

## Georeferencing with QGIS



Georeferencing (georectifying) is the process of generating GIS data from an image. You will need the data from georeference.zip

### 1. Assigning a location to an image

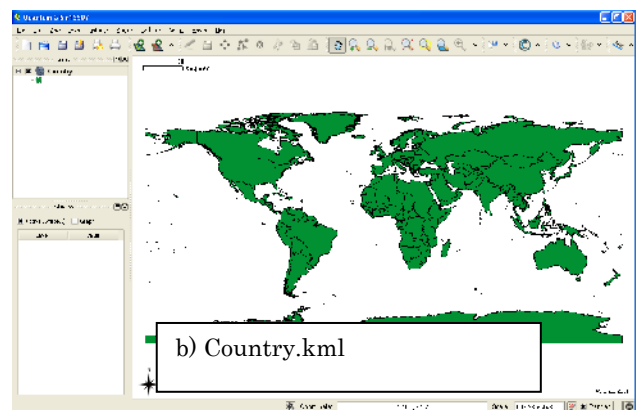


a) BluemarbleJul2004.jpg

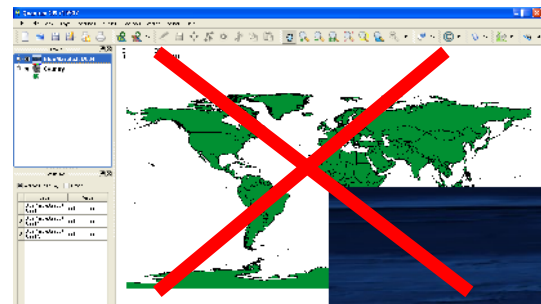
a) This is a NASA “blue marble” global satellite image (<http://earthobservatory.nasa.gov/Features/BlueMarble/>). They are jpeg images without geographic information.

Any image can be assigned with geographic information.

b) Open the vector file Data\Georeference\Country.kml. This is a reference file to show if the satellite image is ‘in the right place’.  
Open the raster file BlueMarbleJul2004.jpg. Because there is no geographic information the image is placed in a ‘default’ and incorrect position. Remove this layer.



b) Country.kml



Jpg without world file positioned incorrectly  
incorrect

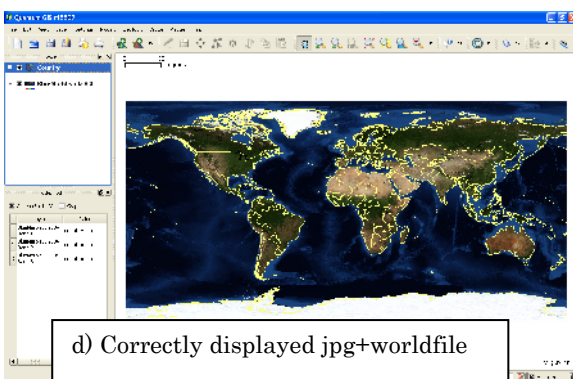
c) All we need to assign geographic information is a ‘world’ file that contains some basic information. Here is the world file that we need to position our image correctly.

c) Example world file

```
0.066666666666667
0
0
-0.066666666666667
-179.96666666666665
89.96666666666665
```

Line contains the pixel size on the x-axis.  
Lines 2 & 3 concern pixel rotation, but we don't care about this and set them to zero  
Line 4 is the pixel size on the y-axis  
Line 5 is the Longitude of the centre of the top-left pixel  
Line 6 is the Latitude of the centre of the top-left pixel

d) Create a new text file called “BlueMarbleJul2004.jgw” with the numbers shown above (provided in WorldFileExample.txt). Now re-open the jpeg image “BlueMarbleJul2004.jpg” in QGIS. The



