

Module 1: Basic Map with QGIS Software

Tutorial by Jeff Blossom (revised by Lex Berman)

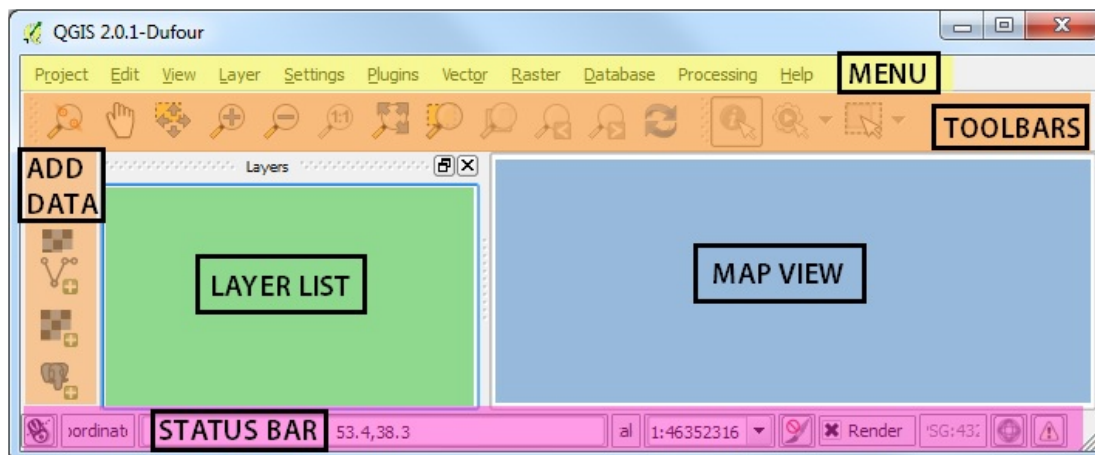
Jan 18, 2017 – IQSS DataFest

In this module we will use QGIS to open spatial data and create a basic reference map. We will work with vector and raster data, tweak symbology, and use QGIS Print Composer to add a legend and scalebar to our finished map.

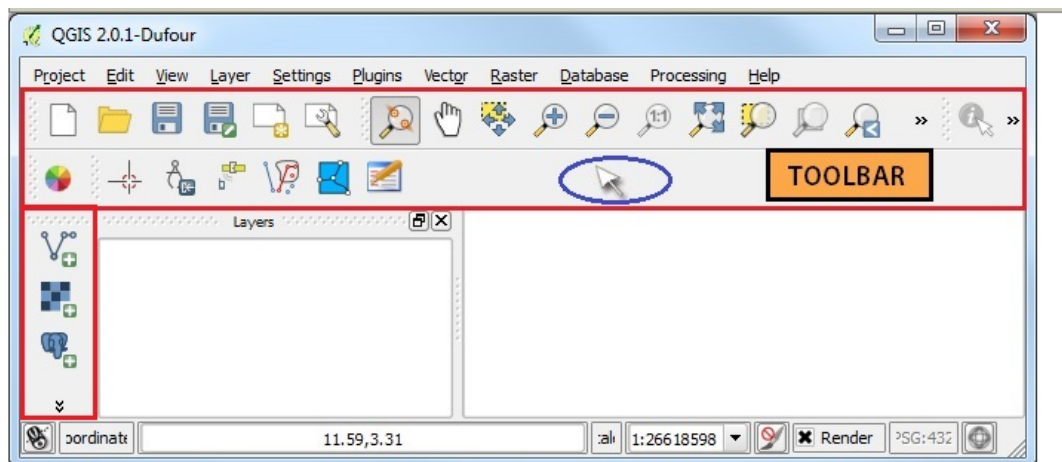
This exercise will feature the route taken on the Out of Eden Walk (www.outofedenwalk.org).

- 1) *Create a workspace.* Download and unzip the “mod_1_cartography” folder to your desktop.
- 2) *Start QGIS.* **Start > All Programs > QGIS Essen > QGIS Desktop 2.14**

Click **Project > New** to open a new map. The QGIS interface has several parts to interact with, labelled on the diagram below.

