Performing Spatial Queries

QGIS Tutorials and Tips

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Performing Spatial Queries

Spatial queries are core to many types of GIS analysis. In QGIS, this functionality is available via the **Spatial Query** plugin.

Overview of the task

We will be working with 2 datasets - a lines layer representing rivers and a point layer representing cities. The task is to run a spatial query to find all cities that are within 10 kms of a river.

Other skills you will learn

- Opening .zip files directly in QGIS.
- Choosing an appropriate projection and re-projecting vector data.
- Creating buffers.
- Selecting features using SQL-like expressions.
- Coverting a shpefile to a KML file.
- Validating your results using Google Earth.

Get the data

We will use `ne_10m_rivers_lake_centerlines` and `10m_populated_places_simple` datasets from Natural Earth.

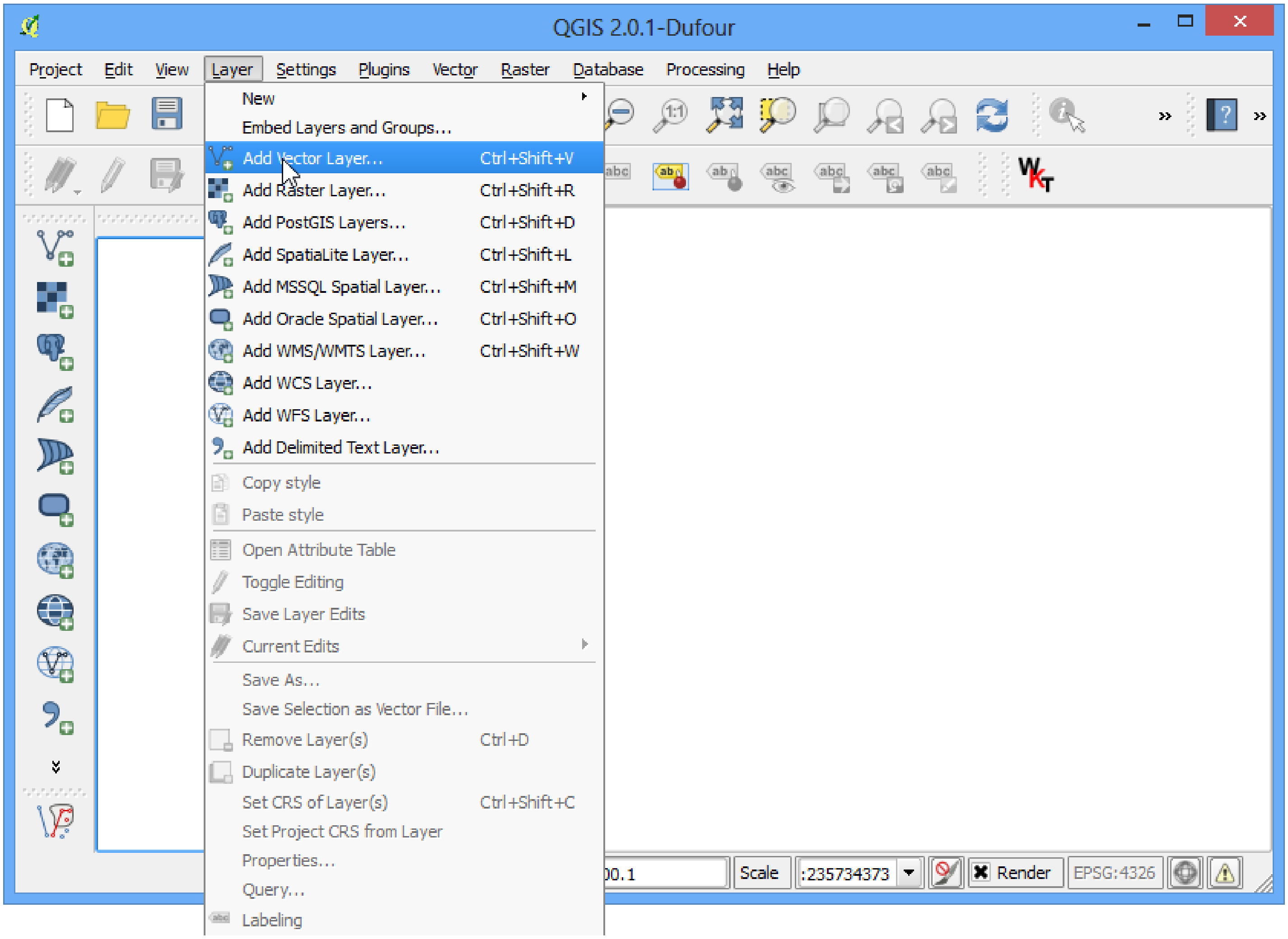
Download Rivers and Lake Centerlines

Download Populated Places.

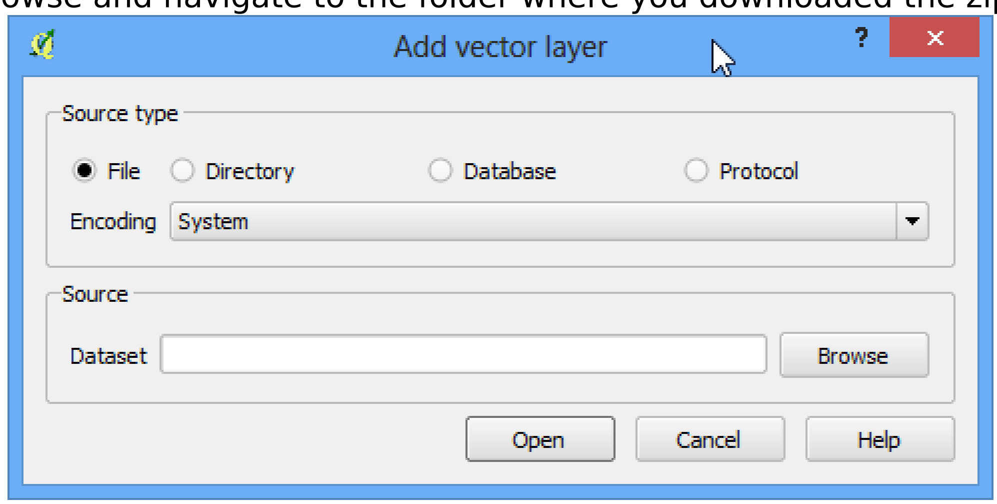
Data Source: [NATURALEARTH]

Procedure

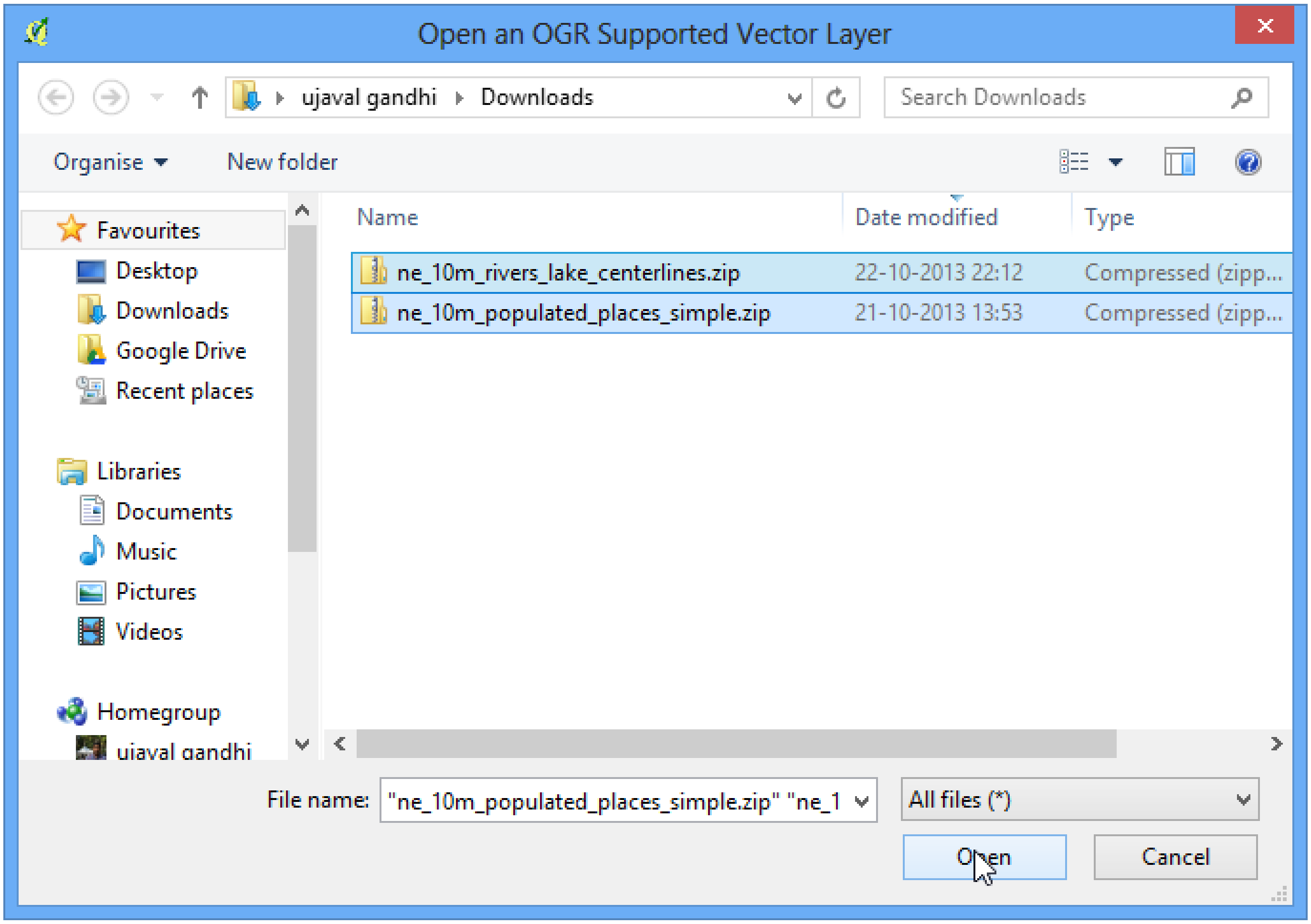
1. Once you have downloaded the data, open QGIS. Go to Layer ‣ Add Vector Layer.



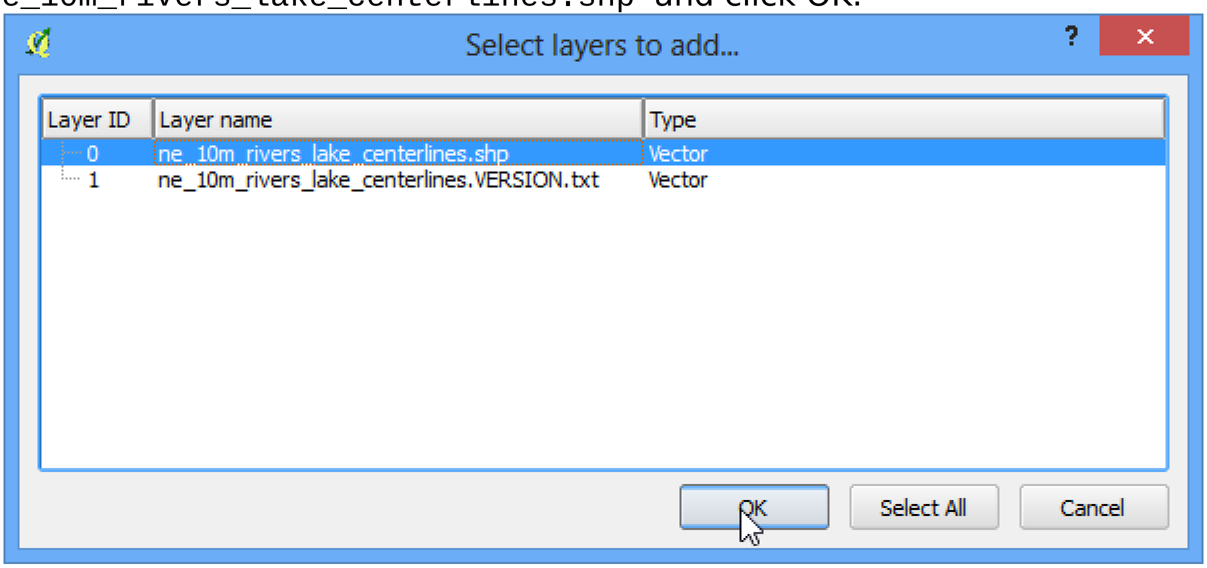
2. Click Browse and navigate to the folder where you downloaded the zip files.



