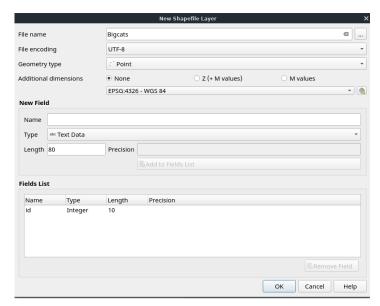


Multiple points can show the distribution of a phenomenon or observation

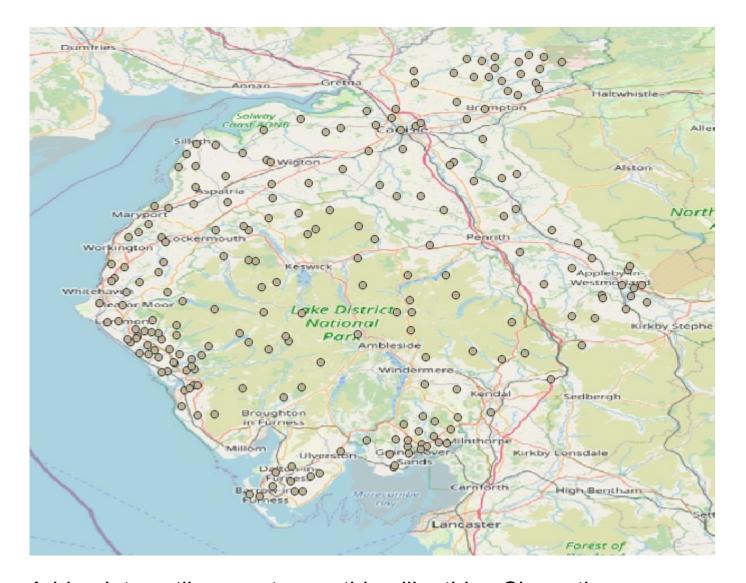
- We can add points directly to a map in a vector layer or...
- Import the data as a *.csv file with columns within that file providing the coordinates of the observation point.
- Here we will create a map simply by adding points semi-randomly around Cumbria to represent observations of big cats (or anything else for that matter – Aliens?).
- The video covers most of what is covered here. Note that images presented here and those of the video will vary slightly due to various iterations having been undertaken for both the video and tutorial.
- There are several techniques to get a good grid this lesson gives just a
 few pointers to get you started. It is deliberately a little convoluted to bring
 in a variety of techniques and to show a bit of problem solving.

Set up the new project and create a new vector layer

- Create a new project and call it "Bigcats".
- Set the CRS to WGS 84 as this gives coordinates in degrees of latitude and longitude.
- Set OpenStreetMap as your base map. Optionally add Cumbria shapefile (not shown here)
- Creat a new vector layer called "Bigcats" by going to: Layer/ Create late /new shapepefile layer.
- Ensure that geometry is set to Point and the CRS is WGS 84 – this gives us coordinates in degrees
- Now select the Bigcats layer and click on the Edit icon then Add points icon
- Now start randomly adding points. Press enter after each point to clear the Feature attribute box.
- If you make a mistake use the Vertex tool to select a point to move or delete



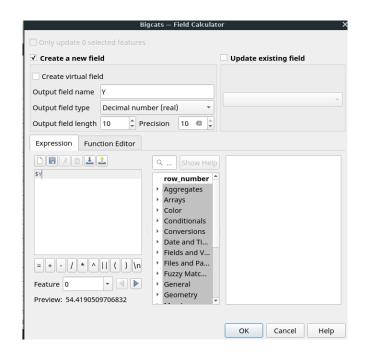
Shapefile setup should look like this

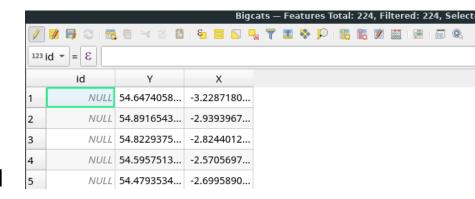


- Add points until you get something like this. Clump the distributions in places (the reason will become clear later)
- When finished press the Save icon
- Toggle off editing

Add coordinates to attributes table

- In Field calculator do the following:
- Enter the Output field name Y.
- Set Output field type to Decimal number (real), Precision 10.
- Insert formula \$Y in the Expression pane.
- Press OK and a new column will appear for the latitudes of each point.
- Repeat process but this time with the
 Output field name X and the formula \$X.
 This gives us a second new column with
 the longitude values tabulated.
- The attributes table should look like the image (bottom, right).
- Press Save and toggle off the editing and close the attributes table.

