

Performing Table Joins

QGIS Tutorials and Tips

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Performing Table Joins

Not every dataset you want to use comes as a shapefile, or in a spatial format. Often the data would come as a table or a spreadsheet and you would need to link it with your existing spatial data for use in your analysis. This operation is known as a **Table Join** and this tutorial will cover how to carry out table joins in QGIS.

Overview of the task

We will use a shapefile of census tracts for California and population data table from US Census Bureau to create a population map for California.

Other skills you will learn

- Creating **.csvt** files to indicate column data types in a CSV file.
- Loading CSV files that do not contain any geometry in QGIS.

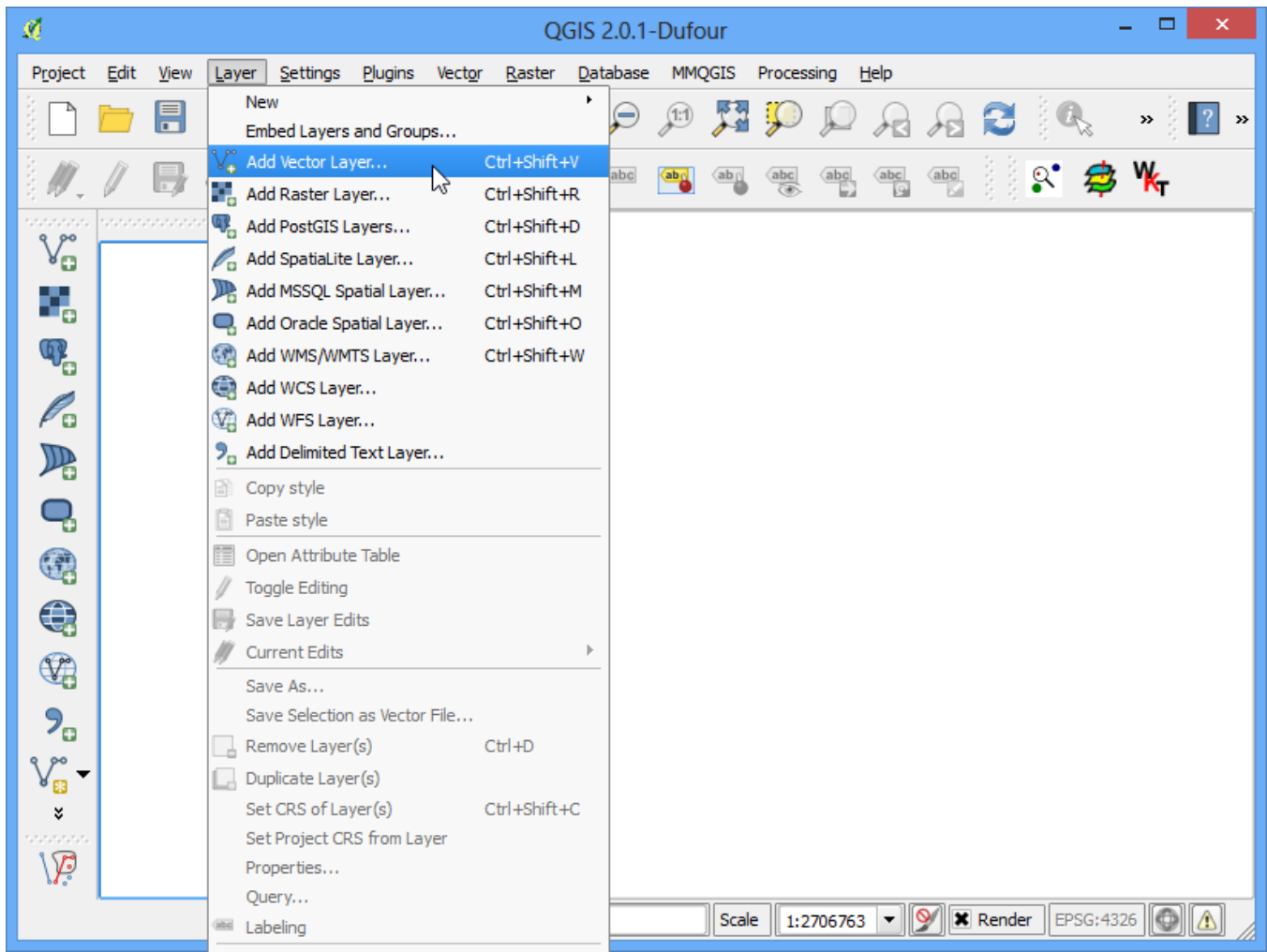
Get the data

[US Census Bureau](#) has various spatial extracts from the MAF/TIGER database. You can query and download census tracts shapefile for California.

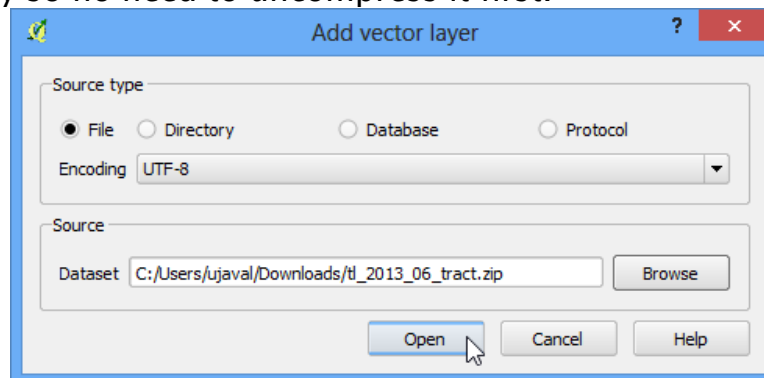
[Americall FactFinder](#) is a repository of all census data for the US. You can use **Advanced Search** and query for the **Topic - Total Population** and **Geographies - All Census Tracts in California** to create a custom CSV and download it.

Procedure

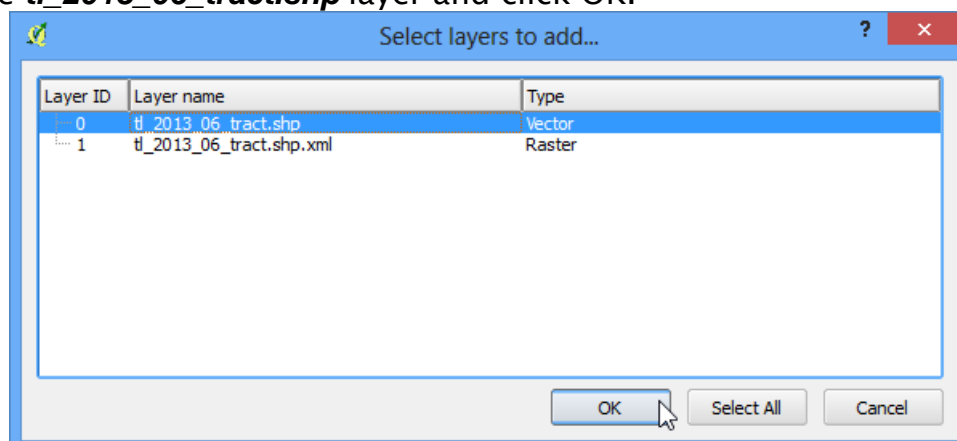
1. We will first load the census tracts shapefile. Go to Layer › Add Vector Layer.