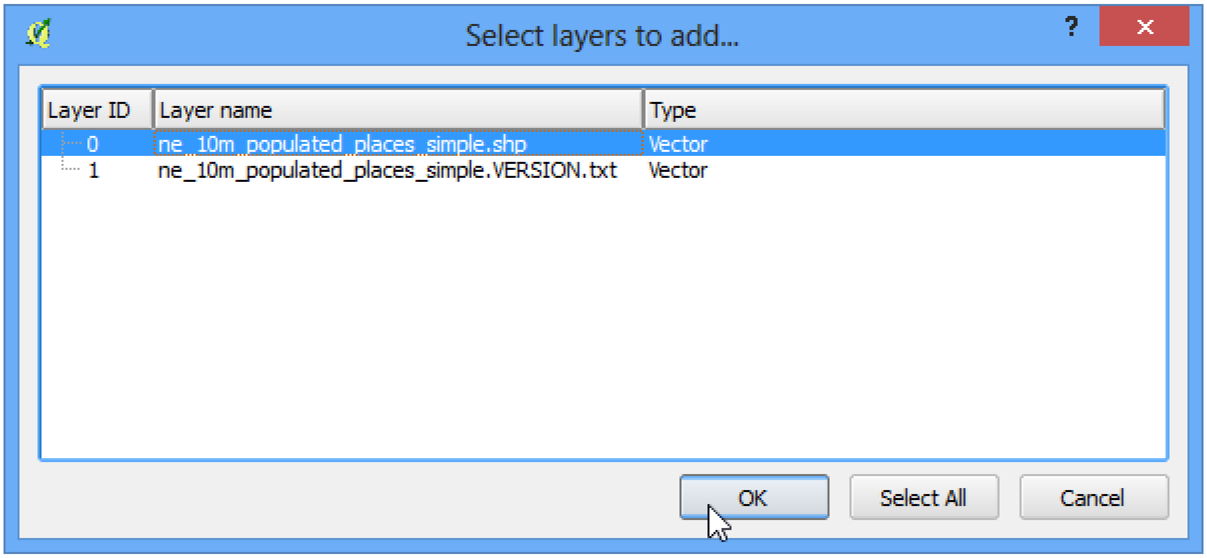
3. Hold the Shift key and click on both the zip files to select them. Click Open.



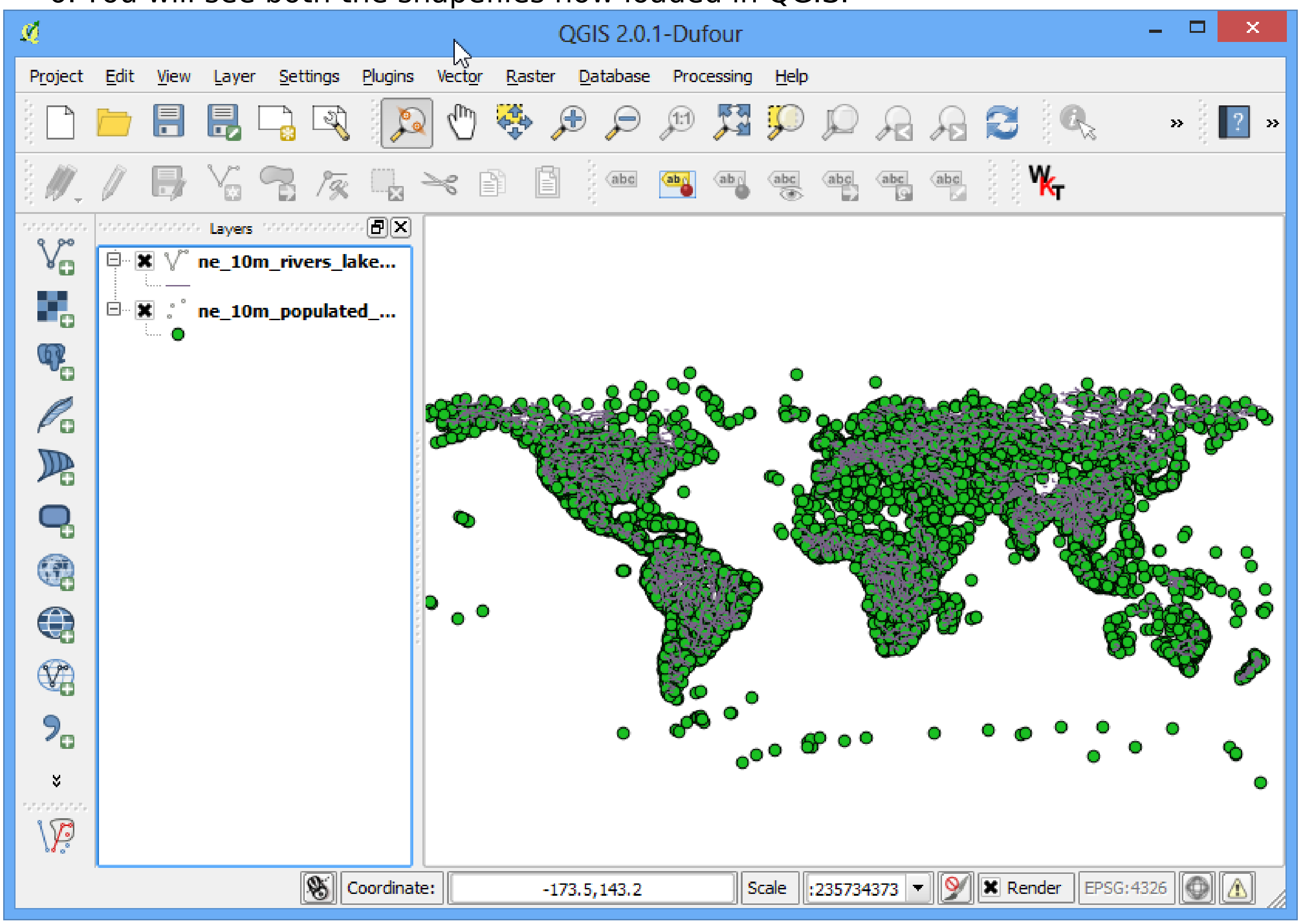
4. You will be asked to choose a layer from the zip archive. Select `ne_10m_rivers_lake_centerlines.shp` and click OK.



5. Since you have selected multiple files, repeat the process for the next file. Select 10m_populated_places_simple.shp and click OK.

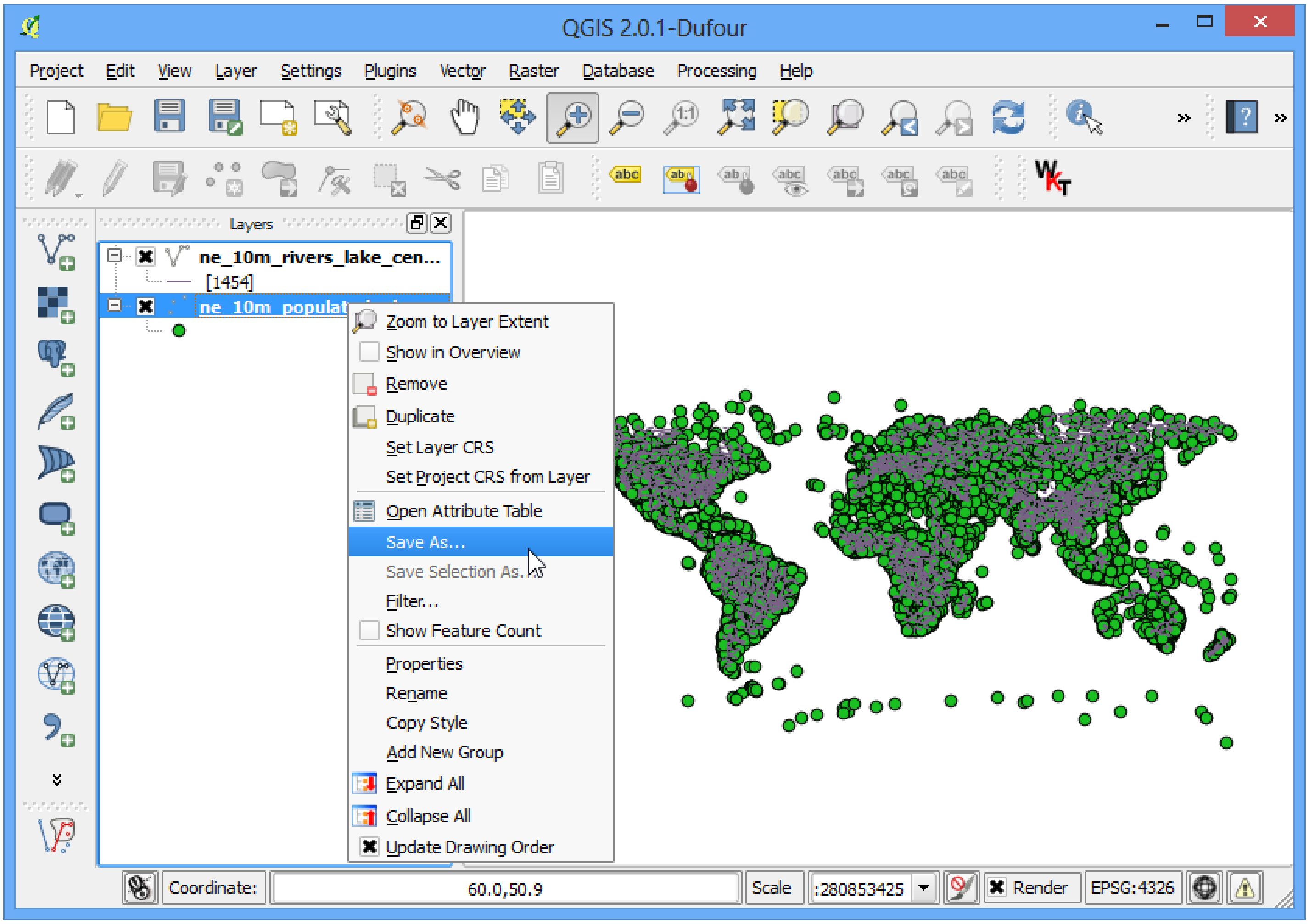


6. You will see both the shapefiles now loaded in QGIS.

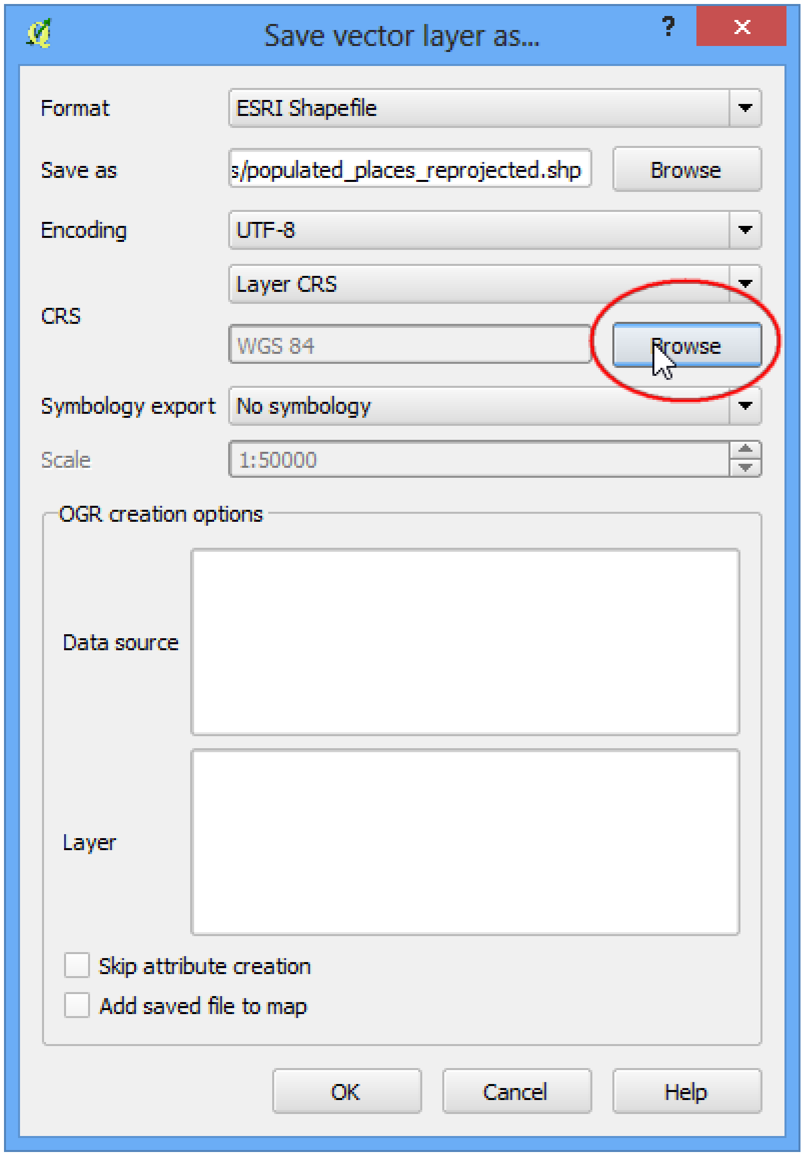


7. We will be created buffers around the point and line layers. The *Buffer* geoprocessing tool in QGIS uses *layer units* to calculate buffer distances. The layers we have are in *Geographic Coordinate Reference System (CRS)* with the unit of *degrees*. This is not appropriate as we want our analysis to use *metres* or *kilometres*. To achive this, we must re-project our layers to a *Projected Coordinate Reference*

System (CRS). Right-click on the `10m_populated_places_simple` layer and choose Save As.



