JNCC OTs GIS meeting

Turks and Caicos

GIS Training Course

Part 1: Using QGIS

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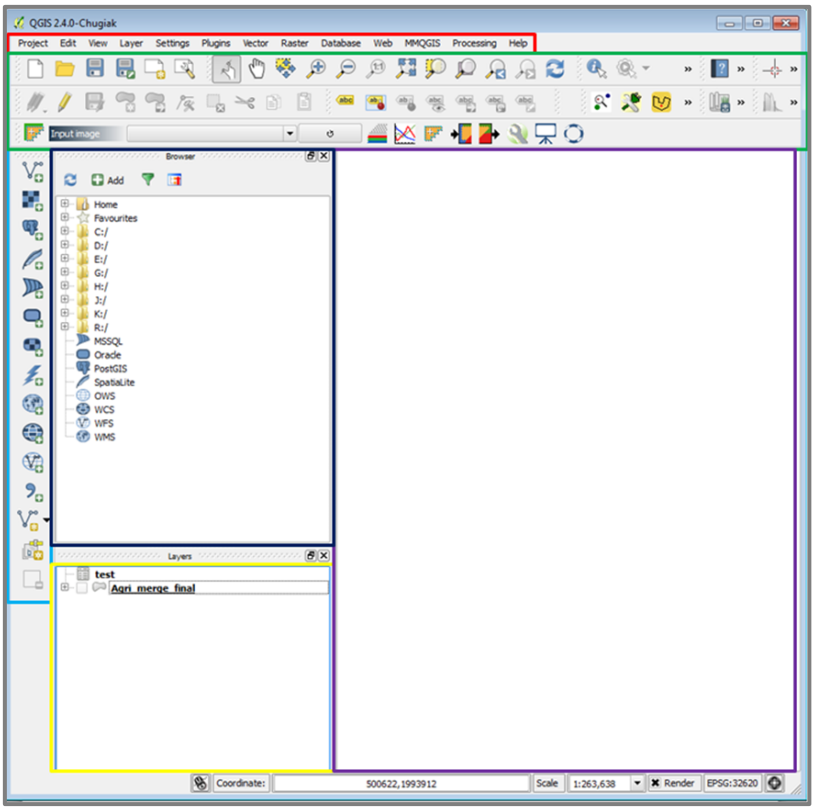
1 Introduction to QGIS

For those unfamiliar with Quantum GIS (QGIS), it is a user friendly Open Source Geographic Information System (GIS) which lets you browse, edit and create a variety of vector and raster formats, including ESRI shapefiles, spatial data in PostgreSQL/PostGIS, GRASS vectors and rasters, or GeoTiff. *

You can create customised plugins and GIS enabled applications using Python or C++ programming languages.*

*http://www.osgeo.org/QGIS

The QGIS interface is split into six areas; The Menu bar (Red), the key tools toolbar (light blue), the advanced toolbar (green), the map legend (yellow) the browser (dark blue) and the map view (purple).



Your most often used sets of tools can be turned into toolbars for basic access. For example, the File toolbar allows you to save, load, print, and start a new project. You can easily customize the interface to see only the tools you use most often, adding or removing toolbars as necessary via the View > Toolbars menu.

Even if they are not visible in a toolbar, all of your tools will remain accessible via the menus. For example, if you remove the File toolbar (which contains the Save button), you can still save your map by clicking on the File menu and then clicking on Save.

The status bar at the bottom of the QGIS window shows you information about the current map. It also allows you to adjust the map scale and see the mouse cursor's coordinates on the map.

Short exercise!

For this exercise, open the QGIS project 'Habitats'.

Below are some of the key functions in the main toolbar try to find these in QGIS and explore their functions.

1.1 Data types

There are two spatial data types available for use within a GIS; Raster and vector data. Raster data represents continuous surfaces, while vector data can be representative of points, lines and discrete areas. In this section of the training course vector data will be used for the analysis and display of agricultural land cover in QGIS.

For your information, here are the possible projection types you might encounter – being aware of the projection you are working with can prevent issues with compatibility between data layers.

EPSG:26719 - NAD27 / UTM zone 19N

EPSG:4326 - WGS 84

1.2 Datasets

There are three datasets required for this exercise;

- PROVO-PARCELS-2009.shp
- Provo_points.shp
- Provo_raster.jp2

The first two datasets are shape files (.shp). However, PROVO-PARCELS-2009.shp is a polygon based shape file, while Provo_points.shp is a point based vector. The Provo_raster.jp2 file is a raster dataset which means it is an image.

