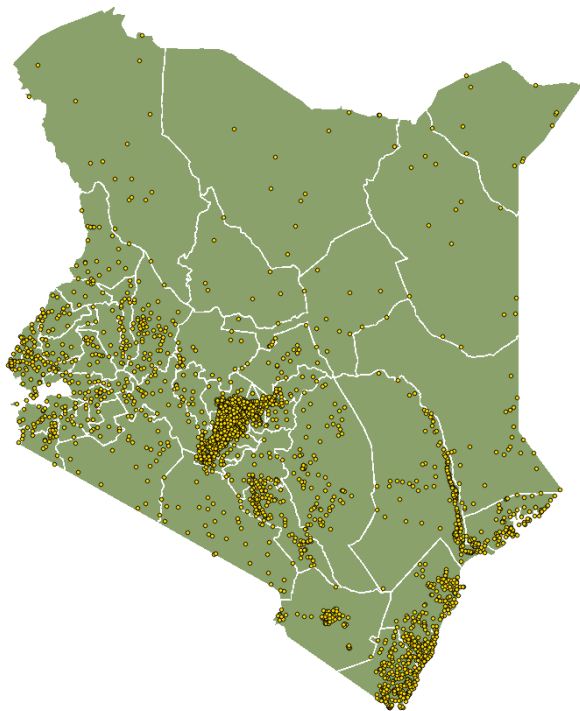


Exercise 3 – Working with the Map Window


Learning objectives: This exercise introduces ‘layer properties’ firstly as a means of managing your data layers, and secondly for symbolising your data to produce thematic maps. We shall be working with a range of spatial data themes for Kenya, including population, health and administrative districts.

Part 1 – Open an existing project file and adding background imagery

1. Open *Exercise3.qgs* from the same location as the project in the previous section (*C:\Intro_Quantum_GIS\Exercises*).
 - We will continue working with Kenya data; only the admin level 1 boundaries and settlements are currently visible.



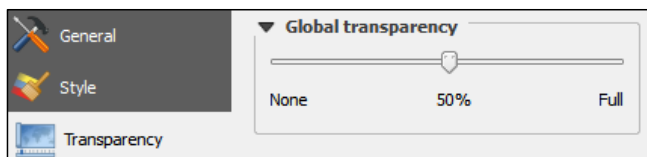
So far on this course we have worked solely with vector data. We will now use a raster layer to provide a context / background to our area of interest – this is a common use for raster data.

1. Add the following datasets to the QGIS project.
 - Click on the **Add Raster Layer** button.
 - Browse to the following datasets and click **Open**
 - C:\Intro_Quantum_GIS\Exercises\Data\Raster\True_Marble\TrueMarble_250m_E2_S_Africa.tif
 - C:\Intro_Quantum_GIS\Exercises\Data\Raster\True_Marble\TrueMarble_250m_E2_N_Africa.tif
 - The rasters will now appear in your Layers list, above the layer that is currently highlighted.
 - Move them to the bottom of the layers window, underneath the Kenyan boundaries.
 - Use the **zoom to layer** tool  or right click on the layer in the Layers window and select **Zoom to layer**.
2. You will notice that the Raster image is now obscured by the *Kenya_adm1* boundaries layer, let's apply transparency to the vector boundary data to see both layers.
 - Right-click on *Kenya_adm1* layer in the **Layers** window and select **Properties**
 - Explore the **Style** tab within the **Properties** menu for the *Kenya_adm1* layer and give it a transparency of 50% (hint: look for *Layer Rendering* section).
 - This will make your raster image visible and provide some geographic context to the admin boundaries

3. Now we'll add and set transparency on a raster layer

Transparency is particularly useful for raster layers as they can easily obscure data lying underneath them. You are now going to add a raster layer into the current project and configure the transparency so that it complements the existing satellite imagery layer.

- Click on the **Add Raster Layer** button.
- Browse to the following file and click **Open**.
C:\Intro_Quantum_GIS\Exercises\Data\Raster\Hillshade\hillshade.tif
- The raster will now appear in your Layers list, above the active layer, reorder it to be immediately above the *TrueMarble* group
- To show the *TrueMarble* imagery through the terrain raster that you have just loaded, open the Layer Properties of the *hillshade* layer.
- Navigate to the Transparency tab, and set the Global Transparency slider to 50%

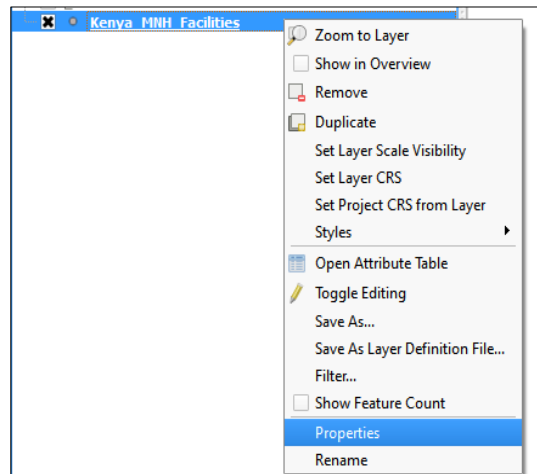


- Click OK. You should see that the *TrueMarble* imagery is now visible through the *hillshade* image, creating a nice terrain effect.

