

GIS and Habitat Management (ACBA 7005)

Visualising and using Raster Data

Aim

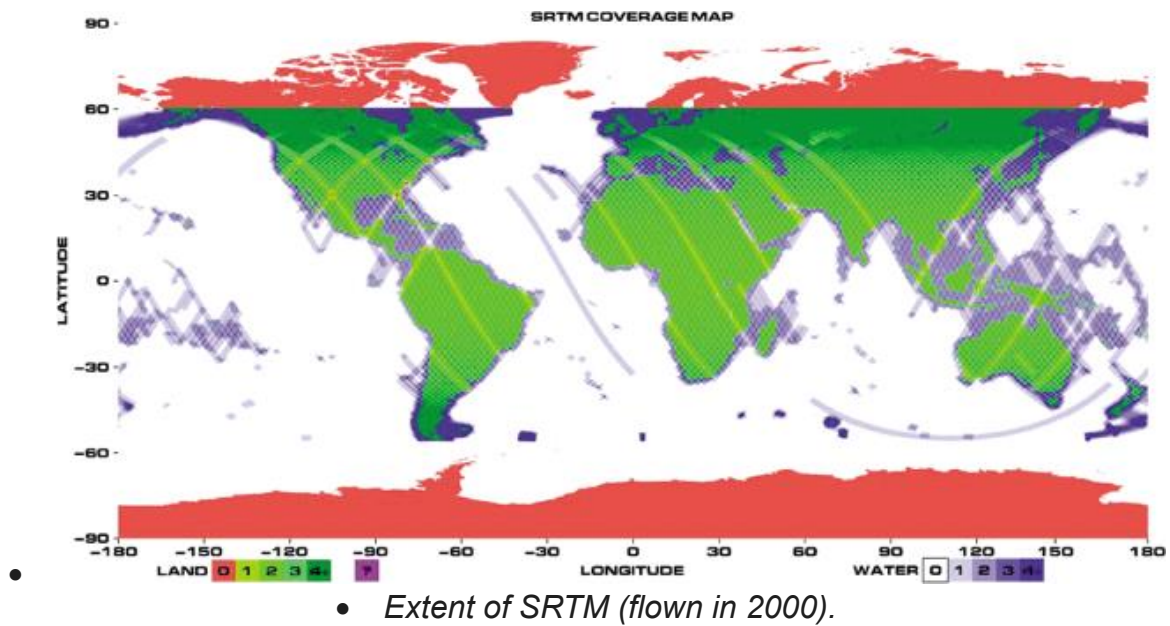
In this lab we will be continuing GIS tasks using raster files to explore elevation data, and the use of rasters to determine potential habitat niches.

Activity – Using Raster Calculator to create habitat specific queries



Image of a Dartford Warbler: [Dartford warblers | The Wildlife Trusts](#)

- 1) Using the SRTM data provided ("SRTM_Gower_BNG_10m.tif"), identify locations (sites) in Gower which would be suitable for the Dartford Warbler given the following criteria:
 - Elevation: Between 10 and 100 metres
 - Slope: On slopes greater than 5 degrees
 - Aspect: On south-facing slopes (between 120 and 240 degrees)



These three topographic variables will be calculated from the DEM, then, using thresholding, will be constrained to pixels that match these three criteria.

2) SRTM data is freely available via the USGS Earth Explorer website:

<https://earthexplorer.usgs.gov/>

- Note that the resolution is relatively coarse
- At 1 arc-second, per pixel, the resolution at the equator is about 30m.
- It will not provide clear definition of individual buildings or trees, but a generalised landscape-level terrain profile

EarthExplorer

There is system maintenance scheduled for Wednesday, February 21, 2024, from 7:00 AM to 2:00 PM

Search Criteria

Data Sets

Additional Criteria

Results

2. Select Your Data Set(s)

Check the boxes for the data set(s) you want to search. When done selecting data set(s), click the *Additional Criteria* or *Results* buttons below. Click the plus sign next to the category name to show a list of data sets.