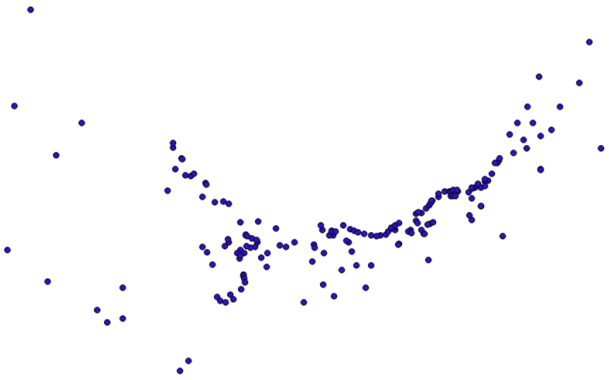


Figure 1. How Provo_points.shp point data look when displayed

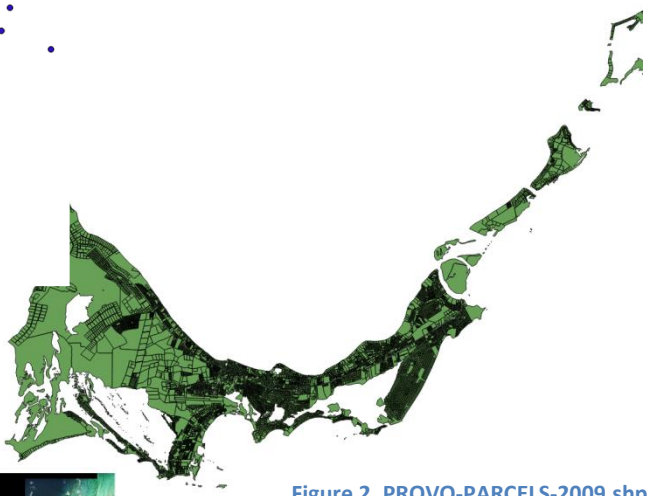


Figure 2. PROVO-PARCELS-2009.shp polygon vector data

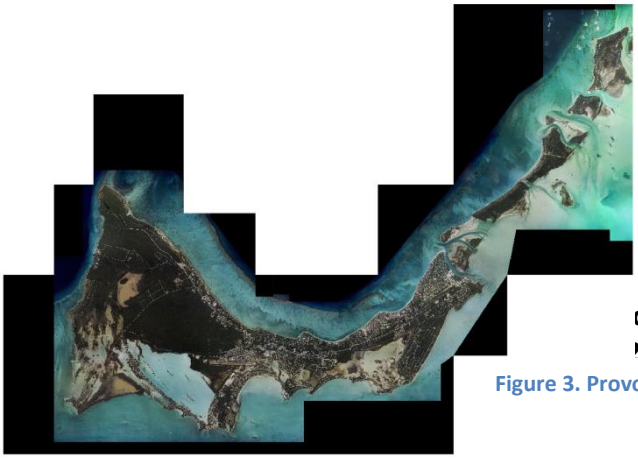


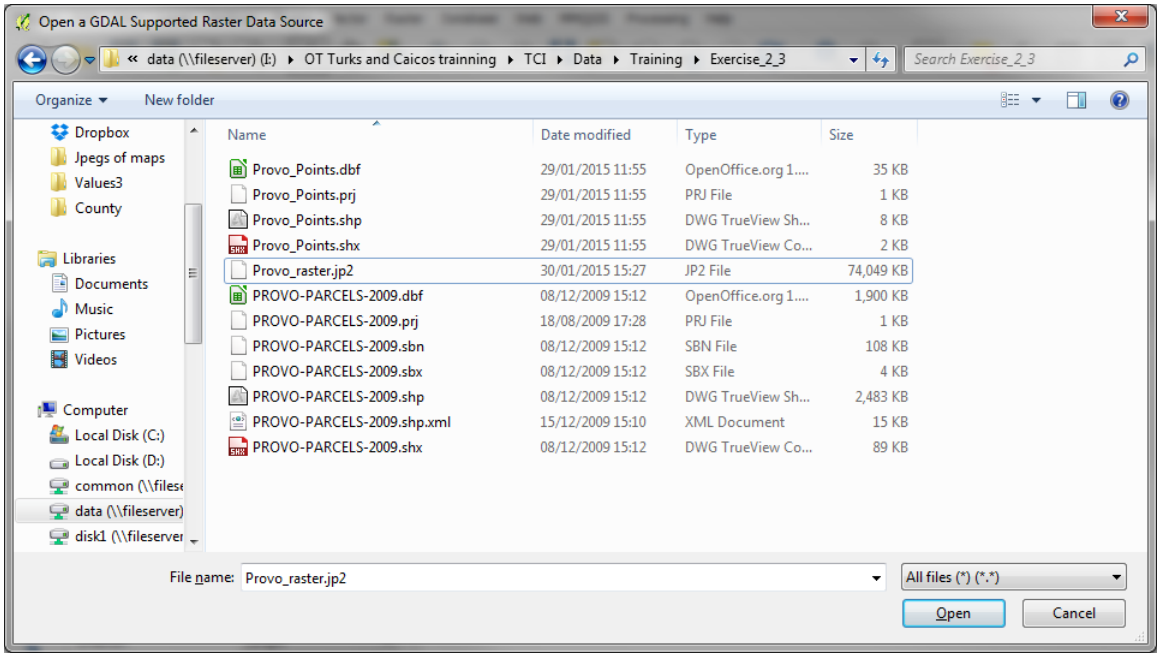
Figure 3. Provo_raster.jp2 raster data

2 Exercise: Developing datasets

2.1 Displaying raster data in QGIS

Import raster data into a new QGIS project using the 'Add Raster Layer' Icon:

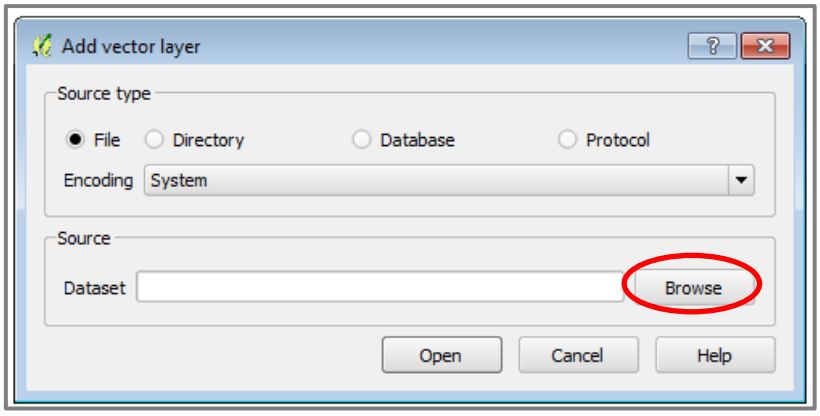
Using the 'Add raster layer' window and selecting 'Browse' the user can navigate to the raster data layers desired, in this case Provo_raster.jp2.



2.2 Displaying vector data in QGIS

Import vector data into a new QGIS project using the 'Add Vector Layer' Icon:

Using the 'Add vector layer' window and selecting 'Browse' the user can navigate to the vector data layers desired, in this case PROVO-PARCELS-2009.shp and Provo_points.shp.



Select and open the desired datasets.

Attribute table

The Provo_points.shp layer provides the information for various amenities located on this island.

FEATURE tells us what facility is at that location.

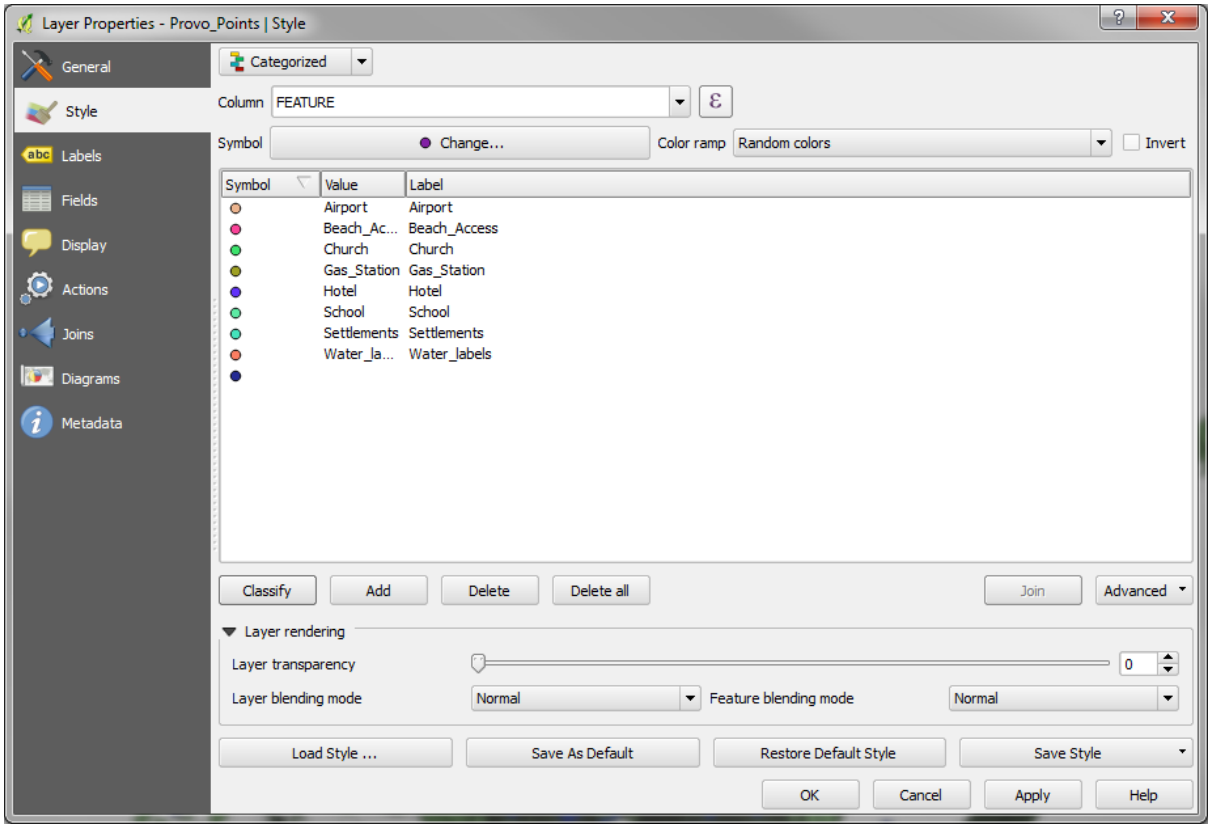
To view the scoring right click on the data layer: Agri_points.shp and select open attribute table.

Colouring the map

In order to view the attributes of the datasets:

- Double click the name of the dataset in the 'Layers' window in QGIS. The layer properties window will appear.
- Within this window, select the 'Style' tab.
- In the first drop down menu select 'categorized'
- In the second drop down menu entitled 'Column' select the category of the data desired. For the Provo_points.shp data this will be 'FEATURE'.
- Select classify

The classes will appear in the window and in the shape file displayed in QGIS.