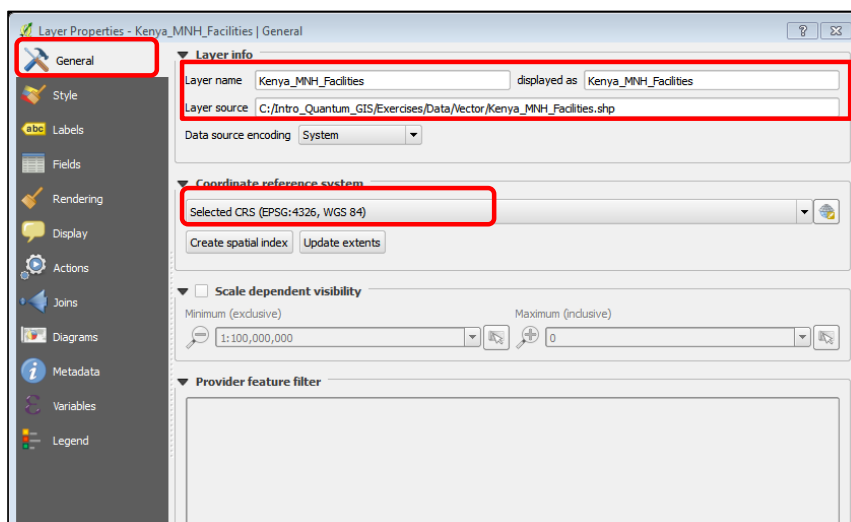
Part 2- Layer Properties & Styling data

When you set properties for a layer, they only apply to the current project - the layer properties do not change for other map projects. We will now explore the layer properties relating to Kenyan Health Facility point vector data

1. Open layer Properties
 - Click the tick-box next to *Kenya_geonames_PPL* to switch off visibility
 - Then tick *Kenya_MNH_Facilities* to switch it on
 - Right-click on *Kenya_MNH_Facilities* in the **Layers** window and select **Properties**



- Click on the **General** tab; this is typically the first place you should visit when working with new data; it provides useful information and functions such as
 - i. **Layer name**: this allows you to type in an alias for the dataset, if the given filename makes little sense; this is only a display name with QGIS and note that the underlying filename won't change
 - ii. **Layer source**: always useful to understand where the data is located
 - iii. **Coordinate reference system**: likewise, always useful to know what CRS is applied to the data

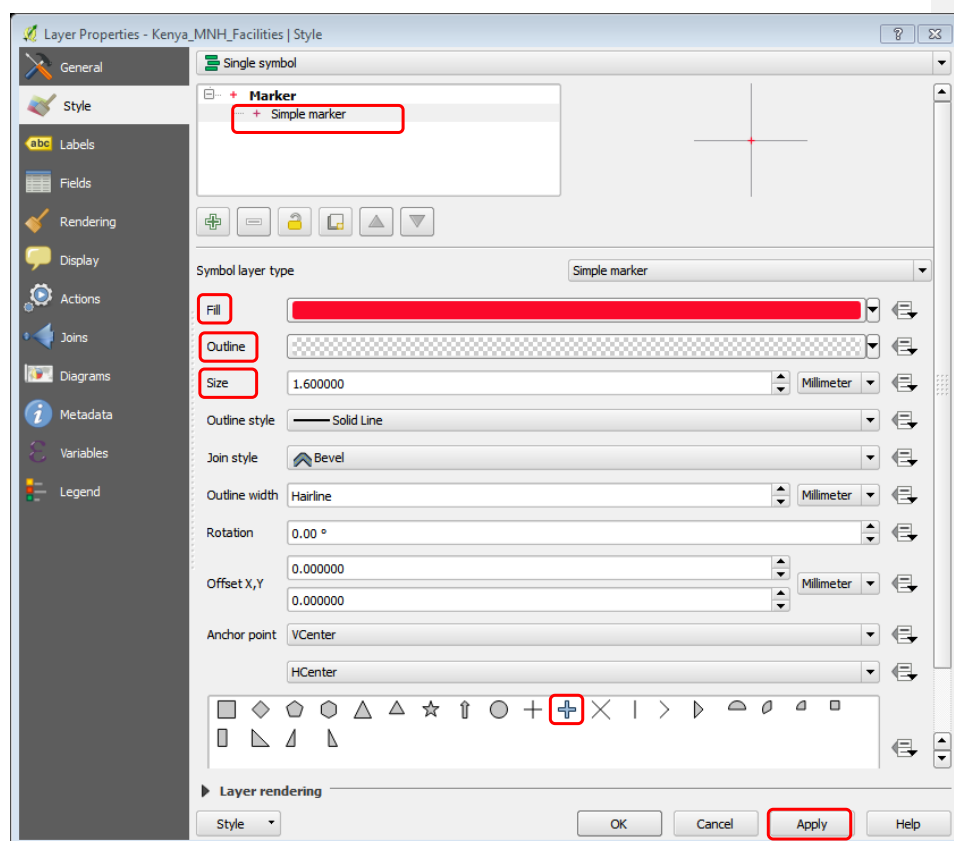


- Explore the other tabs available in the **Properties** window and experiment with the various features.