☐ Use Data Set Prefilter (What's This?)

Data Set Search:

This data set list is cached for performance. If your user permissions have changed or you are not seeing an expected dataset, [click here to refresh your list](#).

- ☒ **Aerial Imagery**
 - ☒ AVHRR
 - ☒ CEOS Legacy
 - ☒ Commercial Satellites
 - ☒ Declassified Data
 - ☒ **Digital Elevation**
 - ☐ CoNED TBDEM
 - ☐ EDNA
 - ☐ GMTED2010
 - ☐ GTOPO30
 - ☒ GTOPO30 HYDRO 1K
 - ☐ IFSAR Alaska
 - ☒ **SRTM**
 - ☒ SRTM 1 Arc-Second Global
 - ☐ SRTM Non-Void Filled
 - ☐ SRTM Void Filled
 - ☐ SRTM Water Body Data
- ☒ **Digital Line Graphs**

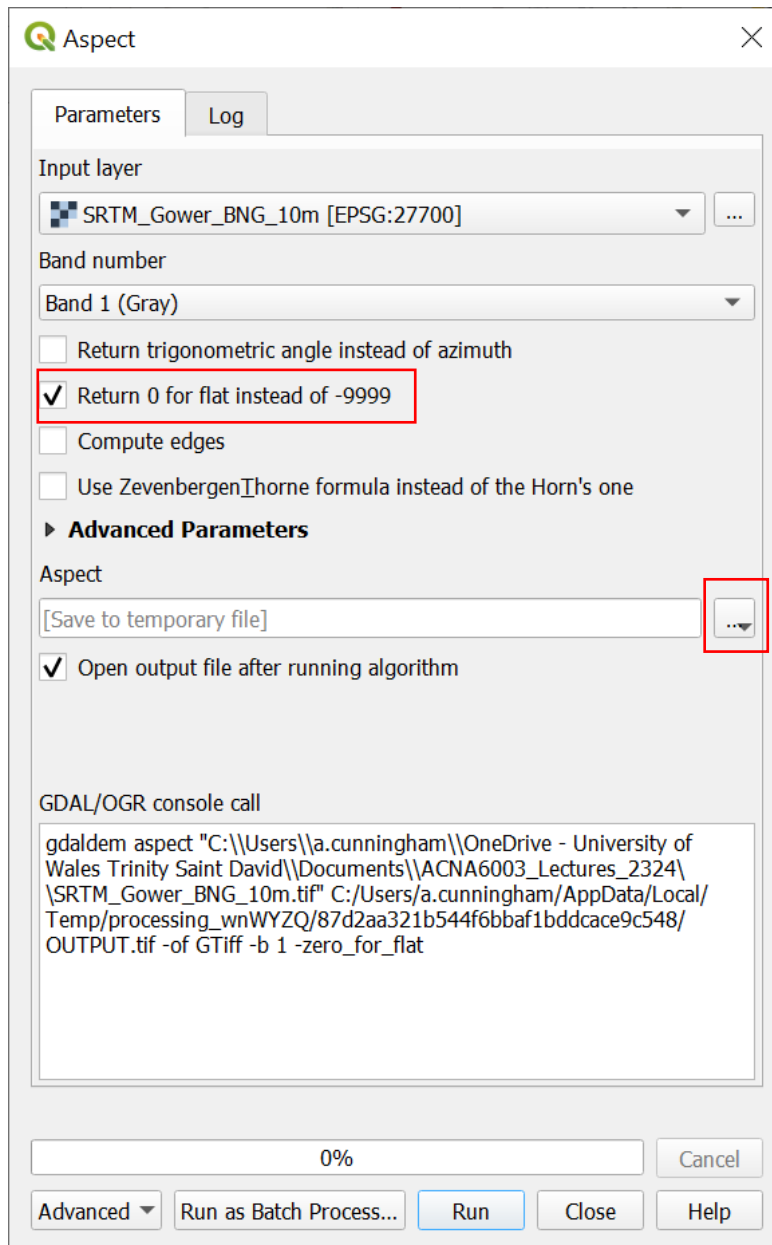
Search Criteria Summary (Show)

