

# WORKING WITH QGIS

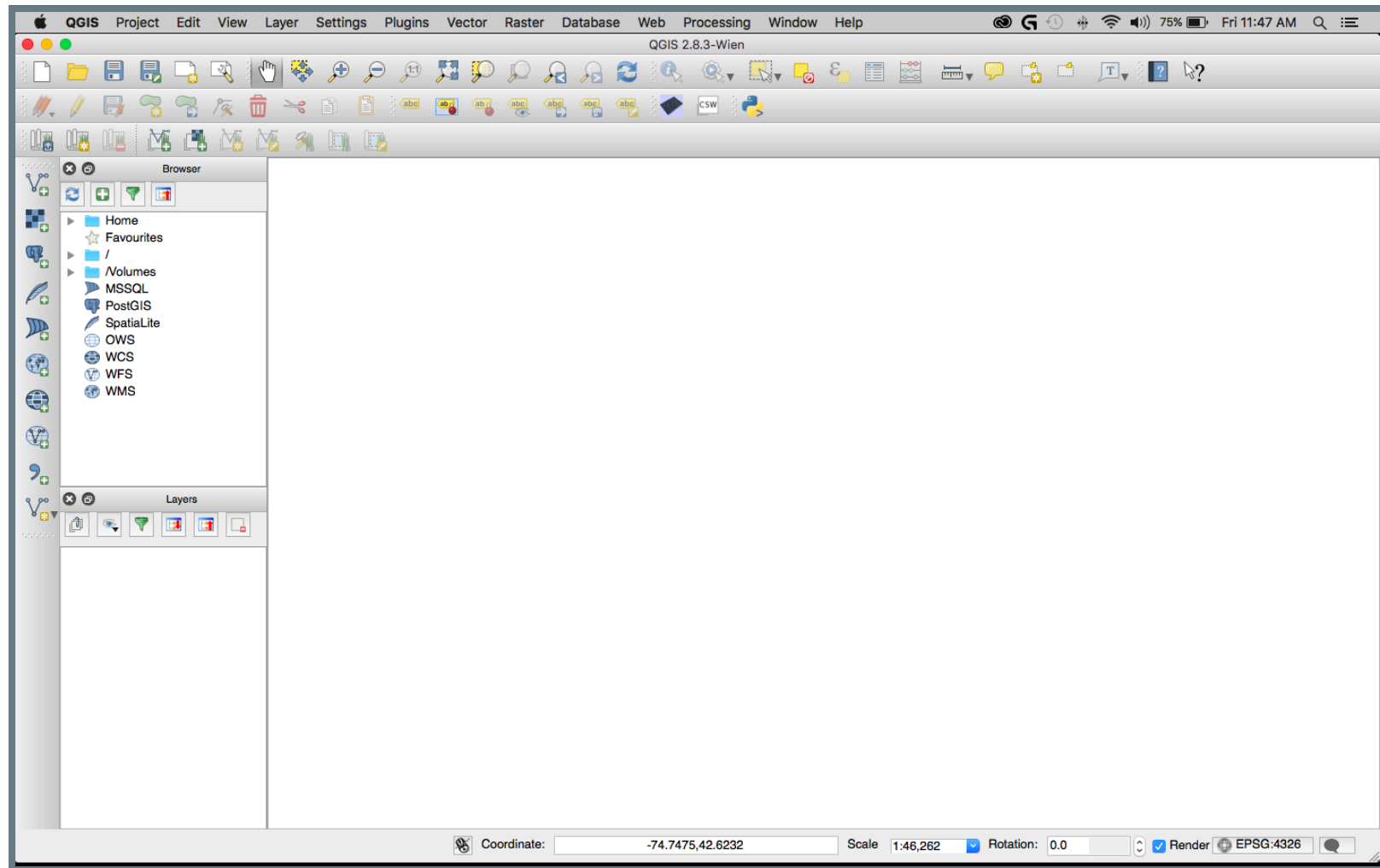
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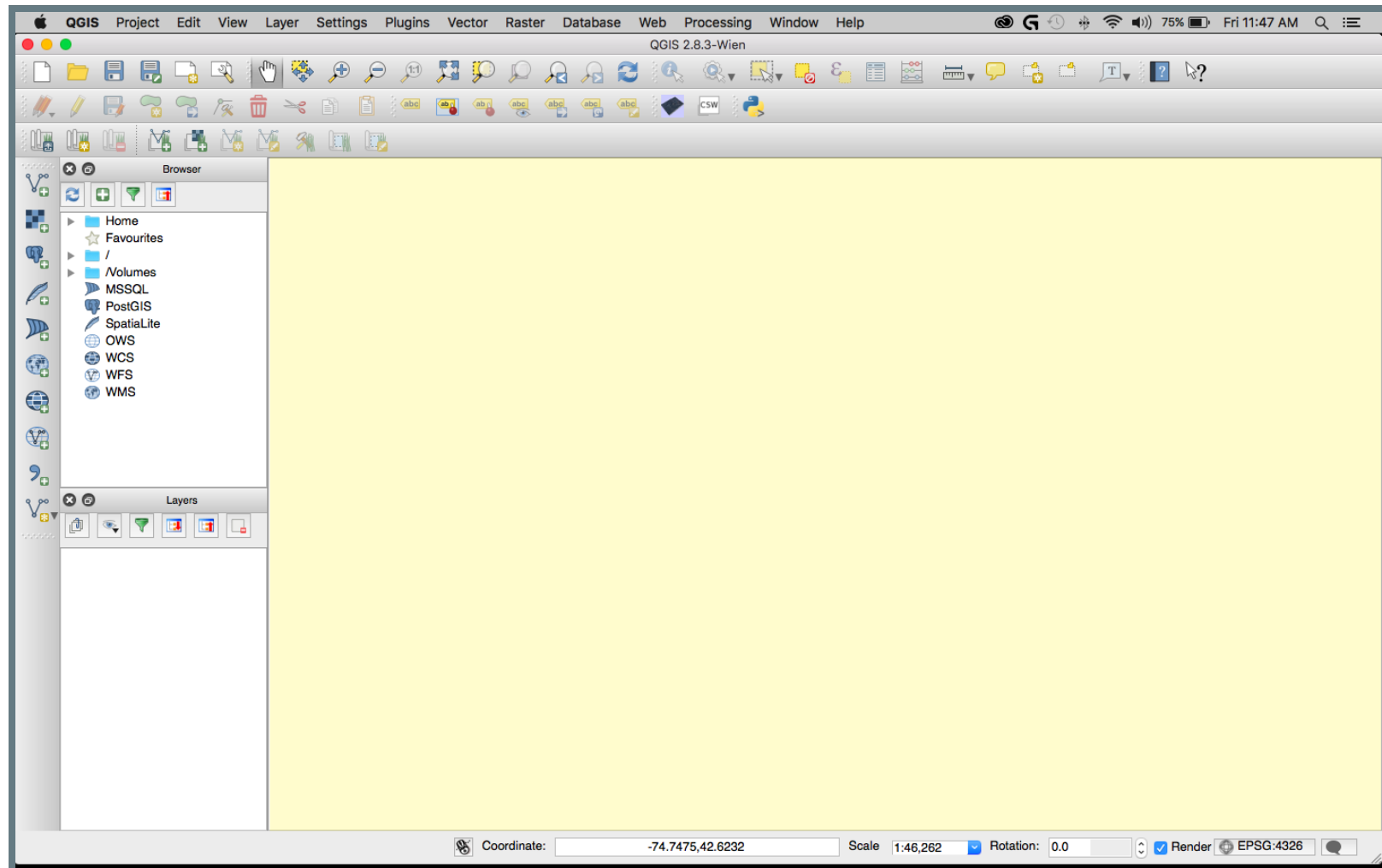
# **A QUICK TOUR OF QGIS**

