# 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

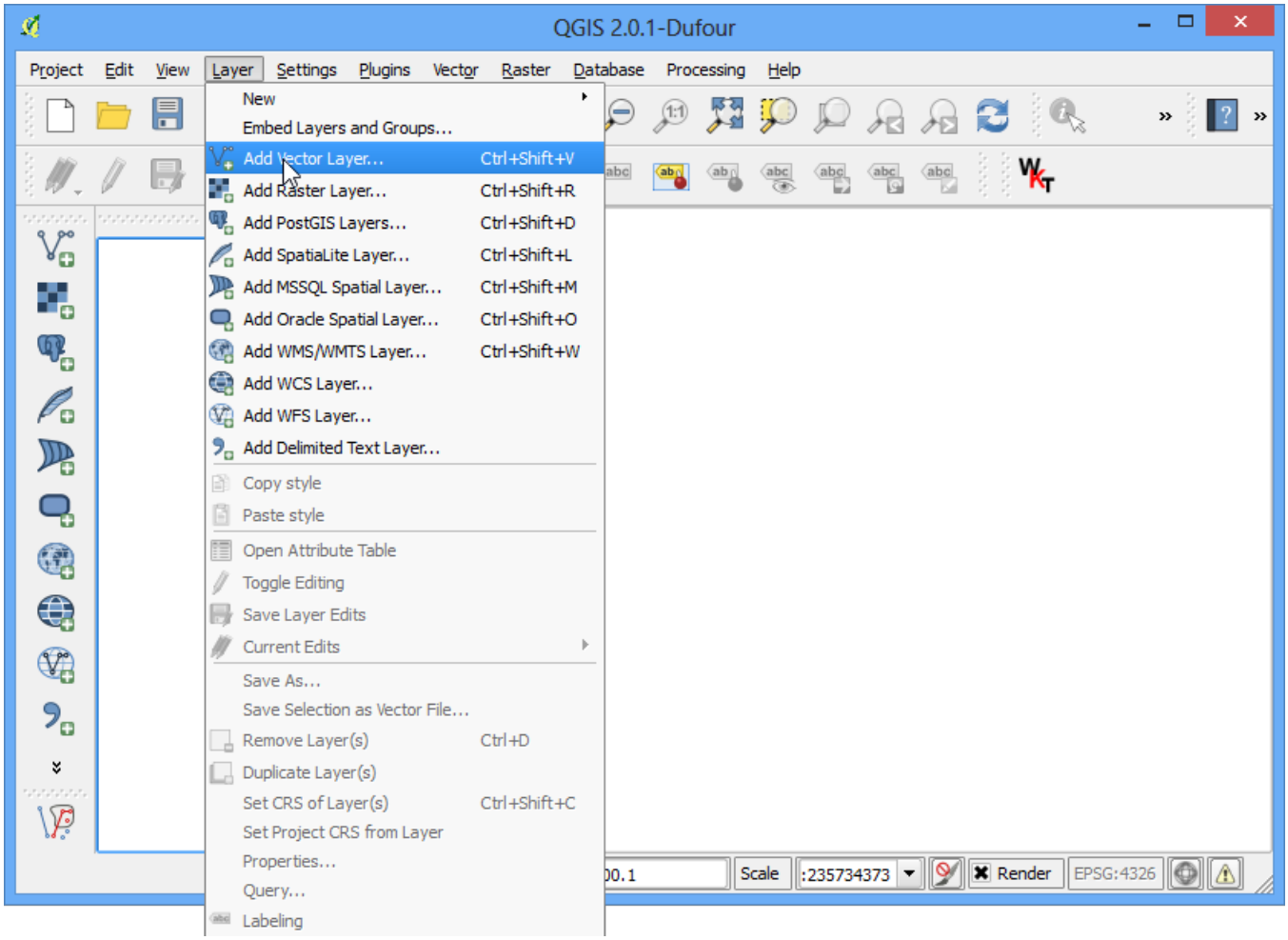
We will use ***ne_10m_rivers_lake_centerlines*** and ***10m_populated_places_simple*** datasets from Natural Earth.

Download Rivers and Lake Centerlines

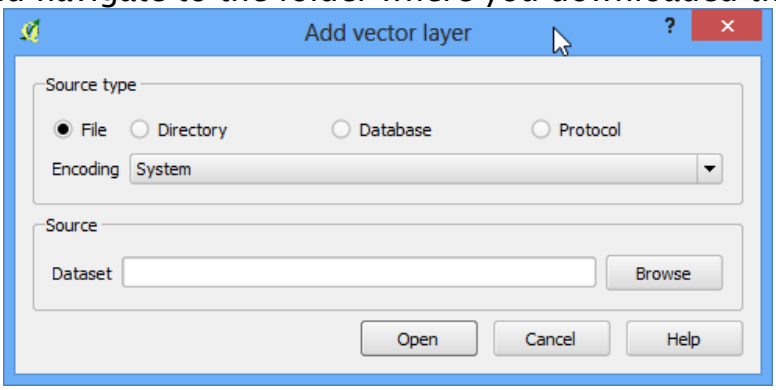
Download Populated Places.

## Procedure

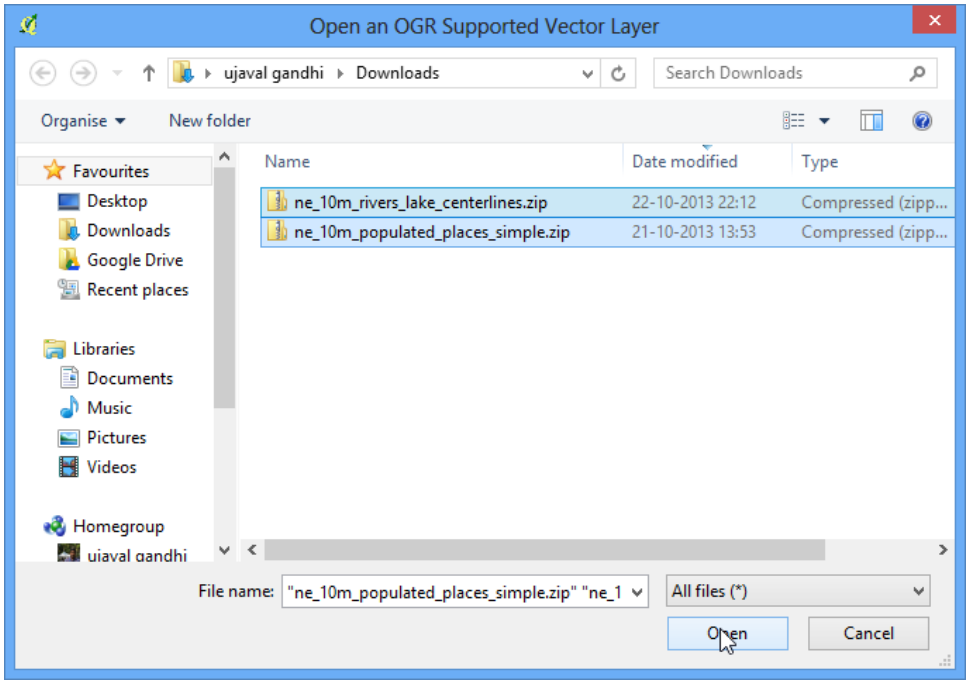
1. Once you have downloaded the data, open QGIS. Go to Layer ‣ Add Vector Layer.