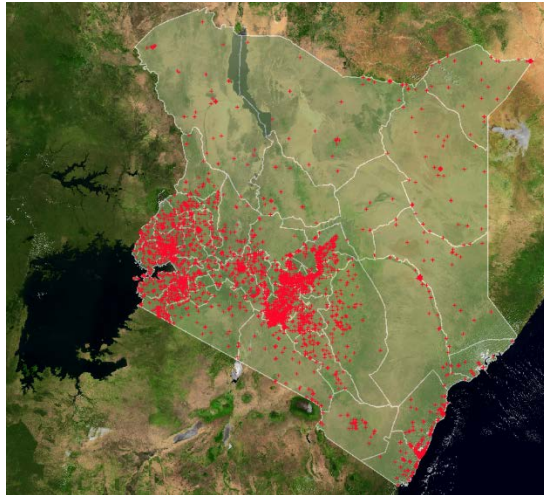
Styling data: when you add layers to a QGIS project, they are automatically assigned default colours and styles. These are simple symbologies with all features represented in the same way.

Often you will want to override the default and assign a particular style and colour to the features within your layer and this is done using the **Style** tab of the **Layer Properties** dialog.

2. Apply simple styling to vector data
 - Select the **Style** tab in the layer **Properties** window for *Kenya_MNH_Facilities*
 - Highlight **Simple marker** in the top of the window
 - In the bottom of the window, select the cross symbol
 - Change the **Fill** colour to red
 - For **Outline** select **Transparent fill**
 - For **Size** select 1.6
 - Click **Apply** and inspect the new data style in the map window



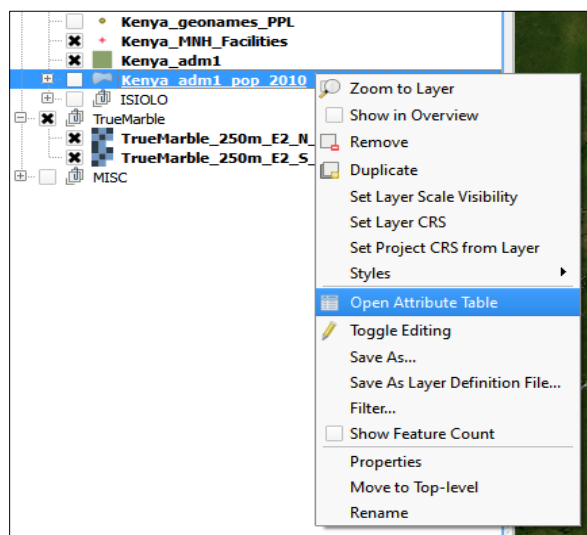
- Feel free to style the data as you wish, indulge your cartographic flair



Part - 3 Creating thematic maps and saving out style files

The simple data styling in the previous section is sufficient for some mapping tasks but before long you will want to apply more detailed styling, or *symbolology*, to draw more insight from your data. Thematic maps, i.e. mapping to a theme, apply different styles to features in the data according to variables in the attribute table. We will now change the symbology of the *Kenya_adm1_pop_2010* data to represent variable population counts in Kenyan counties

1. Open the attribute table for the *Kenya_adm1_pop_2010* layer.
 - Right click on the *Kenya_adm1_pop_2010* layer in the **Layers** window and select **Open attribute table**.



Kenya_adm1_pop_2010 :: Features total: 47, filtered: 47, selected: 0

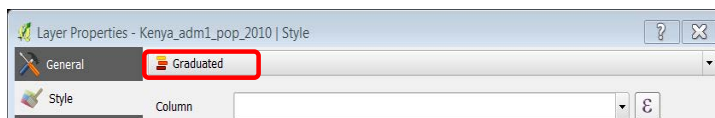
	AREA_NAME	GEO_MATCH	COUNTRY	ADM1_NAME	ADM_LEVEL	COMMENT	FIPS_CODE	BTOTL_2010	B0004_2010
1	MOBASA	KENYA_MOBASA	KEN	MOBASA	1.000000	Coast	KE37	993133.000000	144472.000000
2	MIGORI	KENYA_MIGORI	KEN	MIGORI	1.000000	Nyanza	KE36	963125.000000	204183.000000
3	UASIN GISHU	KENYA_UASIN GI...	KEN	UASIN GISHU	1.000000	Rift Valley	KE52	950733.000000	157826.000000
4	BOMET	KENYA_BOMET	KEN	BOMET	1.000000	Rift Valley	KE11	948238.000000	171734.000000
5	MURANGA	KENYA_MURANGA	KEN	MURANGA	1.000000	Central	KE38	932184.000000	123193.000000
6	MAKUENI	KENYA_MAKUENI	KEN	MAKUENI	1.000000	Eastern	KE32	927752.000000	146642.000000
7	TURKANA	KENYA_TURKANA	KEN	TURKANA	1.000000	Rift Valley	KE51	909495.000000	130899.000000
8	NAROK	KENYA_NAROK	KEN	NAROK	1.000000	Rift Valley	KE41	904739.000000	194338.000000
9	SIAYA	KENYA_SIAYA	KEN	SIAYA	1.000000	Nyanza	KE46	884503.000000	164099.000000

