

Getting started with qGIS

Quantum GIS, or qGIS, is free open-access software for mapping and geospatial analysis. Most of you will be using qGIS to analyze the landscape around each frog and toad survey site (some of you will be using other GIS software that your instructor has expertise with). You may find qGIS a little intimidating at first, mostly because it has a lot of features. However, once you get used to the basics of importing and working with GIS data, you will likely find qGIS no more difficult than other menu-driven software packages. Hopefully you'll also find it pretty fun to play with the maps.

The first step is to download qGIS software. The qGISdownload site is:

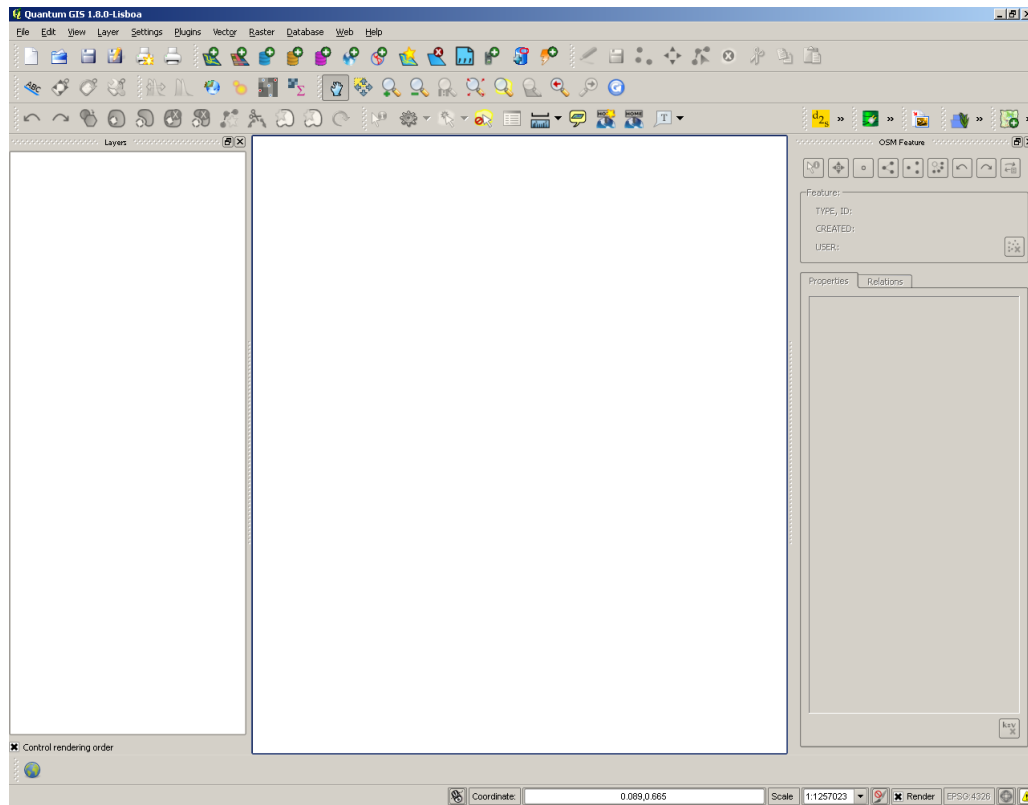
<http://hub.qgis.org/projects/quantum-gis/wiki/Download>

For Windows machines, scroll down to 1.1.and click on “Download QGIS.” Make sure you download the current version (1.8.0) as the older versions have a different set of menus.

For Macs, scroll down to 4.2 (for OS Lion or OS Snow Leopard) and click on the download page.

Save the installer (Setup.exe) to your hard drive. When it's installed, click “run” to install the software in the appropriate directory. *You do not need to install the sample datasets (North Carolina, South Dakota, and Alaska), and in fact, you can save a bunch of installation time by not installing the sample data.*

Once you've installed the software, you can open qGIS by clicking on the Quantum GIS Desktop icon (or the qGIS.exe file within the apps\qGIS\bin folder). The opening screen should look like this:

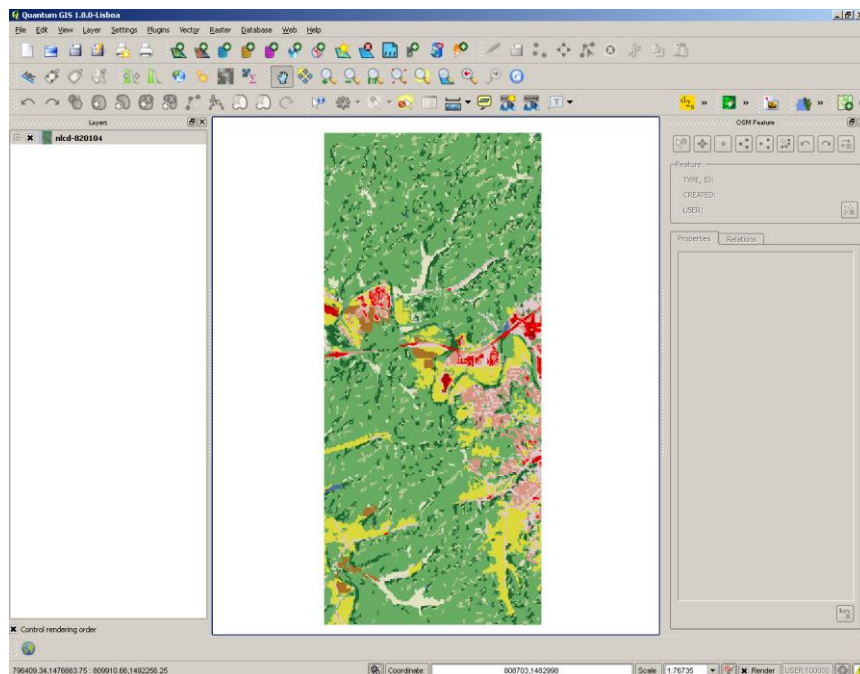


Across the top is the main menu. You can perform most actions from here, or alternatively from the three rows of icons below the menu. Don't worry about the large number of icons – we'll only be using a few of these in our analysis. The large window in the middle will show the working map. The window on the left will show a list of the different datasets (or "layers") that you are working with.

We will be working with four datasets – one that contains the 10 stops within each NAAMP route, one from a national database of roads (Open Street Map), one from the National Wetlands Inventory that shows the location of wetland habitats, and one from the National Landcover Database that shows land use across the United States. The first three of these are all considered "vector data" – that is, data that are based on objects defined by their coordinates on a plane. The NAAMP stops data are simple points, the roads data are lines (which are defined by points), and the wetland data are polygons (lines that form a two-dimensional object). In contrast, the landcover dataset is "raster data" – basically just a picture with different colors to indicate different kinds of land use. In this case, each pixel of the image corresponds to a 30m by 30m square.

Easiest to see with an example. Go to the data site (<http://mirrors.nceas.ucsb.edu/trn/>) and type in the user name and password given to you by your instructor. Then, click on the folder for TN. Download the folder for the first route: 820104 and extract the data files. To do this, save the zip folder to your computer. Then find the zip folder, right click, and choose "extract." Once you have done this, you are ready to import the data files into qGIS. Note that there's one folder for the naamp data, one folder for the nlcd (national landcover database), one folder for the nwi (national wetlands inventory), and one folder for the osm (open street map) road data.

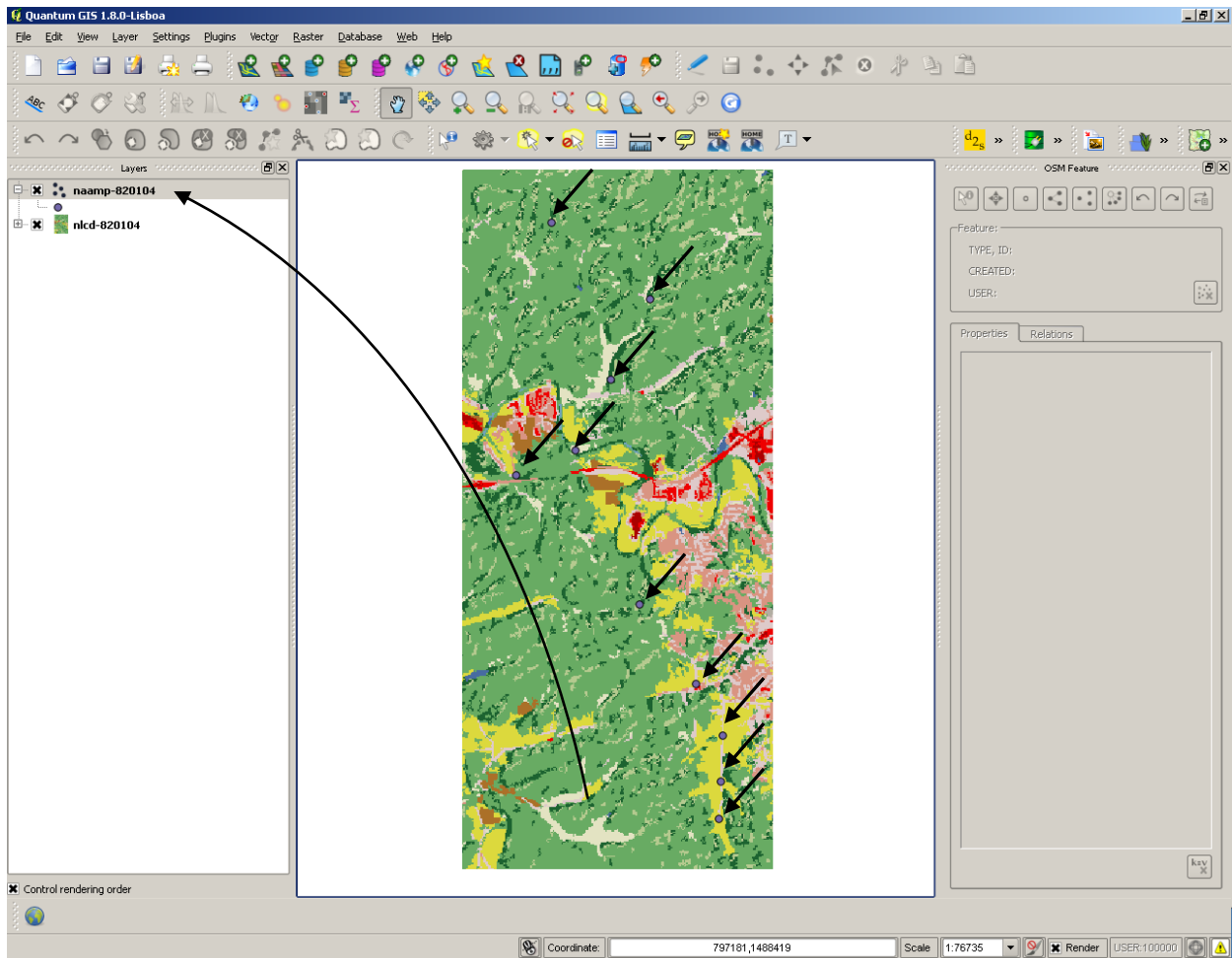
To open the nlcd data in qGIS, go to "Layer" in the top menu and click "Add Raster Layer". Browse to where you saved the nlcd folder and click on the only file in there (a tif file). When it opens, it should look something like the image below. Pretty!



What are you looking at here? To keep the databases down to manageable size, we've gone ahead and trimmed the landcover data to cover a rectangular strip of land that extends at least 1.1 km out from any of the NAAMP survey stops for each route. FYI the full landcover database is something like 18 GB!

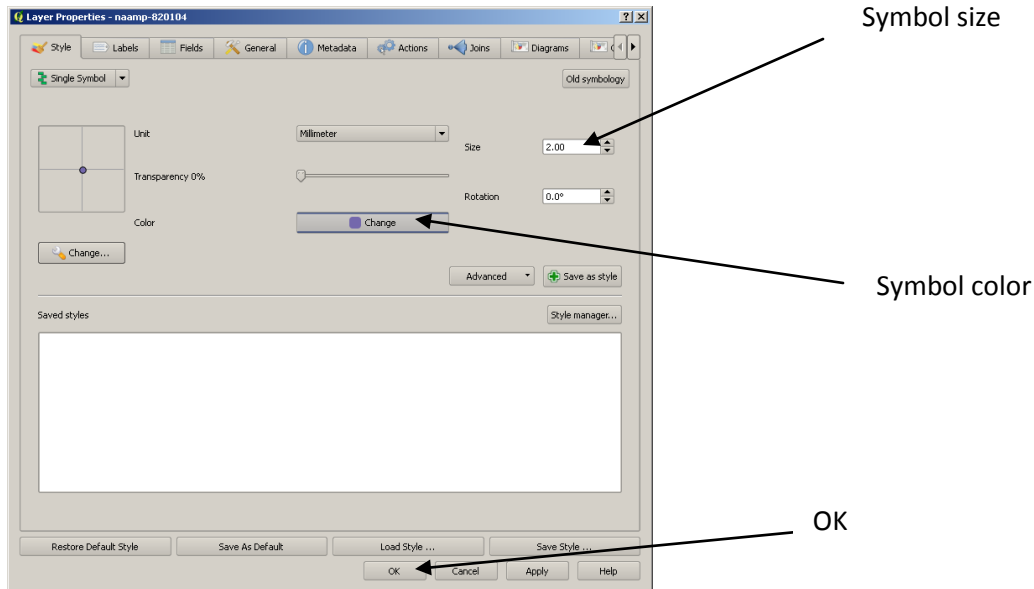
As far as land use goes, different categories of land use are coded with different colors, and the guide to the color codes is found here: http://www.mrlc.gov/nlcd06_leg.php. So, in this route we have mostly deciduous forest (light green), agriculture (yellow), and some developed land (pink to red).

Now let's see where the NAAMP stops are. At the top menu, hit Layer and then Add Vector Layer. Then hit browse and point to the folder naamp/routes. In here is the shapefile (.shp) that contains the stop locations. The file for this route is called "naamp-820104.shp". If you look at the map now, you should see 10 small circles (I've drawn some arrows to indicate where these are), representing the 10 naamp stops for this route. You should also see the name of this data layer displayed at the left (top of the list).

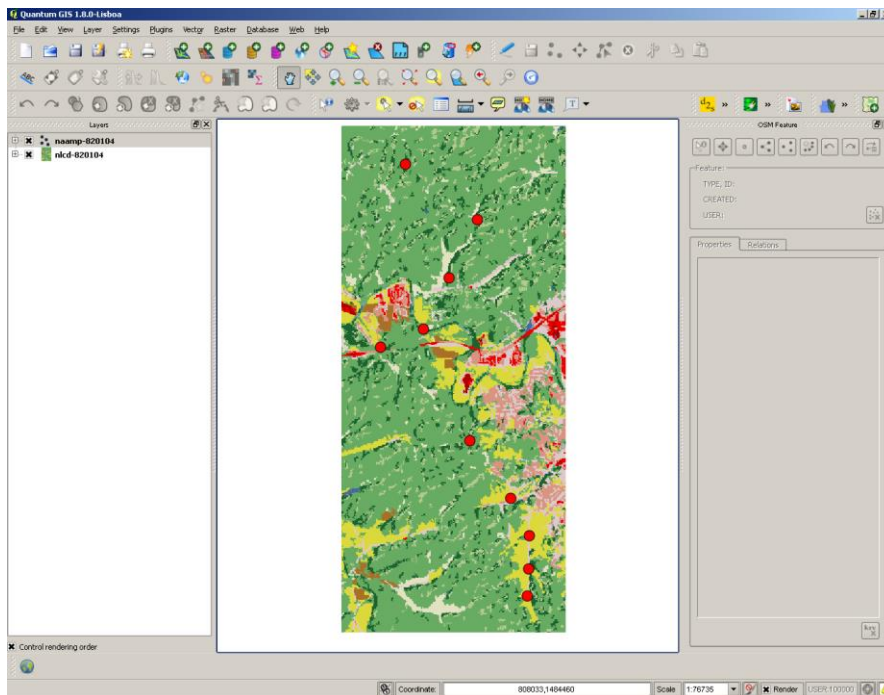


Usually it's a good idea to make the points more visible. To change what the points look like, right click on the name of the layer at the top left window and click on "properties"

The window that pops up will look like this:



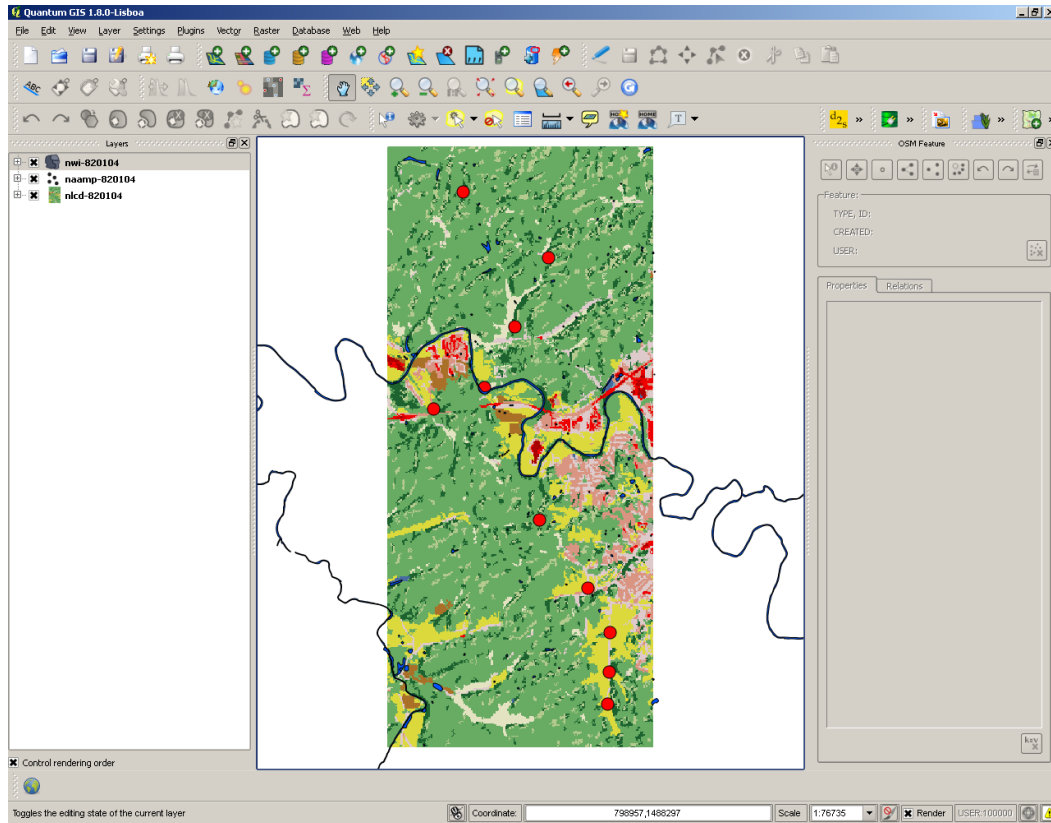
If you click on the change button with the bluish symbol next to it, you can change the color of the circle. For this one, I might suggest red (of course, what will be most visible will depend on which kinds of land use are most common). I might also change the size from 2.00 to 4.00. Then click OK at the bottom (or Apply). The result should look like this:



Much easier to see. At this point, if you haven't already, you should probably save your project using File then Save Project or Save Project As. In general, I try to save every time I add a layer so that if I get in trouble, I can just close and re-open from where I was before.

Next, one might add the wetlands layer. Go to Layer than Add Vector Layer and Browse to the nwi shapefile for this route (nwi folder, then nwi-820104.shp).

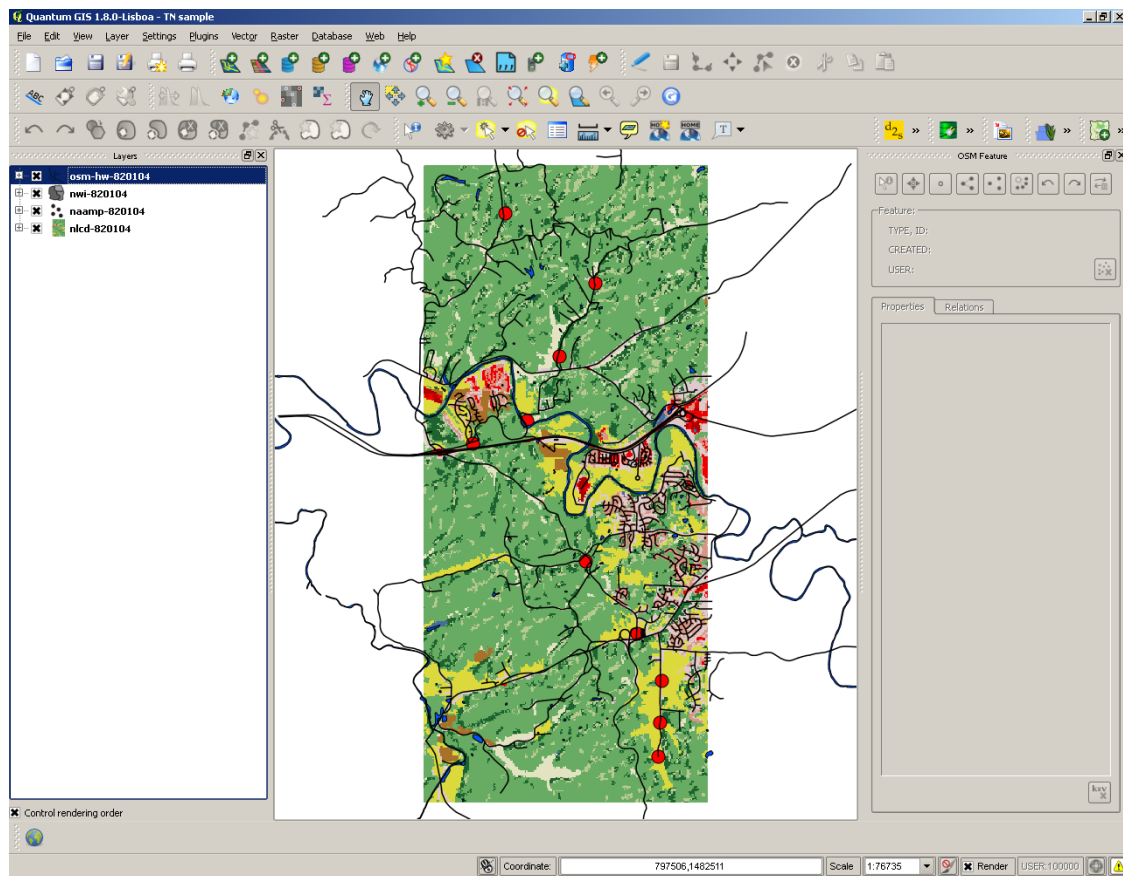
Not much water on this route, but I always like to have my wetlands look blue. So after you've added the wetlands layer, right-click on the layer in the upper left window, and once again click on properties. Change the color to blue. The result should look like this:



Basically, you've got one stream here and a few isolated ponds. But if you compare this image to the one above it (the landcover raster), you'll note several small wetlands that appear in the wetland inventory but not in the landcover data. The landcover data are based on satellite images, whereas the the wetlands inventory data have been ground-truthed – that is, actual humans have gone walking around to check to see what's there. In addition, many wetlands only hold water seasonally, so these may be missed from satellite images. For these reasons, we'll be using the nwi data for wetlands rather than the landcover data. Don't forget to save your progress after adding this layer!

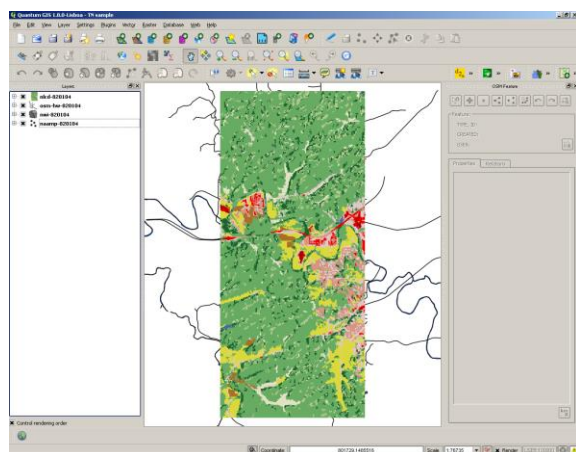
OK, last but not least, let's add the roads layer. Click Layer then Add Vector Layer then browse the osm shapefile (osm-hw-820104.shp). I typically use the properties tab to change the color of roads to black and up the width from 0.26 to 0.40 or 0.50.

Here's the result:



NOW THAT YOU HAVE ALL FOUR LAYERS THAT YOU’LL NEED, TIME FOR SOME IMPORTANT POINTS THAT YOU’LL DEFINITELY NEED LATER ON:

1) It doesn't matter in what order you import the four layers. You can import them in whatever order you want and then switch the order of the layers using the layer window at the left. Whichever layer is on top on the list (here, the osm roads layer) appears on top on the map. Just highlight the layers and change their order in the list to switch the order. For example, you could move the nlcd raster layer to the top, which would look like this:



That's not very helpful of course since you can no longer see the naamp stops, wetlands, or roads.

Typically, I keep the naamp stops on top (since I always want to know where those are), then the roads second from the top (those are thin and won't obscure much), then the wetlands, and finally the landcover data on bottom.

2) For each of the vector layers (stops, roads, and wetlands), you can view an attribute table that contains all the information about the layer. Just highlight a layer on the left window and right click. Open Attribute Table appears about a third of the way down. For the naamp layer, the attribute table shows the siteid, the stop and route number, and the lat/lon. FYI the attribute table is contained in the .dbf file in each data folder and can be opened by Excel or other spreadsheet software.

Attribute table - naamp-820104 : 0 / 10 feature(s) selected

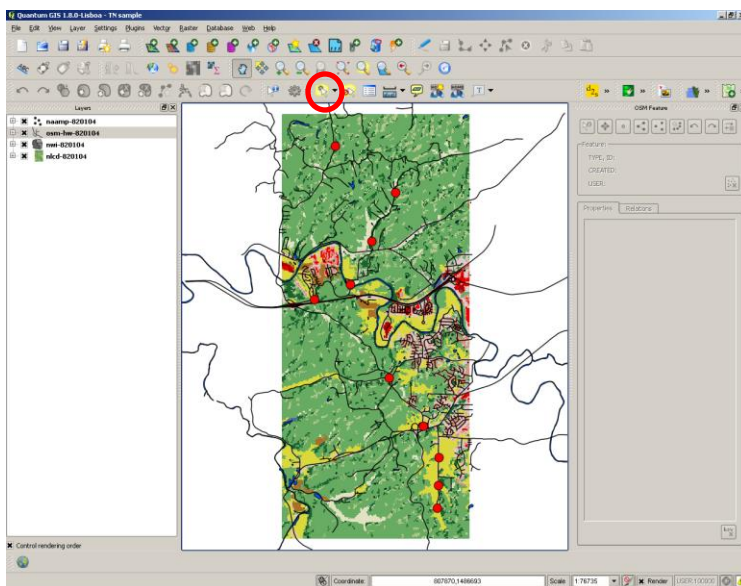
	siteid	stopnum	routenum	lat	lon
0	21392	1	820104	36.0099	-86.9712
1	21393	2	820104	36.0169	-86.9699
2	21394	3	820104	36.0255	-86.9686
3	21395	4	820104	36.0357	-86.9736
4	21396	5	820104	36.0518	-86.9852
5	21397	6	820104	36.0782	-87.0115
6	21398	7	820104	36.082	-86.9968
7	21399	8	820104	36.0946	-86.9869
8	21400	9	820104	36.109	-86.9758
9	21401	10	820104	36.1252	-86.9975

Look for in

☐ Show selected only ☐ Search selected only ☒ Case sensitive

The attribute table for the osm roads layer contains information such as road name and road type. The table for the wetlands data contains the area and wetland type for each individual wetland. We'll use the wetland information later on.

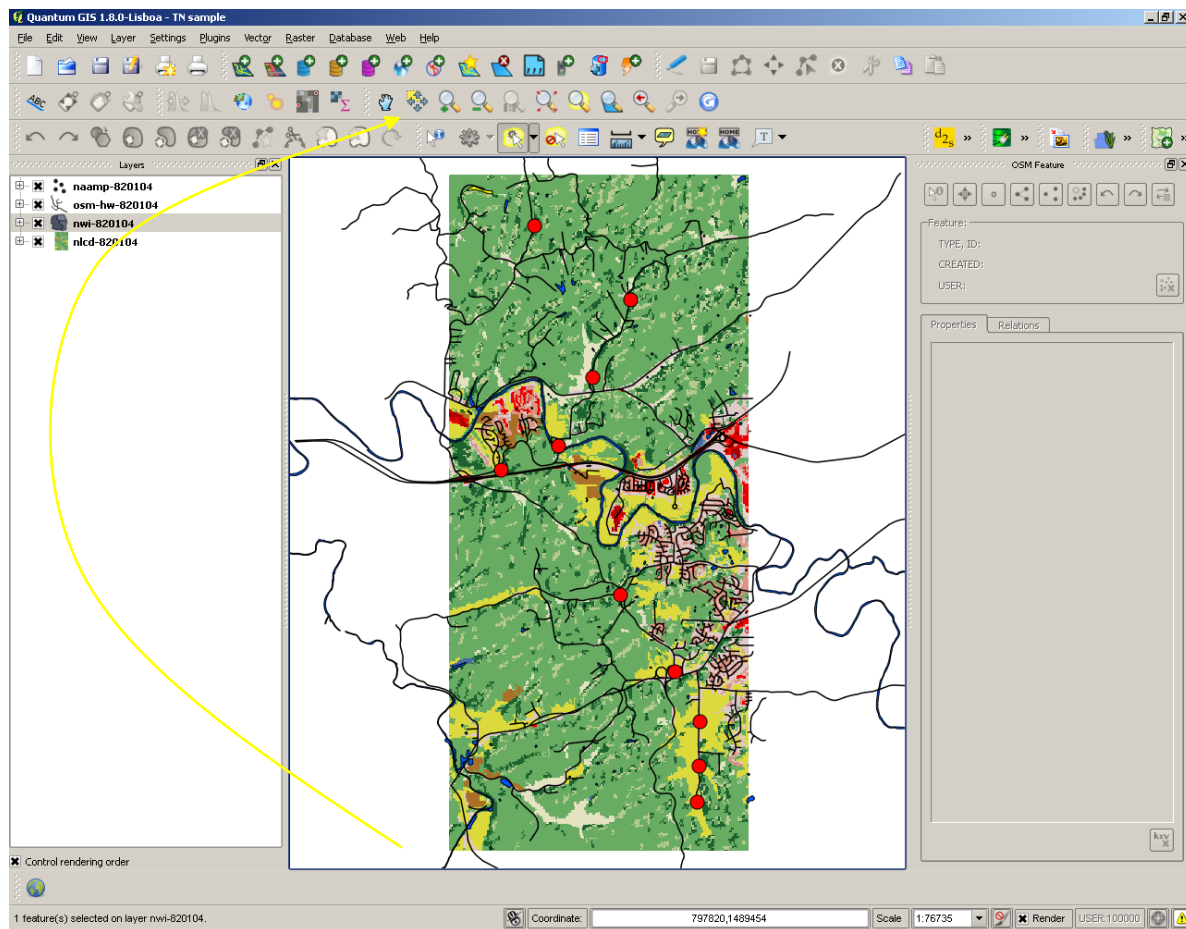
3) You can select individual features in addition to entire layers. For example, if you have the naamp layer highlighted, you can then click on the icon for Select Single Feature (circled in the icon menu).



Now let's select the naamp stop that's closest to the top of the screen. It should turn yellow to indicate that it has been selected (this is a reason not to make all the naamp stops yellow on your map). If you click on the attribute table for the naamp layer, this stop (which turns out to be stop 10) is highlighted. So, you can select individual features to see what's what on your map. The icon just to the right of the Select Single Feature icon can be used to deselect any selected features.

You will also need to be able to select

individual wetlands. Highlight the nwi wetland layer in the Layers window. Then use the Select Single Feature icon to select the thin wetland closest to the upper left-hand corner. It should turn yellow to show that it has been selected (can't see it well below but the arrow shows the location).



Now click on the attribute table for the nwi layer. You'll see that the highlighted wetland is classified as a Freshwater Forested/Scrub Wetland and that the area is 7.46 acres.

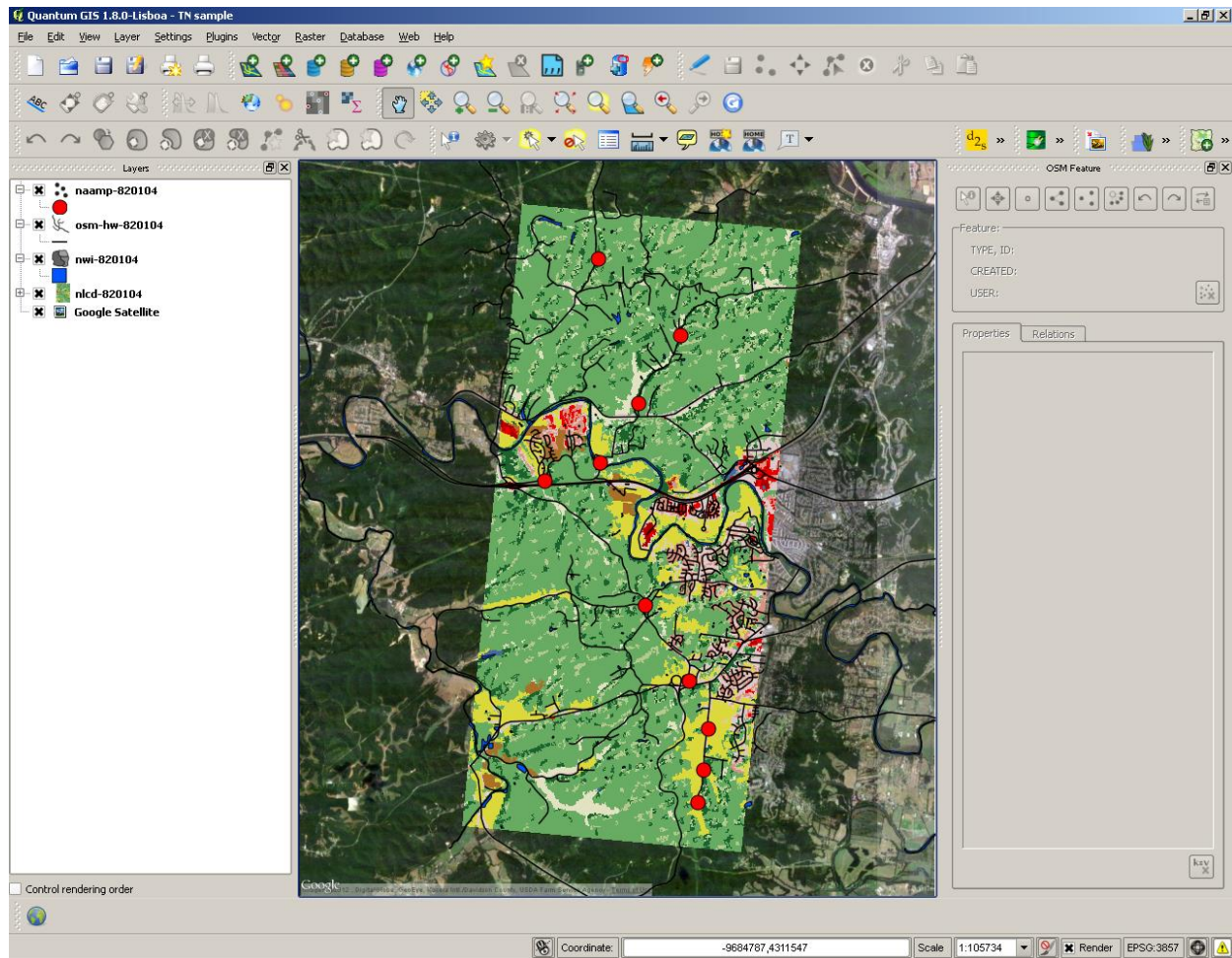
4. You've probably figured this out on your own, but you can zoom in and out using the magnifying glass icons in the middle of the icon menu. Just click on the Zoom In (+) or Zoom Out (-) icon on the screen. For example if you zoom in on any of the stops in the top section of the screen (stops 8,9, or 10), you'll notice that the forest in here contains a lot of small ponds that you probably didn't notice on the map above.

5) Sometimes it's very useful to see the actual landscape, rather than the GIS representation of the landscape. You can actually add a Google satellite image (as in Google Maps) as a layer to your map. Then you can toggle back and forth between the actual image and the GIS map.

To do this, you first need to enable OpenLayers. At the top menu, click Plugins, then "Fetch Python Plugins". Scroll down to the OpenLayers plug in, click on it, and click "Install."

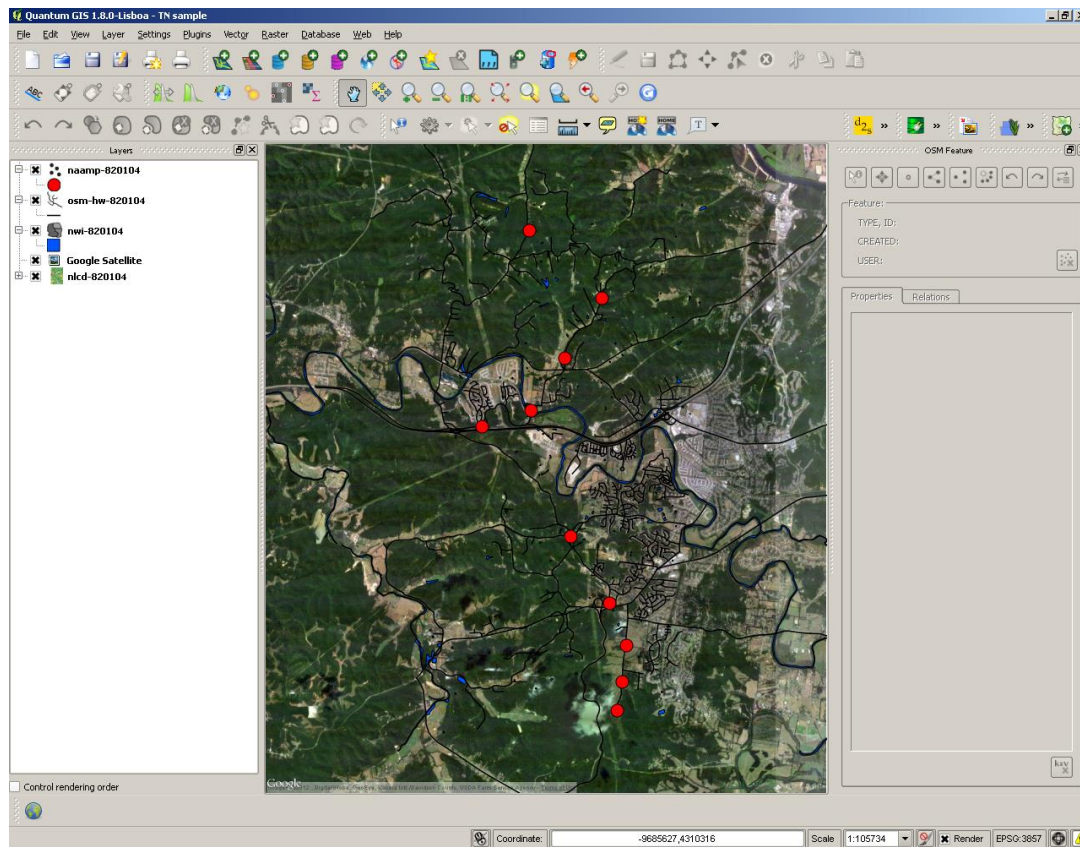
Now when you click again on the Plugins menu, a new option appears for OpenLayers plugin. Follow this menu to “Add Google Satellite layer.”

If you add it to the bottom of the Layer window, the result should look like this:



NOTE: Occasionally you'll get an error where the satellite image comes in a few broken pieces or doesn't line up correctly (you'll know when this happens). If you get this, just zoom in and back out again (or vice-versa) and this seems to fix the problem.

By dragging the Google Satellite layer up to higher on the label list, you can effectively switch back and forth between the satellite image and the landcover raster as the background. If you drag the “Google Satellite” layer tab, up above the nlcd layer, you can see the stops represented on the satellite image:

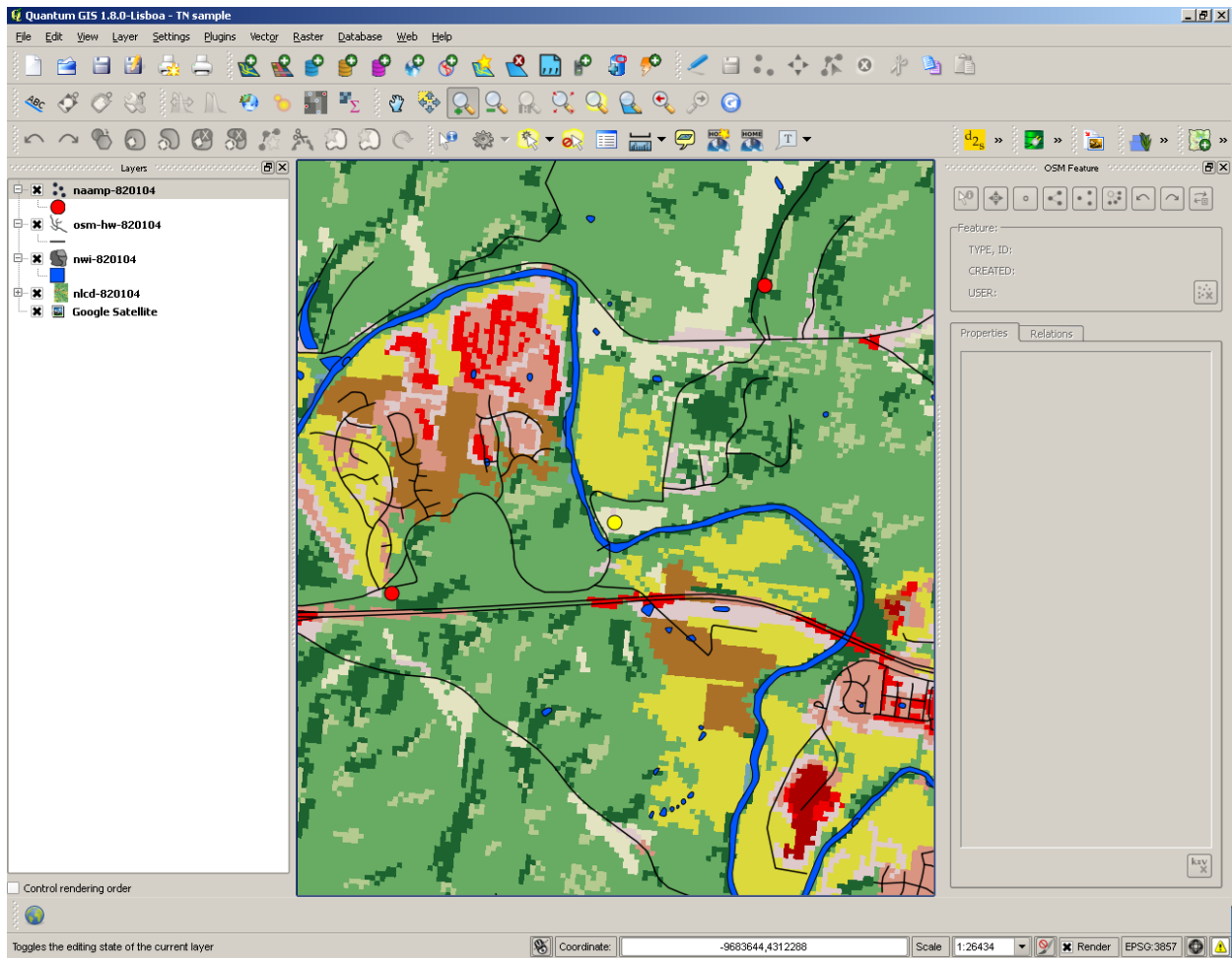


Being able to look at the actual landscape isn't just fun and games. Looking at a satellite image of your site should help you better visualize the landscape that frogs and toads are living in and moving through. This should help you think more clearly about the colored pixels, lines, and polygons that you'll be working with within qGIS. Similarly, seeing the landscape may help you think of additional questions we should be asking in this project.

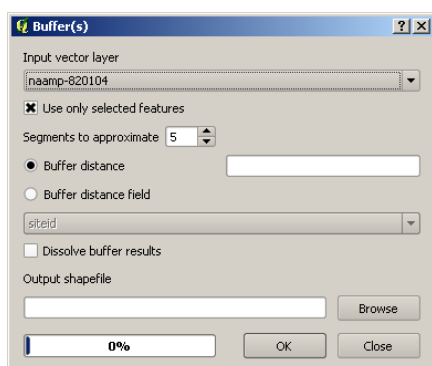
6) One final technique you'll need is drawing "buffers" (really just circles) around the naamp stops. The landscape variables to be assessed examine the landscape within either 200m or within 1000m of each stop. To measure these variables, you'll need to have a circle with a 200 m radius and a circle with a 1000 m radius around each stop.

Let's start with stop #7 from the current map – that's the fourth one down from the top of the screen. Highlight the naamp layer, then click on the "Select Single Feature" icon, then click on stop #7. You can open the attribute table for the naamp layer to check and make sure you've got the right one.

If you zoom in a couple of times on this stop, your screen should look something like this:



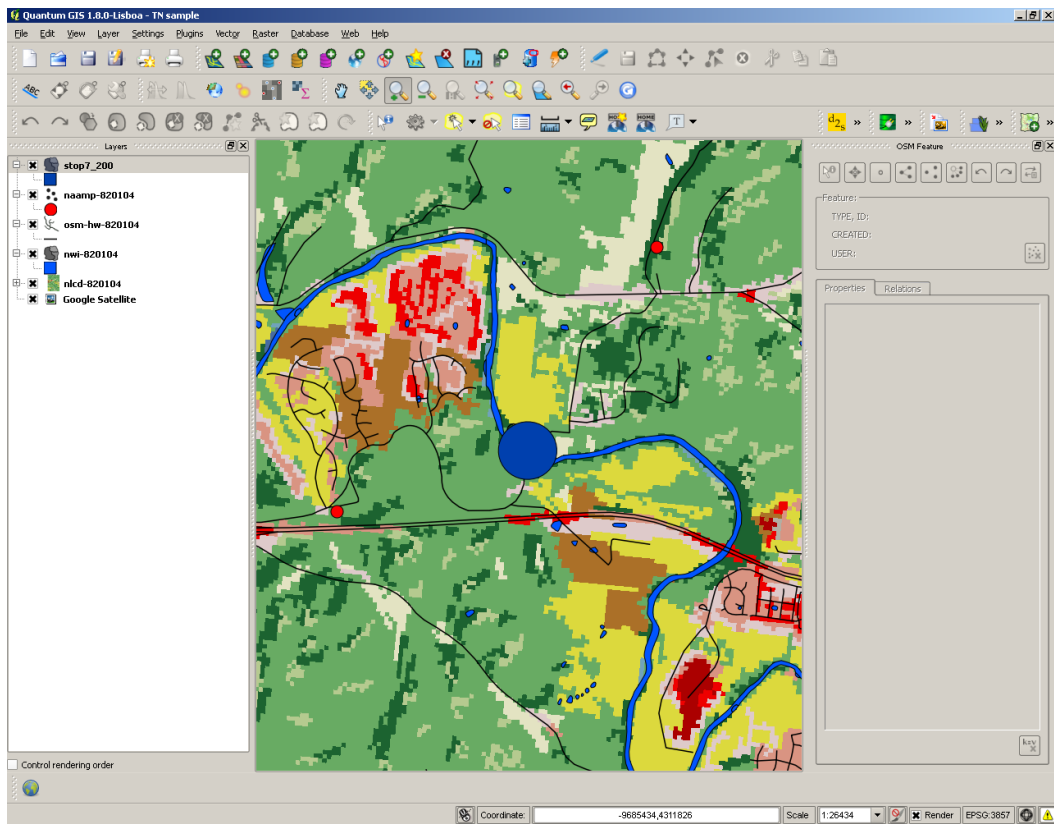
Now, at the top menu, go to Vector, then Geoprocessing Tools, then Buffer. A pop-up window should appear:



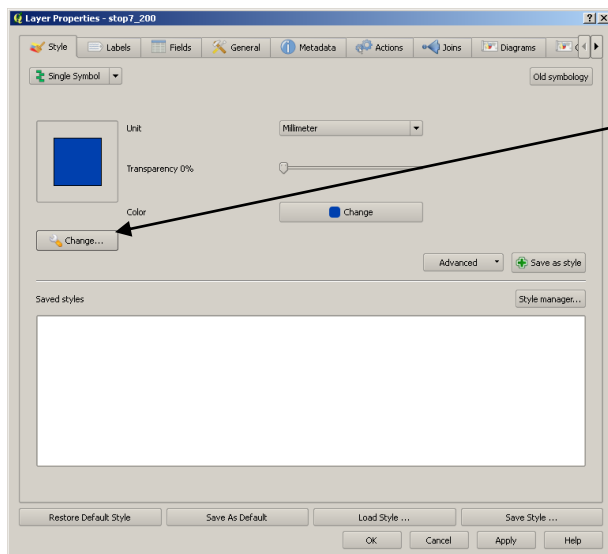
qGIS draws a circle based on segments. To get a better-looking circle, change "Segments to approximate" from 5 to 10. Under buffer distance, type in 200 (for a 200 m buffer). The buffer will be another data layer, so click on browse and tell qGIS where you want to put the file (usually, within the folder that contains the other files for this route). Then give it a name – I'd suggest something like "stop7_200". Click "Save" then "OK" on the Buffer popup window. Click Yes for saving the buffer layer to the TOC (table of contents in the layer window. If you've done all this, you

should get something like this:

Note the big blue circle in the center (the color of your may be different)

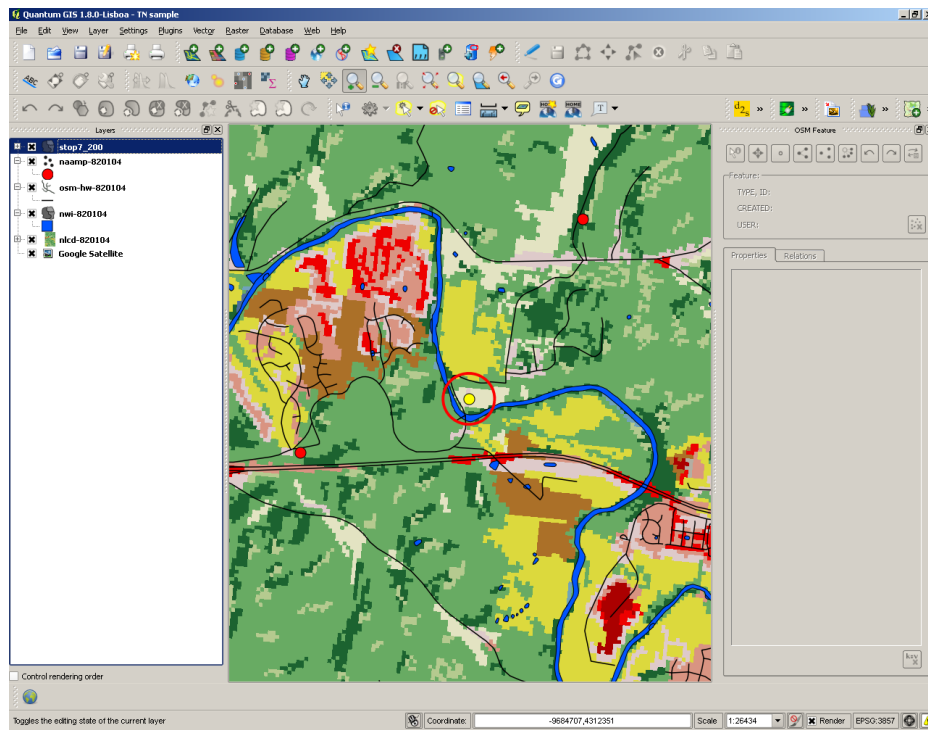


Not super helpful since you can no longer see what's inside the buffer. Highlight the buffer layer then right click to get to Properties.

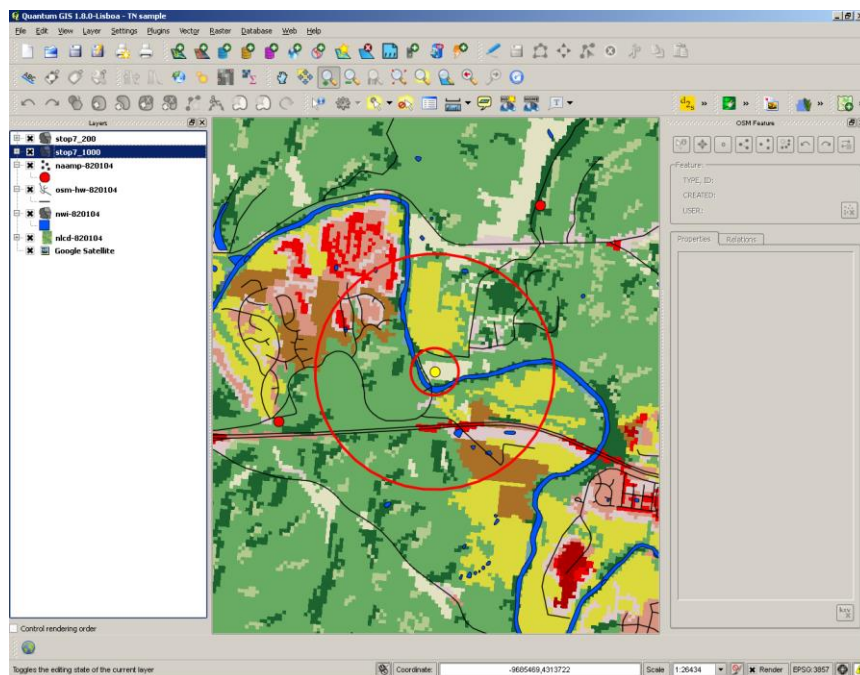


In the properties window, click on the icon of the wrench with "Change..." next to it.

You might change Fill Style to "No Brush", change the Border color to red (I use red here because nothing else right around the stop is red, otherwise I might just use black) and change the Border width to 1.00 to make the buffer more visible. You should get a map that looks like this:



Now you can clearly see what's within 200m of the site. Now do the same thing, but set your buffer distance to be 1000m and name the buffer "stop7_1000." You should be able to produce something that looks like this:



Once again, don't forget to save your work. Congratulations – these are all the basic skills you'll need to do the landscape calculations in qGIS. You're now ready to go on to the formal protocol for "Compiling and Recording Landscape Variables."