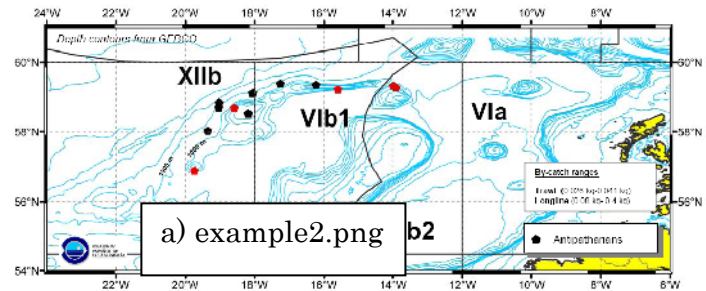
d) Correctly displayed jpg+worldfile

world file is read as metadata and used to assign a position to the image. The image is now in the correct location. Move the satellite image under the country reference file and change this layer's style properties so just the country borders are shown.

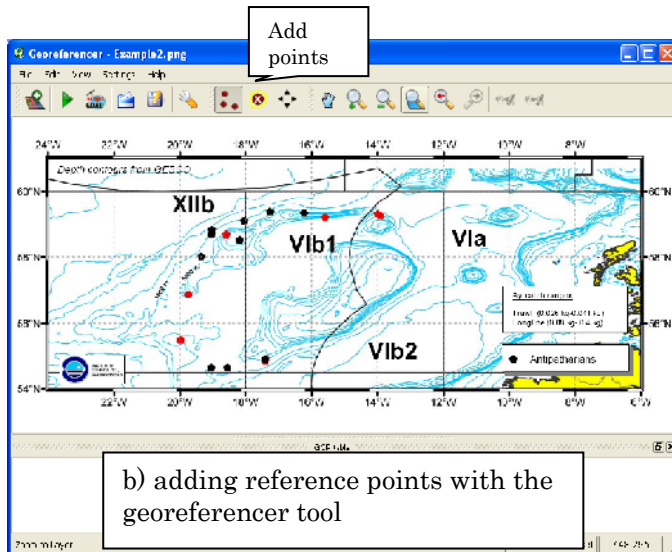
Now we will see what to do if you don't have a world file.

## 2. Assigning a location using reference points

a) Here is a map that we might want to georeference (Example2.png). We can use the grid from the image to help with placement. To do this we need to use a tool that allows us to assign geographic details to points on the image.



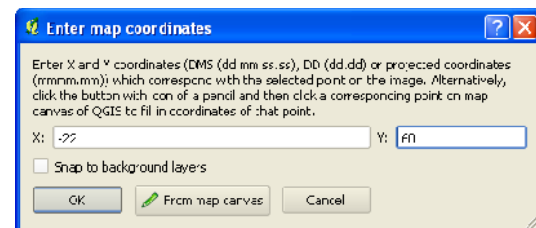
a) example2.png



b) adding reference points with the georeferencer tool

b) In QGIS, select the Georeferencer tool in the plugins menu. Open the file Example2.png. We will assign locations to points on the image using the add-points tool (button with 3 red dots).

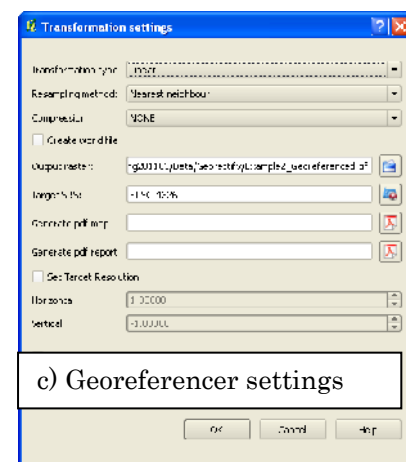
Click the intersection of 60N and 22W. We need to type in the coordinates in decimal degrees (X=-22, Y=60). Click OK to see your assigned point appear in the GCP table