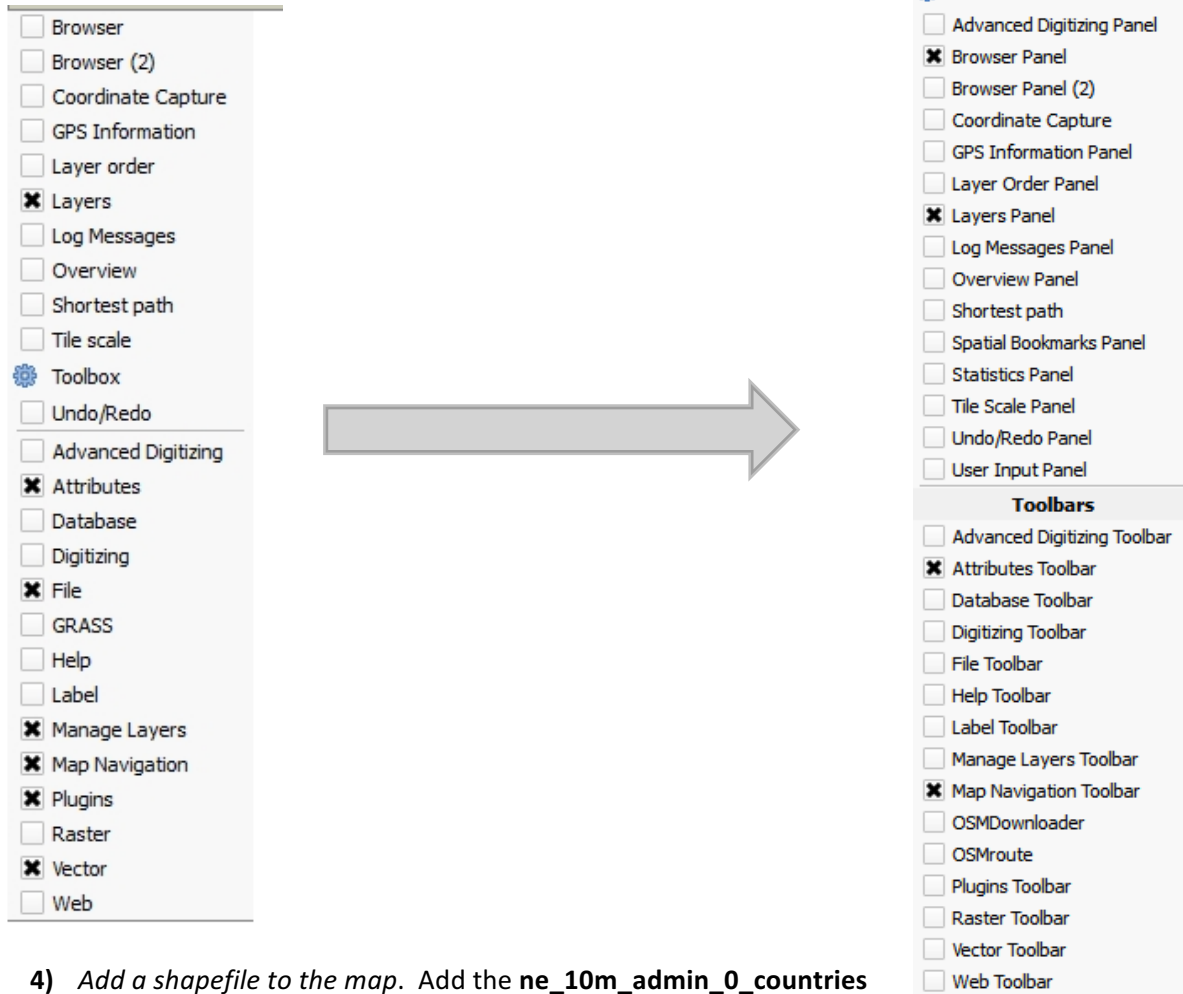


- 3) *Configure the QGIS interface.* First, you'll want to turn off some of the default toolbars that are open. To do this, **right click** on the **empty gray part** of the toolbar (see below)



You'll see the available Panels and Toolbars list (image below left).

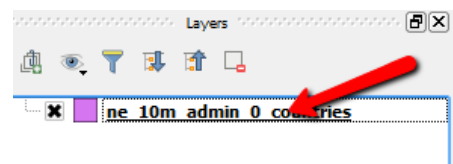
Uncheck all of the panels/toolbars except **Browser**, **Layers**, **Attributes**, and **Map Navigation** (see image below right). You'll have to right click back on the gray area after unchecking each panel/toolbar.



- 4) *Add a shapefile to the map.* Add the **ne_10m_admin_0_countries** shapefile to the map by finding it in the Browser and dragging it onto the map. The country borders will be added to your map. Familiarize yourself with functionality and practice using the map Navigation tools:

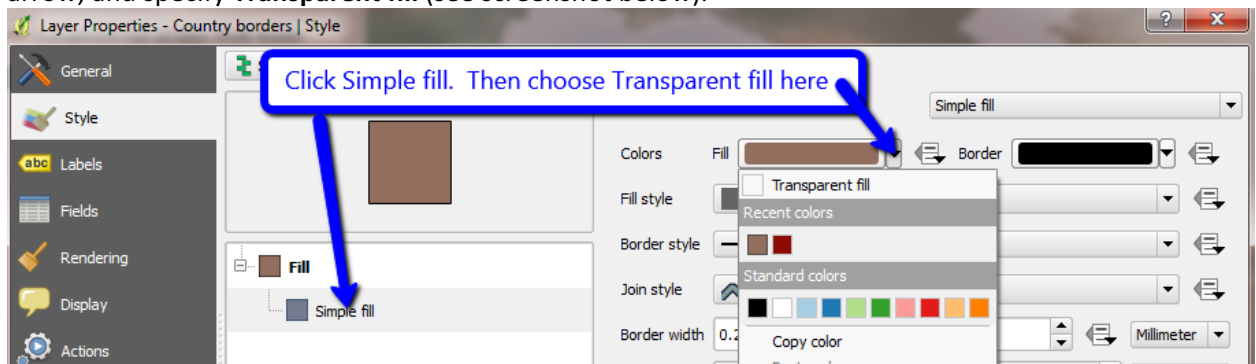
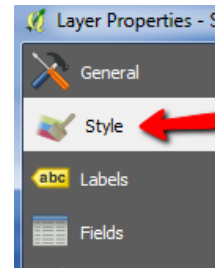


- 5) *Attribute Table of the ne_10m_admin_0_countries layer.* **right click** the layer name **ne_10m_admin_0_countries** in the **Layers** List, then click on **OPEN ATTRIBUTE TABLE**. Note the number of features in the table, and the ability to select rows that relate to features on the map.

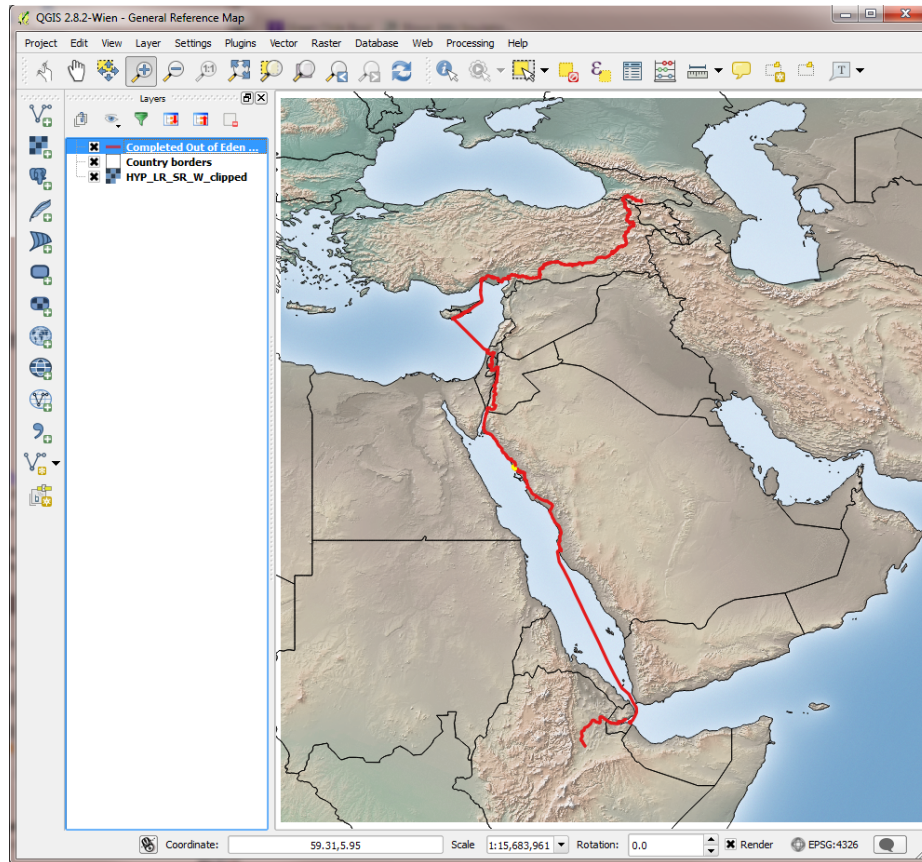


- 6) *Add the Out of Eden Walk route.* Add the shapefile called **completed_route_to_poka** to your map by dragging it from the **Browser** window onto your map.

- 7) *Zoom to the route.* In QGIS, right click the **completed_route_to_poka** layer, and choose **Zoom to Layer**. This zooms the map to the extent of all data in that layer. This is the map extent that you'll use for your map.
- 8) *Change the symbol of the walking route.* Do this by **double clicking** **completed_route_to_poka_1p** in the layer list, and choosing the **Style** option on the left (see screenshot →). In the Style tab, you can set the width, style, and color of this layer. Change it to a thick red line. In the General tab, you can change the name of this layer to something more intuitive like "Out of Eden Route".
- 9) *Save your work.* Click **Project > Save**, and save this project into your **mod_1_cartography** folder, naming it "Map_1"
- 10) *Add a background Raster layer.* Using the Browser, choose the **HYP_LR_SR_W_clipped.tif** and drag this onto your map. This is the "Cross-blended Hypsometric Tints" layer created by Natural Earth that is a beautiful rendition of land cover combined with elevation. More information about this layer can be found here: <http://www.naturalearthdata.com/downloads/10m-raster-data/10m-cross-blend-hypso/>
- 11) *Move the raster layer to the bottom of your layer list.* QGIS draws layers from the bottom of the layer list first, and the proceeds up. So, in order for this raster layer not to obscure the country boundaries and Walk route, click on it and drag it to the bottom of the layer list.
- 12) *Change your countries to "transparent fill".* Double click your Country borders layer, and choose the **Style** tab, and then click **Simple fill**, and under the **Fill** option, click the drop down arrow, and specify **Transparent fill** (see screenshot below).