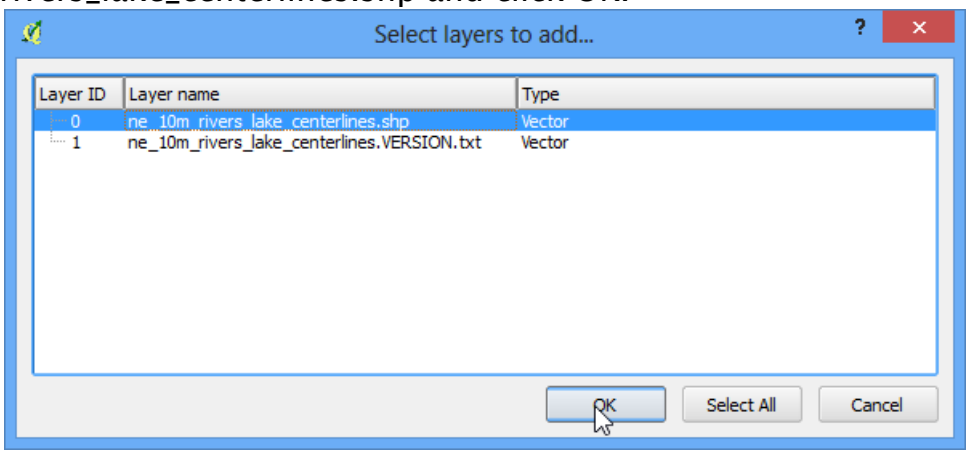

2. Click Browse and navigate to the folder where you downloaded the zip files.



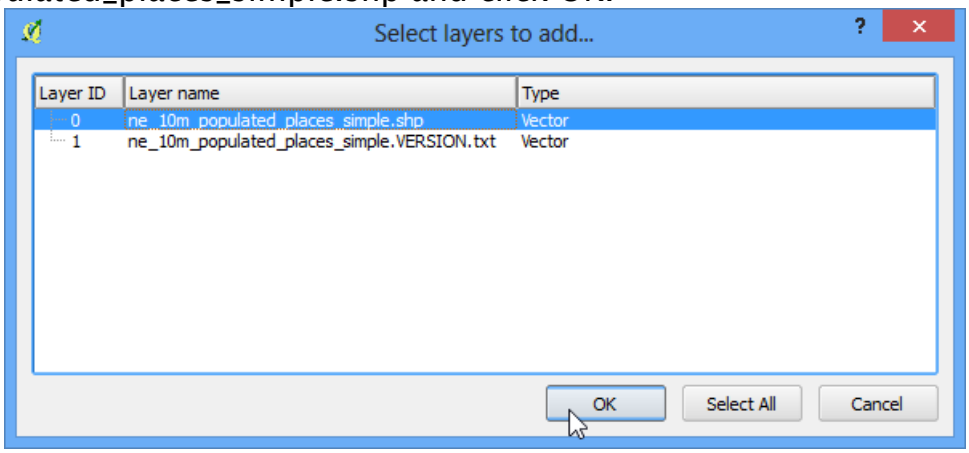

3. Hold the ***Shift*** key and click on both the zip files to select them. Click Open.



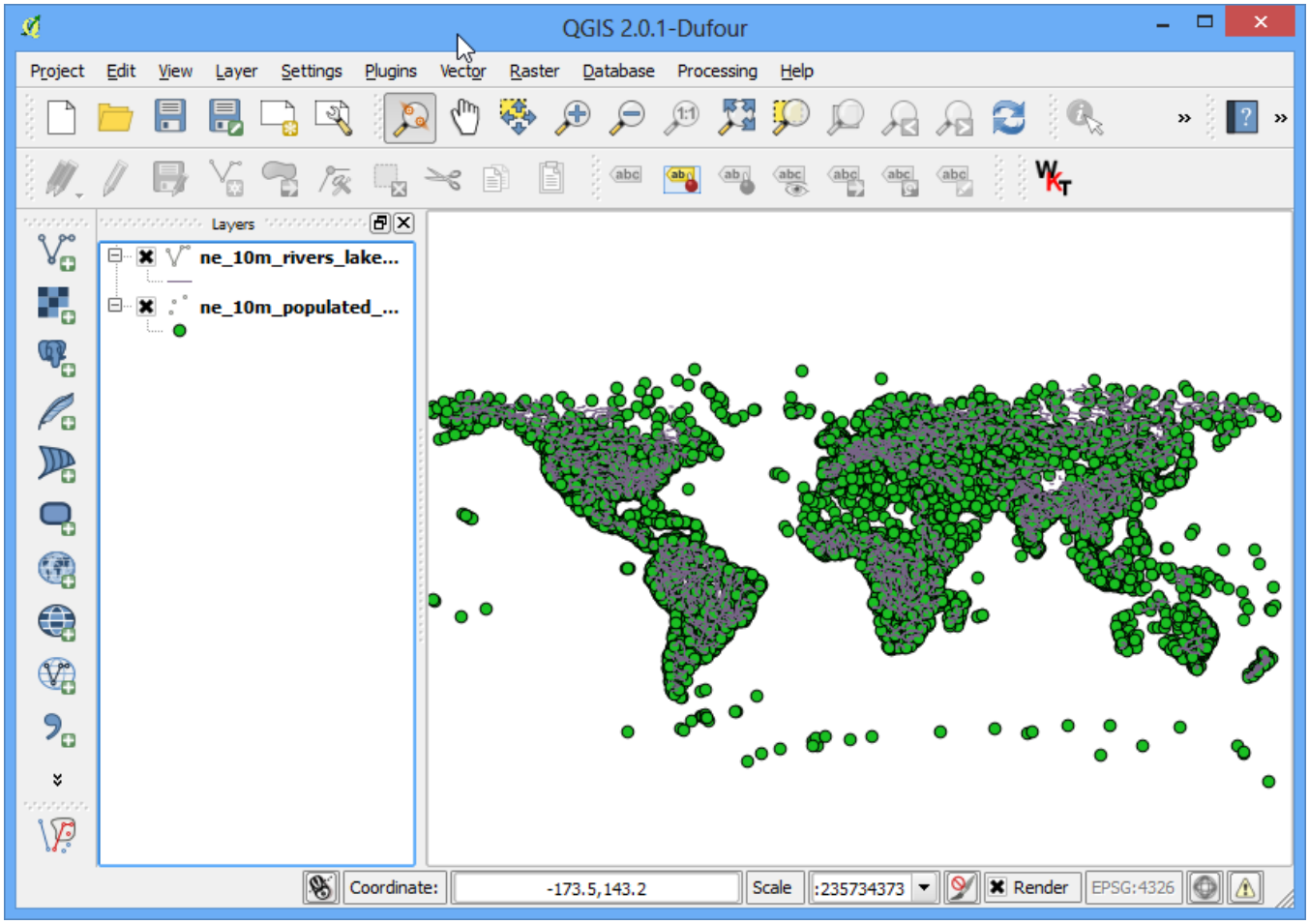

4. You will be asked to choose a layer from the zip archive. Select ne_10m_rivers_lake_centerlines.shp and click OK.



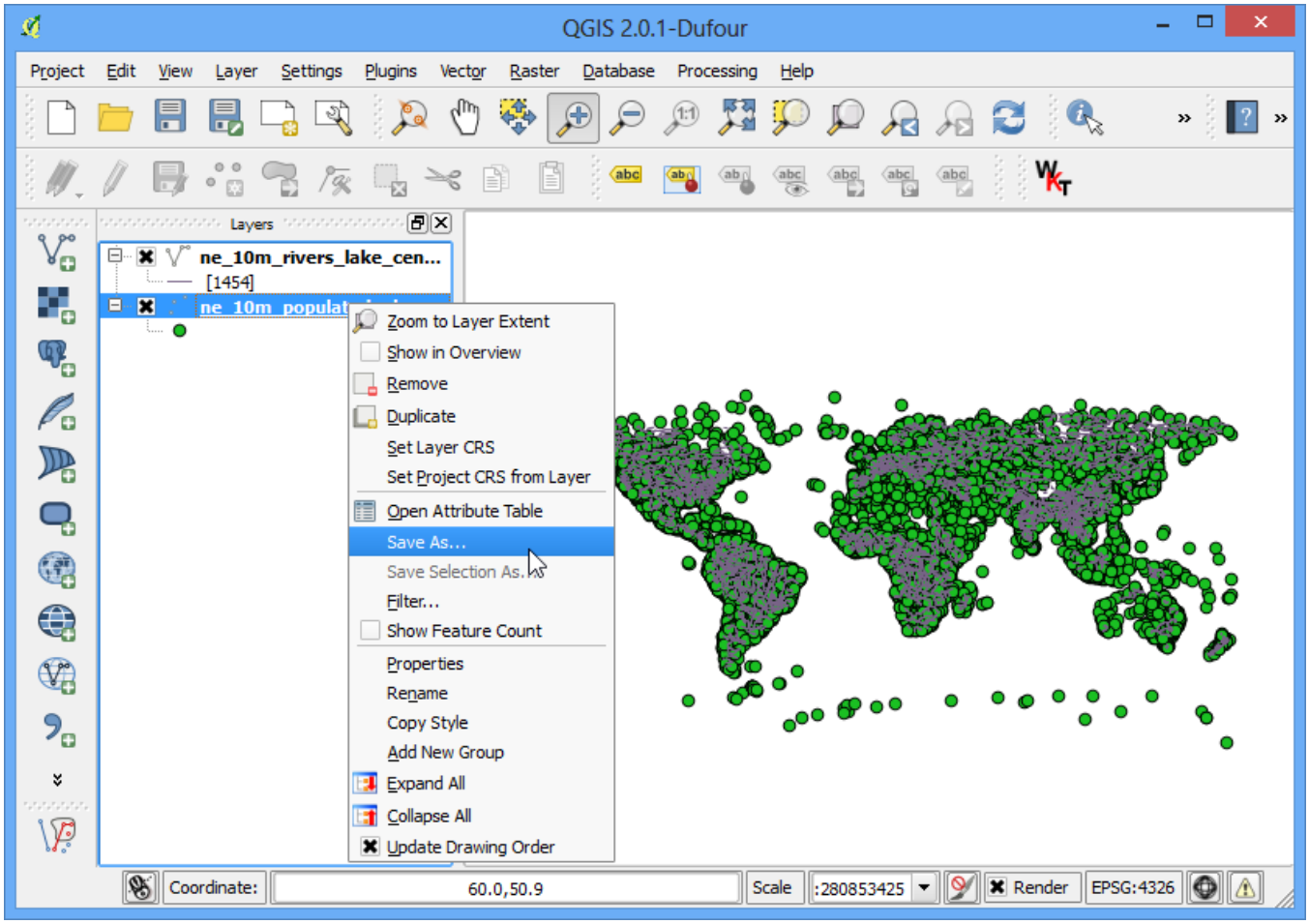

5. Since you have selected multiple files, repeat the process for the next file. Select 10m_populated_places_simple.shp and click OK.



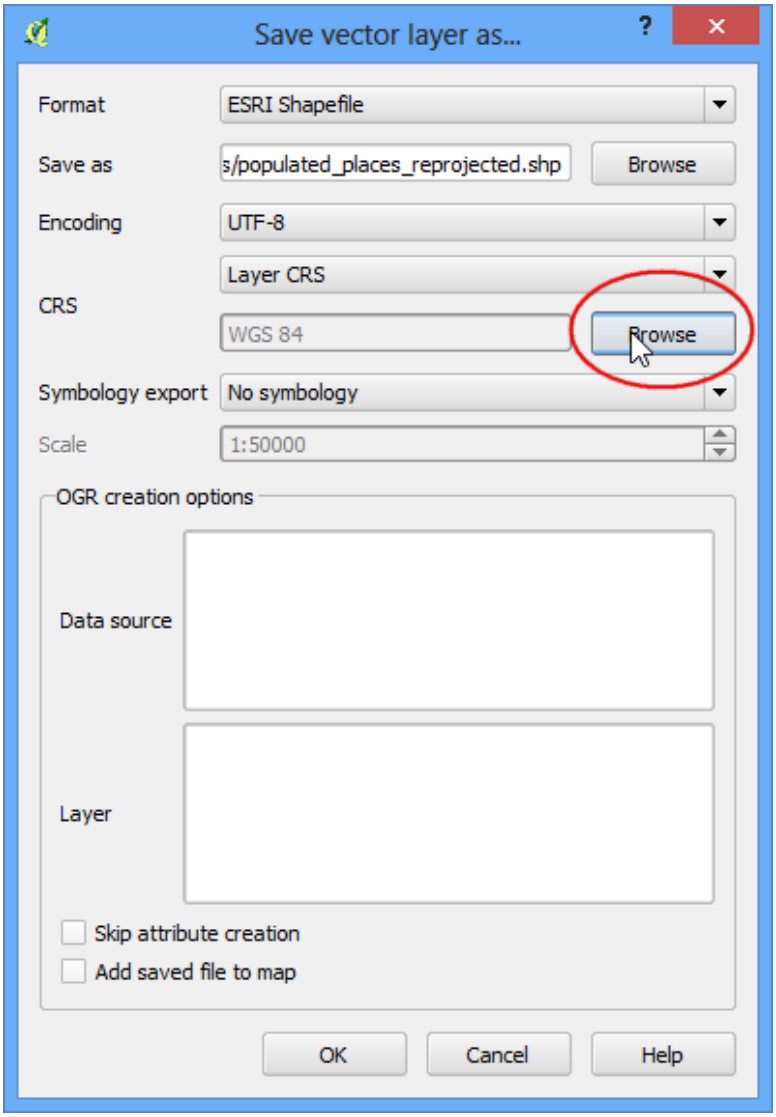

6. You will see both the shapefiles now loaded in QGIS.




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.



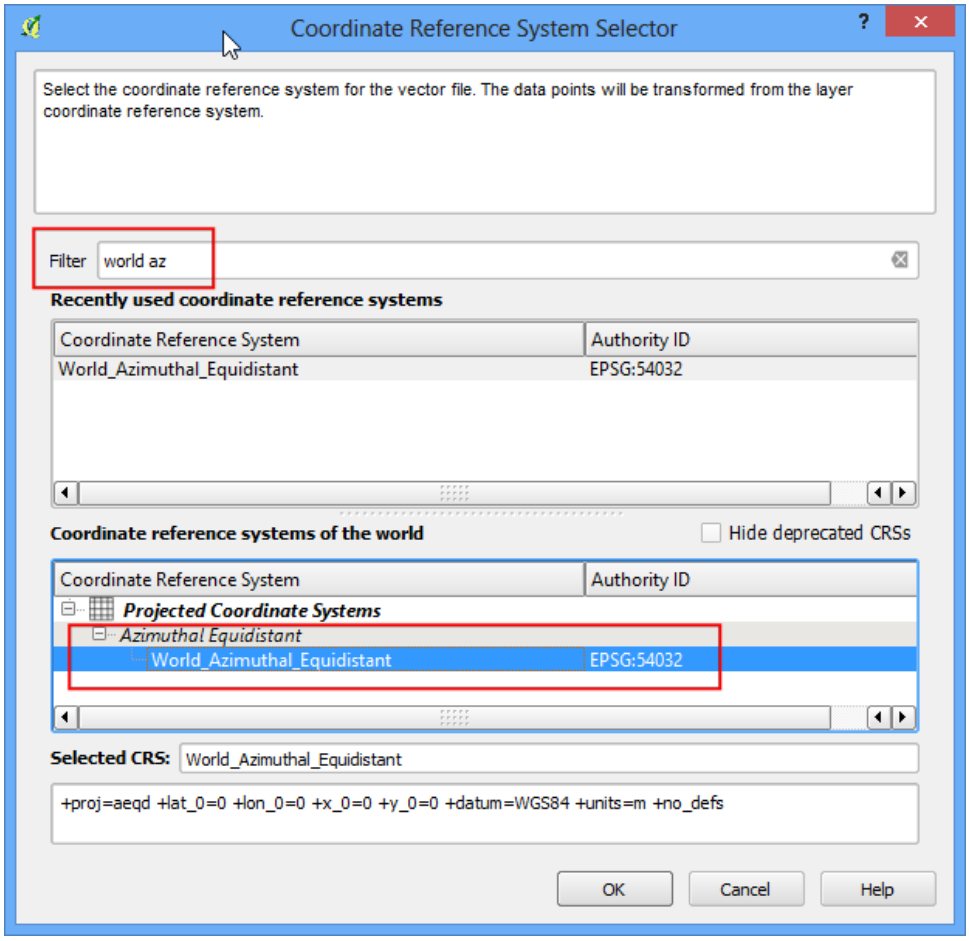

8. In the Save vector layer as... dialog, click Browse next to Save as and select the output file location. Name the output file as ***populated_places_reprojected.shp***. Next, click the Browse button next to CRS.



