Intro to QGIS

Introduction: Geographic Information Systems (GIS) is a tool used to display, create, and analyze spatial information to help solve real world problems. It combines the graphics that make up a map with data tables of associated attributes. QGIS is a GIS platform that is available as a free web-download. This tutorial guides you through the functionality of QGIS using fictitious data of the status of tree health on Brock University's campus. Your task is to identify trees in critical condition that must be removed from the roadsides on campus to prevent road blocks or accidents.

Requirements:
- QGIS 2.x
- A web browser (i.e. Google Chrome)

Part 1: Introducing the QGIS Interface
1. Obtain files to be used for this tutorial from www.brocku.ca/maplibrary/Instruction/QGIS_Data.zip .
2. When prompted click *Save As* and save these files in your personal file folder (i.e. X:Drive) or on an external source (i.e. a USB).
3. Unzip the file.
4. Run QGIS (Start > All Programs > QGIS Brighton > QGIS Desktop 2.6.1) or the latest version.
5. Click *Project* [Menu Bar] > *Save* Navigate to your personal file folder and save the project with a name.

The QGIS interface is made up of toolbars, menu bars, a data view, and a layers pane (see below).
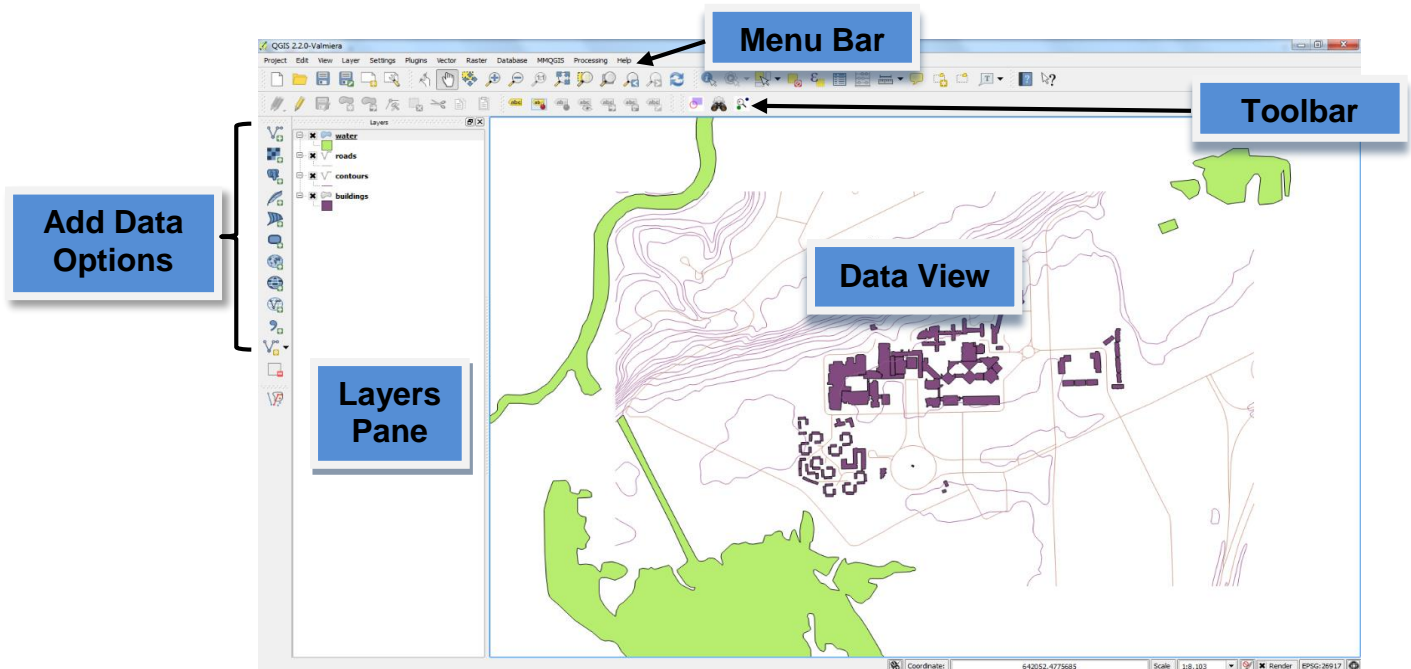
6. The tool bar is used to change the zoom level & pan, and to identify objects.

7. The 'Add Data Options' allows adding various data types such as vector data and raster data.
8. The **Layers Pane** is where layer files display once they are added to the QGIS map document.

