

GIS and Habitat Management (ACBA 7005)

Habitat Creation

Aim

In this lab we will be importing Living Wales data layers to inform habitat creation decisions for Wales. We will investigate through visual interpretation if there are links between habitat and air quality in Wales. We will investigate habitat change and use the developed maps to inform our future habitat management decision for a site of interest. At this stage in the class you can modify the instructions for your site of interest. The layers we will be interpreting will help inform your Habitat Management Plans.

Background

For our first activity we will be exploring the LivingEarth hub which focuses on habitat for Wales (and Australia). The LivingEarth hub has a series of Land Cover Classification files for Wales from 2018-2022. The LivingEarth LCCS code provides an implementation of the Food and Agriculture Organization's (FAO's) Land Cover Classification System (LCCS) designed to be applied to Earth Observation (EO) data. You can read more about it here: [Living Earth LCCS Documentation — LivingEarth Land Cover Classification System \(LCCS\) 0.1 documentation \(livingearth-lccs.readthedocs.io\)](https://livingearth-lccs.readthedocs.io)

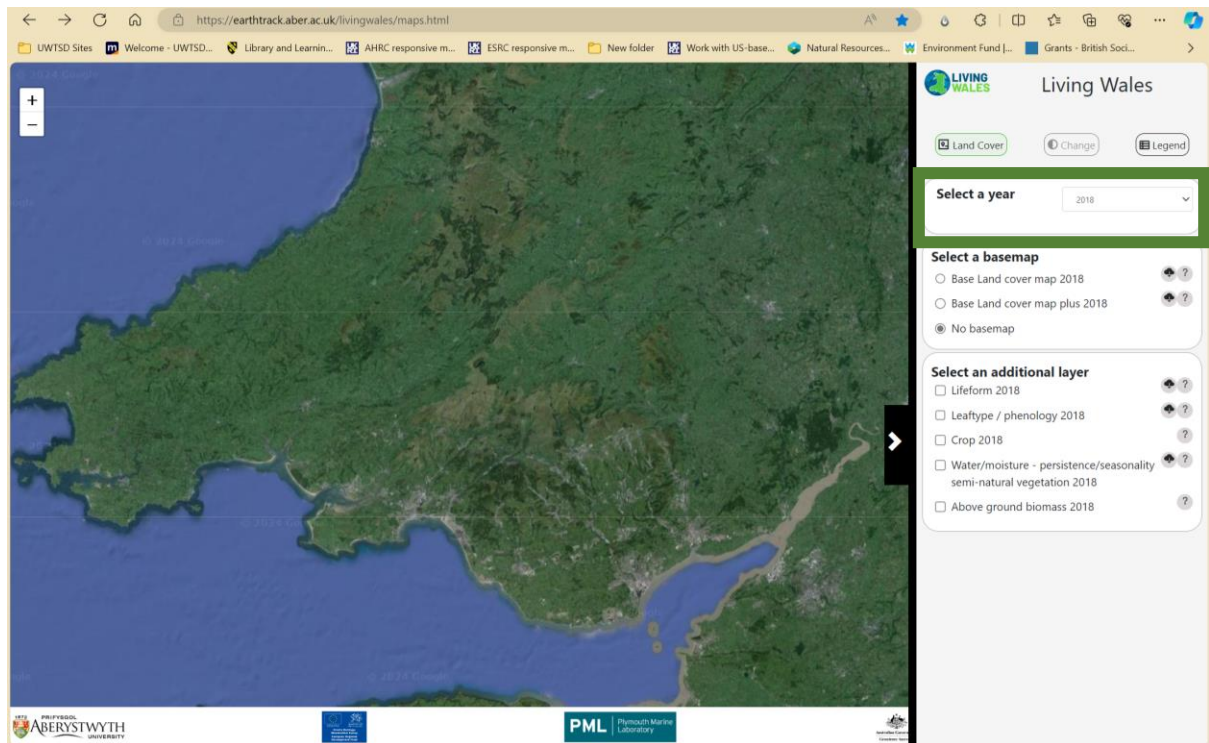
The Food and Agriculture Organization's (FAO's) Land Cover Classification System (LCCS) has two stages, a Dichotomous phase (Level 3) and modular-hierarchical phase (Level 4).