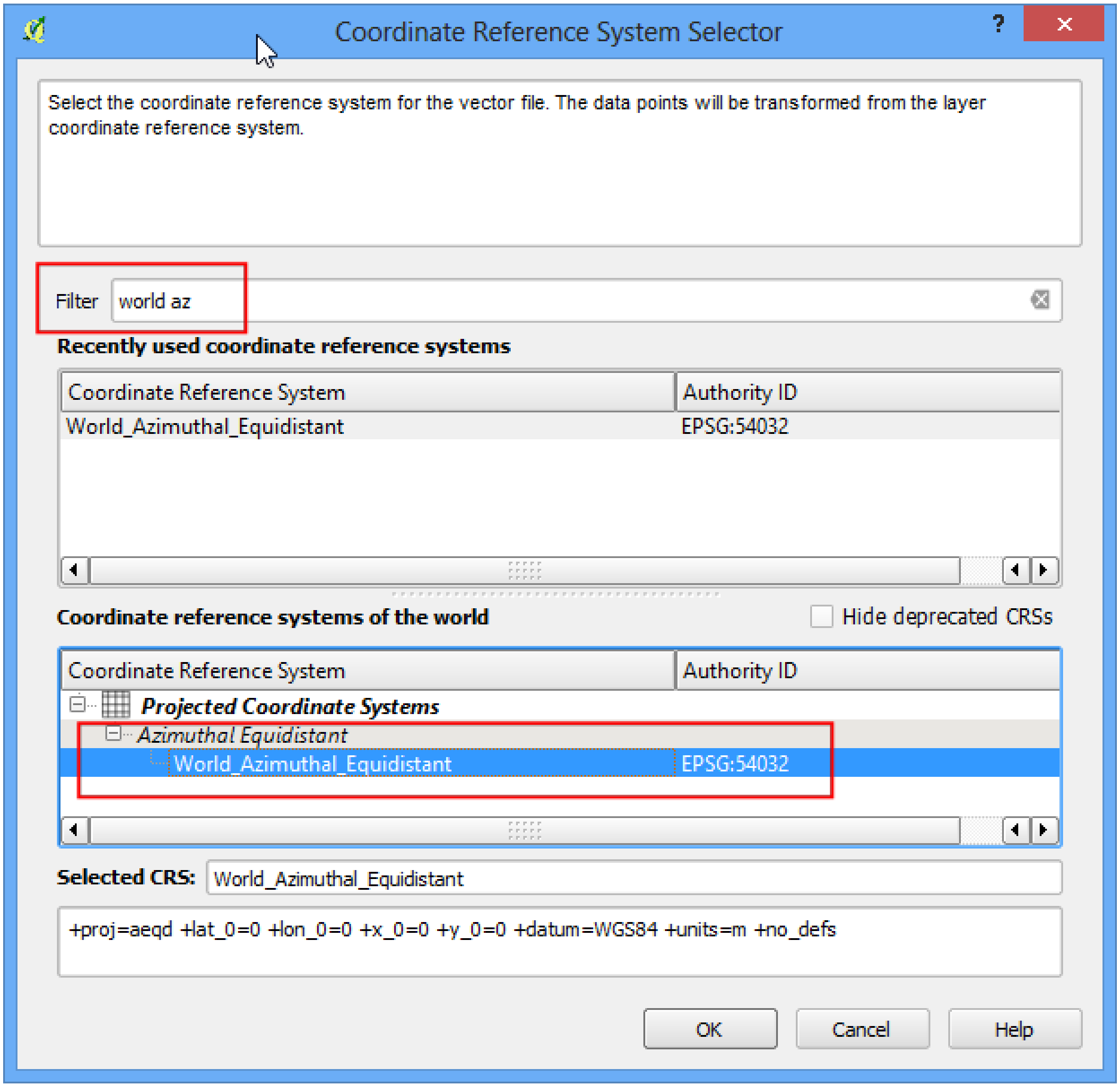
8. In the Save vector layer as... dialog, click Browse next to Save as and select the output file location. Name the output file as `populated_places_reprojected.shp`. Next, click the Browse button next to CRS.



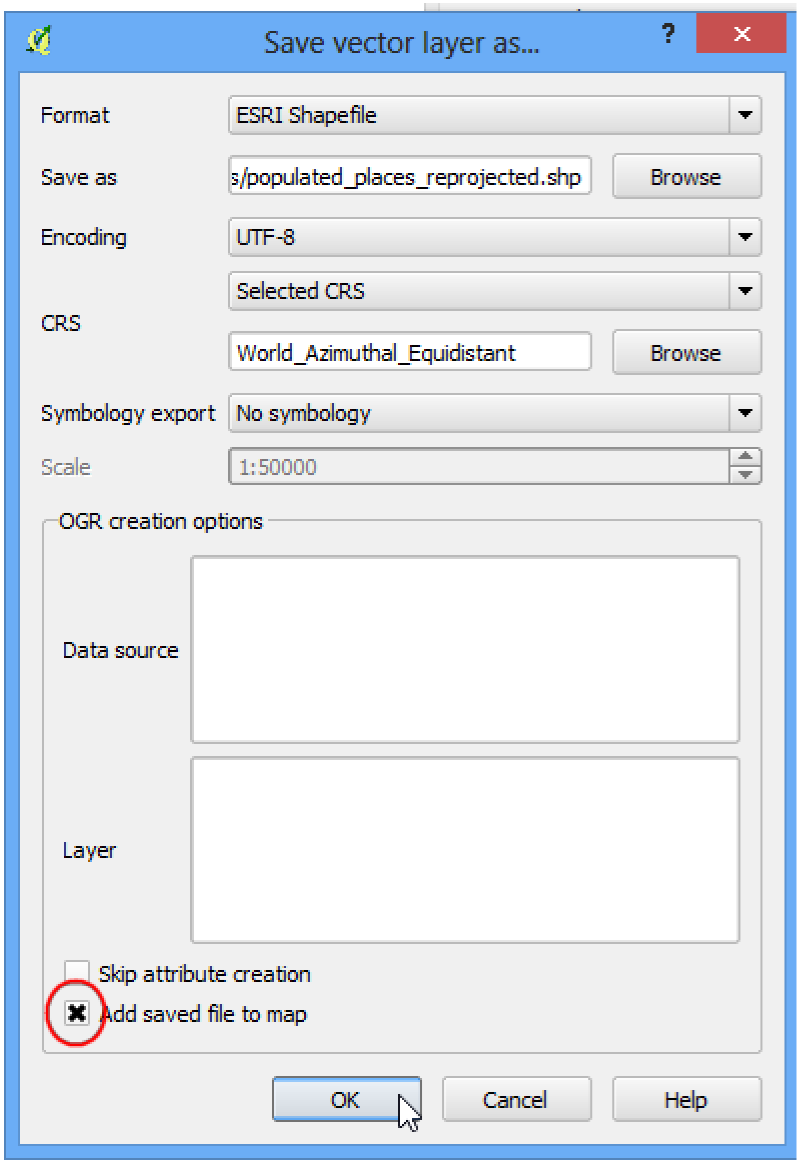
9. Now we must choose an appropriate CRS for our purpose. For creating buffers, a Azimuthal Equidistant projection would be best suited as radial distances around the center of the projection are accurate. In our case, since the dataset is global, we will choose a world projection. In the Coordinate Reference System Selector dialog, start searching for *world az..* and you will see the results show up. Select the *World_Azimuthal_Equidistant* and click OK.

Note

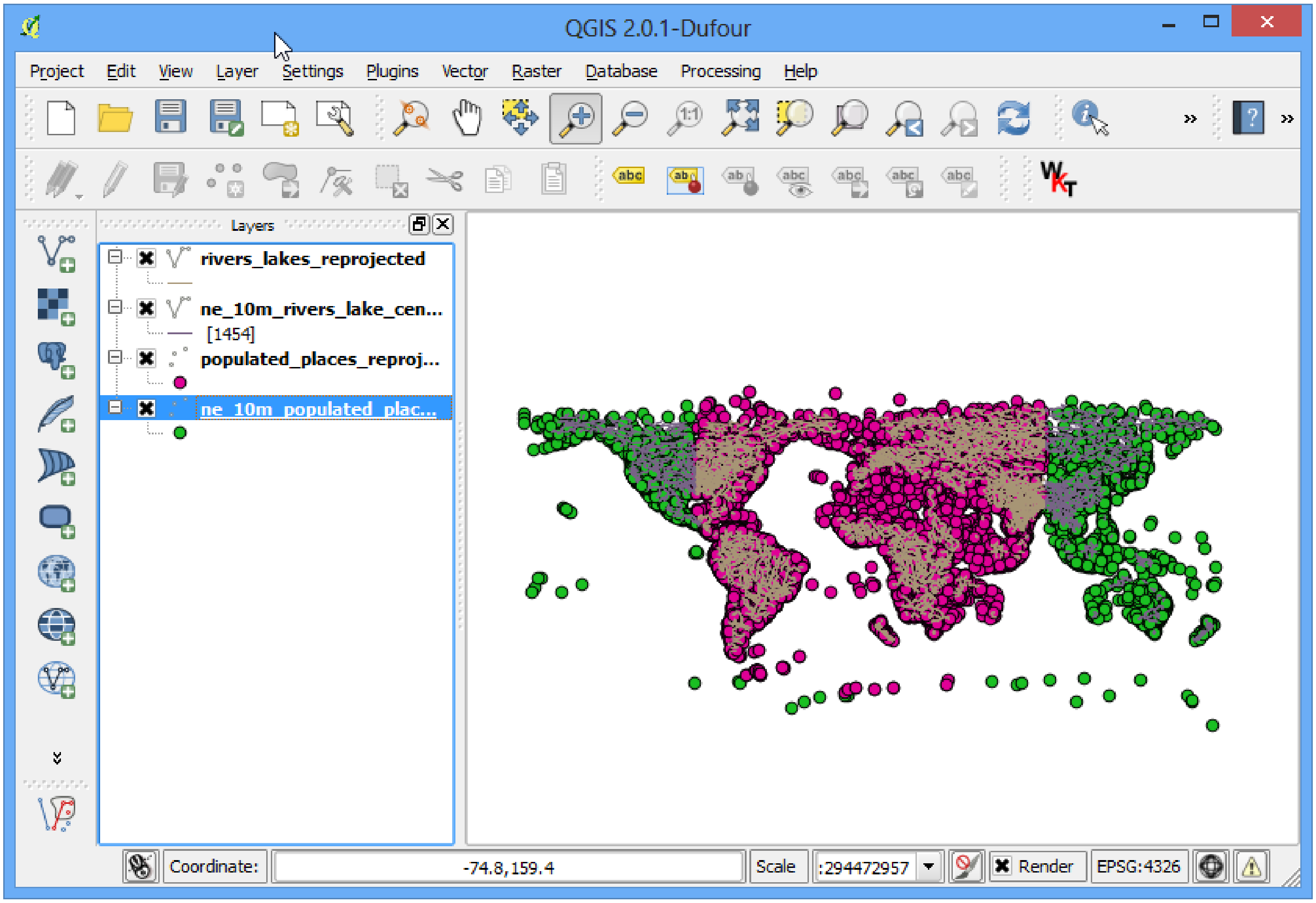
The *World_Azimuthal_Equidistant* projection spans 90 degrees from the origin. Here the origin being 0 degrees longitude, the only data contained within +/- 90 degrees longitude will be converted.