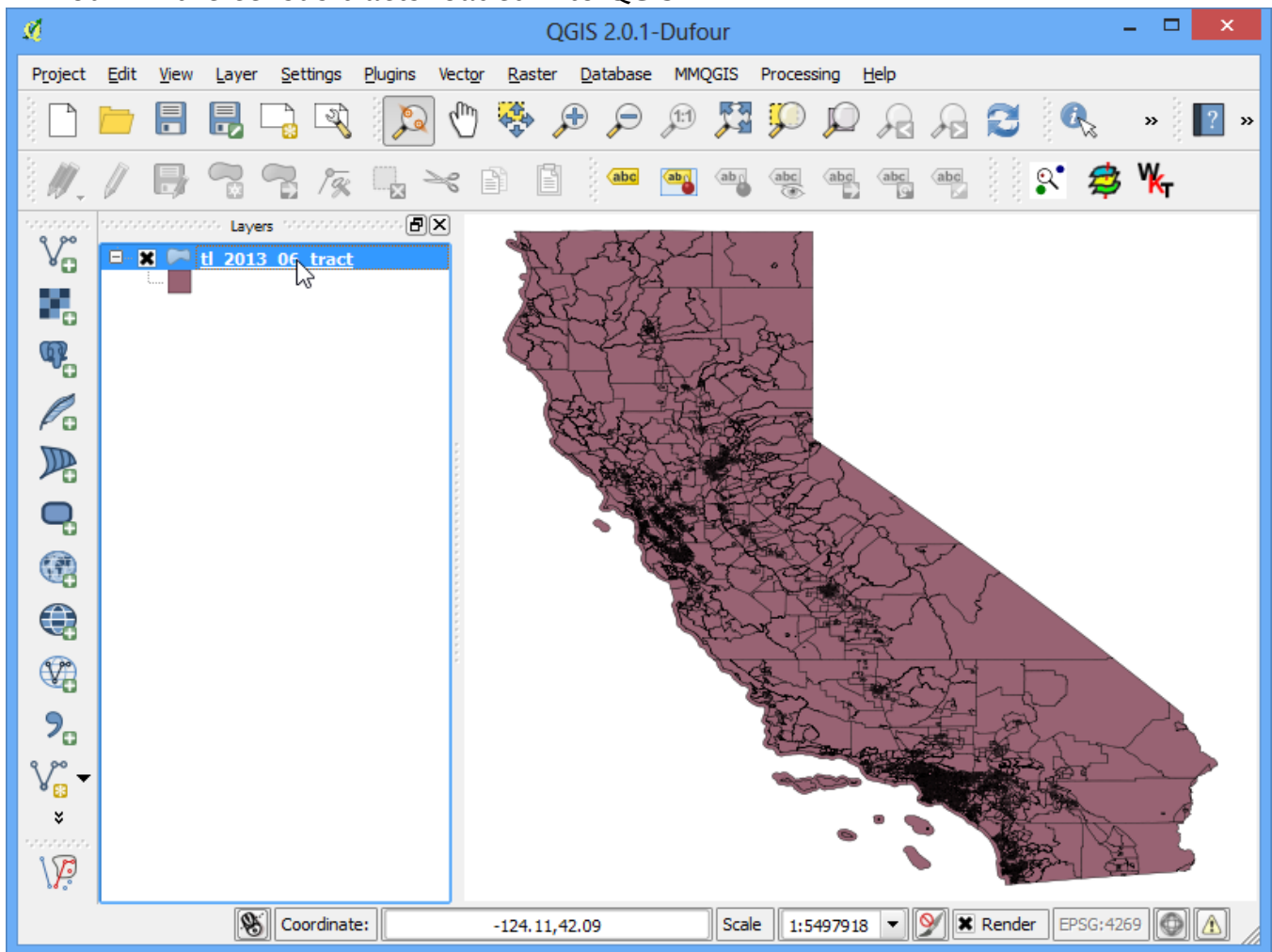
2. Browse to the downloaded zip file ***tl_2013_06_tract.zip*** and select it. QGIS can open zip files directly so no need to uncompress it first.



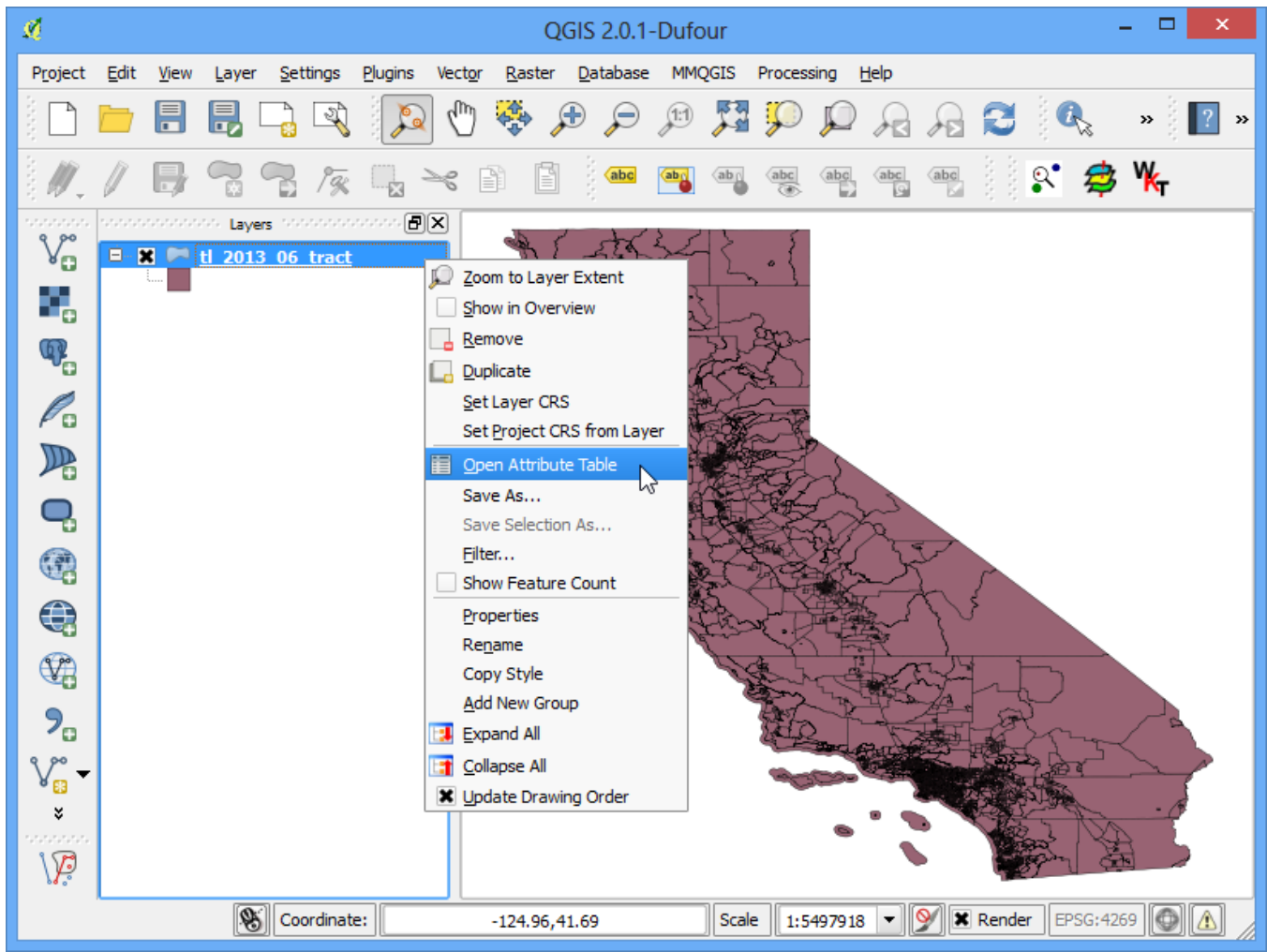
3. Select the ***tl_2013_06_tract.shp*** layer and click OK.



4. You will the census tracts loaded into QGIS.



5. Right-click on the layer and select Open Attribute Table.



6. Examine the attributes of the tracts shapefile. To join a table with this shapefile, we need a unique and common attribute for each feature. In this case, the GEOID field is a unique identifier for each tract and can be used to **link** this shapefile with any other table containing the same ID.