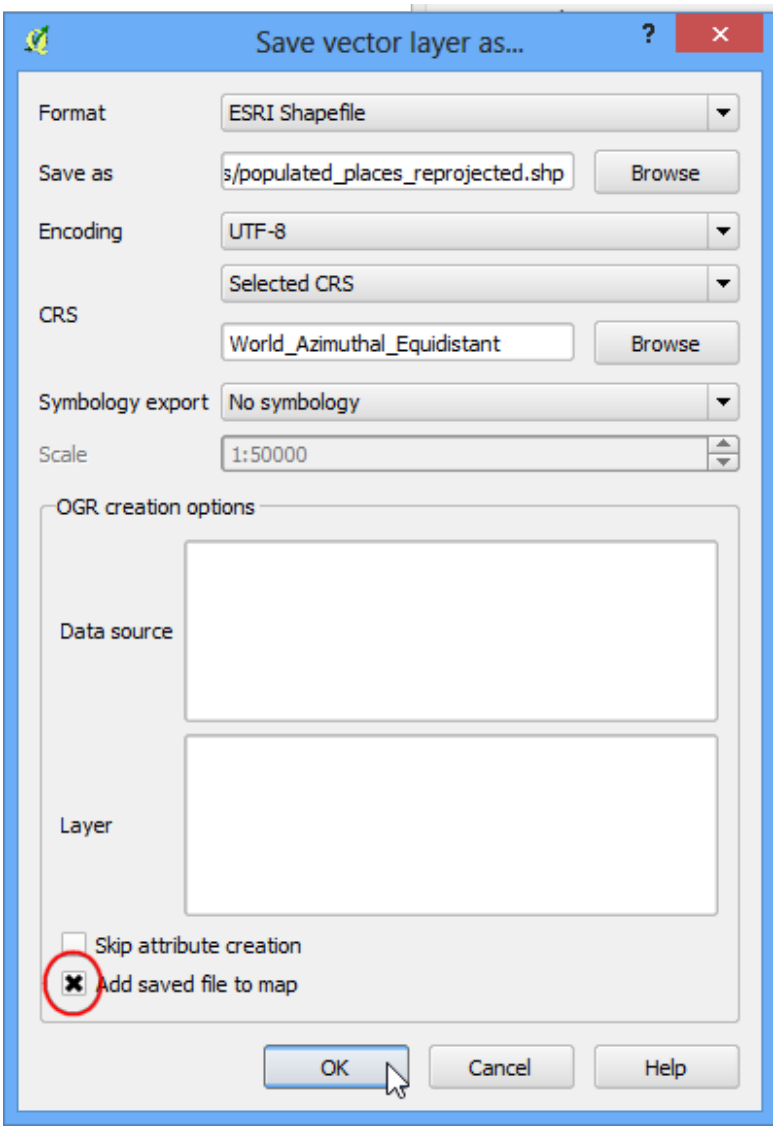

9. Now we must choose an appropriate CRS for our purpose. For creating buffers, a Azimuthal Equidistant projection would be best suited as radial distances around the center of the projection are accurate. In our case, since the dataset is global, we will choose a world projection. In the Coordinate 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*

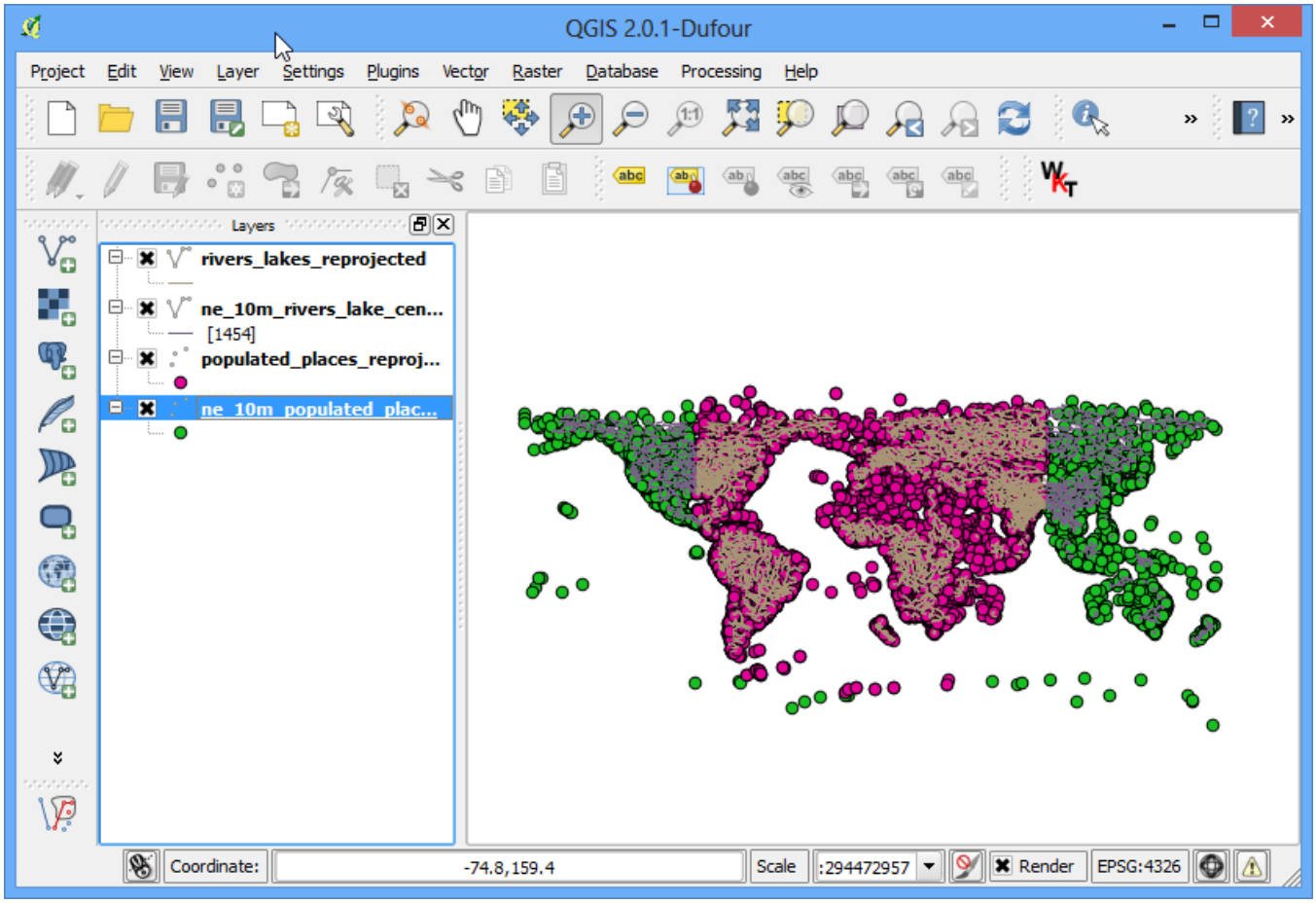
The ***World_Azimuthal_Equidistant*** projection spans 90 degrees from the origin. Here the origin being 0 degrees longitude, the only data contained within +/- 90 degrees longitude will be converted.



