

Preparing global soil and landuse data for QSWAT

Chris George

January 2015

Version 1

1 Introduction

The WaterBase website has on its *Data* page http://www.waterbase.org/download_data.html maps for soil and landuse covering most of the world, and QSWAT comes with lookup tables for these maps (*global_soils* and *global_landuses*) already prepared and stored in the project database. This document describes how to use QGIS to prepare maps for a particular watershed.

Start by opening the *GlobalData* project, which you can find in your QSWAT installation, in a folder of the same name, probably in *C:\Users\<user>\.qgis2\python\plugins\QSwat¹* as *GlobalData.qgs*: see (Figure 1)

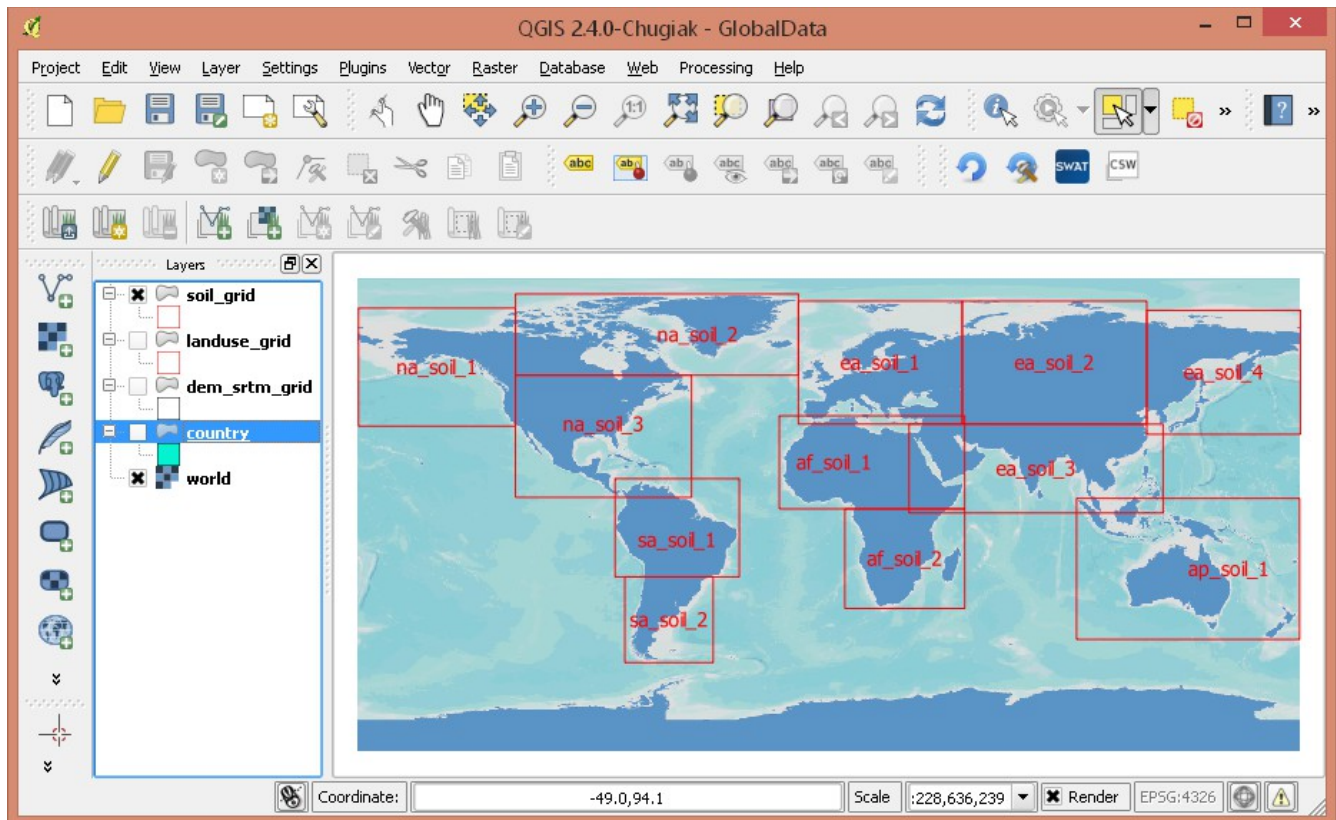


Figure 1: The *GlobalData* project

This project includes as well as the continents a shapefile of the world's countries (not visible in Figure 1) a grid of SRTM tiles (not visible in Figure 1), extents of global landuse maps (not visible in Figure 1) and extents of global soil maps. So if, for example, you want to model a watershed in South Africa you can see that the soil map you need from WaterBase is *af_soil_2*. Displaying the landuse grid would show you that you need the landuse map *af_land_2*.