# A BLANK MAP



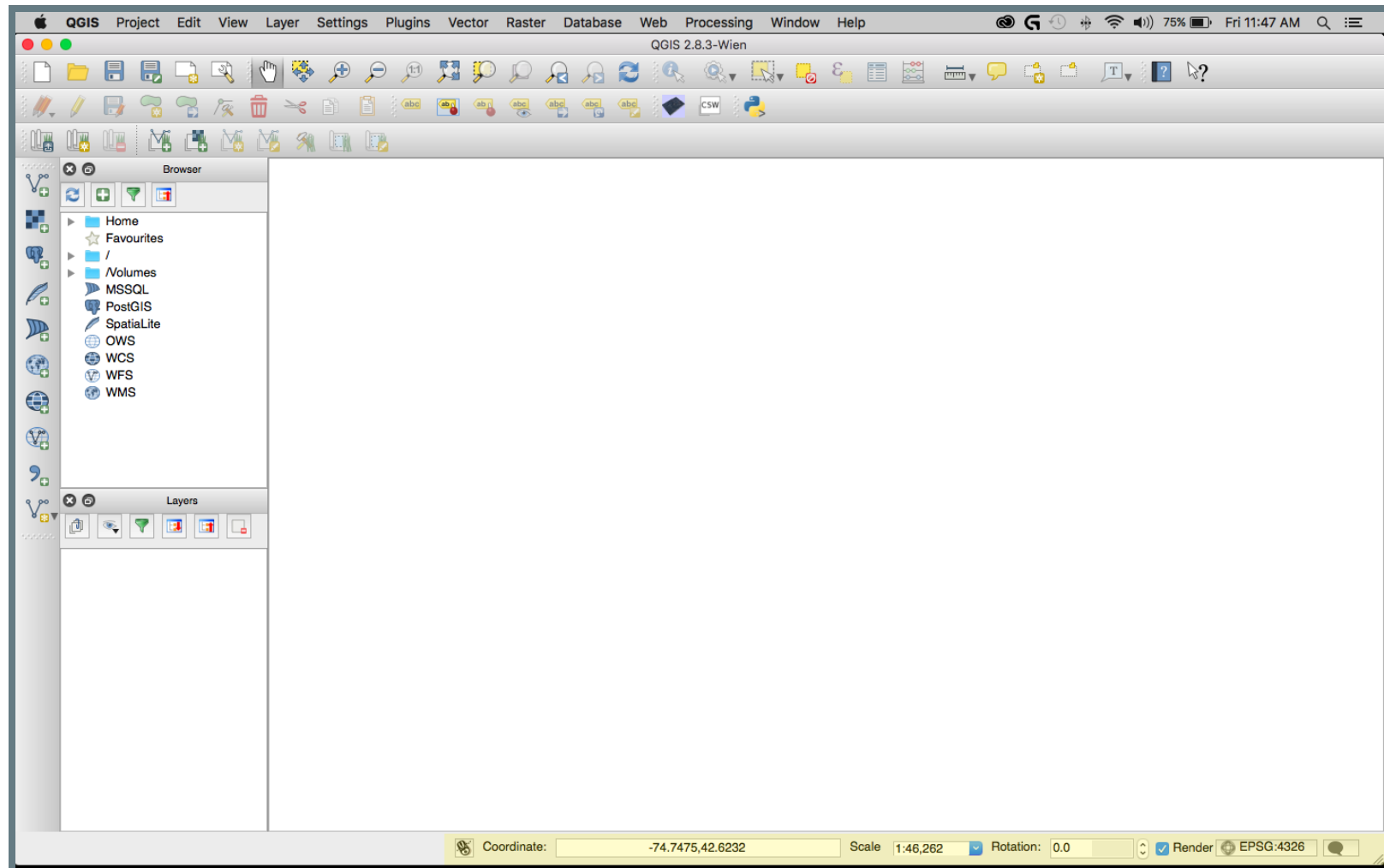
# THE MAP PANE

This is where your map will be displayed



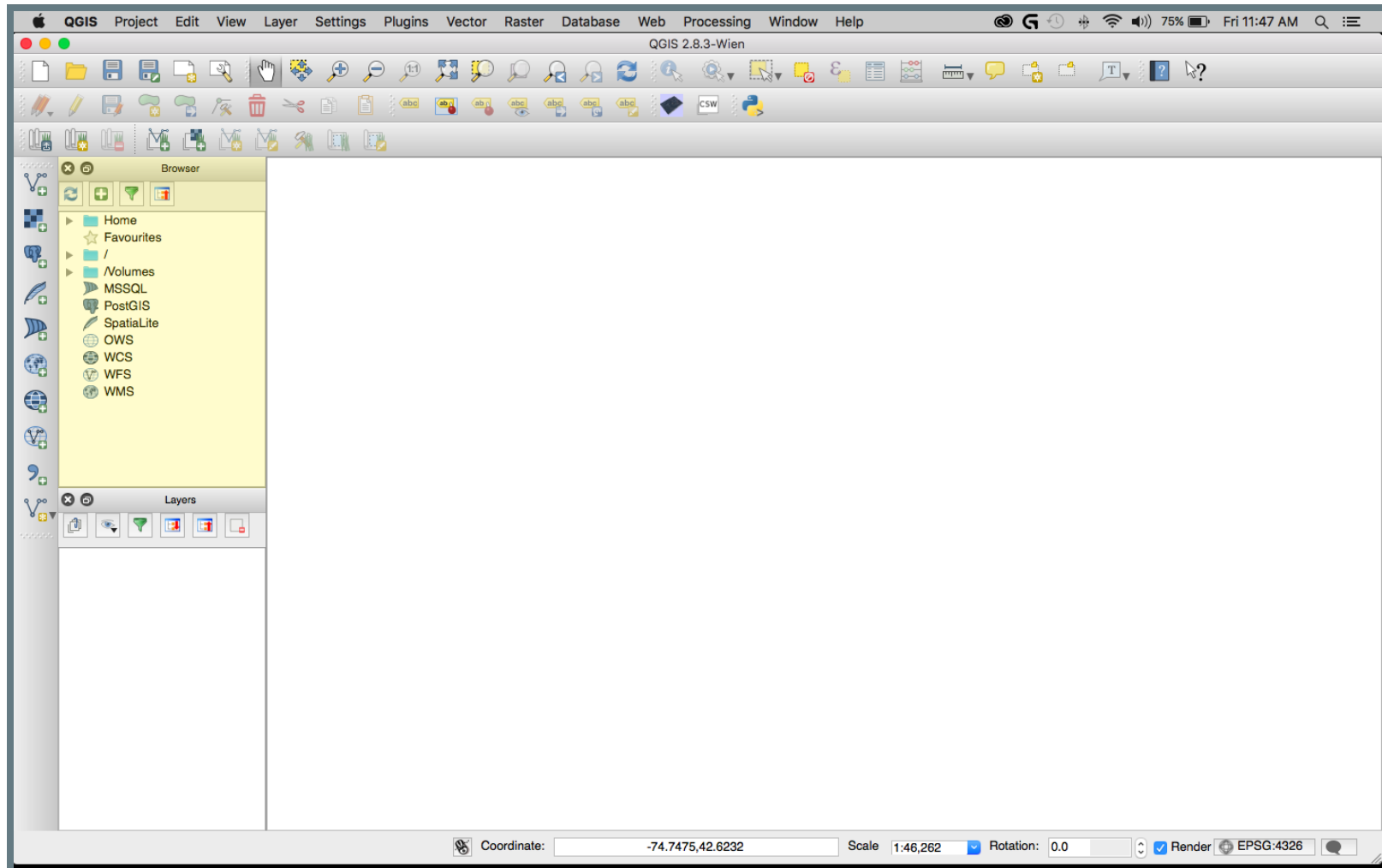
# MAP INFORMATION

Projection and scale along with other info



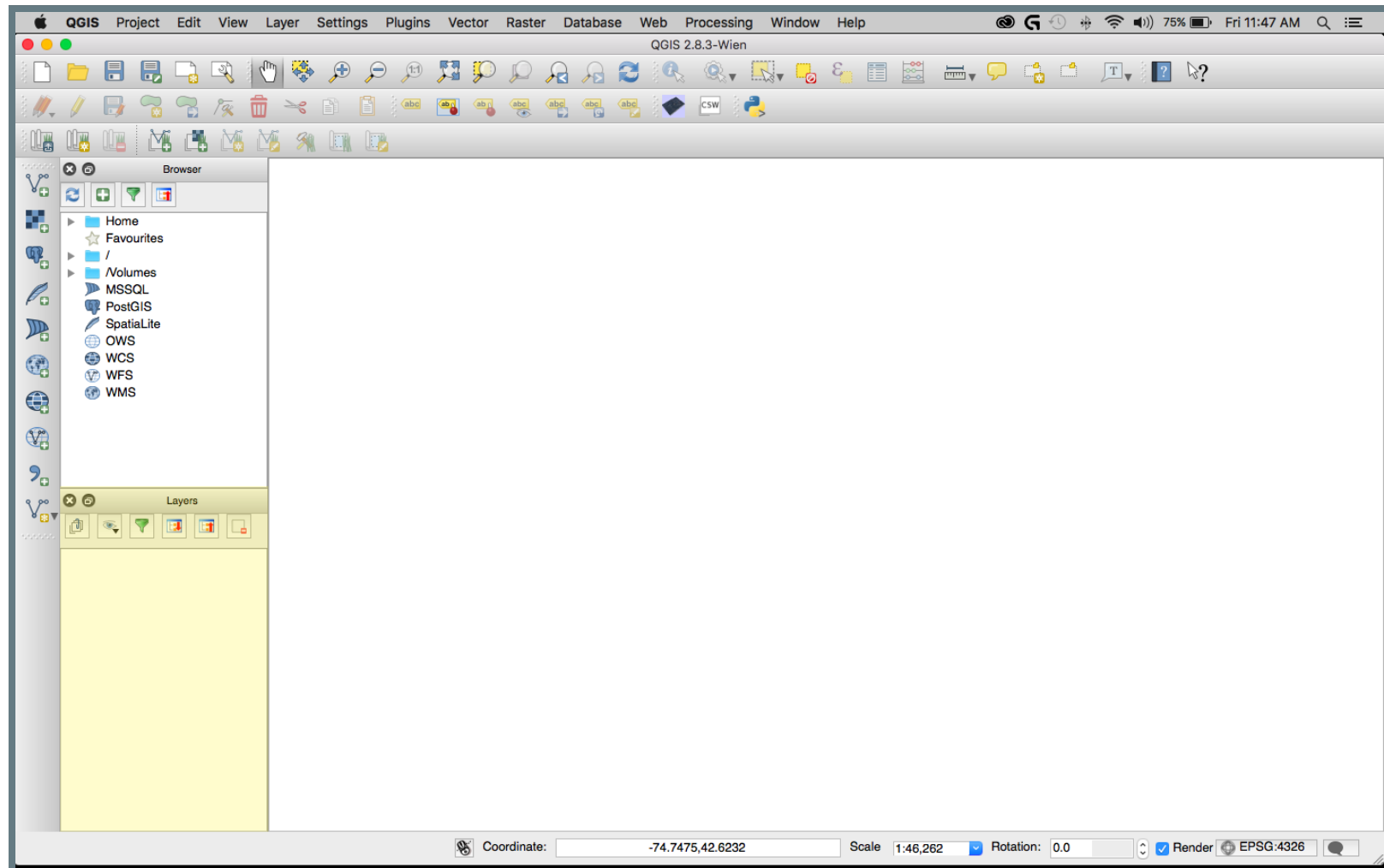
# THE BROWSER PANE

Here you can navigate to your data



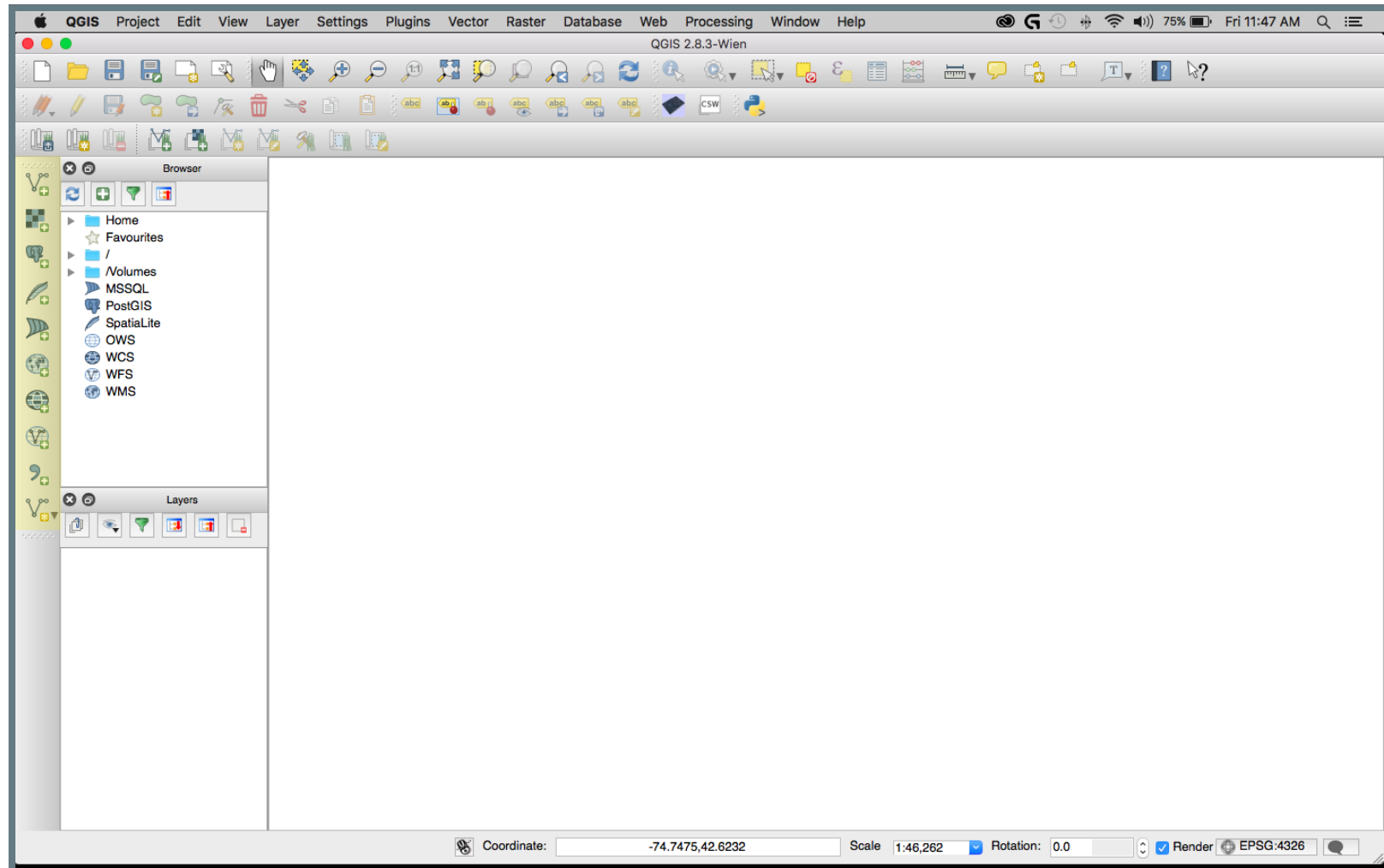
# THE LAYERS PANE

Here is where QGIS displays what layers you have on your map