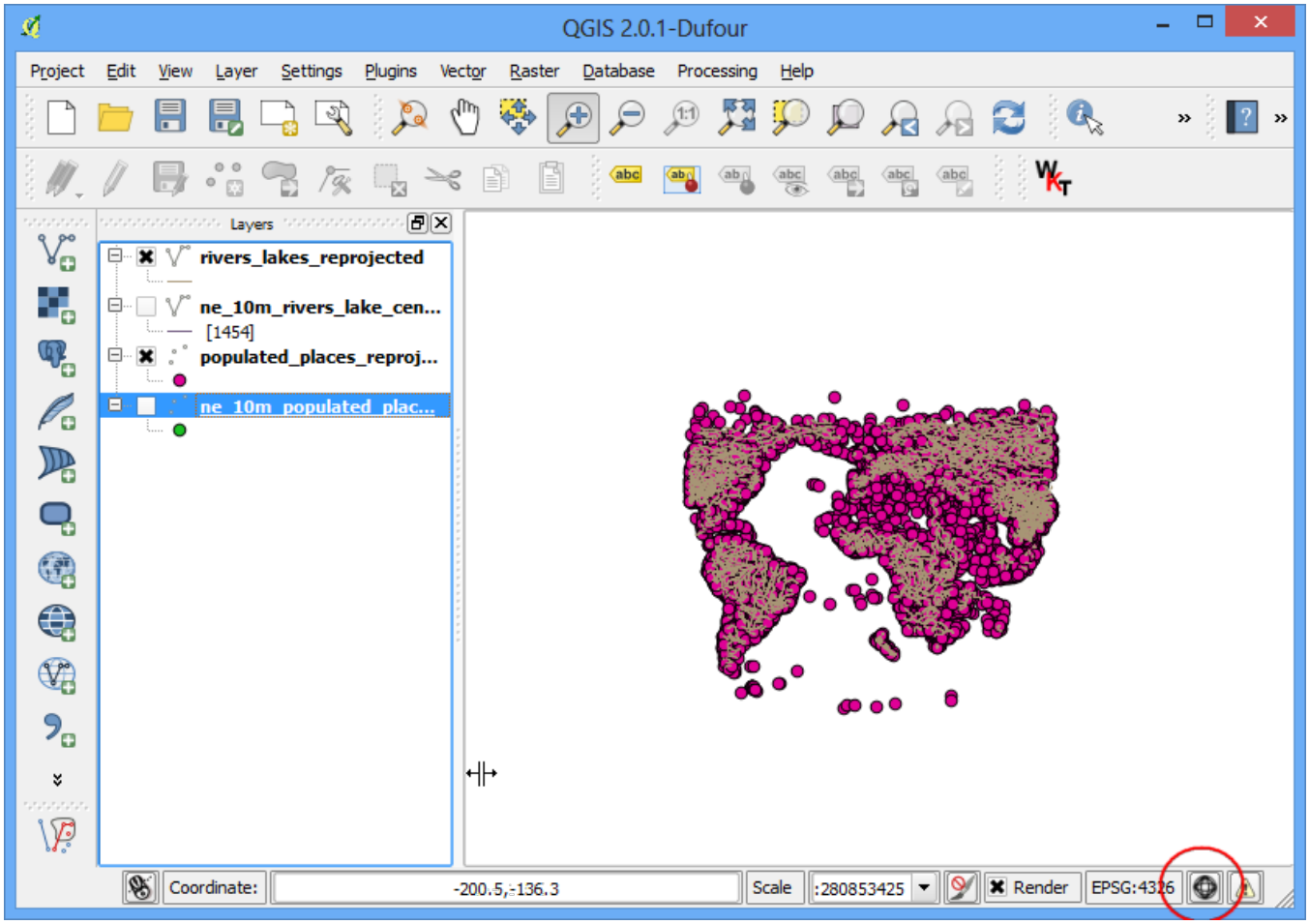

10. Back in Save vector layer as ... dialog, check the box next to Add saved file to map and click ***OK***.



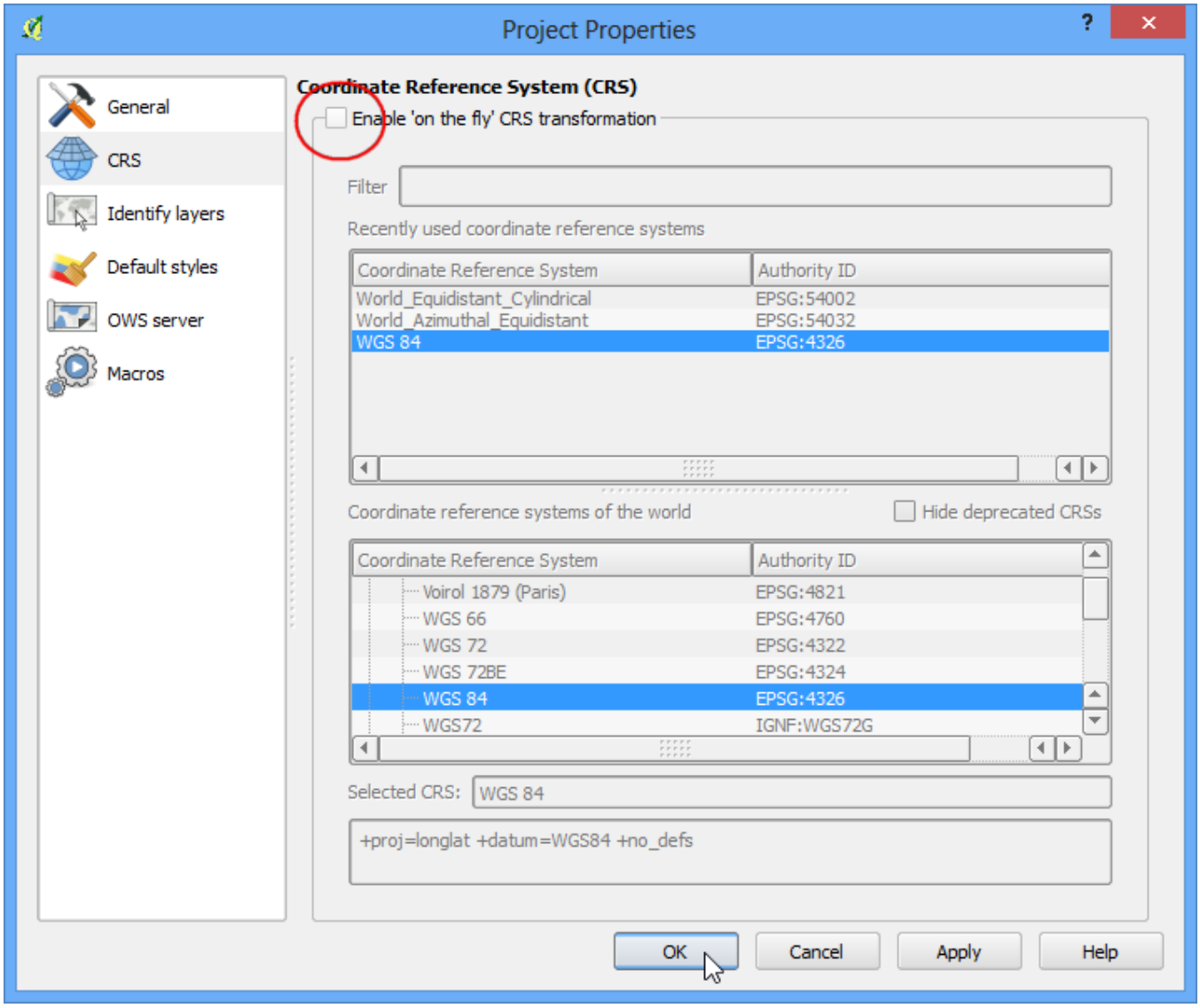

11. Repeat the re-projection process for the ***ne_10m_rivers_lake_centerlines*** layer and save the new layer as ***rivers_lake_reprojected.shp***.



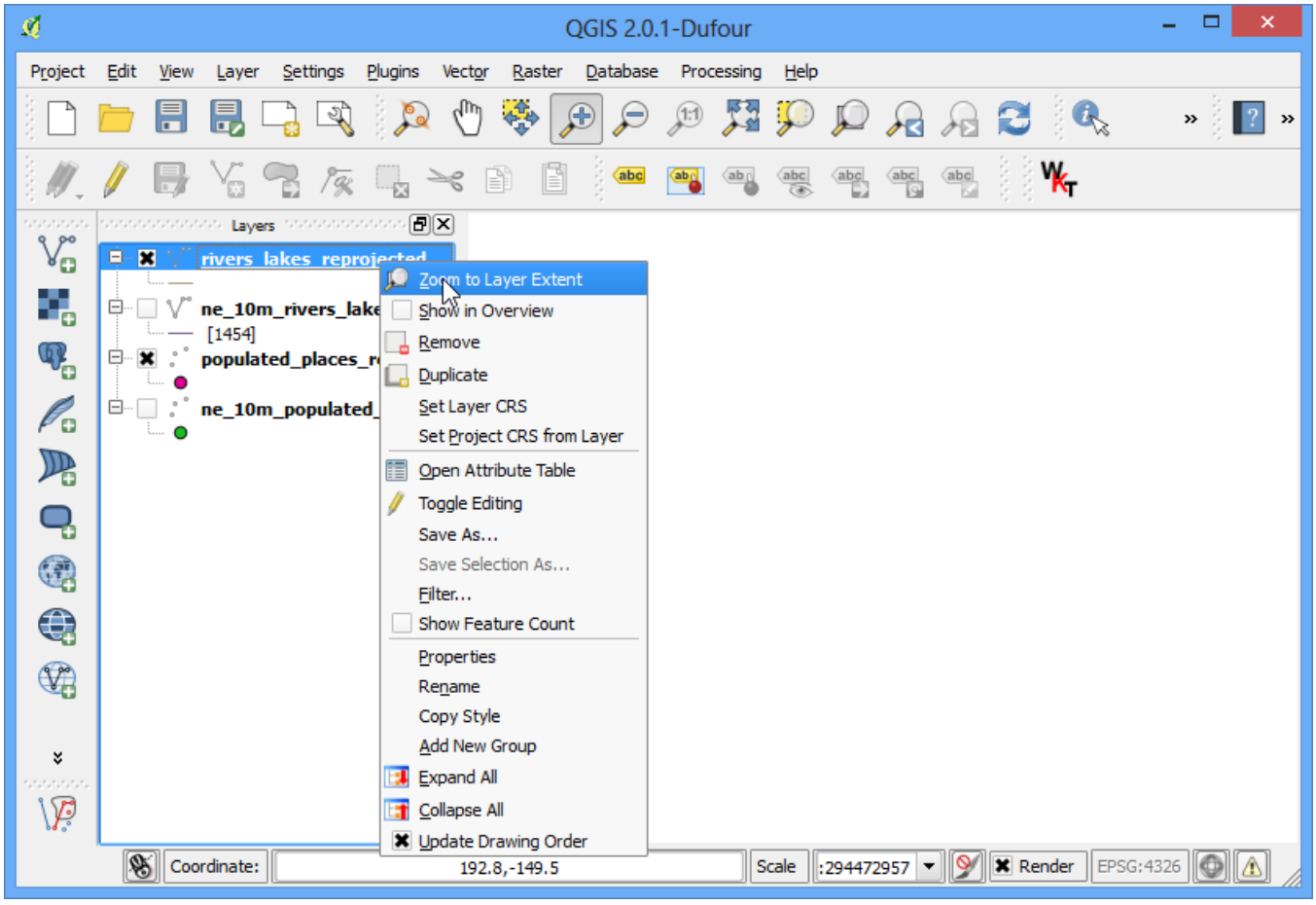

12. Now you will have 4 layers in your ***Layers Panel***. Un-check the boxes next to the original layers to display only the re-projected layers. The re-projected layers are still being shown in the ***Geographic CRS*** because of a setting. Let's turn that off. Click on the Project Properties button.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



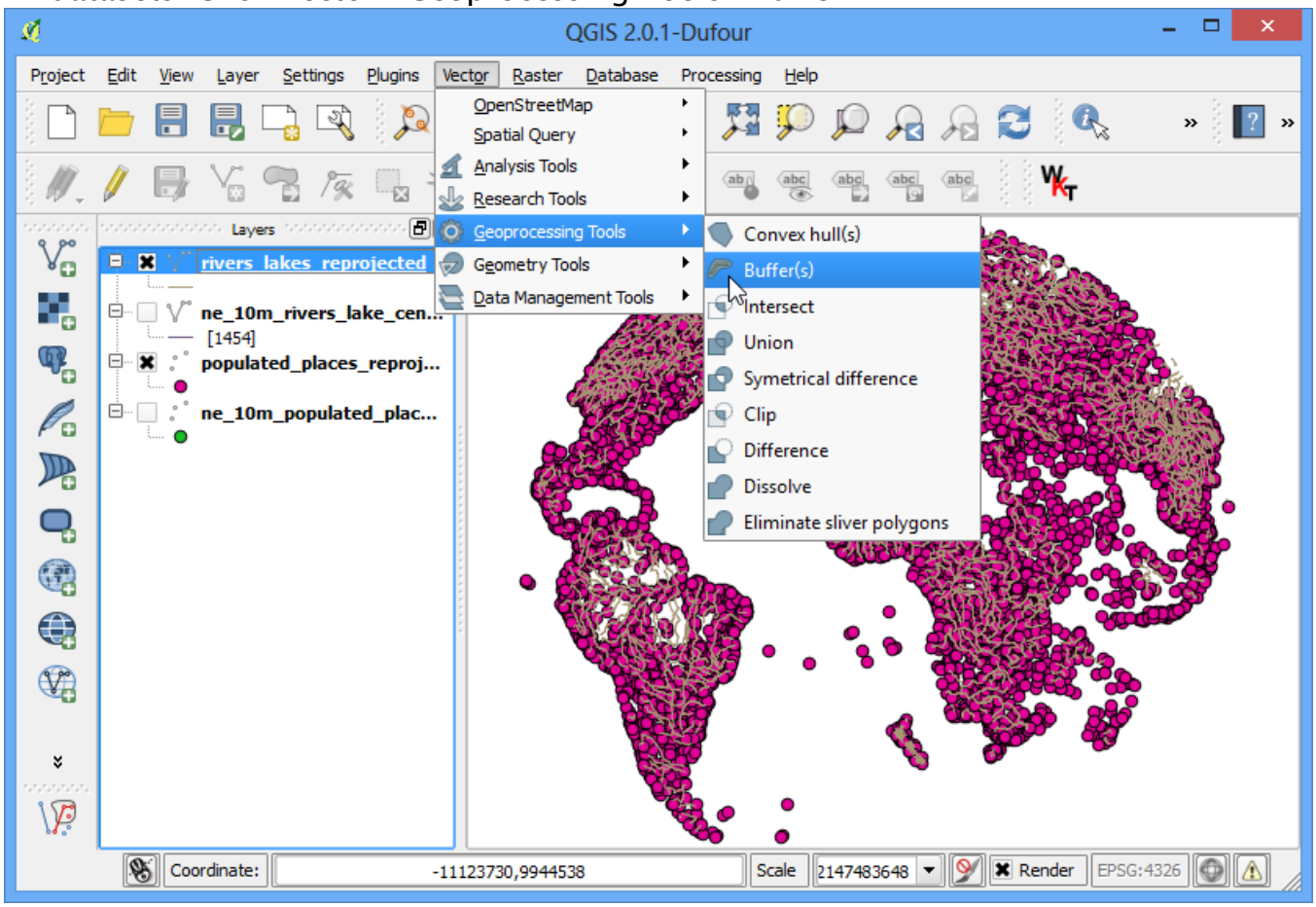

13. In the CRS tab of the Project Properties dialog, un-check the box next to Enable on-the-fly CRS transformation. Click OK.



