THE UNIVERSITY OF NEW MEXICO

2018 NM LTAP Center QGIS Training

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Part A. Introduction to QGIS

1. QGIS

- QGIS is a free and open source cross-platform (Windows, Mac OS, Linux, BSD, and Android) Desktop Geographic Information System (GIS)
- QGIS can help users create, edit, visualize, analyze, and publish geospatial data
- QGIS integrates with other open source GIS software, including but not limited to PostGIS, GRASS GIS, and MapServer
- QGIS supports shapefiles, coverages, file or personal geodatabases (only feature class), many raster formats (e.g., .tif, .img, etc.), and many other formats (e.g., PostGIS layers and SpatiaLite layers, GPX layers, etc.)

2. QGIS vs. ArcGIS

- QGIS – free and open source software, more stable, less analysis tools, multi-platform
- ArcGIS – commercial software, less stable, more analysis tools, single-platform

3. Start to Learn QGIS

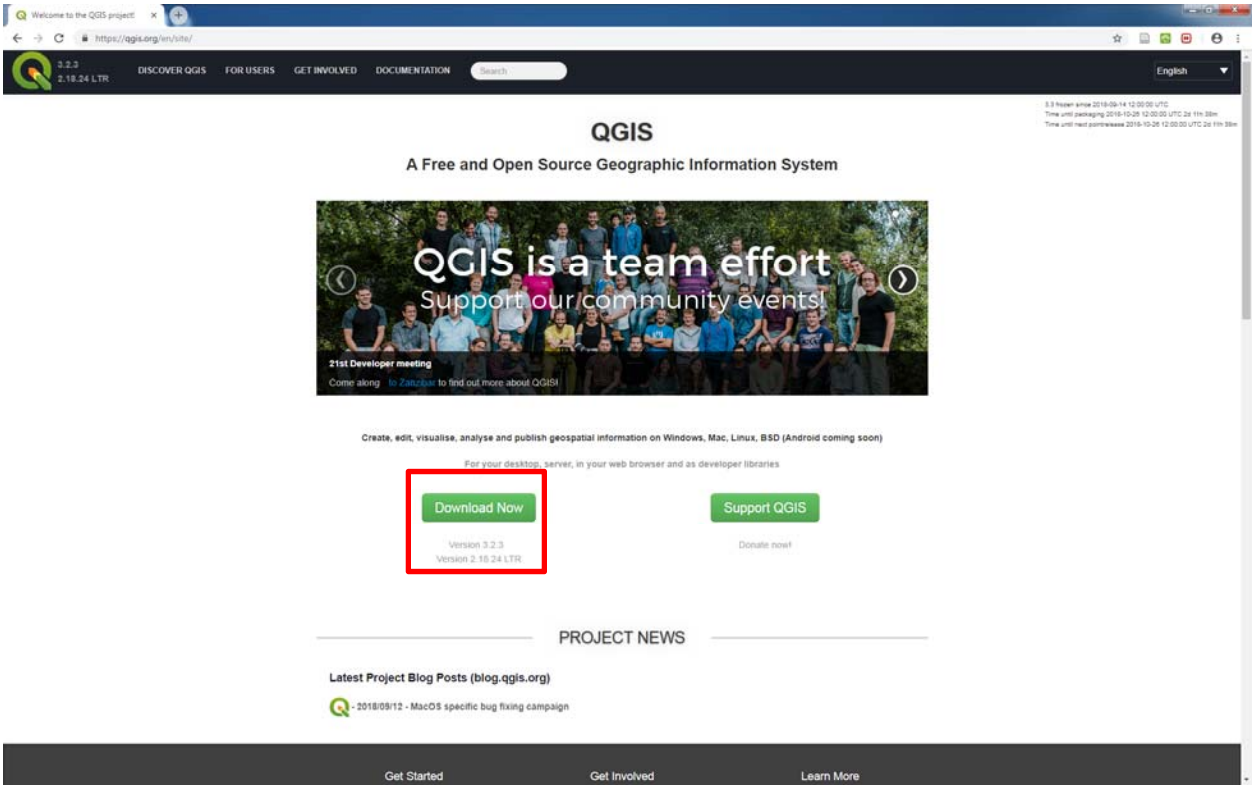
- Graser, A. 2016. *Learning QGIS*, 3rd ed. Packt Publishing, Birmingham, UK.
- Mastering QGIS, Menke, K., Smith, R. Jr., Pirelli, L., and Van Hoesen, J. *Mastering QGIS*, 2nd ed. Packt Publishing, Birmingham, UK.
- Graser, A., Mearns, B., Mandel, A., Ferrero, V. O., and Bruy A. QGIS: Becoming a GIS Power User. Packt Publishing, Birmingham, UK.
- Website
    - QGIS Workshop http://maps.cga.harvard.edu/qgis/
    - QGIS Tutorials and Tips http://qgistutorials.com
- Online Education
    - Udemy Introduction to GIS https://www.udemy.com/gis-for-everyone/
    - Udemy Learnt to use QGIS https://www.udemy.com/draft/149366/

Part B. Getting Started with QGIS

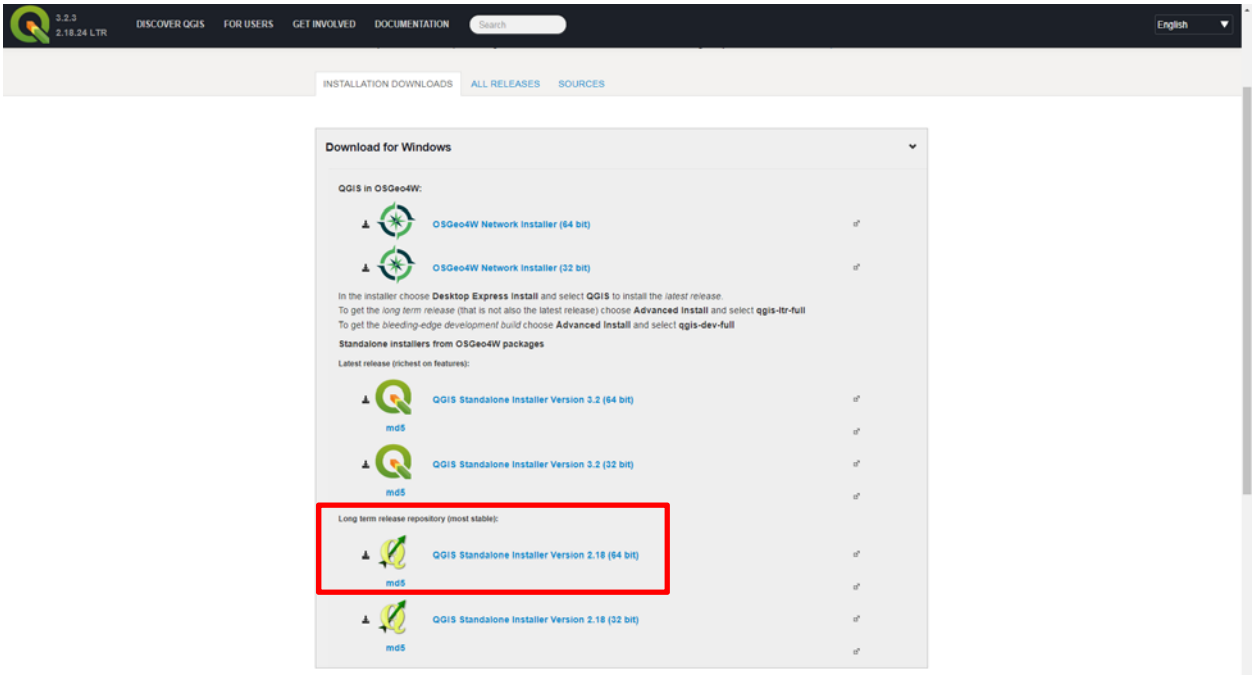
1. Download QGIS

(1) Go to www.qgis.com

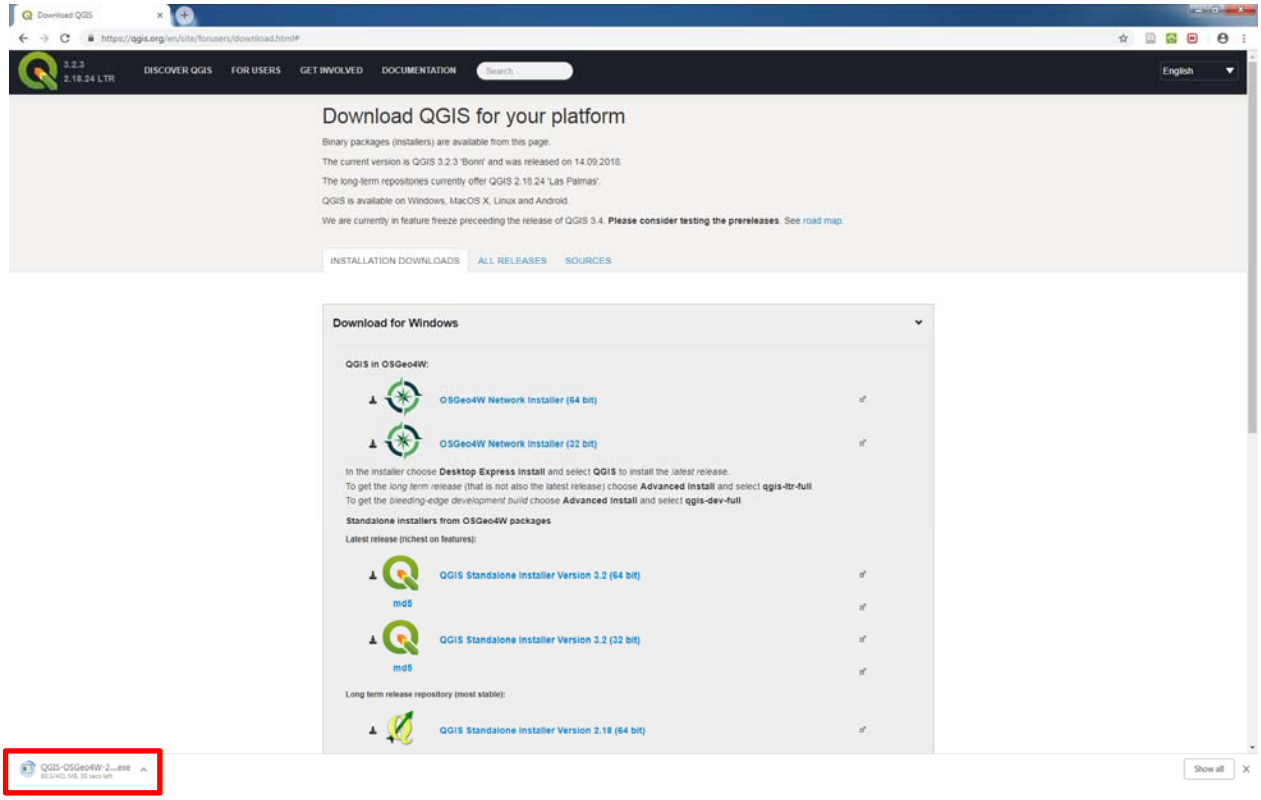
(2) You will see a website looks like this; click on “Download Now” to go to the download page



(3) Select the latest version that is compatible with your operating systems to download; preferably 64-bit; the long term release version is the most stable one for your choice

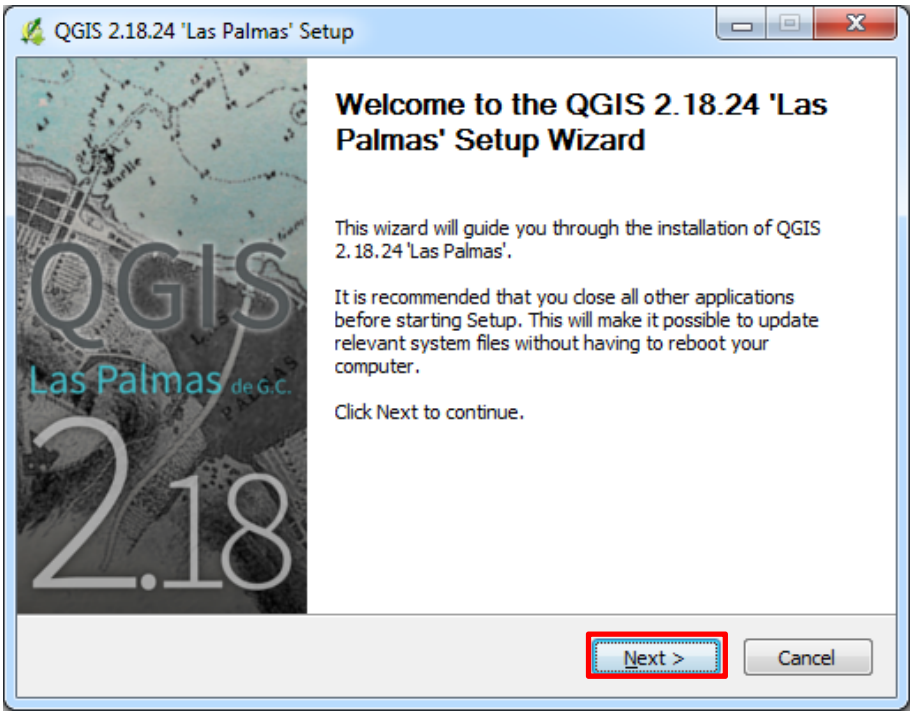


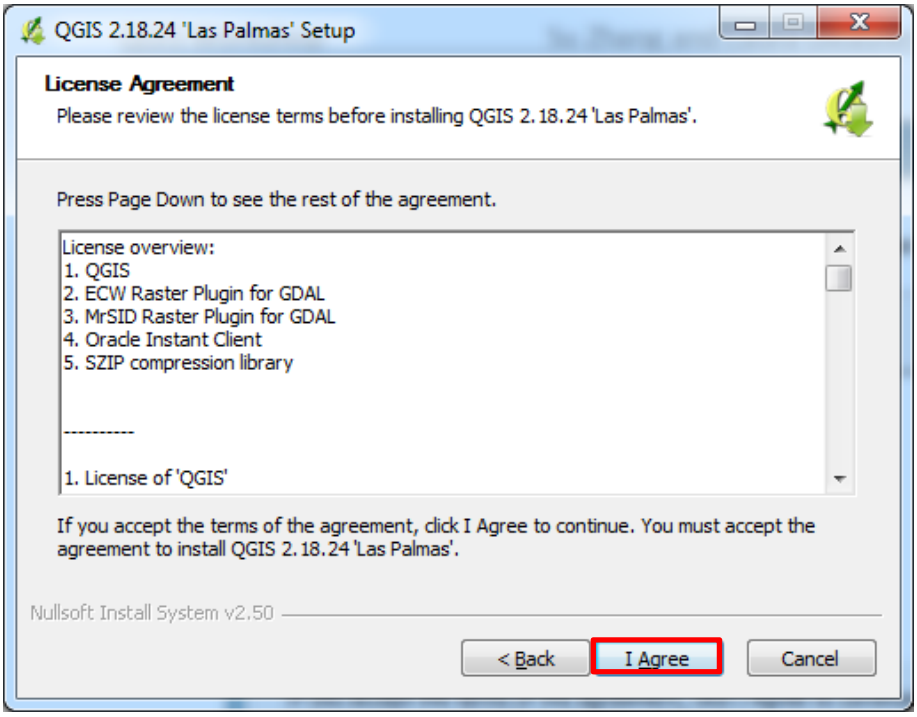
(4) Click on the QGIS Standalone Installer Version 2.18 (64 bit) and the web browser should be able to automatically download the installer

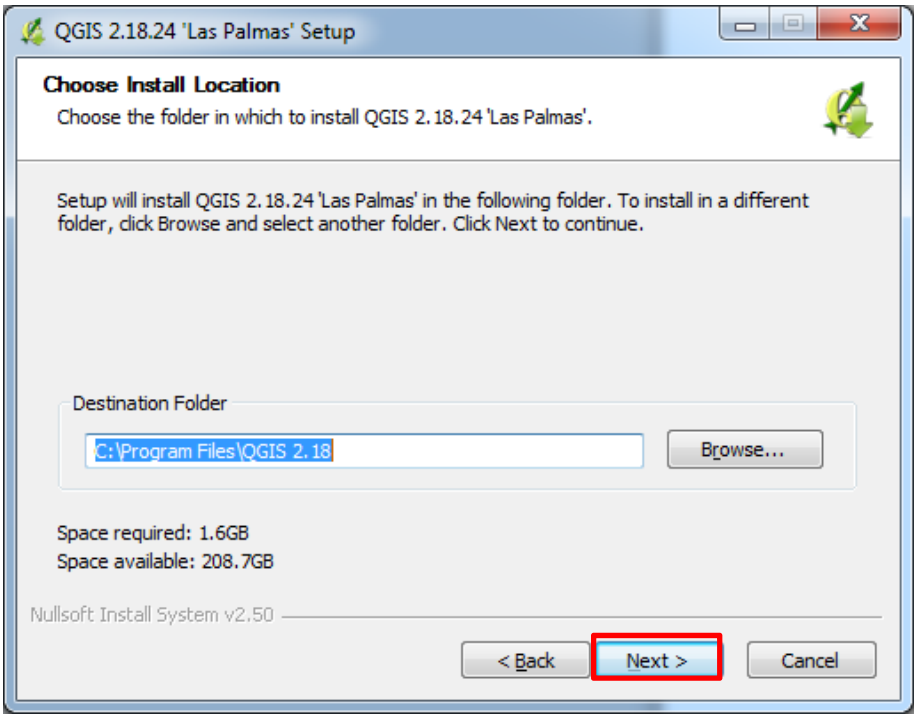


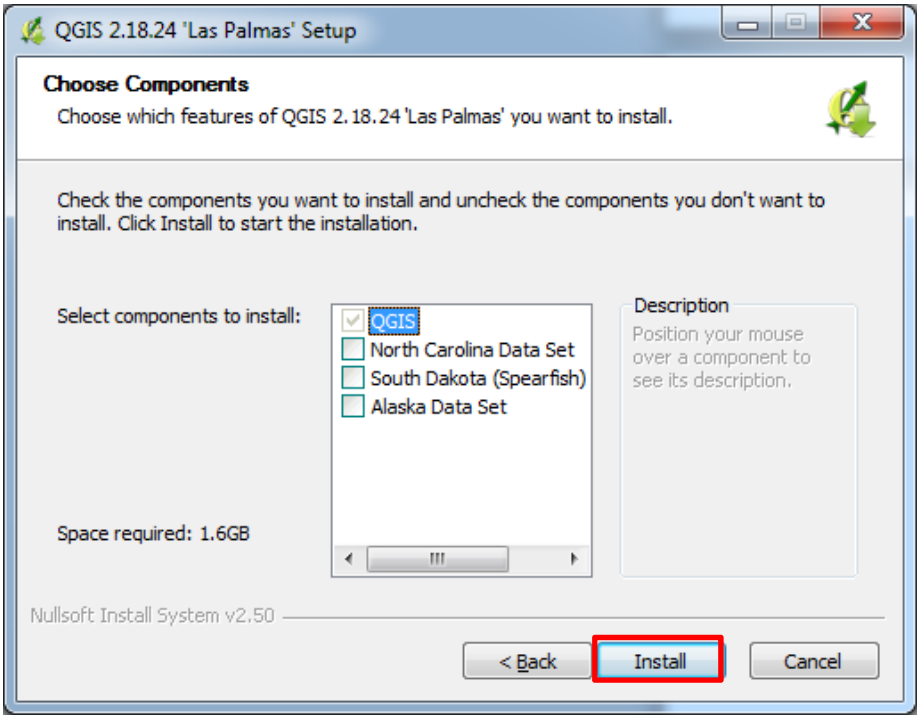
2. Install QGIS

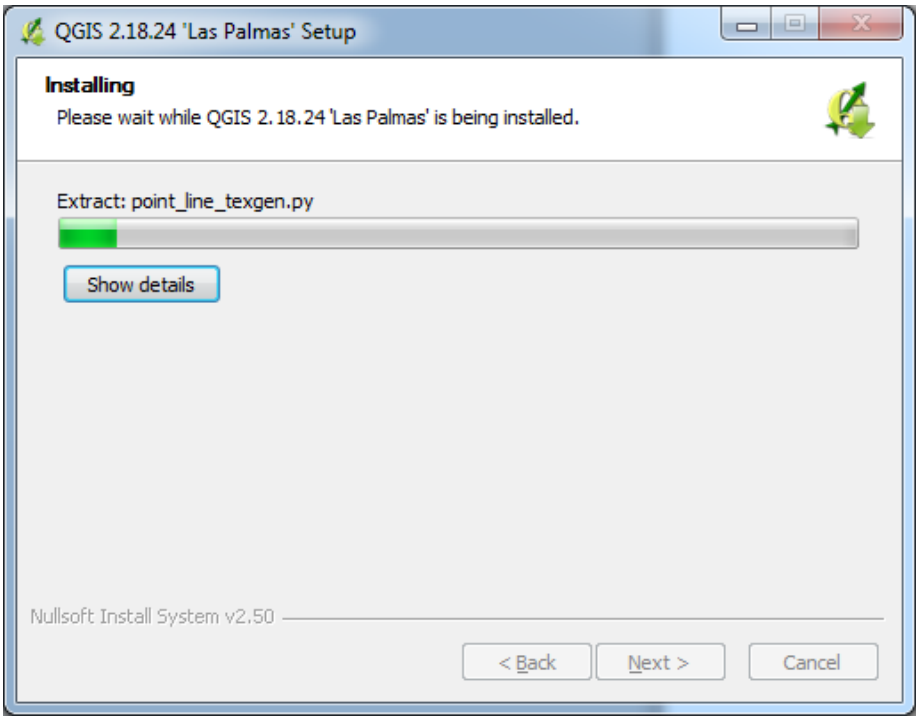
(1) Double click the installer; QGIS Setup Wizard will pop up; click Next to start the installation process; you will see a few dialogues including the License Agreement, Installation Location, and Components to Install, etc.



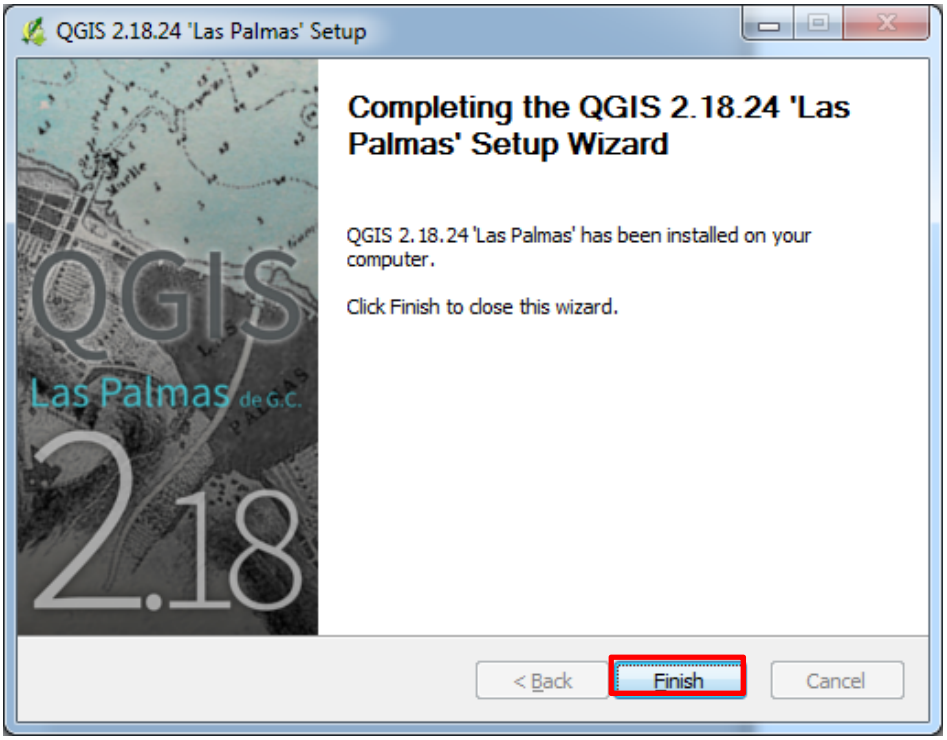

QGIS 2.18.24 'Las Palmas' Setup
License Agreement
Please review the license terms before installing QGIS 2.18.24 'Las Palmas'.
Press Page Down to see the rest of the agreement.
License overview:
1. QGIS
2. ECW Raster Plugin for GDAL
3. MrSID Raster Plugin for GDAL
4. Oracle Instant Client
5. SZIP compression library
---
1. License of 'QGIS'
If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install QGIS 2.18.24 'Las Palmas'.
Nullsoft Install System v2.50
< Back
I Agree
Cancel


QGIS 2.18.24 'Las Palmas' Setup
Choose Install Location
Choose the folder in which to install QGIS 2.18.24 'Las Palmas'.
Setup will install QGIS 2.18.24 'Las Palmas' in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\Program Files\QGIS 2.18
Browse...
Space required: 1.6GB
Space available: 208.7GB
Nullsoft Install System v2.50
< Back
Next >
Cancel


QGIS 2.18.24 'Las Palmas' Setup
Choose Components
Choose which features of QGIS 2.18.24 'Las Palmas' you want to install.
Check the components you want to install and uncheck the components you don't want to install. Click Install to start the installation.
Select components to install:
QGIS
North Carolina Data Set
South Dakota (Spearfish)
Alaska Data Set
Description
Position your mouse over a component to see its description.
Space required: 1.6GB
Nullsoft Install System v2.50
< Back
Install
Cancel


QGIS 2.18.24 'Las Palmas' Setup
Installing
Please wait while QGIS 2.18.24 'Las Palmas' is being installed.
Extract: point_line_texgen.py
Show details
Nullsoft Install System v2.50
< Back
Next >
Cancel

(2) Click “Finish” to complete the installation process



Note: if you are using Mac OS X, click “Download for Mac OS X”, and then select the version you want to download; the installation file (.dmg file) will be automatically downloading; you can install it directly. In the past, you have to the QGIS download page http://www.kyngchaos.com/software/qgis to do.