# THE ADD LAYERS TOOLBAR

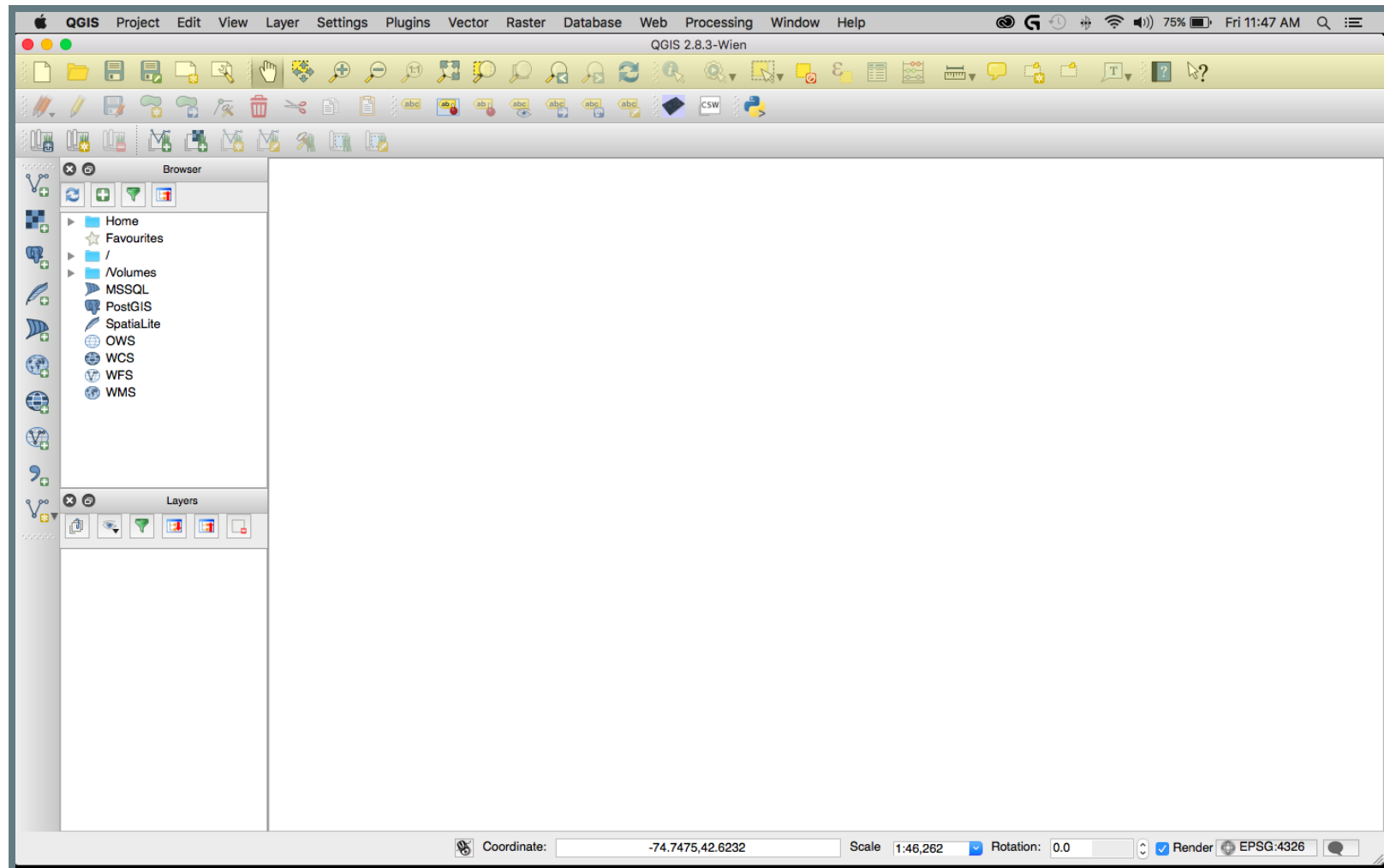
Here is where you add new layers





# OTHER TOOLS

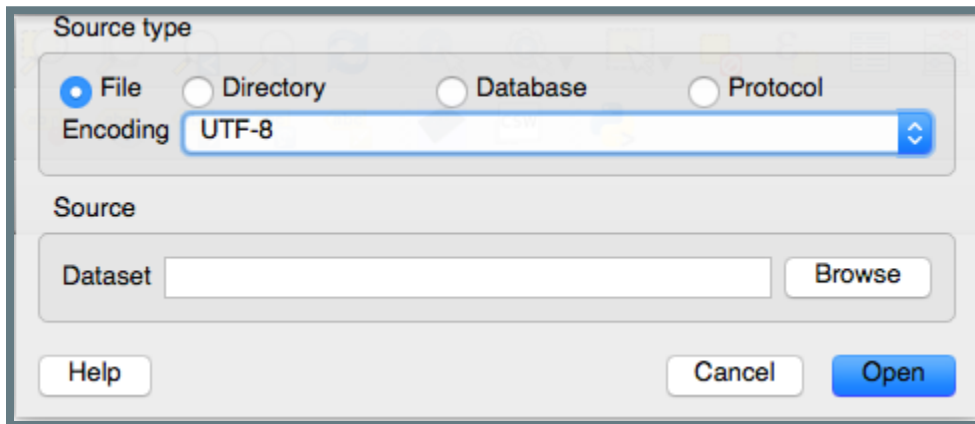
Select, pan and zoom, among others



# **BUILDING A MAP**

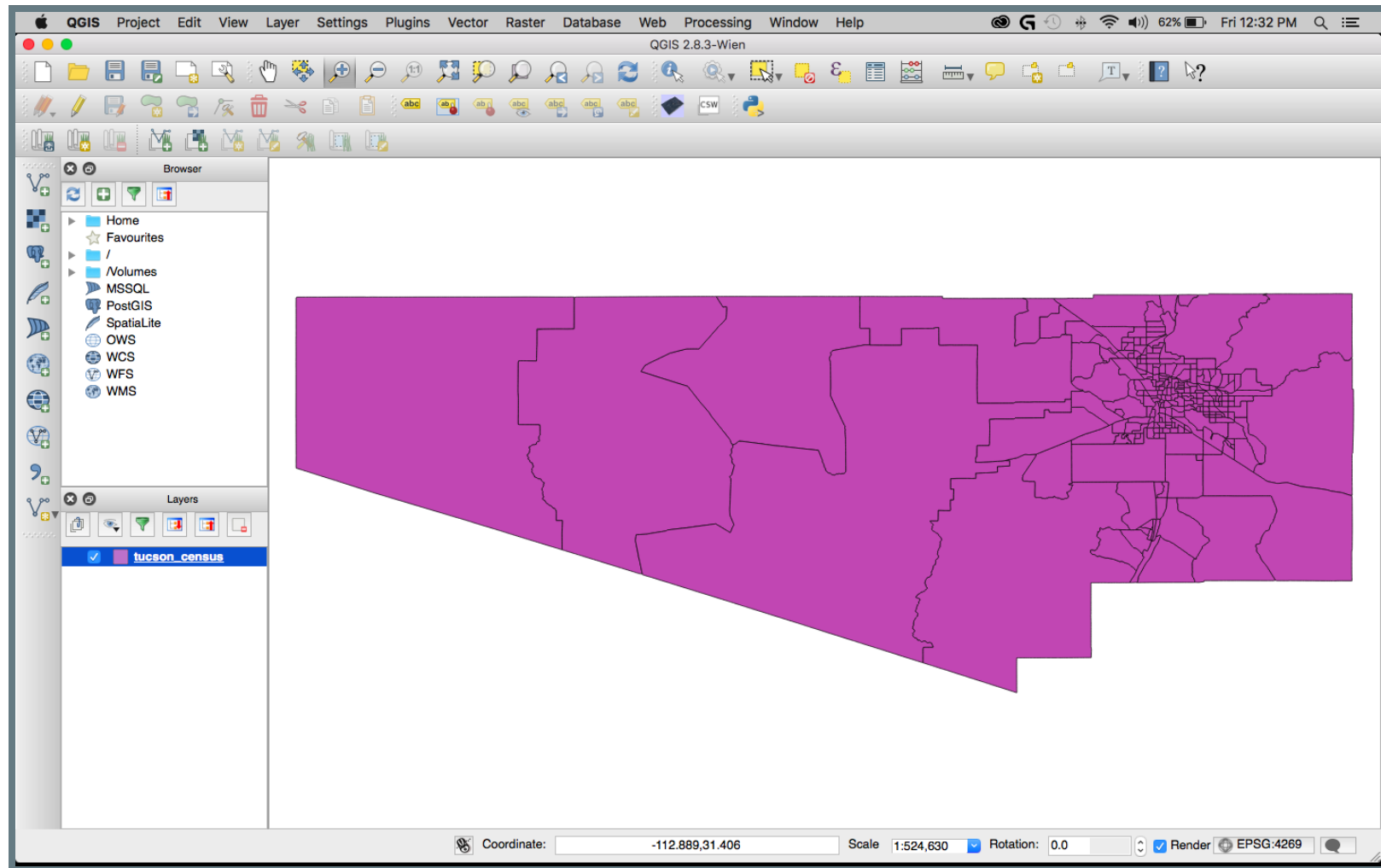
# ADDING A LAYER

1. Click on the  button to add a shapefile
2. This pops up a dialog





3. Click browse and navigate to the tucson\_census.shp file
3. Click open twice to add the shapefile as a layer to the map