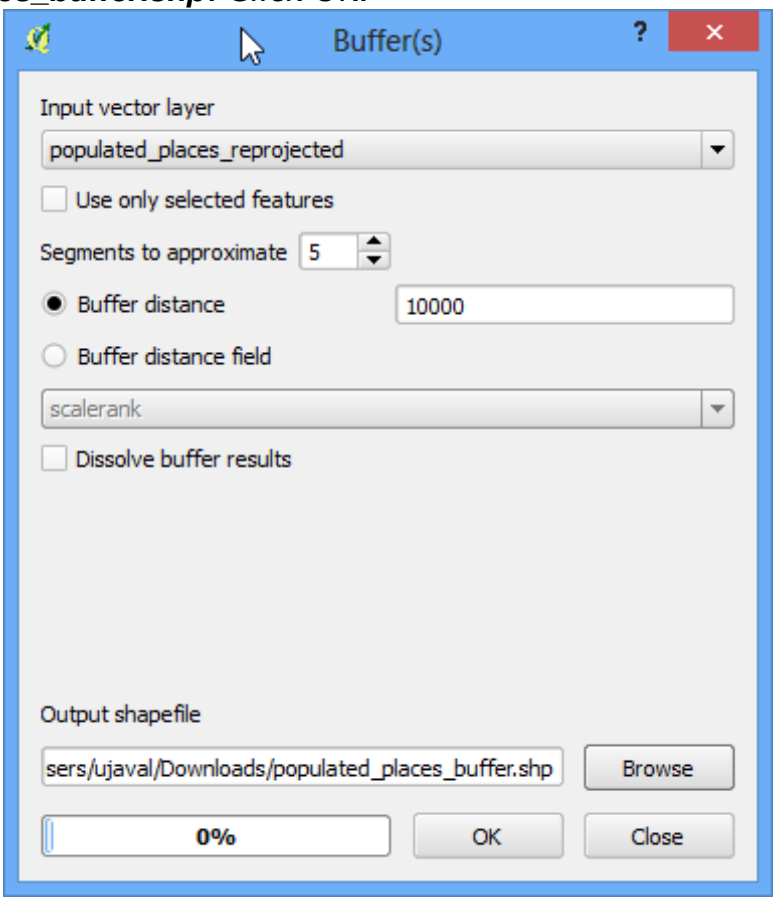

14. Back in the main QGIS window, right-click on any one of the re-projected layers and select Zoom to Layer Extent.



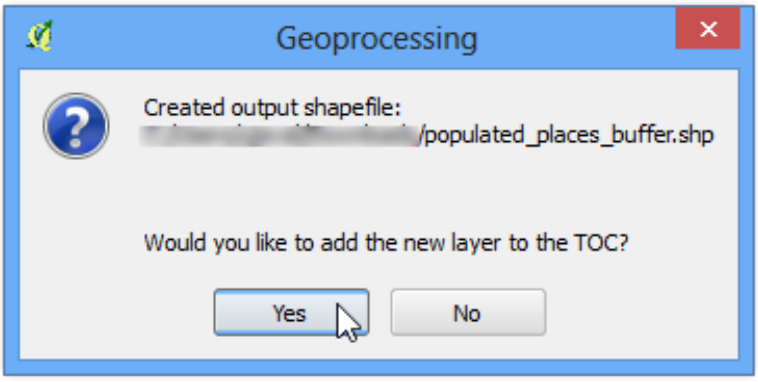

15. Now you will see the data in the layer's CRS. We will now create buffers for both the datasets. Click Vector ▸ Geoprocessing Tools ▸ Buffer.



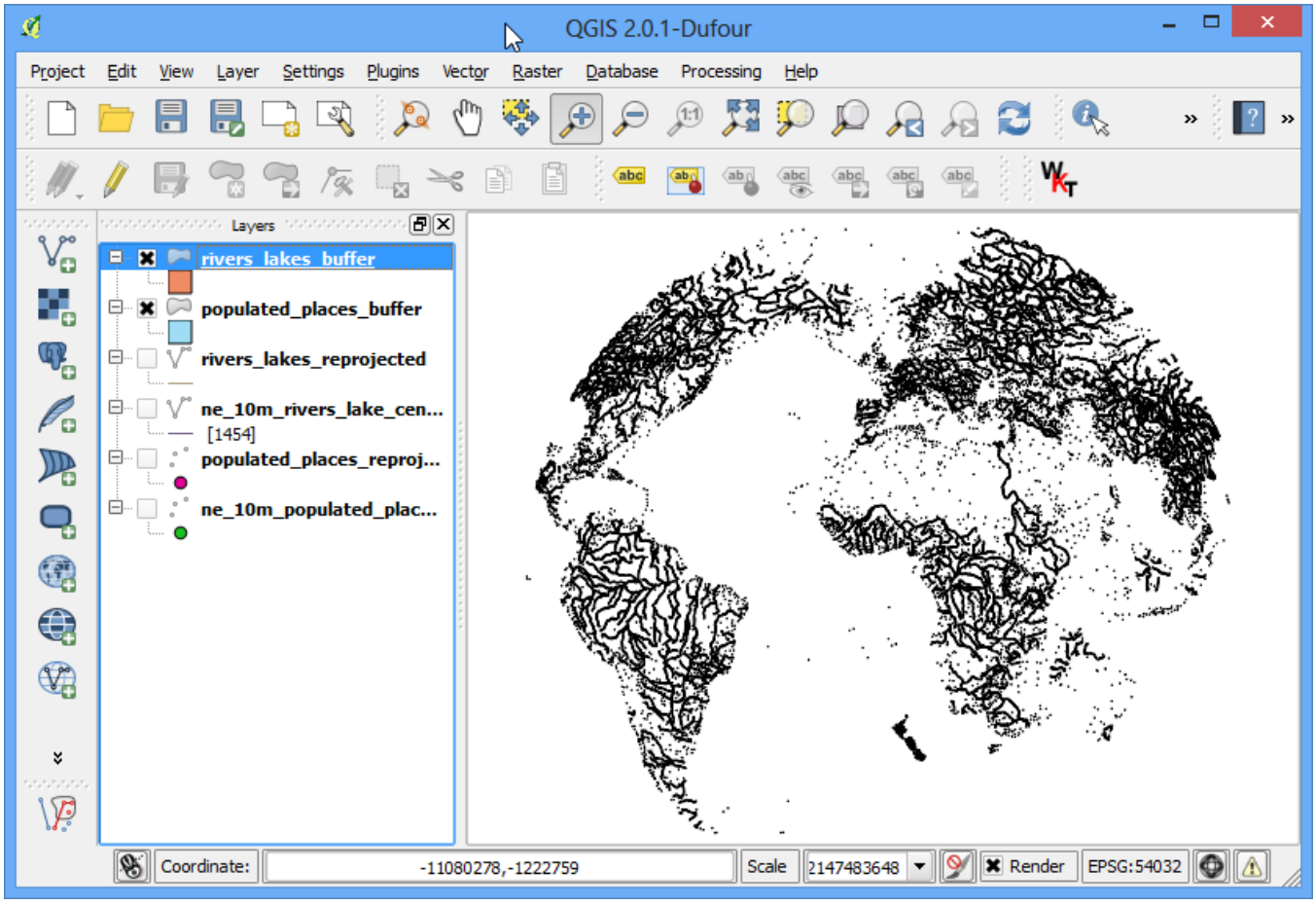
16. In the Buffer tool, select ***populated_places_reprojected*** layer as Input. Enter the buffer distance as ***10000***. Note that we want a buffer of 10kms and since the CRS units are metres, we need to enter 10,000. Enter the output file name as ***populated_places_buffer.shp***. Click OK.