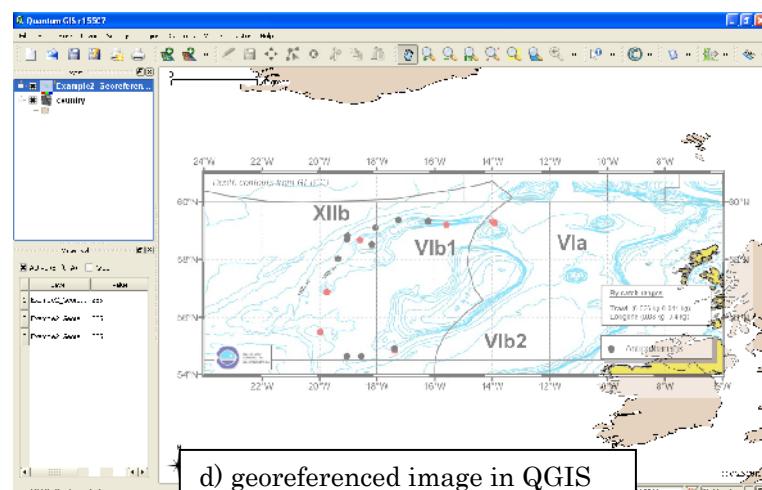
c) Repeat this process for the following locations: (54N, 22W), (60N, 8W), (54N, 8W).

Now set up the "Transformation settings" from the settings menu. We will generate a new output raster (Example2\_georeferenced.tif). Check the box "Load in QGIS when done". Leave everything else as the default. Click OK.

Finally, click the green "play" button to create the new layer and load into QGIS. Close down the georeferencer (Note you don't have to save the GCP points, but if you wanted to repeat this process on another map with the same extents you can save these points and load them into another map later).



c) Georeferencer settings



d) georeferenced image in QGIS

d) In QGIS load the country layer to check our new image. Place the georeferenced image on top and change the transparency in the layer properties to 50%. Check that the part of Ireland you can see on the image matches the country reference map.

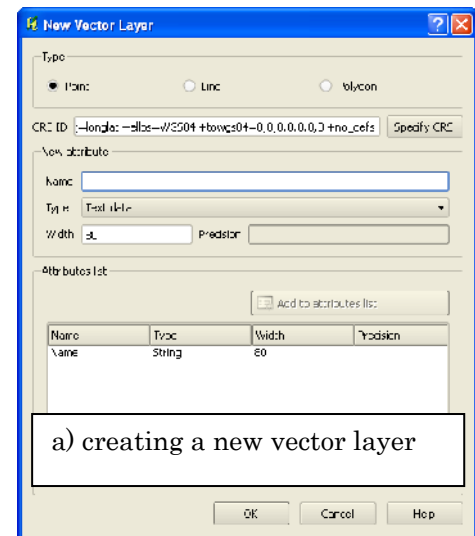
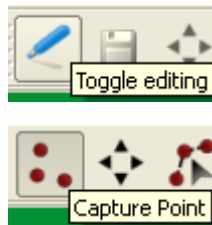
Next we will try to extract data from the image

### 3. Extracting data from a georeferenced image

a) The example image contains data that we want to extract. In this case point locations of specimens. The simplest way to do this is to create a new layer and add points to it by visually referencing the image.