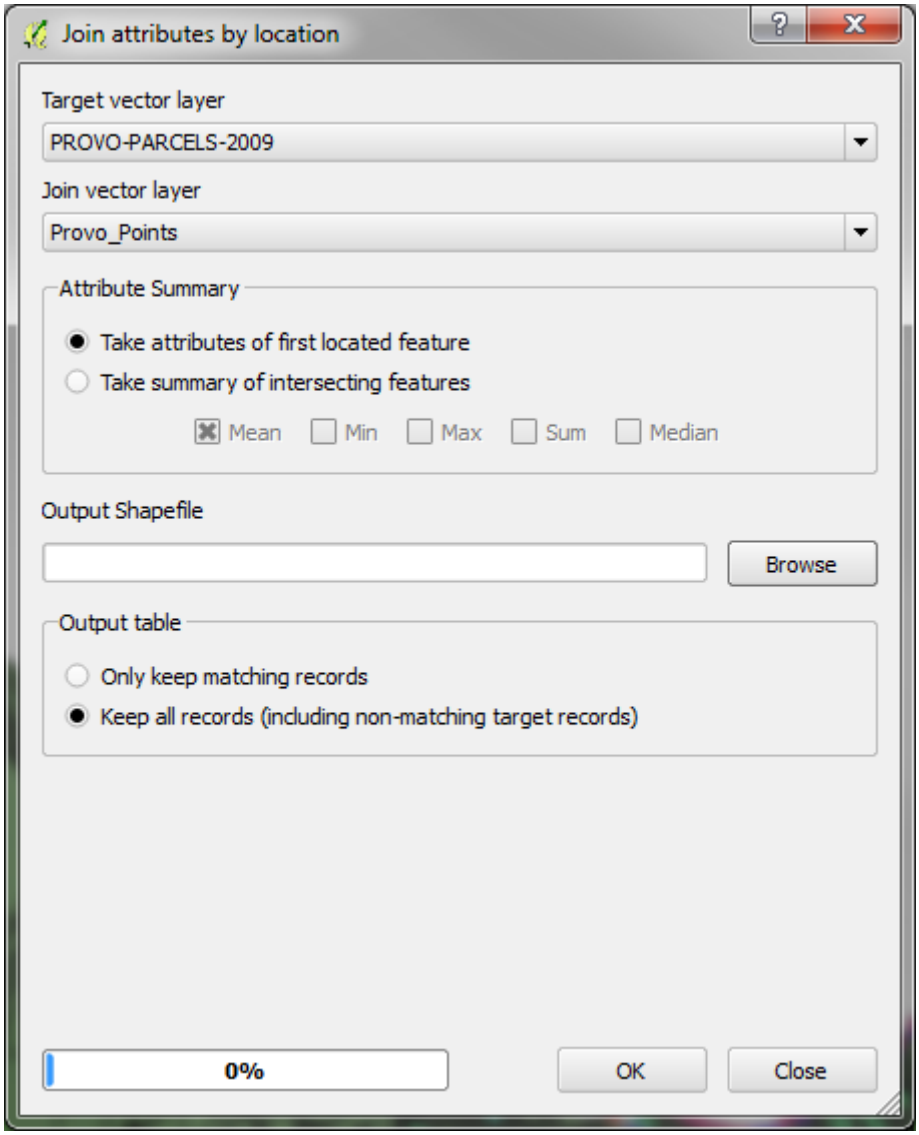


For ways to edit the colours for each class in order to represent your data more appropriately, refer to Section 2.4.

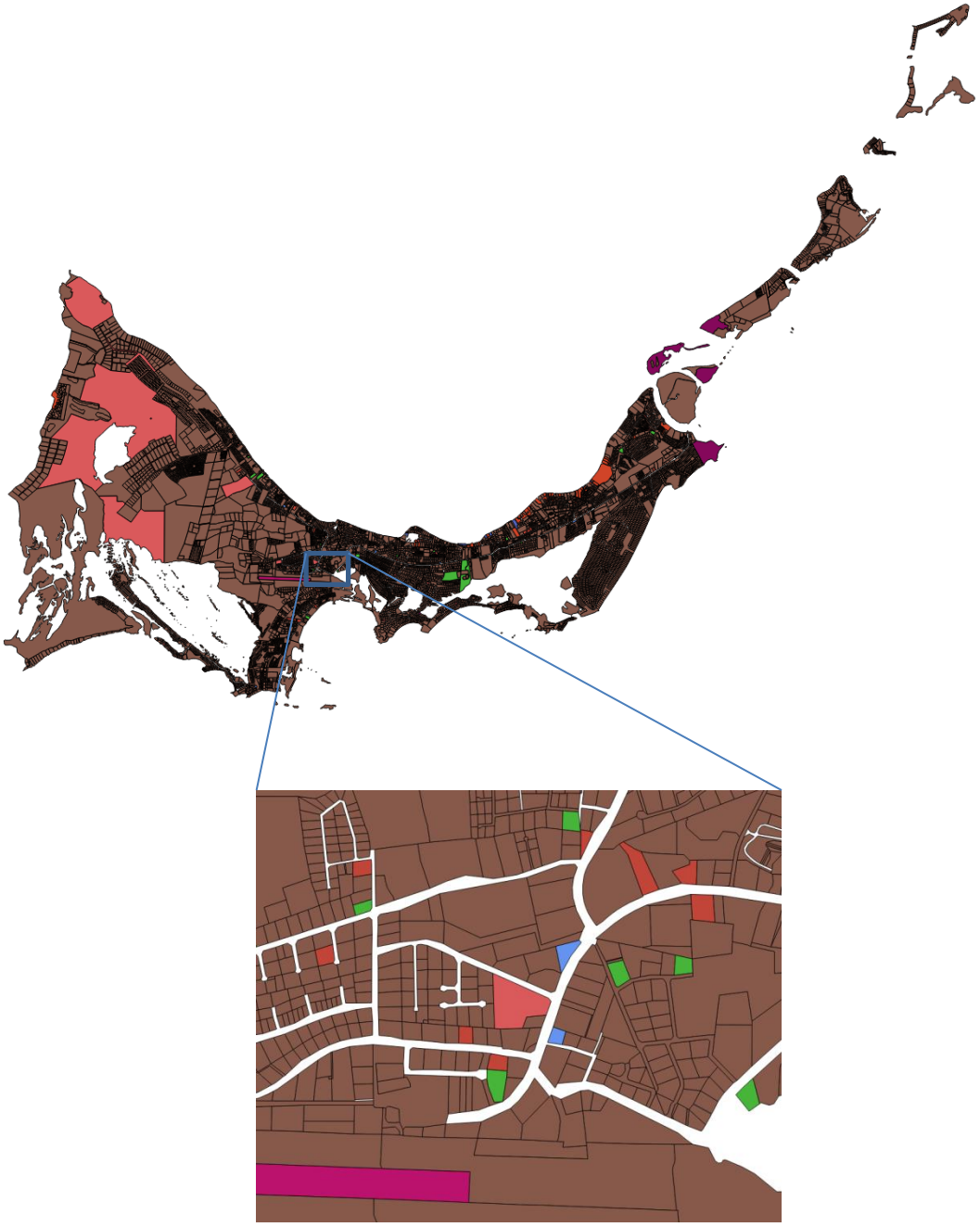
2.3 Merging attributes

In this exercise we are looking at districts. In this exercise you want to find which districts have a school to start an information campaign amongst the children

Under the 'Vector' option in the main toolbar in QGIS, select 'Data Management Tools'> 'Join Attributes by Location'.



Name and save as appropriate, for example ‘Prov_Amenities.shp’. Where the point and polygon data correspond, new polygons will have been created, telling you which districts have schools within them.