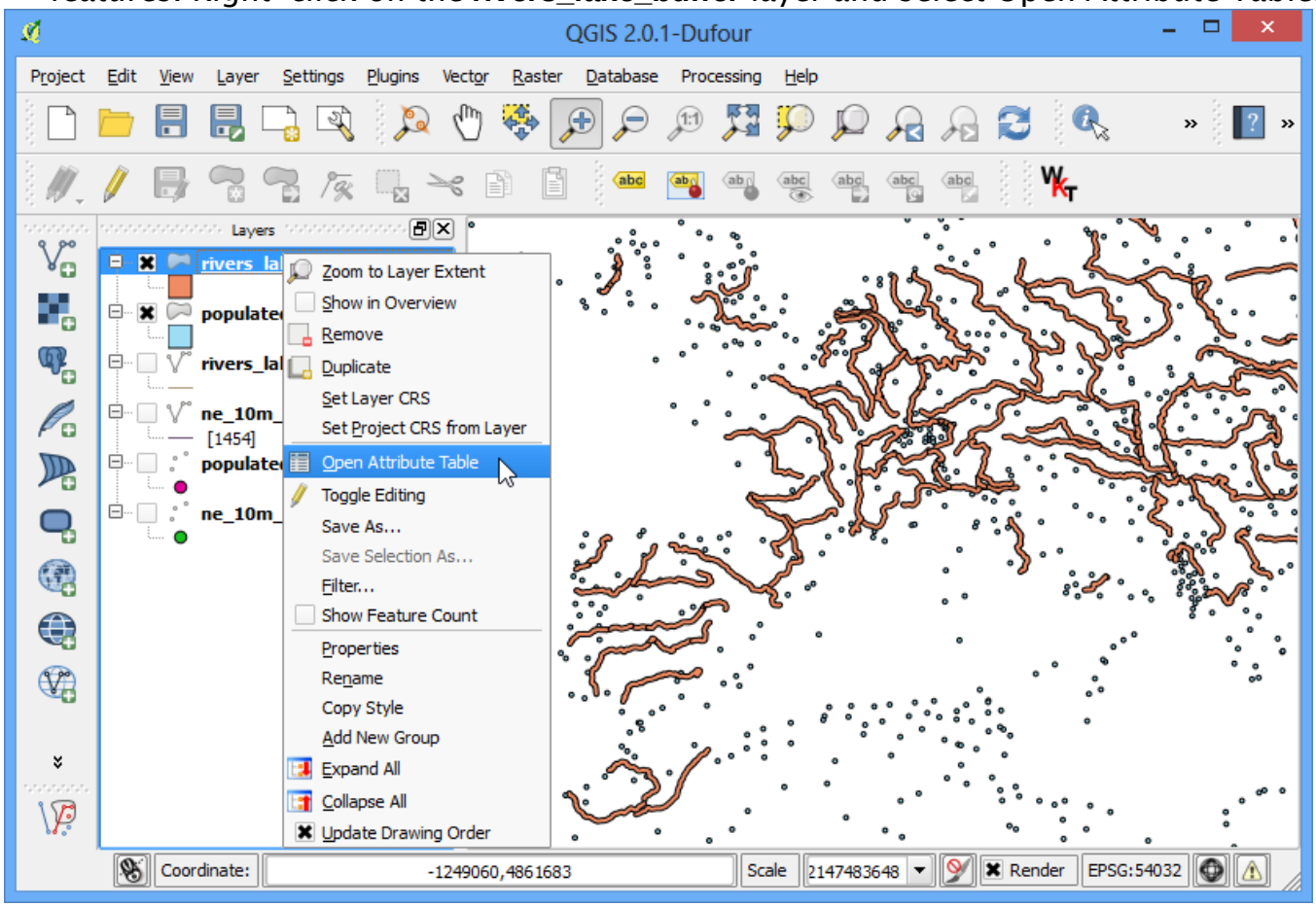

17. Once the buffer processing is over, click the Yes to add the newly created layer to the TOC.



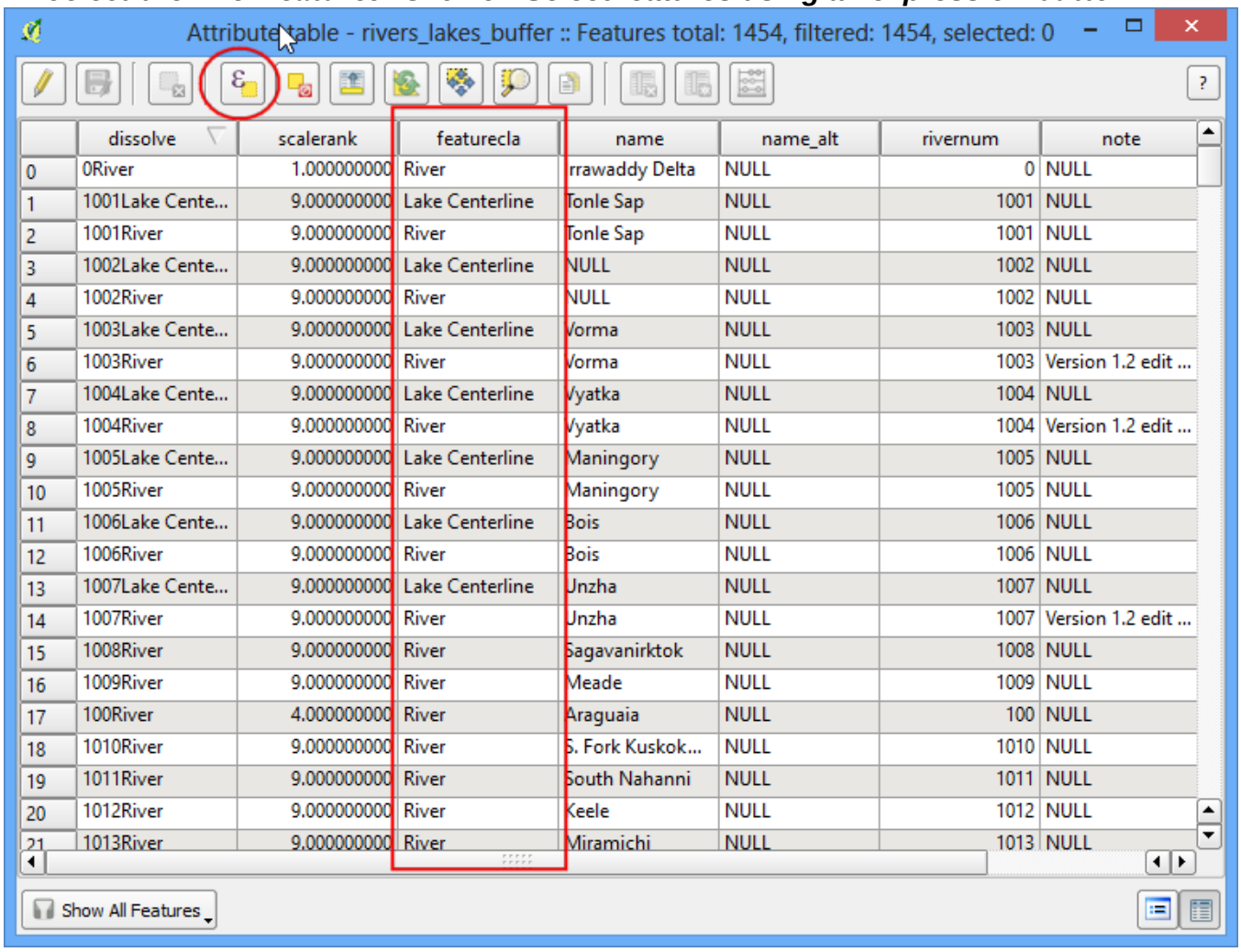

18. Repeat the same buffer process for the ***rivers_lake_reprojected*** layer and create an output file named ***rivers_lake_buffer.shp***.




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.

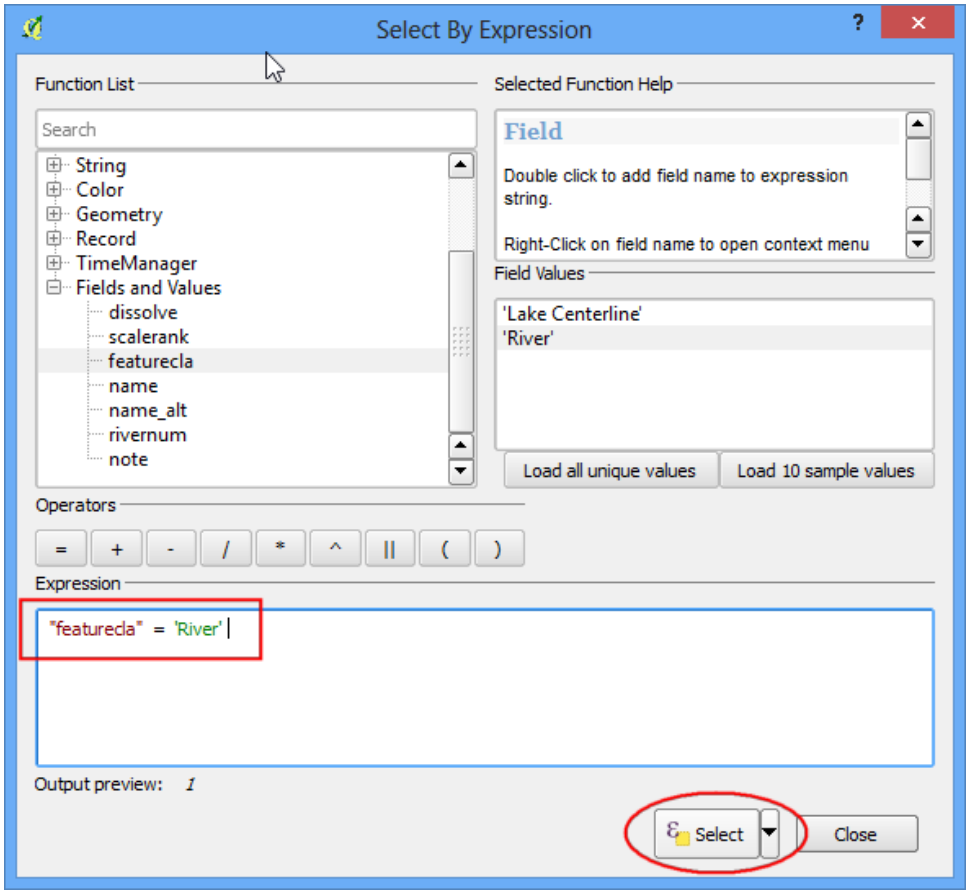


20. You will see that the ***featurecla*** attribute contains the information we can use to select the river features. Click on ***Select features using an expression*** button.