Note: for Linux please use the following command line for downloading and installation

sudo add-apt-repository http://qgis.org/debian

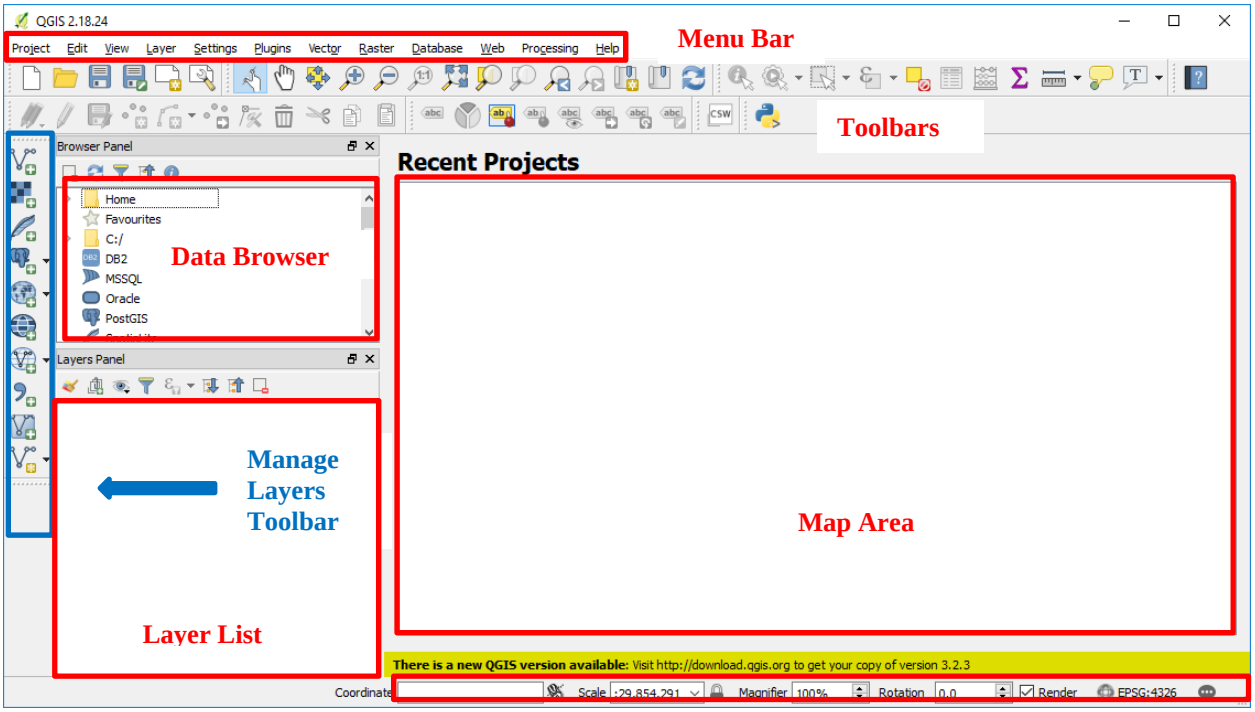
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-key CAEB3DC3BDF7FB45

sudo apt update

sudo apt install qgis

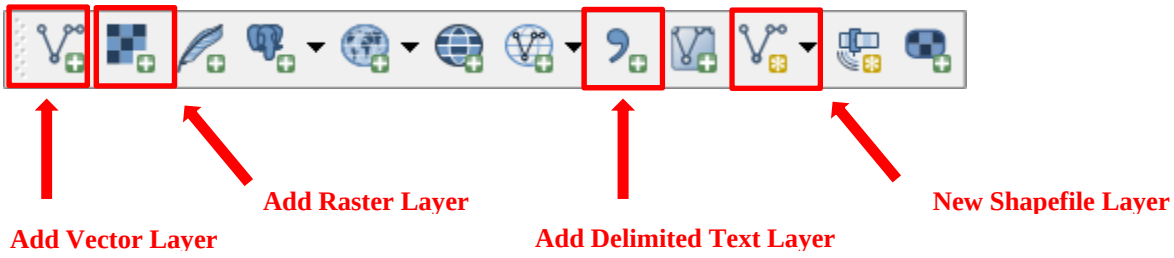
3. The QGIS Interface and Installing Plugins

(1) Start QGIS Desktop 2.18



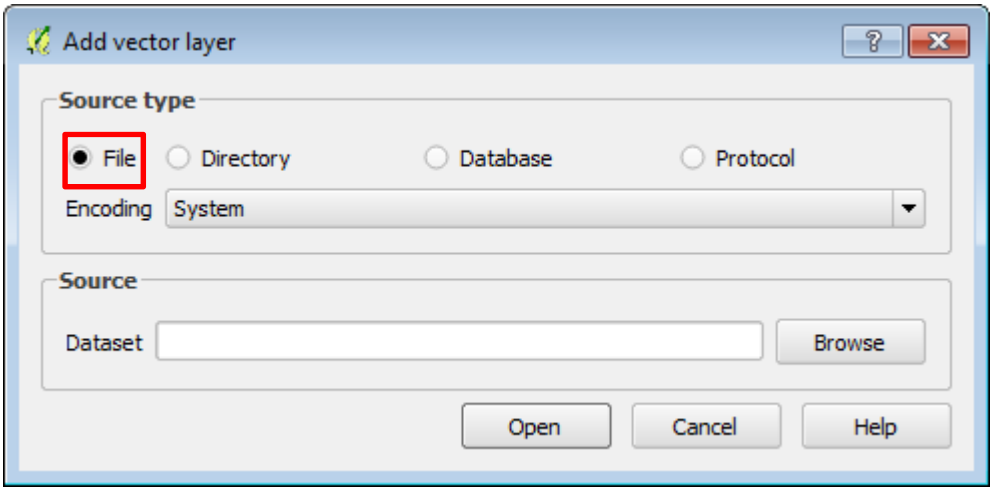
(2) You can move and dock any of the toolbars to a new location

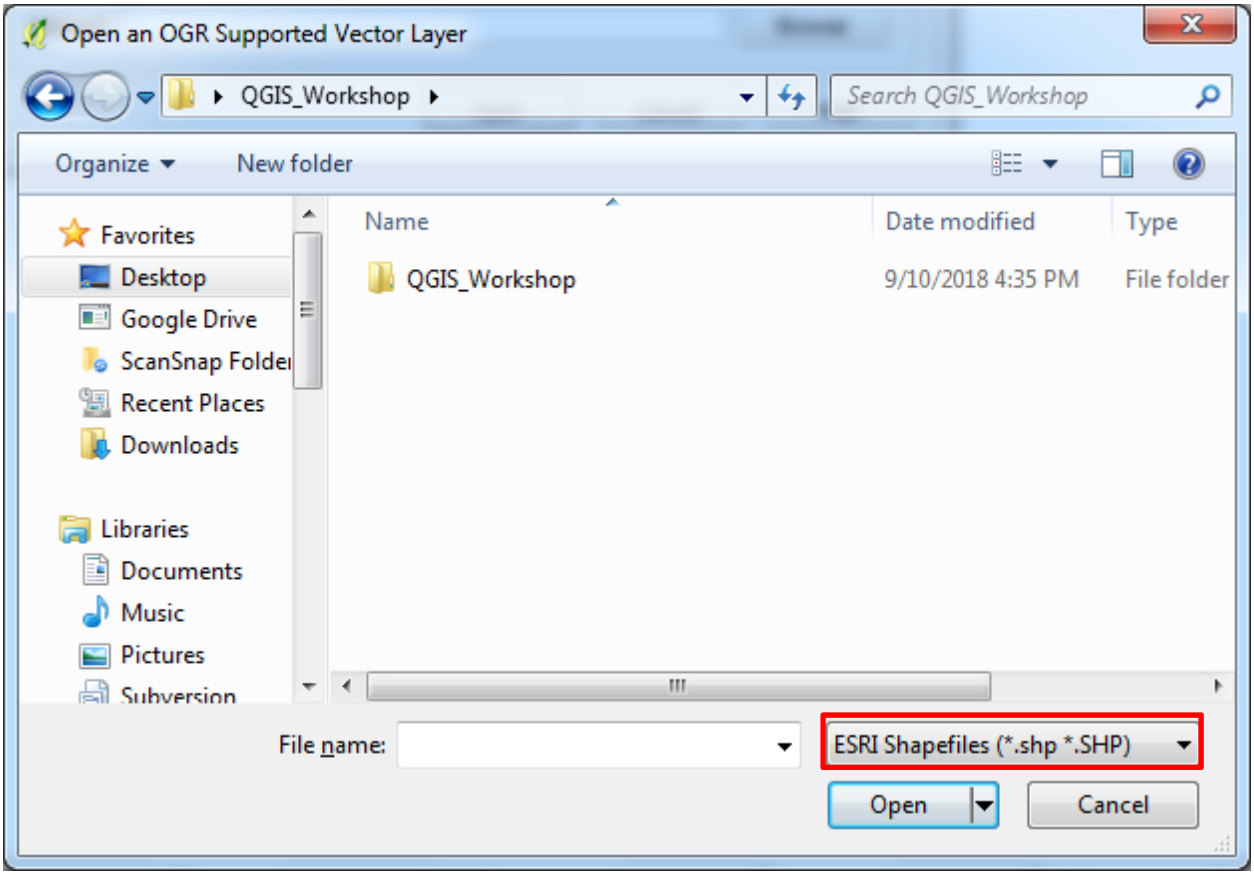
(3) You can add data by using the "Manage Layers Toolbar" or by dragging and dropping the correct file (.shp file, .tiff file, .img file, .bmp file, .csv file, etc.) to the Map Area. When using the "Manage Layers Toolbar", browse to the location of the input data folder for inserting. SpatiaLite layers, PostGIS layers, WMS/WFS/WCS layers, Virtual layers, Oracle GeoRaster layers can also be added by using the "Manage Layers Toolbar"

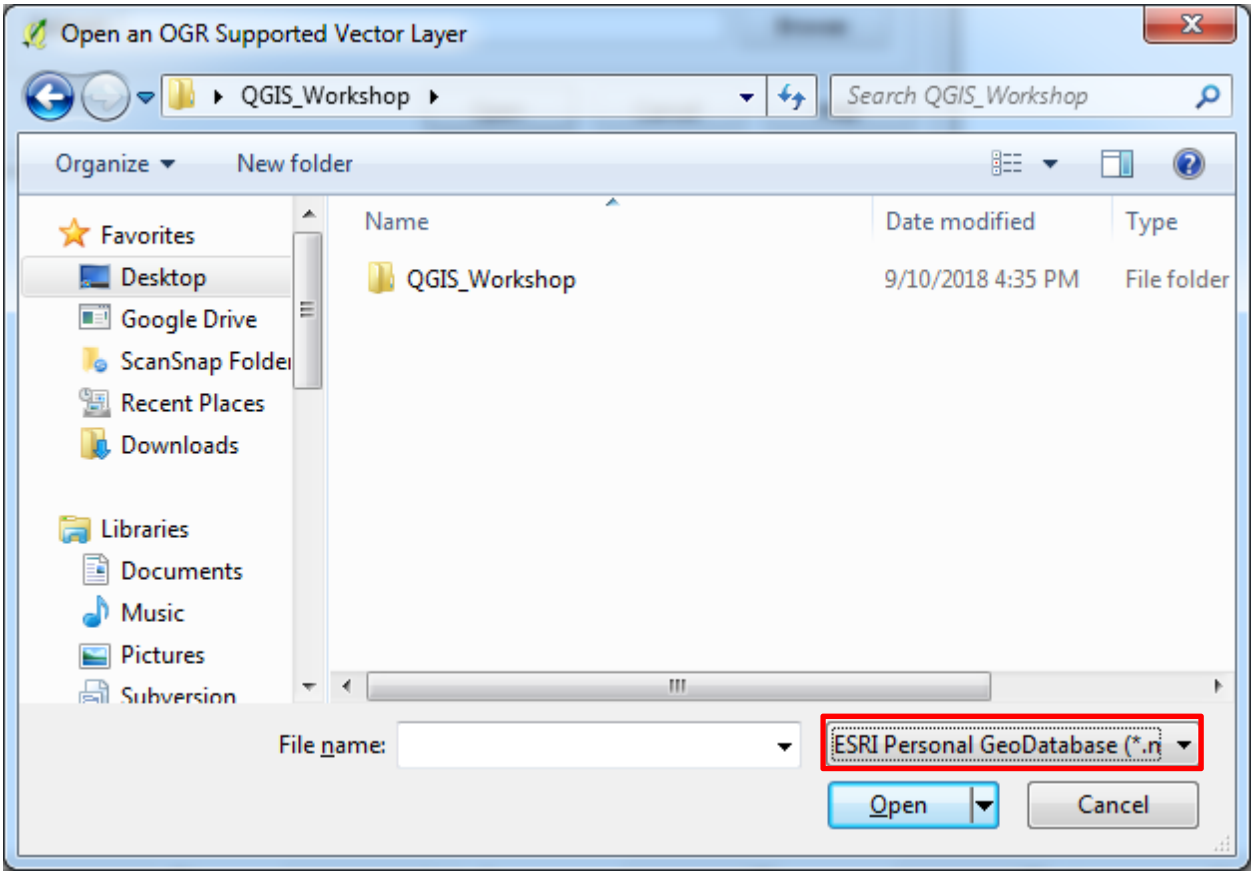


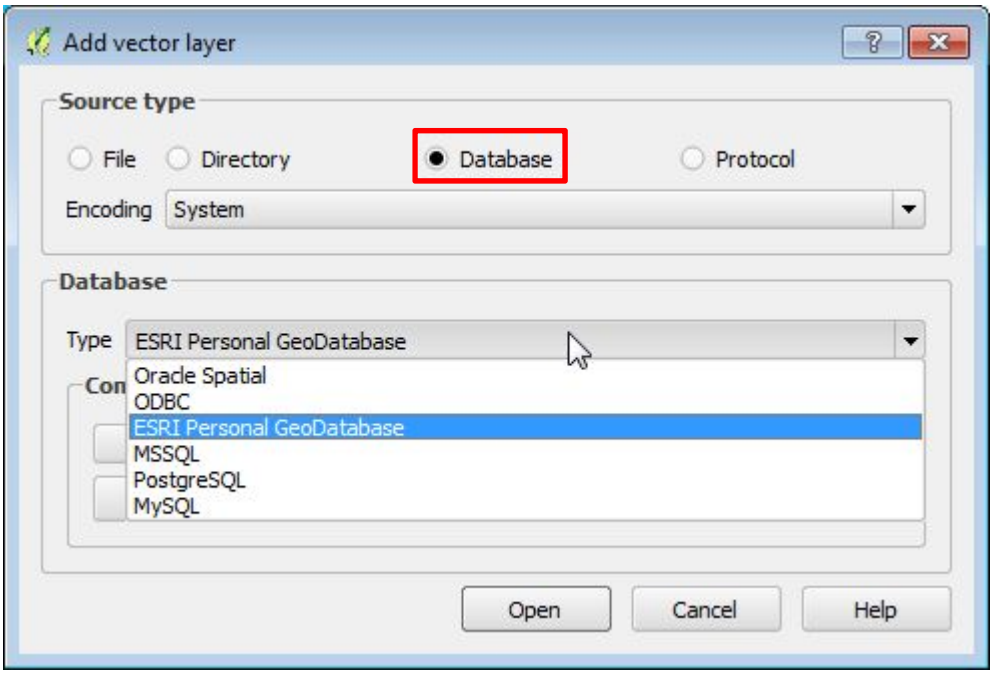
(4) Add vector layer; select Source type as File for shapefiles or desktop ESRI Personal Geodatabases; select Source type as Database for server hosted ESRI Personal Geodatabase or other types of databases

Note: File Geodatabase also works!





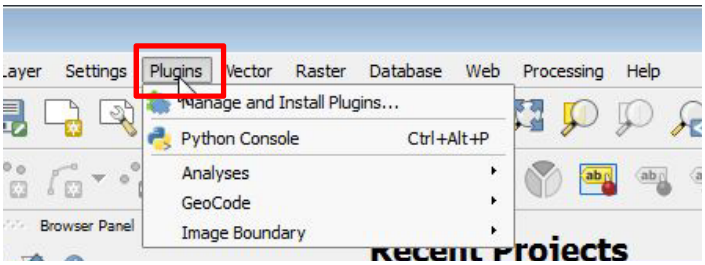

Open an OGR Supported Vector Layer
QGIS_Workshop
Search QGIS_Workshop
Organize
New folder
Favorites
Desktop
Google Drive
ScanSnap Folder
Recent Places
Downloads
Libraries
Documents
Music
Pictures
Subversion
Name
Date modified
Type
QGIS_Workshop
9/10/2018 4:35 PM
File folder
File name:
ESRI Personal GeoDatabase (*.gdb)
Open
Cancel


Add vector layer
Source type
File
Directory
Database
Protocol
Encoding
System
Database
Type
ESRI Personal GeoDatabase
Oracle Spatial
ODBC
ESRI Personal GeoDatabase
MSSQL
PostgreSQL
MySQL
Open
Cancel
Help

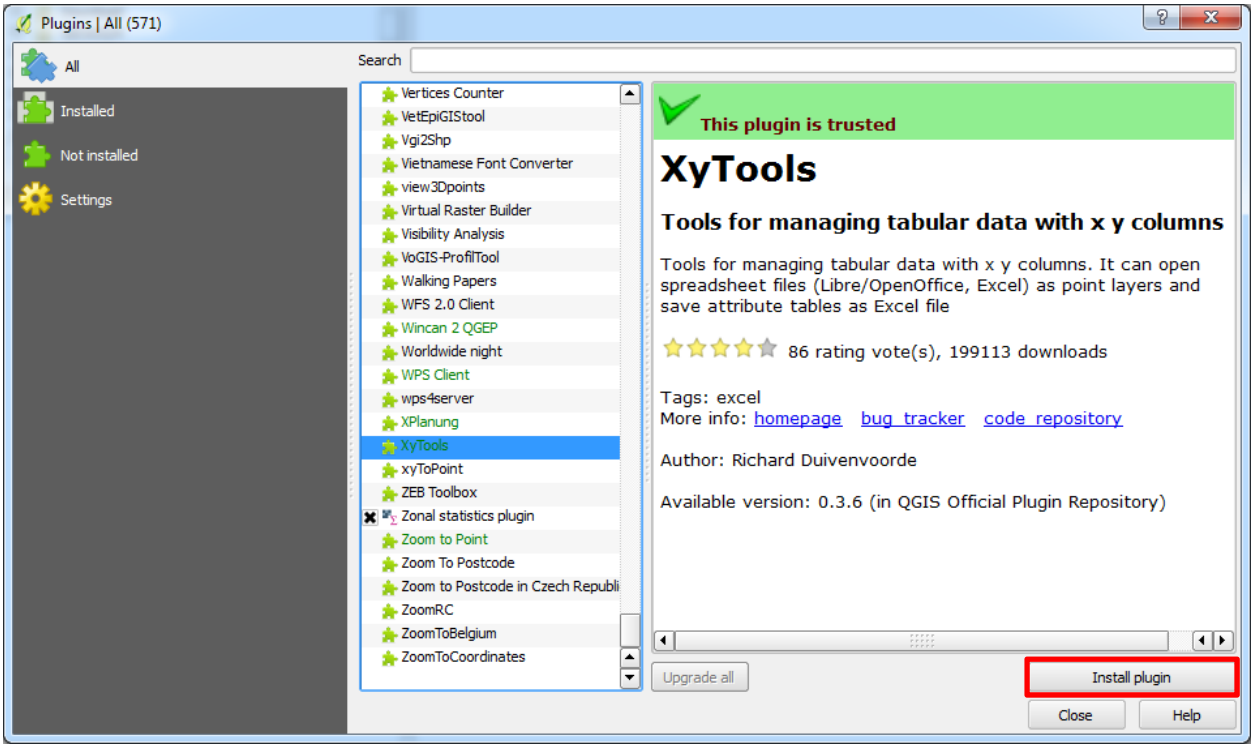
4. Installing Plugins

Many default tools come with QGIS installation. QGIS also has “Plugins” available to help the users with geoprocessing tasks. One of the great benefits of QGIS is that it has an active development community which develops plugins to greatly extend QGIS’s functionality.

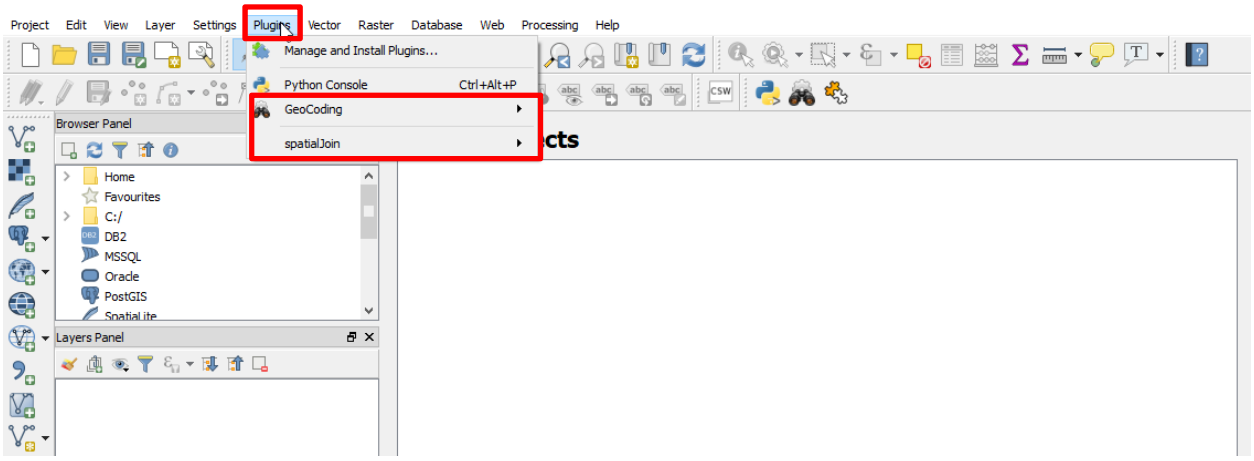
(1) Click the “Plugins” in the Menu Bar and then go to Manage and Install Plugins



(2) One example is provided here to demonstrate how to install plugins. In the Plugins dialogue, under the All Plugins, search for XyTools Plugin; when you find it, click on it and the explanation of this tool will be displayed on the right-hand side; click on “Install Plugin” to install it

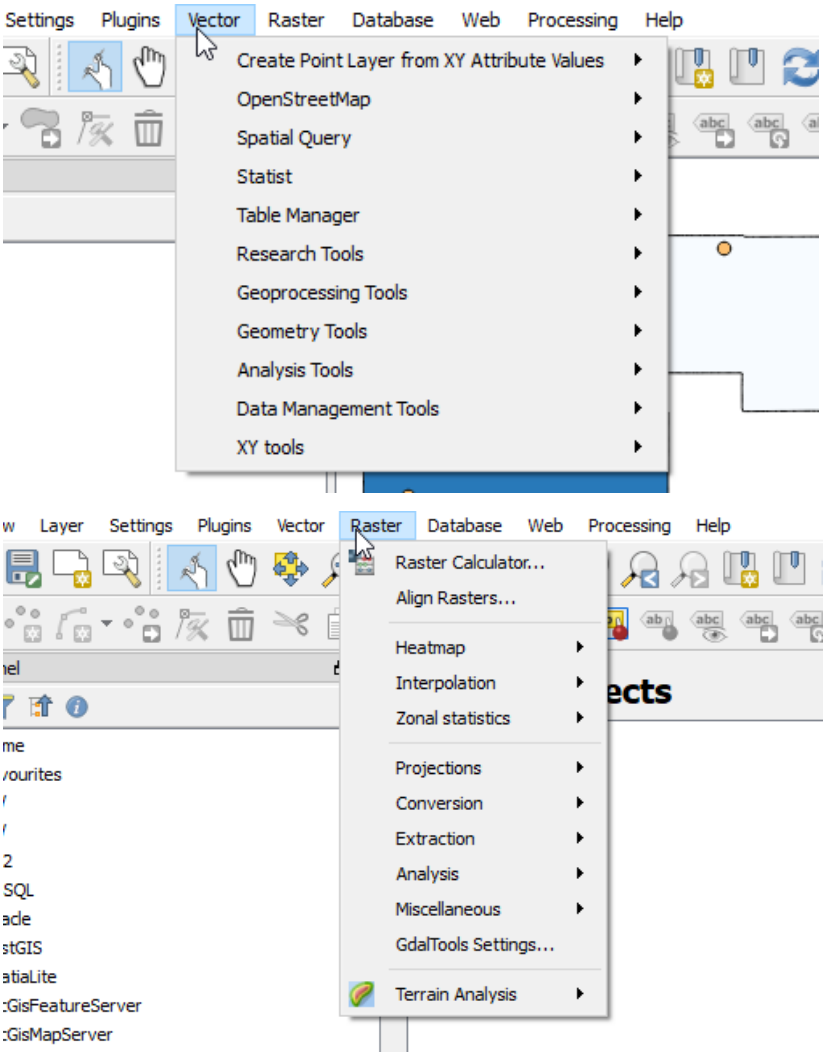


(3) Installed plugins could be located in different places. For example, the installed XyTools Plugin is located under Vector menu in the Menu Bar. Most of the installed plugins will be located under Plugins menu in the Menu Bar



(4) Some great plugins that you should consider

OpenLayer Plugins, Zonal Statistics, Heatmap, Table Manager, GeoCoding, and SpatialJoin, etc. There are many other available plugins provided by QGIS and you can explore them on your own time. For ESRI ArcMap users, you will discover that many of the QGIS tools have the same logic and functionality as ArcMap



Part C. Working with Vector Data

1. Adding Vector Data

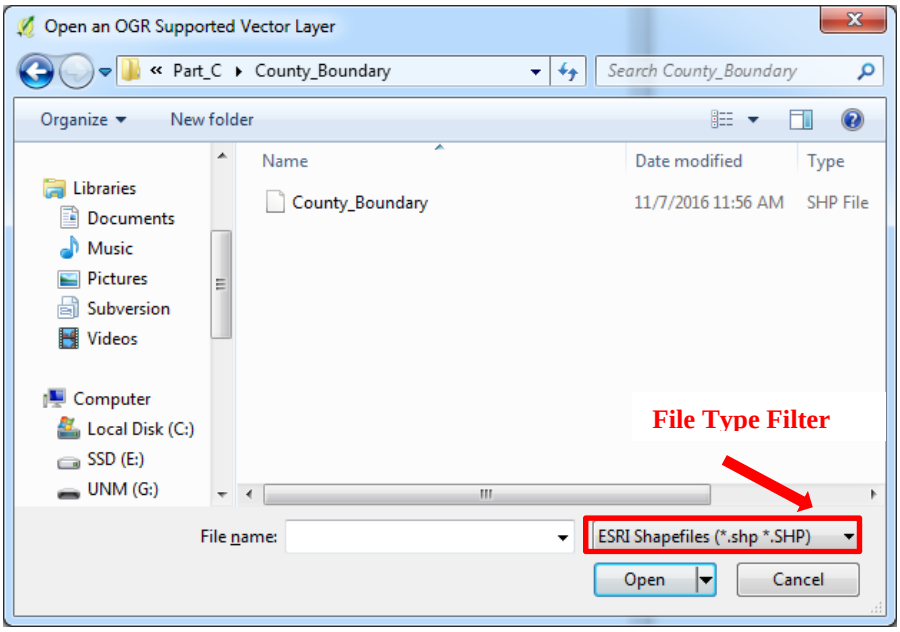
(1) Open QGIS Desktop application

(2) Navigate to the folder of QGIS_Training >>> Part_C >>> County_Boundary

(3) Click on the County_Boundary.shp and drag and drop it into your map area; you can also use the Add Vector Layer tool to add the layer; another option is using the Browser Panel to add data.

