigate. An example of a panel map is shown below. Please have at least 3 panels. You can also have a panel showing the future site configuration. Think about the previous exercises we have undertaken to develop this panel map.



Your final panel map should be exported as a PDF and developed using Print Layout. Well done!