Your map should now look like the one below:



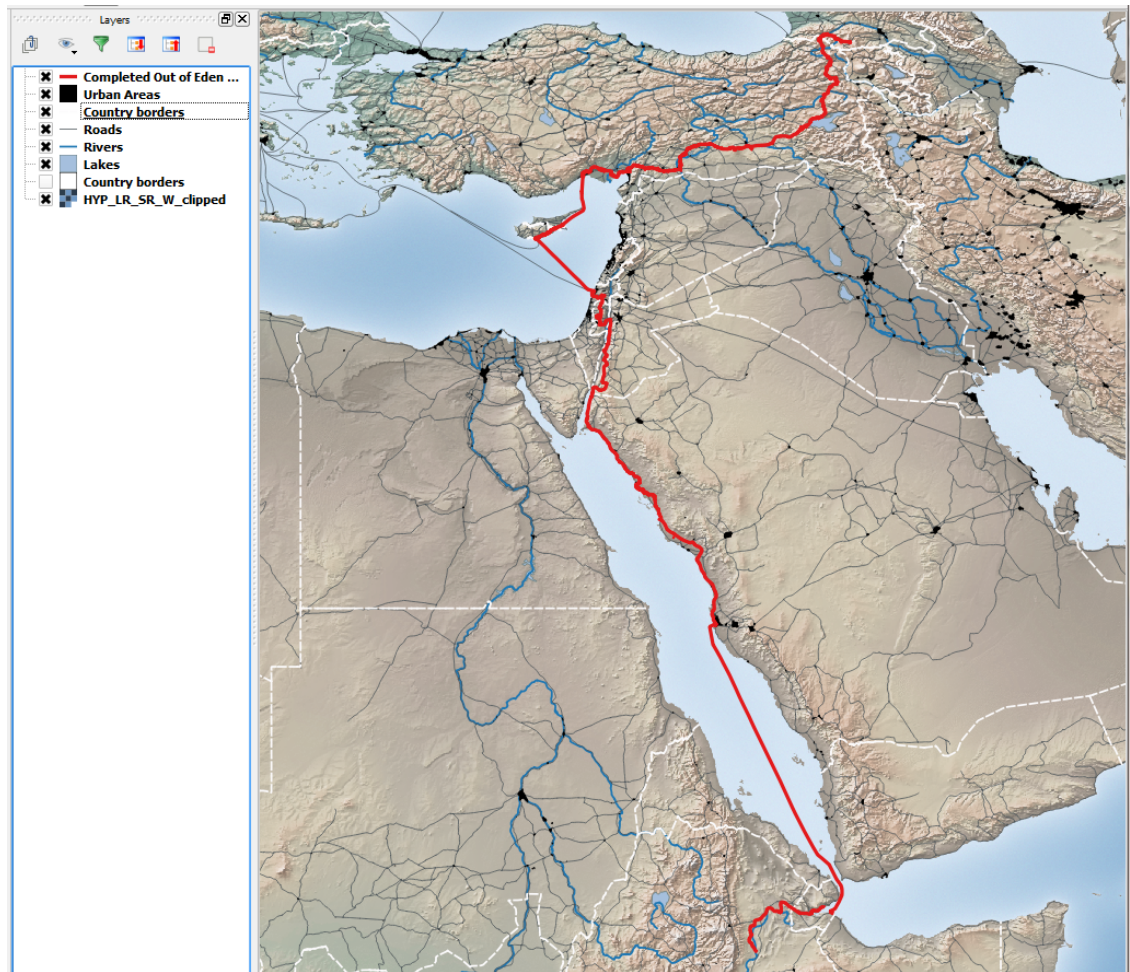
13) Add more layers to your map, and symbolize. Use the **Add Vector Layer** button, and add the following layers from the Shapefiles folder:

ne_10m_roads.shp
 ne_10m_urban_areas.shp
 ne_10m_lakes.shp
 ne_10m_rivers_lake_centerlines.shp
 ne_10m_admin_0_boundary_lines_land.shp