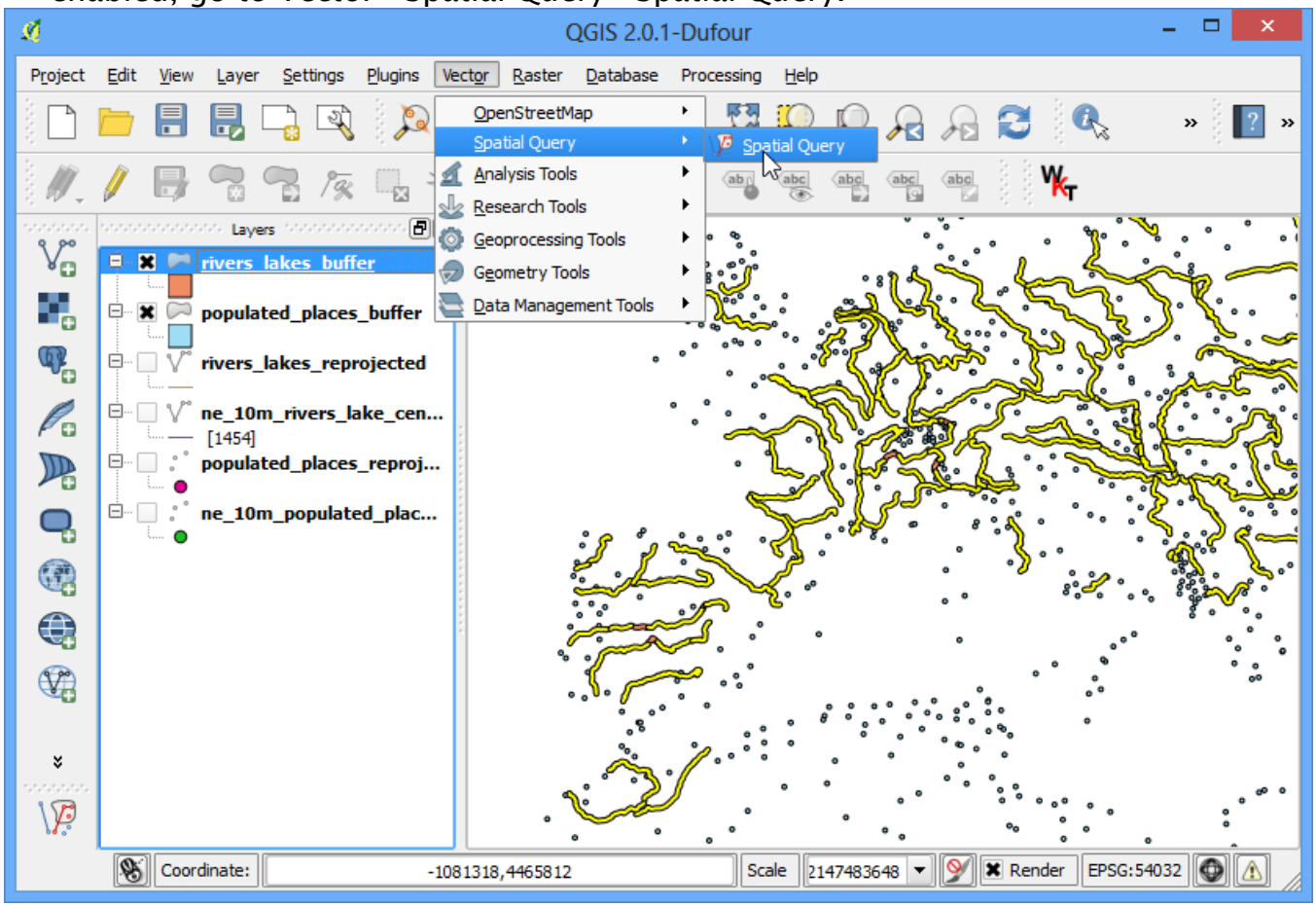



| | dissolve | scalerank | featurecla | name | name_alt | rivernum | note |
|---|---|---|---|---|---|---|---|
| 0 | 0River | 1.000000000 | River | rrawaddy Delta | NULL | 0 | NULL |
| 1 | 1001Lake Cente... | 9.000000000 | Lake Centerline | Tonle Sap | NULL | 1001 | NULL |
| 2 | 1001River | 9.000000000 | River | Tonle Sap | NULL | 1001 | NULL |
| 3 | 1002Lake Cente... | 9.000000000 | Lake Centerline | NULL | NULL | 1002 | NULL |
| 4 | 1002River | 9.000000000 | River | NULL | NULL | 1002 | NULL |
| 5 | 1003Lake Cente... | 9.000000000 | Lake Centerline | Vorma | NULL | 1003 | NULL |
| 6 | 1003River | 9.000000000 | River | Vorma | NULL | 1003 | Version 1.2 edit ... |
| 7 | 1004Lake Cente... | 9.000000000 | Lake Centerline | Vyatka | NULL | 1004 | NULL |
| 8 | 1004River | 9.000000000 | River | Vyatka | NULL | 1004 | Version 1.2 edit ... |
| 9 | 1005Lake Cente... | 9.000000000 | Lake Centerline | Maningory | NULL | 1005 | NULL |
| 10 | 1005River | 9.000000000 | River | Maningory | NULL | 1005 | NULL |
| 11 | 1006Lake Cente... | 9.000000000 | Lake Centerline | Bois | NULL | 1006 | NULL |
| 12 | 1006River | 9.000000000 | River | Bois | NULL | 1006 | NULL |
| 13 | 1007Lake Cente... | 9.000000000 | Lake Centerline | Unzha | NULL | 1007 | NULL |
| 14 | 1007River | 9.000000000 | River | Unzha | NULL | 1007 | Version 1.2 edit ... |
| 15 | 1008River | 9.000000000 | River | Sagavanirktok | NULL | 1008 | NULL |
| 16 | 1009River | 9.000000000 | River | Meade | NULL | 1009 | NULL |
| 17 | 100River | 4.000000000 | River | Araguaia | NULL | 100 | NULL |
| 18 | 1010River | 9.000000000 | River | S. Fork Kuskok... | NULL | 1010 | NULL |
| 19 | 1011River | 9.000000000 | River | South Nahanni | NULL | 1011 | NULL |
| 20 | 1012River | 9.000000000 | River | Keele | NULL | 1012 | NULL |
| 21 | 1013River | 9.000000000 | River | Miramichi | NULL | 1013 | NULL |

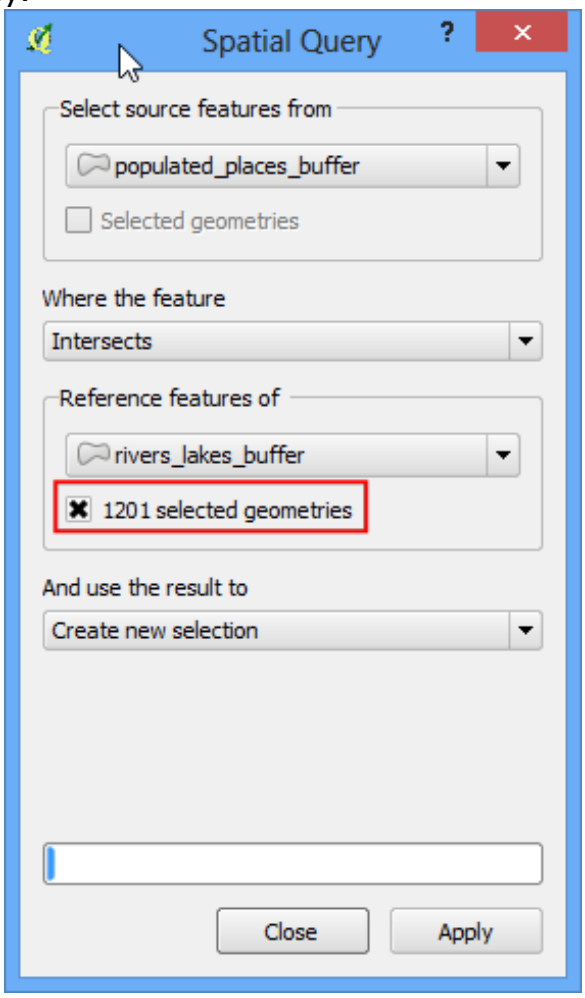
21. Enter the expression ***"featurecla" = "River"`and click :guilabel:`Select*** and then click "guilabel:***Close*** to back to the main QGIS window.



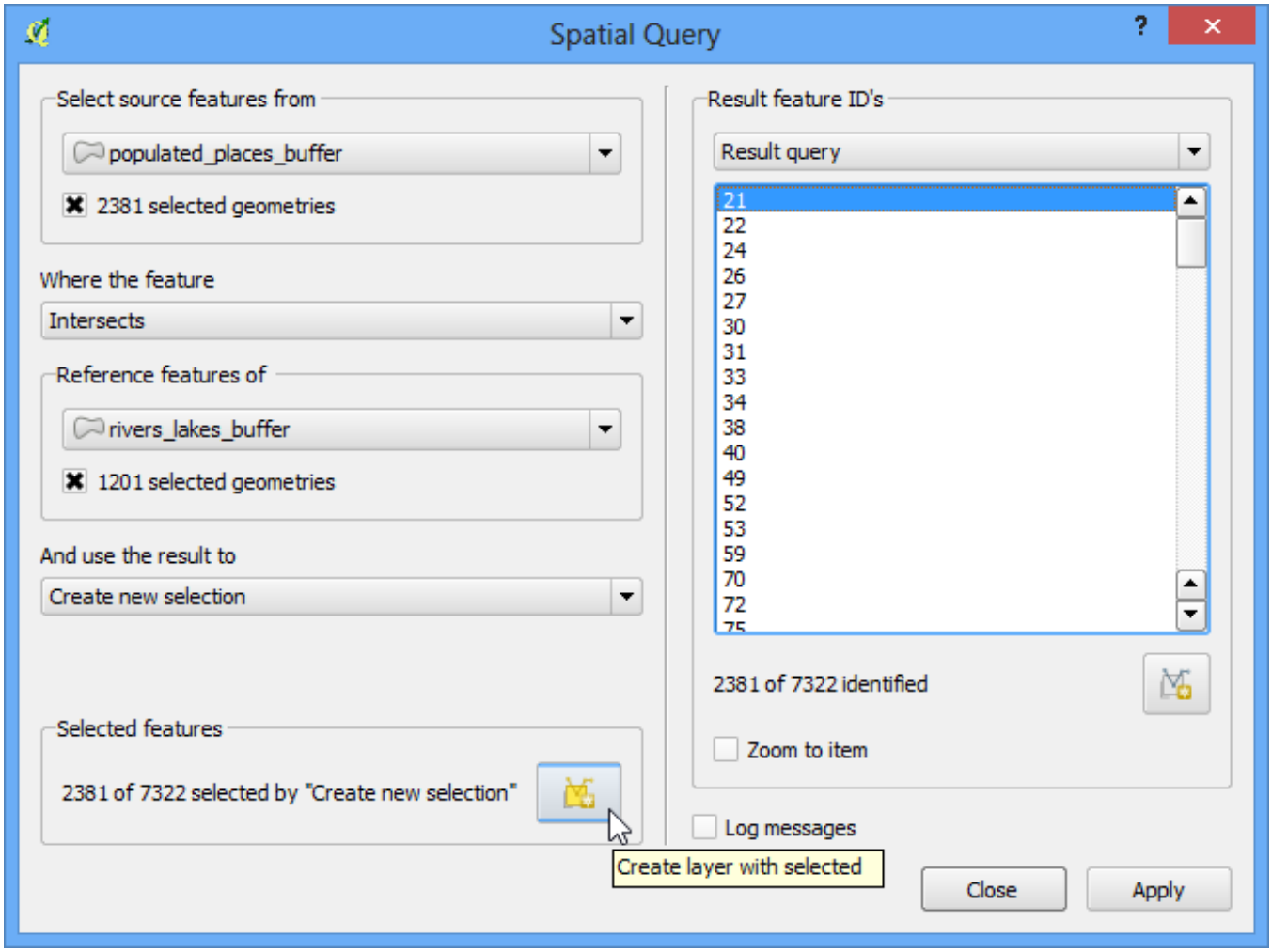

22. Now we are ready to perform the spatial query. You need to enable the ***Spatial Query plugin*** to use this functionality. See Using Plugins for more details. Once enabled, go to Vector ▸ Spatial Query ▸ Spatial Query.



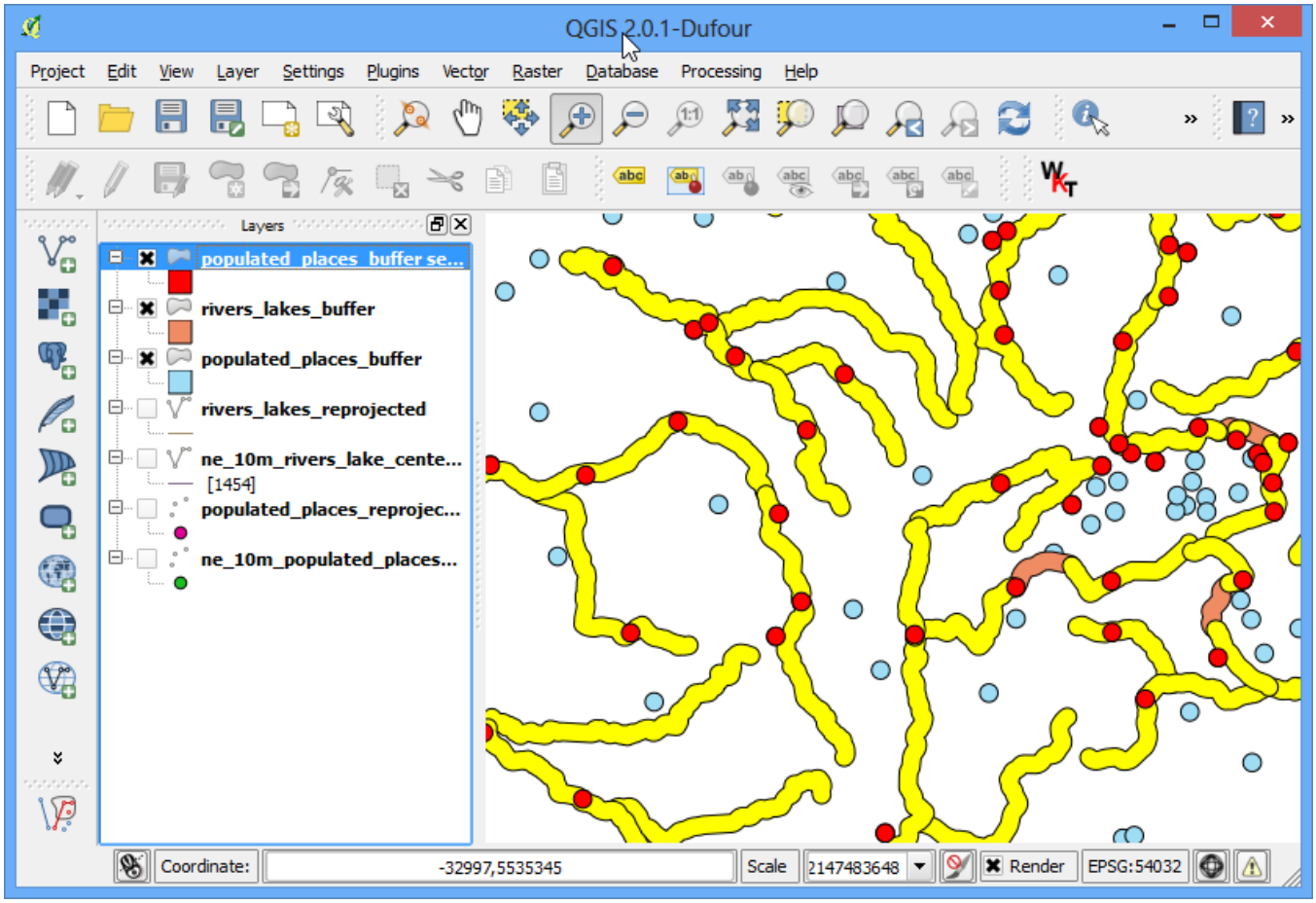
23. For our query, we want to select features from the buffered places that intersect with the buffered river lines. Make sure the checkbox next to ***selected geometries*** is checked. This is to ensure the query uses only river features that we selected previously. Click Apply.