Show All Features

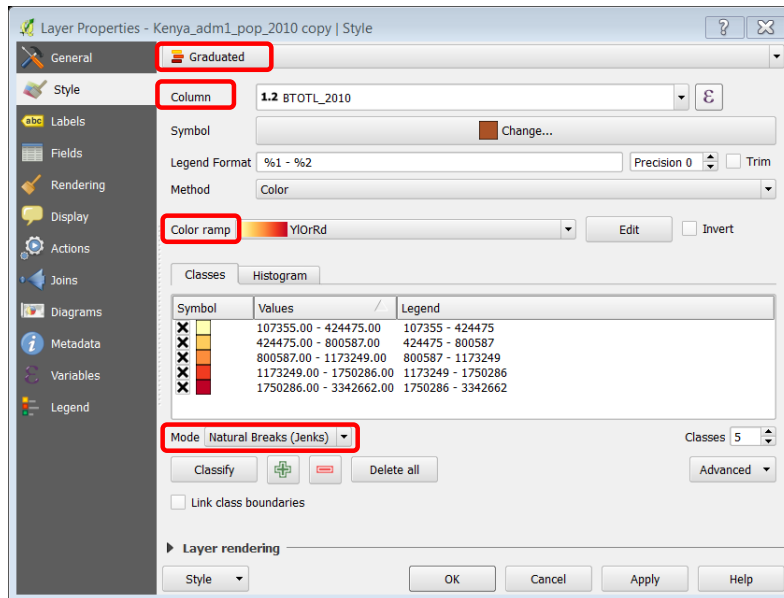
- Scroll along the attribute table until you see a column called **BTOTL_2010**. This column shows you the total population counts for each admin 1 'county' in Kenya for 2010. If you click on the field header **BTOTL_2010** the table will sort by ascending values; click again to reverse the sorting. This is a quick way up to understand min/max values for numerical data.
- You will use the **BTOTL_2010** column to symbolise the **Kenya_adm1_pop_2010** layer.
- Close the attribute table.

2. Symbolise the *Kenya_adm1_pop_2010* layer by total population.

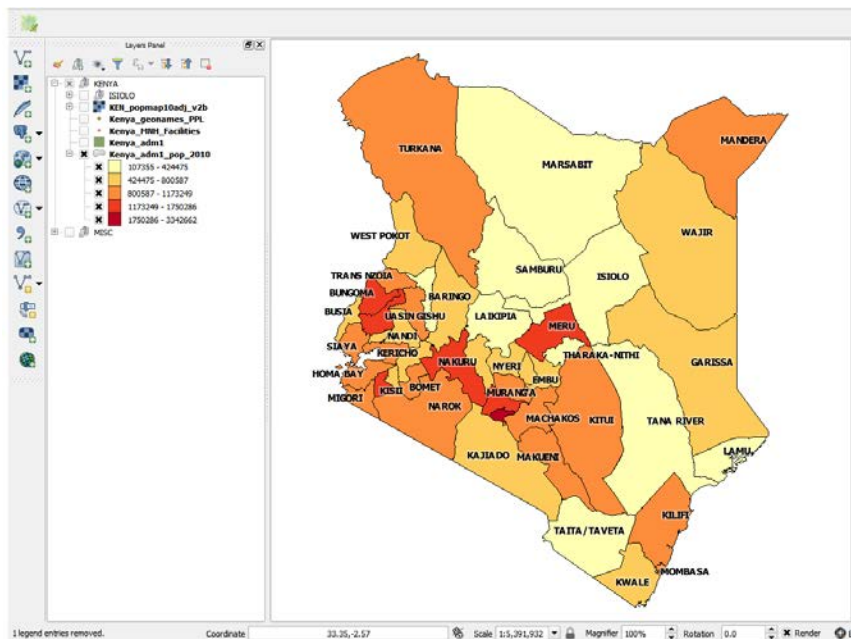
- Firstly, to avoid confusion, switch off the *Kenya_adm1* layer and *Kenya_MNH_Facilities* layer. Check the tick box next to each layer to make them invisible.
- Now make the *Kenya_adm1_pop_2010* layer visible
- Right click on the *Kenya_adm1_pop_2010* layer in the **Layers** panel and select **Properties**.
- Click on the **Style** tab.
- From the dropdown menu that currently displays **Single Symbol**, select **Graduated**. This selection option determines how the features in the dataset will be styled or 'symbolised.'