Attribute table - tl_2013_06_tract :: Features total: 8057, filtered: 8057, selected: 0

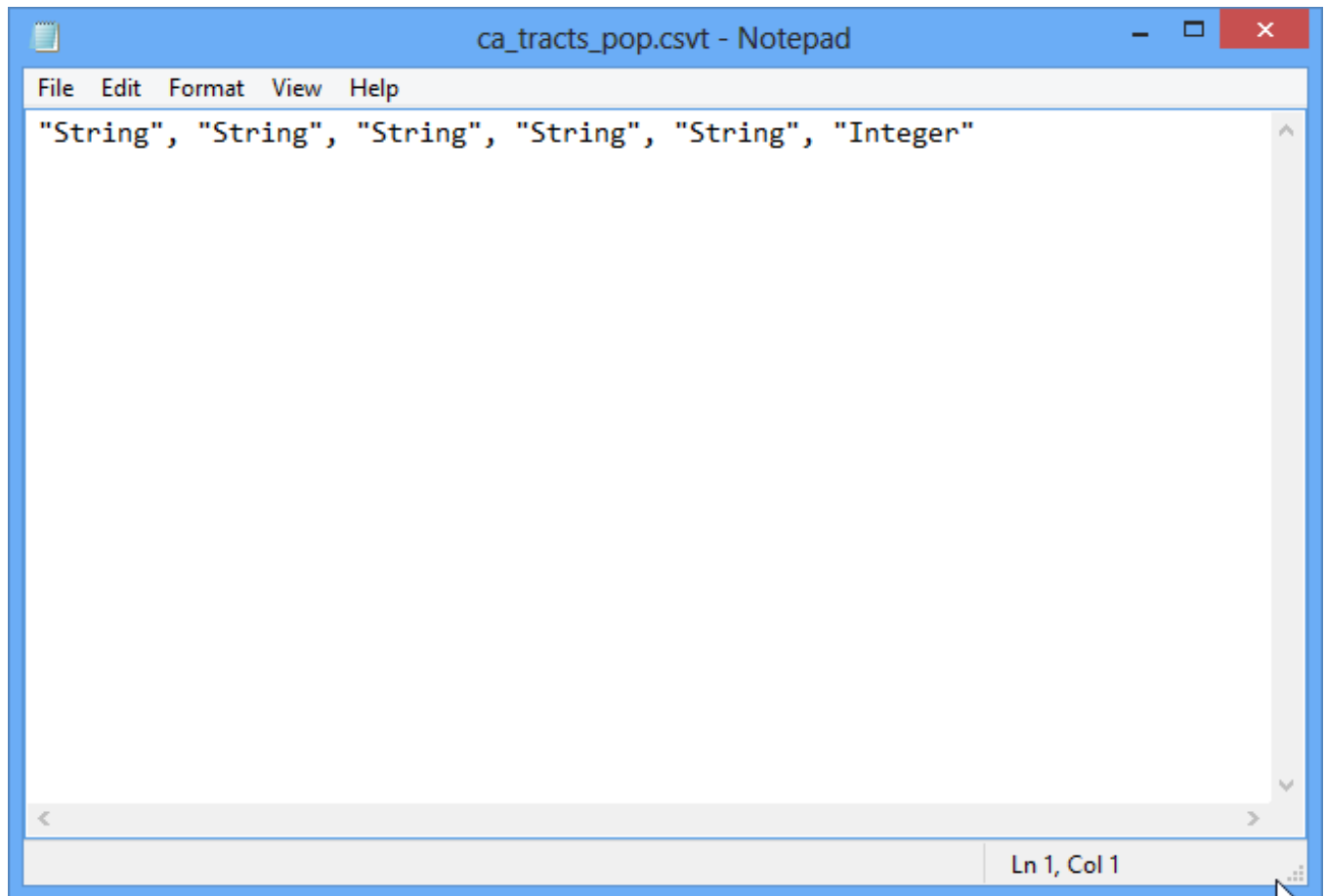
| | STATEFP | COUNTYFP | TRACTCE | GEOID | NAME | NAMELSAD | MTFCC |
|----|---------|----------|---------|-------------|---------|--------------------|-------|
| 0 | 06 | 001 | 442700 | 06001442700 | 4427 | Census Tract 44... | G5020 |
| 1 | 06 | 001 | 442800 | 06001442800 | 4428 | Census Tract 44... | G5020 |
| 2 | 06 | 037 | 204920 | 06037204920 | 2049.20 | Census Tract 20... | G5020 |
| 3 | 06 | 037 | 205110 | 06037205110 | 2051.10 | Census Tract 20... | G5020 |
| 4 | 06 | 037 | 205120 | 06037205120 | 2051.20 | Census Tract 20... | G5020 |
| 5 | 06 | 037 | 206010 | 06037206010 | 2060.10 | Census Tract 20... | G5020 |
| 6 | 06 | 037 | 206020 | 06037206020 | 2060.20 | Census Tract 20... | G5020 |
| 7 | 06 | 037 | 206050 | 06037206050 | 2060.50 | Census Tract 20... | G5020 |
| 8 | 06 | 037 | 207400 | 06037207400 | 2074 | Census Tract 20... | G5020 |
| 9 | 06 | 001 | 442900 | 06001442900 | 4429 | Census Tract 44... | G5020 |
| 10 | 06 | 037 | 192410 | 06037192410 | 1924.10 | Census Tract 19... | G5020 |
| 11 | 06 | 037 | 192510 | 06037192510 | 1925.10 | Census Tract 19... | G5020 |
| 12 | 06 | 037 | 192520 | 06037192520 | 1925.20 | Census Tract 19... | G5020 |
| 13 | 06 | 037 | 192610 | 06037192610 | 1926.10 | Census Tract 19... | G5020 |
| 14 | 06 | 037 | 192700 | 06037192700 | 1927 | Census Tract 19... | G5020 |
| 15 | 06 | 037 | 194500 | 06037194500 | 1945 | Census Tract 19... | G5020 |
| 16 | 06 | 037 | 195100 | 06037195100 | 1951 | Census Tract 19... | G5020 |
| 17 | 06 | 037 | 195300 | 06037195300 | 1953 | Census Tract 19... | G5020 |
| 18 | 06 | 001 | 443001 | 06001443001 | 4430.01 | Census Tract 44... | G5020 |
| 19 | 06 | 001 | 443002 | 06001443002 | 4430.02 | Census Tract 44... | G5020 |
| 20 | 06 | 001 | 443102 | 06001443102 | 4431.02 | Census Tract 44... | G5020 |
| 21 | 06 | 001 | 443301 | 06001443301 | 4433.01 | Census Tract 44... | G5020 |