Note: To quickly locate .shp files, use the file type filter.

QGIS does not have one Add Data button, but rather many different buttons depending on your data type. This is a notable difference between ArcMap and QGIS.



2. Attribute Table

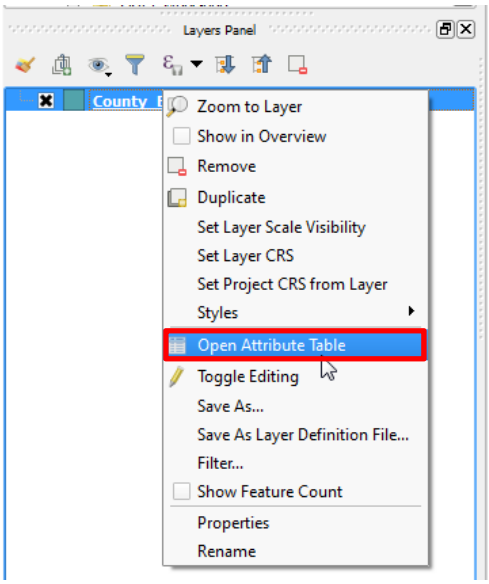
(1) Right-click on the County_Boundary layer in the Layers Panel

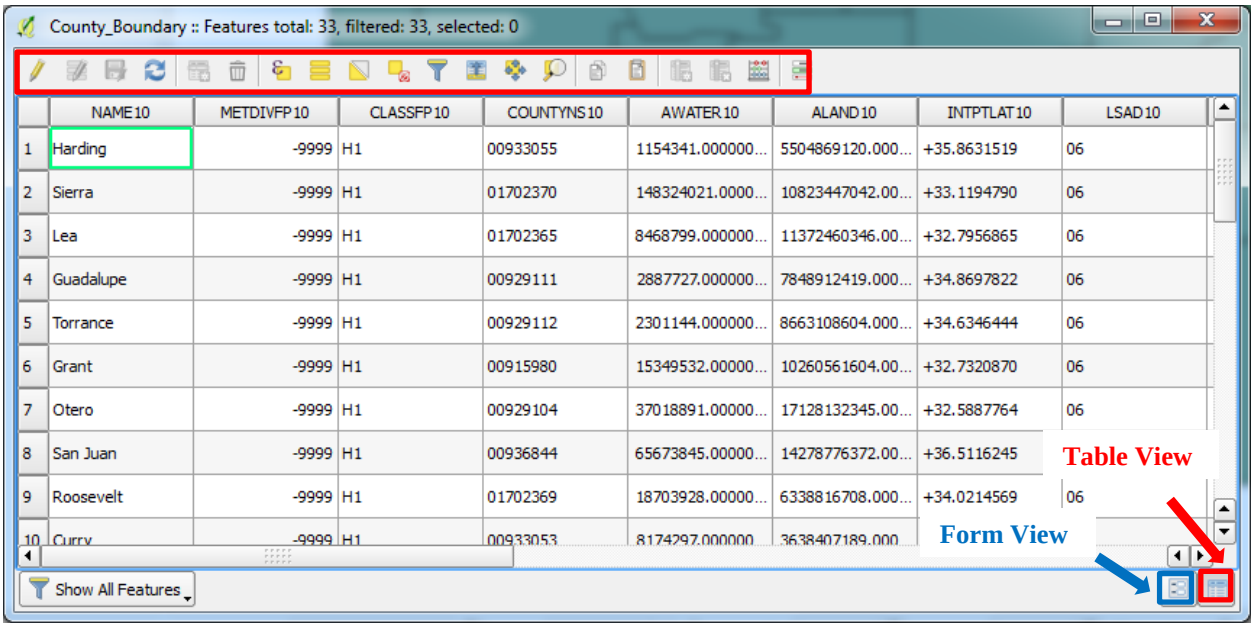
(2) Left-click on the Open Attribute Table option

(3) The design of the attribute table is very similar to ArcMap

(4) Unlike ArcMap, there are not FID and Shape fields

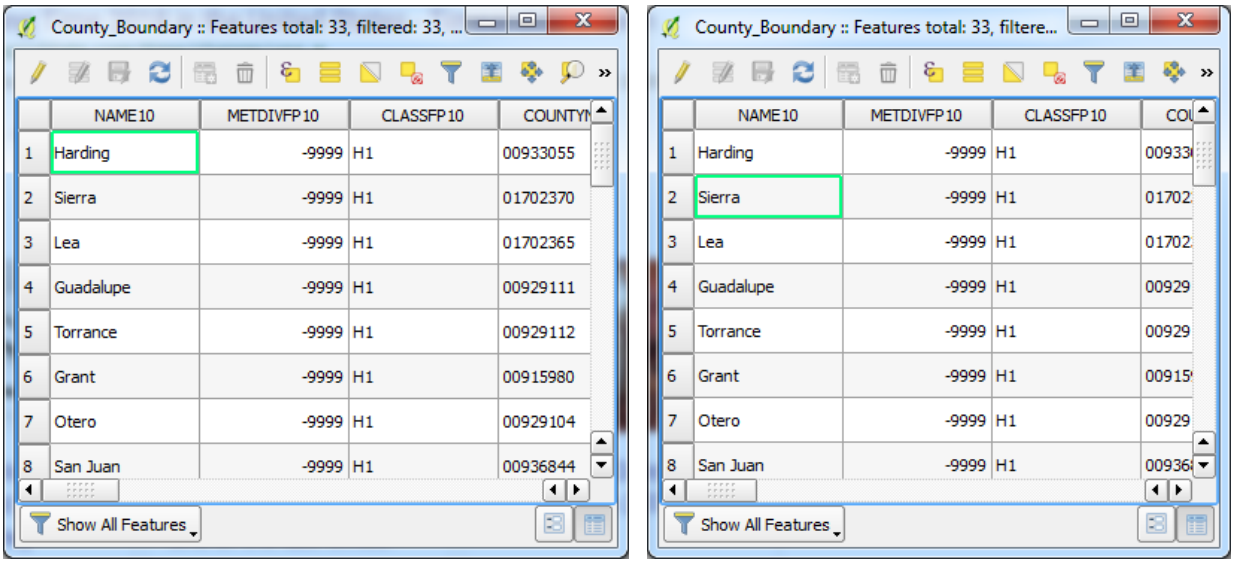
(5) In the attribute table, users can edit attributes, add features or delete features, select features, invert selection, deselect features, zoom map to the select row, move selection to the top, copy and paste selected features, create new fields, delete fields, and use field calculator (see below).





Note: In order to edit attributes, add or delete features, and create or delete fields, users need to click the button to toggle editing mode; to exit editing mode, left-click on the same button. Users can also right-click on the layer and then left-click on toggling editing to exit.

(6) Unlike ArcMap, users can open the same attribute table as many times as they want.



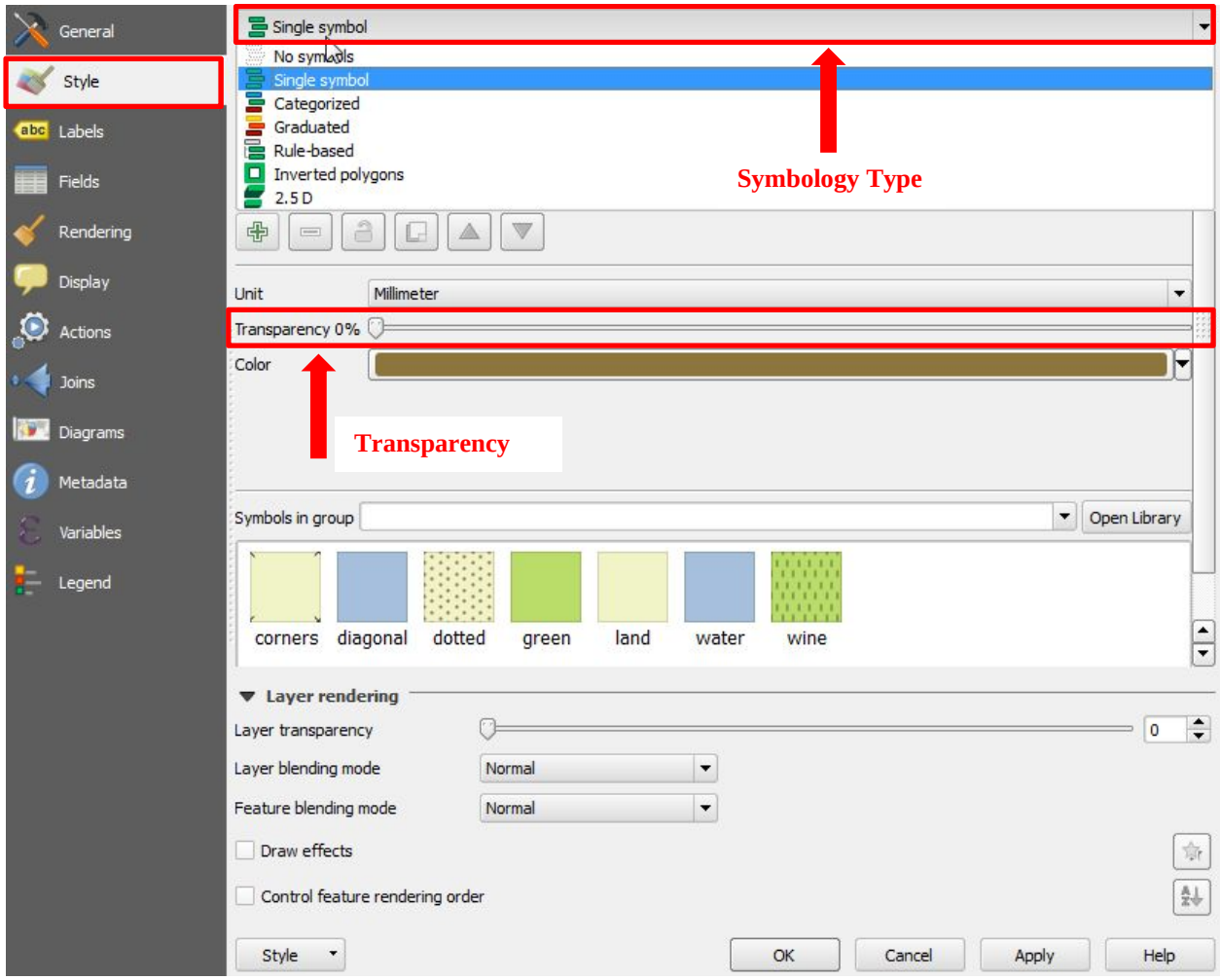
(7) Users can also sort a field by right-click on the field name and then select “Sort”; another simple way is left-click on the field name then it will automatically sort descending or ascending

(8) To see the summary statistics of a field, use the “Basic statistics for numerical (or text) fields” tools in Vector >>> Analysis Tools, users can also use the Statist plugin for the same function

(9) To rearrange the order of the fields, users need to install the Table Manager Plugin; users need to save the vector file (shapefiles or geodatabases) with rearranged fields as a new file to permanently keep the arrangements

3. Styling Vector Data

(1) Double-click on the County Boundary layer within the Layers Panel to bring up the layer's property dialogue; the default tab is Labels; click on the "Style" tab



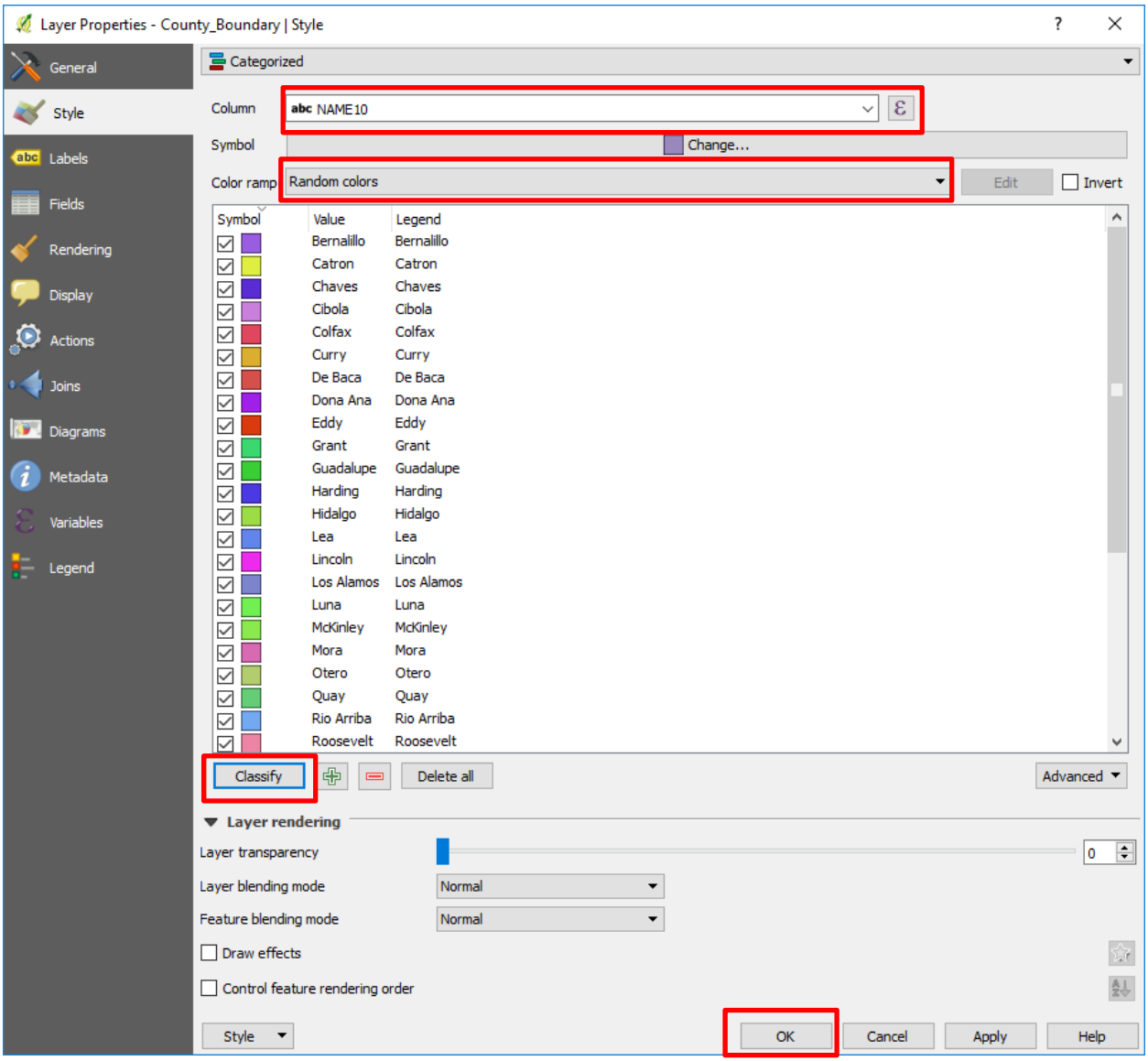
(2) Many symbology options are available, including

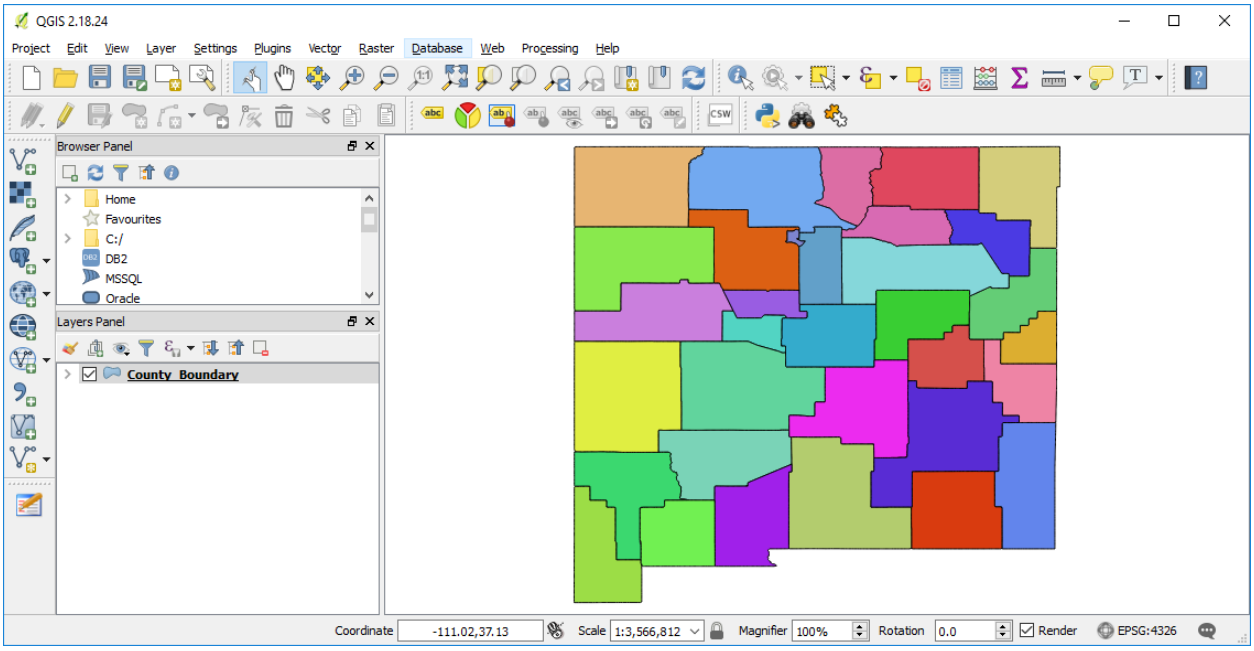
- Single symbol
- Categorized
- Graduated
- Rule-based
- Inverted polygons
- 2.5D

For this exercise, we will use Categorized. Change the Style from Single Symbol to Categorized

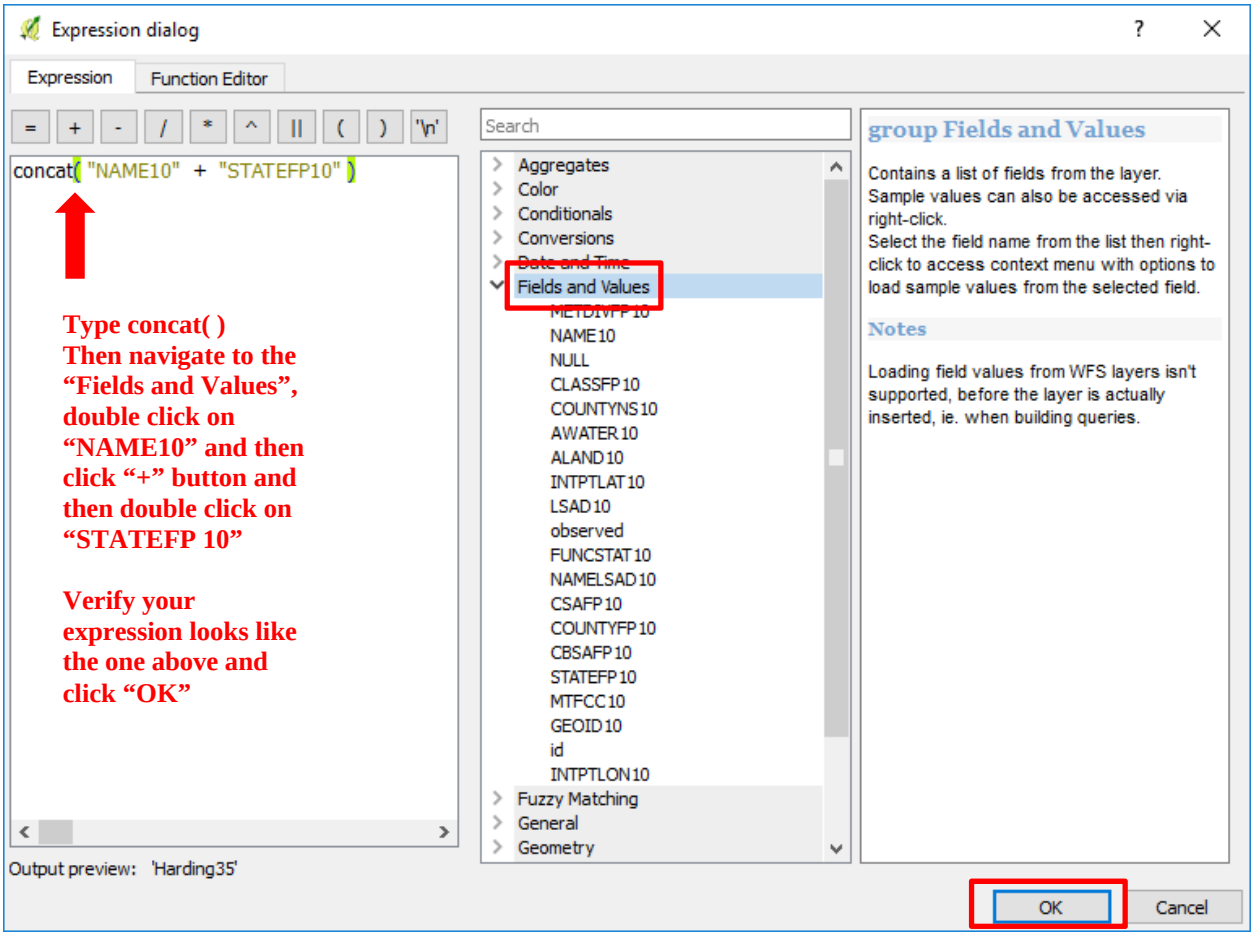
(3) Select NAME10 for Column

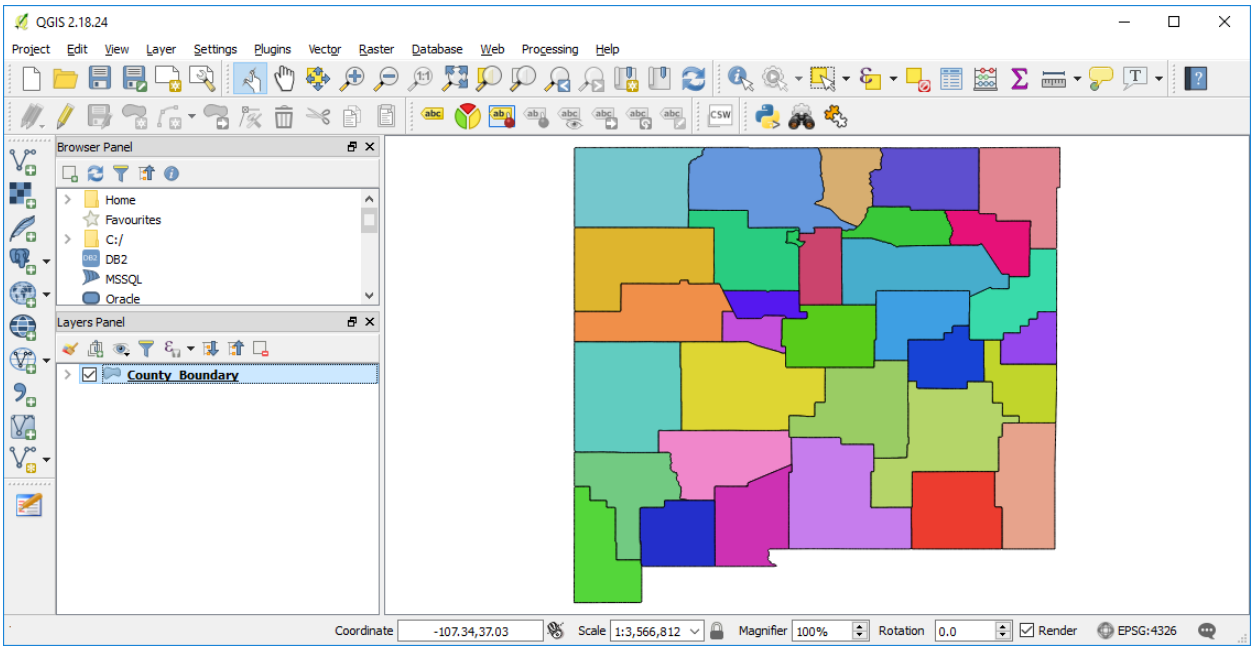
(4) Left-click on Classify; the symbols for different categories will display; and the color ramp will automatically change to "Random colors"


Layer Properties - County_Boundary | Style
General
Style
Labels
Fields
Rendering
Display
Actions
Joins
Diagrams
Metadata
Variables
Legend
Categorized
Column
NAME10
Symbol
Change...
Color ramp
Random colors
Edit
Invert
Symbol
Value
Legend
Bernalillo
Catron
Chaves
Cibola
Colfax
Curry
De Baca
Dona Ana
Eddy
Grant
Guadalupe
Harding
Hidalgo
Lea
Lincoln
Los Alamos
Luna
McKinley
Mora
Otero
Quay
Rio Arriba
Roosevelt
Classify
Delete all
Advanced
Layer rendering
Layer transparency
Layer blending mode
Normal
Feature blending mode
Normal
Draw effects
Control feature rendering order
Style
OK
Cancel
Apply
Help


QGIS 2.18.24
Project
Edit
View
Layer
Settings
Plugins
Vector
Raster
Database
Web
Processing
Help
Browser Panel
Home
Favourites
C:/
DB2
MSSQL
Oracle
Layers Panel
County_Boundary
Coordinate
-111.02,37.13
Scale
1:3,566,812
Magnifier
100%
Rotation
0.0
Render
EPSG:4326

(5) QGIS can also concatenate two fields (strings) for symbolization. Click the  button at the end of the Column row to start the “Expression dialog”; repeat previous steps for symbolization.