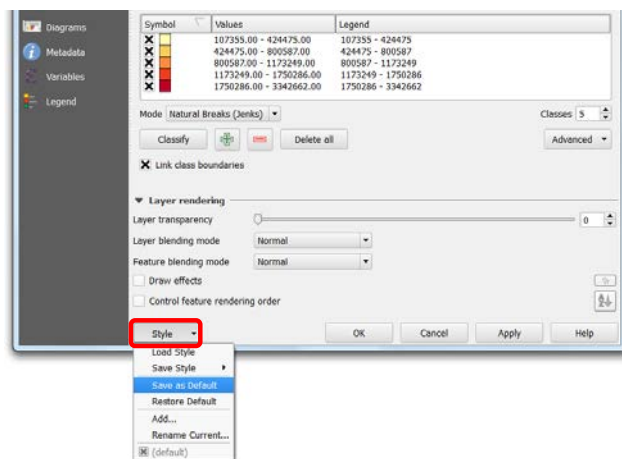
- In the new layout that appears, click on the **Column** dropdown menu, and select **BTOTL_2010**.
- From the **Color ramp** menu select an appropriate colour option or follow the suggested style below
- For **Mode** (i.e. classification mode) select Natural Breaks (Jenks); the **Classes** window will then display the value bands (if it doesn't respond at any stage, click **Classify**)
- Look at the various options available in the **Mode** drop-down menu; different modes are employed to display different types of data and also to draw out specific trends in the data; consequently visualisations can vary enormously – experiment with these options and see how the map changes
- Click **OK**



- You will see that the Kenyan counties have been re-symbolised and display variable population counts across the country, with the value bands defined in the legend (in the Layers Panel)

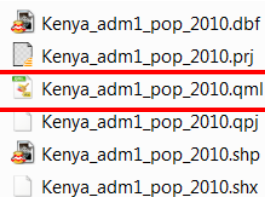


3. Save the symbology you have created for the *Kenya_adm1_pop_2010* dataset.
 - Right click on the *Kenya_adm1_pop_2010* dataset in the **Layers** window and select **Properties**.
 - Click on the **Style** tab.
 - Click on the **Style** drop-down menu in the bottom-left of the window.
 - Click **Save As Default**.



- Click **OK**.
- This will create a new file in the same folder as the population dataset. The file will have the same name as the dataset, but it will have a file extension of .qml. Confirm this for yourself by browsing to the data files in Windows Explorer:

C:\Intro_Quantum_GIS\Exercises\Data\Vector\WorldPop



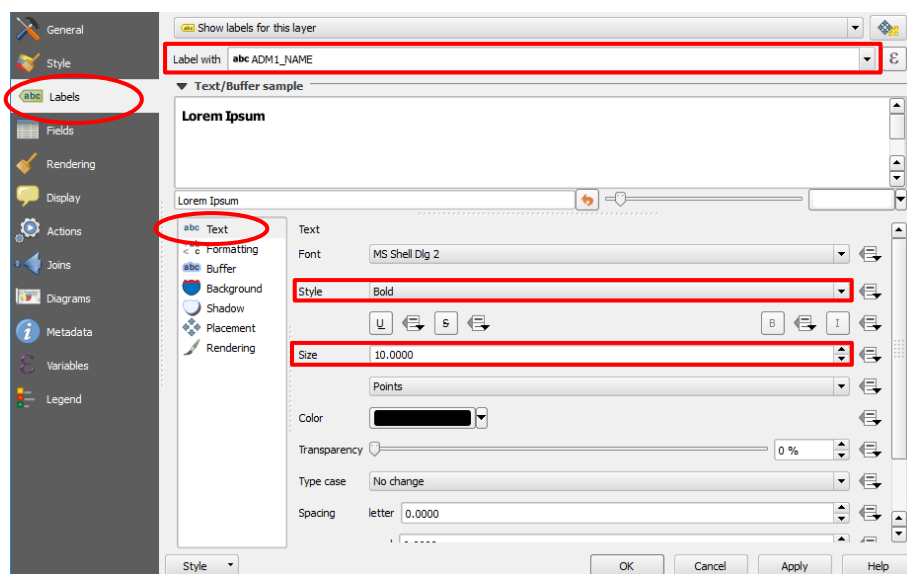
Commented [HD1]: Path has changed to
C:\Intro_Quantum_GIS\Exercises\Data\Vector\USCB

- When you load this dataset into a new QGIS project, it will now automatically symbolise itself as it will pull the symbology information from the .qml layer.
- If you had a second population dataset with the same table fields (BTOTL_2010 in this case), you could load this .qml file into QGIS to symbolise your other dataset; this option is available from the same **Style** drop-down menu – **Load Style**; this is an efficient way of ensuring mapping consistency within an organisation or project