Show All Features

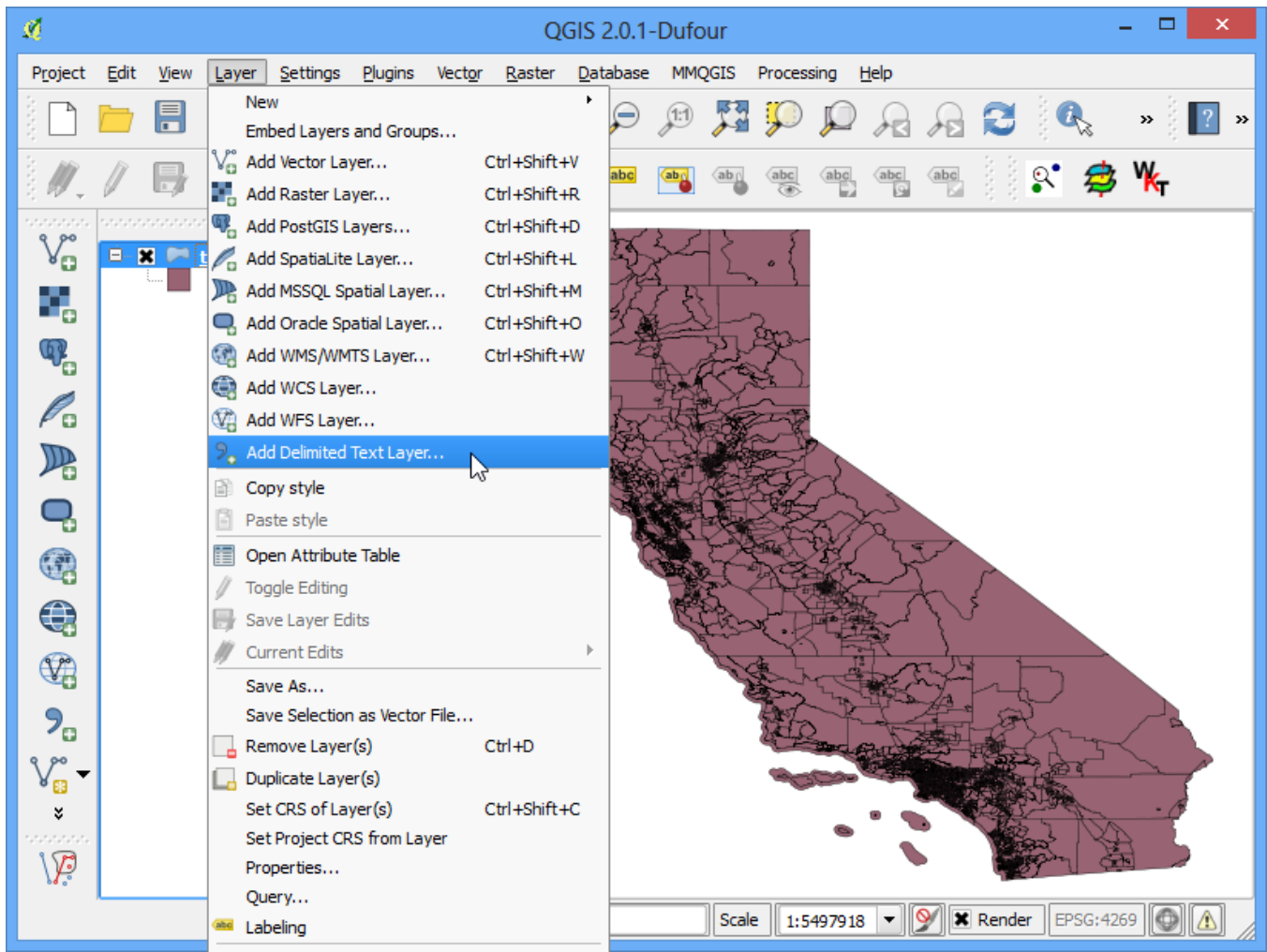
- Open the CSV file **ca_tracts_pop.csv** in a text editor. You will notice that each row of the file contains information about a tract along with the unique identifier we saw in the previous step. Note that this field is called GEO.id2 in the CSV. You will also note that the D001 column has population value for each of the census tract.

```
ca_tracts_pop.csv - Notepad
File Edit Format View Help
POPGROUP.id,POPGROUP.display-label,GEO.id,GEO.id2,GEO.display-label,D001
001,Total population,1400000US06001400100,06001400100,"Census Tract 4001, Alameda County, California",2937
001,Total population,1400000US06001400200,06001400200,"Census Tract 4002, Alameda County, California",1974
001,Total population,1400000US06001400300,06001400300,"Census Tract 4003, Alameda County, California",4865
001,Total population,1400000US06001400400,06001400400,"Census Tract 4004, Alameda County, California",3703
001,Total population,1400000US06001400500,06001400500,"Census Tract 4005, Alameda County, California",3517
001,Total population,1400000US06001400600,06001400600,"Census Tract 4006, Alameda County, California",1571
001,Total population,1400000US06001400700,06001400700,"Census Tract 4007, Alameda County, California",4206
001,Total population,1400000US06001400800,06001400800,"Census Tract 4008, Alameda County, California",3594
001,Total population,1400000US06001400900,06001400900,"Census Tract 4009, Alameda County, California",2302
001,Total population,1400000US06001401000,06001401000,"Census Tract 4010, Alameda County, California",5678
001,Total population,1400000US06001401100,06001401100,"Census Tract 4011, Alameda County, California",4156
001,Total population,1400000US06001401200,06001401200,"Census Tract 4012, Alameda County, California",2416
001,Total population,1400000US06001401300,06001401300,"Census Tract 4013, Alameda County, California",3528
001,Total population,1400000US06001401400,06001401400,"Census Tract 4014, Alameda County, California",4314
001,Total population,1400000US06001401500,06001401500,"Census Tract 4015, Alameda County, California",2630
001,Total population,1400000US06001401600,06001401600,"Census Tract 4016, Alameda County, California",2163
001,Total population,1400000US06001401700,06001401700,"Census Tract 4017, Alameda County, California",2667
001,Total population,1400000US06001401800,06001401800,"Census Tract 4018, Alameda County, California",1703
001,Total population,1400000US06001402200,06001402200,"Census Tract 4022, Alameda County, California",2385
001,Total population,1400000US06001402400,06001402400,"Census Tract 4024, Alameda County, California",2351
001,Total population,1400000US06001402500,06001402500,"Census Tract 4025, Alameda County, California",1784
001,Total population,1400000US06001402600,06001402600,"Census Tract 4026, Alameda County, California",1151
001,Total population,1400000US06001402700,06001402700,"Census Tract 4027, Alameda County, California",1569
001,Total population,1400000US06001402800,06001402800,"Census Tract 4028, Alameda County, California",3345
001,Total population,1400000US06001402900,06001402900,"Census Tract 4029, Alameda County, California",1434
001,Total population,1400000US06001403000,06001403000,"Census Tract 4030, Alameda County, California",2788
001,Total population,1400000US06001403100,06001403100,"Census Tract 4031, Alameda County, California",2238
Ln 1, Col 1
```

8. We could import this csv file without any further action and it would be imported. But, the default type of each column would be a String (text). That is ok except for the **D001** field which contains numbers for the population. Having those imported as text would not allow us to run any mathematical operations on this column. To tell QGIS to import the field as a number, we need to create a **sidecar** file with a **.csvt** extension. This file will have only 1 row specifying data types for each column. Save this file as **ca_tracts_pop.csvt** in the same directory as the original **.csv** file. You can also **download the csvt file from here**.



9. Now we are ready to import the CSV file to QGIS. Go to Layer › Add Delimited Text Layer.



10. Browse to the folder containing the CSV file and select it. Make sure you have selected File format as CSV (comma separated values). Since we are importing this as a table, we must specify that our file contains no geometry. Select the No geometry (attribute only table) option. Click OK.

Create a Layer from a Delimited Text File

File Name:

Layer name: Encoding:

File format: ☒ CSV (comma separated values) ☐ Custom delimiters ☐ Regular expression delimiter

Record options: Number of header lines to discard: ☒ First record has field names