Aspect

3) Aspect: To calculate the topographic variables, use the following steps:

Either:

- 'Raster' drop-down menu > 'Analysis' > 'Aspect'
- Search 'Aspect' in the Processing toolbox and use the GDAL 'Aspect' function
- Provide the DEM provided as the input layer
- Specific the output file path (location) and filename



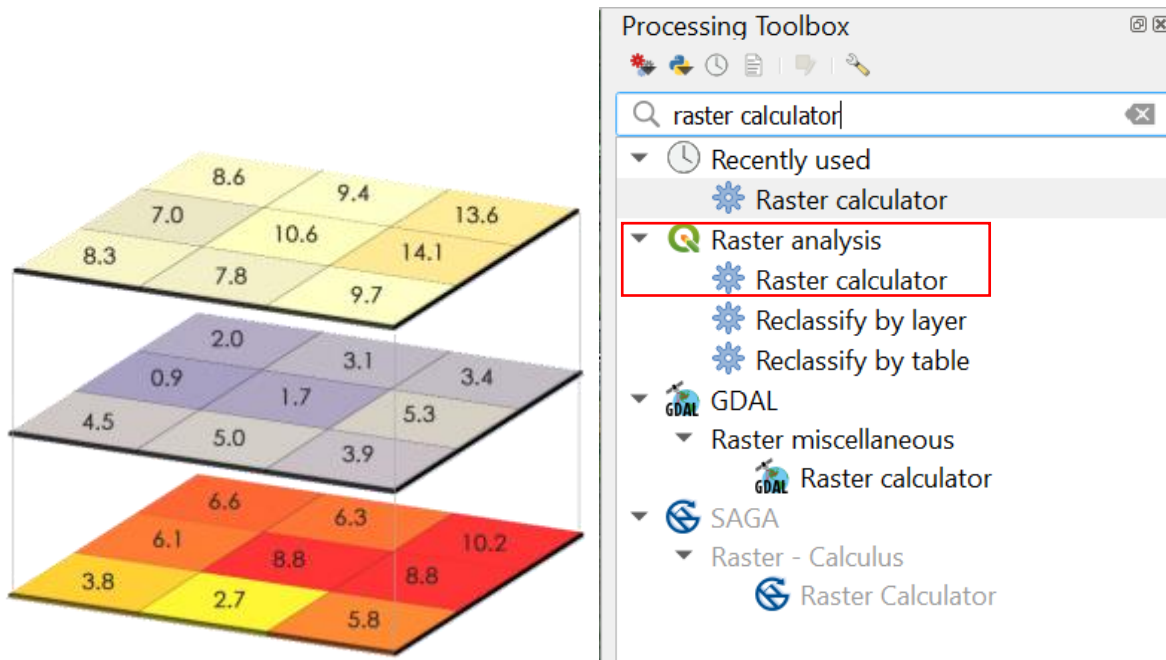
Slope

4) Either:

- 'Raster' drop-down menu > 'Analysis' > 'Slope'
- Search 'Slope' in the Processing toolbox and use the GDAL 'Slope' function
- Provide the DEM provided as the input layer
- Specific the output file path (location) and filename

Raster Calculator

- 5) As all the grids (Elevation, Slope, Aspect) align / match, they can all be assessed simultaneously to calculate the thresholded output, as all the pixels from each of the layers overlap. Therefore, a single equation can be used.
- 6) Search 'Raster Calculator' in the Processing toolbox and use the QGIS 'Raster Calculator' function



The equation (expression) can be entered once, using all three input variables.