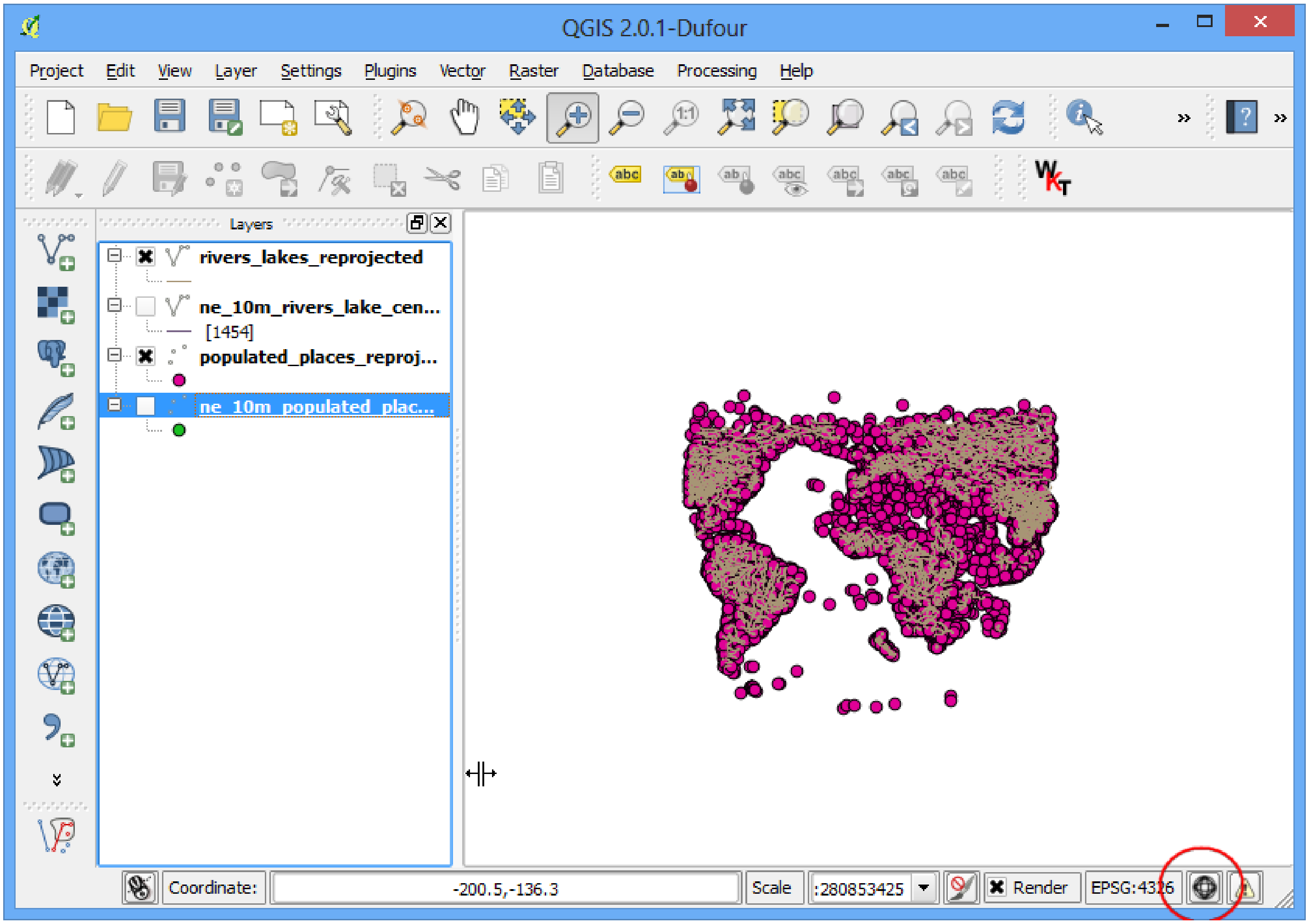
10. Back in Save vector layer as ... dialog, check the box next to Add saved file to map and click *OK*.



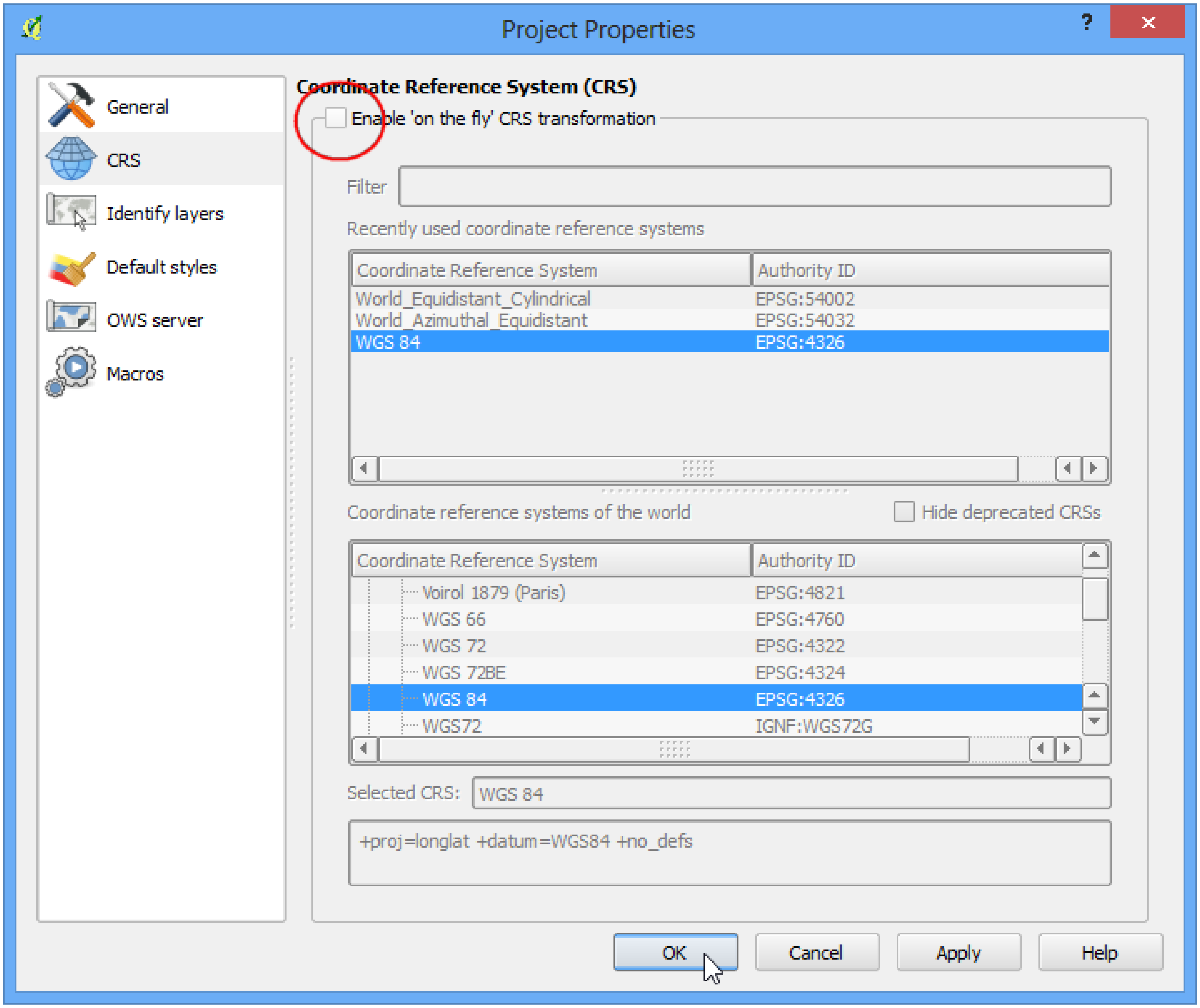
11. Repeat the re-projection process for the `ne_10m_rivers_lake_centerlines` layer and save the new layer as `rivers_lake_reprojected.shp`.



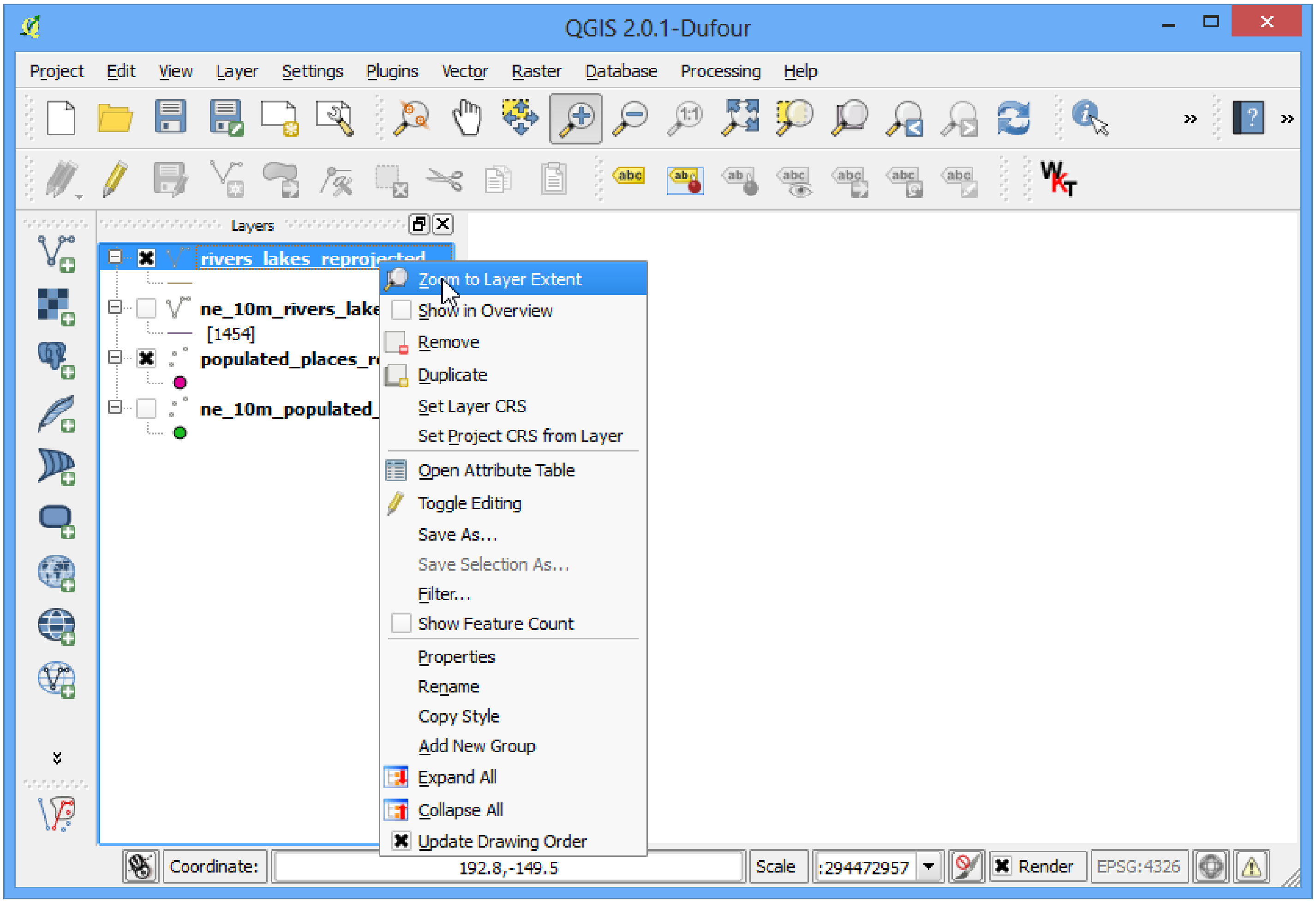
12. Now you will have 4 layers in your Layers Panel. Un-check the boxes next to the original layers to display only the re-projected layers. The re-projected layers are still being shown in the *Geographic CRS* because of a setting. Let's turn that off. Click on the Project Properties button. This setting can also be accessed from Project ▸ Project Properties.