The same [page](#) at the WaterBase site also has maps of river basins which you might like to use to identify your area of interest more closely.

¹ Or *C:\Documents and Settings\<user>\.qgis2\python\plugins\QSwat* in Windows XP.

2 Find the extent

The first task is to fix the extent of the watershed, the maximum and minimum latitude and longitude (in degrees) to include all of it. You may well have this information already, but if not there are a number of ways to discover it.

- **Using a river basins map** you can zoom in to your basin and simply read off latitudes and longitudes from the *Coordinates* display at the foot of the QSWAT window.
- **Using your DEM**, if it is currently in lat-long (geographic) projection you can again just move the mouse to its edges and read coordinates. If it is already projected you can load it, and start the process of saving it in lat-long projection. Right click on its entry in the *Layers* panel, and select *Save As...* In the resulting *Save raster layer as...* form, click on *Change* beside *CRS* and in the *Coordinate Reference System Selector* you will usually find *WGS 84*, with authority id *EPSG: 4326* among the recently used CRSs, otherwise you have to find it in the lower box, as one of the ***Geographic Coordinate Systems***. Make sure it is selected (in the bottom box), click *OK* and in the *Save raster* form you will find the extent in degrees is now shown, so you can make a note of the values and then *Cancel* the form.
- **Using QSWAT** if you have a projected DEM, start your project, and in the *Watershed Delineation* form select the DEM. Then go to the *DEM properties* tab and you will see the extent displayed.

It would normally be adequate to use one decimal place when noting the degrees of latitude and longitude, but the global soil maps are quite coarse and there is a danger of clipping them too finely and having no data around the edges, so it is better to round up or down (according to which edge you are on) by 0.2°. Make sure you round outwards from your area rather than into it.

If your longitude is West of the prime (Greenwich) meridian it will be used as a negative number. Latitudes in the southern hemisphere are similarly negative.

3 Clip the soil and landuse maps

We want to clip our soil and landuse maps to the extent we have noted, which is very simple.

First we load into QGIS the soil map we selected. Then we use *Raster* → *Extraction* → *Clipper* to bring up the *Clipper* form (Figure 2). We check the map we want to clip is selected for input, we *Browse* to a suitable folder (or create one) and type in a suitable name, check *No data value* and use a suitable negative number, like -9999, and provide the values for the extent. We check *Load into canvas when finished* and click *OK*. Click *OK* to remove the two following messages.

You do not need to immediately close the *Clipper* form. You can just load the landuse map, adjust the input file in the form to that map, edit the output file name in the box, and click *OK* to clip the landuse file using the same no data value and extent.