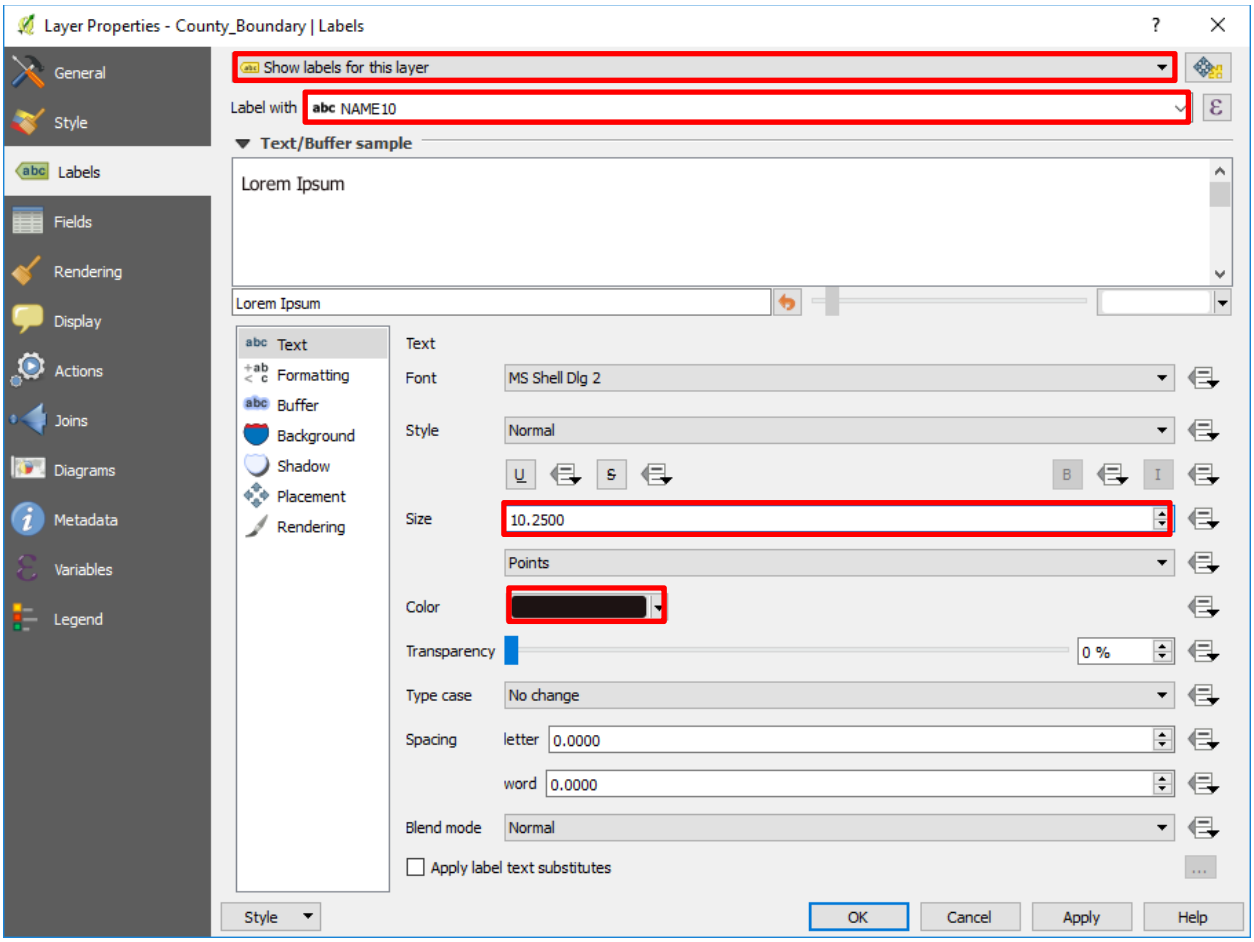


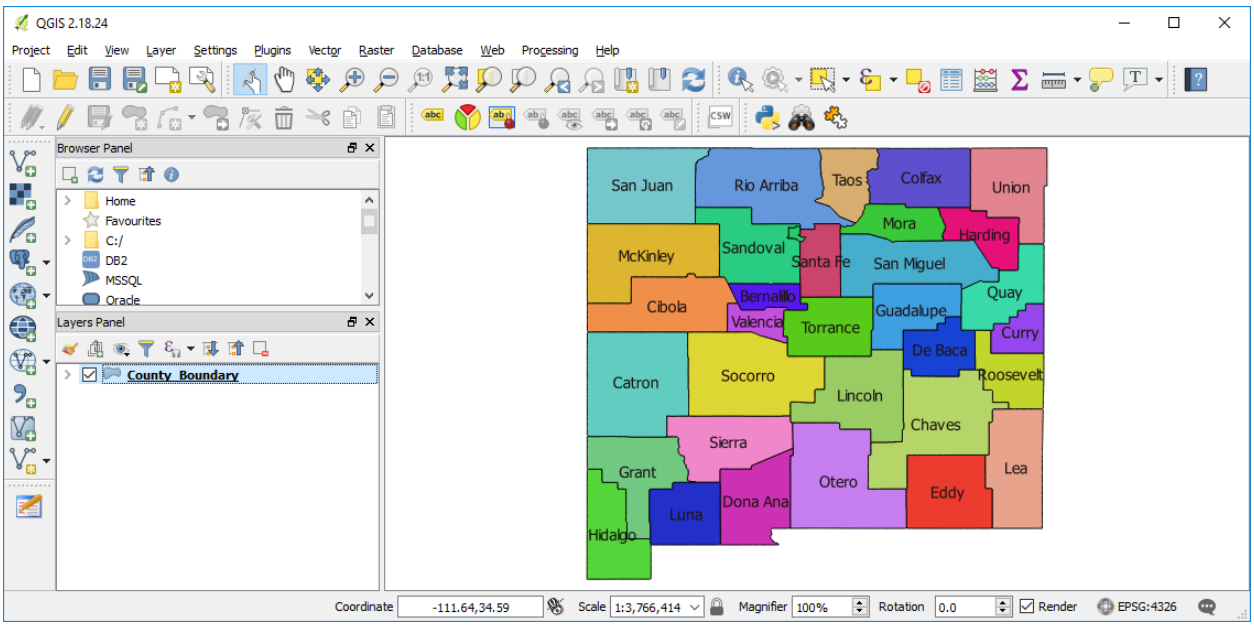
4. Labeling Vector Data

(1) Double-click on the County_Boundary layer within the Layers Panel to bring up the layer's property dialogue; click on the "Labels" tab

(2) Select "Show labels for this layer"

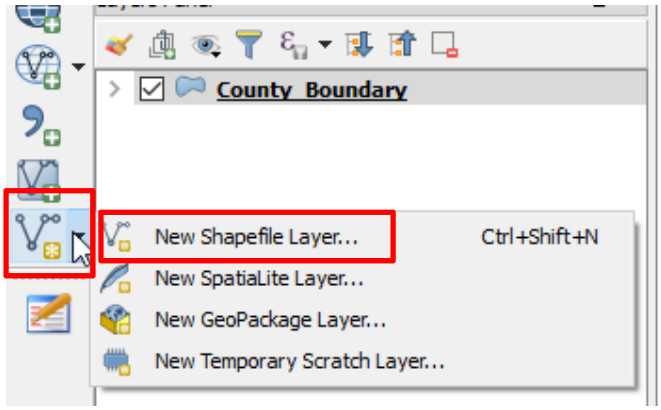
(3) Label with "NAME10"; choose an appropriate font size and color for display; click on OK

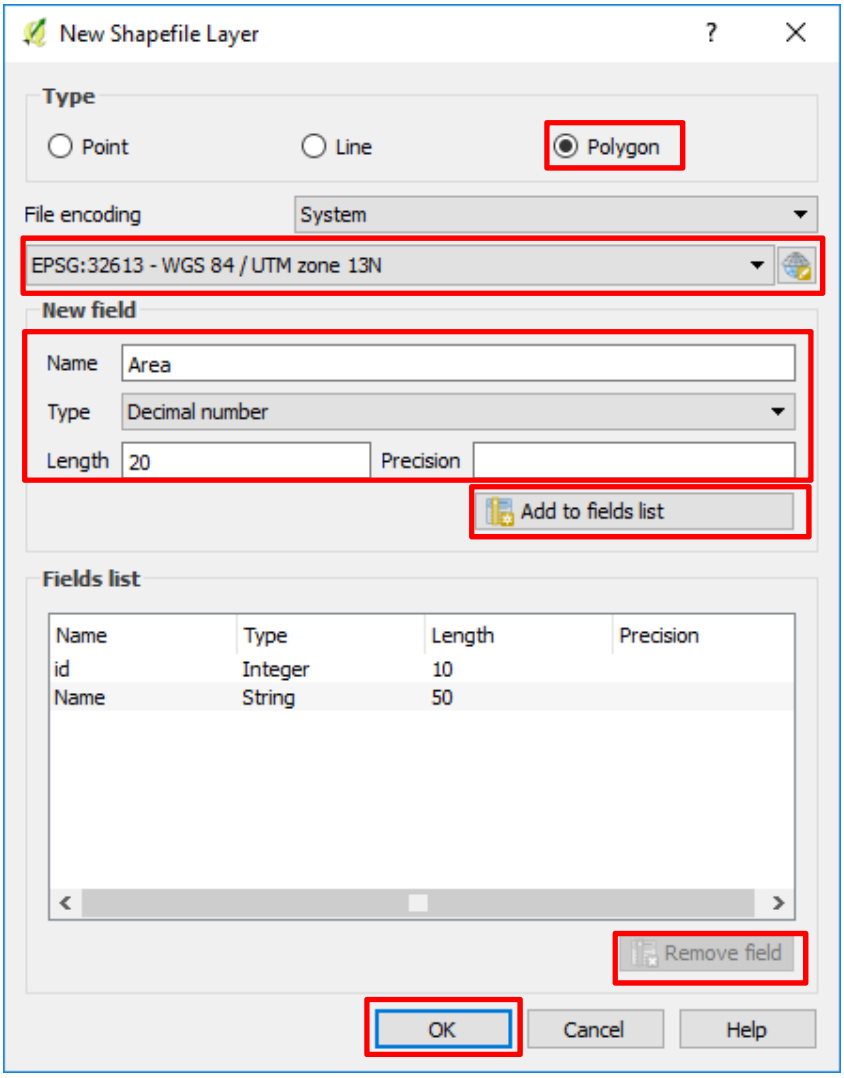




5. Creating New Vector Layers

(1) Click the New Shapefile Layer button; make sure the current selection is New Shapefile Layer because this tool can also be used to create New SpatiaLite Layer, New GeoPackage Layer, and New Temporary Scratch Layer; the New Shapefile Layer dialogue will pop up after click on "New Shapefile Layer"; fill in the Name for the New Field, Type, and other information. Click Add to fields list. Click OK

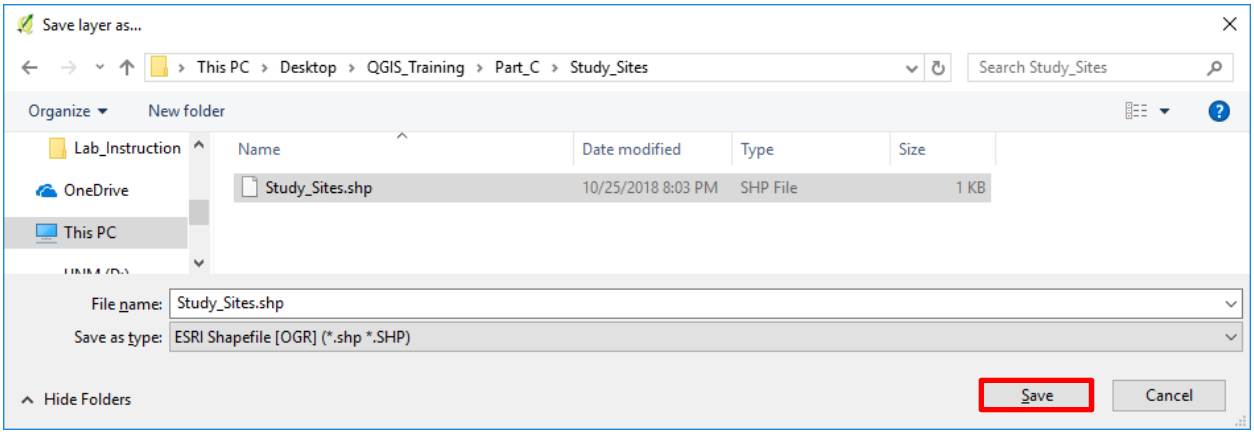




Select the type for the new shapefile.

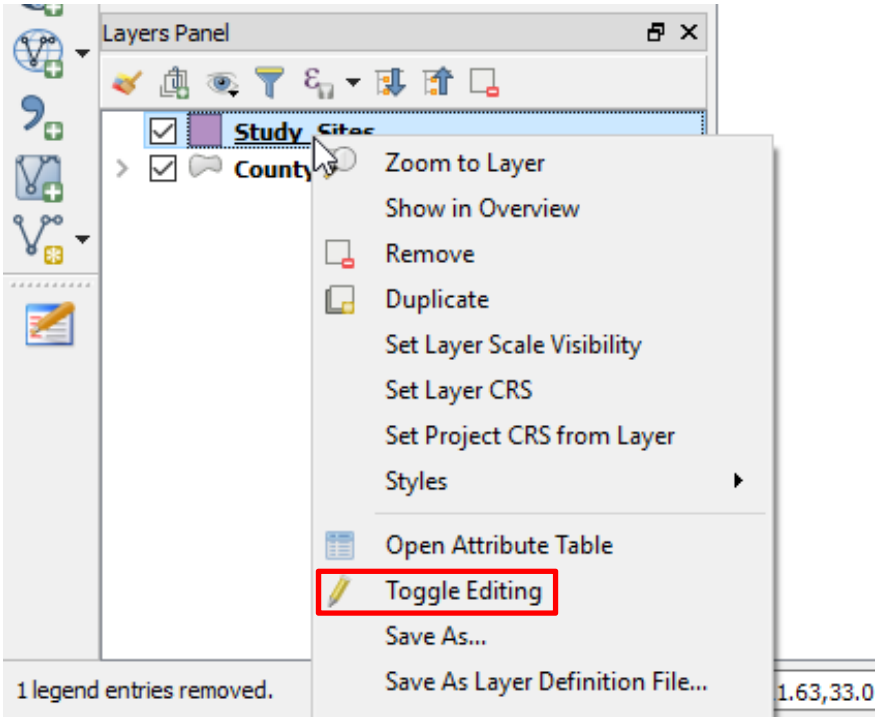
This can be used to remove fields.

(6) Once clicking on OK, the “Save layer as dialogue will display”; type in Study_Sites as the layer name; make sure the layer will be saved in QGIS_Training >>> Part_C >>> Study_Sites folder



(7) The Study_Sites layer will be automatically added to your Layers Panel

(8) Right-click on the Study_Sites layer and then click on Toggle Editing

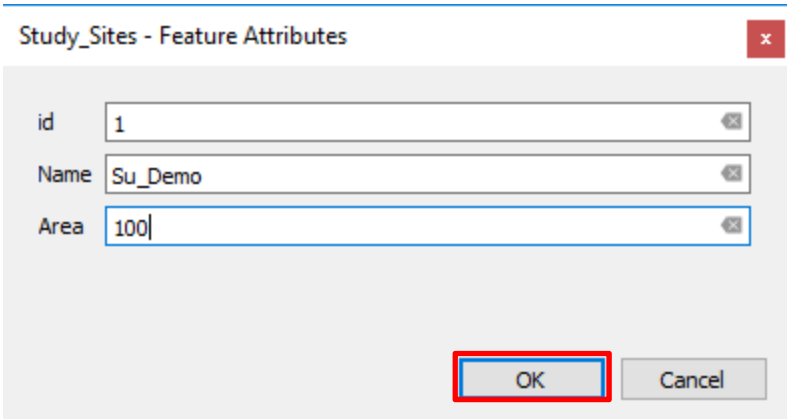


(9) Click on Add Feature button in the Digitizing Toolbar.

(10) Click on the Mapping Area to create a polygon, when done, right-click

(11) The Feature Attributes dialogue will display

(12) Type in the attributes value; for the Area field, just type in a random number for now; click on OK to finish the first feature

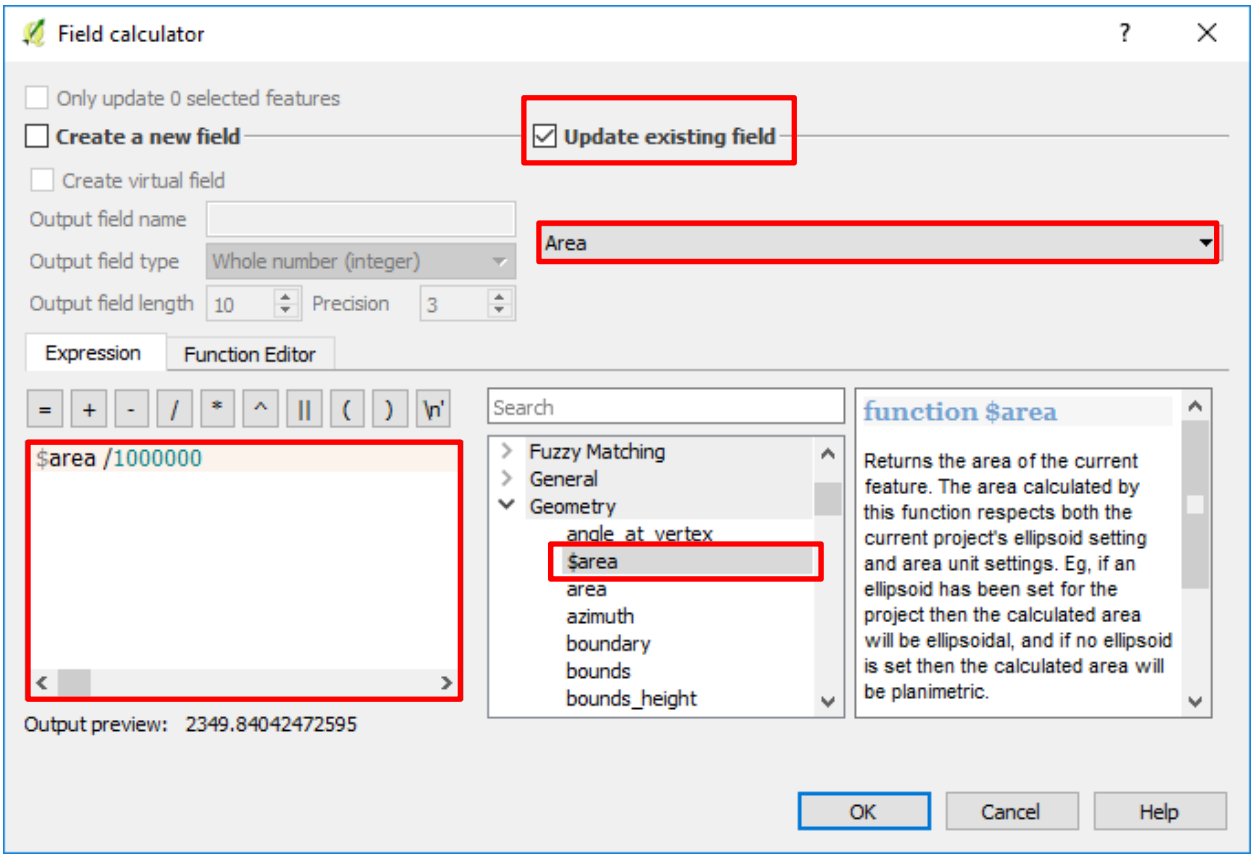


(13) To calculate the real area for the feature your just create, you need to update the existing area field; to do this, you need to set your current project's coordinate system to a projected coordinate system unless your layer is already in a projected coordinate system like we did when we created the Study_Sites layer; otherwise it will give you a "arcsec" value for area

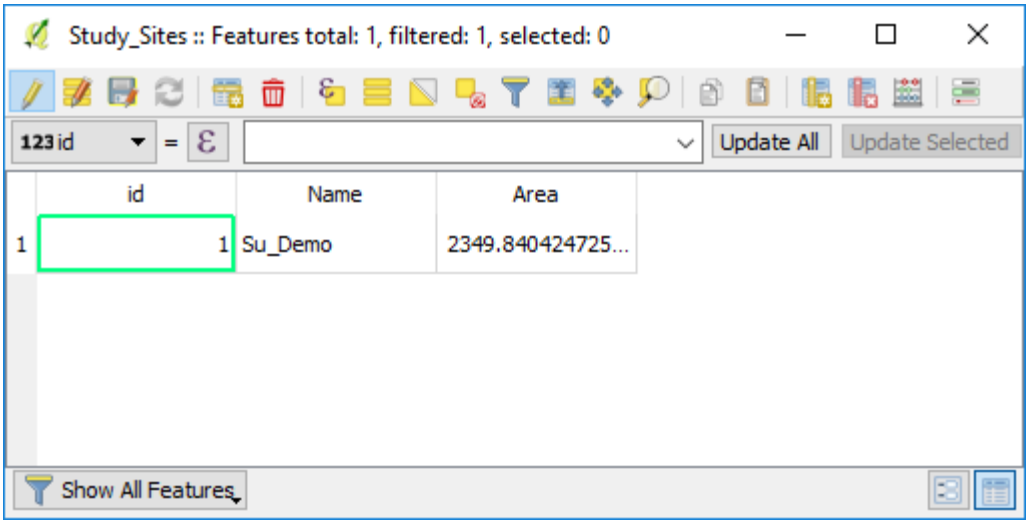
(14) To change the current project's coordinate system, go to Project >>> Project Properties >>> CRS >>> select an appropriate coordinate system such as NAD 83 UTM Zone 13 N or WGS84 UTM Zone 13 N

(15) Open the attribute table of the feature, and then click "Open field calculator" button

(16) Select "Update existing field", and then select $area; click on OK



(17) Your attribute table should look like this; notice that the area's unit is km^2

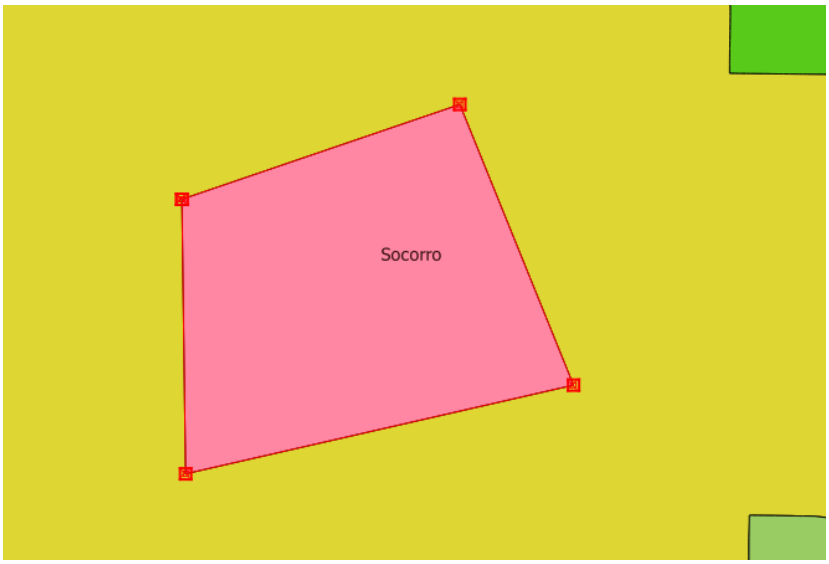


(18) When done, click the “Save Layer Edits” button in the Digitizing Toolbar; and then click on the “Toggle Editing” to turn off the editing mode

6. Editing Features

(1) In editing mode, click on the “Node Tool” button in the Digitizing Toolbar

(2) Click on the nodes of your feature of interest to start editing



(3) When done, click the “Node Tool” button again to stopping editing

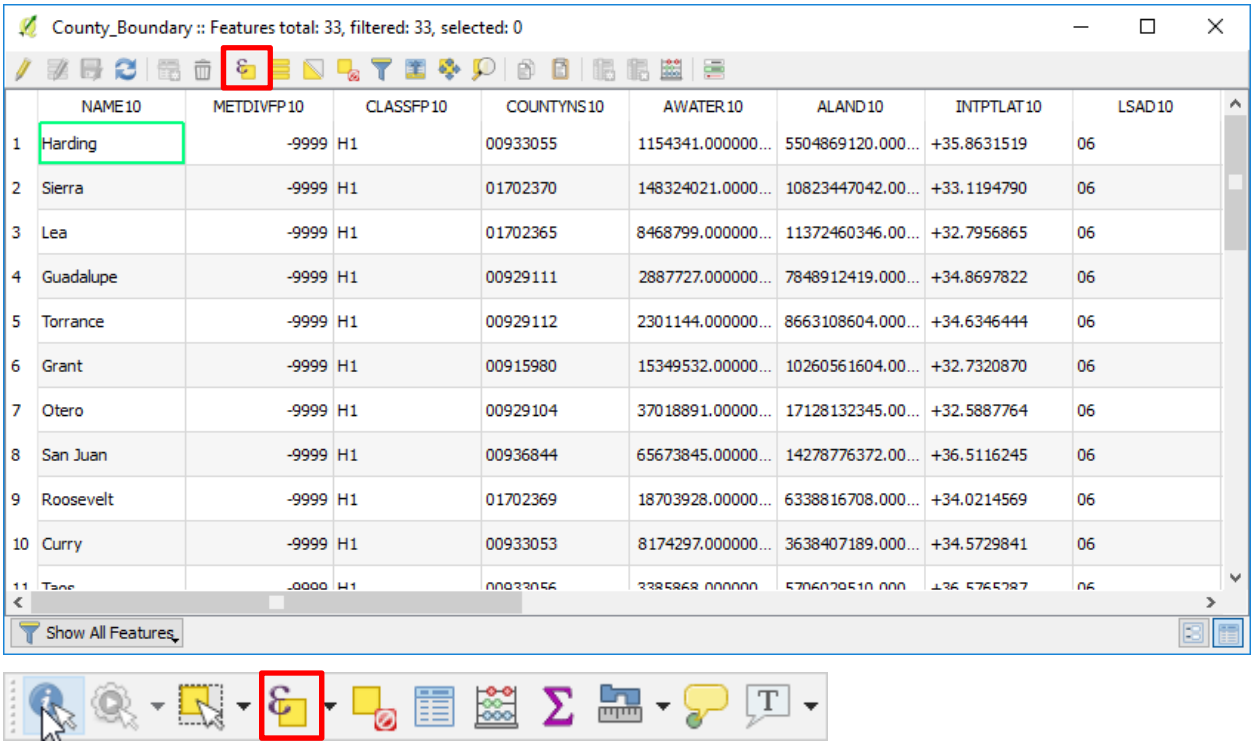
(4) Click the “Save Layer Edits” button to save your edits; and then click on the “Toggle Editing” to turn off the editing mode