Part 2: Adding Data

1. Set the projection of the Data View. Project menu > Project Properties > CRS > select *Enable 'on the fly' CRS transformation*

2. Type *NAD83 / UTM zone 17N* into the **Filter** box and select this same option that appears in the 'Coordinate Reference System' window at the bottom. Click *OK*.

3. In order to add data in QGIS be aware of what data types you are adding, i.e. vector or raster data, or data packaged as an Esri geodatabase. There are separate buttons for various data.

4. Click the *Add Vector* button 　.

5. In the 'Add vector layer' window under 'Source type' select *File*.

6. For 'Dataset' browse to the folder where you saved the files for this tutorial. In the dropdown menu beside where you type the file name change this option from 'All Files (*)' to 'ESRI Shapefiles (*.shp, *.SHP)'. Add the **buildings**, **contours**, **roads**, & **water** shapefiles by clicking the first file, holding down shift and clicking the last file, then click *Open*. In the 'Add vector layer' window click *Open* again.
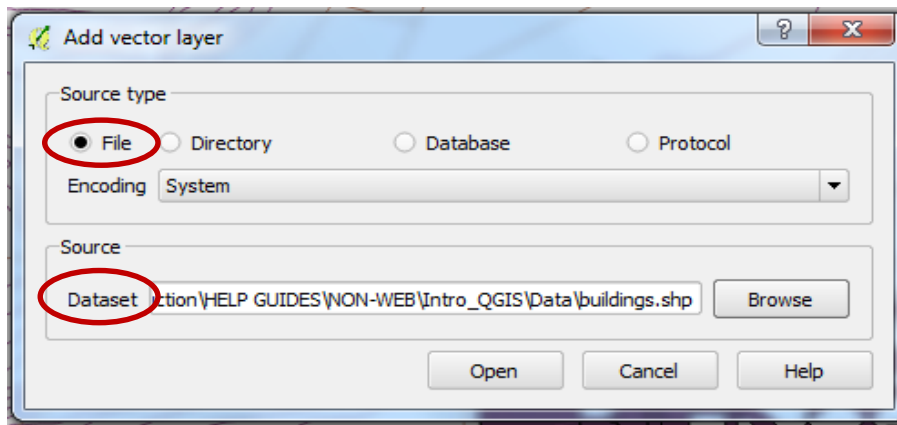

NOTE: when the layers appear in the 'Data View' they may be zoomed out and appear only as a dot. To zoom into the extent of the data, right click one of the layer names in the 'Layers Pane' and click 'Zoom to Layer'.

7. Layers can be renamed by right clicking the layer name in the 'Layers Pane' and selecting *Rename*.

8. To change the symbology of a layer, right click the layer name and select *Properties*.

9. The 'Layer Properties' window will appear; change the colour and size of the feature within the 'Style' tab. Once selection is made, click *OK*.

10. Symbology of a layer can be set to represent a categorization of the data. For example, distinguish the different "Types" of buildings on campus.
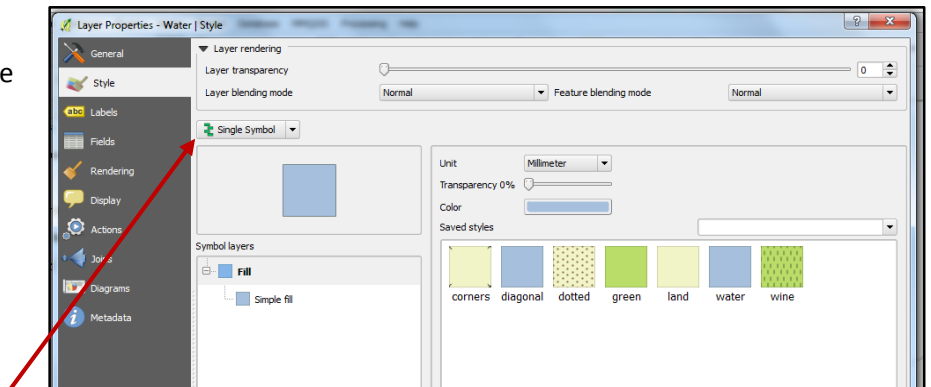
11. In the Layer Properties Style window for the buildings click the dropdown arrow next to 'Single Symbol' and select *Categorized*.

12. In the 'Column' dropdown menu select *Type*, and then click *classify*. This classifies each of the different building types with unique colour symbology. Click *OK*.