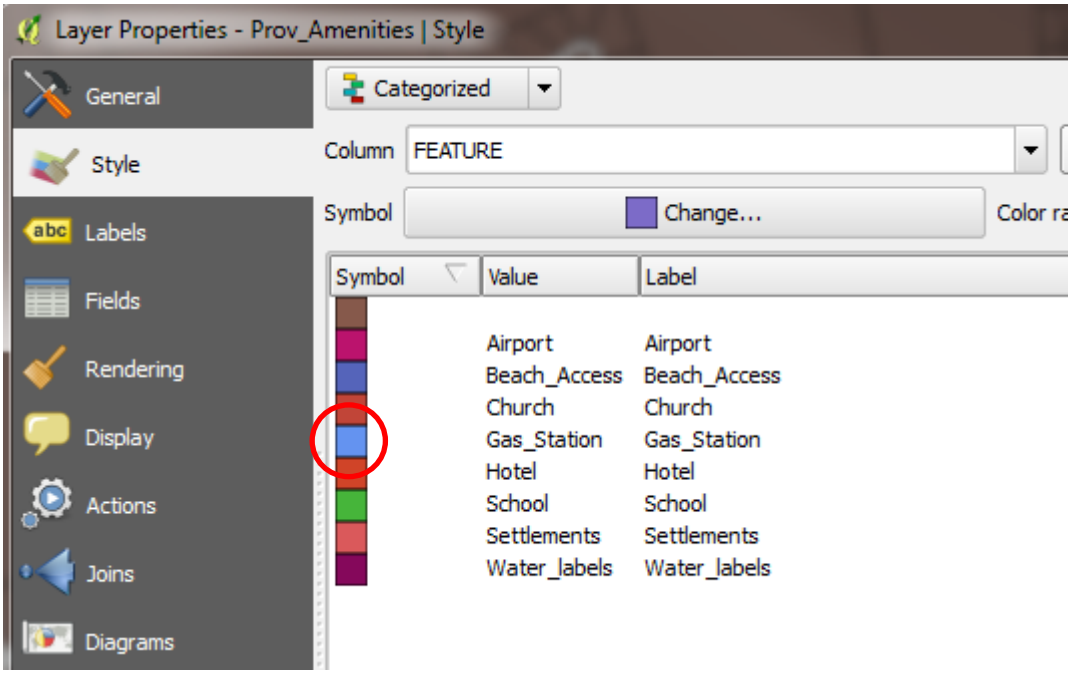


2.4 Editing display

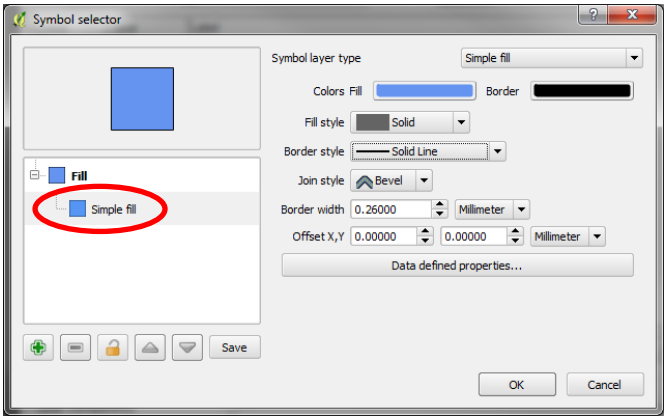
Changing the colours of the map

The colouring of the polygons can also be edited for display purposes. Appropriate colour for map display can be important, particularly when displaying values of features.

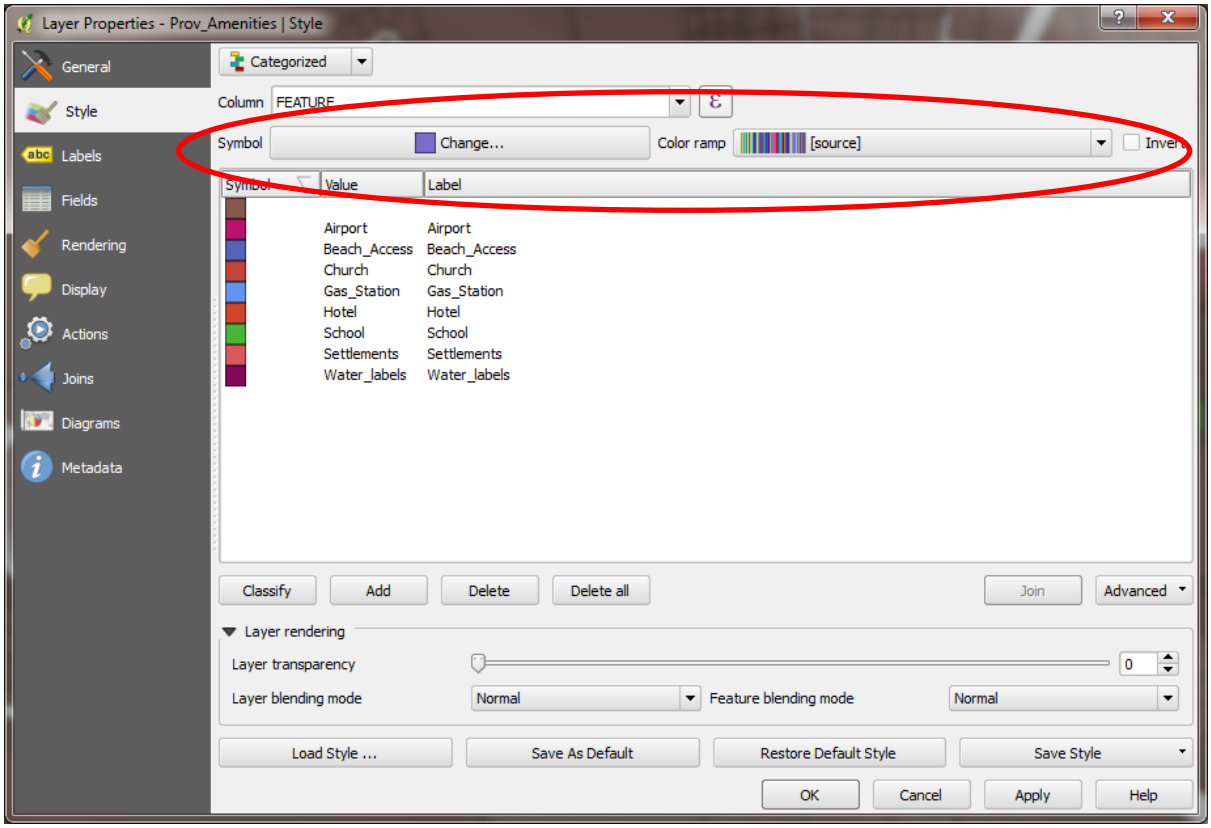
To edit the display colours of the shape files, double click on the desired layer and navigate to the 'style' tab. Individual classes can be edited by double clicking the colour square in the 'Symbol' column.



Use the symbol editor to change individual class colours and border styles.



In order to change the colours of all classes, colour ramps can be created and applied. Alternatively, the user can select all the classes by holding the 'Shift' button and selecting classes, then clicking 'Change', which will allow manual changing of all the classes display properties.