# AND WE HAVE A MAP

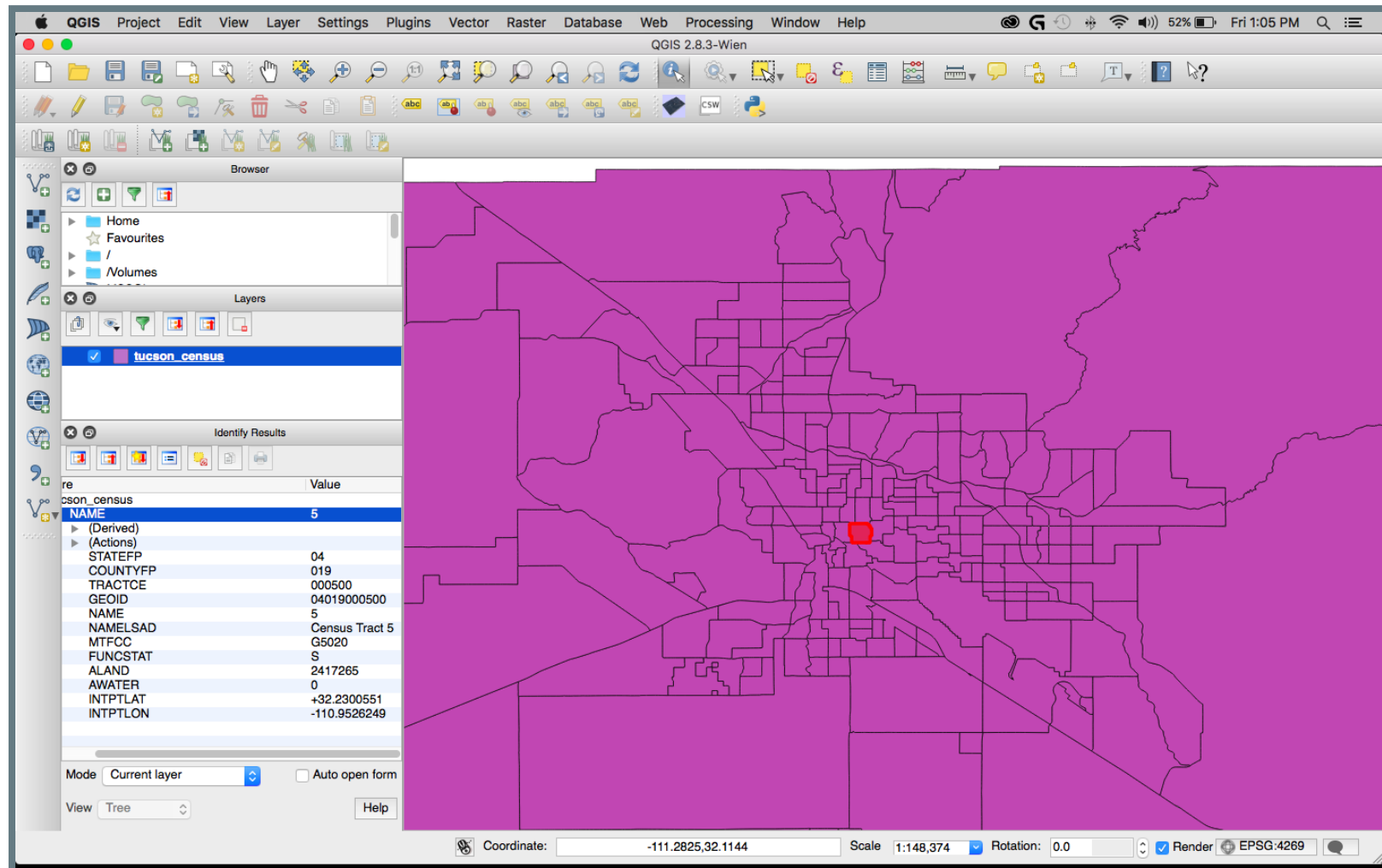


## EXPLORING WHAT WE HAVE SO FAR

This layer is basically a feature collection. Each individual polygon within it is known as a feature. Let's explore a feature.

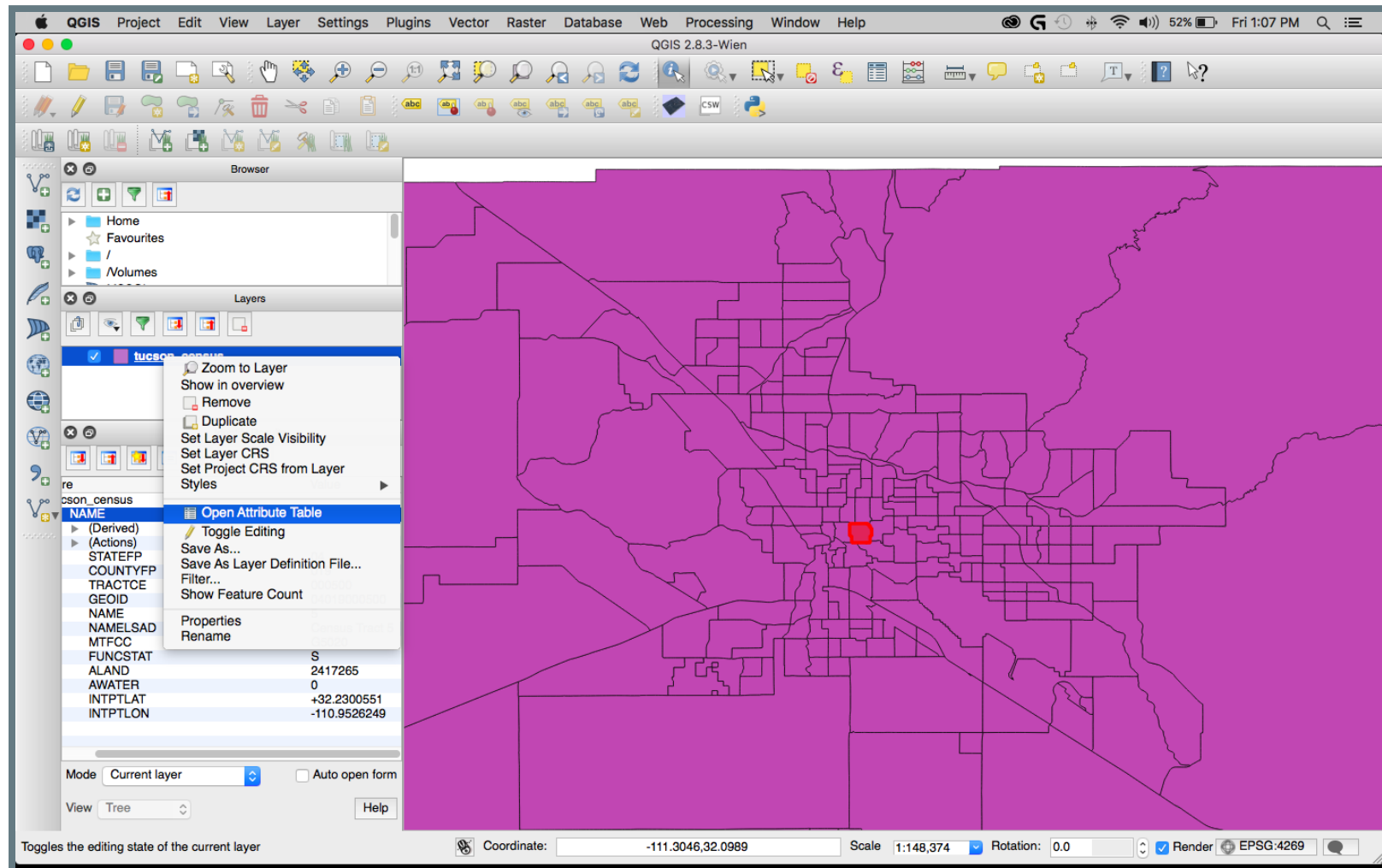
1. Click on the  icon in the top toolbar. Then click in the map to zoom in to an area.
2. Click on the  in the top toolbar to bring up the Identify Features Tool. Click on a feature within the map.

This brings up a new box below the Layers pane containing information about the feature you clicked on. The clicked feature will also be highlighted.