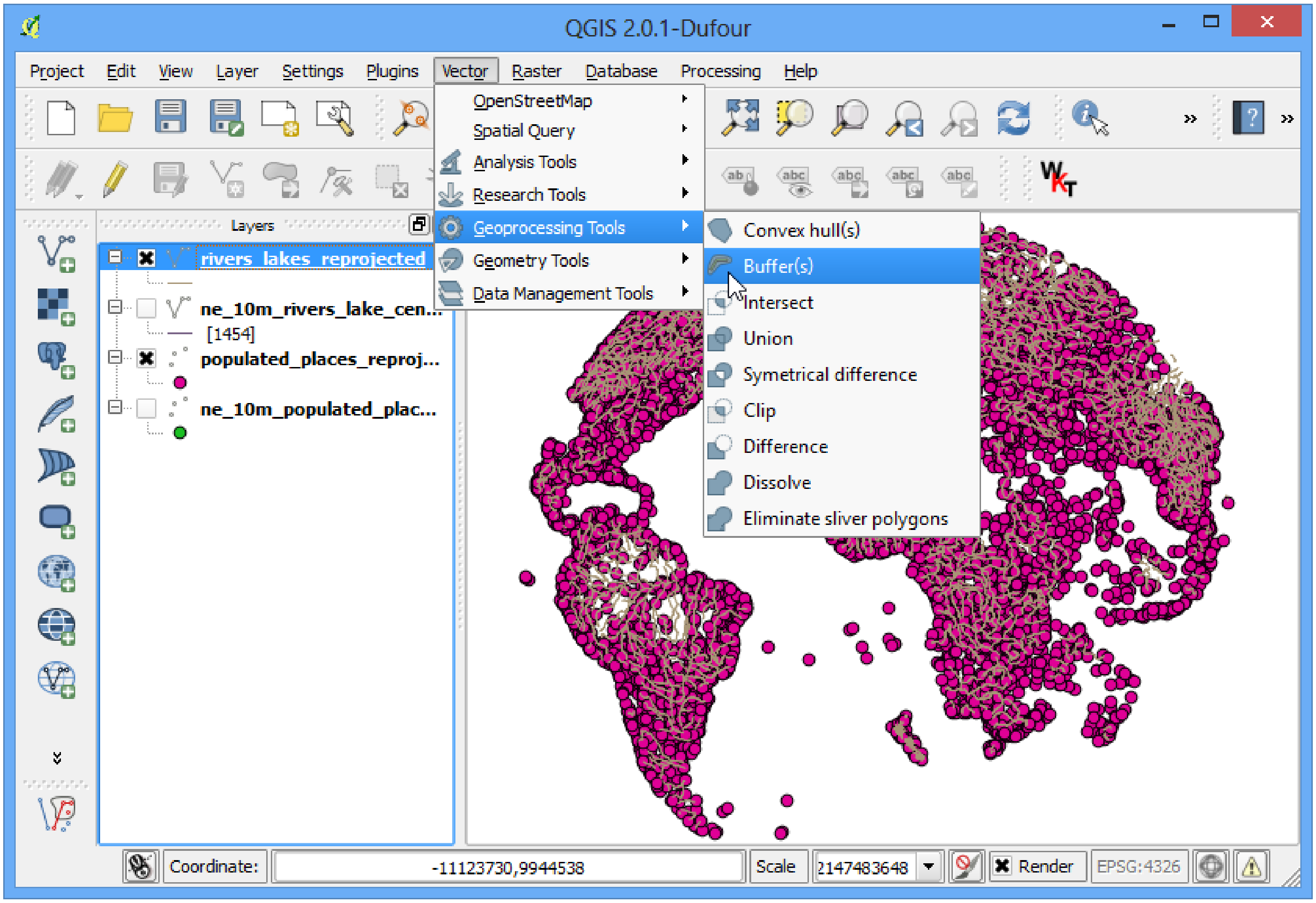
13. In the CRS tab of the Project Properties dialog, un-check the box next to Enable on-the-fly CRS transformation. Click OK.



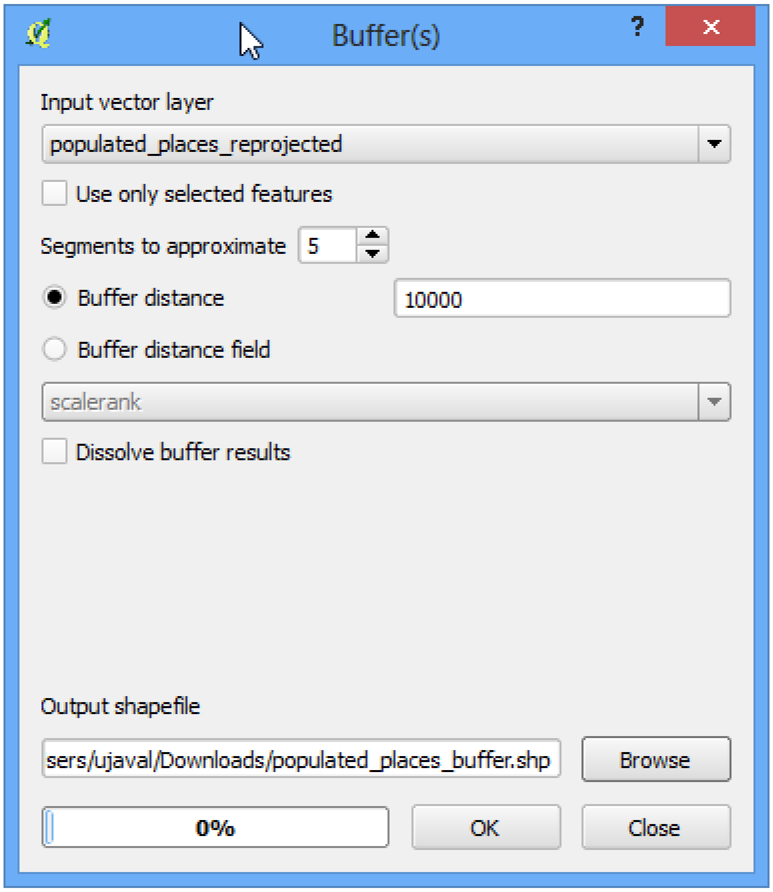
14. Back in the main QGIS window, right-click on any one of the re-projected layers and select Zoom to Layer Extent.



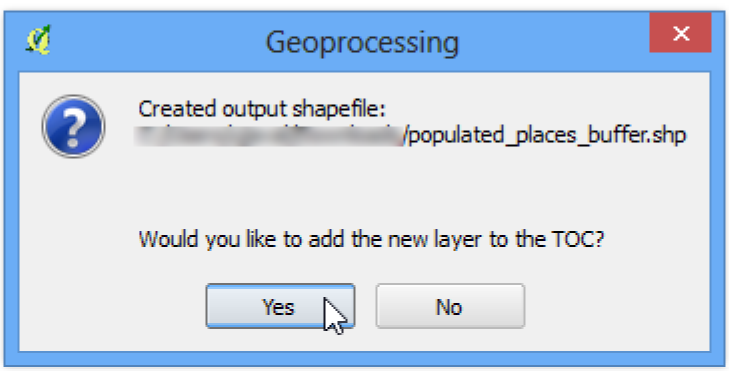
15. Now you will see the data in the layer's CRS. We will now create buffers for both the datasets. Click Vector ‣ Geoprocessing Tools ‣ Buffer.



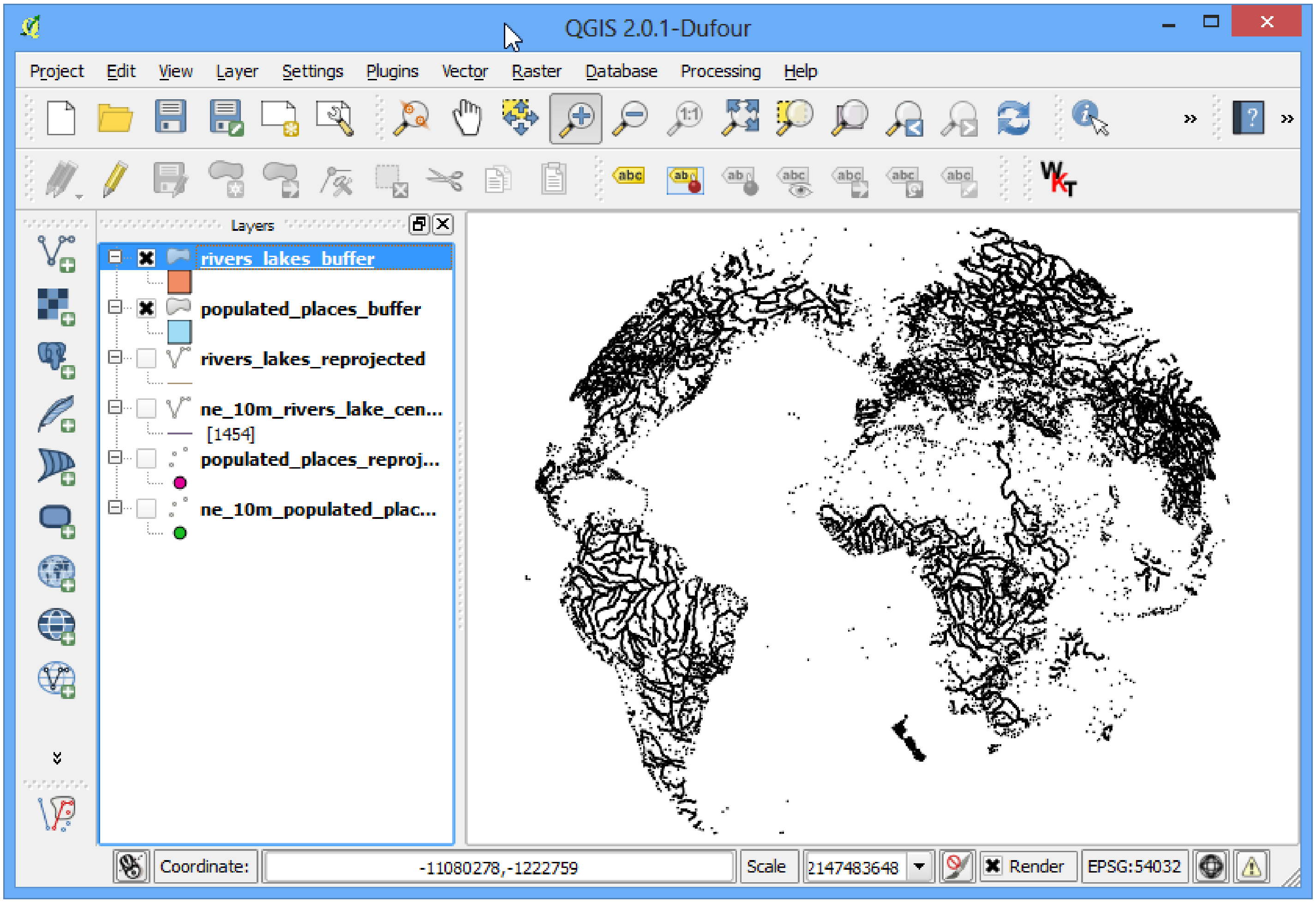
16. In the Buffer tool, select `populated_places_reprojected` layer as Input. Enter the buffer distance as *10000*. Note that we want a buffer of 10kms and since the CRS units are metres, we need to enter 10,000. Enter the output file name as `populated_places_buffer.shp`. Click OK.