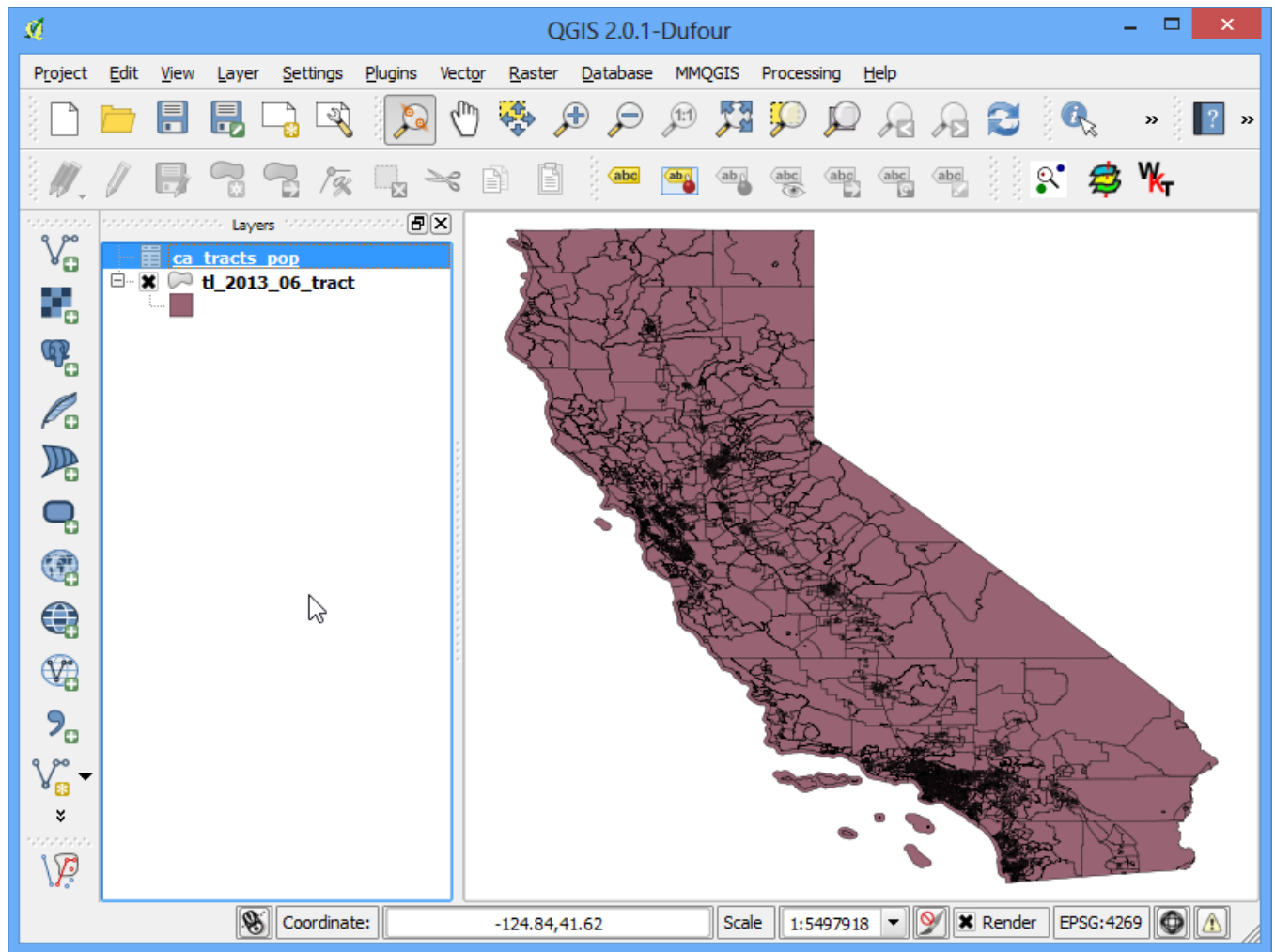
Field options: ☐ Trim fields ☐ Discard empty fields ☐ Decimal separator is comma

Geometry definition: ☐ Point coordinates ☐ Well known text (WKT) ☒ No geometry (attribute only table)

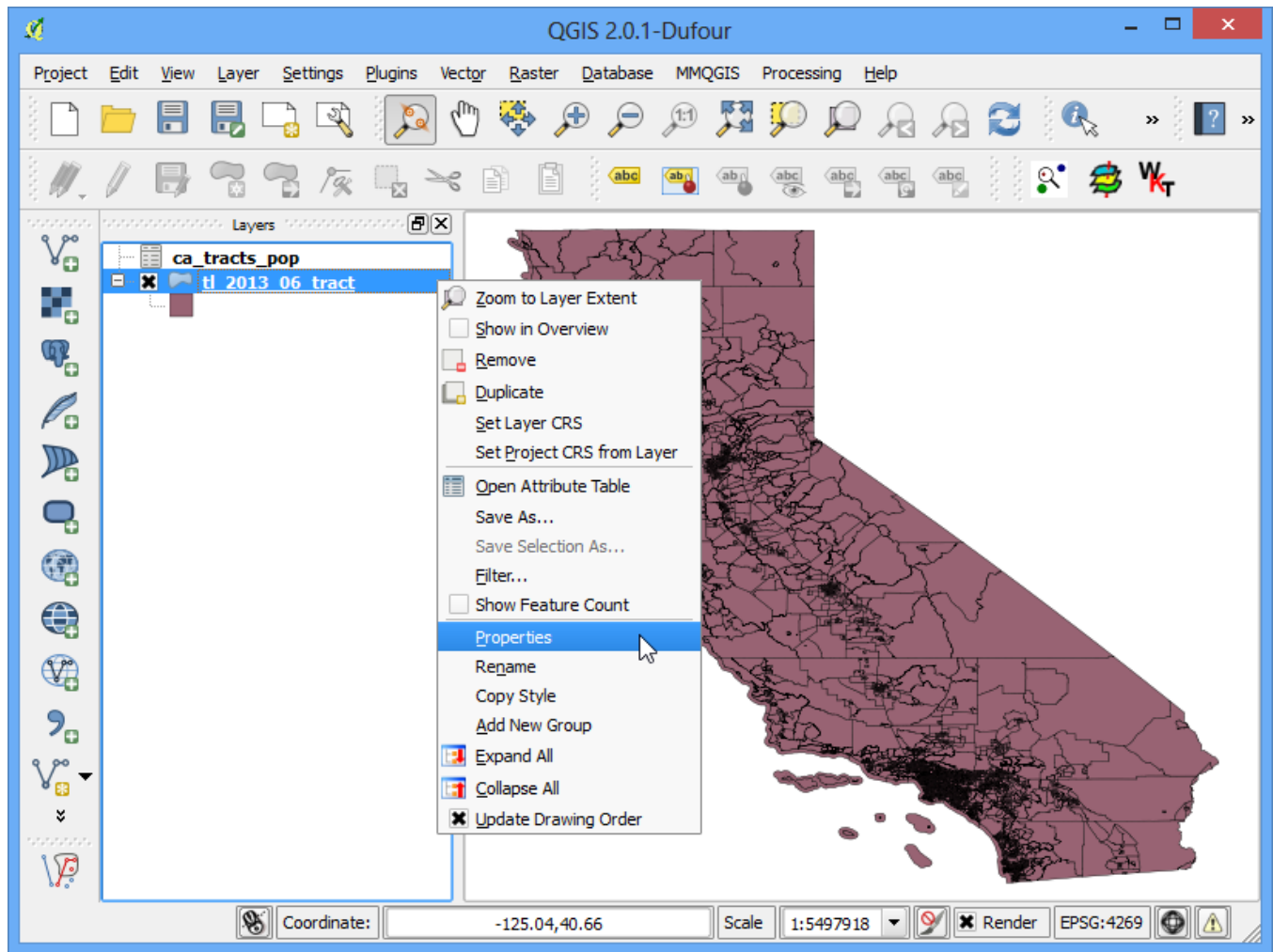
Layer settings: ☐ Use spatial index ☐ Use subset index ☐ Watch file

| | POPGROUP.id | POPGROUP.display-label | GEO.id | GEO.id2 | GEO.display-label |
|---|-------------|------------------------|----------------------|-------------|-----------------------------------|
| 1 | 001 | Total population | 1400000US06001400100 | 06001400100 | Census Tract 4001, Alameda County |
| 2 | 001 | Total population | 1400000US06001400200 | 06001400200 | Census Tract 4002, Alameda County |
| 3 | 001 | Total population | 1400000US06001400300 | 06001400300 | Census Tract 4003, Alameda County |
| 4 | 001 | Total population | 1400000US06001400400 | 06001400400 | Census Tract 4004, Alameda County |
| 5 | 001 | Total population | 1400000US06001400500 | 06001400500 | Census Tract 4005, Alameda County |