[LAND COVER CLASSIFICATION SYSTEM \(fao.org\)](https://www.fao.org/land-cover-classification-system/)

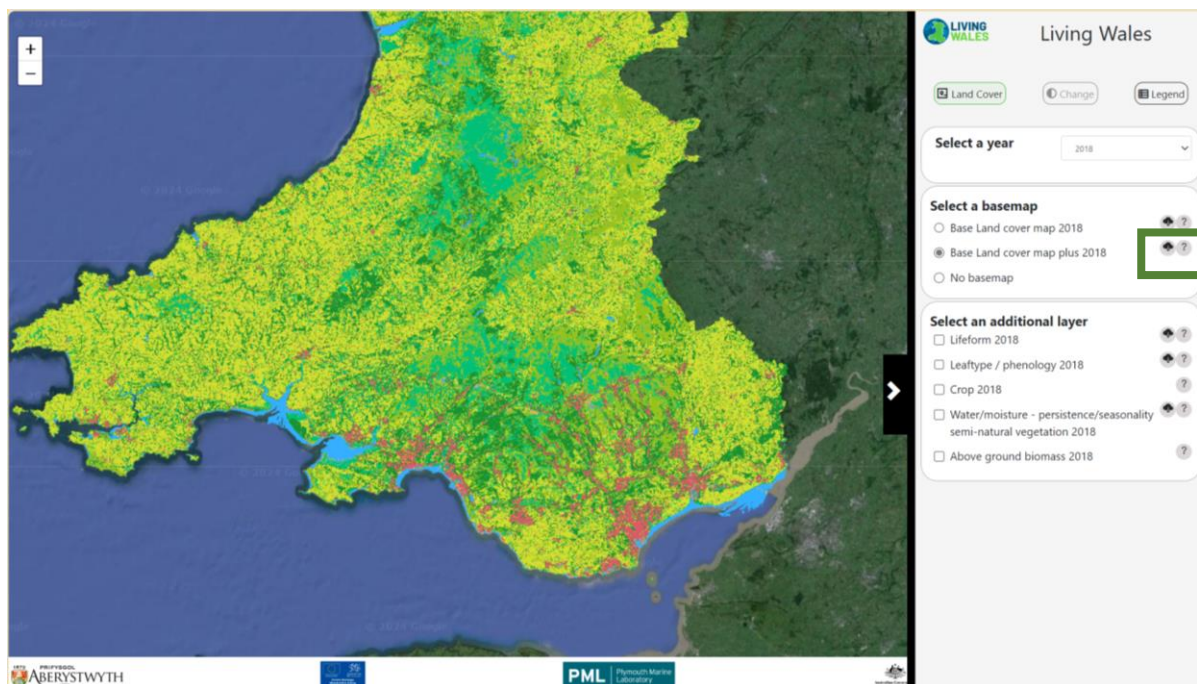
Activity 1 – Exploring Living Wales and downloading data for QGIS

For this first activity we will explore the LivingWales hub and download some raster data.

- 1) Click on: [Wales trees \(aber.ac.uk\)](https://www.aber.ac.uk/living-wales/).



- 2) Click on select year and choose '2018', then select 'Base Land cover map plus 2018' A new layer should appear across Wales at a resolution of 10m.
- 3) Explore this data layer. Click on the information '?' icon to find out more about it and the various classes of habitat it is showing.
- 4) To download the dataset as a tif, click on the download icon next to the selected layer. Save this .tif file in your OneDrive in a memorable place. *It should be called level3_plus_2018_cut.tif* and is 461MB so will take a few minutes to download.



- 5) Repeat the same steps for the land cover map for 2022 (Base Land cover map plus 2022). Download this .tif file to your OneDrive. The file should be called level3_plus_2022_cut.tif.
- 6) Next, start up QGIS and we will be importing these layers into a new project.

Activity 2 - Getting data for emissions.

Click on: [Glastir Woodland Creation - Scoring Layer - Air Quality | DataMapWales \(gov.wales\)](https://data.gov.wales/dataset/glastir-woodland-creation-scoring-layer-air-quality). This link will send you to DataMapWales where you will be able to download a map showing Air Quality in Wales. This data was compiled by the National Atmospheric Emissions Inventory (NAEI), and it uses 1km grid squares as a point source data, as well as road transport data. These inputs are compiled, averaged, and mapped across the UK, and are then split by source category and further split by pollutant. The specific layer used in this project is 'Total emissions <PM10', which contains emissions from 2012 using CORINAIR SNAP sensors and measures pollutants in particulate matter of less than 10µm.

Sources of PM10 in the UK include road traffic, industry, and power production. Results from numerous investigations of human respiratory and other diseases show consistent statistical associations between human exposure to outdoor levels of PM10 and adverse health impacts. **Vegetation intercepts airborne particulate matter (PM10), reducing concentrations in the air, thereby improving air quality.** This reduces the amount of PM10 exposure to humans and, in turn, can reduce the incidence of respiratory illness.

For more information, click on here: [Download emission maps - NAEI, UK \(beis.gov.uk\)](https://beis.gov.uk/data-downloads). In short, the data we are downloading air quality data that is grouped into categorical groups.

- 1) Navigate to Spatial data download and select 'Zipped Shapefile' and press download.

Use this data in another application

Please refer to the [licence](#) to understand the conditions of using this data.