(5) Like ArcMap, your area geometry value will not be updated automatically; you need to recalculate it after you made changes to your features

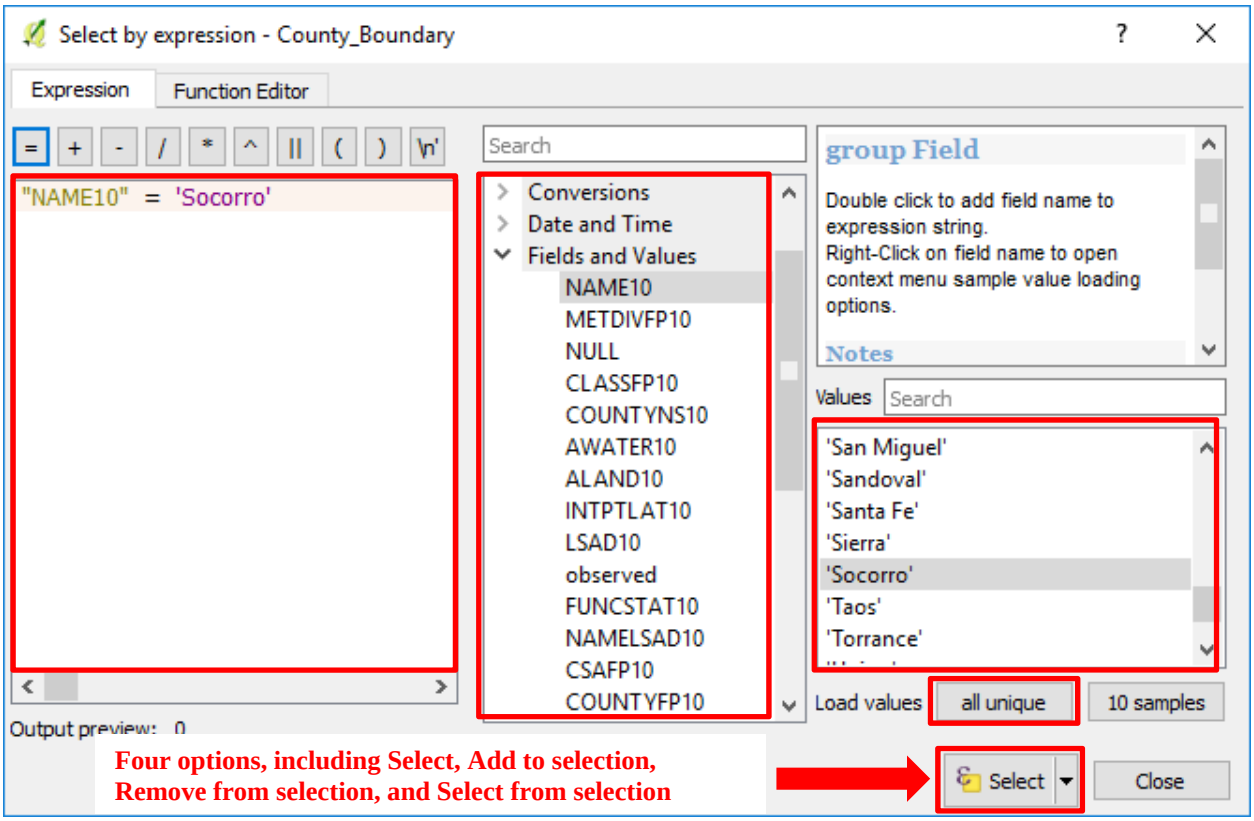
7. Data Query Based on Attributes

(1) Open the attribute table of the County_Boundary layer

(2) Click on the “Select features using an expression”; you can also activate this function by clicking on the “Select features using an expression” button in the “Attribute Toolbar”



(3) In the Select by expression dialogue, building the query expression.



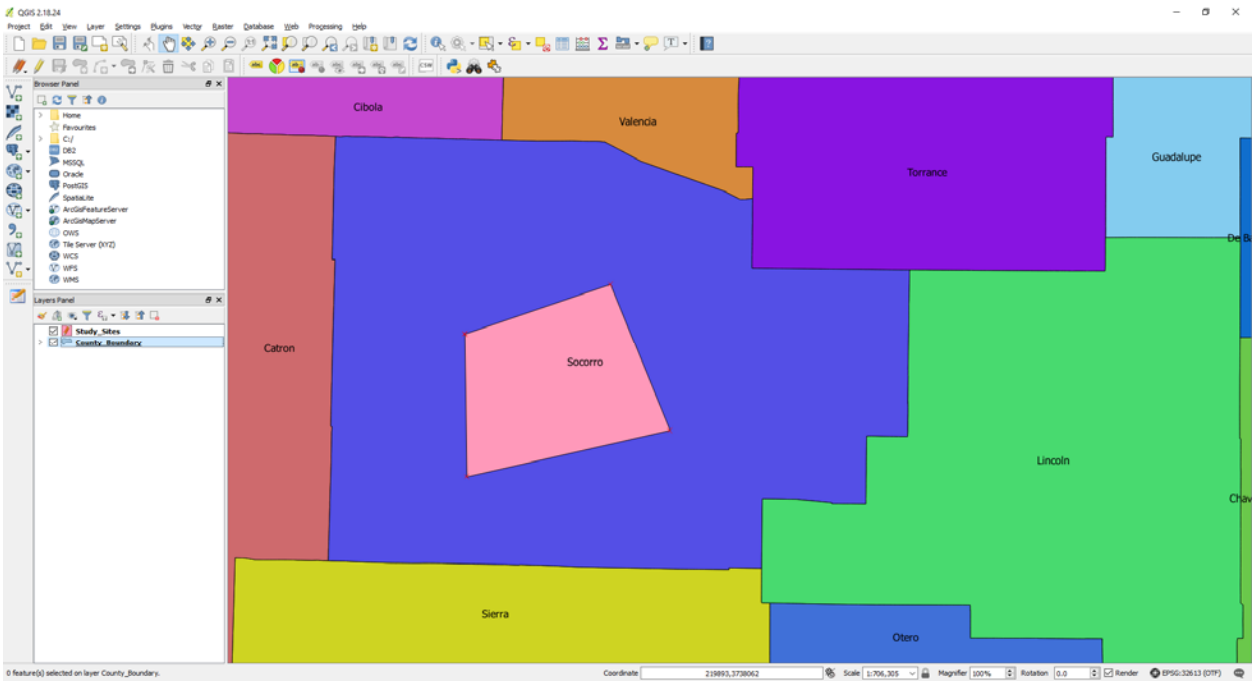
(4) Browse the Fields and Values to select the NAME10, double-click on it

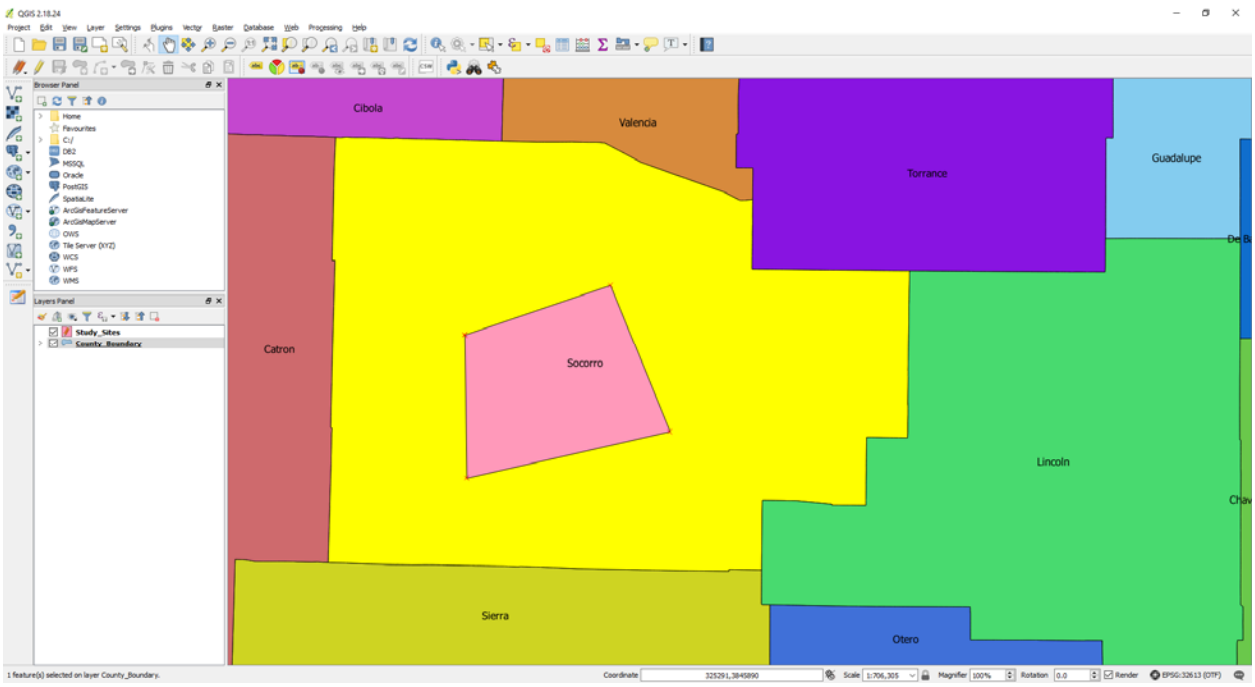
(5) Click the “=” sign under “Expression”

(6) Click “all unique” next to “Load Values”

(8) Click on Select

(9) Go to the mapping area and users can see selected features will be highlighted in yellow color.





8. Data Query Based on Location

(1) Load the Airport shapefile in the Part_C folder

(2) Go to Vector (in the Menu Bar) >>> Spatial Query

Note: two vector layers are required for this tool.

(3) The Spatial Query dialogue will display

(4) Select County_Boundary for “Select source features from”

(5) Select Contains for “Where the feature”

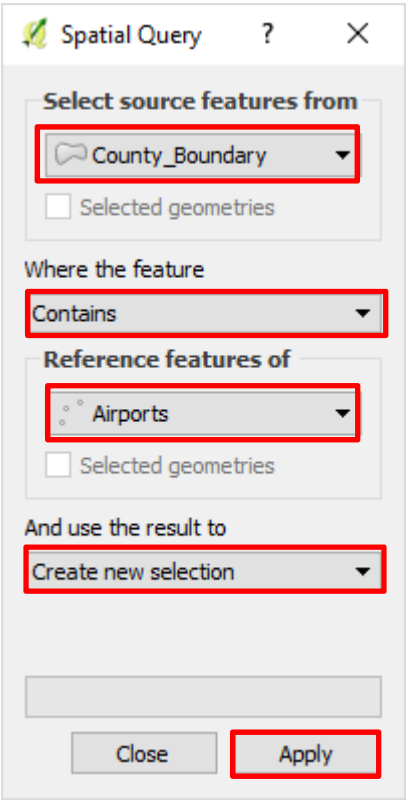
(6) Select Airports for “Reference features of”

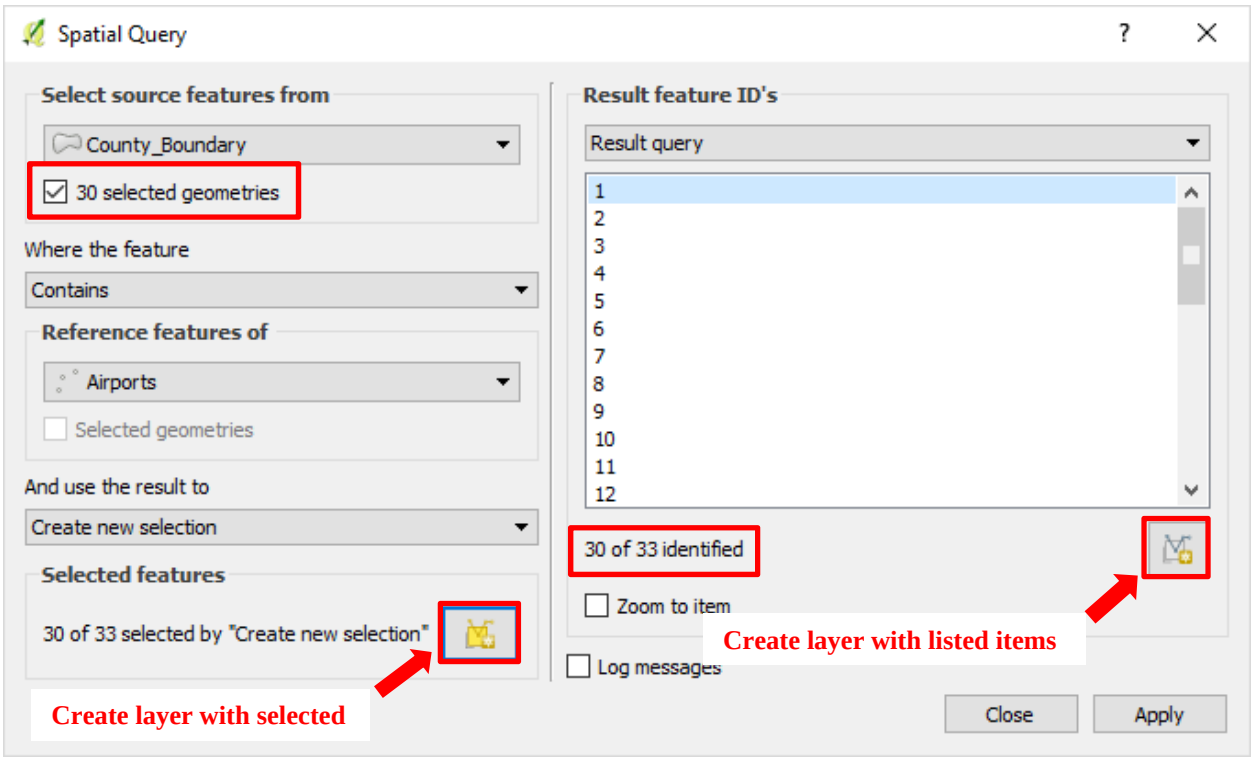
Select Create new selection for “And use the result to”

(7) Click on Apply

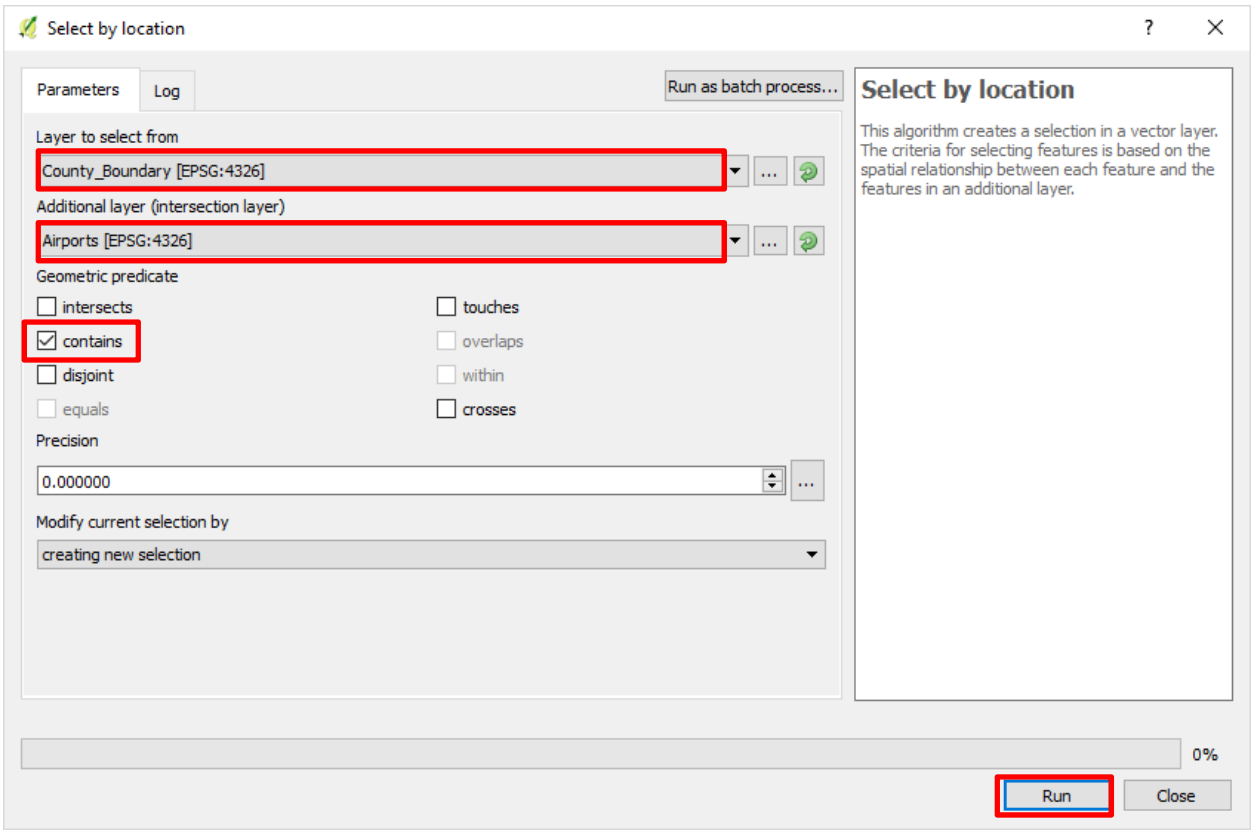
(8) In the result dialogue, select “Zoom to item” to see the selected feature

(9) Users can also click on “Create layer with selected” or “Create layer with listed items” to create a feature layer

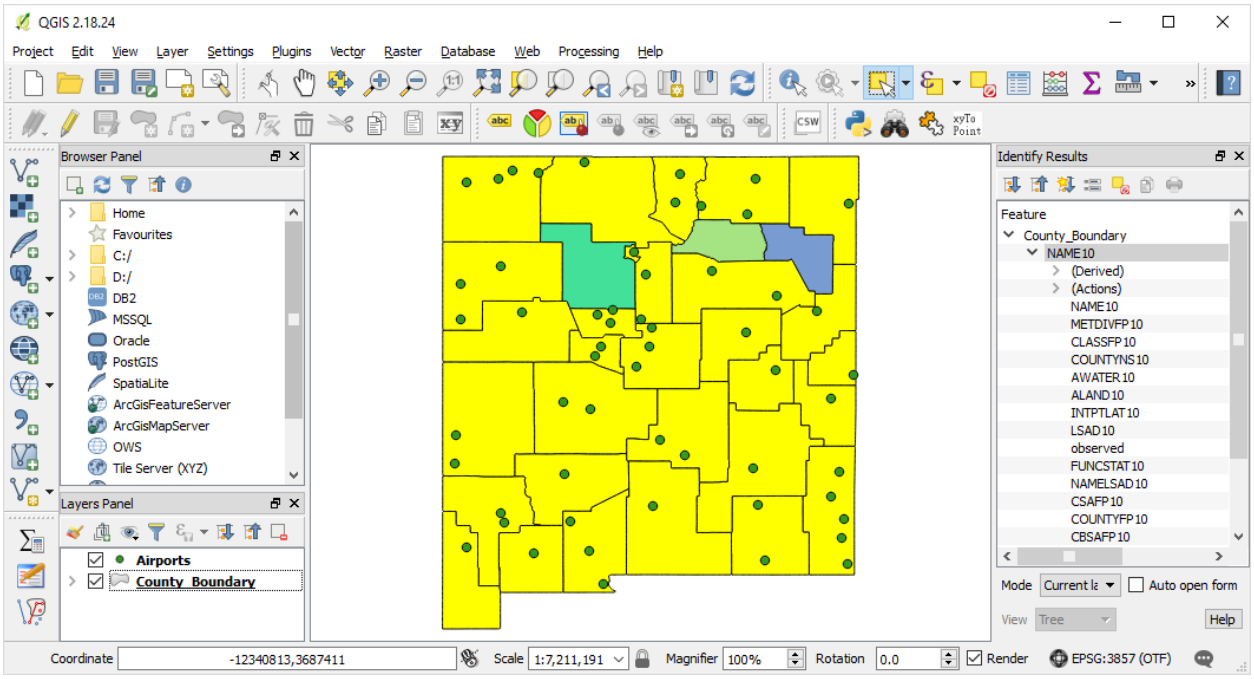




(9) Another tool to do spatial query based on location is Vector >>> Research Tools >>> Select by Location



Note: when using this tool, make sure the two layers have the same coordinate system.

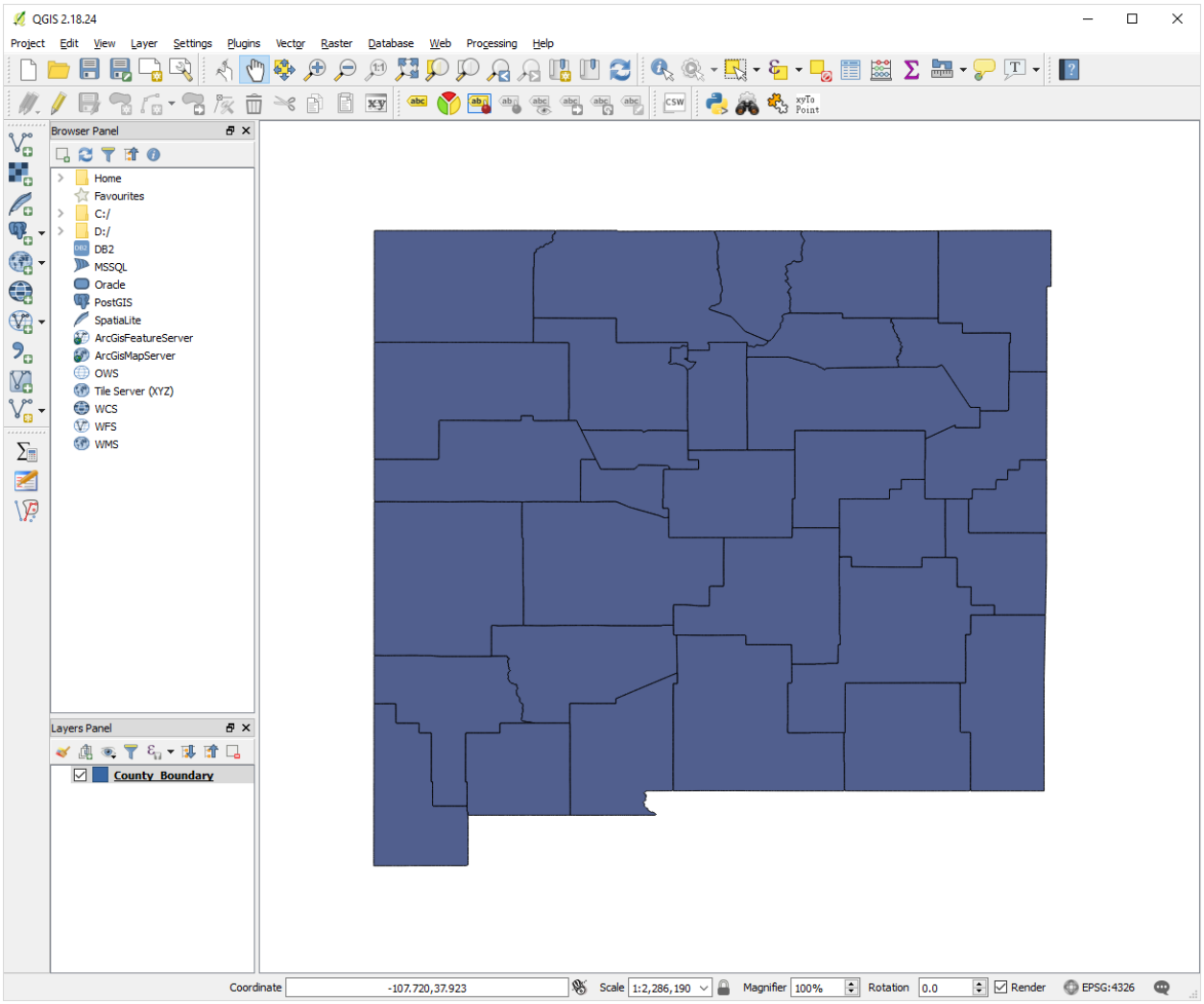


9. Table Join

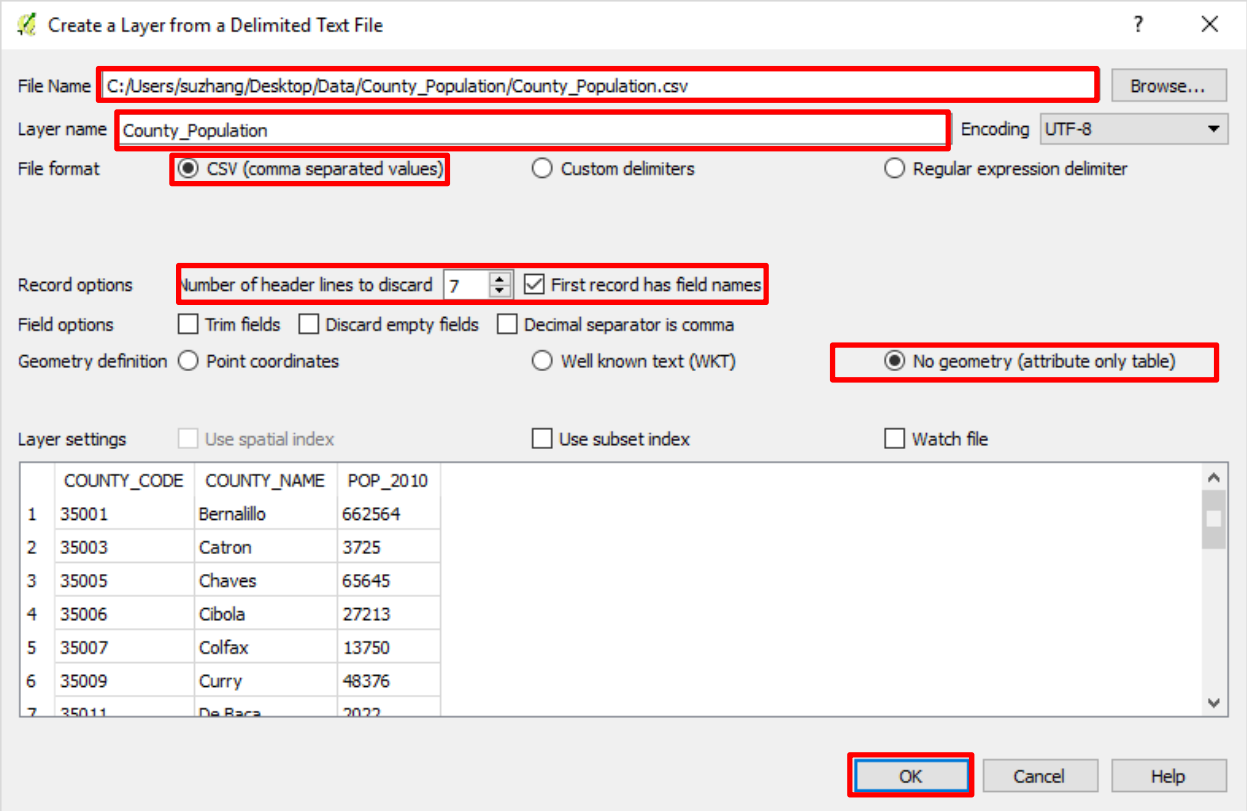
Sometimes a single shapefile does not include all the information you want, which makes “Table Join” to be necessary and useful; Table Join is typically used to append the fields of one table to another through an attribute or field common to both feature layers/tables.