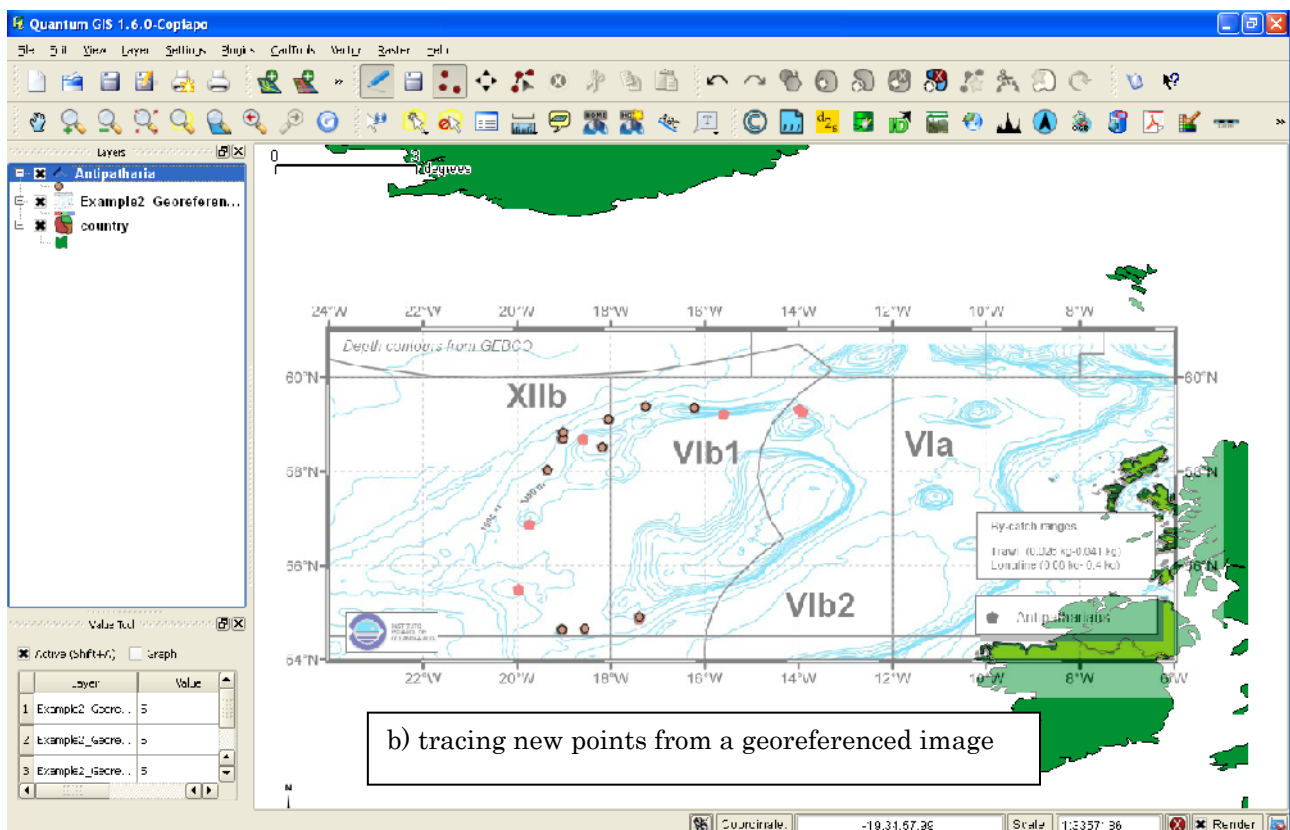
In QGIS select New Shapefile in the Layer menu. Make a new attribute called "Name", then click "Add to attributes list". Click OK, then choose a filename for your new layer (Antipatharia.shp). Then click save.

b) The new layer will appear in QGIS. Make sure you have the "Digitising" toolbar loaded (View-Toolbars-Digitising). Click the toggle editing (blue pen) button to start editing the layer. To create a new point click the "capture point button" and click on the map in the centre of one of the black pentagons (signifying an Antipatharia sample). You will be prompted to type in the attribute for the sample we will call all points "Antipatharia". Click OK to finish. Repeat for all points.



a) creating a new vector layer

Click the toggle editing (blue pen) button to finish. Now you have a new gis layer derived from your image.



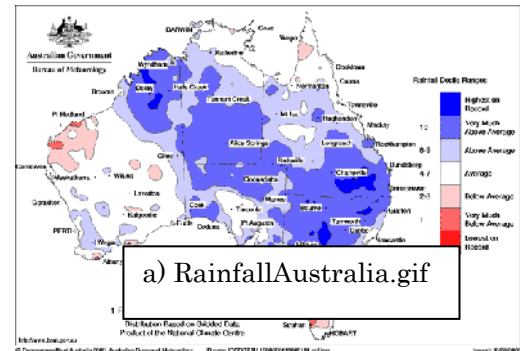
You can use a similar process to capture areas.