OWS endpoints

[Copy WMS endpoint link](#)

[Copy WFS endpoint link](#)

Find out [how to use OWS \(WMS and WFS\) endpoints](#)

Spatial data download

Zipped Shapefile ▼

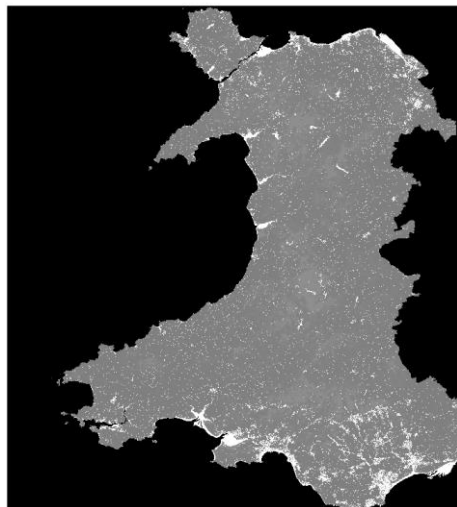
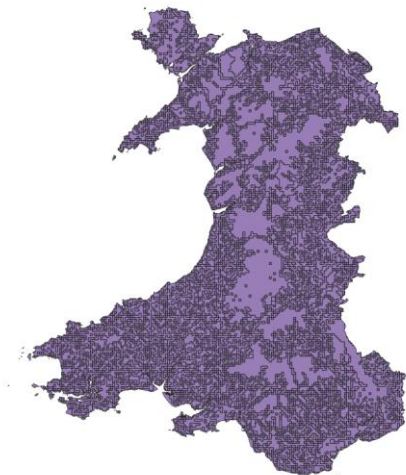
Download 

Metadata download

Select metadata format ▼

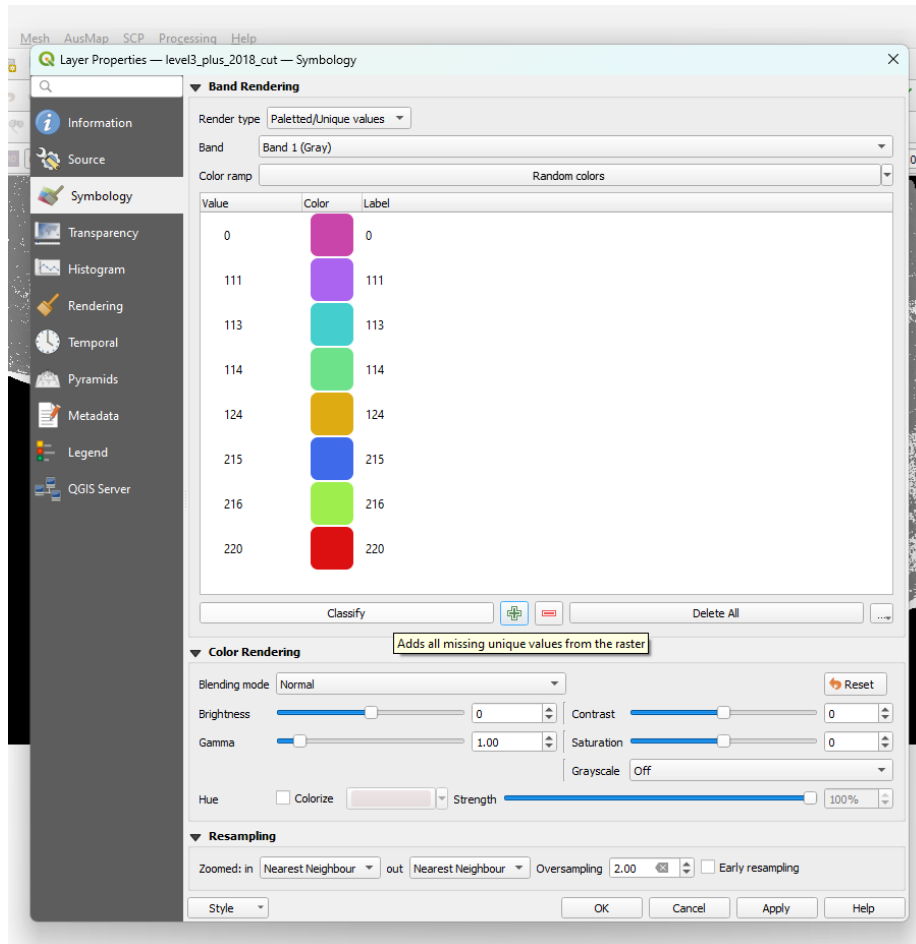
Download 

- 2) Save your zipped shapefile to your OneDrive, extract your files and also add this to QGIS. Your layers should look like the images below (with two for 2018 and 2022).