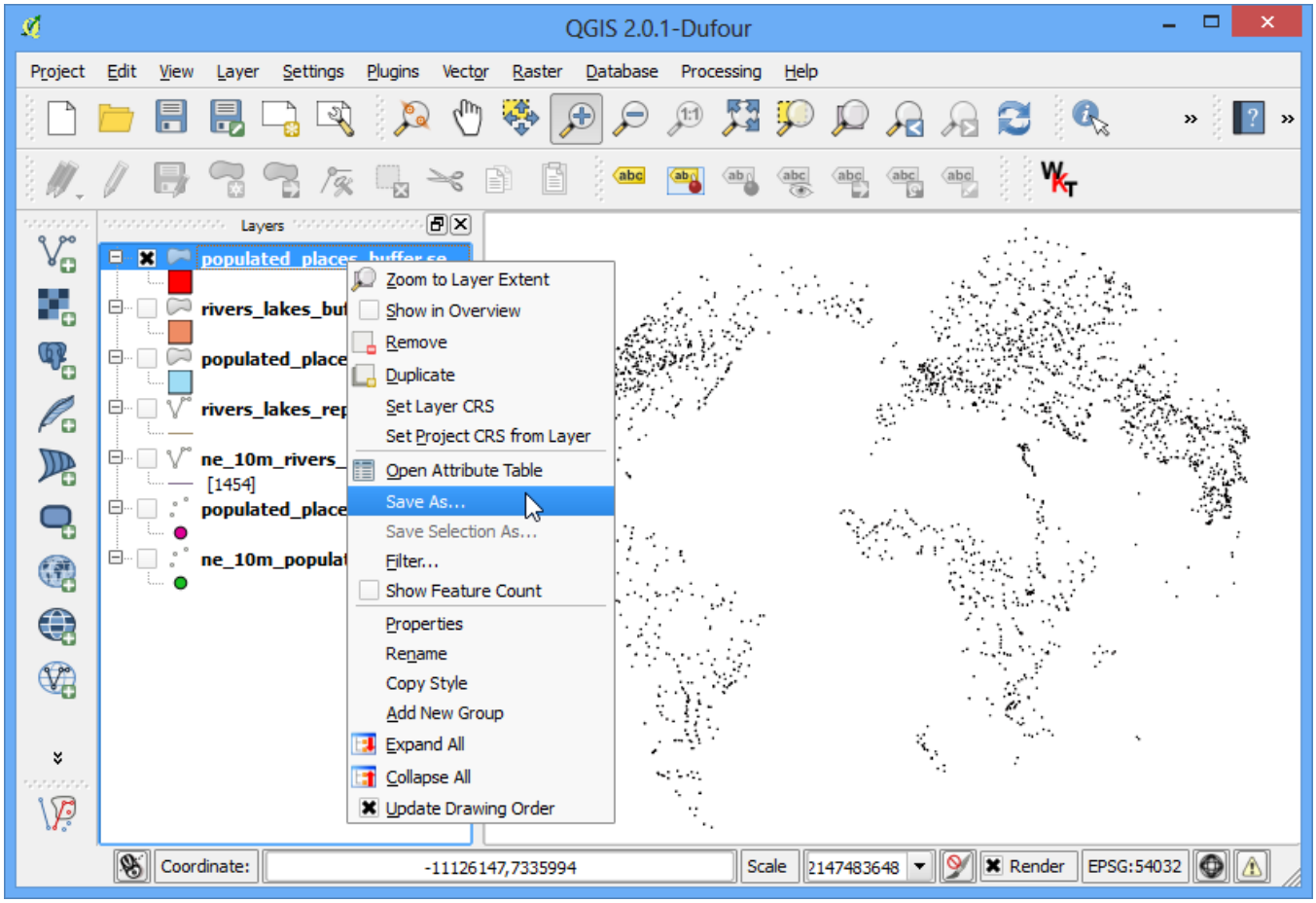

24. Once the query is complete, you will see a new section named Selected features. Click on the Create layer with selected button. A new layer will be added to the ***Layers Panel***. Click Close.



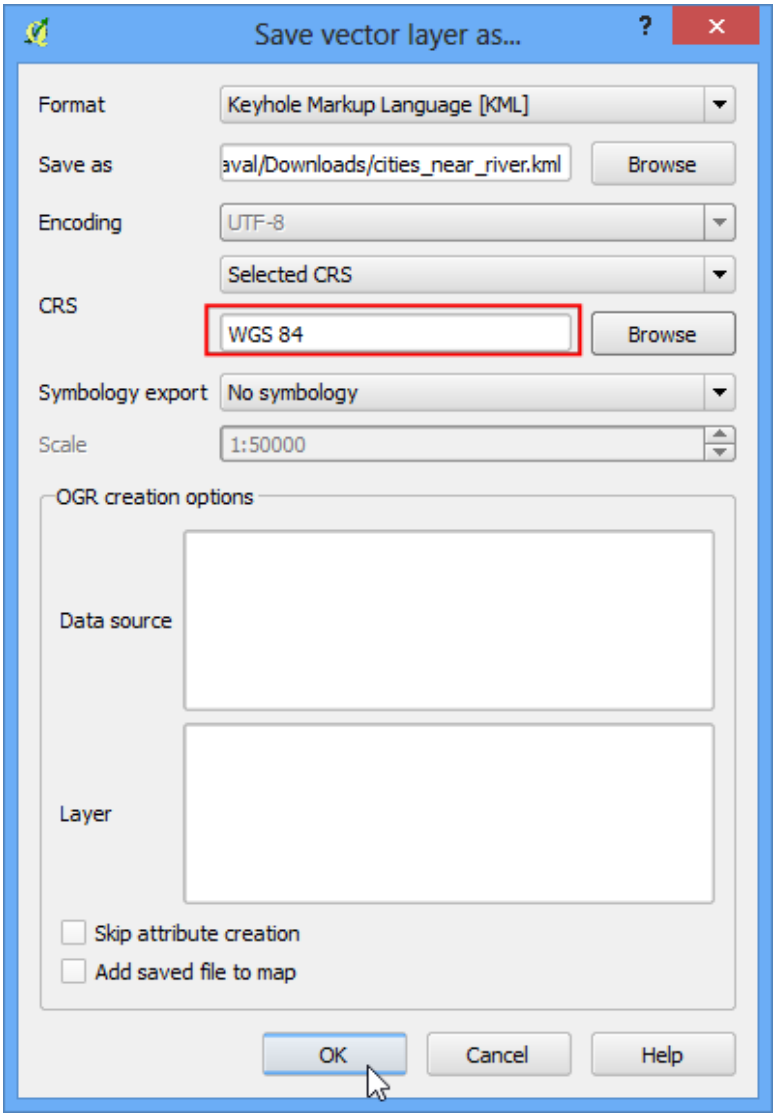

25. Zoom-in to any area and compare the results. You will notice that only the features that intersect with river buffers.



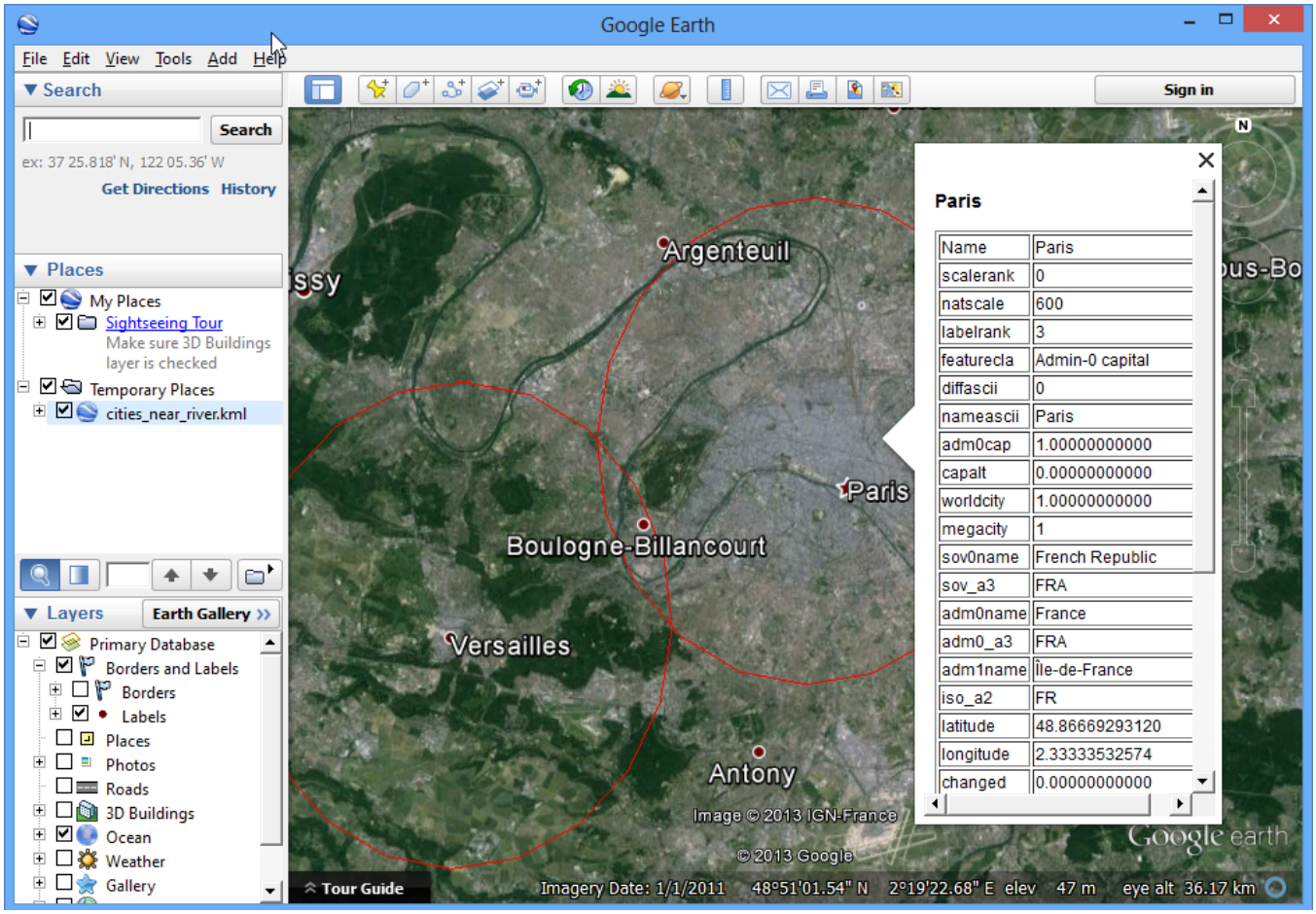

26. I usually like to verify my results to ensure the analysis is not flawed. One way to verify the results is to export this layer as a KML file and load it up in Google Earth. You can check if the areas you found really are within 10kms of a river. Right-click the layer and Save As....




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
Sign in
Search
ex: 37 25.818' N, 122 05.36' W
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
Argenteuil
Paris
Boulogne-Billancourt
Versailles
Antony
Image © 2013 IGN-France
© 2013 Google
Google earth
Tour Guide
Imagery Date: 1/1/2011 48°51'01.54" N 2°19'22.68" E elev 47 m eye alt 36.17 km
Paris
Name Paris
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natscale 600
labelrank 3
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diffascii 0
nameascii Paris
adm0cap 1.00000000000
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worldcity 1.00000000000
megacity 1
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