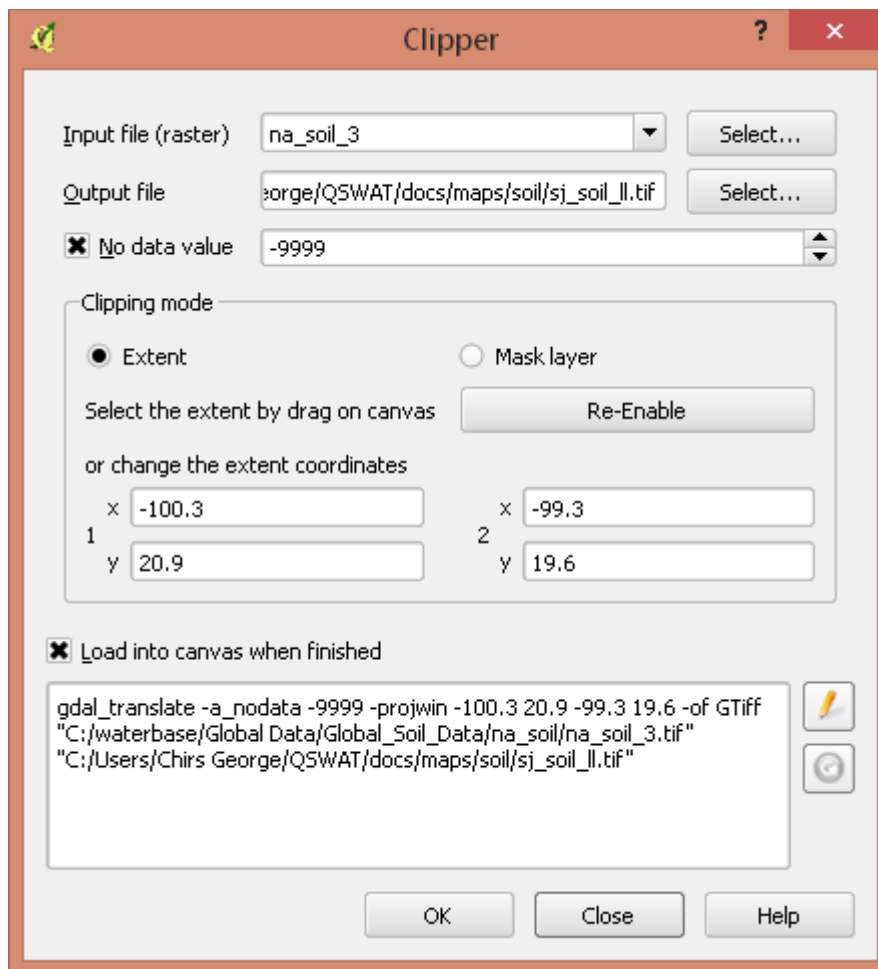


Figure 2: Clipping the soil map

4 Reproject the clipped soil and landuse maps

The clipped grids are not yet saved as files. A simple way to reproject maps in QGIS is to save them and give the new projection at the same time. We need to save the clipped grids in an “equal area” projection, i.e. one in which each grid cell has the same area. And, of course, we need to use the same projection for the soil and landuse maps as for the DEM. The current lat-long projection is not appropriate because at different latitudes the same amounts of longitude will represent different distances. Universal Transverse Mercator (UTM) is a good general choice for the new projection. It is available almost everywhere, and while not exactly an equal area projection is sufficiently close for most SWAT modelling. We need a suitable UTM zone. We can find the zone from a map like <http://www.dmap.co.uk/utmworld.htm>, or use the formula $(x + 180)/6$ rounded up to the next integer, for a reasonably central longitude x in our area. So, for example, if x is -100 the UTM zone will be $80/6$, or 13.3 , rounded up, to give 14 . Then we note whether we are in the northern or southern hemisphere.

Right click on the soil entry in the *Layers* panel and select *Save As...* This opens the *Save raster layer as...* form. Check that *GTiff* is the selected format. *Browse* to the map folder, and use something like *soil_utm* as the file name. Click the *Change* button beside the *CRS* box to bring up the *Coordinate Reference System Selector* (Figure 3). For zone 14 in the northern hemisphere, for example, we need to find *WGS84 / UTM zone 14N*. If we have used it recently it will appear in the upper *Recently used*

box. Otherwise we have to find it in the lower box. It will appear under **Projected Coordinate Systems** rather than **Geographic** and can be found much closer to the bottom than the top. Note that it has an EPSG number of 32614, while the corresponding zone in the southern hemisphere has an EPSG number of 32714. So if you know the zone and the north or south hemisphere you can calculate the EPSG number. QGIS does not support finding the CRS by EPSG number, however. On the other hand, once you have used it it will appear in the recently used list, making it much quicker next time. Make sure the right zone appears in the *Selected CRS* box, and click *OK*. Then click *OK* in the *Save* form.