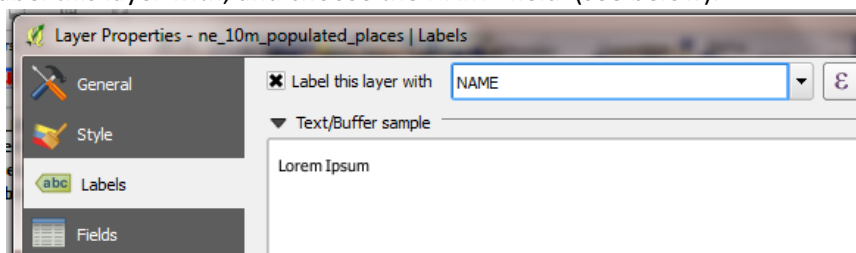
Rename these layers to easier to read names. Now it's time to arrange the order and symbology of these layers to improve the look of your map. Here are a few tips to follow as you do this:

- Use intuitive, recognizable colors and styles, such as blue for lakes, and a dashed line for country borders. Use the ne_10m_admin_0_boundary_lines_land.shp layer and choose a dashed symbol for this layer. It contains just the country border lines, and will look better than the country polygon outlines symbolized.
- Areas such as the Lakes and Urban Areas usually look better without an outline border. In the Styles menu choose "No Pen" for the border for these layers.
- Symbolize your map so there is a visual hierarchy. For example, the roads are so numerous that if a thick line is used, they dominate the map. Use a thin gray line to mute their appearance.

Your map should start to look like the one below:

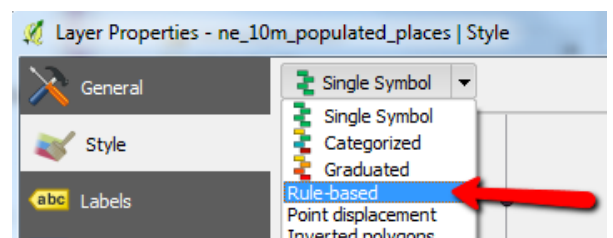



- 14) *Adding places and labels.* Use the **Browser** to add the **ne_10m_populated_places.shp** file to your map. **Right click** this layer and choose **Open Attribute Table**. Note the amount of information this table contains. Note that the “NAME” field contains the place name, and this is what we want to appear on the map. **Double click** the ne_10m_populated_places layer to open its properties. In the General tab rename this layer to “Cities”. Click the **Labels** tab, and click the X next to Label this layer with, and choose the NAME field (see below).

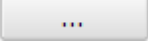


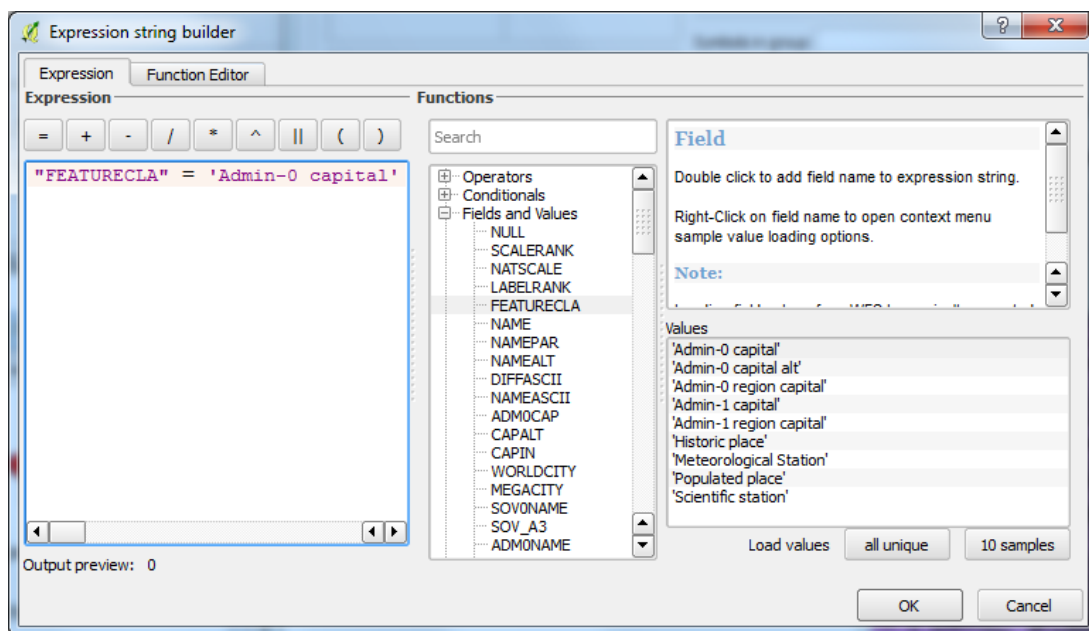
Click Apply, and now the labels will appear on your map. This is way too many labels! Let's filter out this list to include just capital cities.