Layer Properties - Prov_Amenities | Style
General
Style
Labels
Fields
Rendering
Display
Actions
Joins
Diagrams
Metadata
Categorized
Column
FEATURE
Symbol
Change...
Color ramp
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Symbol
Value
Label
Airport
Beach_Access
Church
Gas_Station
Hotel
School
Settlements
Water_labels
Classify
Add
Delete
Delete all
Join
Advanced
Layer rendering
Layer transparency
0
Layer blending mode
Normal
Feature blending mode
Normal
Load Style ...
Save As Default
Restore Default Style
Save Style
OK
Cancel
Apply
Help

3 Exercise: Understanding selection queries

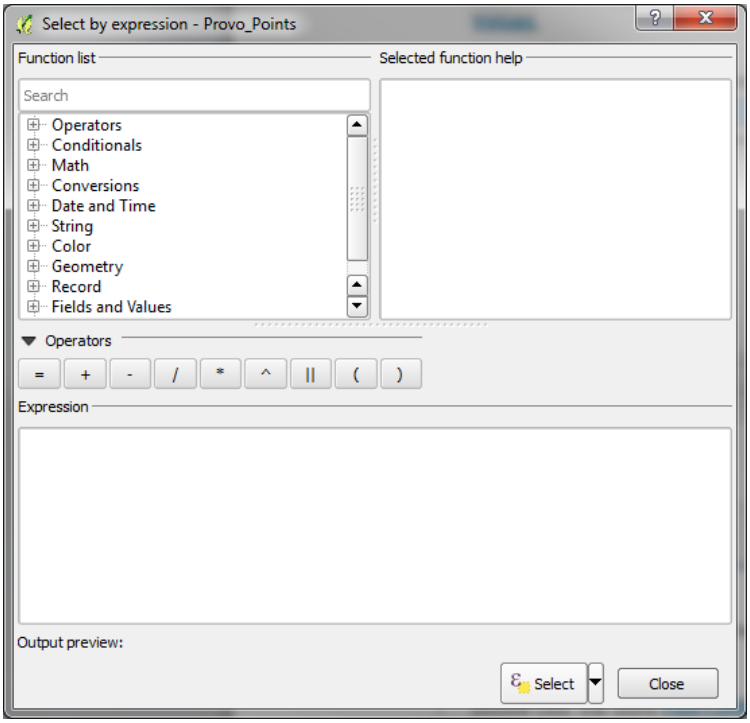
In this scenario we will be looking at fish catch data to find information about a specific species.

Selecting features – Query builder

The query builder lets us run more complex selections on the data. Let's run through one with the Provo Points layer where we will select the schools

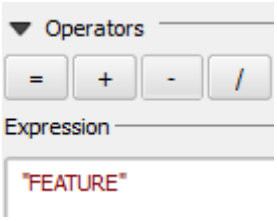
Click the query builder icon

- Select the **Provo_Points** layer in the **Layers list**.
- Click the query builder icon on the tool bar.
- Look down in the **Function list** on the left of this dialog until you see the **Fields and Values**.
- Click on the plus.
- You will now see a list of your fields from the attribute table.



Now we need to tell QGIS to only show us the features where the value of **FEATURE** is equal to **School**.

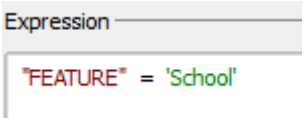
- Double-click the word **FEATURE** in the **Fields** list.
- Watch what happens in the **Expression** field below:



The word **"FEATURE"** has appeared! To build the rest of the query:

- Click the **=** button (under **Operators**).
- Click on the **Load all unique values** button beneath the **Values** field. This will show you the different values contained in the **FEATURE** attribute.
- Double-click the value **School** in the **Values** list.

Your query is this:



And now click **Select**

For further analysis, it's better if we've got the selection features as a separate layer.

- Right-click on the **Provo_Points** layer and click **Save As...**
- Next to the **Save as** field in the dialog that appears, click the **Browse** button.
- Save the layer within the exercise folder.
- Check the **Add saved file to map** box in the **Save vector layer as...** dialog.
- Click **OK**. It will tell you that **Export to vector file has been completed**.
- Click **OK**.

Additional

Now create a separate dataset each for hotels and churches.

4 Exercise: Adding a Data table and Joining Layers

The data sets being used for this section of the Exercise are:

- Islands.shp
- Hotel_Count.csv

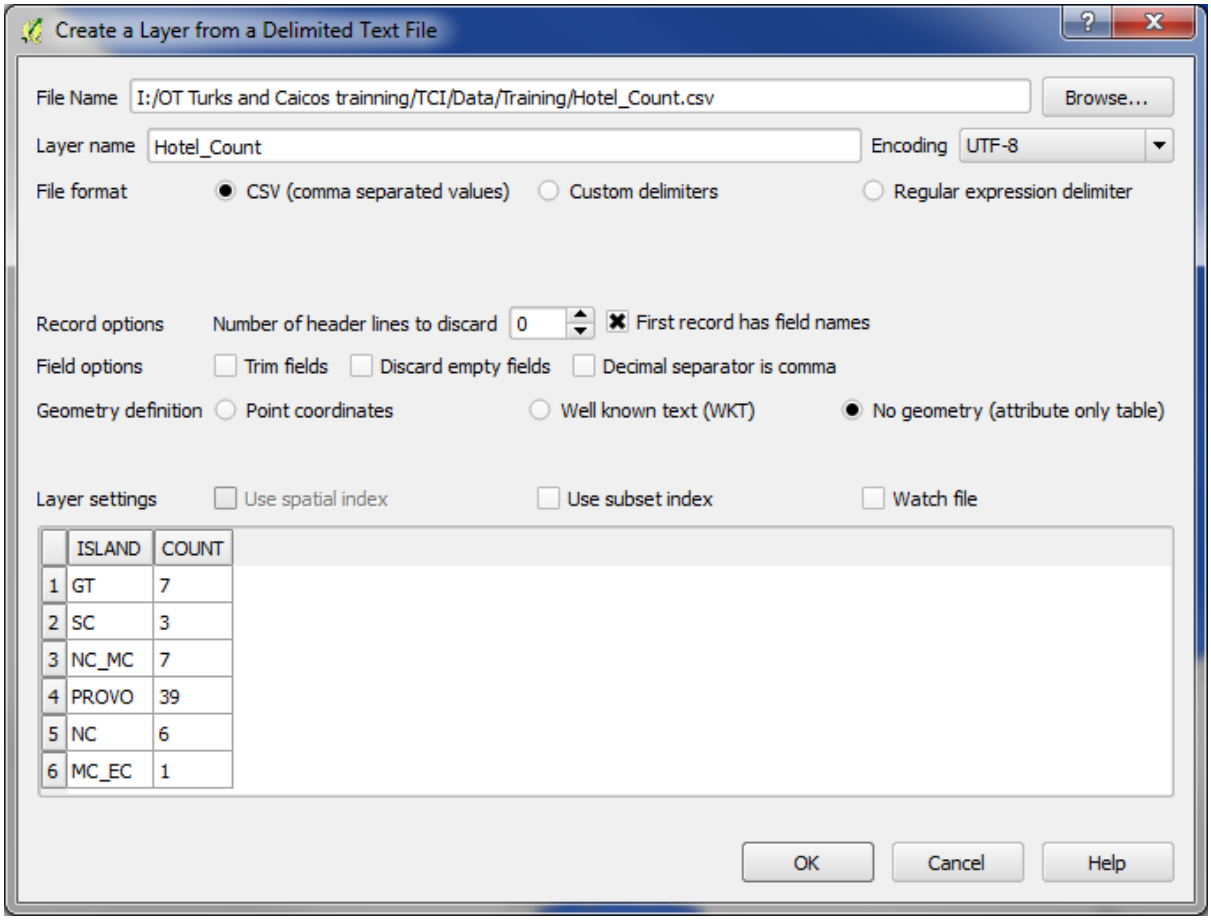
Open QGIS Desktop 2.4.0 and add the Vector layer Islands.shp

To add a table pan to the left hand toolbar and select the 'Add delimited text layer' icon.

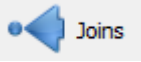
Select the icon. A dialog box will appear from which you can navigate to the Hotel_Count.csv file.

Select the **'CSV (comma separated values)'** button and the **'no geometry (attribute only table)'**

Select ok and check in the map legend that the table has uploaded.