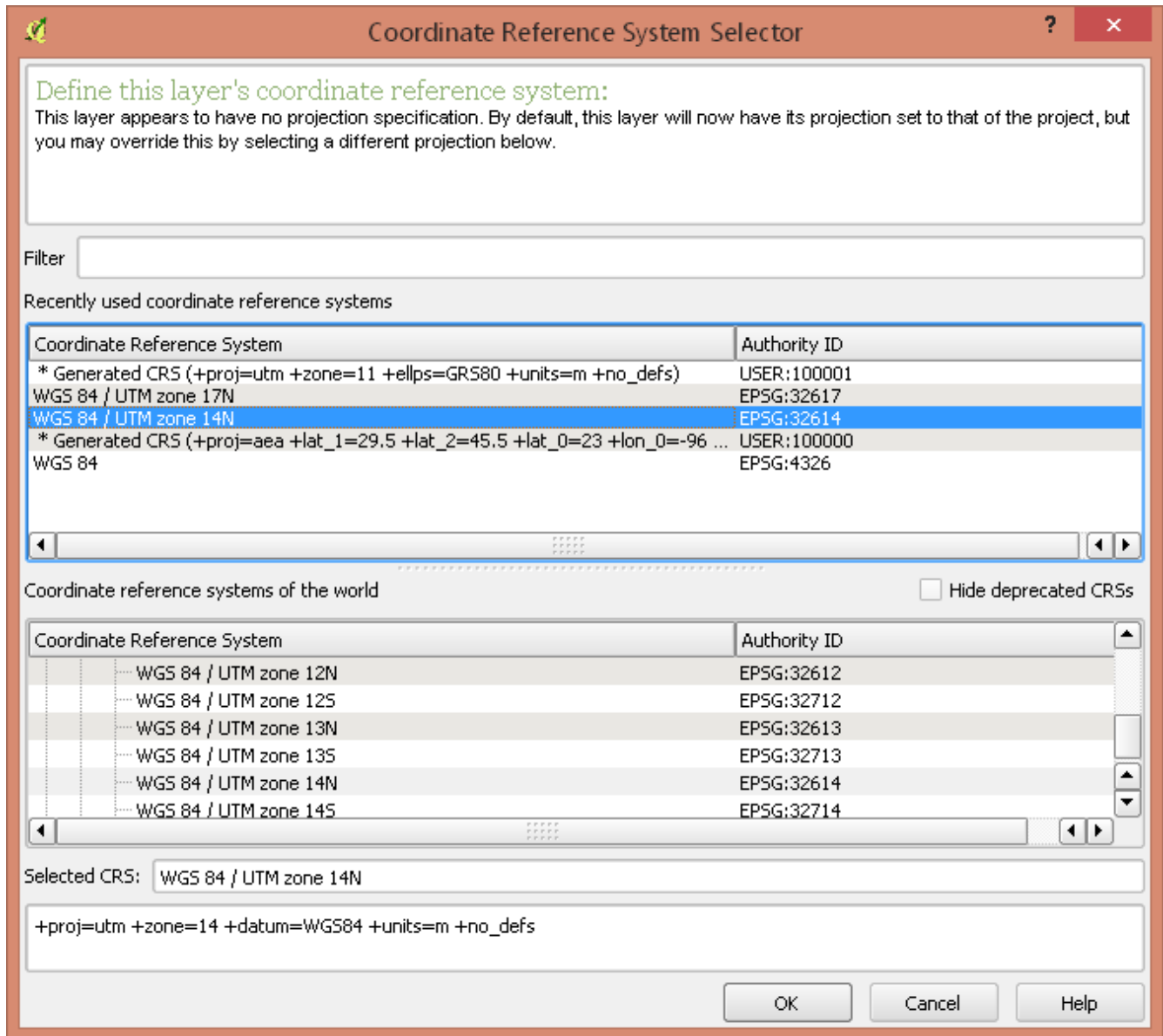


Figure 3: Coordinate Reference System Selector

Reproject the landuse file in the same way. Be careful to change the CRS to the UTM projection before completing the save.

The new files are not loaded as the current projection of the canvas is lat-long. You can start a new QGIS instance and load them if you want to examine them.

Close the current project, probably discarding it if it is the GlobalData project, as you may need to use

it again in a different area.