- 15) *Filtering out just the capital cities.* In the Style tab of the Cities layer, click the dropdown arrow next to **Single Symbol**, and choose **Rule-based labeling**. See red arrow in screenshot at right. In the Rule

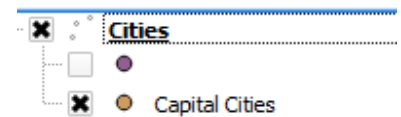


Properties dialog, click the Plus button:  to add a rule.

- A) In the **Rule Properties** window, enter “Capital Cities”.
- B) Click the “...” button  in the **Filter** field. This will open the Expression string builder window.
- C) In the Expression string builder window, double click **Fields and Values** under the Functions. Then double click **FEATURECLA**. It will add FEATURECLA to your Expression on the right.
- D) Click the “=” button under Expression.
- E) Click the “**all unique**” button on the lower right. This will add the unique field values contained in the FEATURECLA field.
- F) Double click the '**Admin-0 capital**' choice from the Value list. Your Expression builder should look like the window below:

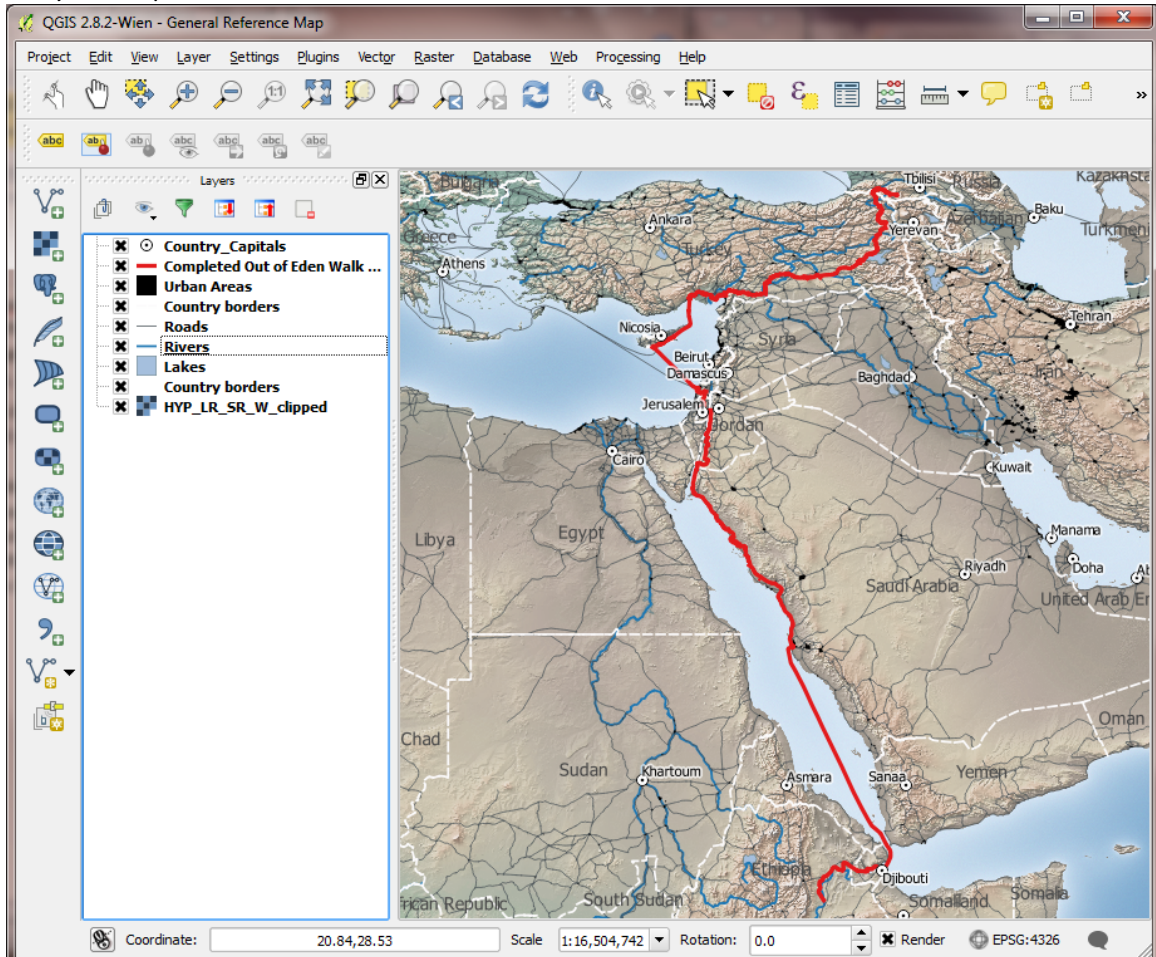


- G) Click **OK** to close the Expression string builder, and **OK** to close the Rule properties, and **OK** to close the Cities Layer Properties window. Now you should have a new layer “Capital Cities” under your Cities layer. Turn it on by clicking the X next to it, and turn the one above it off. See screenshot at right. Now your map will only show the capital cities and labels.