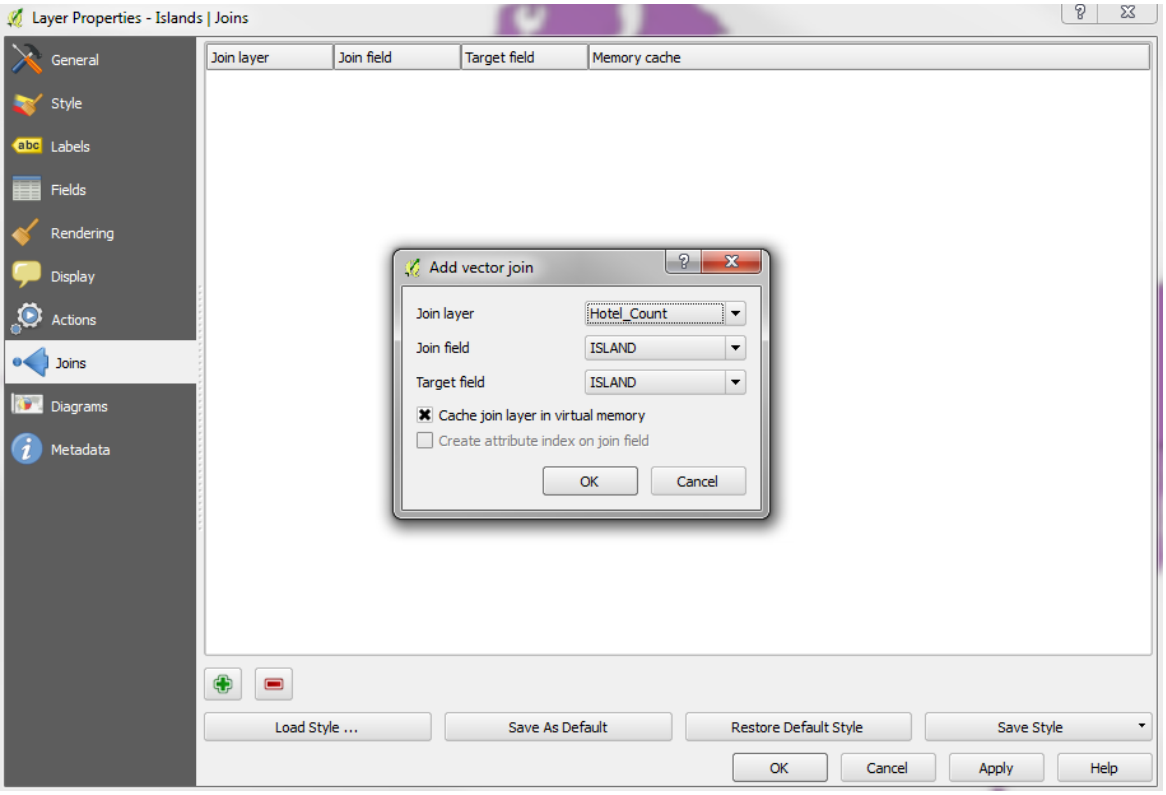
To perform the join between the two data layers 'right click' on the Habitat map in the map legend.

Scroll down the list to 'Properties' and select. A dialog box will appear. In the left hand column select the Join icon 

and subsequently the add icon

The dialog box that shows provides options for which layers to join to the Islands and what fields to use to perform the match (Join field and Target field). Select:

- Join layer: Hotel_Count
- Join field: ISLAND
- Target field: ISLAND

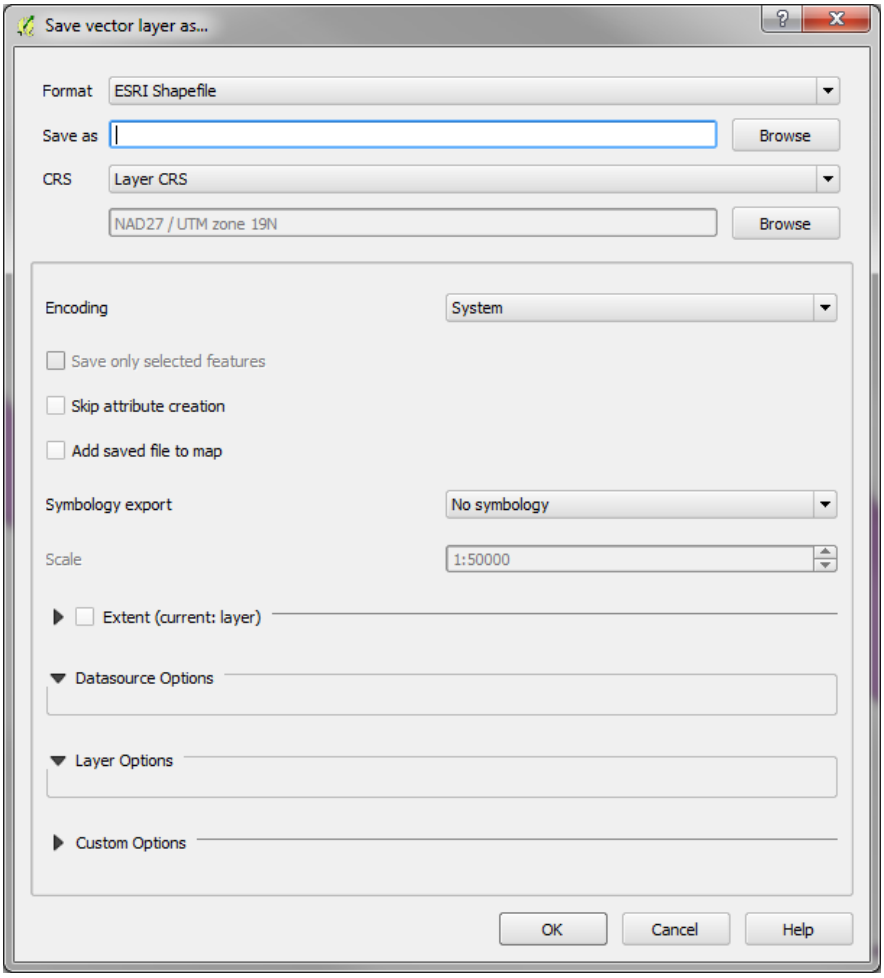


Select ok and navigate to the map layers. Right click on Island layer and scroll down to open the attribute table.

There should now be a new field called Count that provides the total number of hotels on each island.

To save the shapefile with the additional information, scroll to the map legend, right click on the Islands layer and move down to 'save as'.

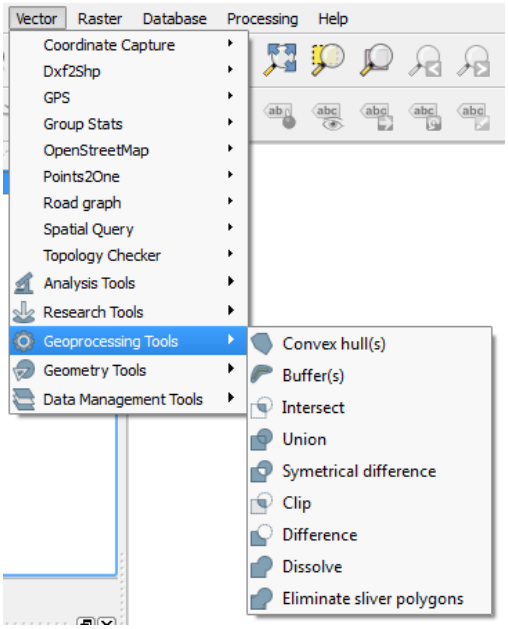
Select and location and name to save the shapefile under and ensure the projection (CRS) is correct. In this case it is NAD27/ UTM Zone 19N.