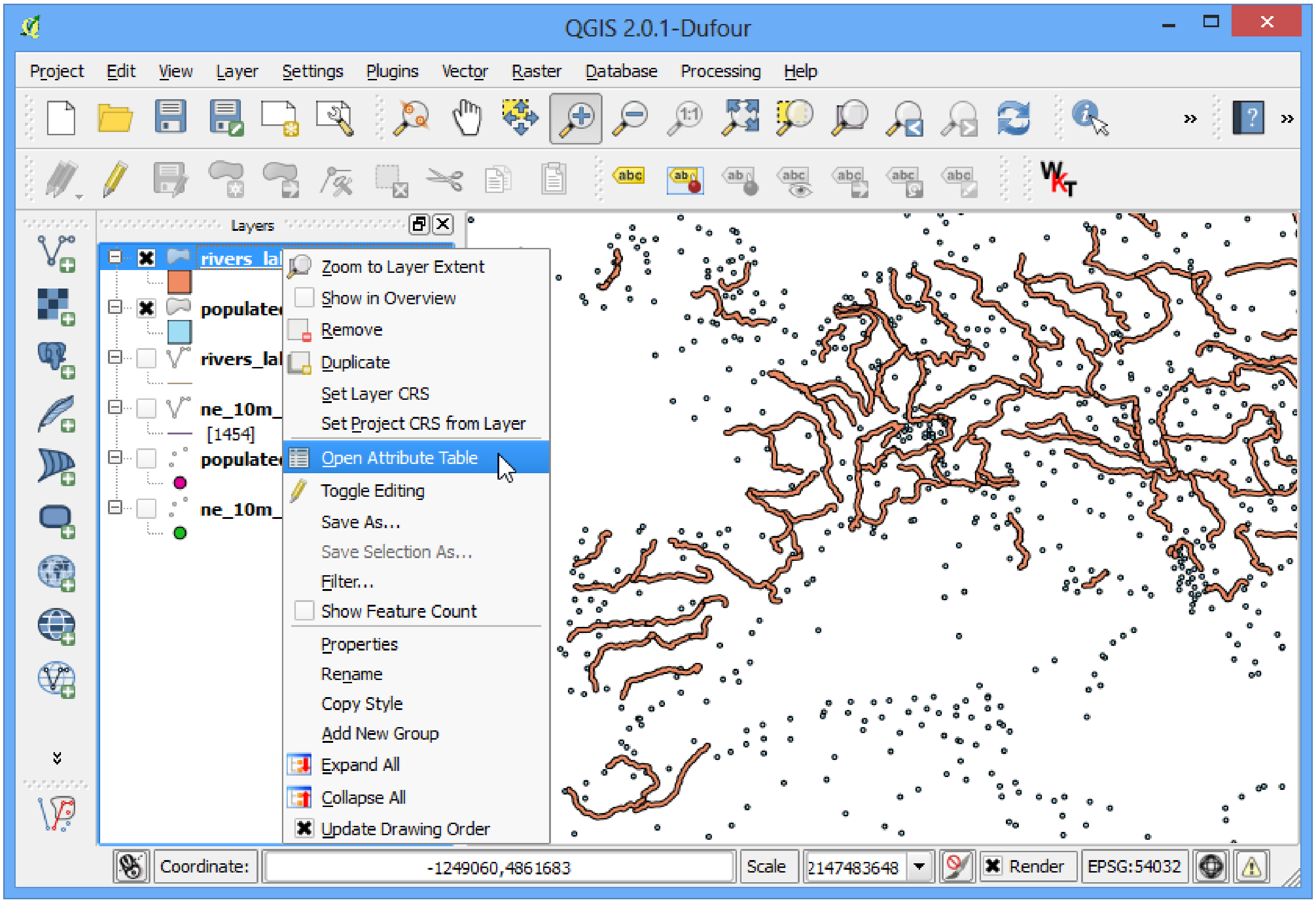
17. Once the buffer processing is over, click the Yes to add the newly created layer to the TOC.



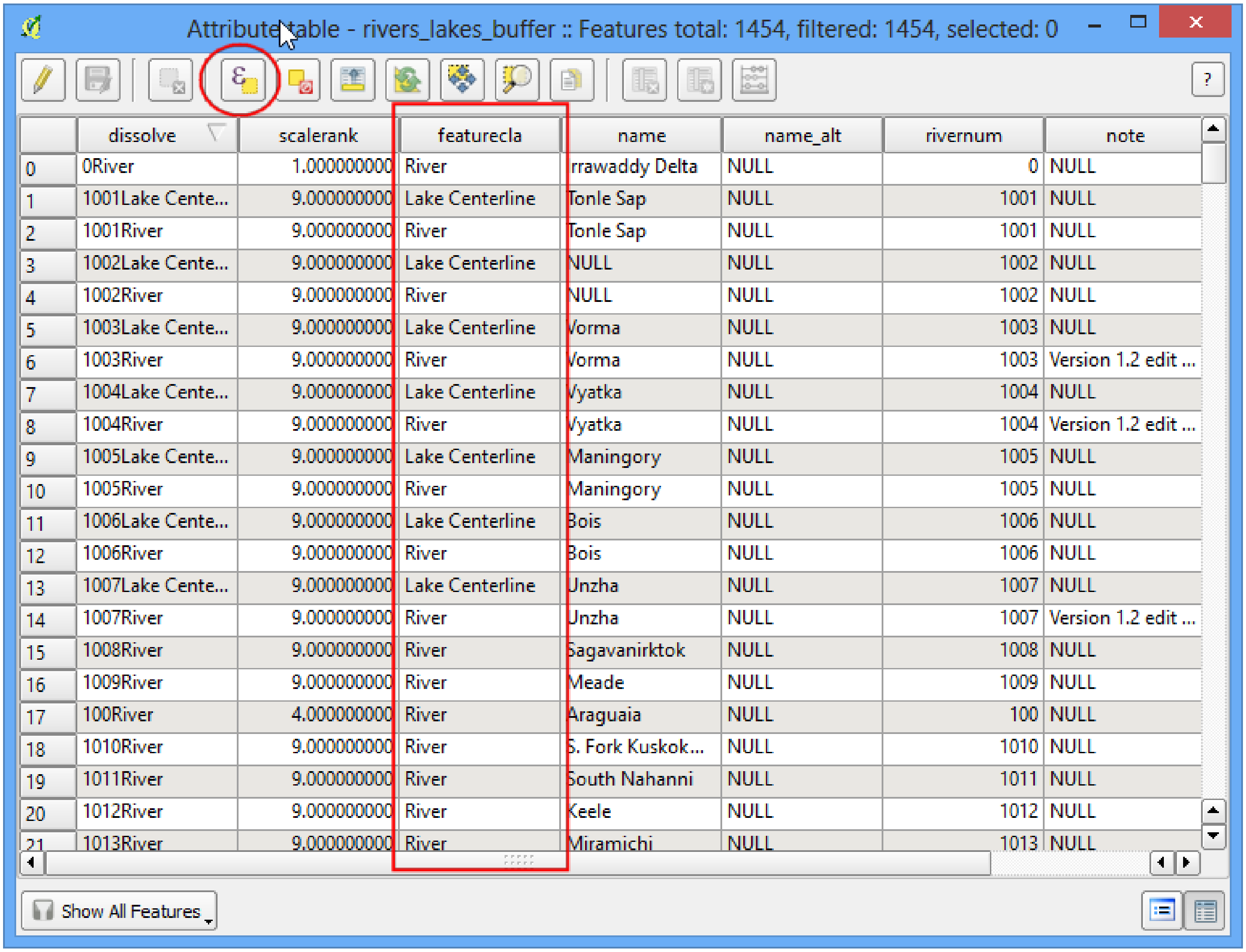
18. Repeat the same buffer process for the `rivers_lake_reprojected` layer and create an output file named `rivers_lake_buffer.shp`.



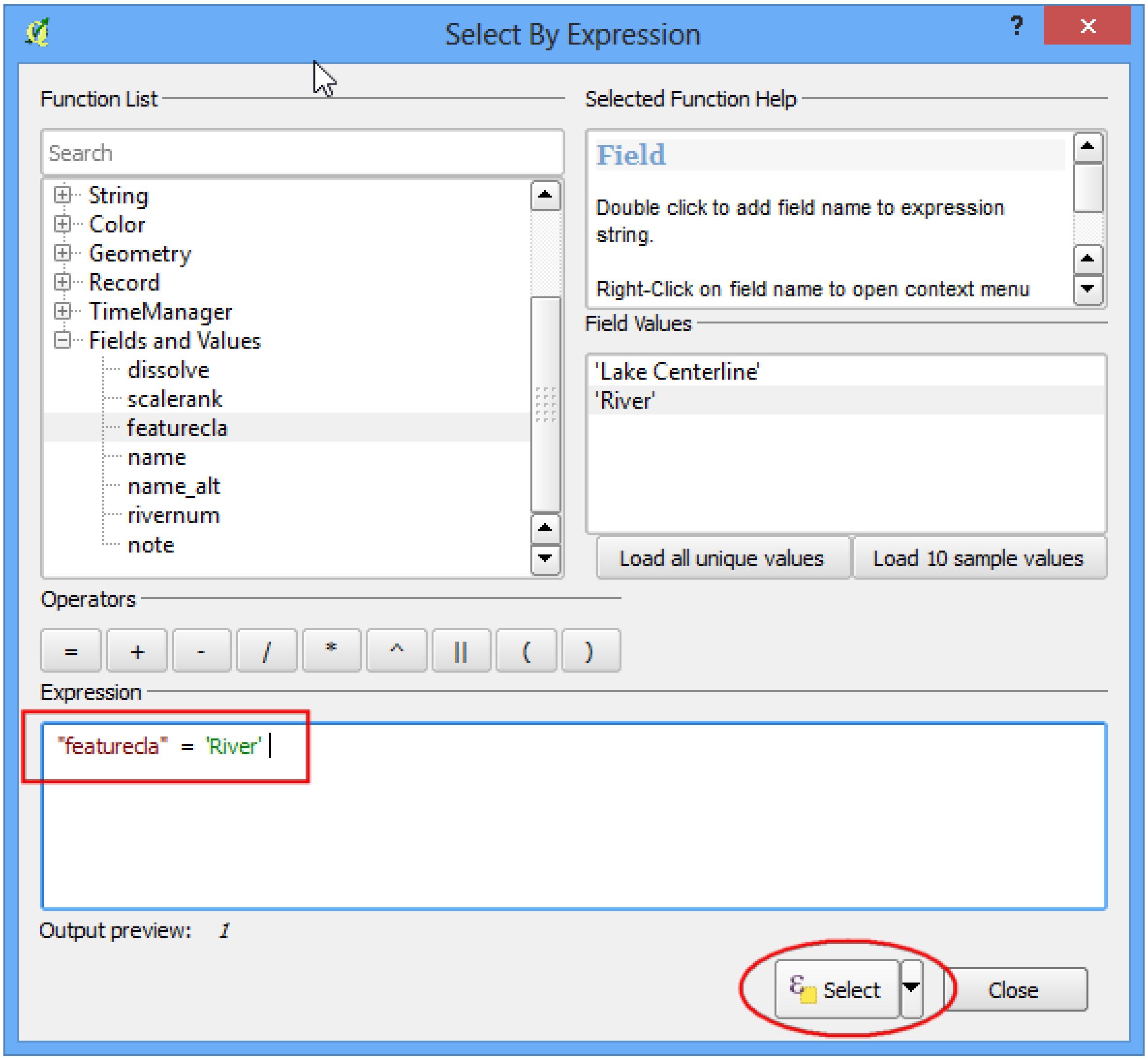
19. The `rivers_lake_buffer` contains features that are both rivers as well as lakes. Our analysis calls for using only river features, so we will run a query to select only river features. Right-click on the `rivers_lake_buffer` layer and select Open Attribute Table.