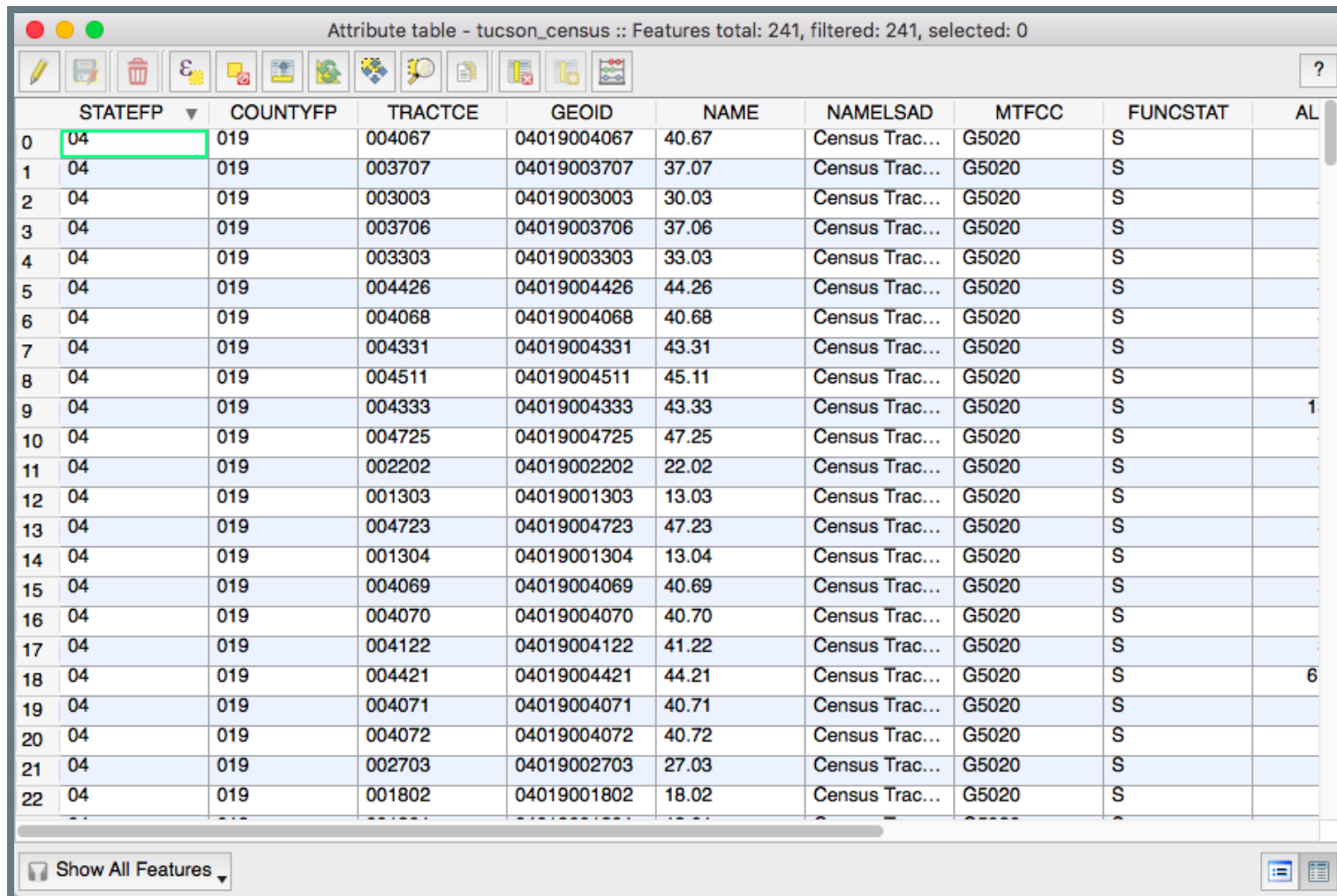
We can also bring up information about all features by accessing the data behind the shapefile.

Right click on the layer and select Open Attribute Table to bring up the data.





This opens a new window displaying the data in a spreadsheet format. The data can be selected, searched, sorted and filtered here. You can also perform calculations and add new columns here.



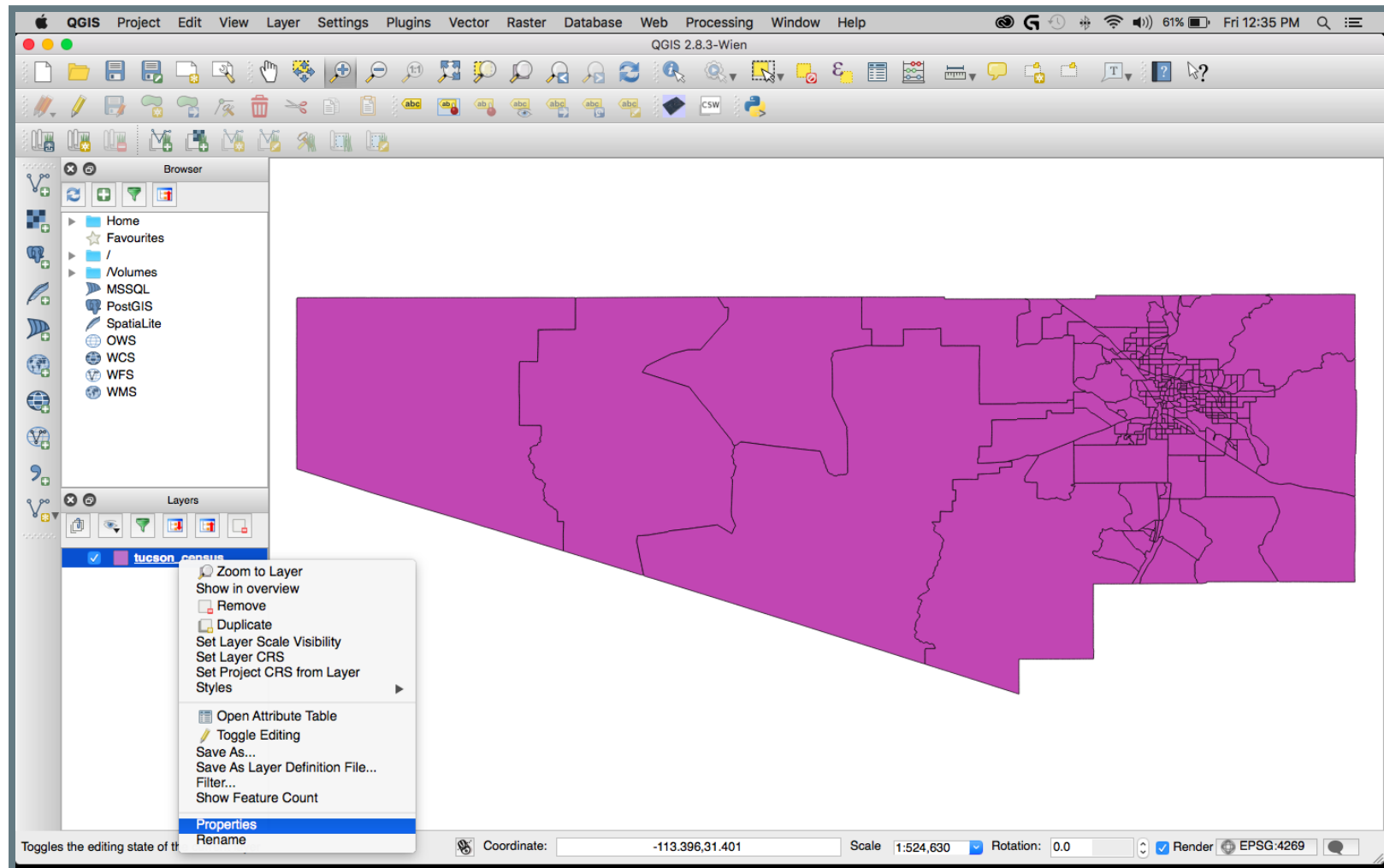
Attribute table - tucson\_census :: Features total: 241, filtered: 241, selected: 0

|    | STATEFP | COUNTYFP | TRACTCE | GEOID       | NAME  | NAMELSAD       | MTFCC | FUNCSTAT | AL |
|----|---------|----------|---------|-------------|-------|----------------|-------|----------|----|
| 0  | 04      | 019      | 004067  | 04019004067 | 40.67 | Census Trac... | G5020 | S        |    |
| 1  | 04      | 019      | 003707  | 04019003707 | 37.07 | Census Trac... | G5020 | S        |    |
| 2  | 04      | 019      | 003003  | 04019003003 | 30.03 | Census Trac... | G5020 | S        |    |
| 3  | 04      | 019      | 003706  | 04019003706 | 37.06 | Census Trac... | G5020 | S        |    |
| 4  | 04      | 019      | 003303  | 04019003303 | 33.03 | Census Trac... | G5020 | S        |    |
| 5  | 04      | 019      | 004426  | 04019004426 | 44.26 | Census Trac... | G5020 | S        |    |
| 6  | 04      | 019      | 004068  | 04019004068 | 40.68 | Census Trac... | G5020 | S        |    |
| 7  | 04      | 019      | 004331  | 04019004331 | 43.31 | Census Trac... | G5020 | S        |    |
| 8  | 04      | 019      | 004511  | 04019004511 | 45.11 | Census Trac... | G5020 | S        |    |
| 9  | 04      | 019      | 004333  | 04019004333 | 43.33 | Census Trac... | G5020 | S        | 1  |
| 10 | 04      | 019      | 004725  | 04019004725 | 47.25 | Census Trac... | G5020 | S        |    |
| 11 | 04      | 019      | 002202  | 04019002202 | 22.02 | Census Trac... | G5020 | S        |    |
| 12 | 04      | 019      | 001303  | 04019001303 | 13.03 | Census Trac... | G5020 | S        |    |
| 13 | 04      | 019      | 004723  | 04019004723 | 47.23 | Census Trac... | G5020 | S        |    |
| 14 | 04      | 019      | 001304  | 04019001304 | 13.04 | Census Trac... | G5020 | S        |    |
| 15 | 04      | 019      | 004069  | 04019004069 | 40.69 | Census Trac... | G5020 | S        |    |
| 16 | 04      | 019      | 004070  | 04019004070 | 40.70 | Census Trac... | G5020 | S        |    |
| 17 | 04      | 019      | 004122  | 04019004122 | 41.22 | Census Trac... | G5020 | S        |    |
| 18 | 04      | 019      | 004421  | 04019004421 | 44.21 | Census Trac... | G5020 | S        | 6  |
| 19 | 04      | 019      | 004071  | 04019004071 | 40.71 | Census Trac... | G5020 | S        |    |
| 20 | 04      | 019      | 004072  | 04019004072 | 40.72 | Census Trac... | G5020 | S        |    |
| 21 | 04      | 019      | 002703  | 04019002703 | 27.03 | Census Trac... | G5020 | S        |    |
| 22 | 04      | 019      | 001802  | 04019001802 | 18.02 | Census Trac... | G5020 | S        |    |