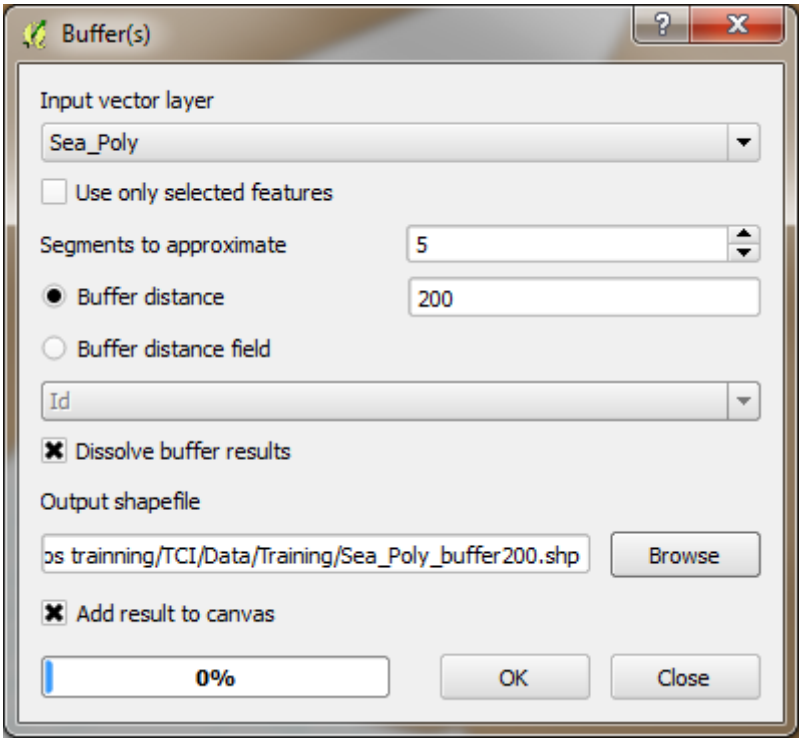
5 Exercise: Vector Processing

Identifying areas of land close to the coast

It has been decided that roads within 200m of the coast will be considered as at risk for the purposes of this analysis. To identify these areas we will use a **Buffer** operation, found in the **Geoprocessing Tools** menu, under the **Vector** menu, upon the **Sea_poly** layer.



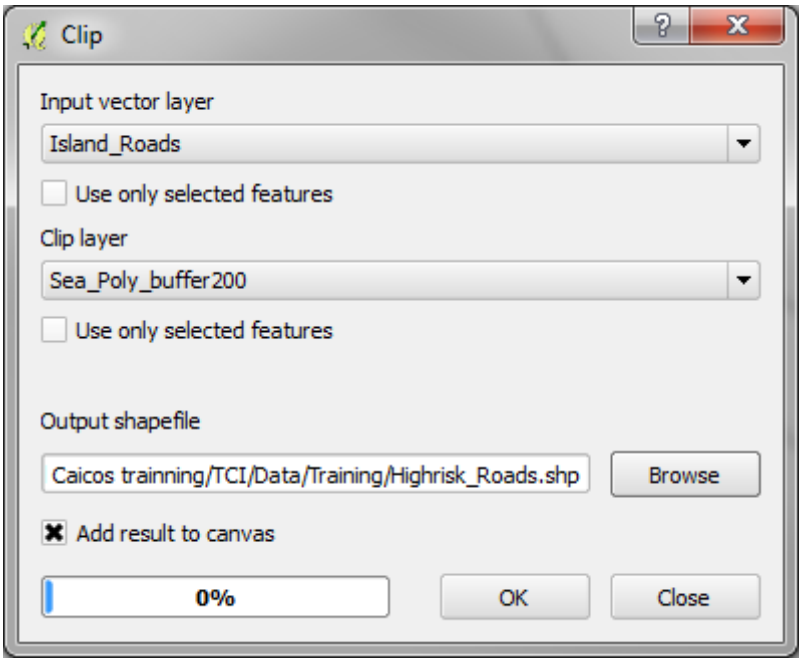
Open the **Buffer** dialogue window and set the **Input Vector Layer** to **Sea_poly**. Ensure that the **Buffer** distance option is highlighted and that the distance field is set to 200m. Tick **the Dissolve buffer results** option and use the **Browse** button to save the output shapefile in a sensible location. Call the shapefile **Sea_poly_buffer200.shp** and tick the **Add result to canvas** option.



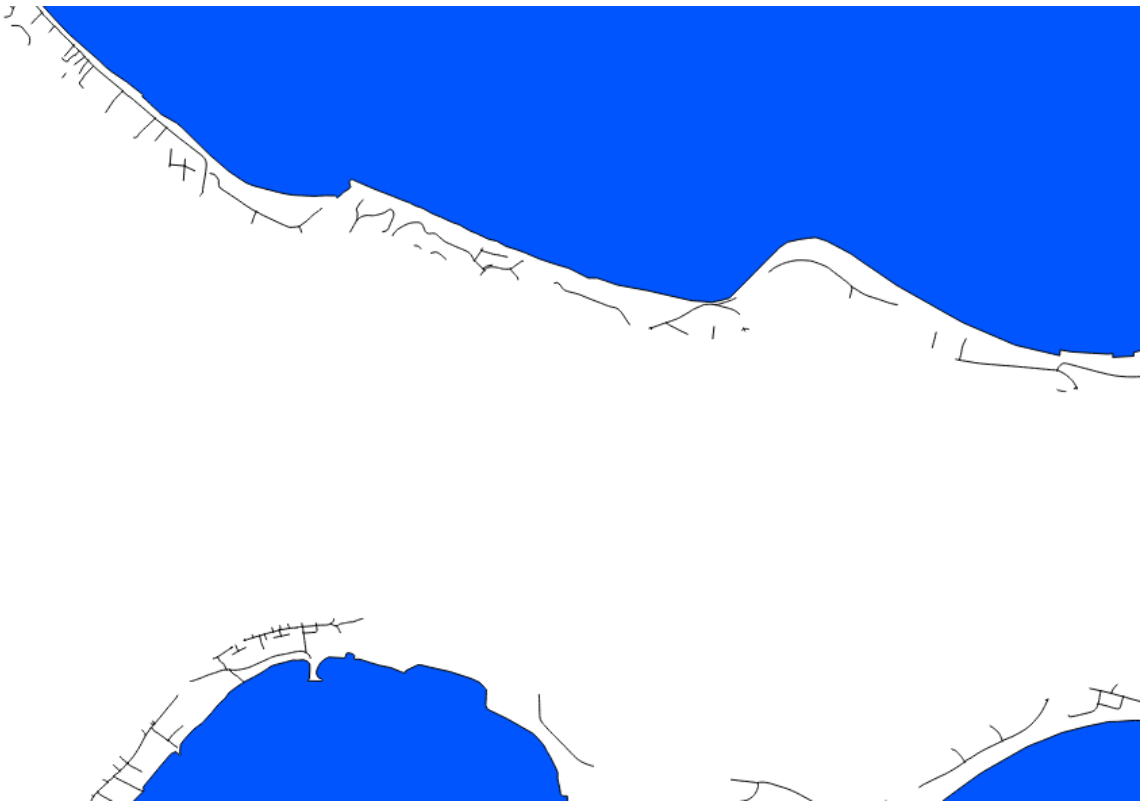
Identify roads that are within 200m of the sea

In the final step we will use an overlay operation to discover which roads fall within the 200m sea buffer.

We will be using the **Clip** operation found in the **Geoprocessing Tools** menu, this time to clip your Island_roads **Input vector layer** by the Sea_buffer200 layer. Call the output shapefile Highrisk_Roads.



The results of this operation should give you a layer that looks like this:



Additional Exercise

Load in the contour data!

Can you identify the roads that are not only within 200m of the sea, but also below 2m in height and, therefore, at particular risk of being affected by storm surges?

6 Installing and managing plugins

GIS has many analysis capabilities but to work with some of these we need to load special modules called 'plugins' To begin using plugins, you need to know how to download, install and activate them. To do this, you will learn how to use the Plugin Installer and Plugin Manager.