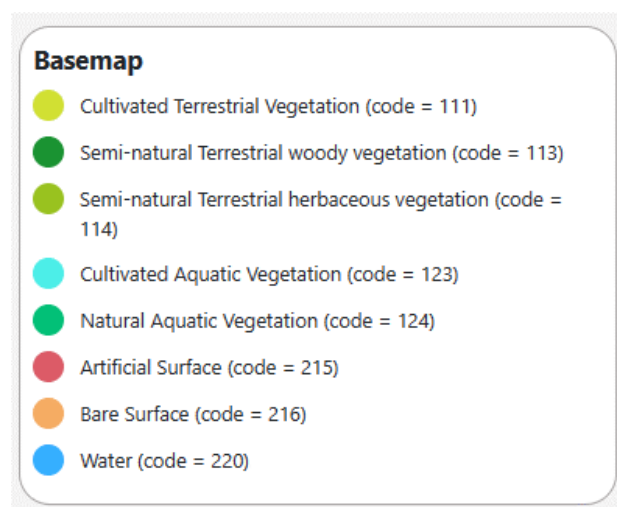


Activity 3 – Changing Map Properties

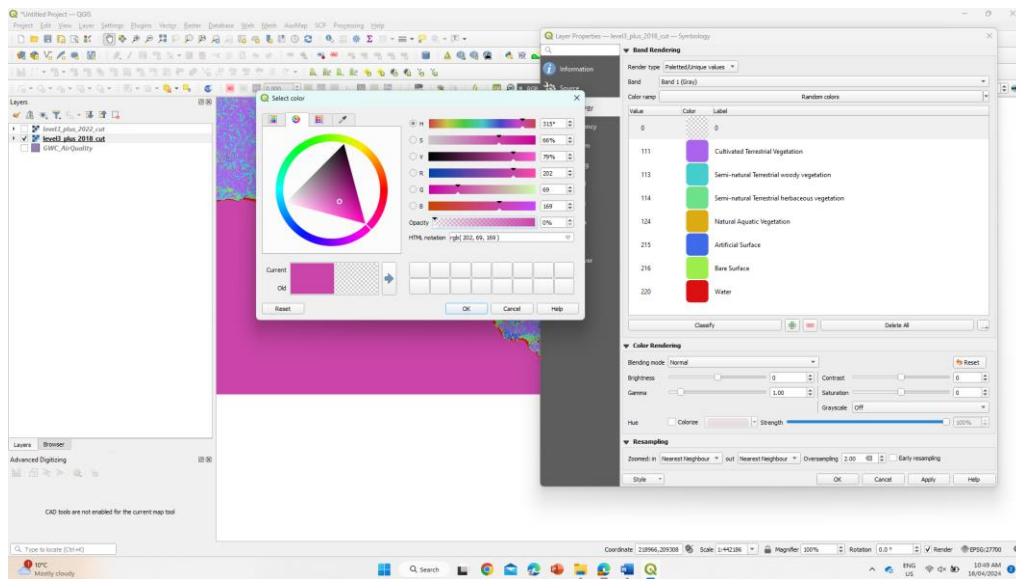
- 1) Right click on the Level3_plus_2018_cut layer. Select 'Properties'. Click on Symbology. Change the render type to Paletted/Unique values. Click on 'classify' and the unique values should now be displayed (as shown below).



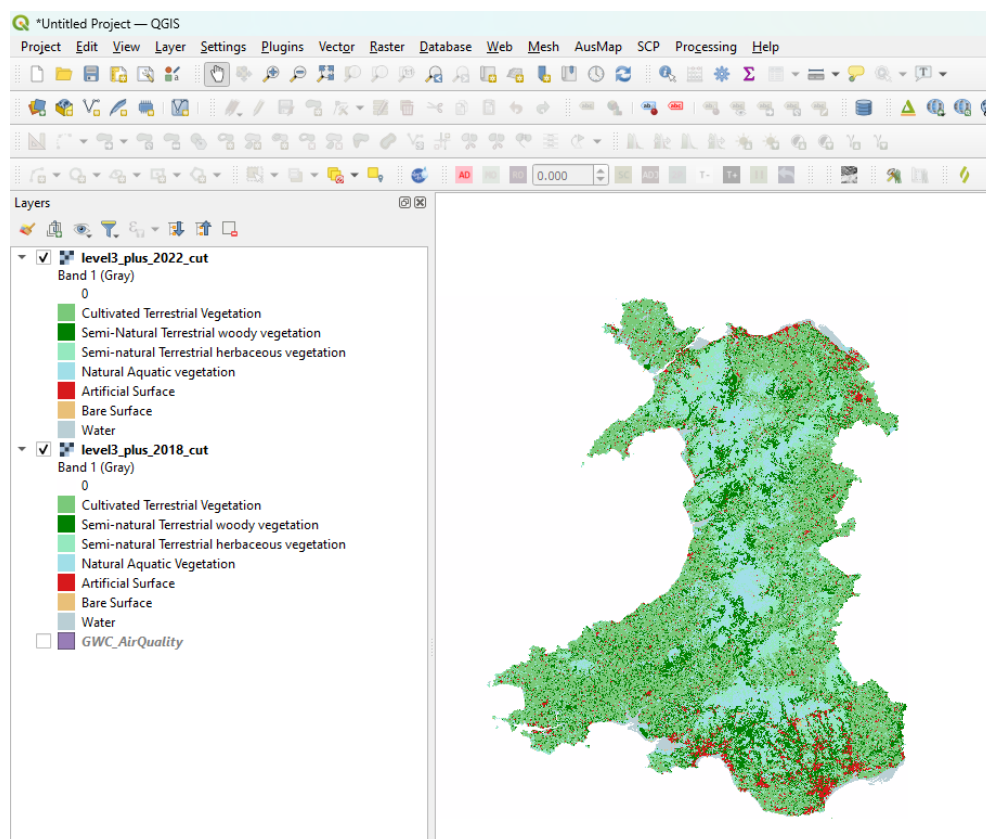
- 2) You will need to modify the 'Label' and the Colour for each value. A reminder of the codes and habitat is shown below:



- 3) You can also make the '0' label transparent by changing the opacity (as shown below).



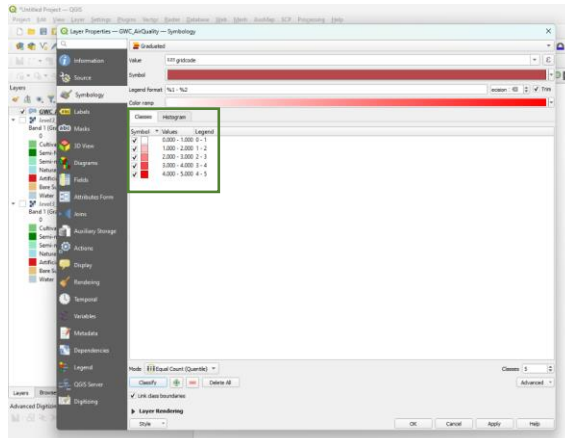
- 4) Repeat these steps for both the 2018 and 2022 tif files. You can choose whatever colour scheme you like but keep it consistent. An example output is shown below.



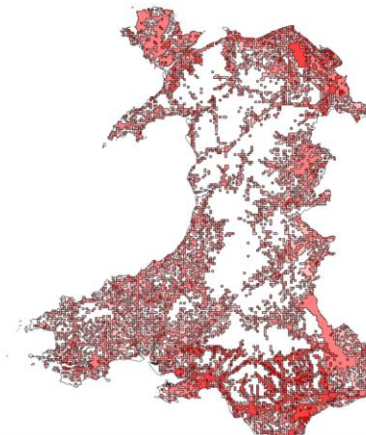
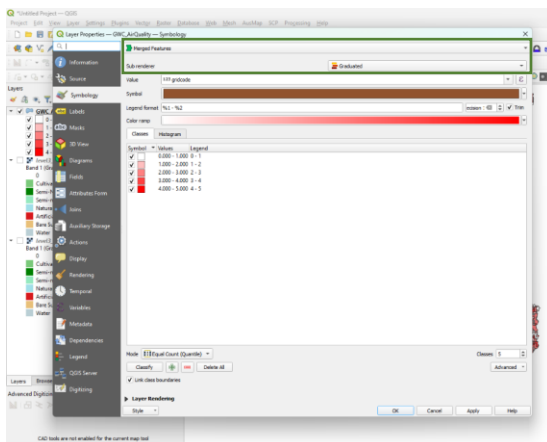
- 5) Do not forget to save your work.

Activity 4 - Changing the style of the GWC_AirQuality Map

- 1) Right click on your GWC_AirQuality Map layer and select 'Symbology'.
- 2) Select 'Graduated' and then make Value = GridCode. This means that you are setting a colour to correspond with each of the values in the GridCode.
- 3) Click on Classify and you should see the values and associated symbology appear (as shown below).



- 4) In this example a graduated colour scheme has been selected. Click 'Apply' and the output should look like the map shown above. You can tidy this map up a bit by selecting 'Merged Features' instead of graduated and select Graduated as a Sub-renderer (shown below).