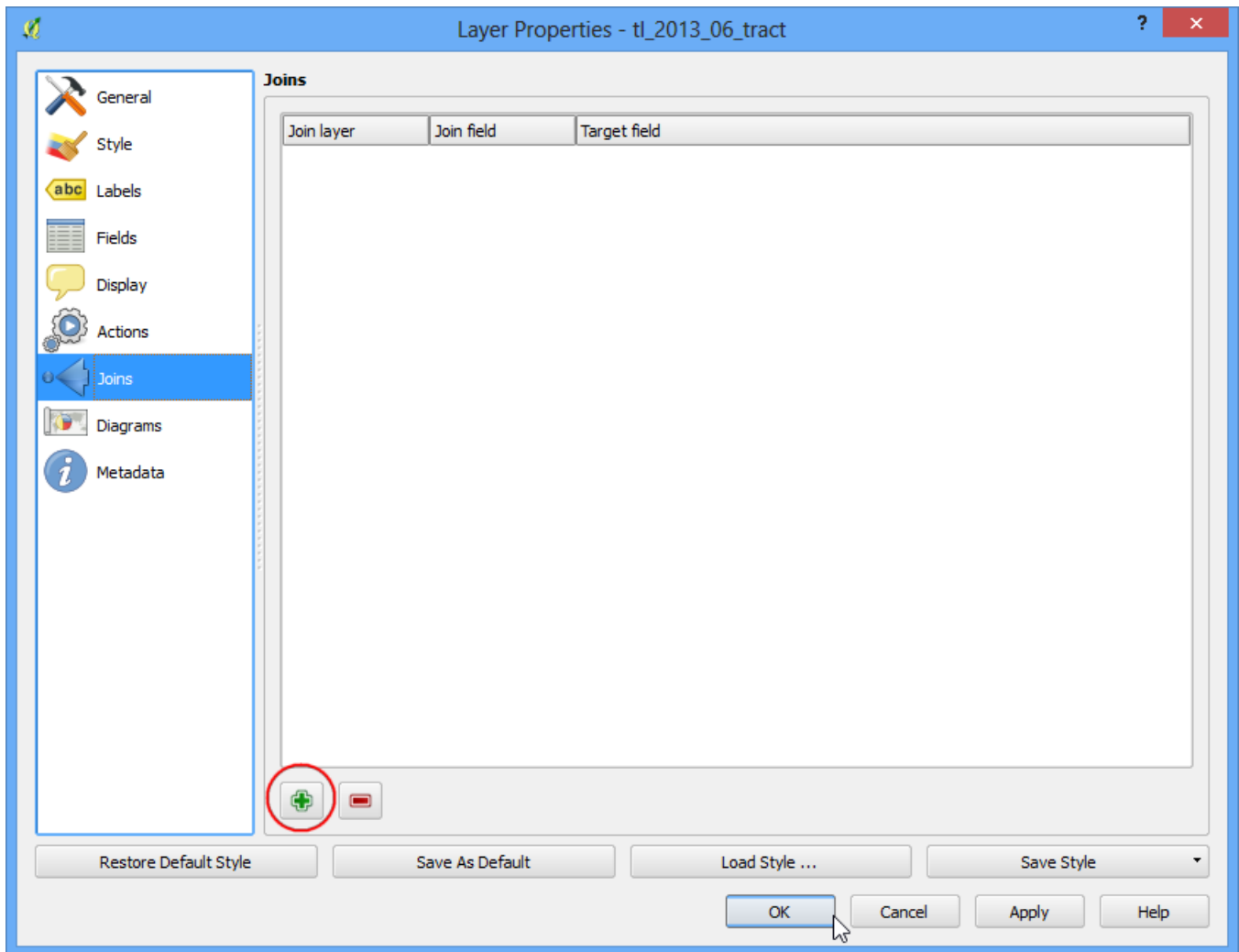
11. The CSV will now be imported as a table to QGIS.



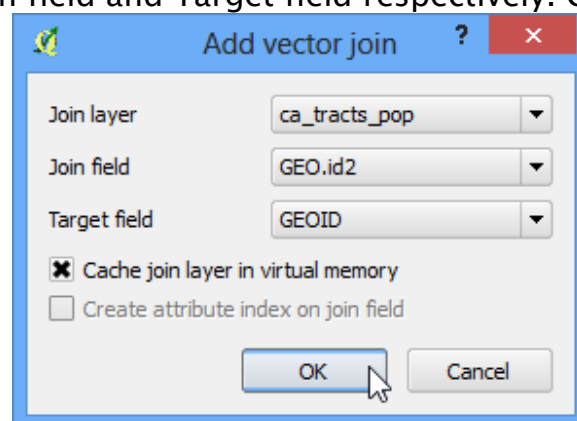
12. Select the ***tl_2013_06_tract*** layer. Right-click on it and select Properties.



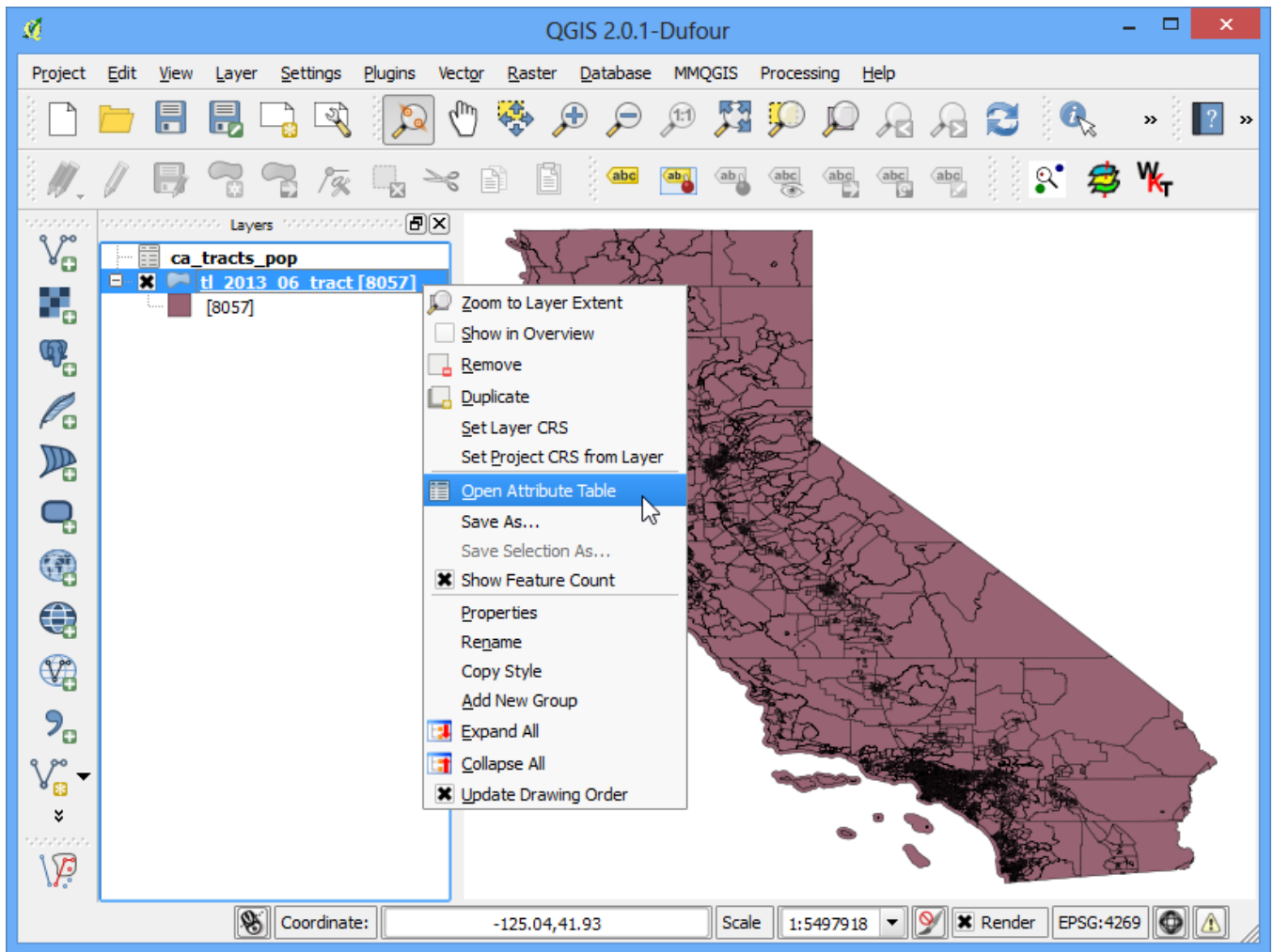
13. In the Layer Properties dialog, select the Joins tab. Click on the + button at the bottom to create a new table join.