(1) Start a new QGIS project

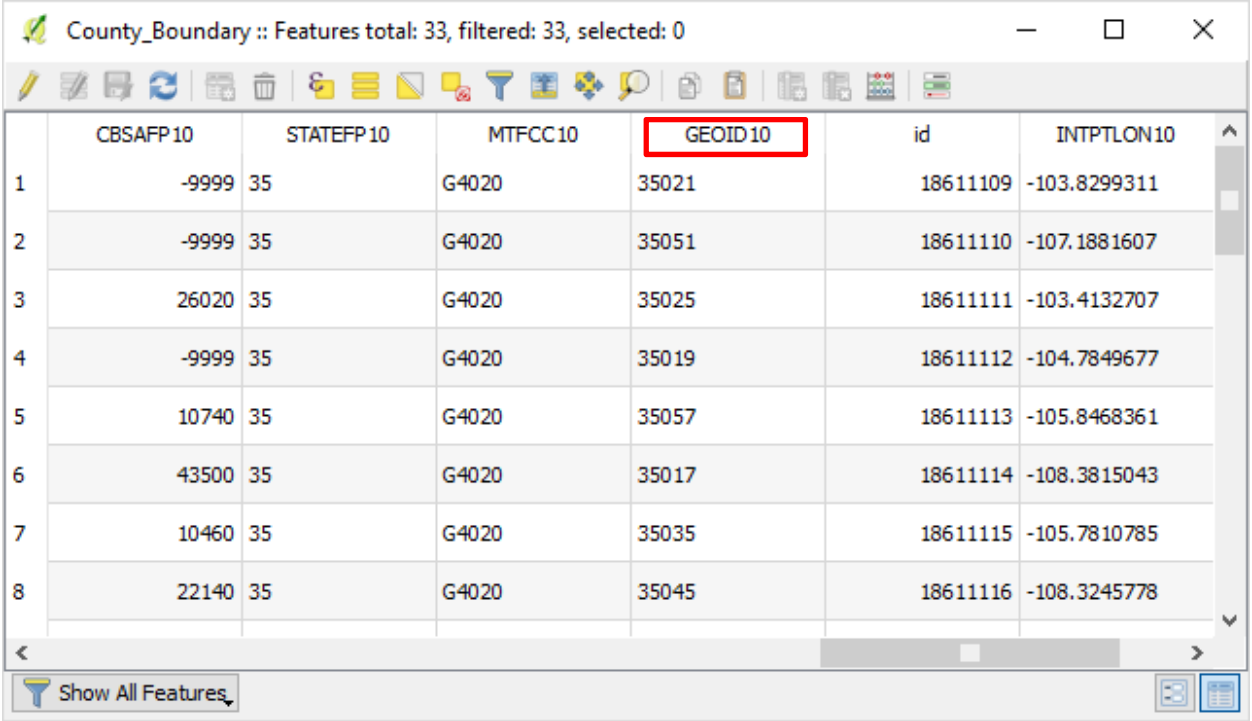
(2) Add the County_Boundary shapefile located in QGIS_Training >>> Part_C >>> County_Boundary folder



(3) Click on the “Add Delimited Text Layer” button; in the “Create a Layer from a Delimited Text File” dialogue, browse to the location of the County_Population.csv file; provide a layer name, select CSV for file format, select 7 for Number of header lines to discard, check on First record has field names, and then select “No geometry”; click on OK

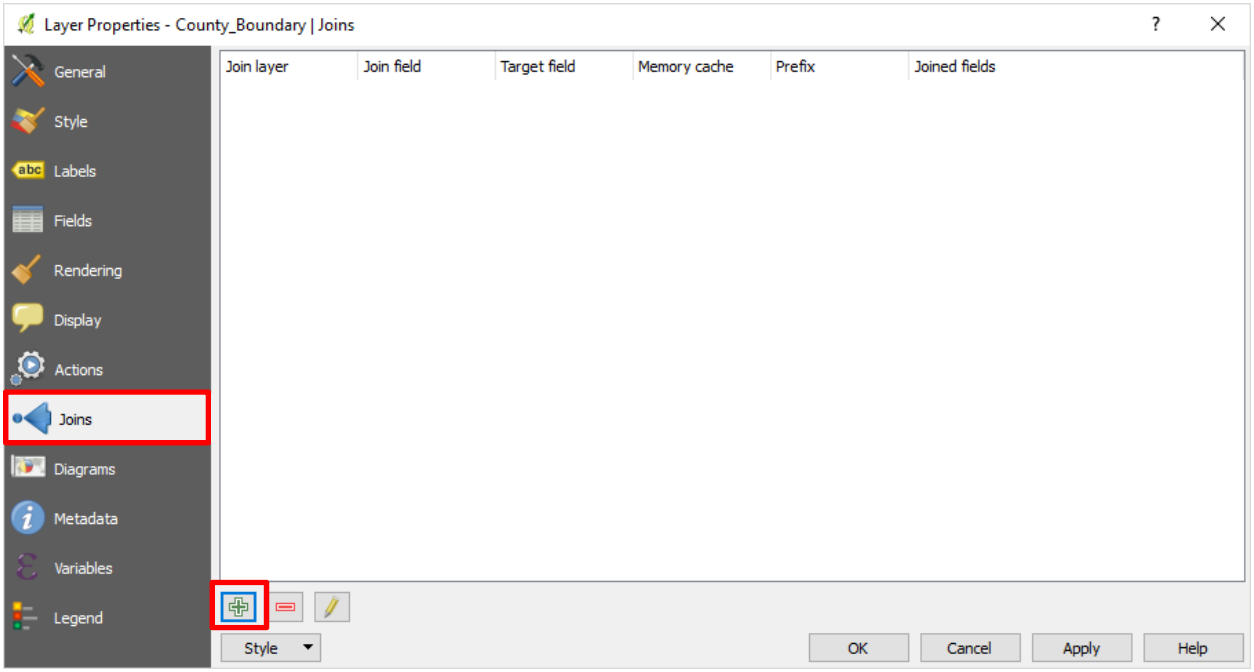


(4) Right-click on the County_Boundary layer and then left-click on Open Attribute Table; browse the table and find the unique IDs for each county (GEOID10)

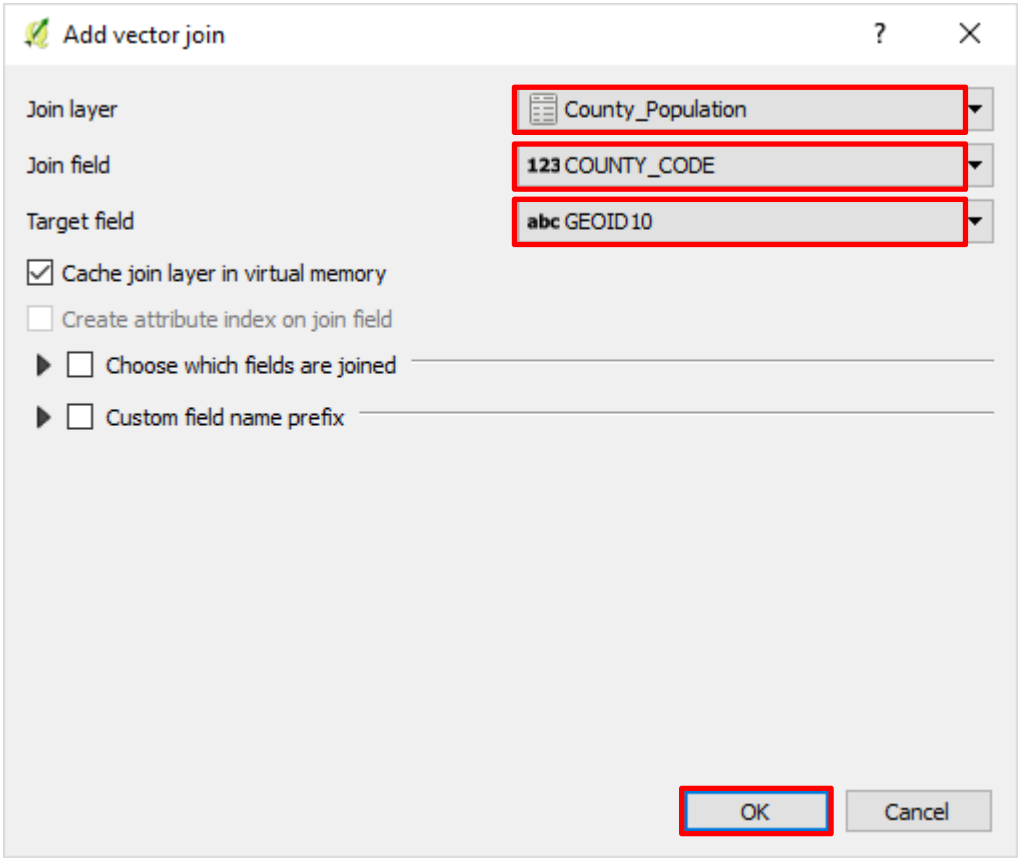


(5) Close the attribute table

(6) Right-click on the County_Boundary layer and then left-click on Properties; click on Joins on the Layer Properties dialogue; then click on the Green Plus (+) sign

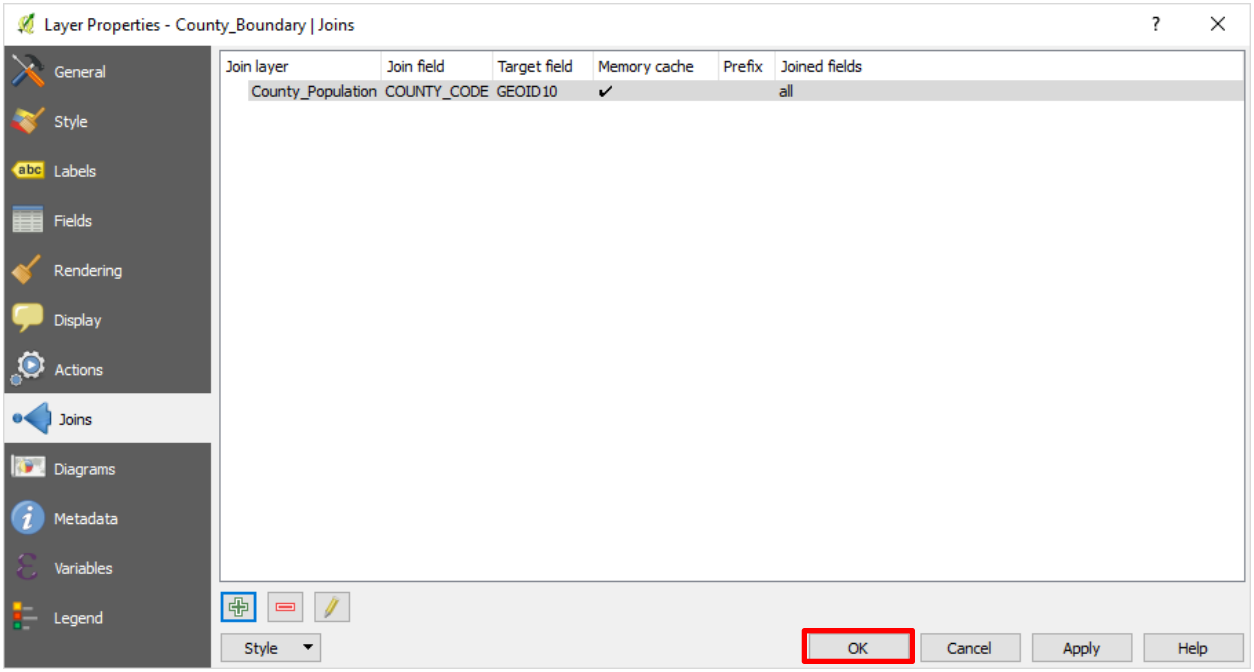


(7) In the “Add vector join” dialogue, select County_Population for “Join layer”, select COUNTY_CODE for “Join field”, and select GEOID10 for Target field



(8) Click on OK

(9) In the Layer Properties dialogue, it should show that the layer is appropriately joined; click on Ok to close the dialogue

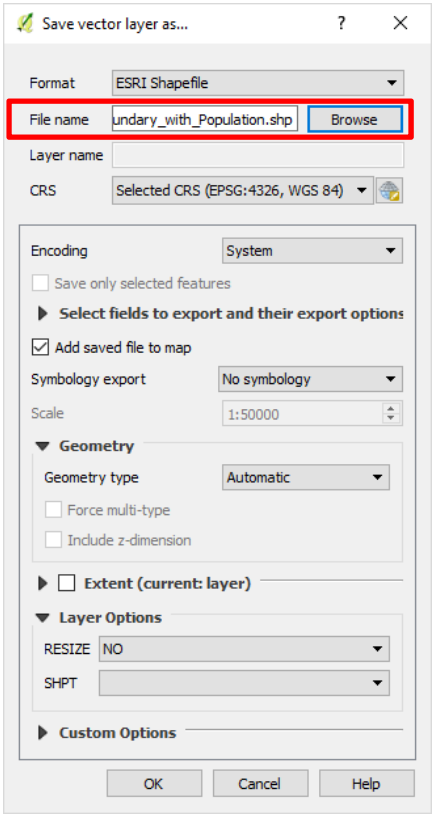


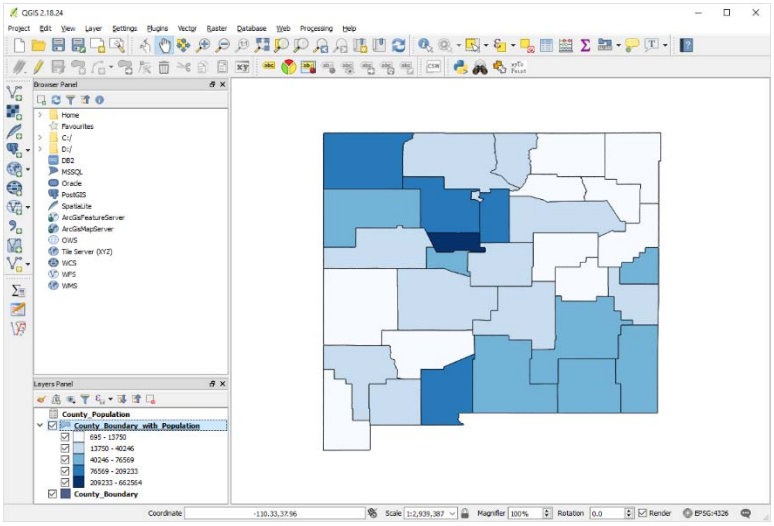
(10) Open the attribute table of the County_Boundary layer again

(11) You can see that the two fields in the County_Population layer are joined with the County_Boundary layer

(12) The table joined result is temporary; right-click on the boundary layer and click on “Save As” to <u>permanently</u> save the joined layer (same as ArcMap)

(13) Visualize the new layer with Graduated symbol (for the field of County_P_1)





10. Spatial Join

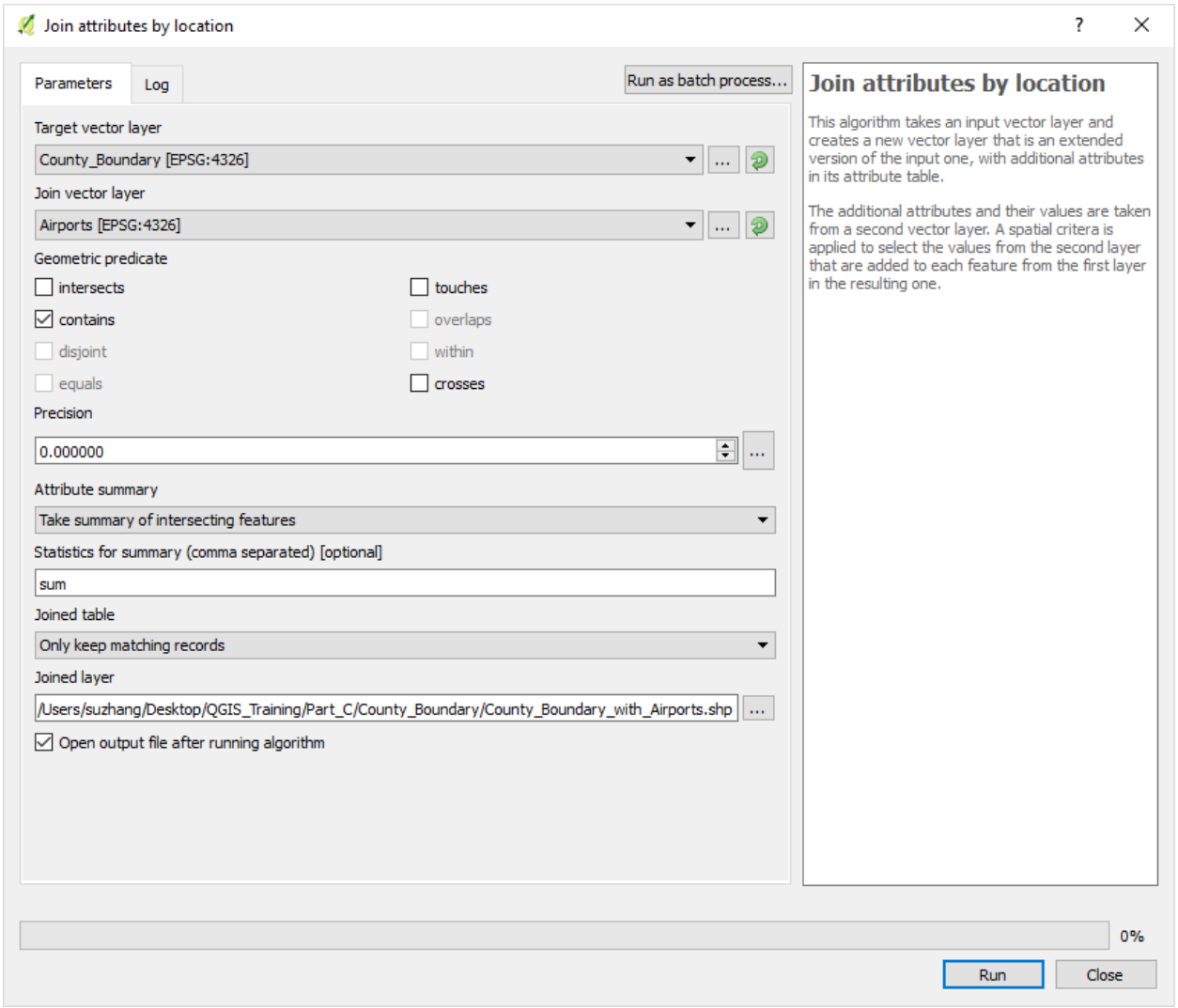
Another common operation is joining attributes from one feature to another based on their spatial relationships, known as Spatial Join. The target features and the joined attributes from the join features are written to the output feature class. Two tools can conduct spatial join operation, including the "spatialjoin" plugin and the "Join attributes by location" tool. For this exercise we only focus on the use of the "Join attribute by location" tool.

(1) Create a new project

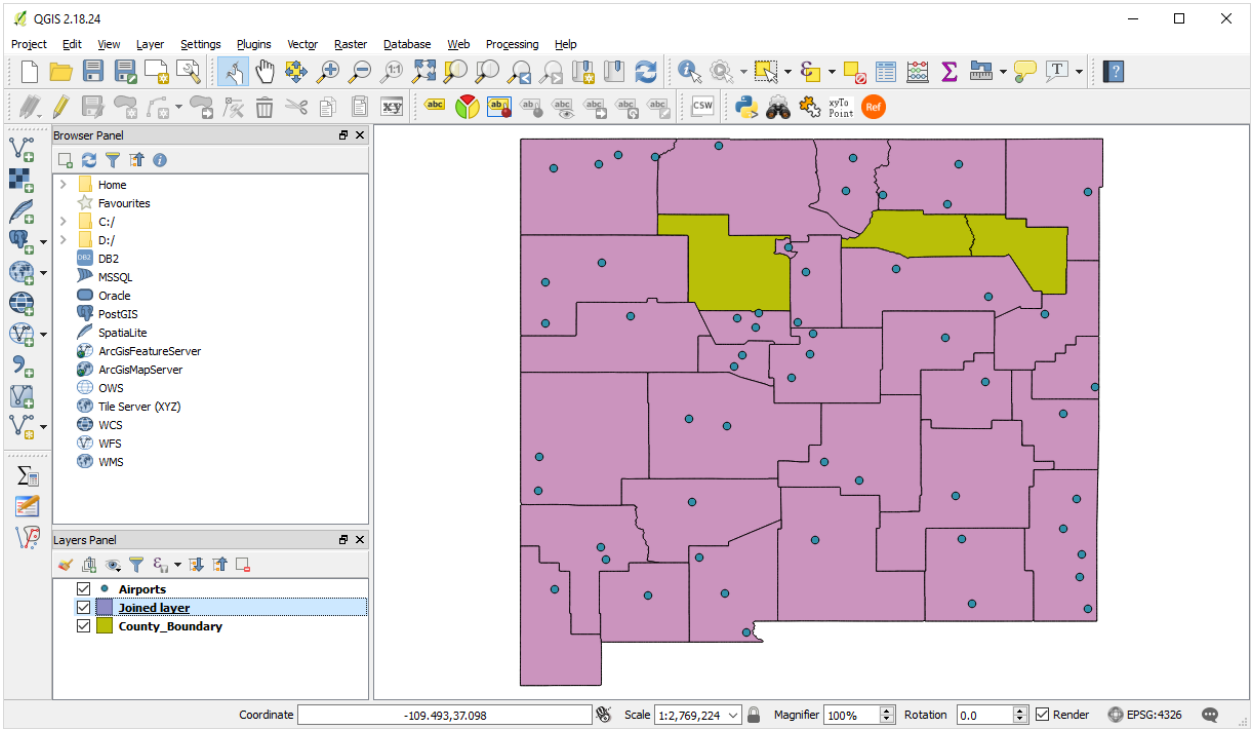
(2) Insert the County_Boundary layer and the Airport layer

(3) Go to Vector >>> Data Management Tools >>> Join attributes by location

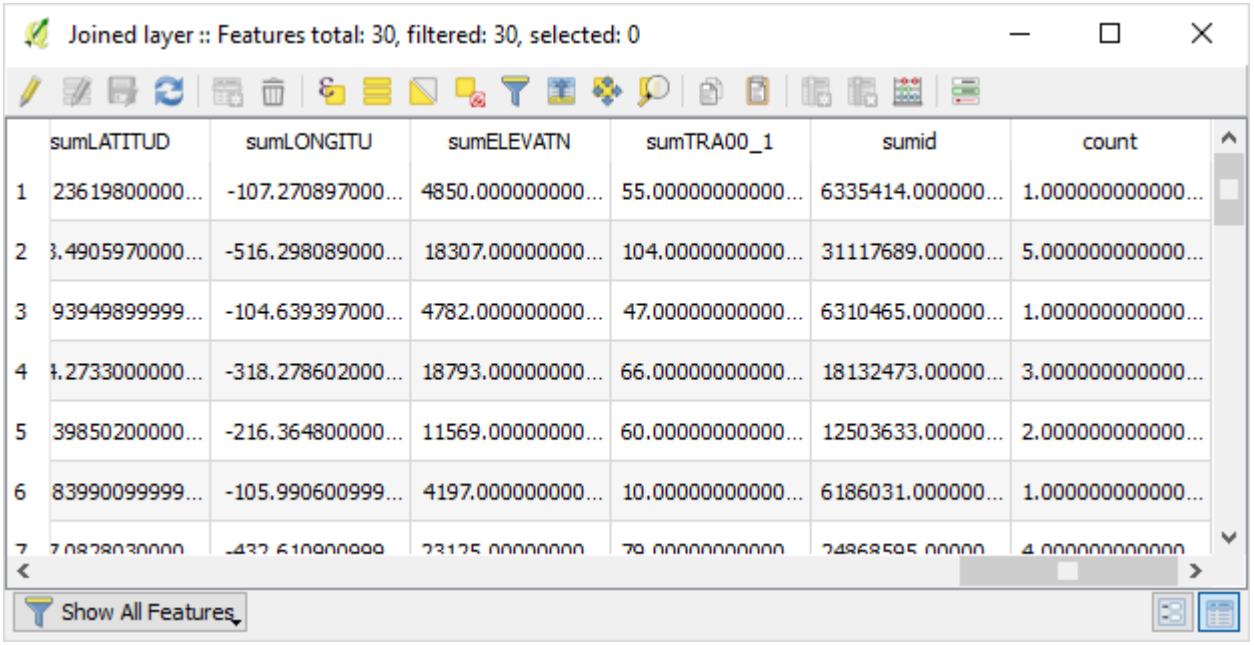
(4) Target vector layer uses the County_Boundary layer; Join vector layer uses the Airports layer; Geometric predicate uses contains; Attribute summary uses Take summary of intersecting features; Statistics for summary (comma separated) uses sum; have all the input parameters setup as the following screen capture; and then click on Run