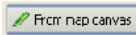
#### 4. A trickier example

a) I have an image of rainfall in Australia. I want to extract the zones with lowest rainfall. But this map doesn't have any coordinate reference points.

We can use geographic features on the map and tie these to our reference map to assign location.

Open our country reference map and zoom to Australia. Then open the picture "RainfallAustralia.gif" in the georeferencer.

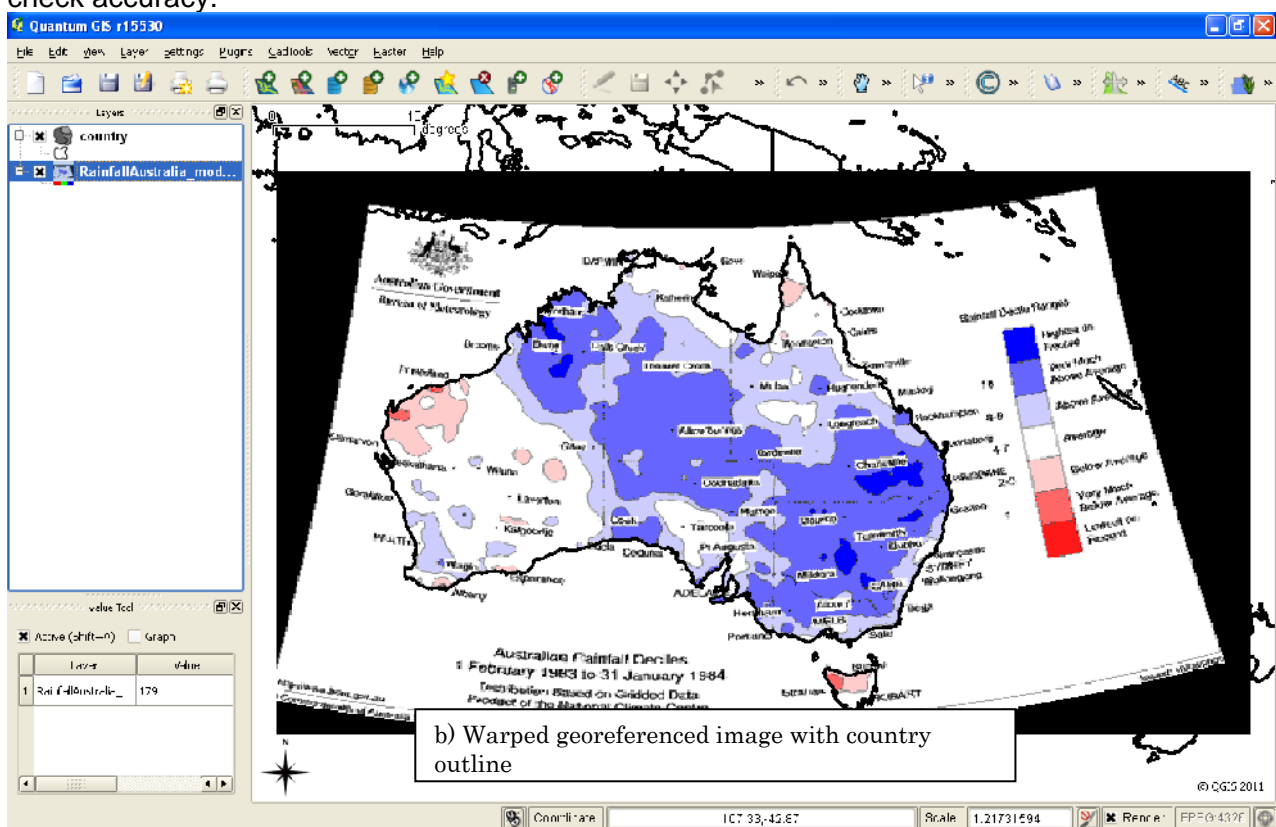


Click the add point button and then click on the northernmost part of the coastline. Instead of typing in coordinates we will select "From map canvas".  Then click on the equivalent location on the reference map.