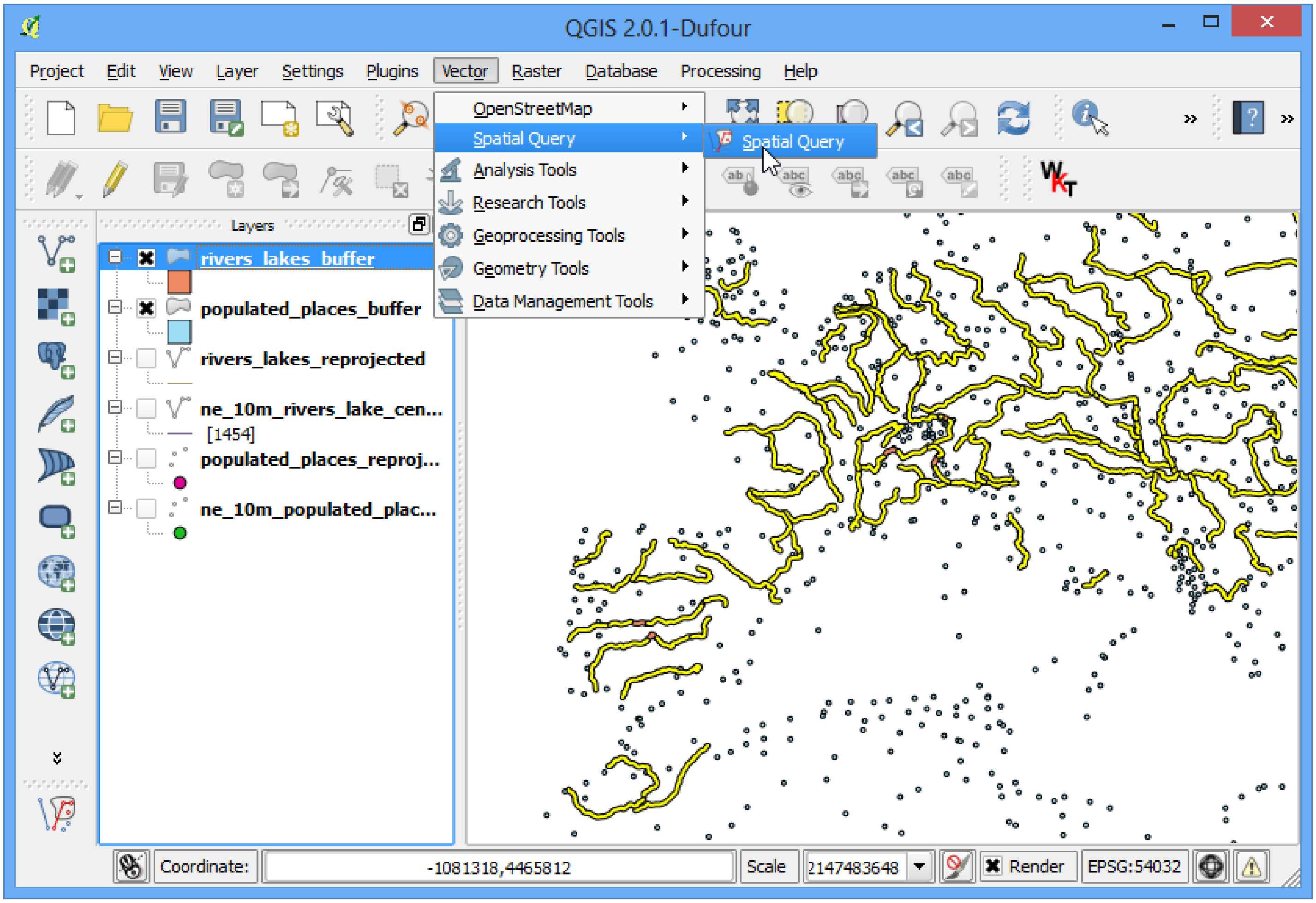
20. You will see that the *featurecla* attribute contains the information we can use to select the river features. Click on *Select features using an expression* button.



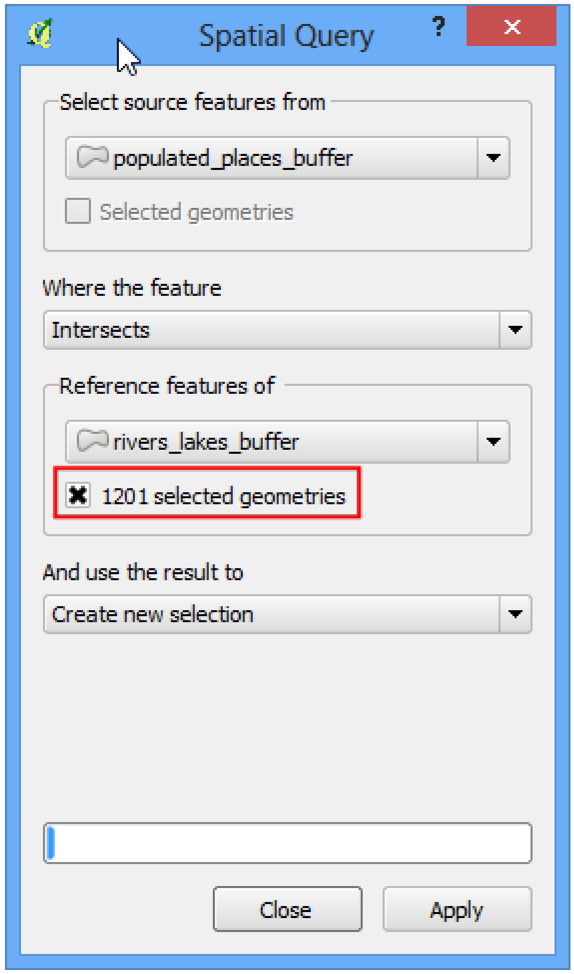
21. Enter the expression *"featurecla" = "River"* and click Select and then click Close to back to the main QGIS window.



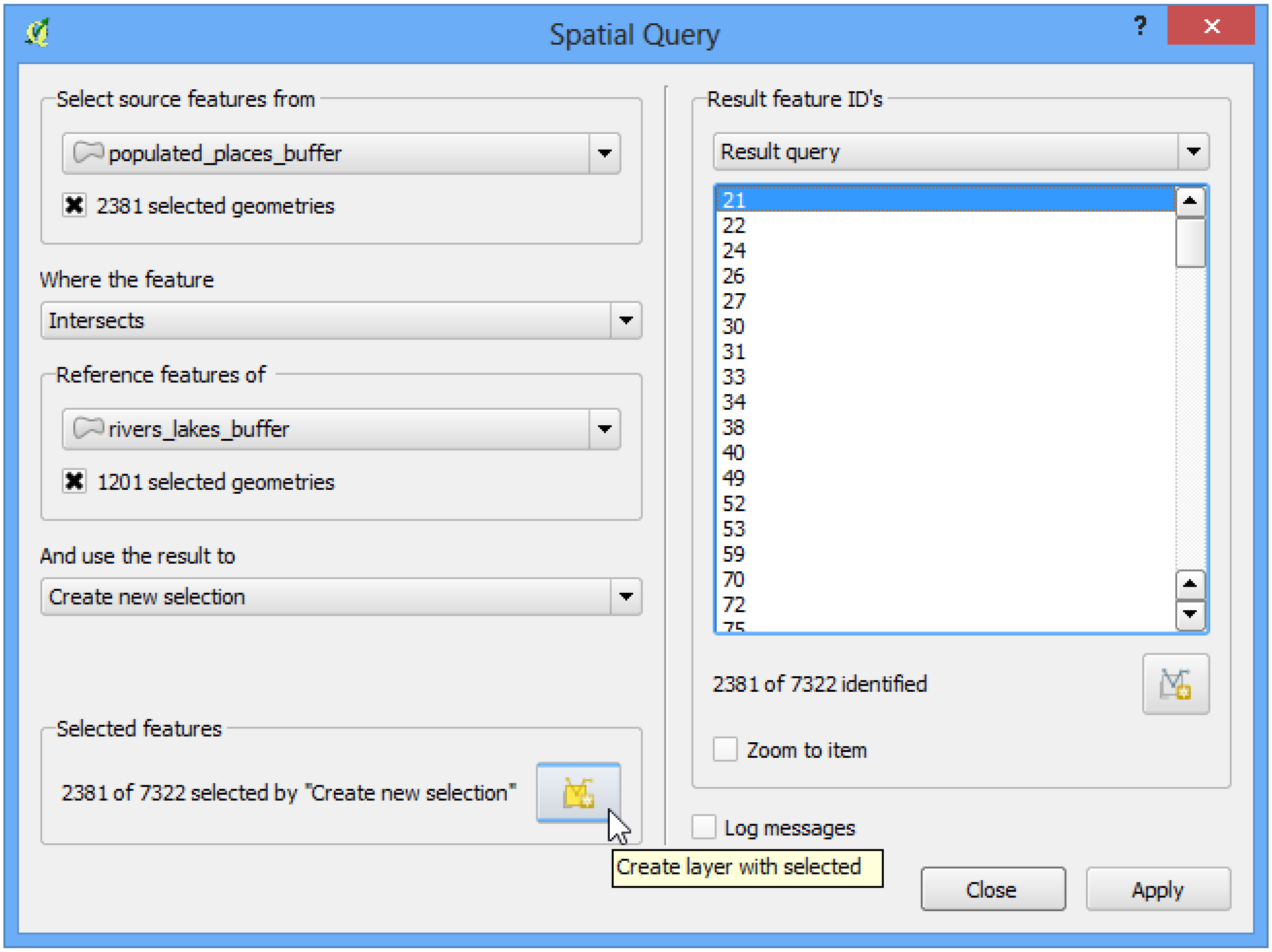
22. Now we are ready to perform the spatial query. You need to enable the *Spatial Query plugin* to use this functionality. See *Using Plugins* for more details. Once enabled, go to Vector ‣ Spatial Query ‣ Spatial Query.



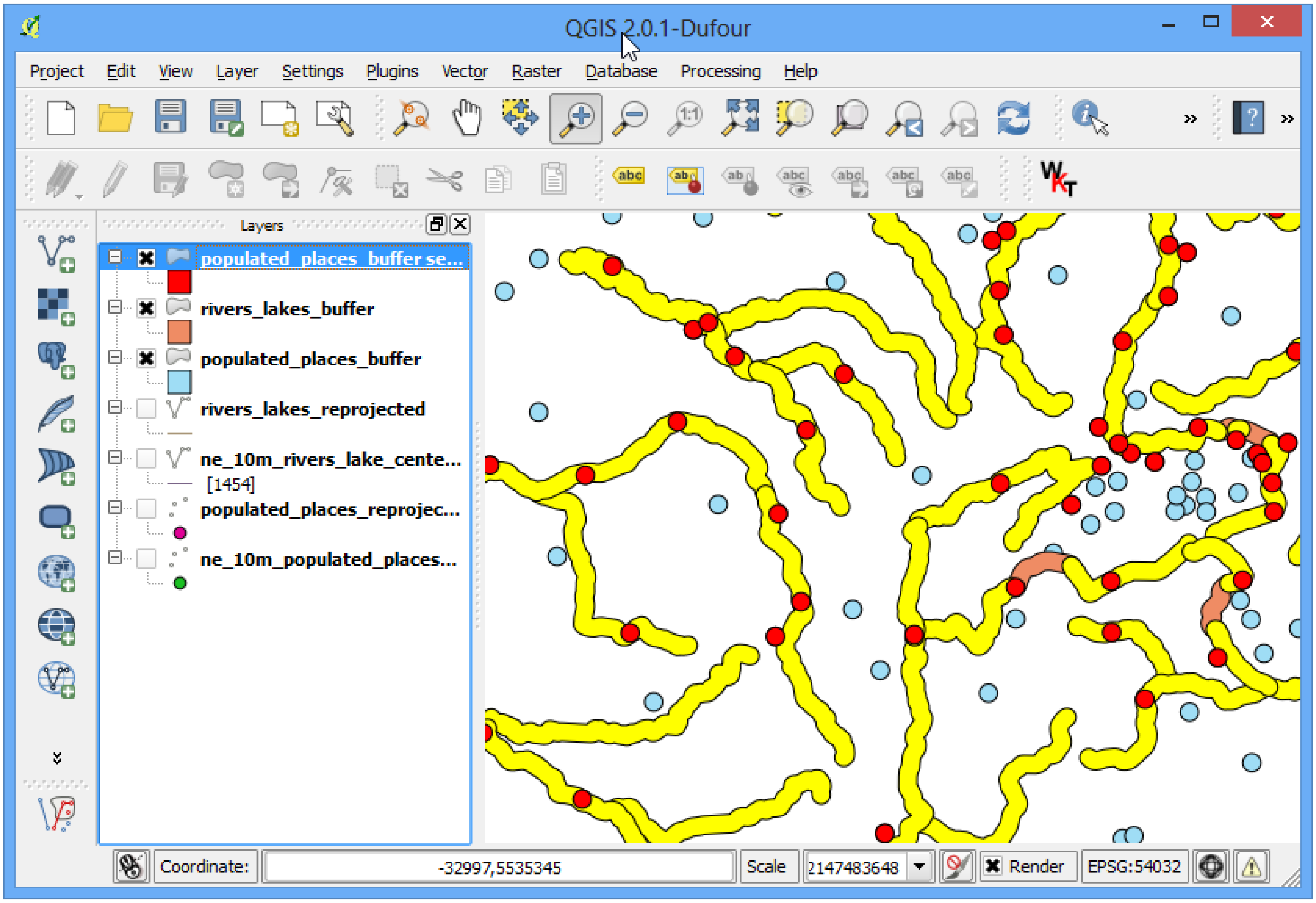
23. For our query, we want to select features from the buffered places that intersect with the buffered river lines. Make sure the checkbox next to *selected geometries* is checked. This is to ensure the query uses only river features that we selected previously. Click Apply.