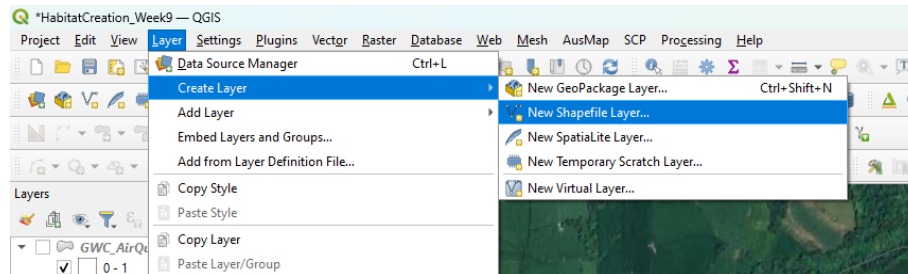


Can you notice a difference between the two methods?

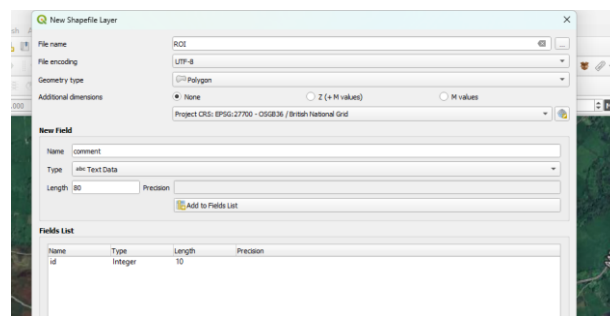
Activity 5 - Create a region of interest (ROI) and clip the Rasters by this extent

Next, we will be creating a Shapefile to highlight an extent that you are interested in. This could be your Habitat Location or a region with poor air quality (as observed in the previous activity).

- 1) Click on Layer and navigate to 'Create Layer', then 'New Shapefile Layer'.



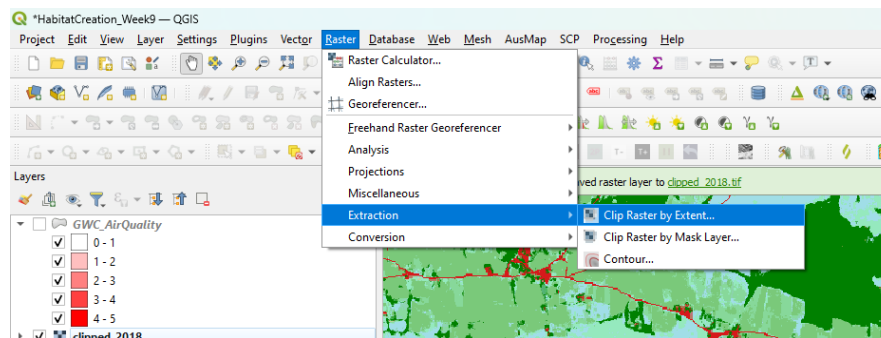
- 2) A new window will pop up called 'New Shapefile Layer'. Call it ROI and give it the geometry type of 'Polygon'. Ensure the project CRS is selected and save it to your OneDrive. Remember to do this you will need to click on the '...' icon next to the Filename.



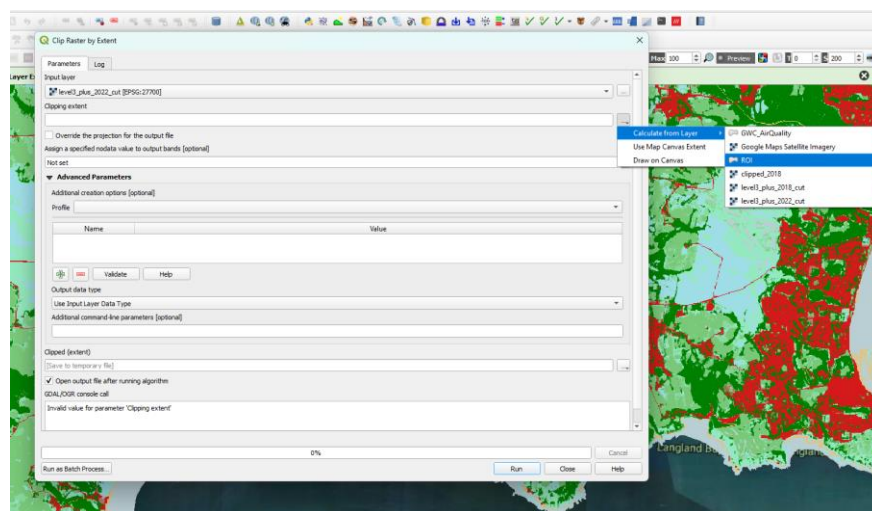
- 3) Press OK and use the edit tools to modify your empty Shapefile to create a 'Region of interest'. From here, each person will have a different region of interest and not everyone will have the same shape. After you have digitised your Shapefile you can customise how it looks. Here is an example shown below.