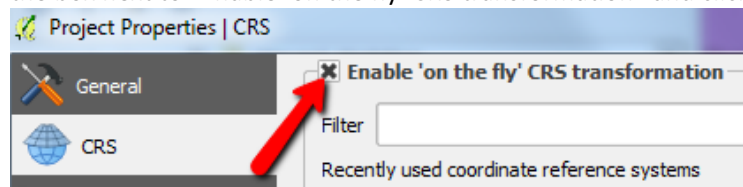


- 16) **Add country labels to the map.** Double click the **Country Areas** layer, choose **Show labels for this layer** at the top, and set **Label with** to the **SOVEREIGNT** field. Click **Apply** and country labels will be added to the map. To make the labels stand out more, click the **Buffer** option, and check the Draw text buffer box. Experiment with the other labelling options to see how this affects the map.
- 17) **Change your Country Areas symbol.** For the Country Areas symbol, make it a Simple Fill with both a transparent fill and border. Since country borders are symbolized with the Country

Borders line file, we don't need any symbology for Country Areas, other than the labels. Now your map should look similar to the one below:



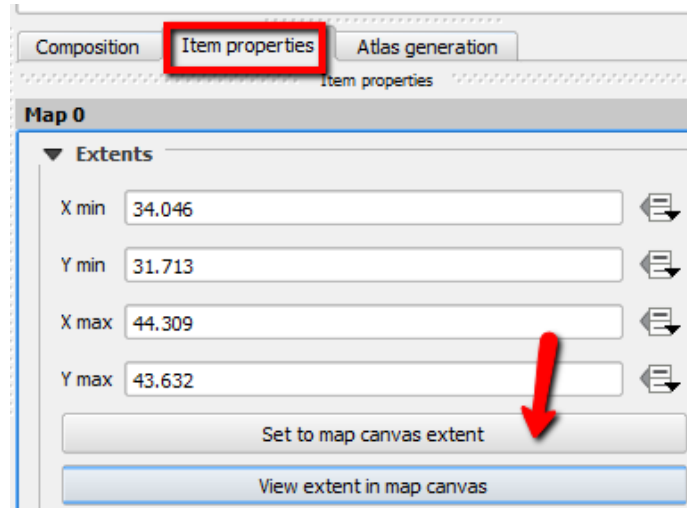
- 18) Enable “on the fly” coordinate transformation. Shapefiles may be mapped in different coordinate systems, and this command will ensure that all of your shapefiles draw in their proper locations. Click **Project > Project Properties** and click the **CRS** tab on the left. Then click the box next to “Enable ‘on the fly’ CRS transformation” and click **OK**.






Reproject the map into “Africa Albers Equal Area Conic” projection filter for 102022

- 19) Compose your final map with **Print Composer**. Now it's time to add other necessary elements to the map like a title, scale bar, legend, and sources. This is accomplished in QGIS's Print Composer. Click **Project > New Print Composer**. Enter **The Out of Eden Walk** as the title, and click **OK**. On the right hand side of the print composer change the page size to **ANSI A (Letter; 8.5x11 in)** and the Orientation to **Portrait**.