Part 3: Adding Point Data from a table
In addition to adding shapefiles to the map project, point files from a data table can be created with corresponding coordinates.

1. Click the **Add Delimited Text Layer** ⬚ button.
2. Under 'File Name' click **Browse**. Select the **Brock_trees** file from the QGIS_Data folder and click **Open**. The rest of the window will automatically fill with the appropriate information.
3. Before clicking **OK** in the 'Create Layer from a Delimited Text File' window, select the **CSV (Comma Separated Values)** toggle beside 'File Format'. Click **OK**.
4. The 'Coordinate Reference System Selector' window will appear. In the 'Filter' box, type*: NAD83 / UTM zone 17N*.
5. The filtered results will appear under 'Coordinate reference systems of the world'. Select the corresponding search result and click **OK**.
6. Points will appear in the **Data View**, each point represents a tree. In order to continue with our analysis, we must first save these points in a shapefile (.shp) format. Right click the newly created **Brock_trees** points layer and select **Save As...**
7. In the 'Save vector layer as' window, ensure that the 'Format' is an **ESRI Shapefile**. Browse to where you would like to save the shapefile [QGIS_Data] and create a file name (i.e. Trees) and click **Save**.
8. Under 'Encoding' verify **Add saved file to map** is checked and click **OK**.
9. New points for the trees will appear in the **Data View**. To keep the **Layers Pane** organized it is recommended to remove the Brock_trees CSV file from the map by right clicking the layer name and selecting **Remove**. Click **OK** when prompted.
10. SAVE!

Part 4: Buffering & Selecting by Location Query
Brock University would like to remove trees that are deemed to be in "poor" condition and are within a 20 metre radius of the roads on campus; to avoid potential road blocks or accidents. To do this, we must first create a 20m buffer around the roads.

1. Click 'Vector' from the top menu bar. Select **Geoprocessing Tools > Buffer(s)**. Fill in the 'Buffer(s)' window to reflect the image at right.
2. In the 'Output shapefile', browse to your own local storage files and give a name to the buffer [road_buffer_20m], and **Save**. Back in the 'Buffer(s)' window click **OK** to run the buffer tool. Once the buffer is finished processing click **Close**.
3. To see all the features more clearly in the **Data View,** make the buffer layer transparent. This is done in the same window where the layers' symbology is altered [HINT: Properties > Style > Layer Transparency]. Change the transparency to 50%. Click **OK**.
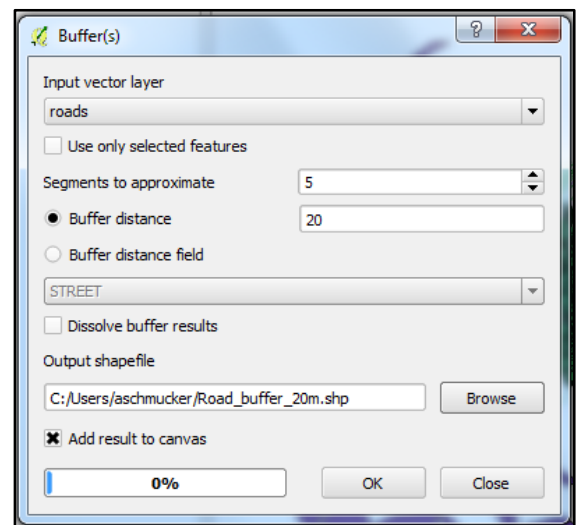
4. Now we want to select the trees located only within the road buffer. Click the 'Vector' menu and select *Research Tools > Select by location*. Fill in the 'Select by location' window to match the image on the right and click *OK* [NOTE: the files names may vary as you may have used different naming conventions]. Once it is finished processing, click *Close*.
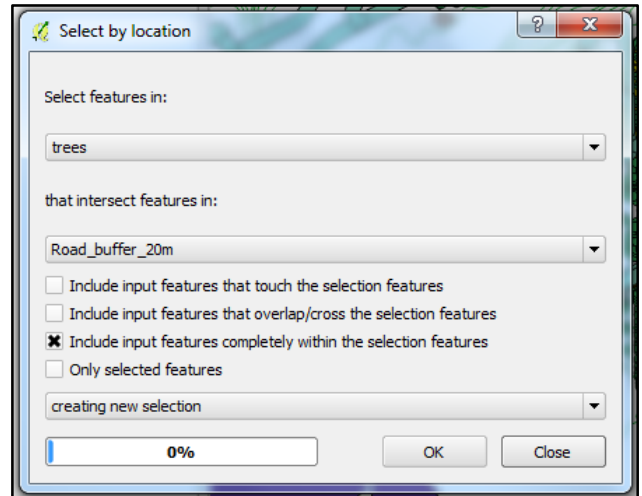
5. The selected trees will be displayed in yellow in the **Data View**. Save this selection as a shapefile. Right click trees file in the Layers Pane and click *Save As...* Ensure the Format is *ESRI Shapefile*. Click *Browse* and select your data folder [QGIS_Data], and name the new shapefile [trees_buffer] click *Save*. Back at the 'Save vector layer as…' window, select *Save only selected features* and *Add saved file to map*, then click *OK*.

OPTIONAL: Selecting the trees within 20m of the roads can also be done by performing what is known as a *Clip*. Click the 'Vector' menu and select *Geoprocessing Tools > Clip*. Fill in the 'Clip' window to match the image, and *SAVE*. After processing, click *Close*.

6. **Remove** the Trees layer from the Layers Pane (HINT: *Right Click> Remove*). Now only trees within the 20m road buffer are visible.
7. SAVE!
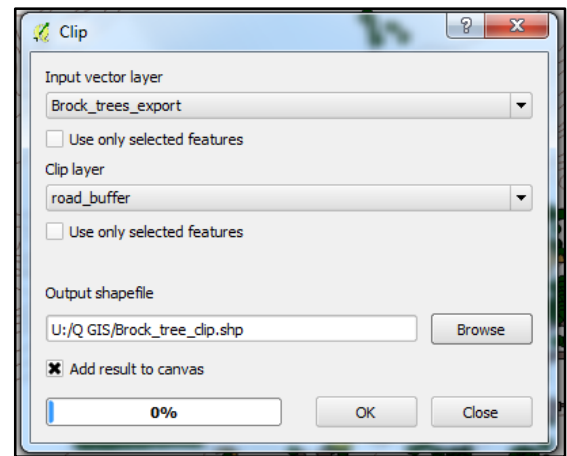
Part 5: Select by Attribute
1. To identify the trees in poor condition to be removed, right click the new tree layer that was created in the previous step [trees_buffer] and select *Open Attribute Table*.
2. Click the *Select by expression* button.
3. In the 'Function List' expand 'Fields and Values' and double click *CanopyCond*. Notice this appears in the expression box.
4. Under 'Operators' click the equal (=) sign button.
5. Under the 'Field Values' window click the *all unique* button. Double click *Critical*.
6. Press the space bar and in all caps type *OR*. Double click *CanopyCond* again equals (=) button, then under 'Field Values' double click *Poor*.
7. Click *Select*, then *Close*.
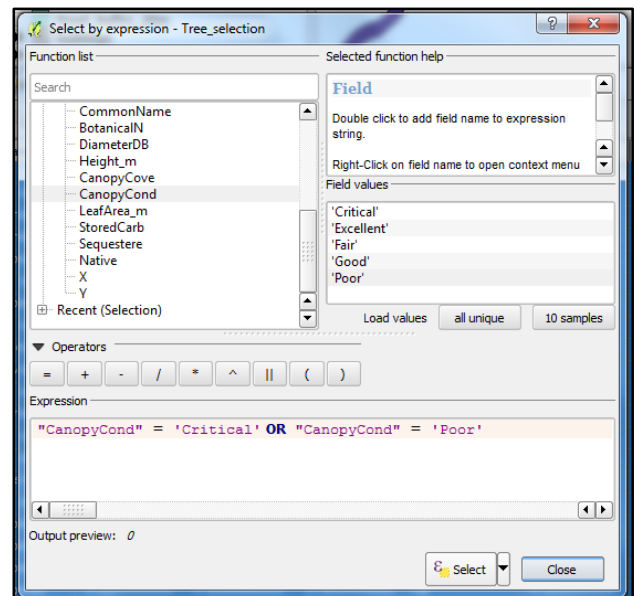
8. Still in the attribute table, from the *Show All Features* button, select *Show Selected Features.* This shows only the trees that met the query criteria. Close the attribute table.
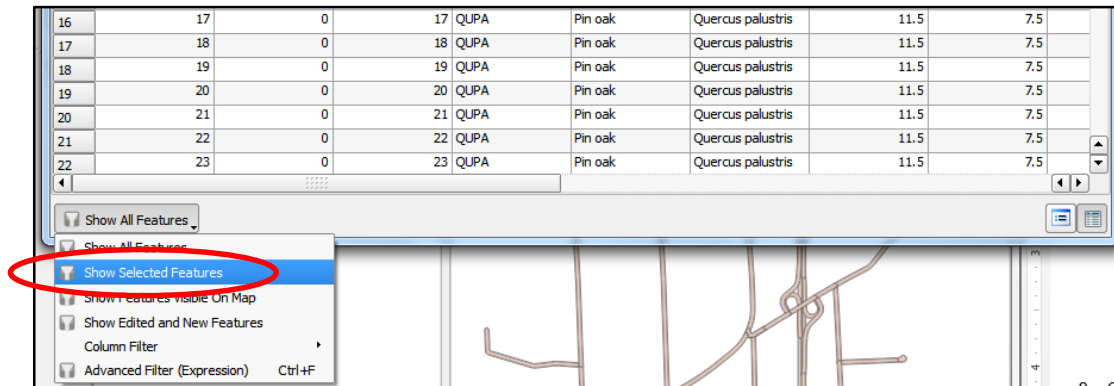