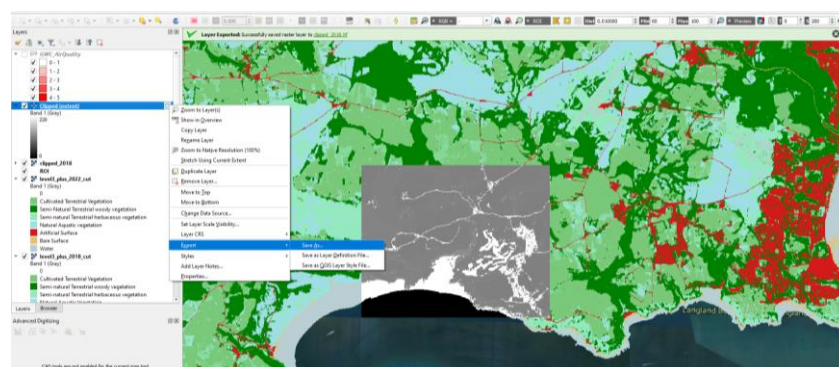
- 4) Once you have your Shapefile (ROI), this can be used to clip the raster file by its extent. To do this, click Raster < Extraction < Clip Raster by Extent.



- 5) A new window will appear. Select your input layer as your 2022 .tif file (Raster layer). Your clipping extent will be calculated from the Shapefile we have just created. Under Clipping Extent, select 'Calculate from Layer' and navigate to your ROI Shapefile.



- 6) Press 'Run'. After it has finished you will have a new (much smaller file) that has been clipped to your ROI. If this layer is temporary, remember to save it to your OneDrive (as shown below).

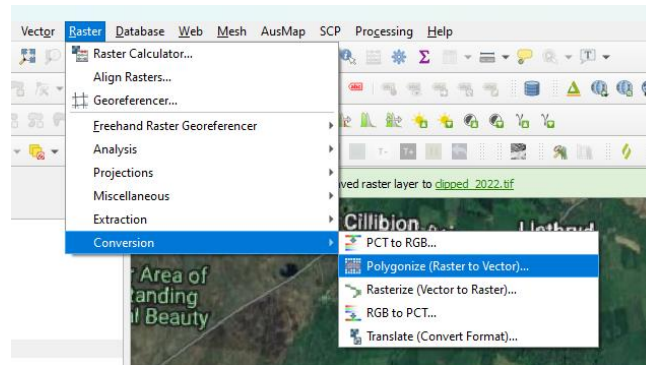


- 7) Repeat these steps for your other habitat Raster file (you will want 2018 and 2022).

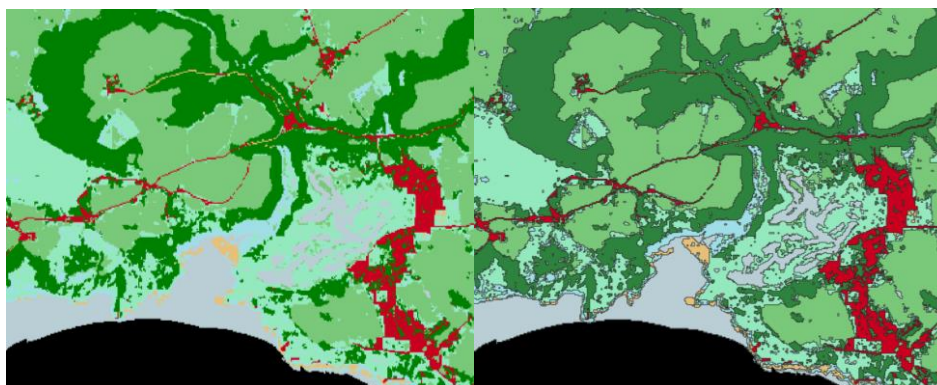
Activity 6 - Polygonising your Raster and calculating area

Next, we are interested in calculating the area of each habitat class in your ROI. This will be useful for your management plan (and for lots of other applications). It can tell you the area (m²) of each habitat type.

- 1) Click on Raster>Conversion>Polygonise. Select the raster file that you want to convert into Polygons.



- 2) This tool will essentially 'draw' around the raster grid cells to create a series of raster shapes. Repeat the Polygonising process for each of your years data (2018 and 2022). *You can also change the symbology of the Polygonised dataset to match your categories (as shown before in Activity 3, and visualised below).*



Can you see the difference between the two layers?

- 3) This dataset might look quite ugly, but now we are able to open the attribute table to the Polygonised layer and calculate the area for each habitat type. To do this we will open the Attribute Table and use the field calculator to calculate the Area of each habitat. Right click on the polygonised layer and select attribute table.

me know. Remember, once you have added these in excel, you may want to convert your figures into km² if it makes more sense. Remember 1 Square Meters (m²) is equal to 0.000001 Square Kilometers (km²). You can create a table in Excel of Habitat Classes (example shown below).