To avoid the tedious process of repeating this a lot, I have stored some points that you can load. Select File-Load GCP Points and choose "AustraliaReference.points". A number of reference points should appear around the coastline.

The image does not use the same geographic projection as the underlying reference map, so we need to warp the image to fit the reference. Select Settings-Transformation settings and select Transformation type = Polynomial2. Give the output file the name RainfallAustralia\_georeferenced.gif. Click OK and then run the geotransformation (green play button).

b) You should see a warped version of your image appear in QGIS. Overlay the country border to check accuracy.

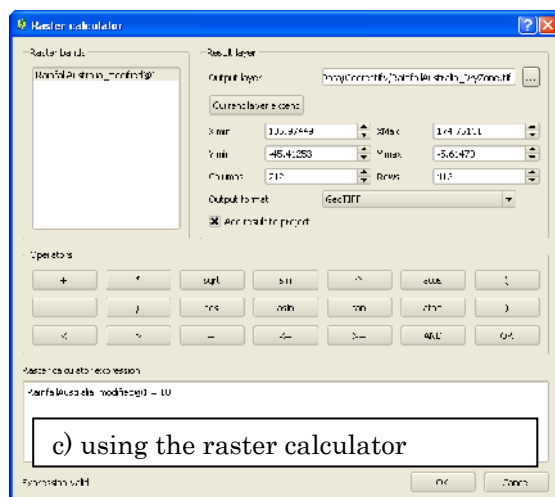
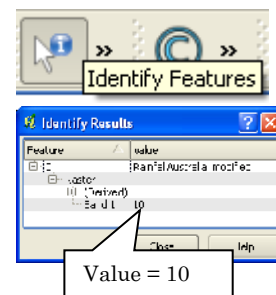


Question: What would happen if you used a linear transformation type?



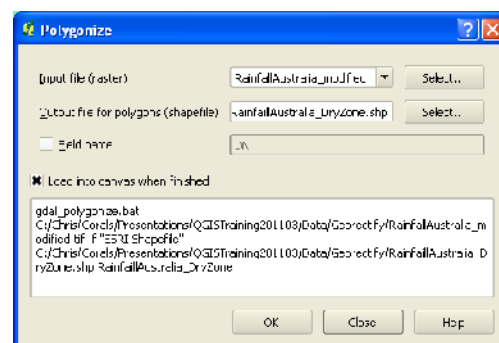
c) Now we have our georeferenced image we want to extract the areas marked “very much below average”. We could trace around these, but curves are difficult to trace. Instead we are going to transform our map from a raster to a polygon.

We want to find out the value associated with our dry zone. Select the identify features button and then click anywhere in the “very much below average” zone. You should see that the underlying value is 10.



c) We want to create a duplicate image, but only for the area with a value of 10. Open the raster calculator in the Raster menu. Type in the formula “RainfallAustralia\_modified@1 = 10” and select an output file “RainfallAustralia\_DryZone.tif”. Click OK.

d) Now you have generated a binary raster grid with 1 signifying the dry zone and 0 everywhere else. We will convert this layer to a polygon layer using the Raster-Polygonize command. The input file is “RainfallAustralia\_DryZone.tif”, the output should be “RainfallAustralia\_DryZone.shp”. Click OK to create.



We need to remove the areas outside the dry zone.

Click the toggle editing button. Then use the select feature tool to highlight the area outside the dry zone. It will turn yellow when selected. Click the delete feature button to delete. Save your edits



e) Now you have a Polygon of the “dry zone” as it appears in the image. A polygon format allows you to do area analyses such as selecting specimens collected within this zone.