Part 4 - Labelling features

In this part you will label Kenyan Counties on the map, followed by a *Further Work* section which illustrates a very powerful aspect of QGIS map labelling, modifying labels to use different size text depending on values in the attribute table

1. Label the *Kenya_adm1_pop_2010* layer
4. Right click on the layer and select Properties. Click onto the Labels tab:



- From the topmost drop down menu select "Show labels for this layer". This enables label drawing for this layer.
- In the **Label with** dropdown, select the **ADM1_NAME** attribute
- Click the Apply button, and you should see labels appear on the map.
- With the **Text** option highlighted, as above, change the **Size** to **10**, and **Style** to **Bold**
- Experiment with the settings in the lower half of the label dialog such as Buffer, Shadow etc. Clicking Apply instead of OK will allow you to see the effect of your changes without closing the dialog.

Advanced feature: data-defined labelling

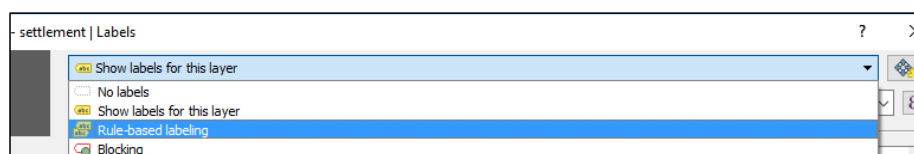
We will now create rule based labels for a settlements layer. We will configure QGIS to change the label style depending on the type of settlement.


1. Use a saved bookmark to re-position the map

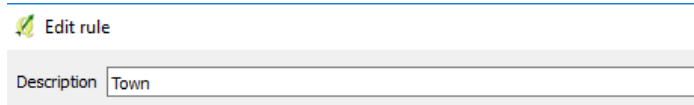
- From the main toolbar select **Show Bookmarks**

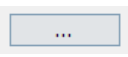


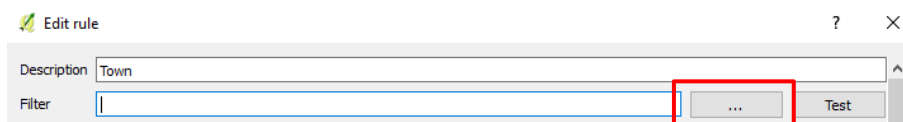
- In the **Spatial Bookmarks Panel** that appears, double-click *Isiolo County* to shift the map view to our area of interest
- Now go up to the **Layers Panel** and click the tick box to the left of *ISIOLO* group folder, to reveal the layer *Isiolo_settlements* on the map window
- Drag the *ISIOLO* group folder to the top of the layer list, unless it is there already
- Expand *ISIOLO* group folder to reveal *Isiolo_settlements* layer; now right-click the layer and select **Properties**
- Click onto the **Labels** tab
- From the topmost drop down menu select "Rule-based labelling". This allows you to create different labels based on rules that you define using the attributes of the layer (e.g "type" = "Town" to have size text 10 etc.)



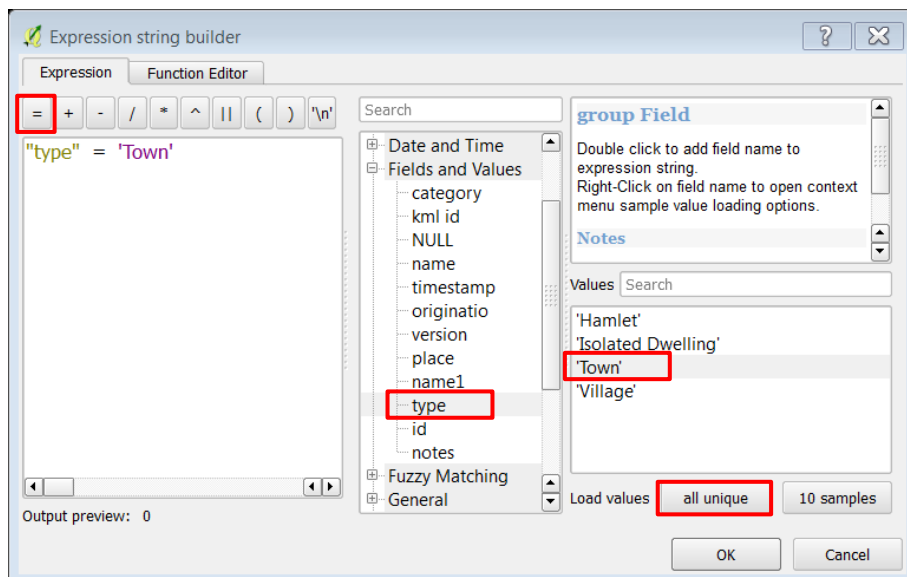
- Click on the  icon to the bottom left hand side of the labelling dialog box. This allows you to add a new rule.
- A new pop up dialog box will appear. For the first rule we will create text for the *Towns* within the settlement dataset. Type *Town* into the Description :