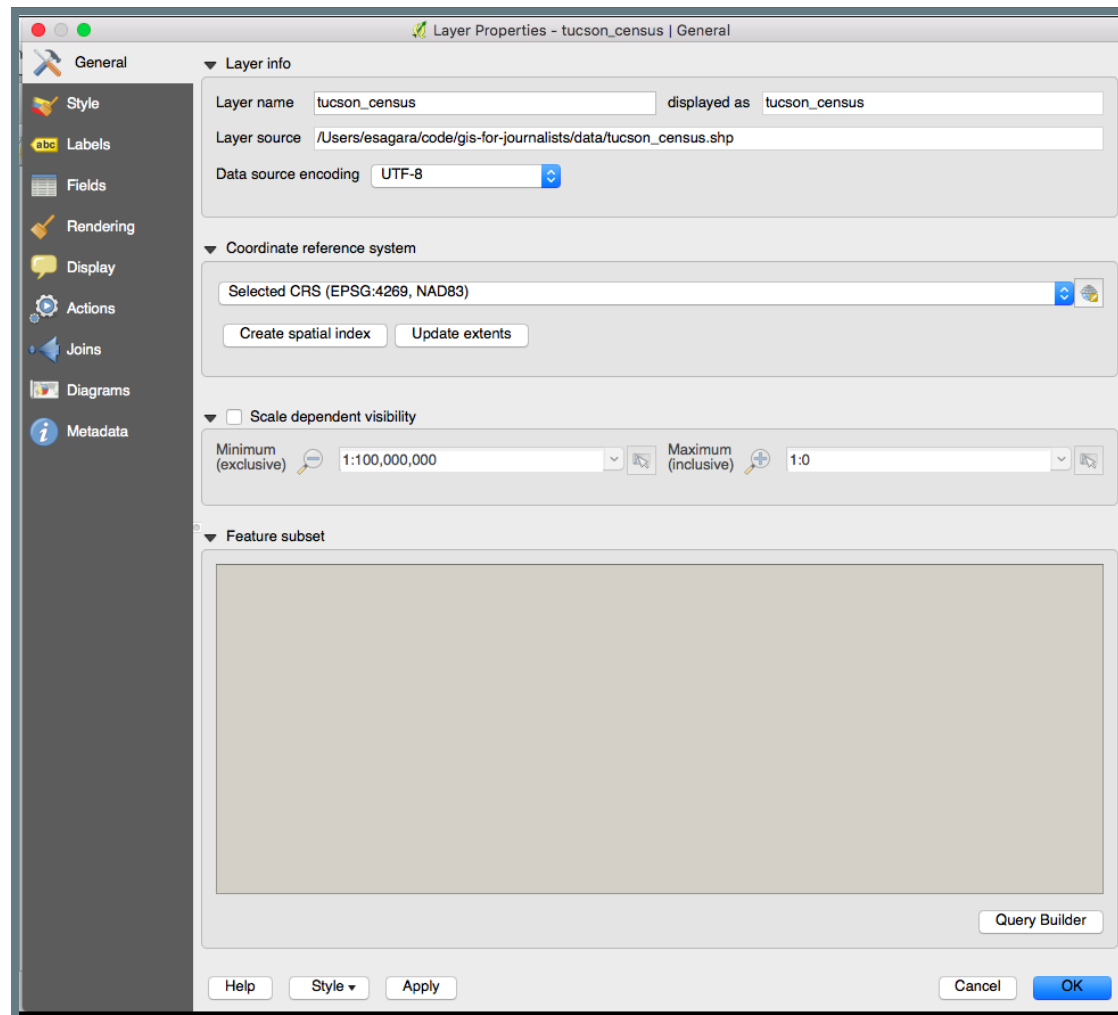
Show All Features

# STYLING THE LAYER

In the layers pane, right click on the tucson\_census layer and select "Properties" to bring up information about the layer.



Clicking on the General tab brings up information about the layer, including its Coordinate Reference System (more about that later).



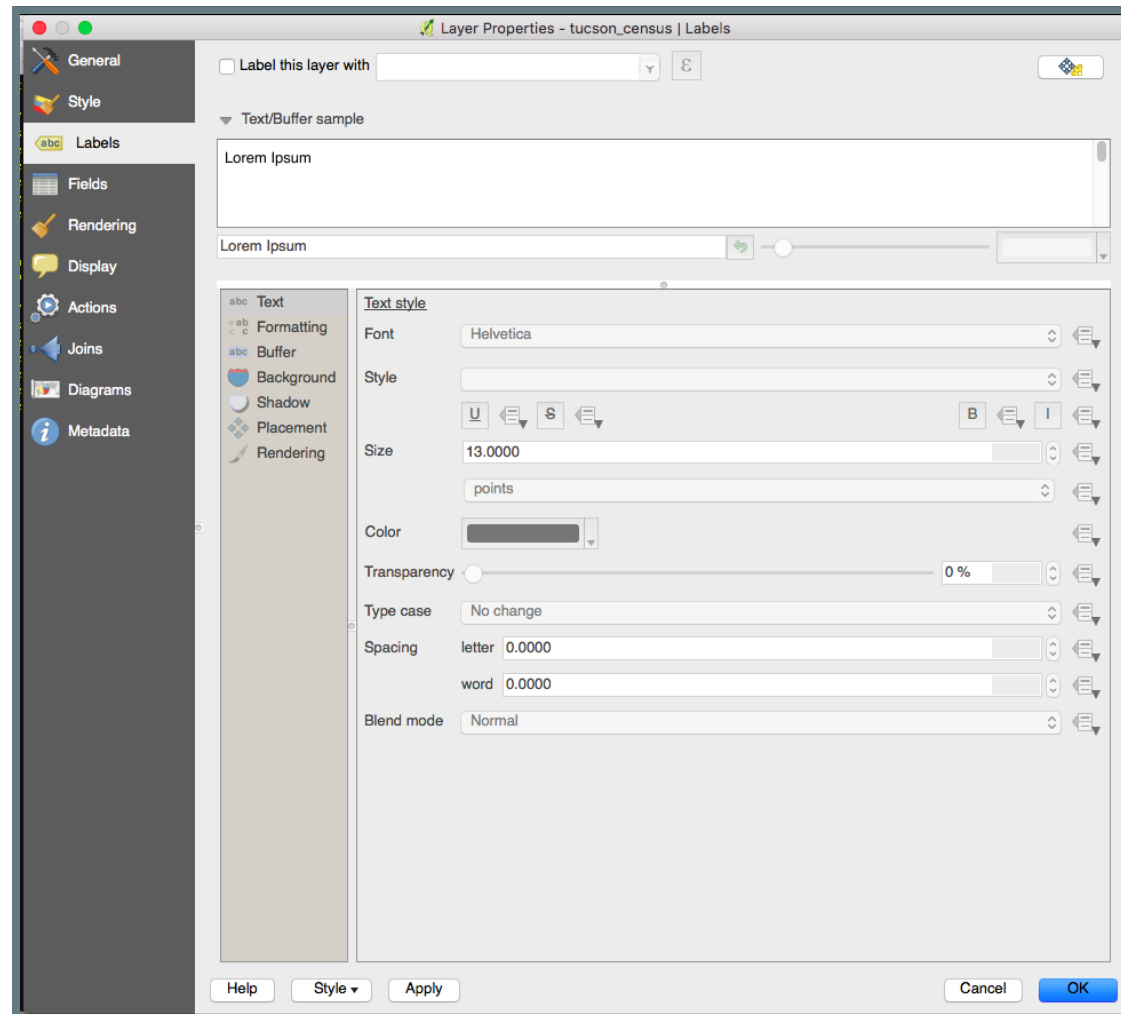
The Metadata tab contains more detailed information about the dataset, including some more geographic information.

The screenshot shows the 'Layer Properties' dialog box for a layer named 'tucson\_census'. The 'Metadata' tab is selected in the left sidebar. The dialog is divided into several sections:

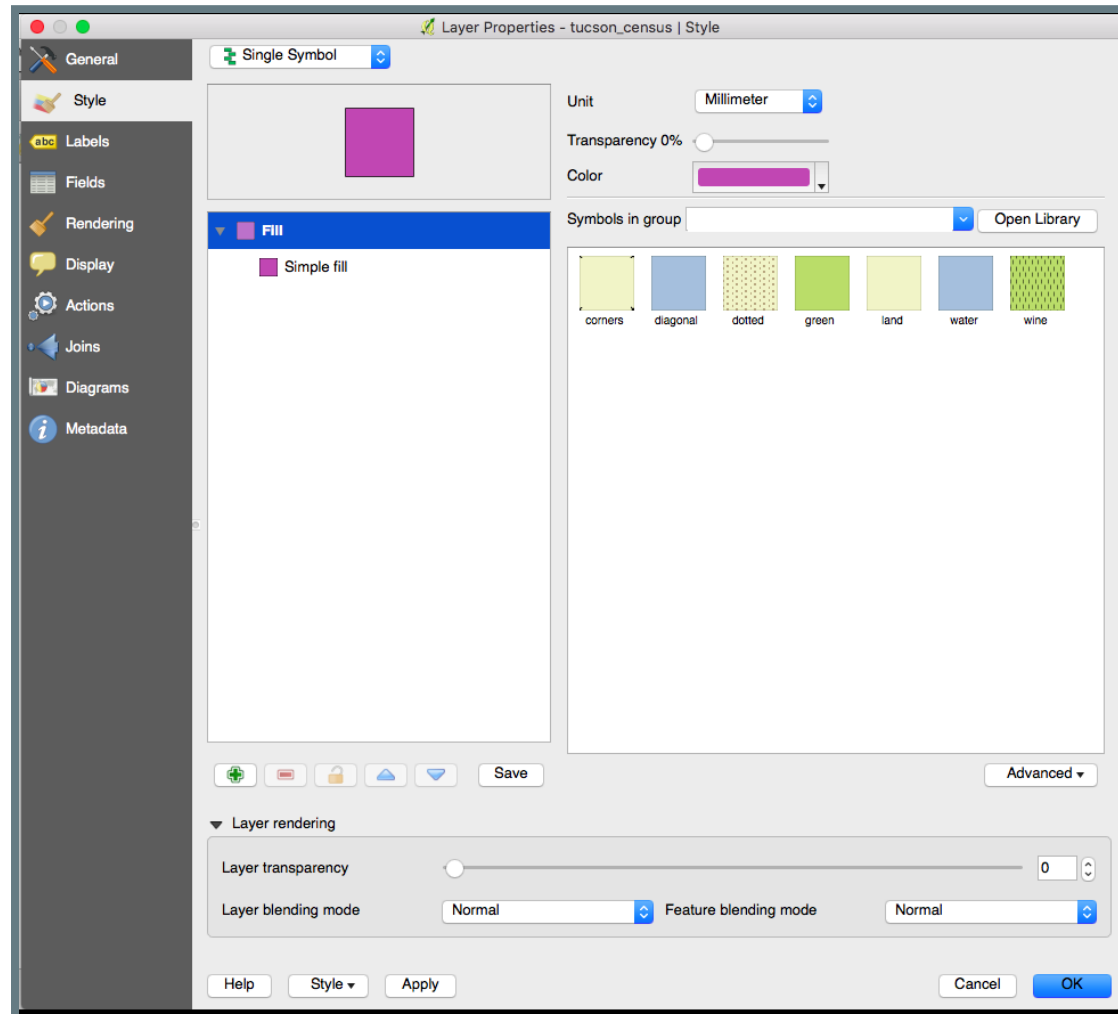
- Description:** Contains fields for Title, Abstract, Keyword list, and DataUrl (with a Format dropdown).
- Attribution:** Contains fields for Title and Url.
- MetadataUrl:** Contains fields for Url, Type (dropdown), and Format (dropdown).
- LegendUrl:** Contains fields for Url and Format (dropdown).
- Properties:** A scrollable area containing:
  - General:**
    - Storage type of this layer: ESRI Shapefile
    - Description of this provider: OGR data provider (compiled against GDAL/OGR library version 1.11.3, running against GDAL/OGR library version 1.11.3)
    - Source for this layer: /Users/esagara/code/gis-for-journalists/data/tucson\_census.shp

At the bottom of the dialog are buttons for Help, Style (with a dropdown arrow), Apply, Cancel, and OK.

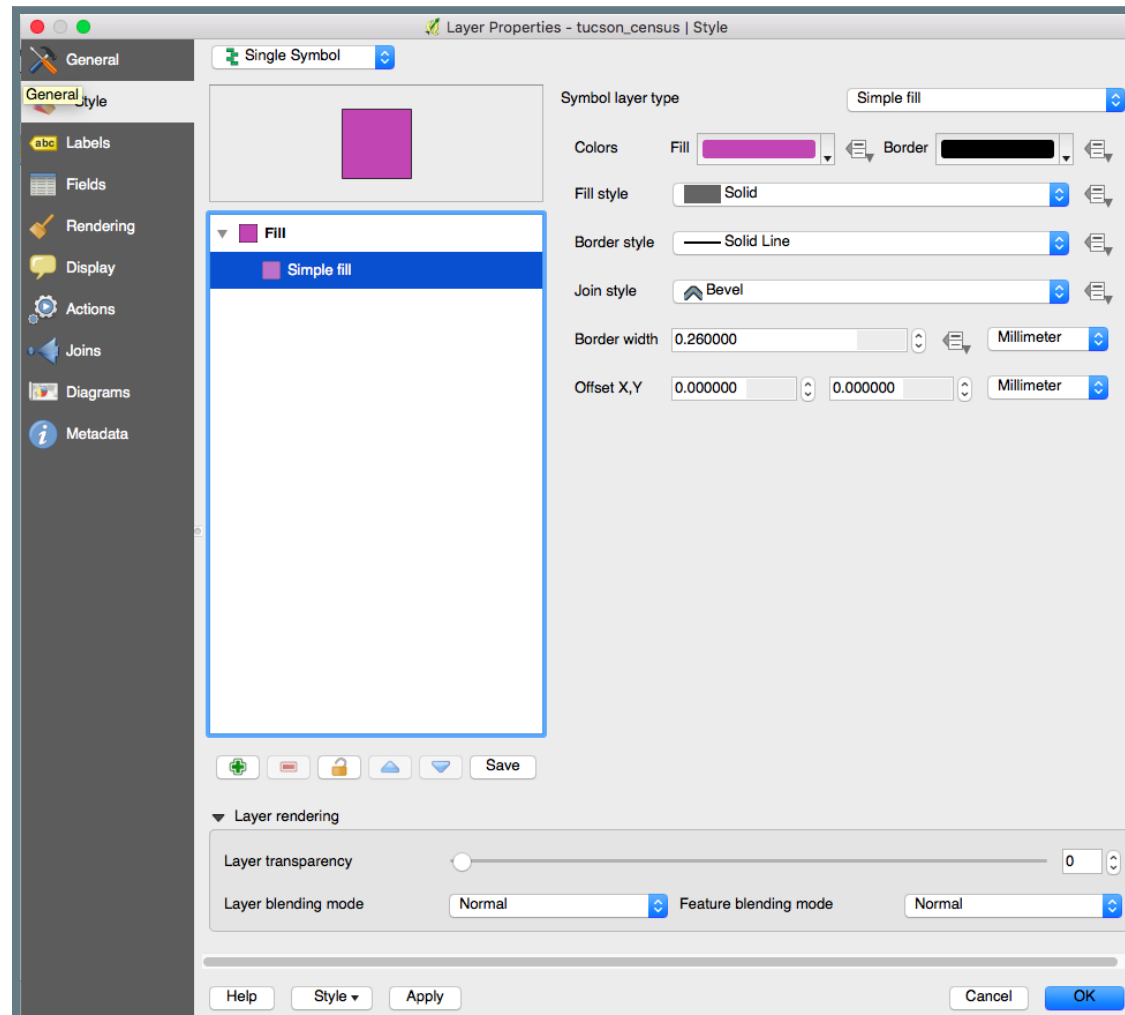
The labels tab allows us to set how the individual features in the layer are labeled. We often handle labeling outside of QGIS, so we are going to skip this.



The style tab allows us to color and set borders on the features within the layer.




Clicking the Simple Fill button brings up a dialog box allowing us to set the color and border of the features.



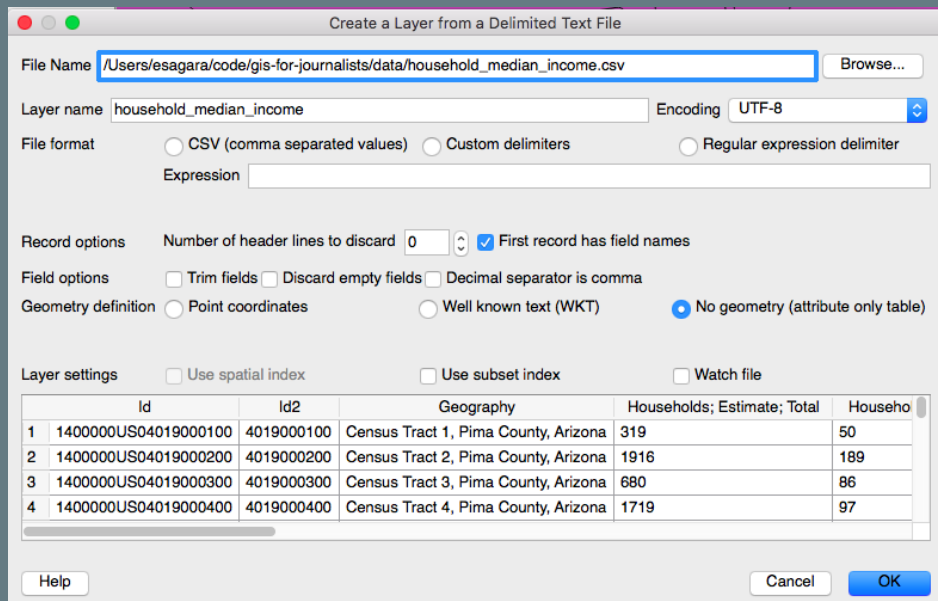


# **JOINING DATA TO THE LAYER**

# ADDING A CSV FILE

1. Start by clicking on the  in the toolbar to the left of your screen.

2. This brings up a dialog box. Click Browse, navigate to the household\_median\_income.csv and open it. Make sure the No Geometry option is clicked before hitting OK.



Create a Layer from a Delimited Text File

File Name:  Browse...

Layer name:  Encoding:

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

Expression:

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

|   | Id                   | Id2        | Geography                            | Households; Estimate; Total | Househo |
|---|----------------------|------------|--------------------------------------|-----------------------------|---------|
| 1 | 1400000US04019000100 | 4019000100 | Census Tract 1, Pima County, Arizona | 319                         | 50      |
| 2 | 1400000US04019000200 | 4019000200 | Census Tract 2, Pima County, Arizona | 1916                        | 189     |
| 3 | 1400000US04019000300 | 4019000300 | Census Tract 3, Pima County, Arizona | 680                         | 86      |
| 4 | 1400000US04019000400 | 4019000400 | Census Tract 4, Pima County, Arizona | 1719                        | 97      |

Help Cancel OK

## **AN IMPORTANT NOTE:**

QGIS automatically interprets all numbers as integers when it imports a CSV file. This can be problematic when you have a number with a leading zero that you need to preserve because integers strip those out.

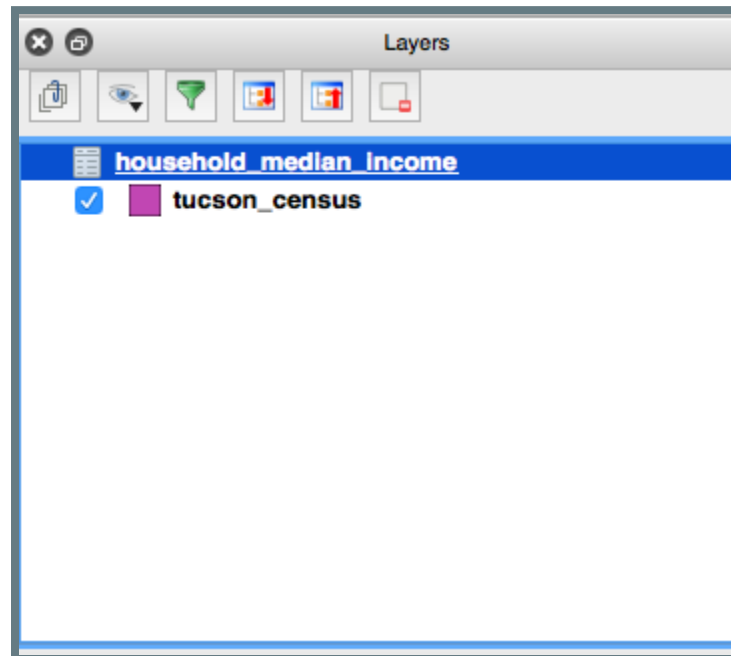
## THE SOLUTION

The solution is to create a separate file similar to a CSV but with only one row. This file is saved as a .csvt file with the same name as your CSV file. In this case it would be household\_median\_income.csvt.


The single row contains a comma-separated list of the data types (encapsulated in quotes) for each column.

```
"String","String","String","Integer","Integer","Integer","Integer"
```

By now the file should appear in your layers as a new item.



## JOINING THE TWO LAYERS

1. Open up the properties for the tucson\_census layer.
2. Click the  button at the bottom.
3. In the dialog box make sure the Join Layer is household\_median\_income. Set the Join Field to "Id2" and the Target Field to "GEOID."
4. Click on "Choose which fields are joined" and select the last four options.
5. Click on "Custom field prefix" and change it to HHMI.
6. Click OK to close the dialog and then OK to close the layer properties.

## The dialog box filled out:

The screenshot shows the 'Add vector join' dialog box in QGIS. The dialog has a title bar with standard window controls (red, yellow, green buttons). The main area contains several configuration options:

- Join layer:** A dropdown menu showing 'household\_median\_income'.
- Join field:** A text input field containing 'Id2'.
- Target field:** A dropdown menu showing 'GEOID'.
- Cache join layer in virtual memory:** A checked checkbox.
- Create attribute index on join field:** An unchecked checkbox.
- Choose which fields are joined:** A section with a checked checkbox and a list of fields. The list includes:
  - ☐ Id
  - ☐ Id2
  - ☐ Geography
  - ☒ Households; Estimate; Total
  - ☒ Households; Margin of Error; Total
  - ☒ Households; Estimate; Median income (dollars)
  - ☒ Households; Margin of Error; Median income (dollars)
- Custom field name prefix:** A section with a checked checkbox and a text input field containing 'HHMI|'.