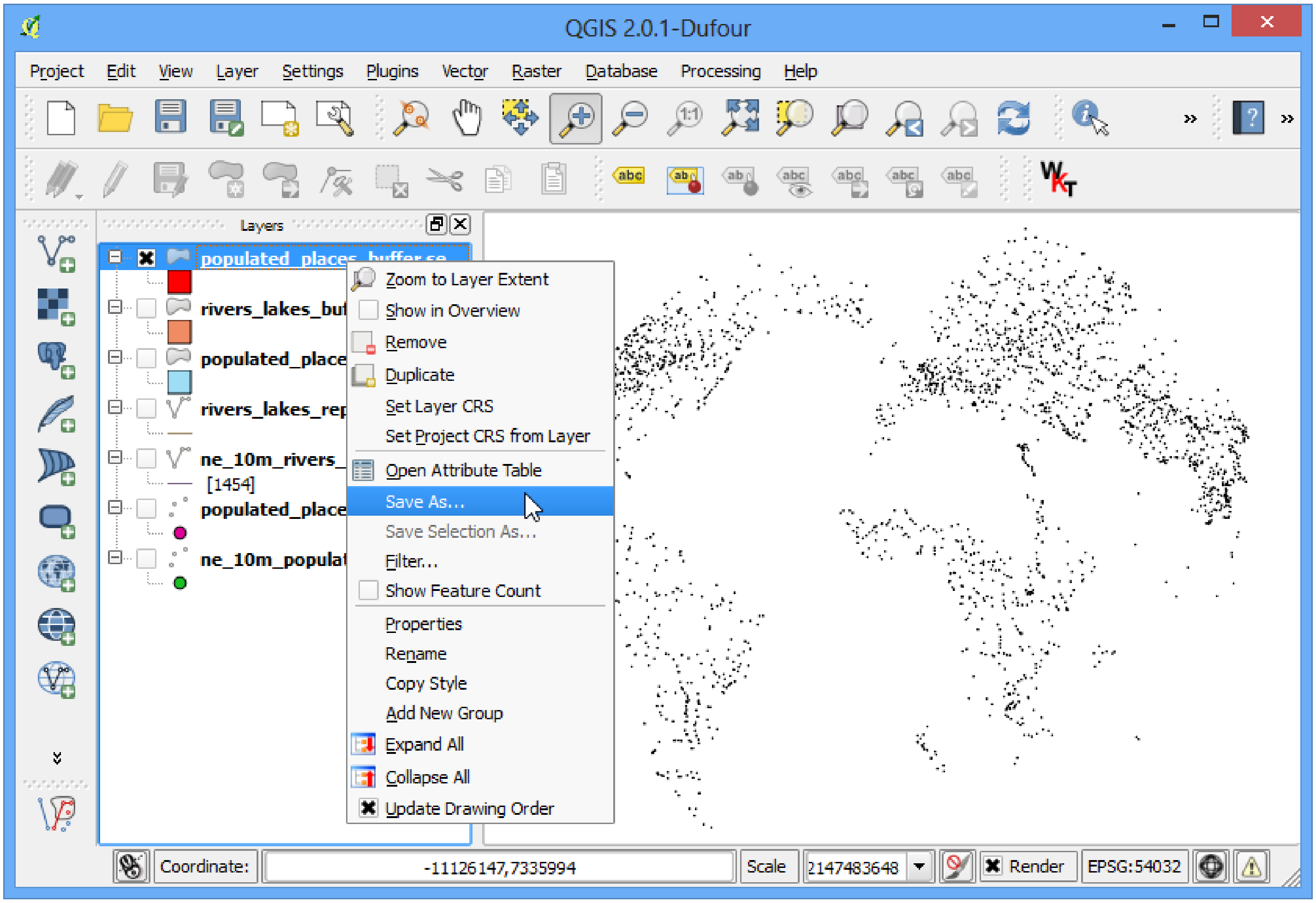
24. Once the query is complete, you will see a new section named Selected features. Click on the Create layer with selected button. A new layer will be added to the *Layers Panel*. Click Close.



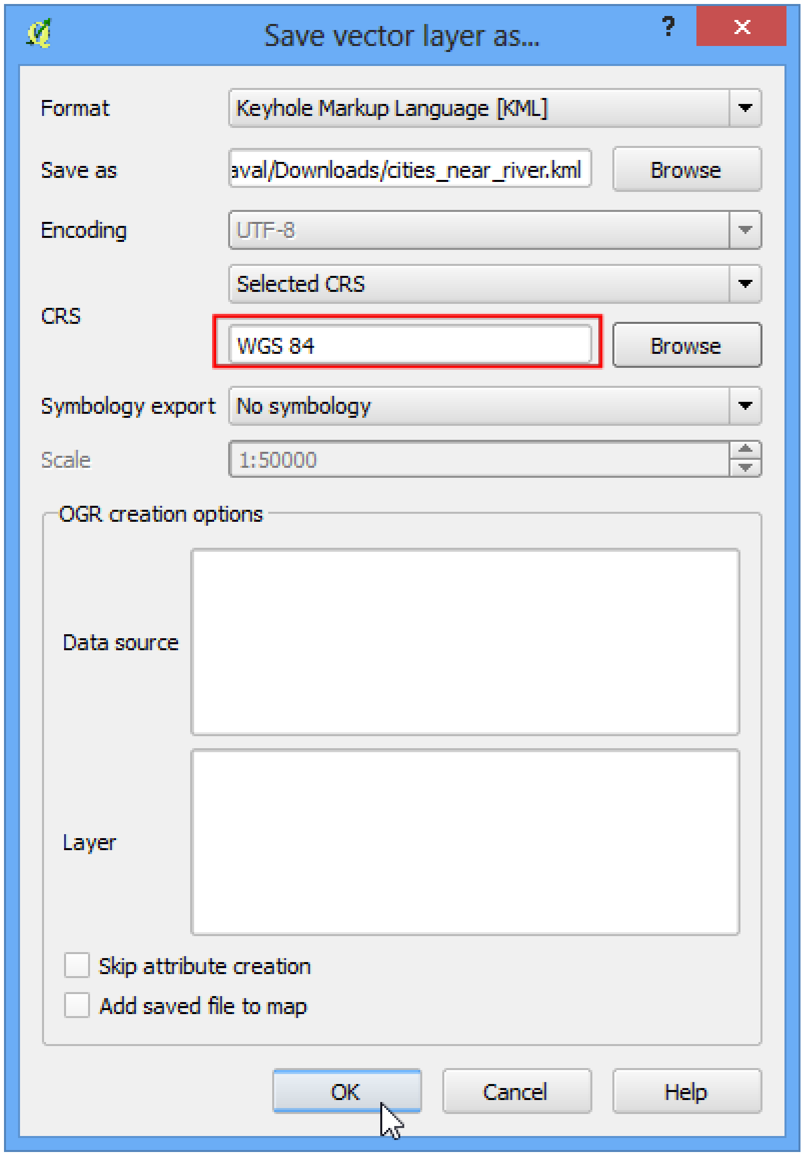
25. Zoom-in to any area and compare the results. You will notice that the new layer contains only the features that intersect with river buffers.



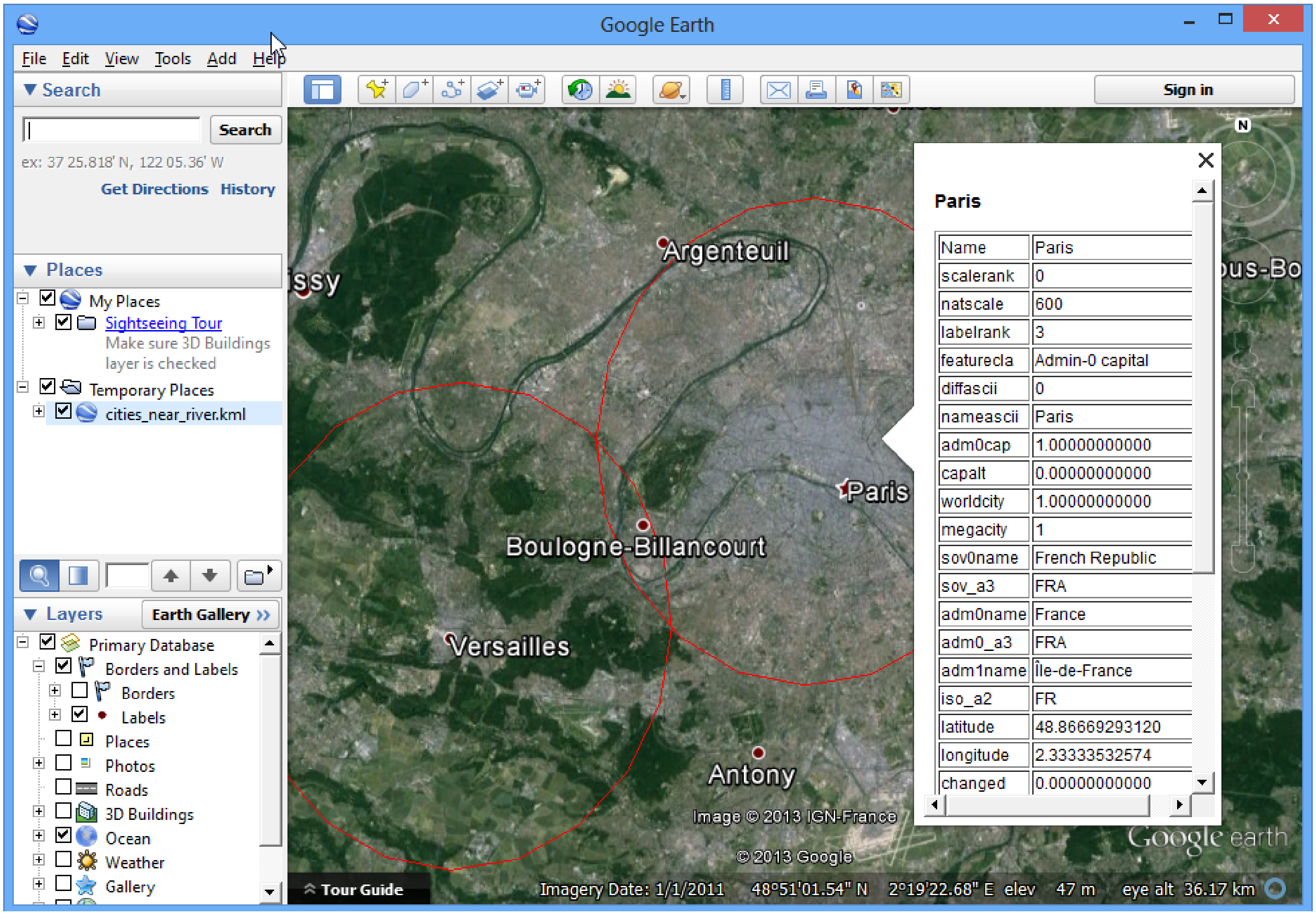
26. We should always verify my results to ensure the analysis is not flawed. One way to verify the results is to export this layer as a KML file and load it up in Google Earth. You can check if the areas you found really are within 10kms of a river. Right-click the layer and Save As....



27. In the Save vector layer as..., choose *WGS84* as the CRS. This because KML format needs the coordinates to be in this CRS. Name your KML as `cities_near_river.kml`.



28. Open Google Earth and verify that the cities represented by these buffers are indeed close to rivers.


Google Earth
File Edit View Tools Add Help
Search
Search
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Get Directions History
Places
My Places
Sightseeing Tour
Make sure 3D Buildings layer is checked
Temporary Places
cities_near_river.kml
Layers
Earth Gallery
Primary Database
Borders and Labels
Borders
Labels
Places
Photos
Roads
3D Buildings
Ocean
Weather
Gallery
Sign in
Argenteuil
Paris
Boulogne-Billancourt
Versailles
Antony
Paris
Name Paris
scalerank 0
natscale 600
labelrank 3
featurecla Admin-0 capital
diffascii 0
nameascii Paris
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adm0_a3 FRA
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latitude 48.86669293120
longitude 2.33333532574
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Tour Guide
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