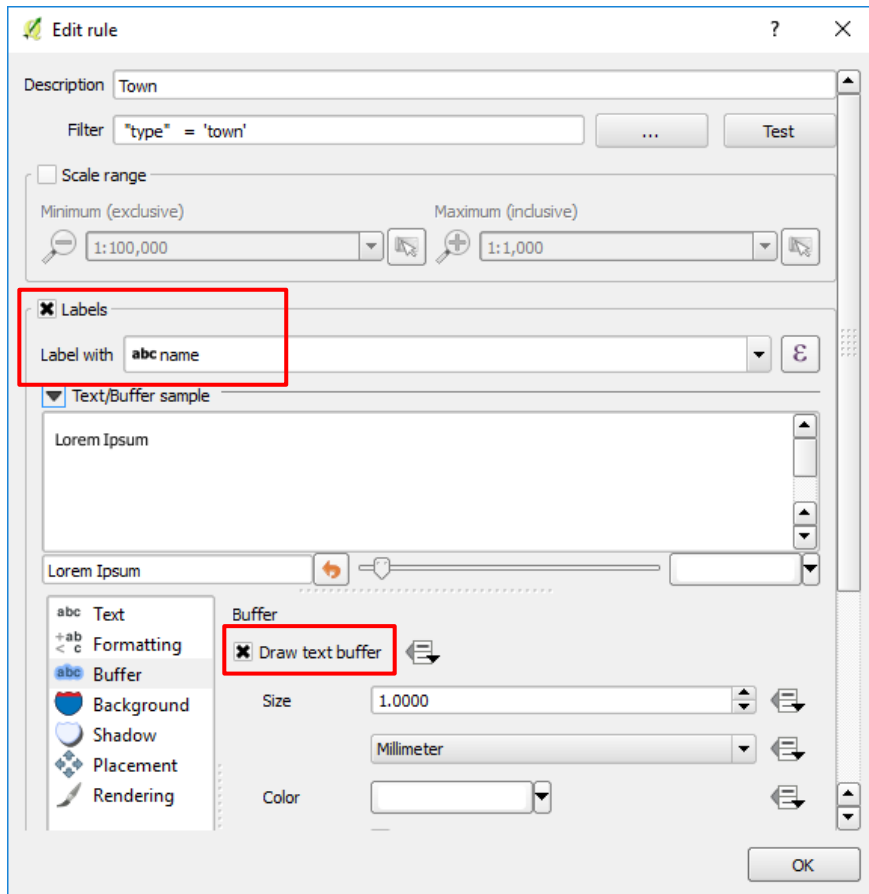
- To the right of Filter click on the  button.



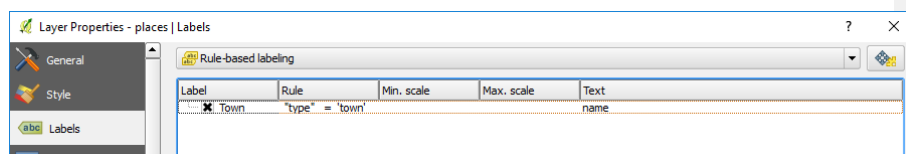
- The rule Expression string builder dialog box pops up. Within the central box expand the **Fields and Values** section to see all of the fields in your table. To create the settlement type labels we need to use the *type* field:



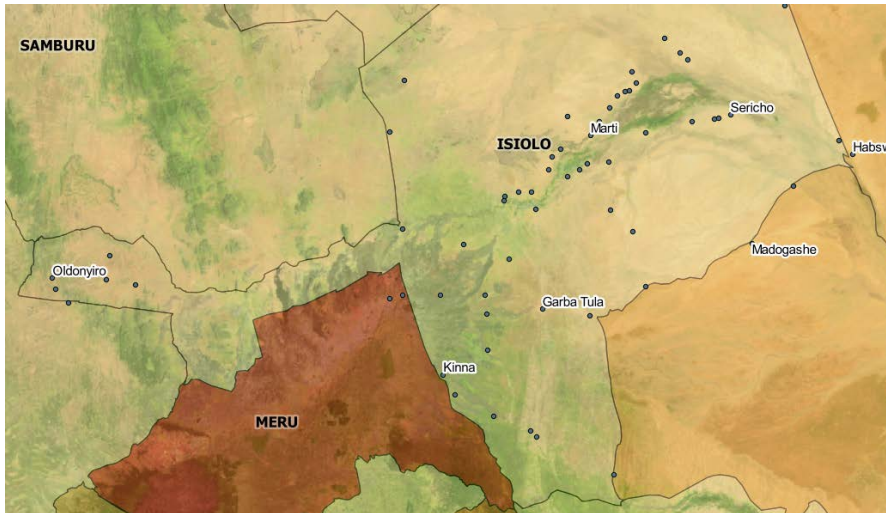
- Double click on the *type* field as shown above. This will make it pop up in the main expression window. Then click the '=' button from the row of function buttons at the top of the main expression window
- With the field *type* still highlighted in the central window, click **all unique** in the lower right of the window; this will list all the unique values in the *type* field, i.e all types of settlement. Double click *town* from the list to complete your expression
- Click OK to complete the expression.
- You should now return to the main labelling window for the Town rule. Firstly, you need to select the field you wish to label with – in this case the name of the settlement – select this from the Label with drop down as highlighted below. Also within this dialog box the size, font, colour and other options can be modified. Select **Arial** as the font, set the **text size** to **9** and the **Buffer size** to **1** (Make sure you tick the Draw text buffer box as shown below). Then click OK.