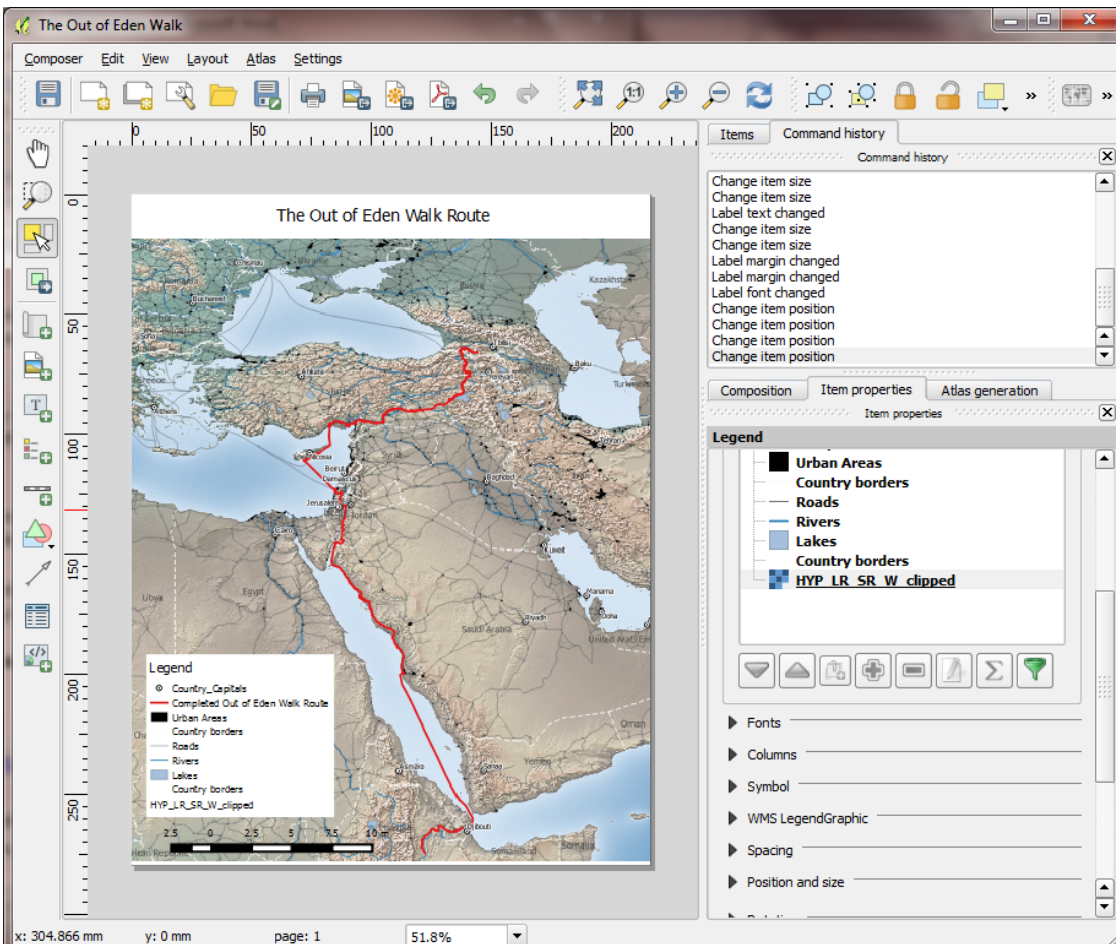
- 20) *Add your map.* Click **Layout > Add Map**, and then **click and drag a box** onto the map canvas. Your map will appear in this box. Your map is now one of the “elements” on your overall map layout. You can resize and reposition it on the page. Also, if the extent of the map does not show exactly what you want, click back on the QGIS window, and zoom to the new map extent. Back in **Print Composer**, click on your map, and choose the **Item Properties** tab on the right. Scroll down, and click the **Set to map canvas extent** button. See screenshot below. Now your map in Print Composer will redraw to the new extent. Each time you change your map extent you’ll have to click this button to update it in the Print Composer.



- 21) *Add a legend.* Click the **Add New Legend** tool , (or Layout > Add Legend) and draw a box on the map to add a **Legend**.
- 22) *Add a scale bar.* Add a Scale bar with the **New Scale Bar** tool:  (or Layout > Add Scale) and draw a box on the map to add the **Scale**.
- 23) *Add a title.* Add a title to the map with the **Add New Label** tool:  tool. All New Labels contain “QGIS” by default. To change this to your map title, click **Item properties** on the right hand side, and change “QGIS” to “Out of Eden Walk Route”
- 24) *Add a North Arrow.* Click Layout > Add Image. Draw a rectangle on the bottom right of the map canvas. On the right-hand panel, click on the **Item Properties** tab and expand the **Search directories** section and select the North Arrow image of your liking. Or add your own image!
- 25) *Add scale, map sources and author.* Add another label, this time put “**Map by <Your Name>, <today’s Date> Data sources: Natural Earth Data and The Out of Eden Walk.**” Make this a smaller sized font, and put it on the very bottom of the map. Your map should now look similar to the one below:

All of the map elements in the Print Composer can be altered/customized by clicking on the element (e.g. the Legend, Scale, Text, etc.) to select it, and altering the Item properties on the right hand side.

26) *Export your map to image.* To export your map to PNG, click **Composer > Export as image**. You will be prompted to adjust the DPI resolution. After exporting, open the PNG to see how it looks! To save your work, Click **Composer > Save Project**.



Helpful QGIS links, and to explore further:

- The Harvard Center for Geographic Analysis's [QGIS tutorial](http://maps.cga.harvard.edu/qgis/): <http://maps.cga.harvard.edu/qgis/>. This includes many helpful QGIS functions, such as how to [add a Google Basemap](http://maps.cga.harvard.edu/qgis/wkshop/basemap.php) to QGIS <http://maps.cga.harvard.edu/qgis/wkshop/basemap.php>
- The QGIS publication "[A Gentle Introduction to GIS](http://docs.qgis.org/testing/en/docs/gentle_gis_introduction/index.html)": http://docs.qgis.org/testing/en/docs/gentle_gis_introduction/index.html
- The [QGIS users guide](http://docs.qgis.org/testing/en/docs/user_manual/index.html): http://docs.qgis.org/testing/en/docs/user_manual/index.html

END OF MODULE 1 CARTOGRAPHY