At the bottom right, there are two buttons: 'Cancel' and 'OK'.

You should now have four new columns at the end of the tucson\_census attribute table.

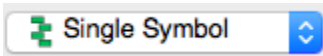
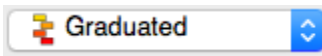

Attribute table - tucson\_census :: Features total: 241, filtered: 241, selected: 0

| STAT | ALAND    | AWATER | INTPTLAT    | INTPTLON     | useholds; Estim | holds; Margin of | Estimate; Media | argin of Error; Me |
|------|----------|--------|-------------|--------------|-----------------|------------------|-----------------|--------------------|
| 0    | 1851359  | 0      | +32.2405665 | -110.8490480 | 1644            | 128              | 30676           | 7006               |
| 1    | 1522786  | 0      | +32.1518292 | -110.9522877 | 933             | 80               | 31728           | 9014               |
| 2    | 2053859  | 0      | +32.2471612 | -110.8661956 | 2082            | 191              | 25047           | 4052               |
| 3    | 1371062  | 0      | +32.1596545 | -110.9523196 | 1874            | 123              | 23664           | 2470               |
| 4    | 3004756  | 0      | +32.2206105 | -110.8666444 | 1780            | 130              | 31622           | 8787               |
| 5    | 4848790  | 113798 | +32.3480444 | -111.0872630 | 1010            | 90               | 76055           | 3978               |
| 6    | 4057877  | 0      | +32.2279670 | -110.8444755 | 2265            | 157              | 49069           | 13791              |
| 7    | 5461784  | 0      | +31.8838284 | -111.0075620 | 2025            | 161              | 42469           | 9137               |
| 8    | 1613445  | 0      | +32.2796583 | -110.9669487 | 1928            | 139              | 34565           | 5814               |
| 9    | 13008468 | 0      | +32.1513189 | -111.0859195 | 1318            | 114              | 59485           | 10144              |
| 10   | 4482151  | 0      | +32.3090255 | -110.9691791 | 1521            | 139              | 32192           | 9146               |
| 11   | 4120988  | 0      | +32.1927416 | -110.9519357 | 1008            | 120              | 28084           | 7042               |
| 12   | 967940   | 0      | +32.2556507 | -110.9822535 | 1244            | 136              | 22955           | 6457               |
| 13   | 3772336  | 0      | +32.2983493 | -110.8329788 | 2248            | 174              | 72756           | 9610               |
| 14   | 1622243  | 0      | +32.2558909 | -110.9708483 | 2244            | 178              | 14940           | 4348               |
| 15   | 2067353  | 0      | +32.2139514 | -110.8211377 | 1733            | 132              | 37083           | 7875               |
| 16   | 1144433  | 0      | +32.2138056 | -110.8106328 | 1431            | 107              | 37712           | 6529               |
| 17   | 3328485  | 0      | +32.1414071 | -110.9370743 | 1204            | 93               | 33874           | 6428               |
| 18   | 61986419 | 0      | +32.2060994 | -111.1549952 | 2692            | 179              | 50793           | 8039               |
| 19   | 1333184  | 0      | +32.2287665 | -110.8193648 | 2787            | 141              | 28086           | 3251               |
| 20   | 1256188  | 0      | +32.2276876 | -110.8110436 | 1072            | 68               | 50913           | 6059               |
| 21   | 1634689  | 0      | +32.2641229 | -110.9493710 | 1788            | 106              | 28698           | 5546               |
| 22   | 1126134  | 0      | +32.2382255 | -110.9212062 | 1297            | 143              | 33947           | 4190               |

Show All Features



**COLORING OUR NEW MAP**

1. To begin open up the properties for tucson\_census.
2. Change  to .
3. Select the next to last option under "Column."
4. Select a color ramp of your choice.
5. Hit the  button.

This is what your dialog should look like.

Layer Properties - tuscon\_census | Style

General

Style

Labels

Fields

Rendering

Display

Actions

Joins

Diagrams

Metadata

Column: HHMIHouseholds; Estimate; Median income (dollars)

Symbol: [Change...]

Color ramp: [source]

Legend Format: %1 - %2

Classes: 5

Mode: Equal Interval

Precision: 0

Trim: ☐

| Symbol                              | Values               | Legend                   |
|-------------------------------------|----------------------|--------------------------|
| <input checked="" type="checkbox"/> | 13193.00 - 33073.60  | 13193.0000 - 33073.6000  |
| <input checked="" type="checkbox"/> | 33073.60 - 52954.20  | 33073.6000 - 52954.2000  |
| <input checked="" type="checkbox"/> | 52954.20 - 72834.80  | 52954.2000 - 72834.8000  |
| <input checked="" type="checkbox"/> | 72834.80 - 92715.40  | 72834.8000 - 92715.4000  |
| <input checked="" type="checkbox"/> | 92715.40 - 112596.00 | 92715.4000 - 112596.0000 |

Classify Add class Delete Delete all ☒ Link class boundaries Advanced

Layer rendering

Layer transparency: 0

Layer blending mode: Normal Feature blending mode: Normal

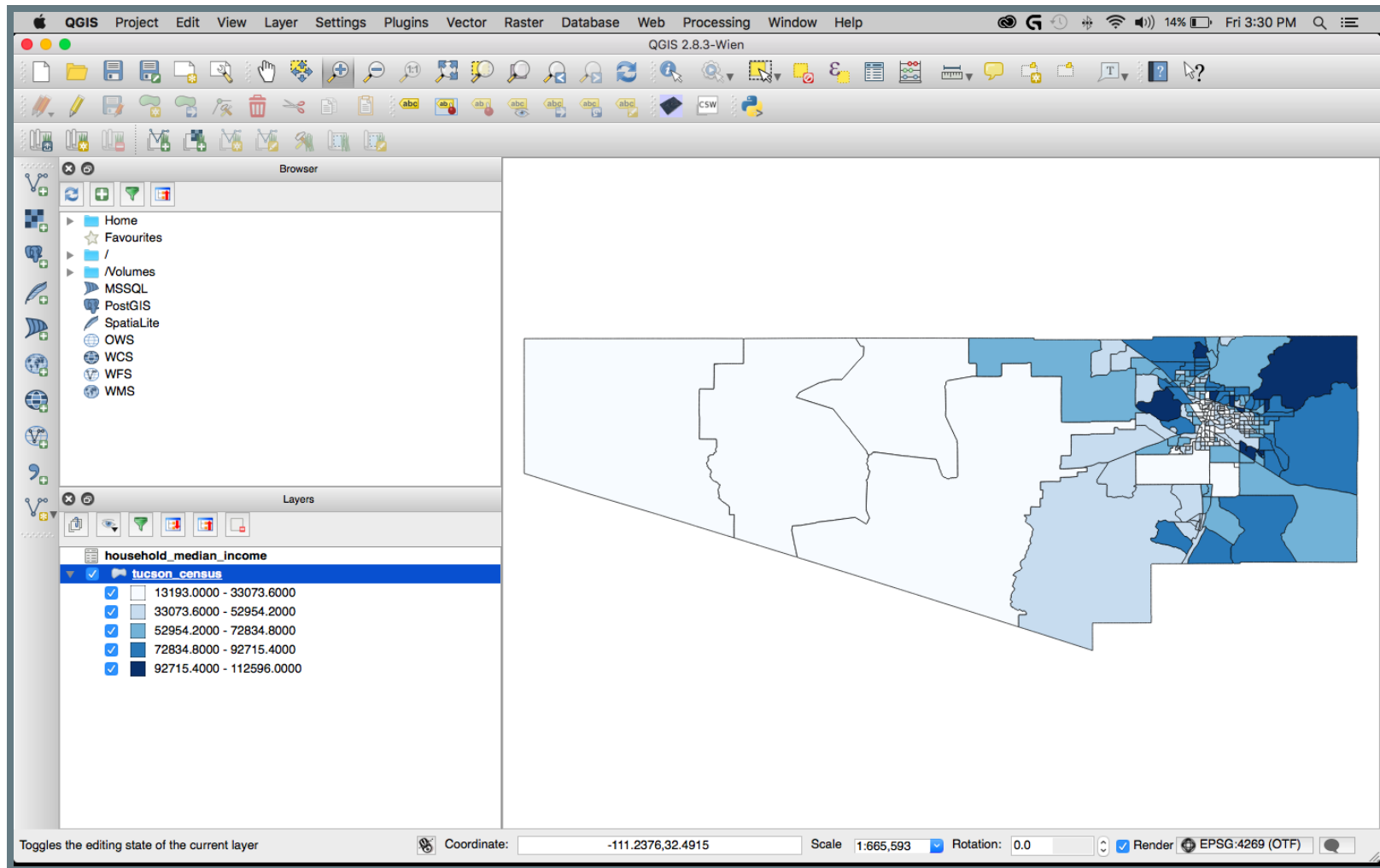
Help Style Apply Cancel OK

## A FEW QUICK NOTES

You can change the number of categories you want to display by changing "Classes" to the preferred number. However large amounts of classes tend to dilute the analysis while smaller amounts obscure results.

You can also change how QGIS calculates where to split up the categories under the "Mode" option. There is a lot of math behind some of these choices and they have specific use cases. Research these options before using them.

# THE FINISHED MAP



# SAVING YOUR WORK

Aside from saving the entire project, you can also export your `tucson_census` to a new file containing the joined data.

## TO SAVE TO SHAPEFILE


1. Right click on tucson\_census in the Layers panel and select "Save As..."
2. Make sure 'ESRI Shapefile' is selected at the top.
3. On the next line, click Browse to navigate to the folder where you want to save your data. Name your file and click "Save."
4. Change your projection if needed.
5. Click OK. A layer with the new shapefile should be added to your map.

## **SAVING TO KML**

Save your map to this format if you plan to use it online with Google Fusion Tables, Google Earth or most other online programs.



1. Right click on tucson\_census in the Layers panel and select "Save As..."
2. Make sure "Keyhole Markup Language [KML]" is selected at the top.
3. On the next line, click Browse to navigate to the folder where you want to save your data. Name your file and click "Save."

4. On the line labeled CRS click the  icon.
5. Select or search for the option that says 'EPSG:4326.' This is the projection used by all KML files.
6. Under Datasource Options change DescriptionField to 'HHMIMedian Income' and NameField to "NAMELSAD."
7. Hit OK and your new KML file should be added to the map.

# CONGRATULATIONS!

## YOU'VE CREATED YOUR FIRST MAP

This presentation and other handouts can be found online at  
<https://github.com/newshackaz/gis-for-journalists>