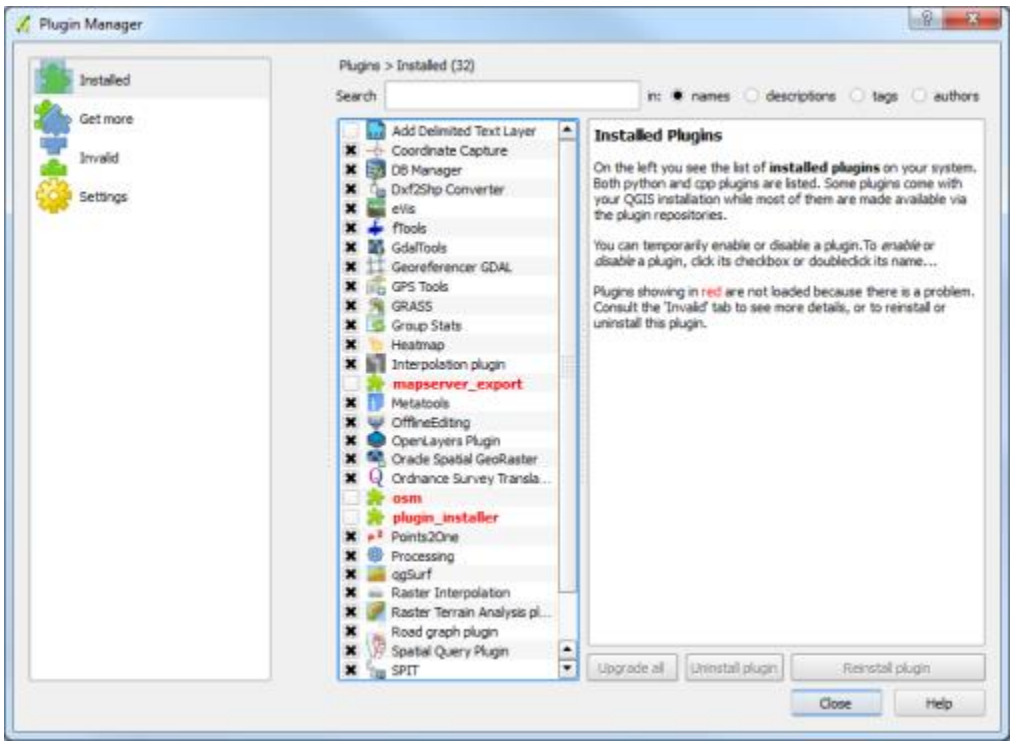
The goal for this session: To understand and use QGIS' plugin system.

First of all look at the Raster and Vector menus and note the number of options available.

Managing plugins

To open the Plugin Manager, click on the menu item Plugins ‣ Manage and install Plugins.

This window shows all the currently installed plugins:



You can activate and deactivate plugins by clicking in the box next to the plugin.

Importantly, however, the list of plugins that you can activate and deactivate only draws from the plugins that you currently have installed. To install new plugins, you need to use the Plugin Installer.

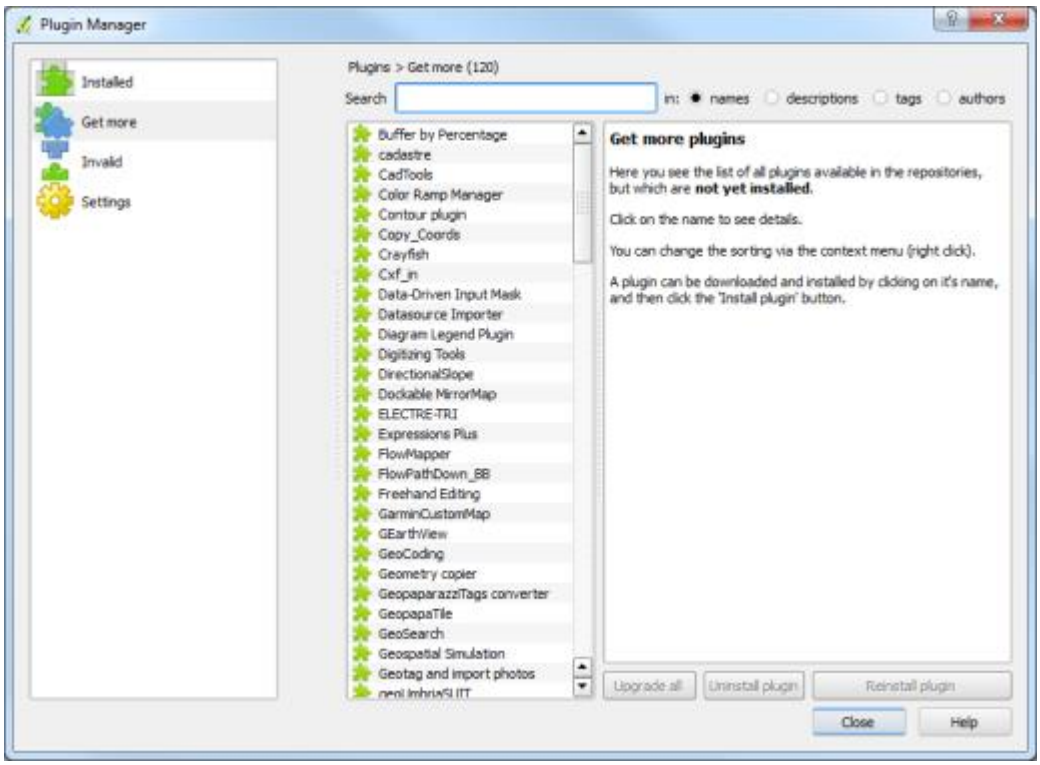
Installing new plugins

From the window you opened in the previous step, select Get More.

The window will now change and the amount of plugins that you see here will differ, depending on your setup.

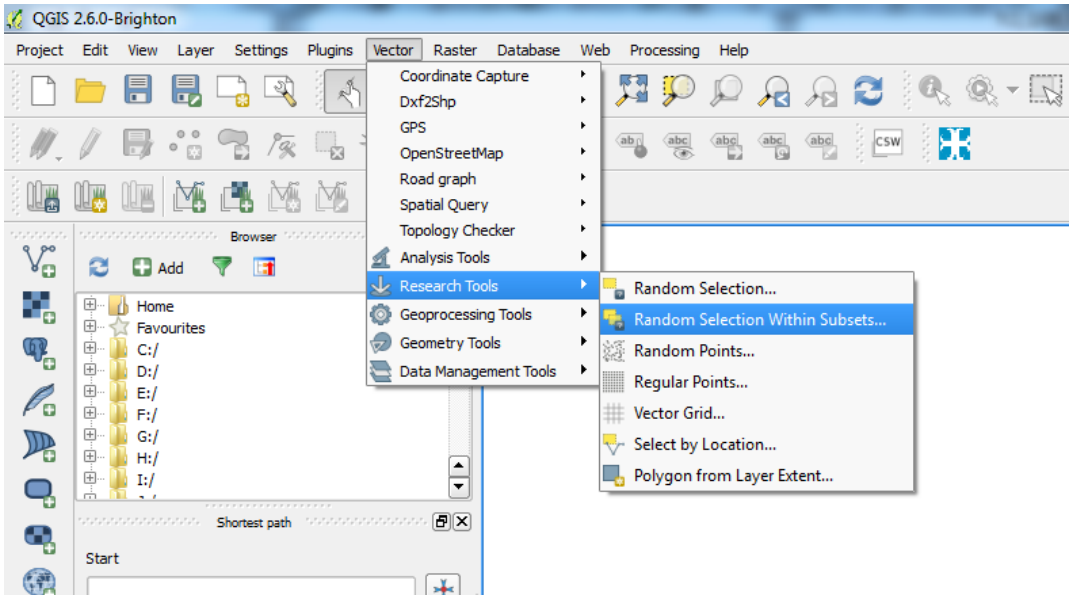
The plugins that are available to you for installation depend on which repositories you are checking.

QGIS plugins are stored online in repositories. By default, only the official repositories are active, meaning that you can only access official plugins. These are usually the first plugins you want, because they have been tested thoroughly and are often included in QGIS by default.



Look through these plugins and see if any look of particular interest to you.

You can install a plugin by selecting it then pressing Install/upgrade plugin.

Exercise

Use the Research tool below to plan sampling points for a monitoring evaluation: