Exercise 8: Mapping and Adding Attribute Data with QGIS

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1. Intro-fossgis-umass

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1.2. Module Licensing Information

Version 1.0.

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2. Mapping GPS points with QGIS and adding attribute data

2.1. Goals

The goal of this module is to create a point layer with locations obtained with a GPS receiver and update the database adding attribute data to the points.

2.2. Introduction

Most GIS packages have utilities or plugins to facilitate the direct download of GPS points from the GPS?receiver into the GIS program, and vice versa. This allows you to upload routes or coordinate pairs from a GIS layer to the GPS receiver, so you can use the GPS in the field to navigate to particular locations. If you are interested QGIS-GPS receiver interaction, we hope to have a resource available on this topic...stay tuned.

Also, QGIS can import GPS files already in the computer in a number of GPS formats. To translate among formats, it uses the capabilities of the open source program GPSbabel http://www.gpsbabel.org/ that should also be installed in the computer. In addition, QGIS has a plugin that will read files in the gpx format [http://www.topografix.com/gpx.asp], an open-standards GPS data format.

For the purpose of this class/lab, we are presenting a generic way of creating a GIS layer from a text file with coordinate pairs. (But for your future projects, and especially if you have many GPS locations, it is advisable to download the GPS files from the receiver directly into QGIS).

2.3. Getting Started

We created a cache location in UTM zone 18N coordinates (the datum is WGS 84). Our GPS machine provided coordinates in UTM, but to make them integrate with the image, they need to be in State Plane, which is what our Orthophoto is referenced in. Here are the UTM Coordinates (zone 18N)

```
Easting 0702893
Northing 4695906
```

In this exercise, we will map this point over an orthophoto of the UMASS campus.

Obtain Orthophoto for UMASS Campus

You can get this photo off the MassGIS website, but to save time, we have uploaded it onto our server. You can get it here [http://linuxlab.sbs.umass.edu/introFossgisUmass/datasets/geocache.zip]. This particular photo is a 1:5,000 Black & White Digital Ortho Image. If you were to download the image from MassGIS, you would have to find the reference sheet that shows which number orthophoto covers the UMass campus. Again, we've simplified this for the purposes of the assignment, as you can see from the image below:

Figure 1: OQ Ids for Amherst

Bring Orthophoto into QGIS

Open QGIS and add the orthophoto quad. Define the projection: State Plane, NAD83, Mass Mainland.

Issues with projections

Now we need to be careful with the projections or the data won't overlay properly. QGIS can handle "on the fly projection" for VECTOR layers. But here, we are combining raster (the orthophoto) and vector (the GPS point layer) into the same project. After repeated tests, we confirmed that if we bring the GPS layer into QGIS in UTM coordinates, the "on the fly projection " will not only fail, but the program will become very unstable and eventually crash. QGIS does not provide the functionality of projecting interactively vectors or rasters. (There are open source libraries that deal with this problem (GDAL/OGR): they are tools to translate among raster and vector formats, but we won't introduce them in this course).

The easiest solution will be to convert the UTM coordinates into State Plane, so they will match with the raster. We found some applets in the web that will help you with this translation in two steps: First, you will convert the UTM coordinates to Geographical (i.e., latitude/longitude) at this website:

http://jeeep.com/details/coord/

(note: the above site seems to be a little unpredictable. But there are lots of other UTM to Geographic coordinate

converters on the web (do a Google search on "UTM to Geographic conversion and you'll see what we mean). Another site we found is at the Canadian Spatial Reference System at http://www.geod.nrcan.gc.ca/apps/gsrug/index_e.php.

But for now, we'll continue with screenshots of the jeeep.com site. Introduce the UTM coordinates listed for the cache above and click "submit". You should see something similar to the image below:
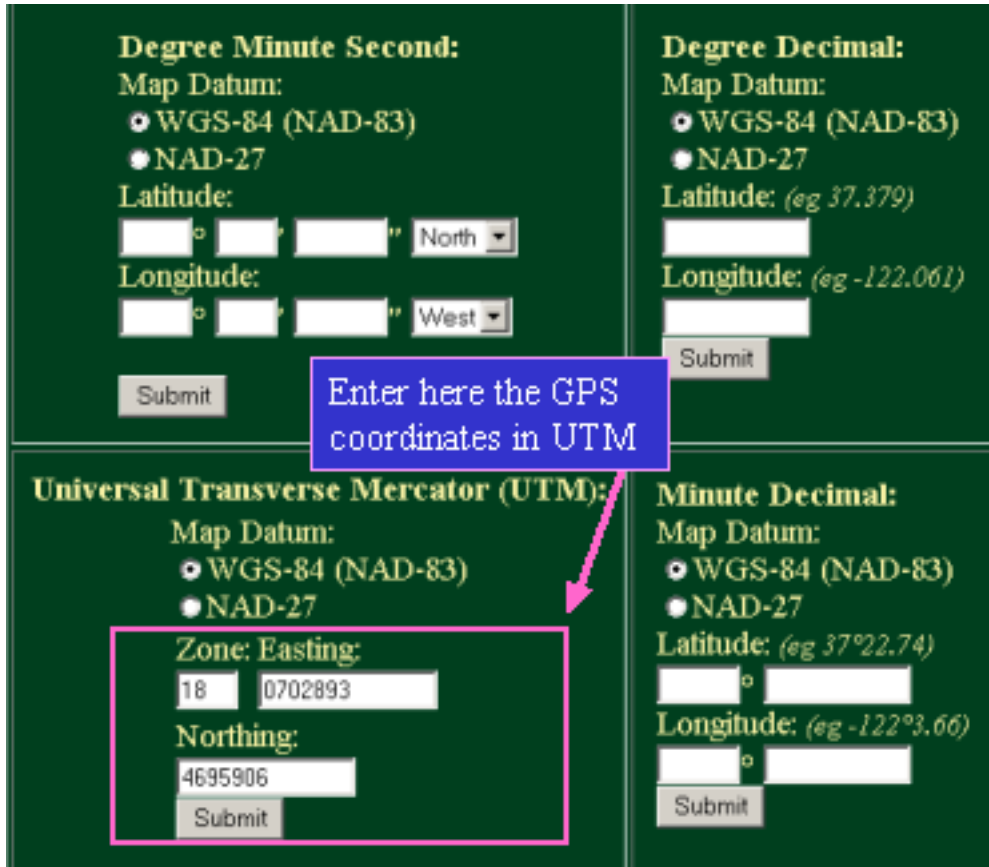

Figure 2: UTM to Geographical

But we still need the coordinates in the State Plane system, not simply geographical. To do this conversion, you can go to http://www.ngs.noaa.gov/cgi-bin/spc_getpc.prl and enter the Geographical coordinates you just obtained to translate them into the State Plane coordinates that our orthophoto is in. You will need to rewrite them as an integer string (i.e. N422320.2 and W0723206.5):

Figure 3: Geographical to St.PL.

These are the GPS coordinates for the cache location in Mass State Plane system:

Figure 4: State Plane Coordinates

2.4. Preparing the X/Y text file

Now, we can prepare the delimited text file with the state plane coordinates. QGIS has a plugin (a tool that you call when you need it) that allows you to turn X/Y coordinates lists into GIS layers as long as they are in a .txt (text) file. Prepare a text file with the coordinates delimited by commas "," (it could also work with other delimiters like tabs, spaces...). The first line of the file will have the names of the column headers or the field names. We've added a couple of campus locations to the cache point to provide some context.

The next image shows the x/y data organized in nice colums, the second image shows how the text file should look for QGIS to read it. Don't worry if, in your text file, your headers (x, y, Use, etc...) don't line up in columns with the coordinates--QGIS will not look at spacing, only at commmas. For this lab, we will use a text composer like notepad in Windows, or kwrite in Linux. Name the file "Geocatching.txt" and save it in your work folder.

x,	y	Site	Use
114766.849,	904787.853	Cache location,	
115121.47,	905224.05,	Holdsworth,	
114881.11,	904903.58,	Mullins Center,	

Figure 5: Parsed text file

```
GPSgeocatch.txt - Notepad
File  Edit  Format  Help
x, y, Site, Use,
114766.849, 904787.853, Cache location,
115121.47, 905224.05, Holdsworth,
114881.11, 904903.58, Mullins Center,
```
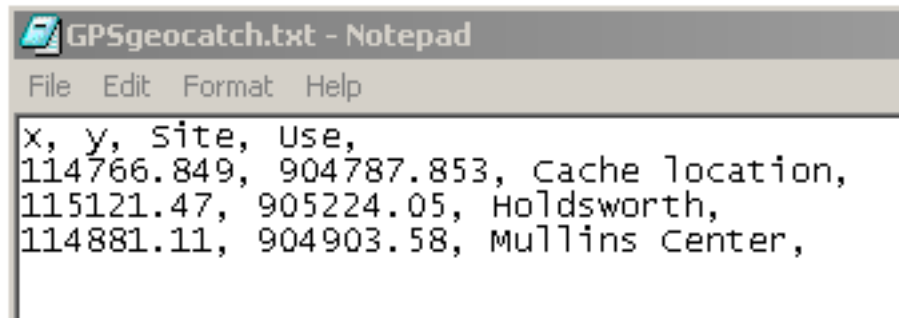
Figure 6: Comma delimited text file

Note that we added an "empty" column or field called "USE". In QGIS you can edit the fields in attribute tables of shapefiles, but you cannot add or delete fields. So if you are planning to enter information about the GPS points in different fields, you should either enter all the information during the text file preparation, as we did in the column "SITE", or just enter the name of the field (as in "USE") and fill in the blanks later in QGIS.

2.5. Create a point layer with the "Add X/Y data" Plugin

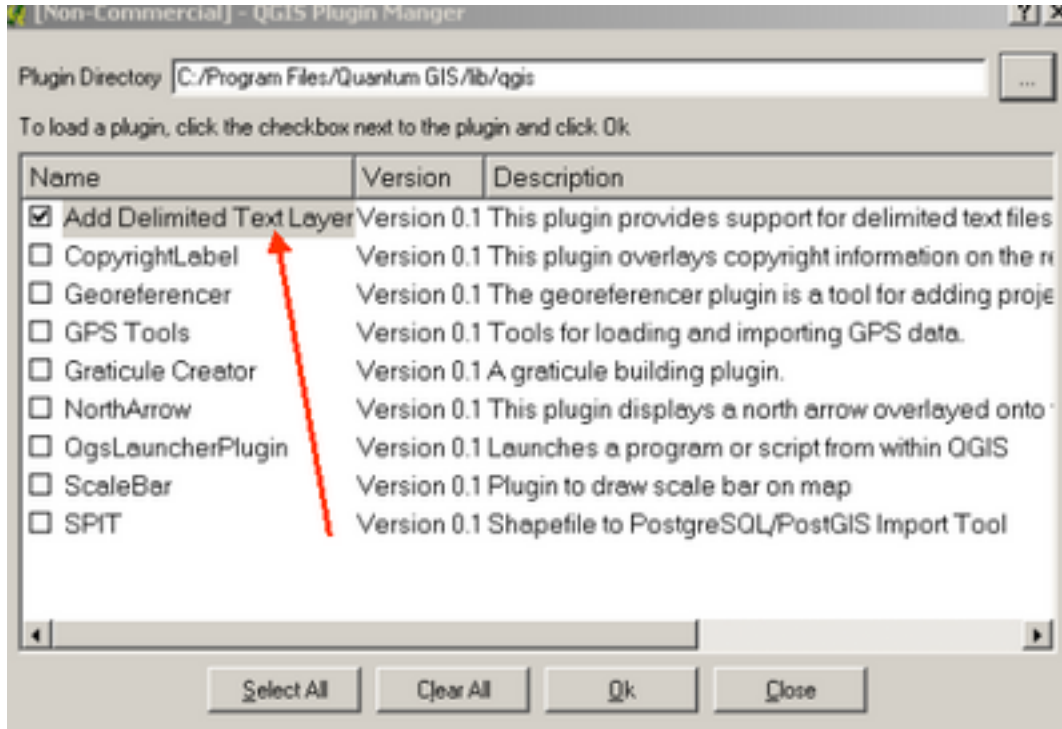In QGIS, go to the menu "Plugins" > "Plugin manager" and check "Add Delimited Text Layer":

Figure 7: Activating plugin

Click in the little icon that just showed up.

Note: In some versions of QGIS the icon will not show up, if this is the case, you can access the function through the plugins menu.

(Plugins > Delimited Text > Add Delimited Text Layer)

Then, fill in the fields of the plugin wizard (some of them may fill in automatically):

1. Browse to the text file with the coordinates: "Geocatching.txt"

2. Name the new layer "geocaching" or "cache_lab" or whatever you prefer.

3. Define the delimiter you used, in this case comma: , (dont use "")

4. Parse the file

5. Choose the field name that corresponds to Easting and Northing ("x" and "y" in this case)
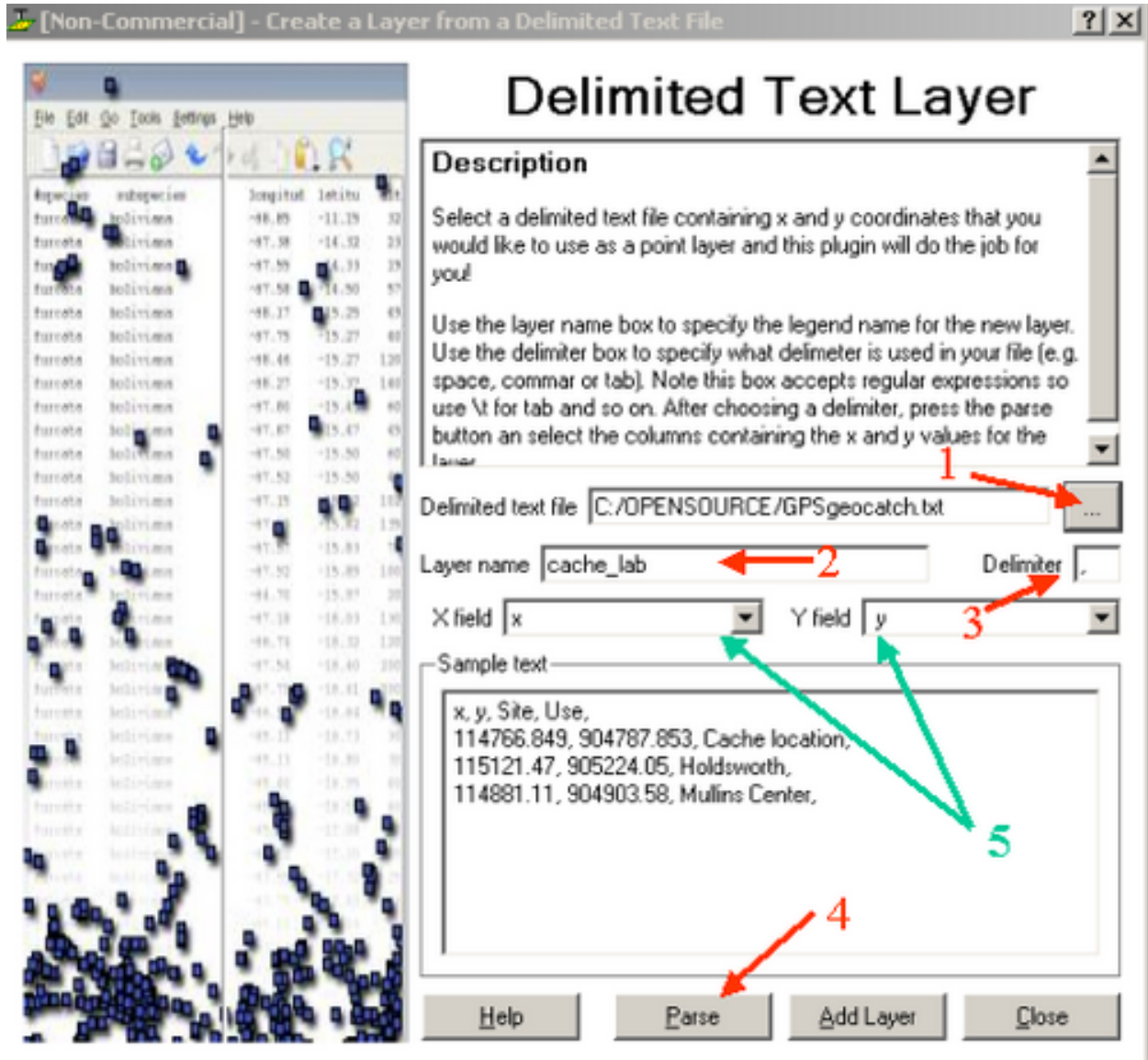
Add the layer and Close.

Figure 8: Add XY data wizard

2.6. Create a permanent layer: shapefile, and bring it into the project

A new layer has been created. You could define the projection information for this temporary layer, but as we cannot edit it further at this stage, we will convert it first into a shapefile. Right click the layer in table of contents (TOC) and "save as shapefile". Store the shapefile in your work folder.

Delete the temporary layer from the TOC and add the shapefile you just created. Right click and define the projection in Properties (Massachusetts Mainland State Plane (Lambert Conformal Conic), NAD 83). Now your

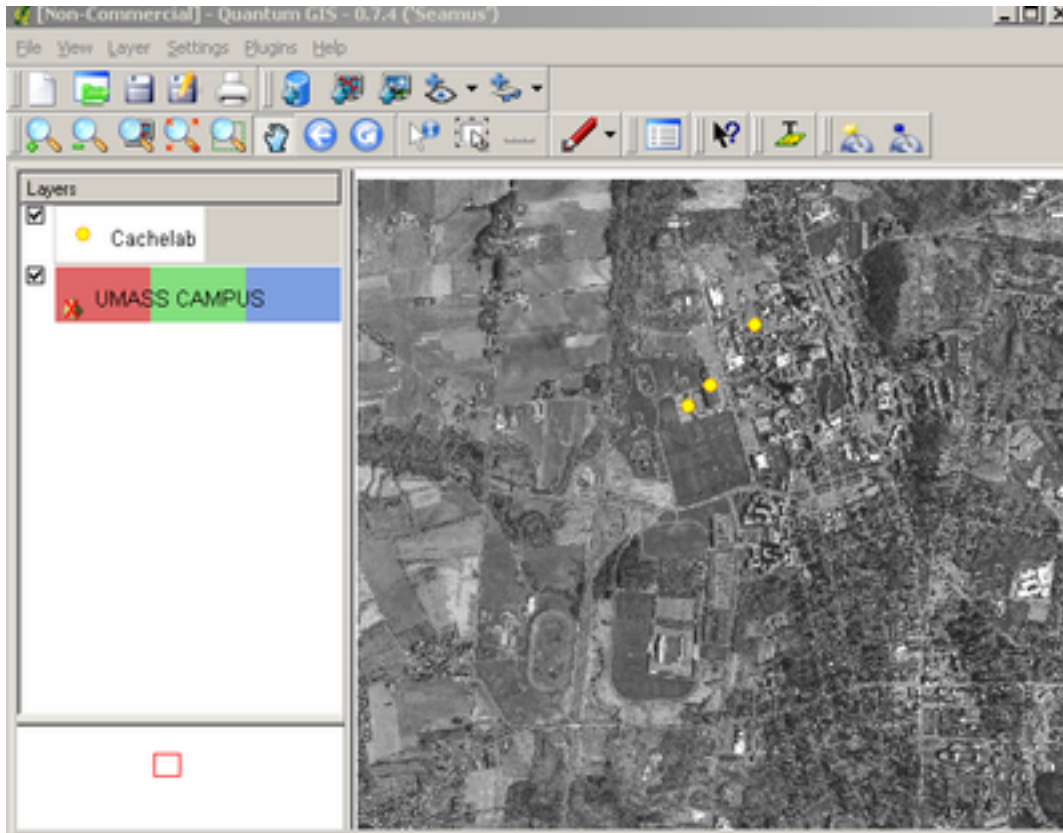points should fall in the "right places" in the UMASS orthophoto.

Figure 9: GPS point layer over UMASS OQ

2.7. Label the points

Open the properties of the shape file. Select the "Label" tab to label the points using the "site" field. You might also want to change the color of the font to make it easier to see. This can be done in the "font style" tab:
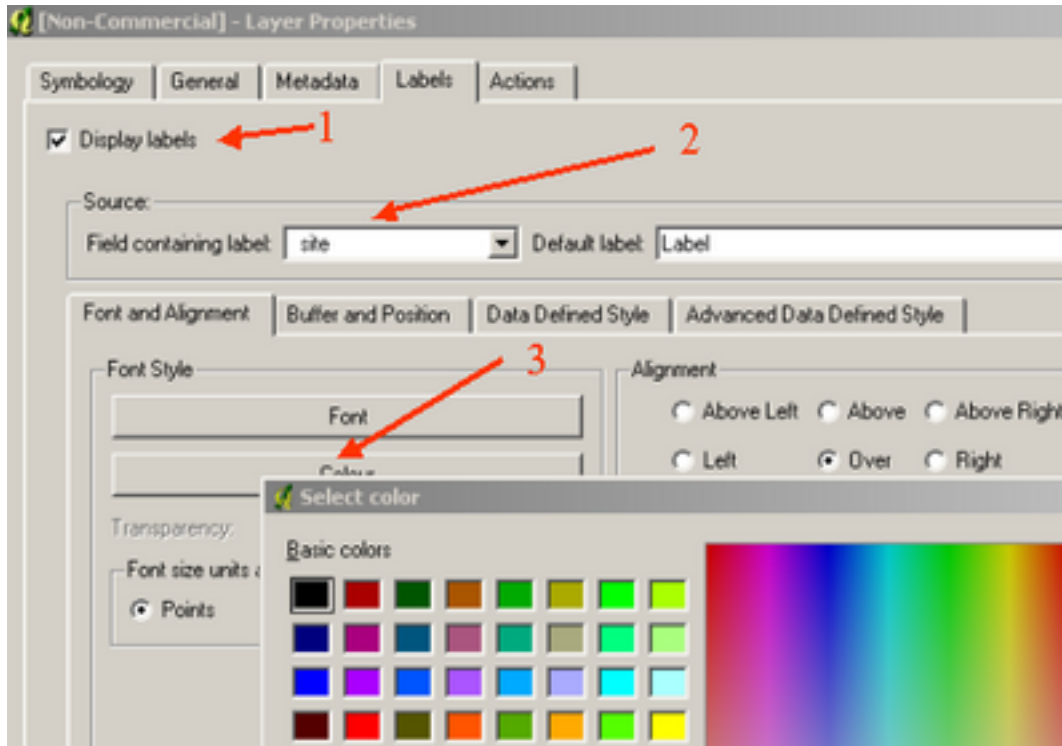
Figure 10: Labelling GPS layer
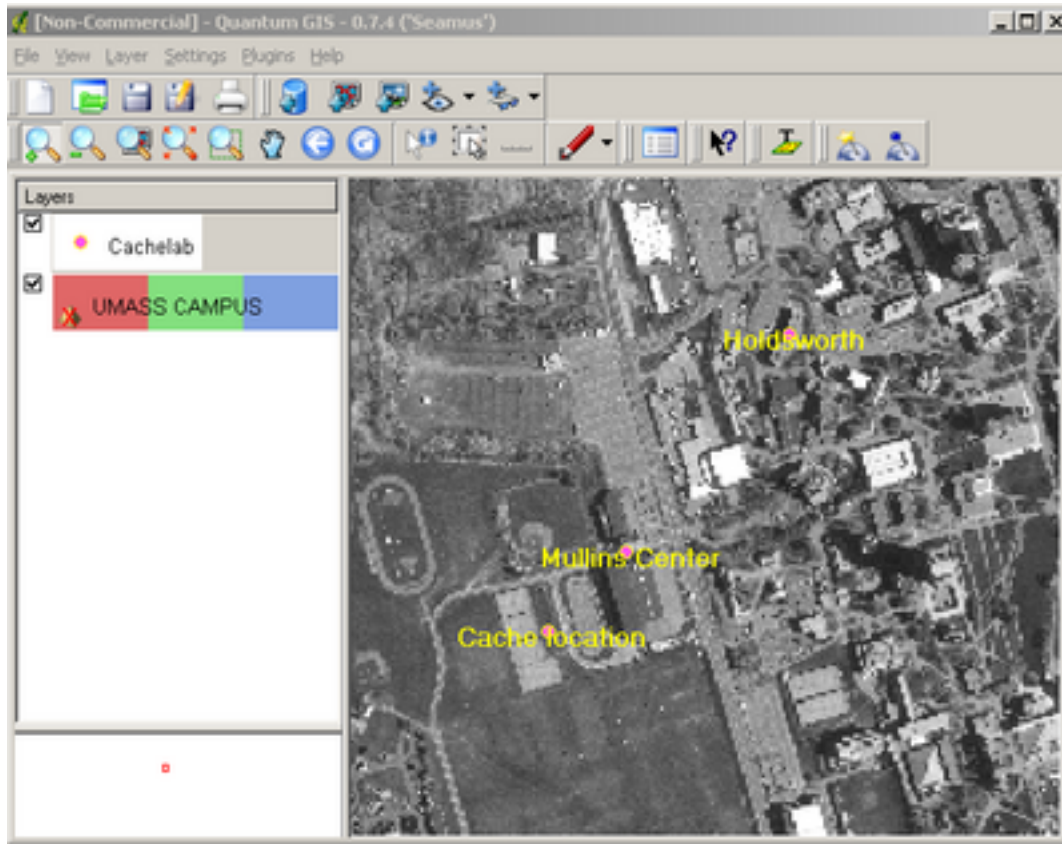
This is how it should look:

Figure 11: Labelled layer

2.8. Add attribute data to the points

When you collect GPS points, you will often collect other information associated to the points. It is a common task to add that information to the database. As we mentioned before, you could add the information while you are creating the text file, or directly in the attribute table, as long as you have created the fields in the first line of the X/Y text file.

To modify the attribute table, select the shapefile in the legend, then hit the "open table"   button:

please define productname in your
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Figure 12: Attribute table

We will fill in the "USE" column. Click "start editing" in the top-right corner in the attribute table. Double click in the cells you want to update. Make up your own info or copy what's provided here. After you are done with your edits, click "stop editing" and save edits.

please define productname in your
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Figure 13: Editing Attribute Table

Congratulations! You've just input GPS points, converted them from a text file to a shape file, and added extra data to them.