- 7) Using the Raster Calculator:
 - Enter the expression in the Expression box
 - Be sure to specify a reference raster layer (use the original DEM, though any of the inputs will work also as they all have the same extent, pixel size and CRS).
 - Specify the output filepath and filename

Raster Calculator

Parameters Log

Expression

Layers

- Aspect@1
- Slope@1
- SRTM_Gower_BNG_10m@1

Operators

+	*	cos	sin	log10	AND
-	/	acos	asin	ln	OR
^	sqrt	tan	atan	(	)
<	>	=	!=	<=	>=
abs	min	max			

Expression

```
"Aspect@1" > 160 AND
"Aspect@1" < 220 AND
"Slope@1" > 5 AND
"SRTM_Gower_BNG_10m@1" > 10 AND
"SRTM_Gower_BNG_10m@1" < 100
```

Expression is valid

Predefined expressions

NDVI

Reference layer(s) (used for automated extent, cellsize, and CRS) [optional]

0 Input(s) selected

Cell size (use 0 or empty to set it automatically) [optional]

0.000000

Output extent [optional]

Not set

Output CRS [optional]

Output

Save to temporary file

☒ Open output file after running algorithm

0%

Advanced Run as Batch Process...

Run Close Help

Raster calculator

This algorithm allows performing algebraic operations using raster layers.

The resulting layer will have its values computed according to an expression. The expression can contain numerical values, operators and references to any of the layers in the current project. The following functions are also supported:

- sin(), cos(), tan(), atan2(), ln(), log10()

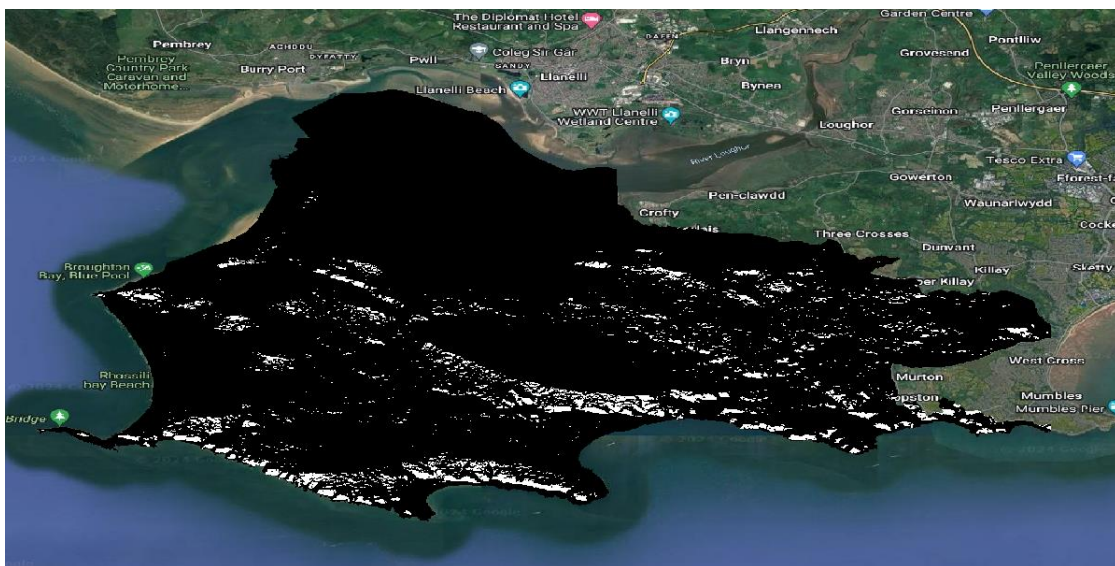
The extent, cell size, and output CRS can be defined by the user. If the extent is not specified, the minimum extent that covers selected reference layer(s) will be used. If the cell size is not specified, the minimum cell size of selected reference layer(s) will be used. If the output CRS is not specified, the CRS of the first reference layer will be used.

The cell size is assumed to be the same in both X and Y axes.