9. Right click the trees_buffer layer and click *Save As…*
10. In the 'Save As…' window ensure the file format is an *ESRI Shapefile*. Browse to the QGIS_Data folder you created for this tutorial, name the new shapefile tree_removal, click *Save*. Back in the 'Save vector layer as…' window, ensure that *Add saved file to map* and *Save only selected features* are selected then click *OK*.

11. In the Layers Pane, **remove** the trees_buffer and the road_buffer.
12. Change the symbol for the tree_removal layer so it is more visible. [right click > *Properties> Style*]

13. SAVE!

This newest tree layer represents the trees that are hazards and will be removed by the tree removal crew. We can now put together and print a map for the crew to use out in the field. The steps below describe this process.

Part 6: Printing A Map
1. Select the 'Project' menu > *New Print Composer* and give the map a name, for example "Tree Removal – Brock University Campus, St. Catharines, ON" Click *OK*.
2. In the **Print Composer** window that appears, select the 'Layout' menu and click *Add Map*. The map will not appear right away. Draw a box at a preferred location on the page using the crosshairs cursor by clicking on the blank page and dragging the cursor.

3. In the 'Layout' menu add map elements such as:
   - Add Arrow [click on map and draw the arrow, ending in the north (up) direction].
   - Add Scalebar [click on the map where the horizontal scale bar is to be].
   - Add Legend [click and form a rectangle where the legend is to be]. NOTE: remove unwanted items from the Legend. With the Legend selected, go to the 'Item Properties' tab, and uncheck *Auto update*; manually update the Legend.
   - Add Label [click and form a rectangle where the text is to be. In the 'Label' box under Item Properties, enter the desired text. Click on *font* under 'Appearance' to change the font size and shape. Adjust the size of the box if the wording doesn't fit].

4. In the 'Item properties' tab adjust the specifics of a layout element such as scalebar, legend, etc.

5. To add a neat line click the ***Add ellipse***   button > 'Add Rectangle', and draw a box around the map image.

6. In the 'Item properties' under 'Shape', beside the word **Style** click ***Change…*** Click ***Simple fill***, then from the colour options, select ***Transparent fill*** (the border colour should default to black). Click ***OK***.

7. To save the final map project click ***Composer*** > ***Save Project***.

8. Export options are available in various formats using the buttons in the image below:
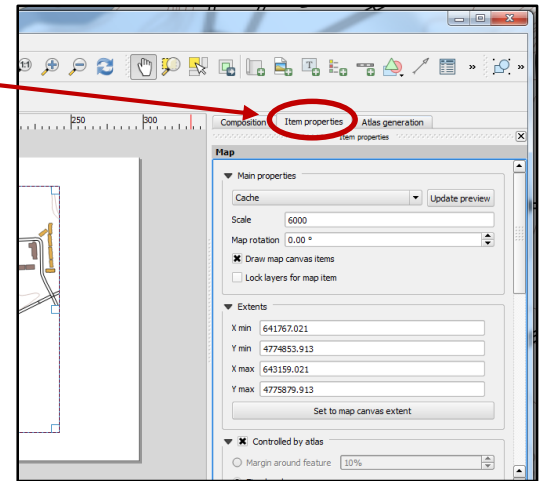
9. Print or add the map into another document, such as Word or PowerPoint.

10. Below is an example of a map created using this QGIS tutorial.