- The **Town** rule should be set up as shown below:



- Click Ok to see the labelling rule in action. Your map window should appear similar to below



- Further rules can be added to the labels to represent the other place types. Create a rule based label for villages using the step by step instructions above.

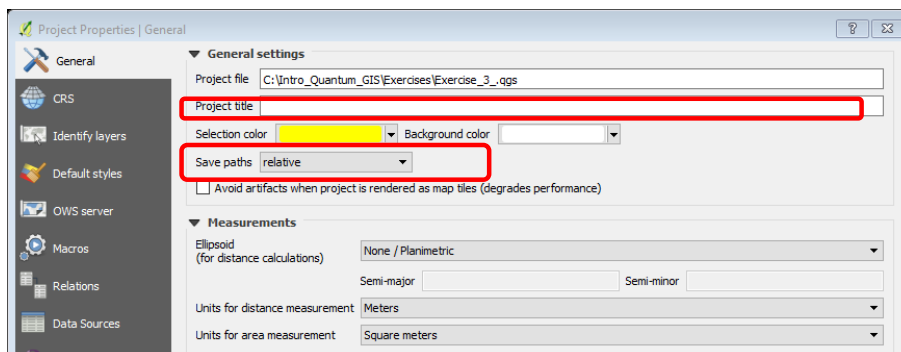
Rule based labelling and symbolising are very powerful tools in QGIS. Within population and resource mapping they can be used to create different labels not only for settlement type and size but also for essential resources such as water quality at wells – perhaps those with good water quality could have different coloured labels to those with poor water quality etc.

Part 5 - Project Properties

The project properties can be viewed by choosing **Project > Project Properties**

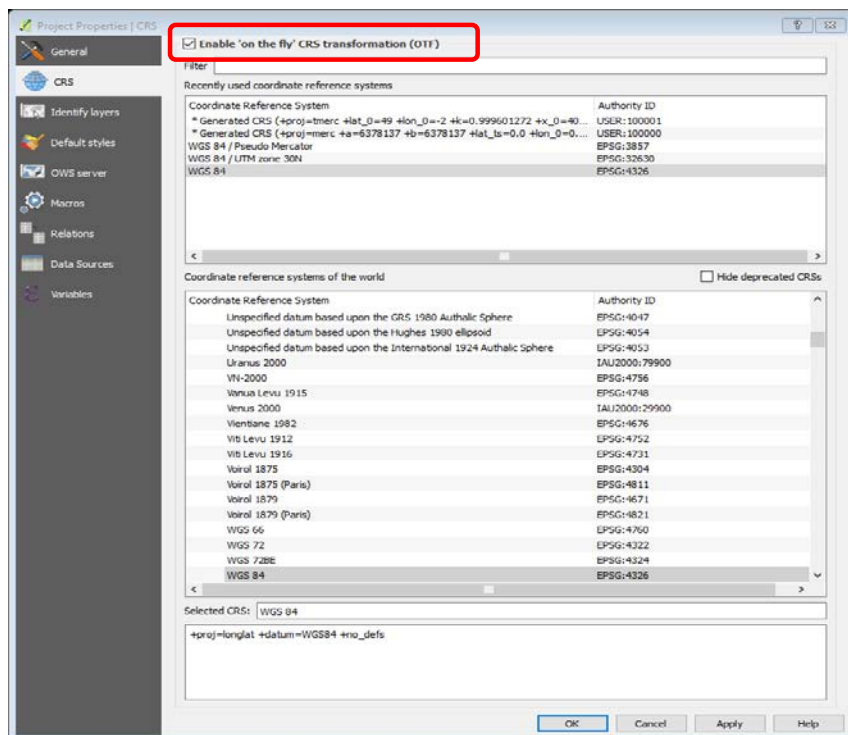
1. General Properties

- You can set a Project Title and customise the way QGIS looks.
- You can also select to save file paths as relative rather than absolute from the **Save Paths** dropdown.



2. CRS Properties

Under the **CRS** (Coordinate Reference System) tab you can set the CRS to be used in the Map, as well as enabling 'on the fly' reprojection, allowing datasets using different CRS to be displayed concurrently in the correct location relative to one another.



The default project CRS and default state for the 'on the fly' reprojection can be set in **Settings > Options...** under the **CRS** tab.

3. Now save your QGIS project

- From the **Project** drop-down menu, select **Save As**, now browse to *C:\Intro_Quantum_GIS\Exercises* and give your map an appropriate name.
- Click on **Save**.