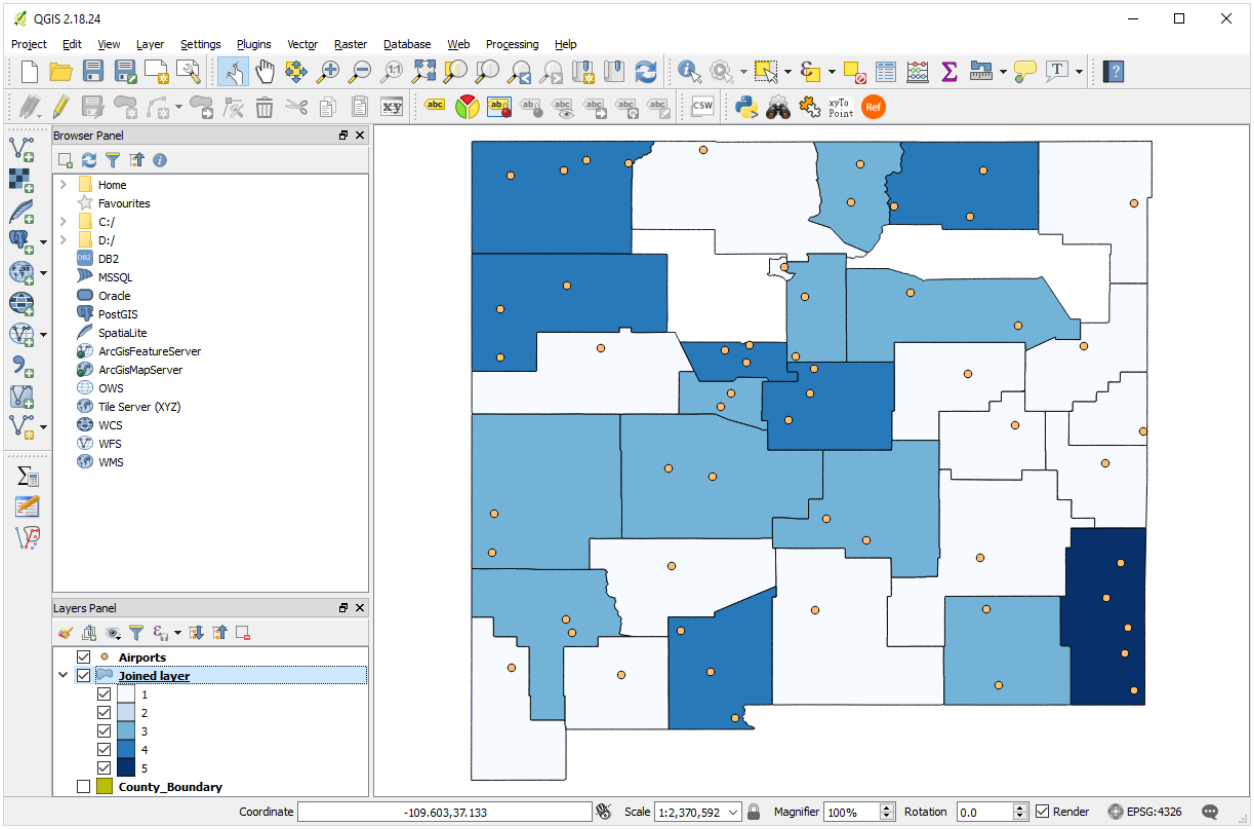
(5) A new layer with the name of “County_Boundary_with_Airports” will be created in the selected folder; however, in the Layer Panel this layer is named with “Joinedlayer”



(6) Open the attribute table of the “Joinedlayer” you will see a field with the name of “count” to indicate how many airport in a specific county



(7) Visualize the new layer with Categorized symbol (for the field of count)



11. Vector Data Analysis

QGIS provide many tools to conduct vector analysis, and many more tools can be found by using the Plugins; go to Vector or Plugins in the Menu Bar to find these tools; all of these tools have the similar function as ArcMap's tools and the uses of them are very straightforward

(1) Research Tools

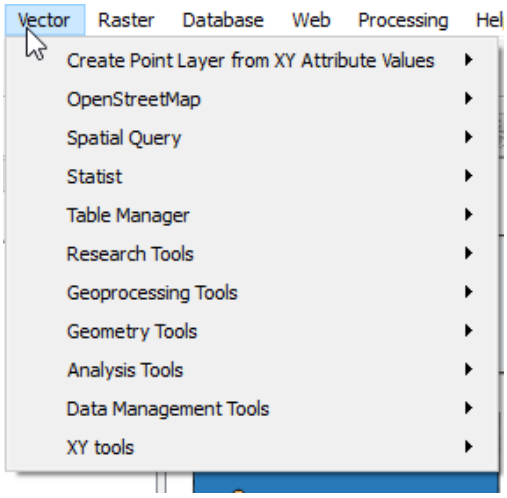
(2) Geoprocessing Tools

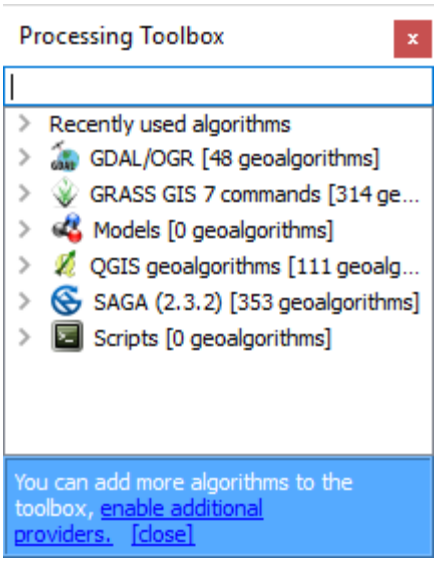
(3) Geometry Tools

(4) Analysis Tools

(5) Data Management Tools

(6) Processing Toolbox



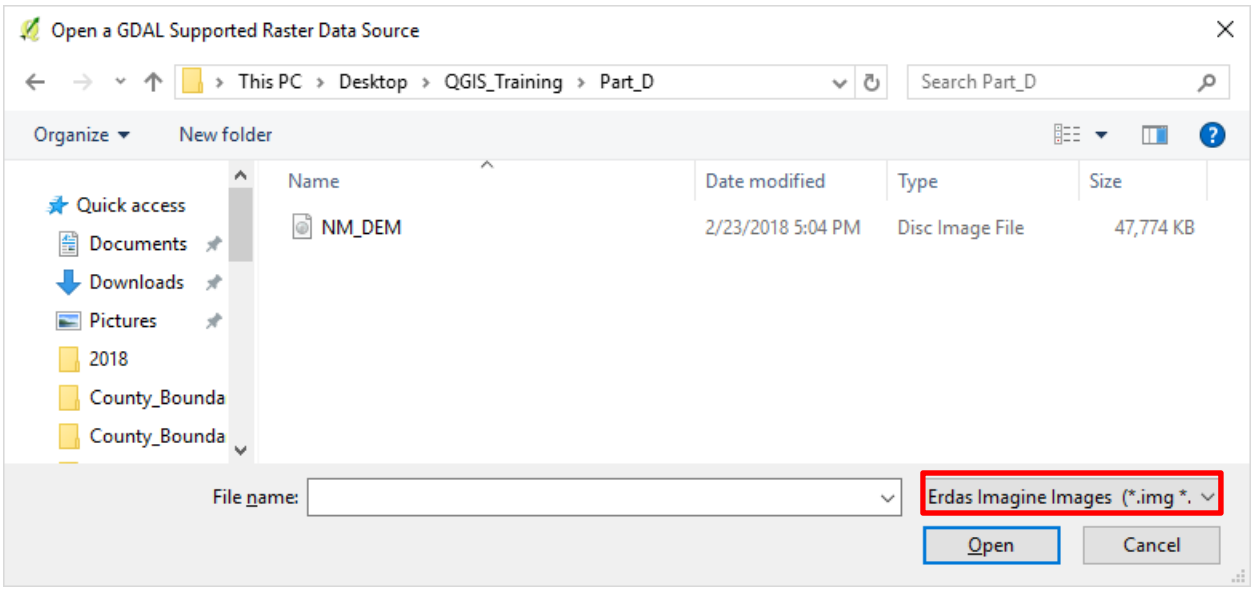


Part D. Working with Raster Data

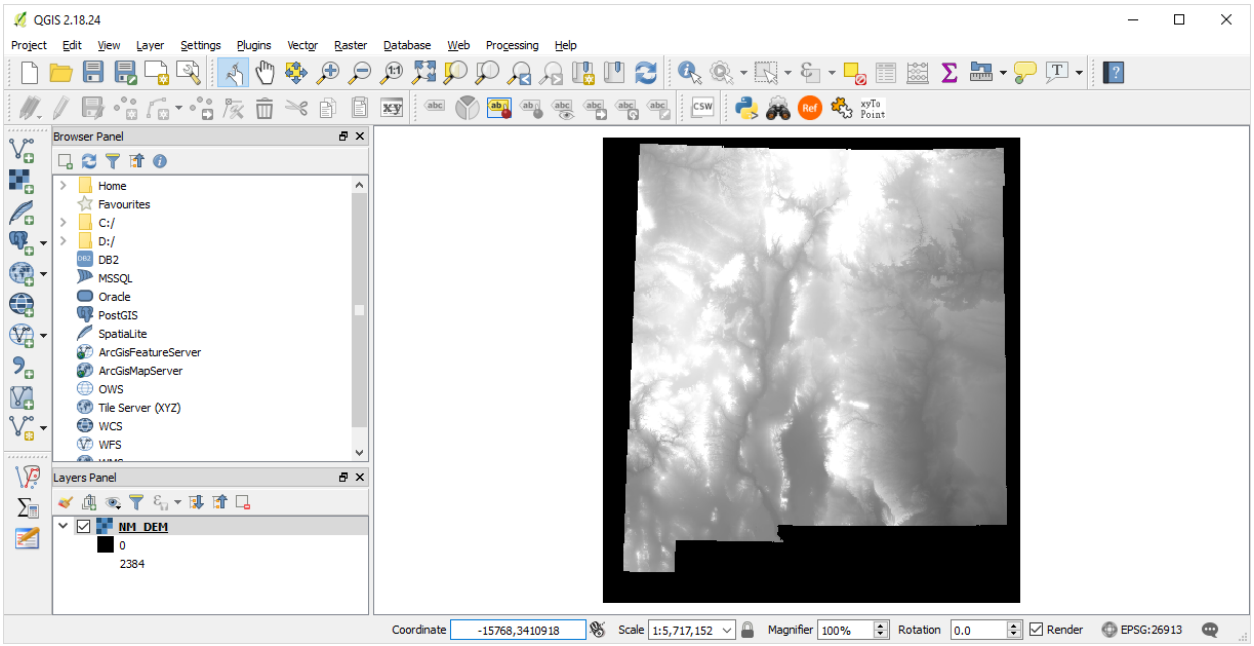
1. Adding Raster Data

(1) Click on “Add Raster Layer” button in the “Manage Layers Toolbar”

(2) In the “Open a GDAL Supported Raster Data Source” dialogue, navigate to QGIS_Training >>> Part_D folder to locate the NM_DEM (.img) file; similar to Add Vector Layer tool, users can use the file type filter to quickly locate the .img file



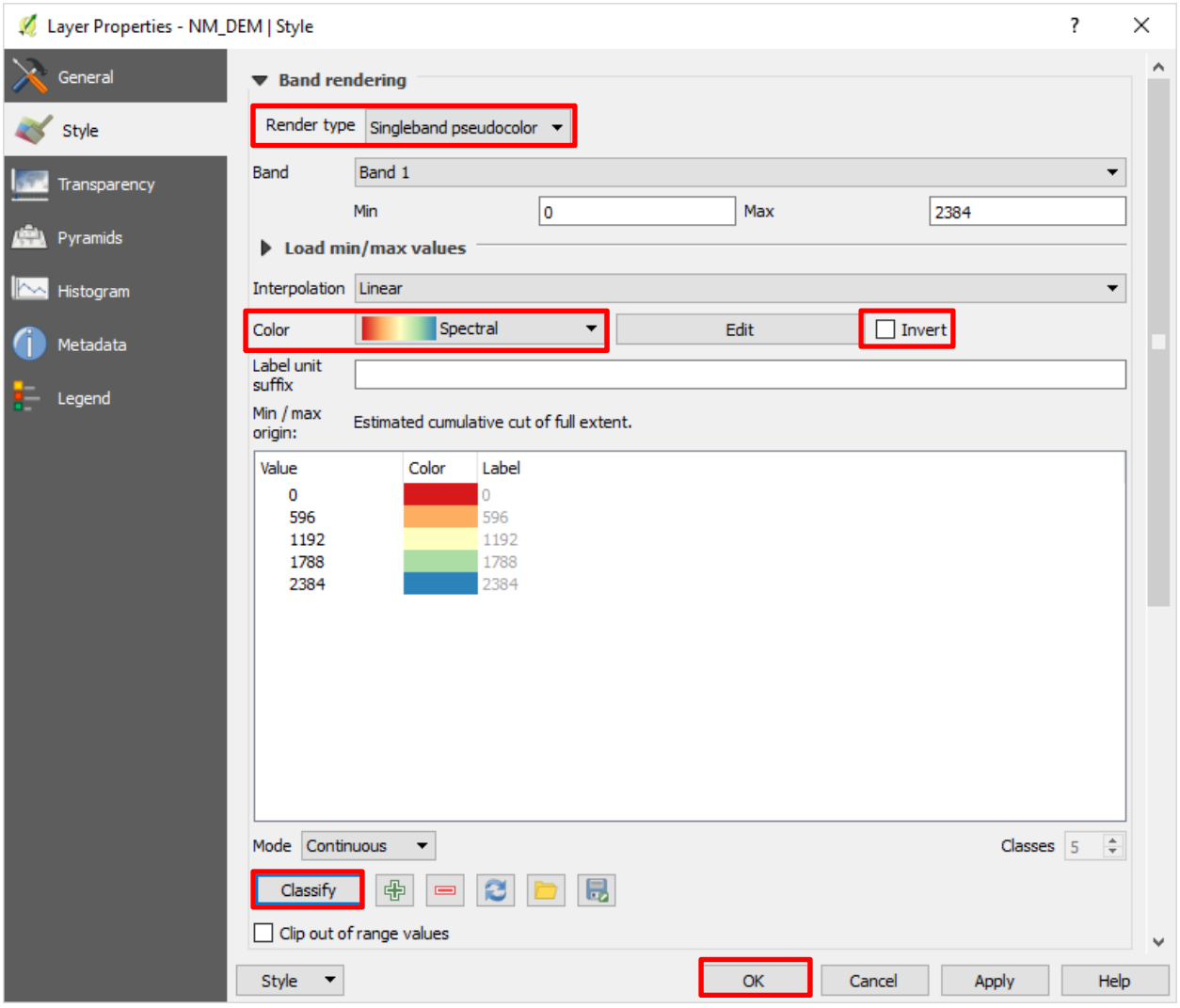
(3) Click on “Open” to open the New Mexico DEM file



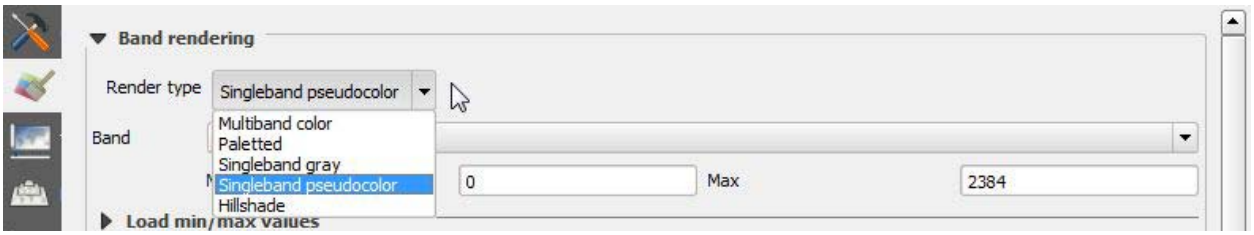
2. Styling Raster Data

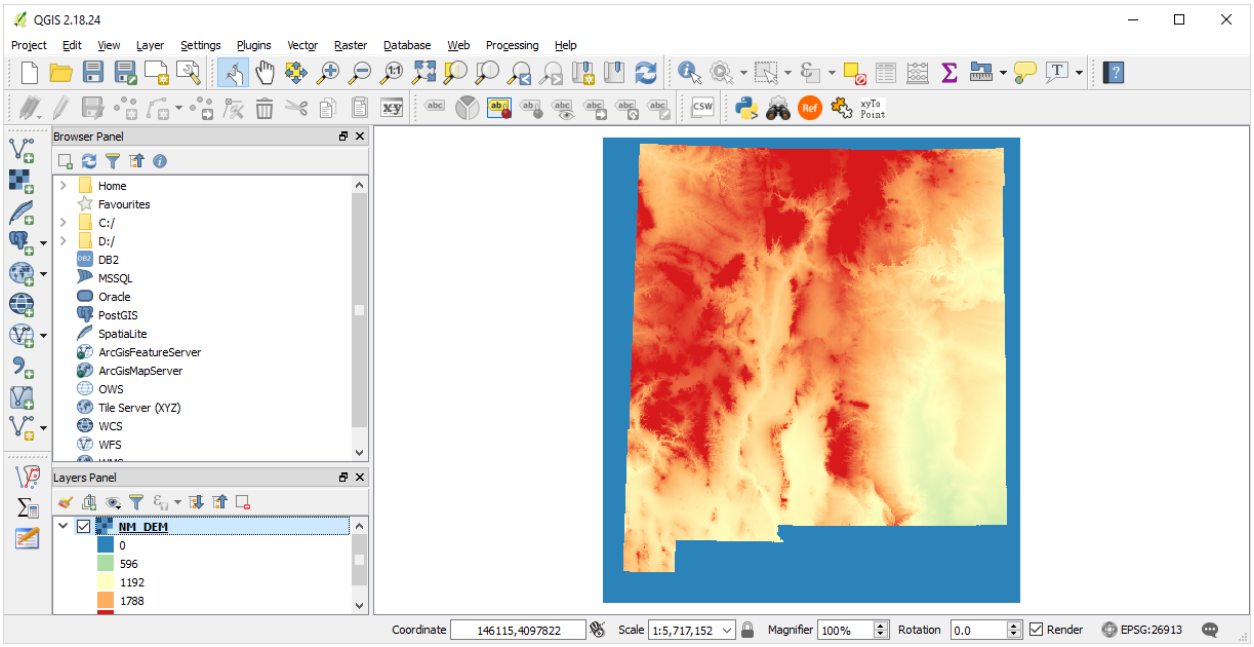
(1) Right-click on the NM_DEM layer in the Layers Panel

(2) In the Layers Properties dialogue, click on the Style tab; change the “Render type” to Singleband pseudocolor; select Spectral for “Color”, and check on Invert; click on Classify; and then click on OK

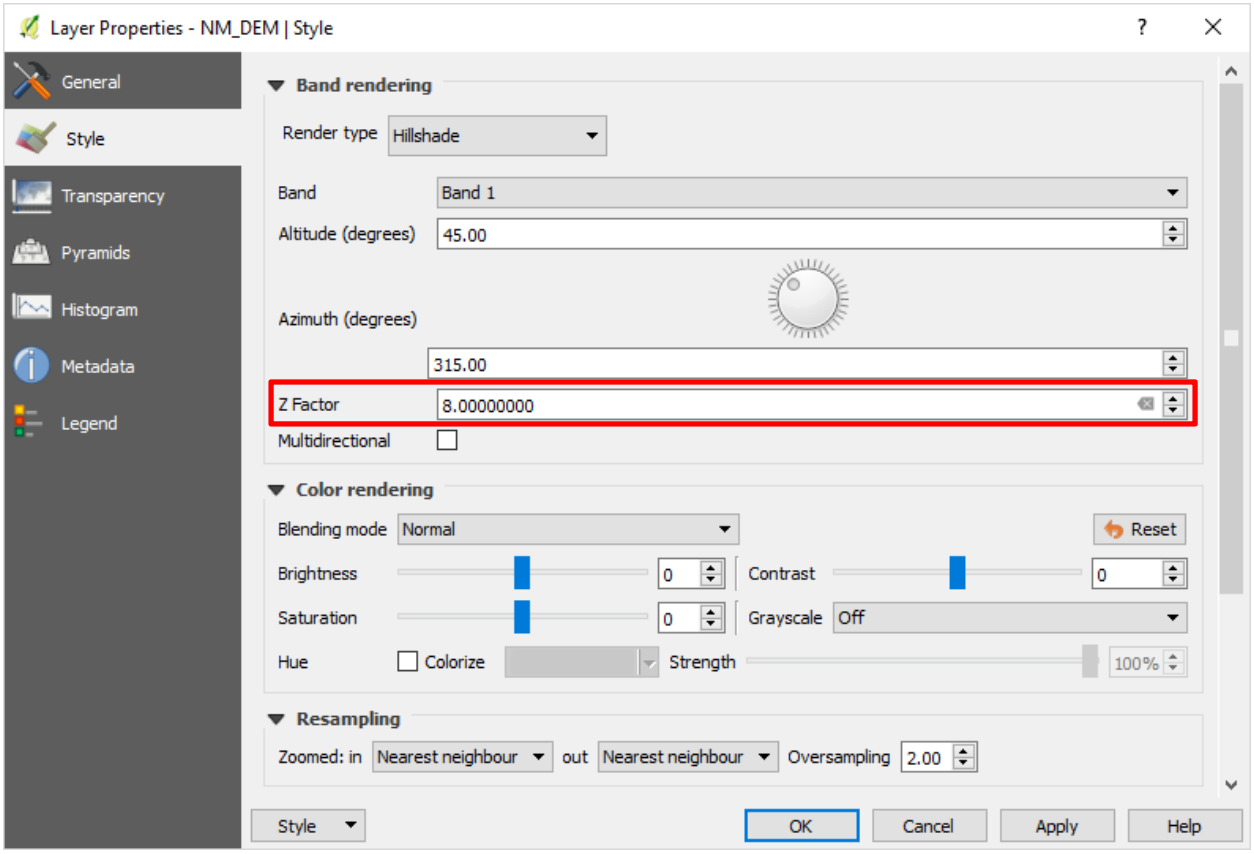


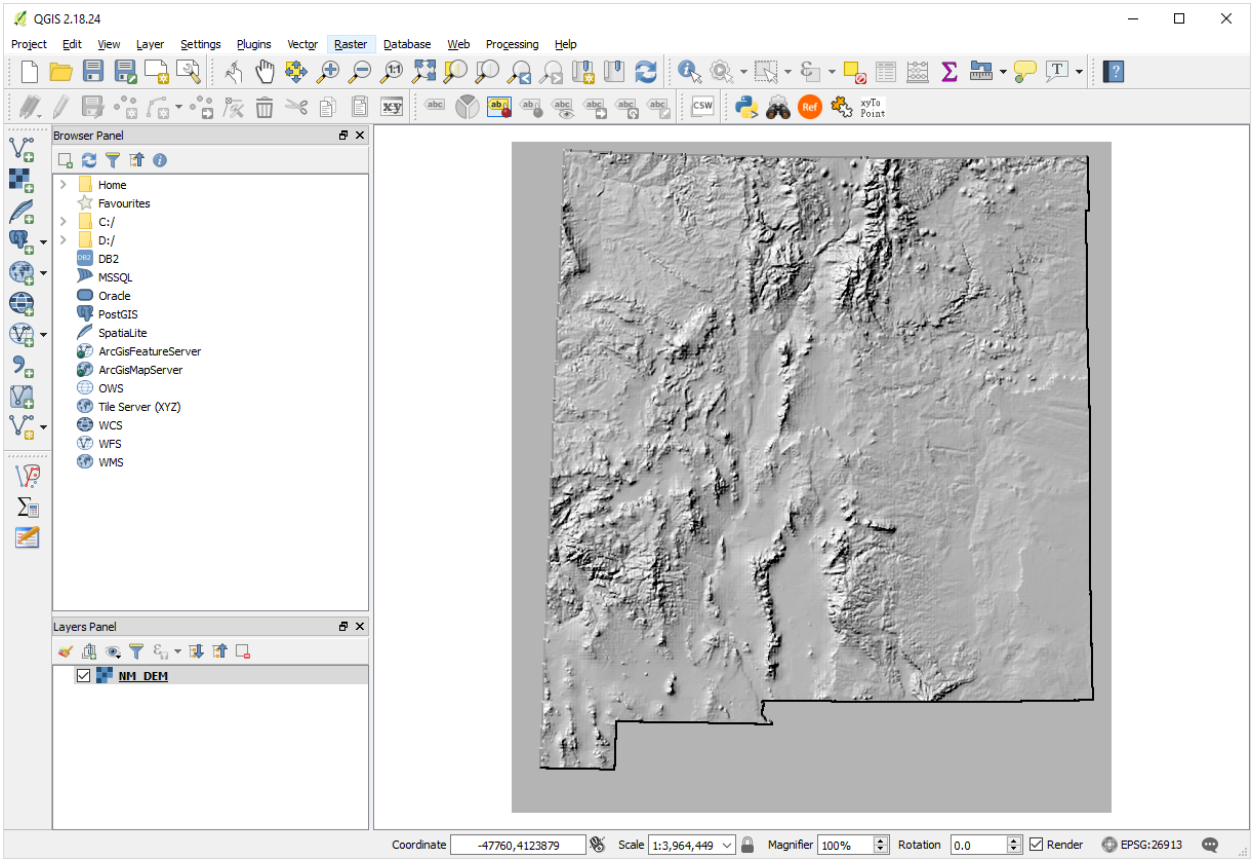
(4) Many other render types can be selected, including the followings





(5) Users can also create a hillshade from the DEM by selecting Hillshade for "Render type." Change the Z factor to 5 or 8 or even larger to exaggerate the elevation difference.