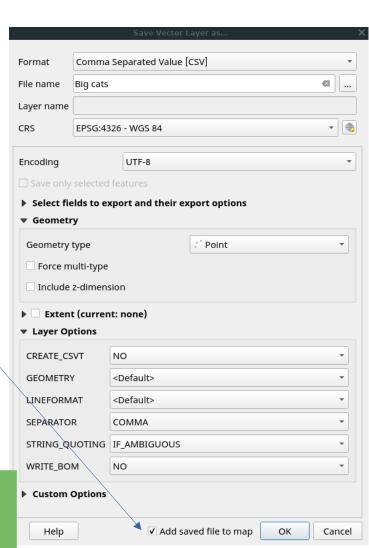




Now lets save this updated attributes table as a CSV

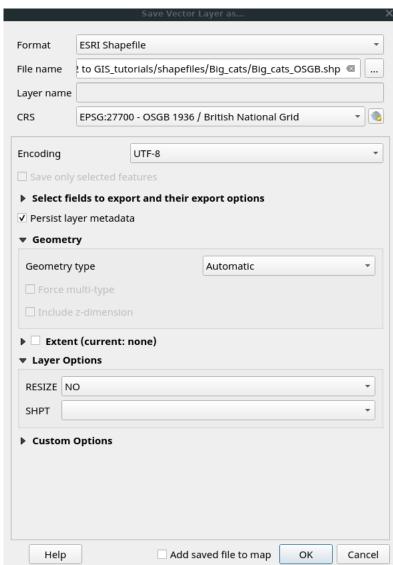
- Right click on the Bigcats layer and choose Export / Save features as.
- In the dialogue box choose Comma separated value, give your file a name and set Geometry type to Point.
- Uncheck the Add saved file to map box.
 We want to import it into the project in a different way so that QGIS knows where to look for the geometry of the points. If we leave this unchecked the file will be present in the project but the points will not appear

(We probably will not use this at the moment but it is nice to have the tabulated data in a spreadsheet form)



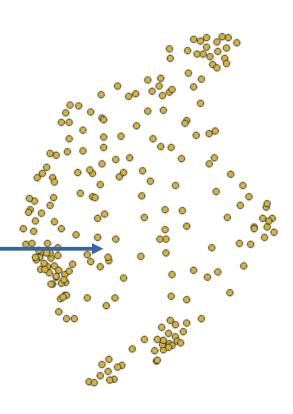
Let's get ready to create a grid – first some housekeeping

- Firstly, let us export our points to a new shapefile in the OSGB 1936 / British National Grid CRS.
- Right click on layer and choose Export
- The dialogue box to the left will appear
- Choose the options detailed here.
- The new shapefile will be in the new CRS.
 Remove the old version from the project.
- Now, to keep things tidy and prevent future angst, save the current project and close it.
- Open a new project call it "CatGrid" or similar and importantly...(I did not do this in the video).
- Go to Project / Properties and set CRS to OSGB 1936 / British National Grid CRS.



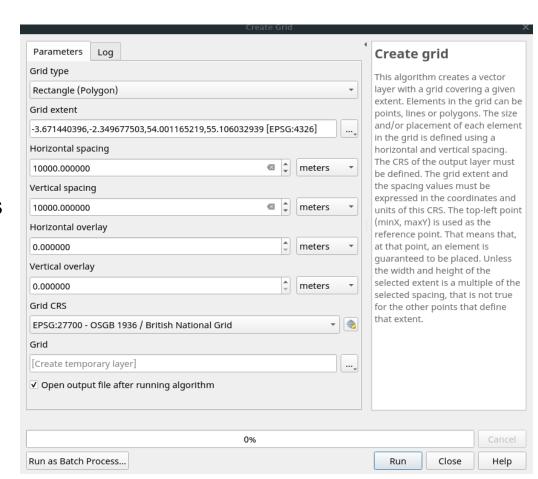
Keep things simple here

- After you have set up the new project in the desired CRS...
- Add the points you have just exported to the OSGB 1936 CRS (Layer / Add Layer / Add Vector Layer).
- No need for a basemap at this point we want to keep things very tidy to prevent any errors associated with CRS transformations.
- · Your points will just look like this.
- We are now going to create a new layer that will contain a grid that will overlay these points.
- Go to Vector / Research tools / Create a grid.
- The dialogue box on the next page will appear and ask you for a few settings.



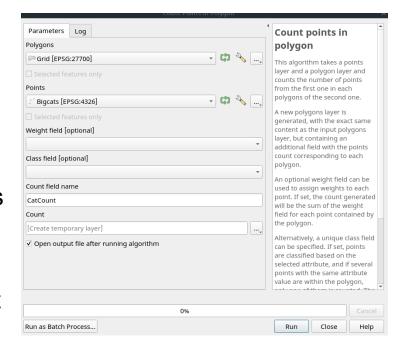
Setting up the grid

- Set the Grid type to polygon.
- CRS to OSGB / 1936 (this allows the grid to be produced in metres).
- Enter 10000 for each spacing (a 10 km grid).
- Choose Grid extent from the canvas and draw a box around all the points.
- Press enter and a coloured grid will appear as a new layer comprising of 10 km x 10 km polygons (they will not appear square, however).
- The new layer should be called "Grid". No need to save it as we will be using this grid to make further layers.



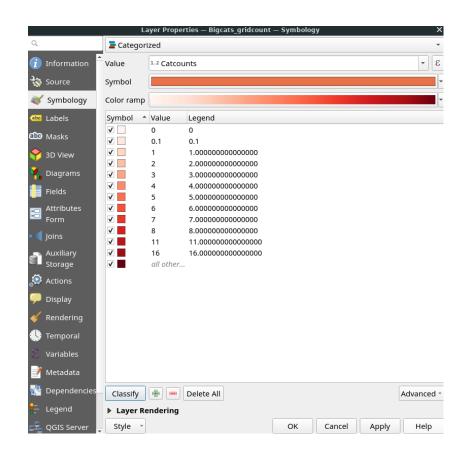
Now let's use the grid to capture the data in the points layer below

- Go to Vector / Analysis Tools / Count Points in Polygon.
- Fill in the dialogue in the same way as shown here.
- The Polygons drop-down needs to refer to the grid layer.
- The Points dropdown needs to be the layer with the points on (Bigcats).
- Rename the Counts field name to something meaningful if you want (here it is "Catcount".
- Press Run and a new grid layer ("Count")
 will appear that we can now go on to adjust
 so that the colour of each grid square
 represents the number of cat sightings
 within that area.



Use the layer properties to colour the grid cells

- Double click on the Count layer (or whatever the new grid that has done the counting is called
- The Layer Properties dialogue will open
- Do the following:
 - Set the drop-down box to Categorized (or Graduated – try both).
 - Value to Catcounts.
 - Colour ramp to Reds (or whatever colour scheme you like).
 - Press Classify and the various categories of counts will appear – in this instance all of them.
 - Press Apply to see the result. You can change the various settings until you are happy the press OK when you are done.

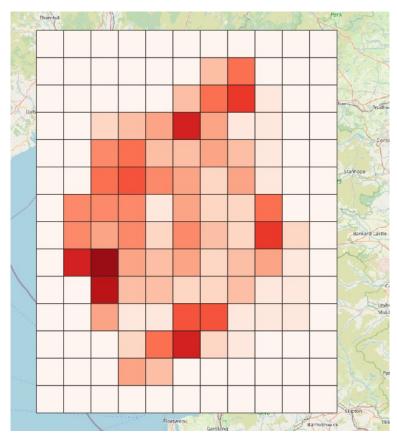


The first iteration of the map should look like this

It is OK but it would be nice to get rid of the cells with no data (i.e. those outside the boundary of Cumbria.

But we would like to retain the cells within the Cumbria boundary that have no sightings – we want to retain zero count and exclude cells with no data.

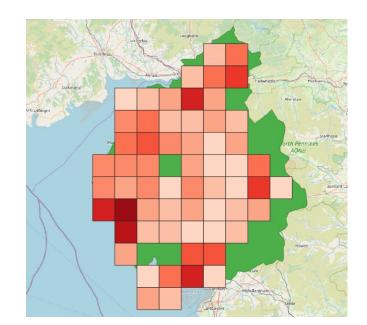
Let's explore a few ways to do this...



Modifying the grid 1. Remove Zero/Null value cells

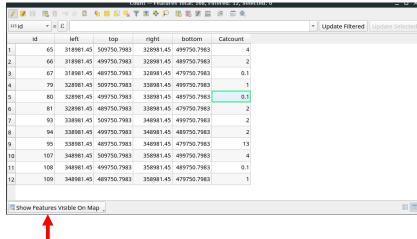
Open Layer Properties
Uncheck the tick next to the zerovalue.

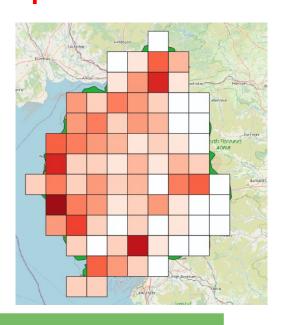
All the zero cells have gone but there are holes in the map. The zero count data is lost from the map. This, is, therefore, unsatisfactory...Let's try something different...



Modifying the grid 2. Add nominal values to attributes table

- Open Attributes Table.
- Zoom in to cells with no colour that are within the Cumbrian border.
- Select Show Features Visible on Map using the drop-down box at the bottom. Now only those cells you are looking at show up in the table.
- Toggle on editing and change the 0 values to 0.1 and then...
- Go to Layer Properties. A new category will have appeared at the bottom. Change colour to white, Value to 0.1 and Legend to 0.
- Uncheck the 0 value (at the top of the list of categories) again so that it is not plotted on the map.
- The map will now look something like this.

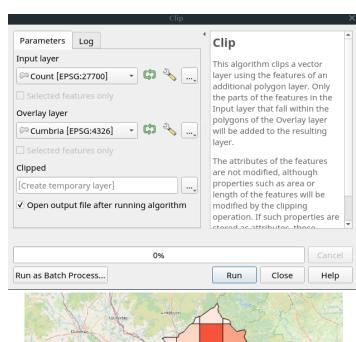


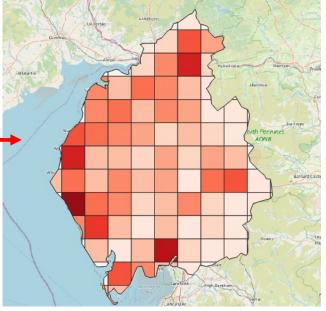


This is a "Heath Robinson" workaround...there are better ways....

Modifying the grid 3. Conduct a Vector Clip

- Add your Cumbria shapefile to the project (if it is not already there).
- Reinstate the full grid by going to Layer properties and checking the 0 Value again. The empty cells will reappear.
- Go to Vector / Geoprocessing tools / Clip.
- Set Input Layers to Count (or whatever your grid is called now) and Overlay layer to Cumbria (your Cumbria shapefile layer)
- Run the procedure and a clipped version of your grid will appear. Formatting will be lost!
- When reformatted, the clipped map will look something like this.
- This is getting better.
- Some gridded data retains a blocky look at the edges because the cells at the edges are not clipped. To achieve this we need to go back to basics.

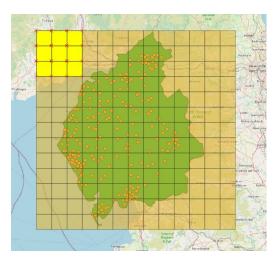


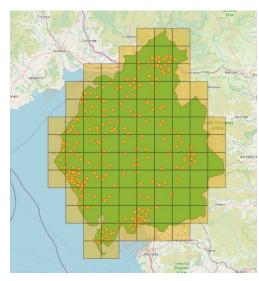


Method 4. Trim the grid before we start (maybe we should have done this first?).

- Create a new grid in the same way that the first one was made – Same size and place.
- Select this new grid layer and toggle editing on
- On the Selection toolbar* (see below) click on the leftmost icon and choose the top option (Select feature(s) from the drop down list.
- Set the grid to about ca. 50% opacity and use the mouse to select cells outside of the area of Cumbria (see top image).
- Press delete and repeat until all cells fully outside of Cumbria have been removed.
- The resulting grid should look like the bottom image.
- This grid can be used as before for the full grid. Save this one as we may use it again at a later date!

*If Selection toolbar is not visible go to View / Toolbars and check the box so it appears. Alternatively, right click on any toolbar to bring up the menu

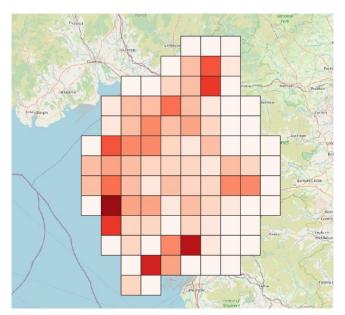




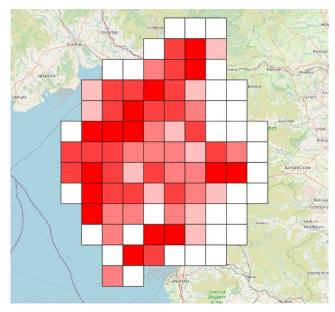
Other things to try

- When you have a colour scheme you like save it as a style file (menu found at bottom of Layer Properties dialogue). This can be used to change the various iterations of your grid to the same scheme without going through everything again.
- Experiment with other settings when in Layer Properties:
 - Instead of Categorized try Graduated. This may be a more appropriate way of display the data in this instance...then...
 - Change the Mode and/or Increase or decrease the number of categories. This gives lots of options to make the map look informative.

At some point we may compare our grid with ones from the OS



Finished map - Categorized



Finished map – Graduated (Equal Count (quartile))