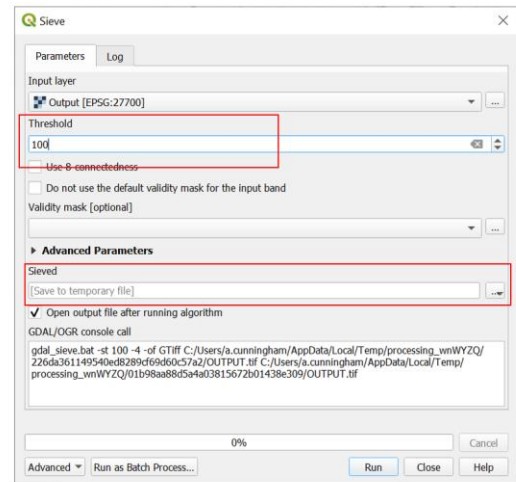
Layers are referred by their name as displayed in the layer list and the number of the band to use (based on 1), using the pattern 'layer_name@band number'. For instance, the first band from a layer named DEM will be referred as DEM@1.

When using the calculator in the batch interface or from the console, the files to use have to be specified. The corresponding layers are referred using the base name of the file (without the full path). For instance, if using a layer at path/to/my/rasterfile.tif, the first band of that layer will be referred as rasterfile.tif@1.

- 8) The output is a binary layer (1's and 0's) where all 1's meet all the criteria. However, the output is 'peppered' with isolated 1's which are not part of larger areas. Your extent should look like the image shown below:



- 9) Sieving is a useful tool for consolidating (cleaning) isolated pixel clusters into larger clusters with neighbouring pixels.

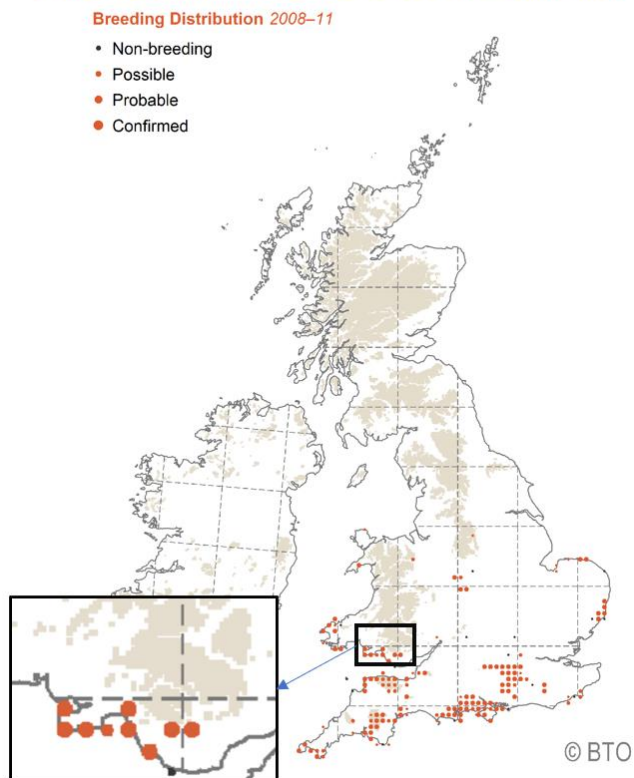


- 10) By making the no-data pixels transparent, using the Symbology function, you can now visualise the classified 'suitable habitat' pixels overlain on a basemap layer.



- 11) Your modelled raster output should reveal areas that match those of known sightings. Due to the protected nature of the bird (Schedule 1), precise locations are not given, but both National Biodiversity Network and British Trust of Ornithology reveal that this species is present on south and west Gower. Recent research to study the habitats of this species on Gower quotes both Rhossili and 'southern cliffs' as known locations: [Dartford warbler research - BSG Ecology \(bsg-ecology.com\)](http://bsg-ecology.com).

Dartford Warbler | BTO - British Trust for Ornithology



12) In this activity we have successfully utilised SRTM data to derived a site suitability map. This approach can be adapted for all sorts of habitat queries to derive habitat appropriate management guidelines.

Further examples of habitat suitability mapping (walkthroughs)

[Habitat Analysis using QGIS 3.22 and QuickMapServices Plugin - CUOSGwiki \(carleton.ca\)](#)

[8.4. Lesson: Supplementary Exercise — QGIS Documentation documentation](#)