Habitat	2018 Extent (km ² or m ²)	2022 Extent (km ² or m ²)	Change (+/-)

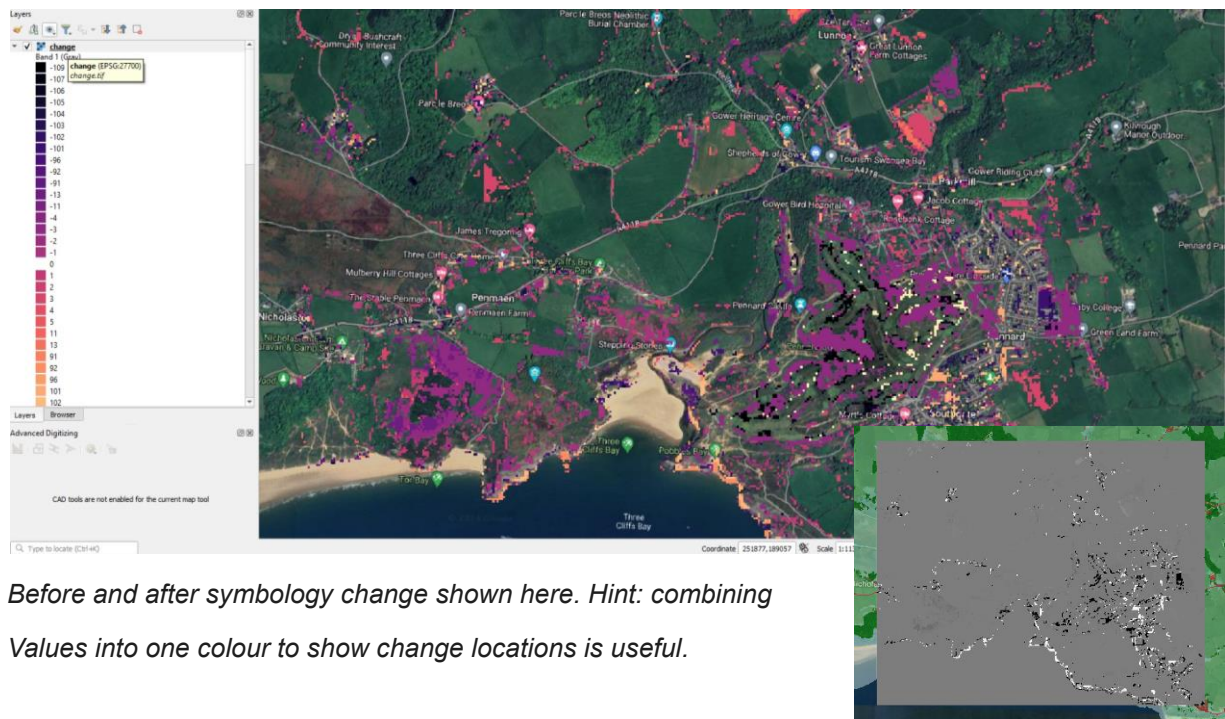
This methodology will also work for Phase1 surveys, flood extents, UKHab, whatever change you need to quantify between two different periods (or more).

Activity 7 - Comparing the visual difference between two extents

In this activity we will create a simple map to highlight where habitat change has occurred in your ROI. Your final output will be a side-by-side map of your ROI for 2018 and 2022. You can customise it to suit your needs (ie., add a scale bar, site names, grid, north arrow, legend, title, location, paths etc).



- 1) Sometimes the changes that have occurred may not be prominent and we may need to highlight change using the raster calculator. This method will just show areas of change, but there are more complicated ways of classifying these changes more precisely (as shown in the extension link).
- 2) Click on Raster calculator and subtract one raster file from another. As a reminder, the Raster Calculator in the Raster menu allows you to perform calculations on the basis of existing raster pixel values. Therefore, if you subtract one from another, you can highlight where change has occurred (see below).
- 3) Your initial output will be a greyscale singleband (shown below), but you can edit this to remove colour for anything = 0 (ie., no '+' or '-' change and therefore a change in habitat).



Before and after symbology change shown here. Hint: combining Values into one colour to show change locations is useful.

- 4) Use the Map creating tools we have looked at in previous sessions to create a final map of habitat changes. **Using this map and your area calculations what changes have occurred at your site?** Can you quantify these? Does visual assessment have any value? Or do you find quantifying the change in area more useful for your site?
- 5) If you complete this, you can also create new Shapefiles to propose any habitat restoration activities for your site. Do not forget to save your work.
- 6) If this was a breeze, you can also produce a final map of your AirQuality results from Activity 4. Well done!

Extension Activity:

Getting specific with your habitat changes spatially? What type of change has occurred (from one type to another):

[Land cover change detection using raster calculator in QGIS - Geographic Information Systems Stack Exchange](#)