14. In the Add vector join dialog, select **ca_tracts_pop** as the Join layer. Next we have to select the field with unique ids in both the shapefile and the CSV. Select **GEO.id2** and **GEOID** as the Join field and Target field respectively. Click OK.



15. Close the Layer Properties dialog and return to the main QGIS window. At this point, the fields from the CSV file are joined with the shapefile. Right-click on the **tl_2013_06_tract** layer and select Open Attribute Table.



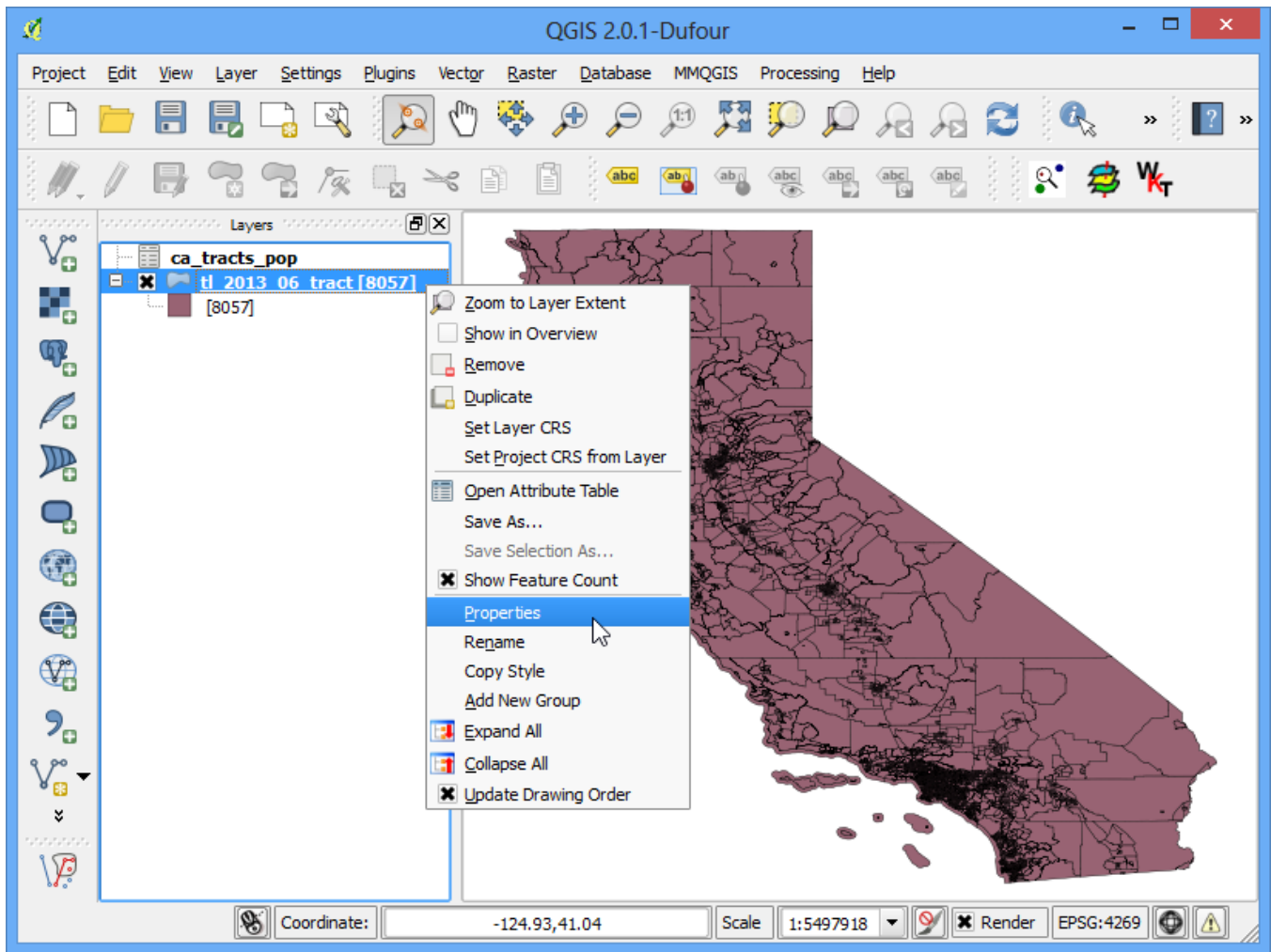
16. You can now see a new set of fields, including `ca_tracts_pop_D001` field added to each feature. Now you have access to the population value of each tract from the CSV file. Close the attribute table and return to the main QGIS window.

Attribute table - tl_2013_06_tract :: Features total: 8057, filtered: 8057, selected: 0

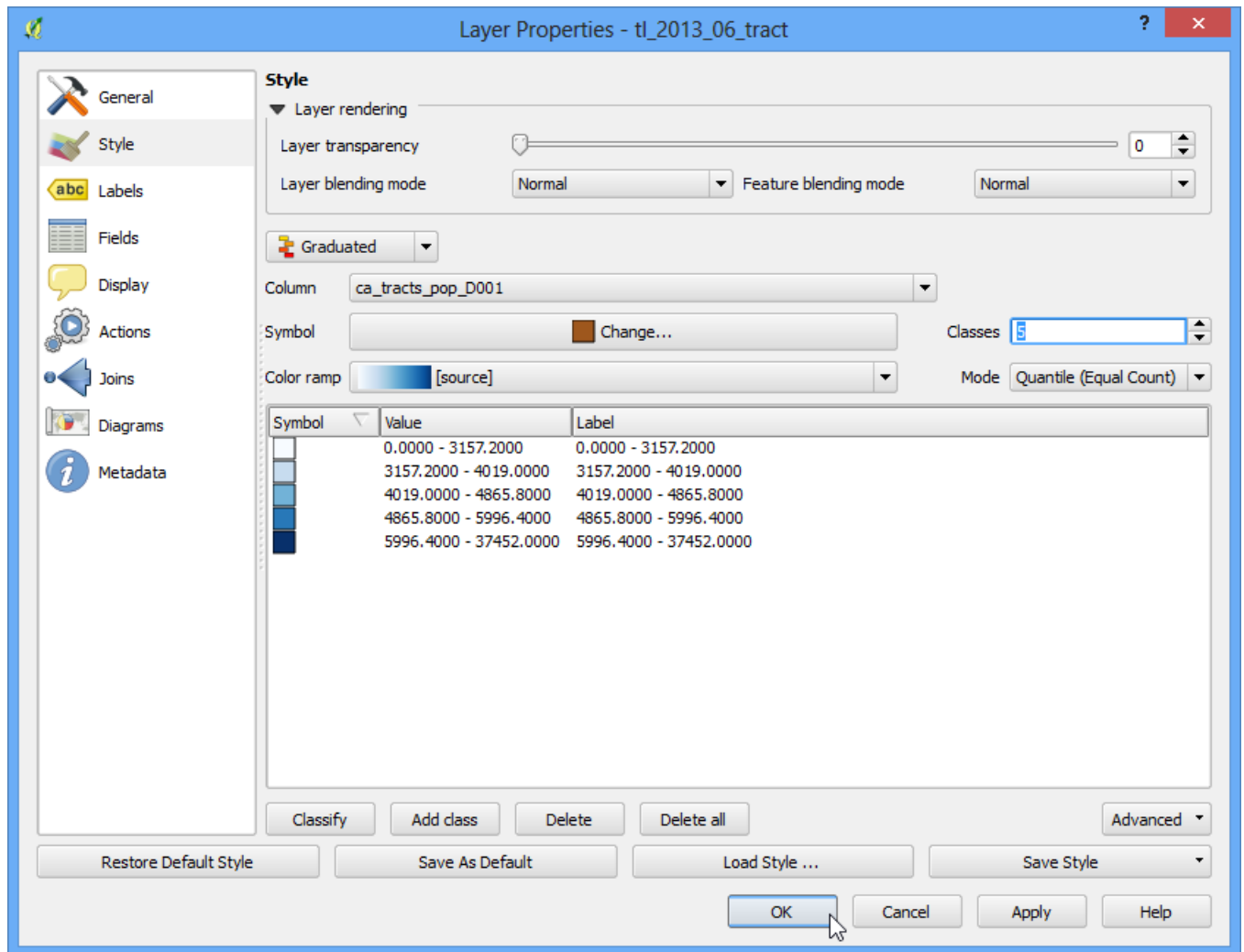
| | INTPTLAT | INTPTLON | tracts_pop_POPGRC | op_POPGROUdi | tracts_pop_GEC | pop_GEOdis | ca_tracts_pop_D001 |
|----|-------------|--------------|-------------------|------------------|----------------|---------------|--------------------|
| 0 | +37.5371514 | -122.0081094 | 001 | Total population | 1400000US06... | Census Tra... | 2873 |
| 1 | +37.5293619 | -121.9931002 | 001 | Total population | 1400000US06... | Census Tra... | 2816 |
| 2 | +34.0175004 | -118.1974975 | 001 | Total population | 1400000US06... | Census Tra... | 2598 |
| 3 | +34.0245059 | -118.2142985 | 001 | Total population | 1400000US06... | Census Tra... | 3766 |
| 4 | +34.0187546 | -118.2117956 | 001 | Total population | 1400000US06... | Census Tra... | 3618 |
| 5 | +34.0682177 | -118.2320356 | 001 | Total population | 1400000US06... | Census Tra... | 3127 |
| 6 | +34.0571230 | -118.2311021 | 001 | Total population | 1400000US06... | Census Tra... | 7883 |
| 7 | +34.0299036 | -118.2244531 | 001 | Total population | 1400000US06... | Census Tra... | 2146 |
| 8 | +34.0561941 | -118.2466502 | 001 | Total population | 1400000US06... | Census Tra... | 1363 |
| 9 | +37.5184093 | -121.9748369 | 001 | Total population | 1400000US06... | Census Tra... | 7194 |
| 10 | +34.0798577 | -118.3181008 | 001 | Total population | 1400000US06... | Census Tra... | 3628 |
| 11 | +34.0798690 | -118.3068568 | 001 | Total population | 1400000US06... | Census Tra... | 3670 |
| 12 | +34.0799255 | -118.3024972 | 001 | Total population | 1400000US06... | Census Tra... | 5067 |
| 13 | +34.0813650 | -118.2961539 | 001 | Total population | 1400000US06... | Census Tra... | 4389 |
| 14 | +34.0800134 | -118.2881064 | 001 | Total population | 1400000US06... | Census Tra... | 3513 |
| 15 | +34.0781753 | -118.3695958 | 001 | Total population | 1400000US06... | Census Tra... | 2037 |
| 16 | +34.1022274 | -118.2669741 | 001 | Total population | 1400000US06... | Census Tra... | 4717 |
| 17 | +34.0992506 | -118.2836893 | 001 | Total population | 1400000US06... | Census Tra... | 3203 |
| 18 | +37.5184218 | -121.9515237 | 001 | Total population | 1400000US06... | Census Tra... | 2917 |
| 19 | +37.5168344 | -121.9605916 | 001 | Total population | 1400000US06... | Census Tra... | 5918 |
| 20 | +37.5071943 | -121.9271475 | 001 | Total population | 1400000US06... | Census Tra... | 4611 |
| 21 | +37.4707325 | -121.9129556 | 001 | Total population | 1400000US06... | Census Tra... | 4074 |

Show All Features

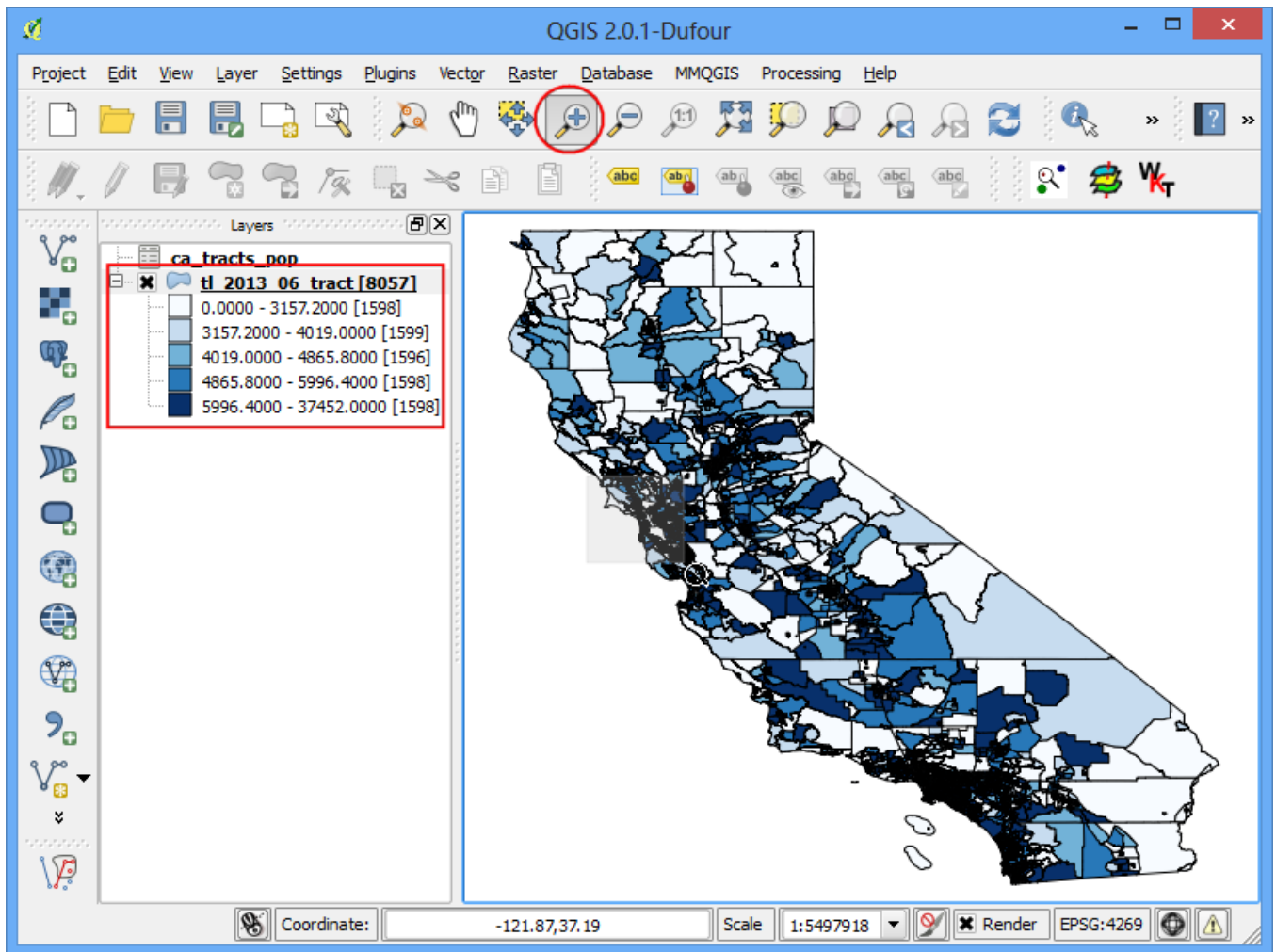
17. Right-click the **tl_2013_06_tract** layer and select Properties.



18. Select the Style tab. Select the Graduated from the drop-down menu. As we are looking to create a population map, we want to assign different color to each census tract feature based on the population count. Select ca_tracts_pop_D001 as the Column. Select a color ramp of your liking from the Color ramp drop-down. In the Mode, select Quantile (Equal Count). Next click Classify. You will see a different color assigned to certain population ranges. Click OK.



19. You will now see a nice visualization of the census tracts as styled using population values. Use the Zoom in tool to select a smaller area from the layer.



20. You have a detailed and accurate population map of California. You can use the same technique to create maps based on variety of census data.