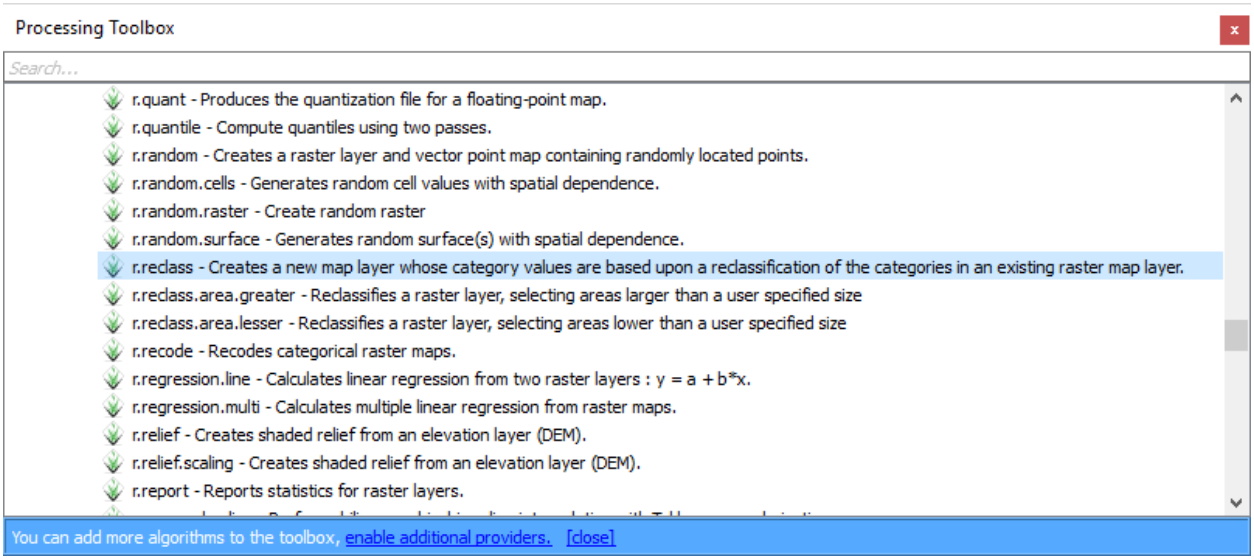




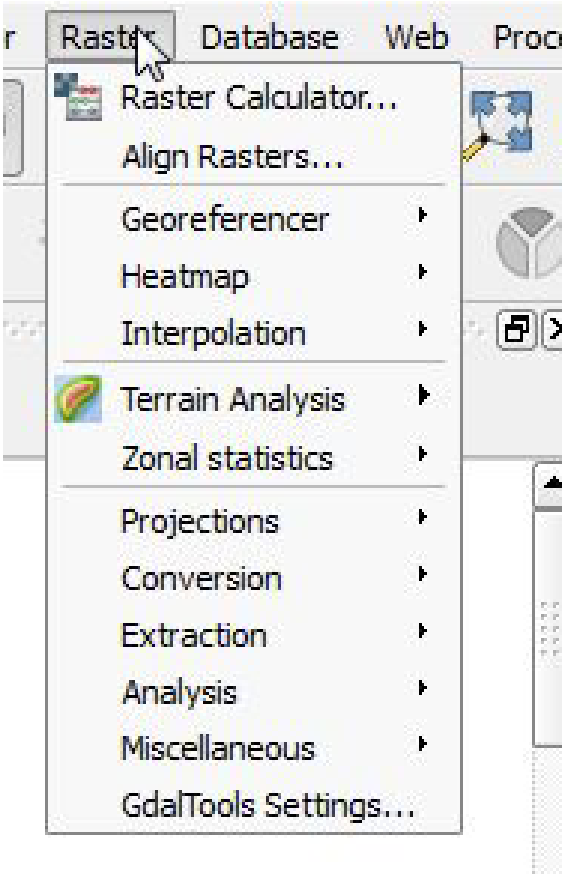
2. Raster Data Analysis

(1) QGIS provide many tools to conduct raster analysis, and many more tools can be found by using the Plugins; go to Raster or Plugins in the Menu Bar to find these tools; all of these tools have the similar function as ArcMap's tools and the uses of them are very straightforward

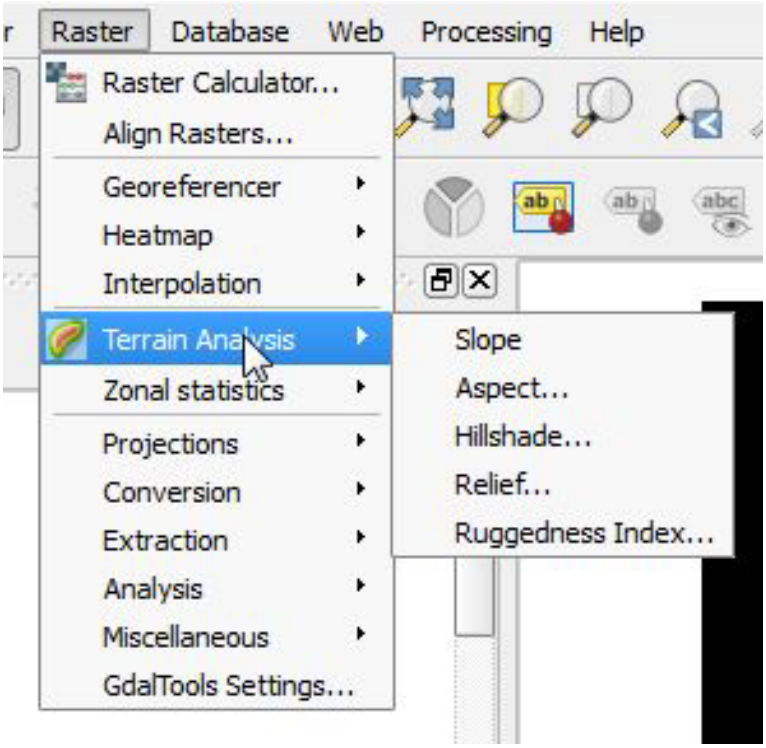
Note: Reclassifying rasters has to use the GRASS reclass tool, which can be found Processing >>> Toolbox >>> GRASS GIS >>> Raster



(2) Some of the common tools include the followings screen capture:

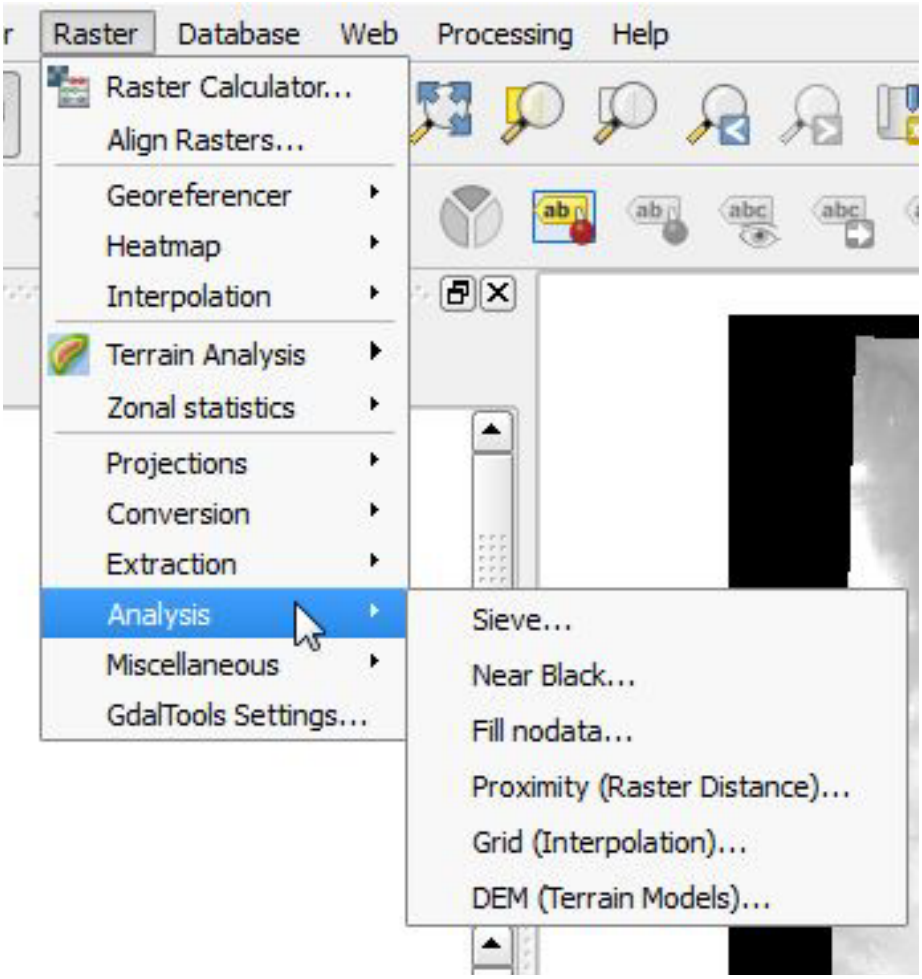


(3) Terrain Analysis is very useful, and it includes the following tools:

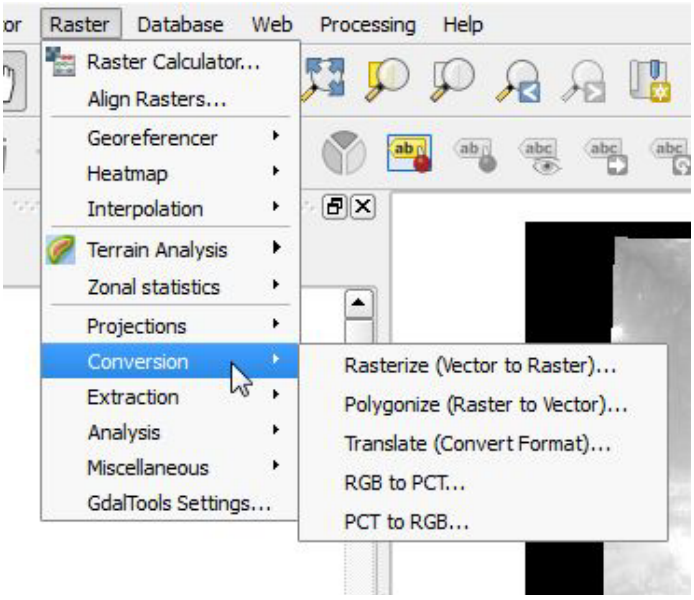


(4) The Georeferencer tool can be used to georeference images

(5) Analysis tools can be used to do the followings:

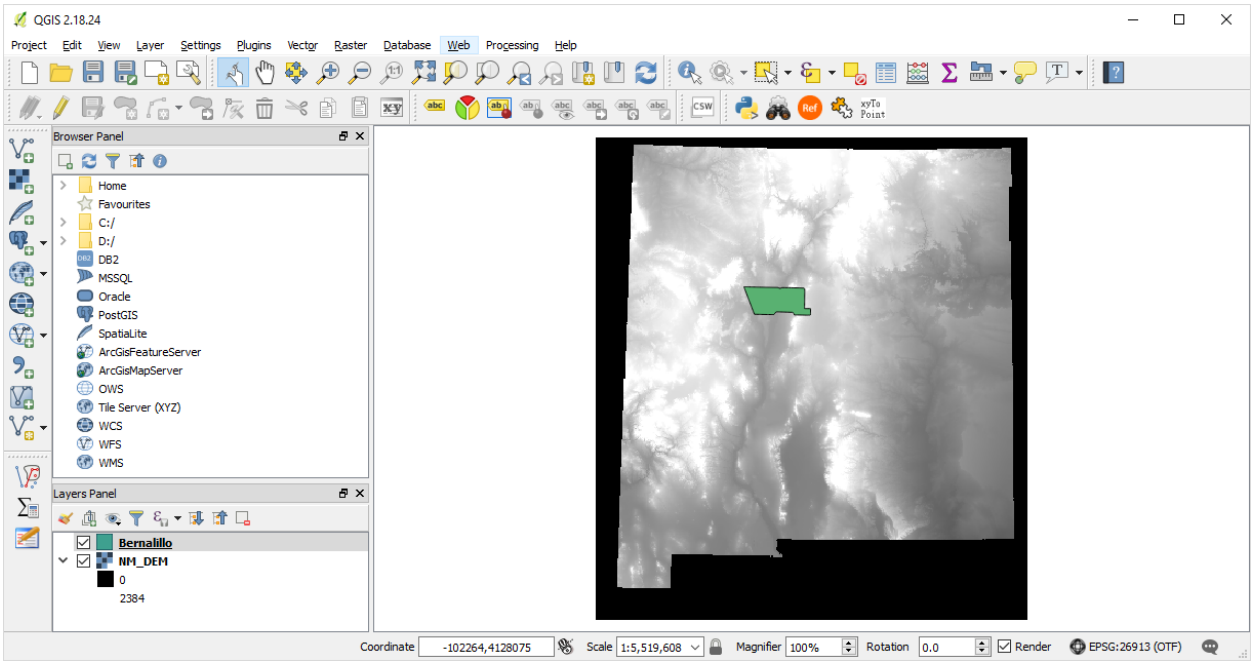


(6) Interpolation and Heatmap are plugins; raster calculator, Zonal statistics, Conversion, Extraction, and Projections are also very useful tools

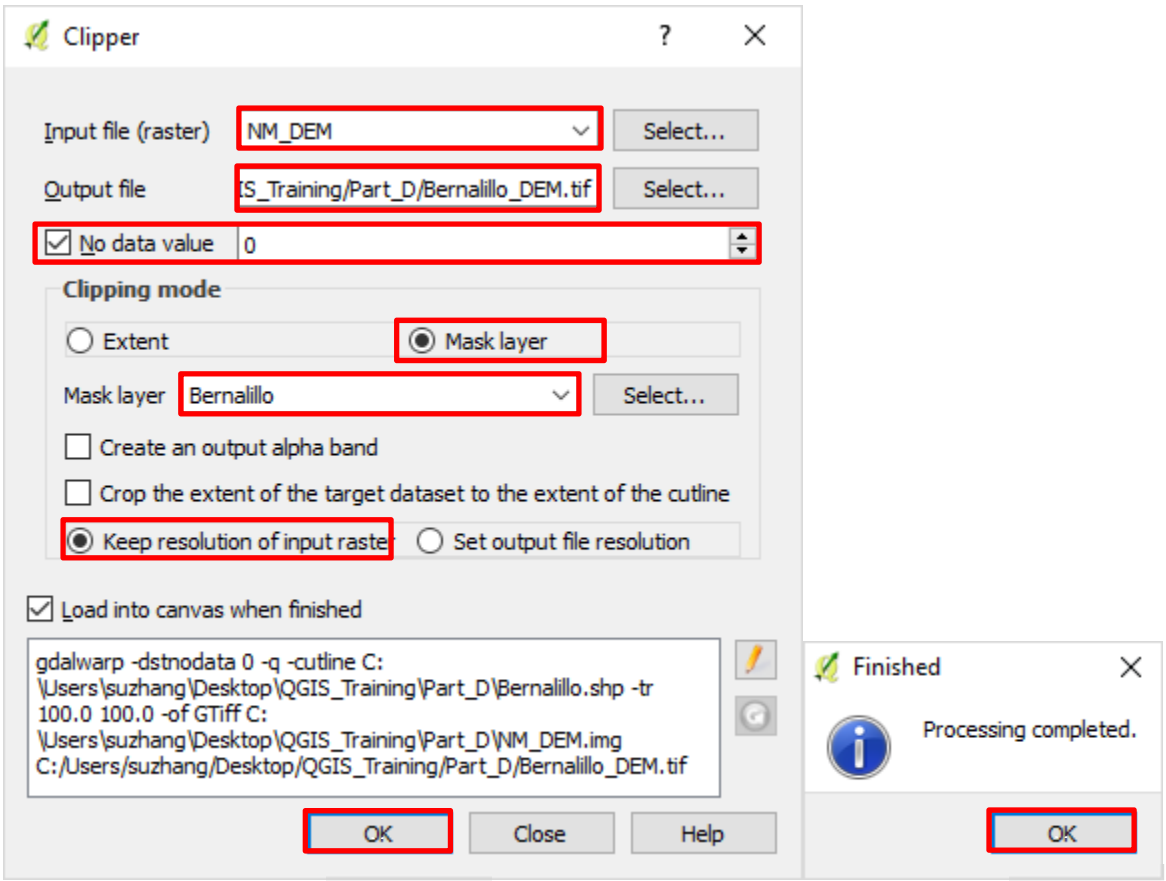


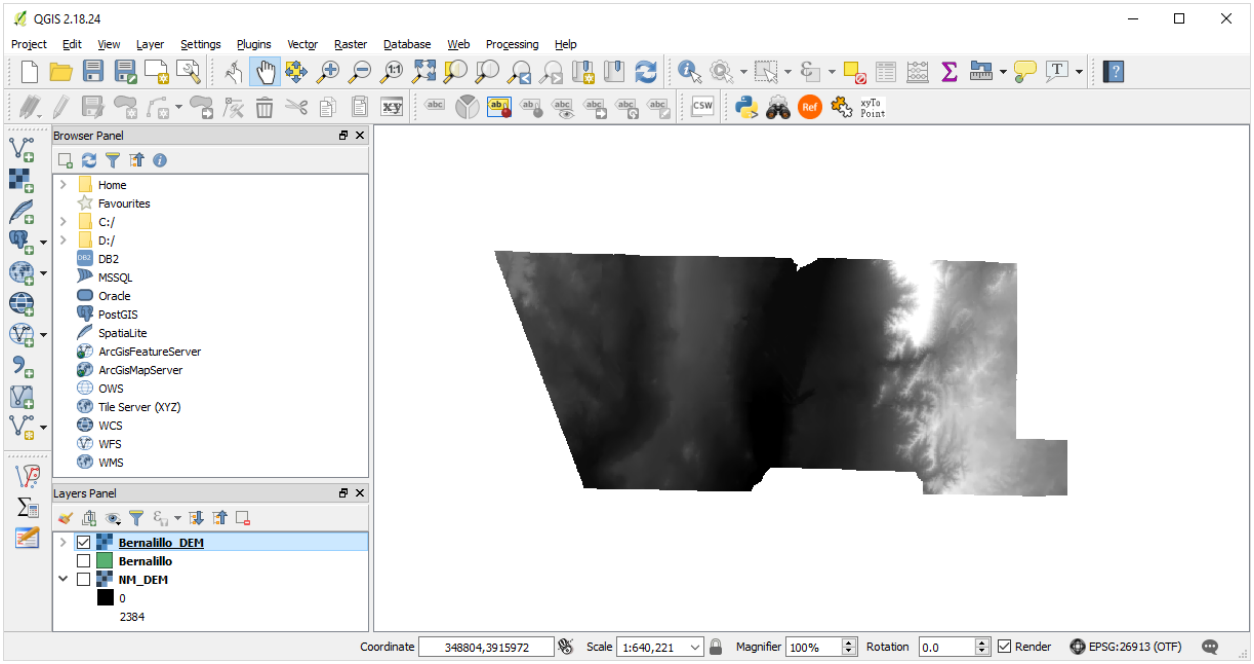
(7) As an example to use these tools, we are going to explore the Clipper tool

(8) Start a new project; add the Bernalillo layer and NM_DEM layer in the QGIS_Training >>> Part_D folder.



(9) Go to Raster >>> Extraction >>> Clipper




QGIS 2.18.24
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Oracle
PostGIS
SpatiaLite
ArcGisFeatureServer
ArcGisMapServer
OWS
Tile Server (XYZ)
WCS
WFS
WMS
Layers Panel
Bernalillo_DEM
Bernalillo
NM_DEM
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2384
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Magnifier 100%
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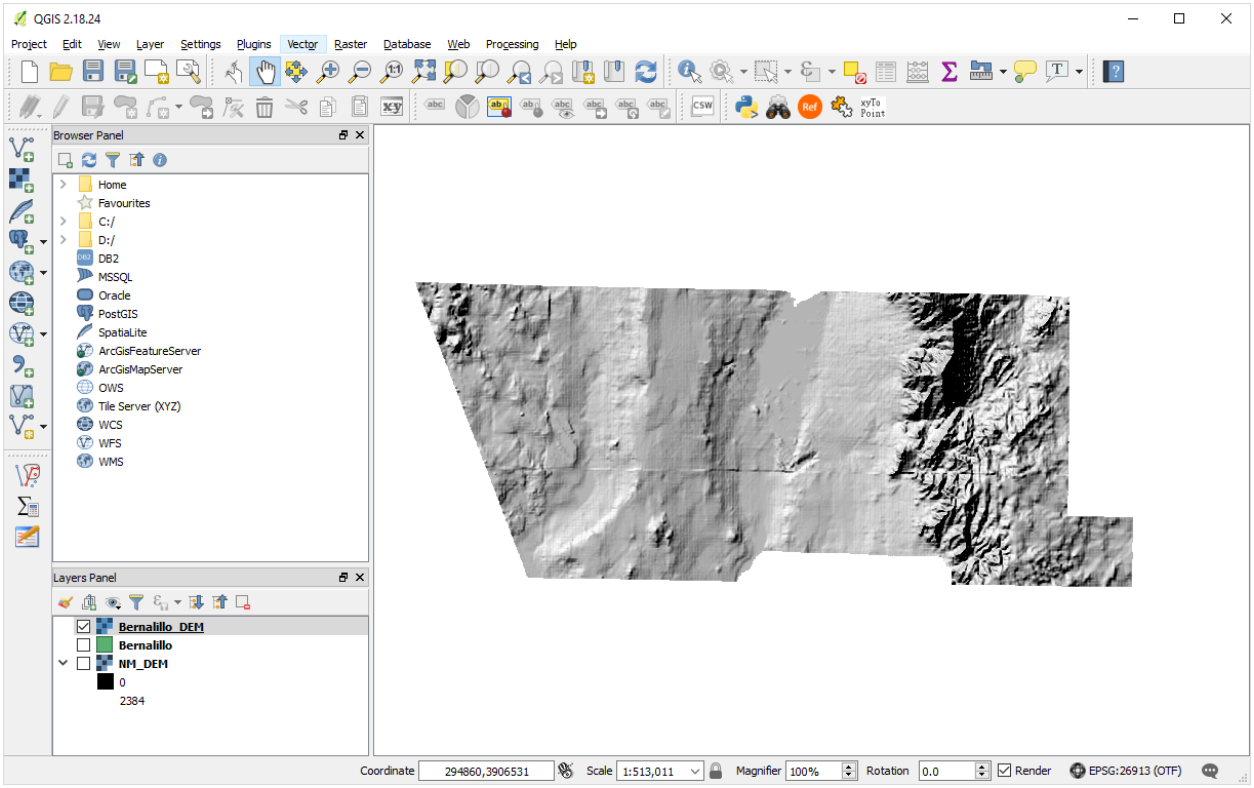
EPSG:26913 (OTF)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Oracle
PostGIS
SpatiaLite
ArcGisFeatureServer
ArcGisMapServer
OWS
Tile Server (XYZ)
WCS
WFS
WMS
Layers Panel
Bernalillo_DEM
Bernalillo
NM_DEM
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2384
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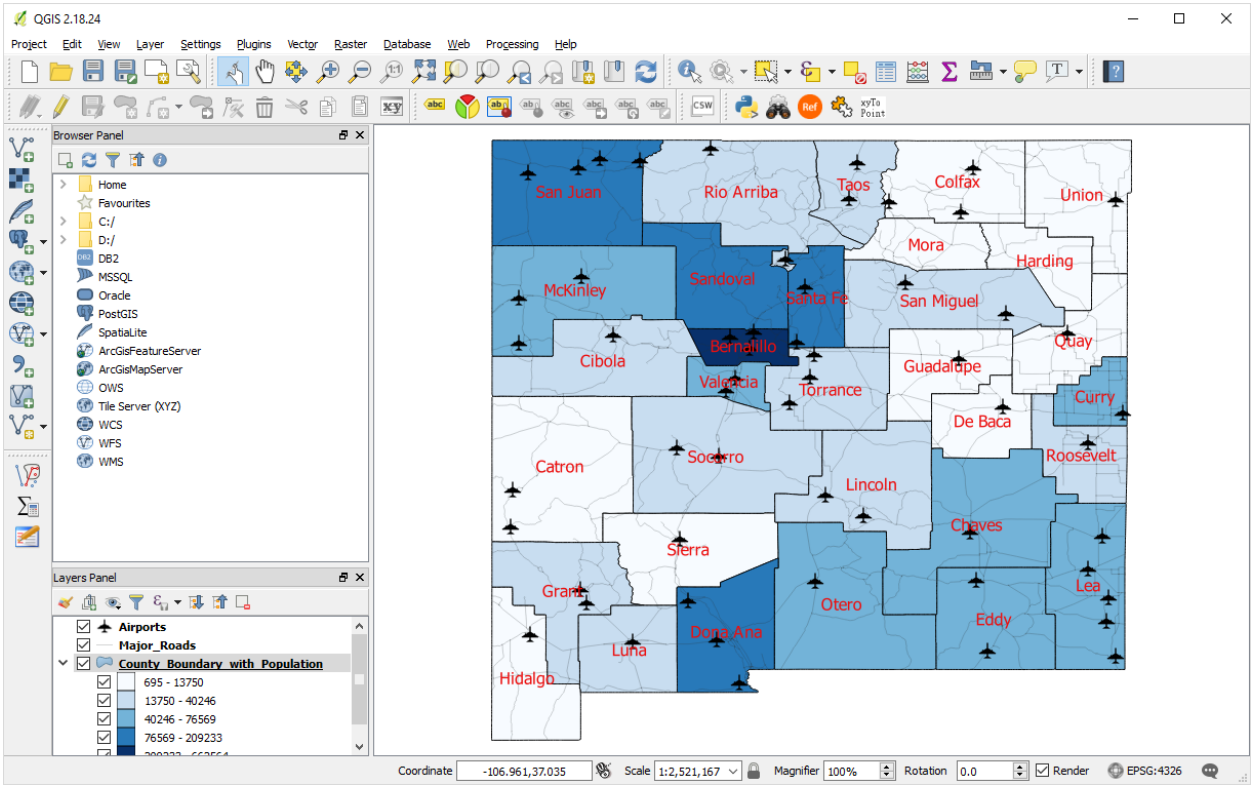
EPSG:26913 (OTF)

Part E. Creating Maps

1. Add the layers in QGIS_Training >>> Part_E folder.

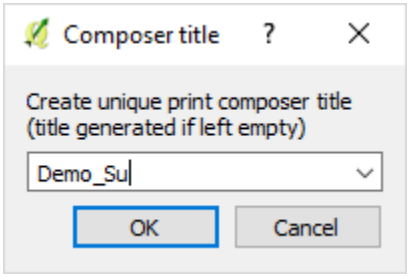
2. Table Join County_Population data to County_Boundary data; use Graduated for symbolization; label county name; add Major_Roads data and Airports data and symbolize them



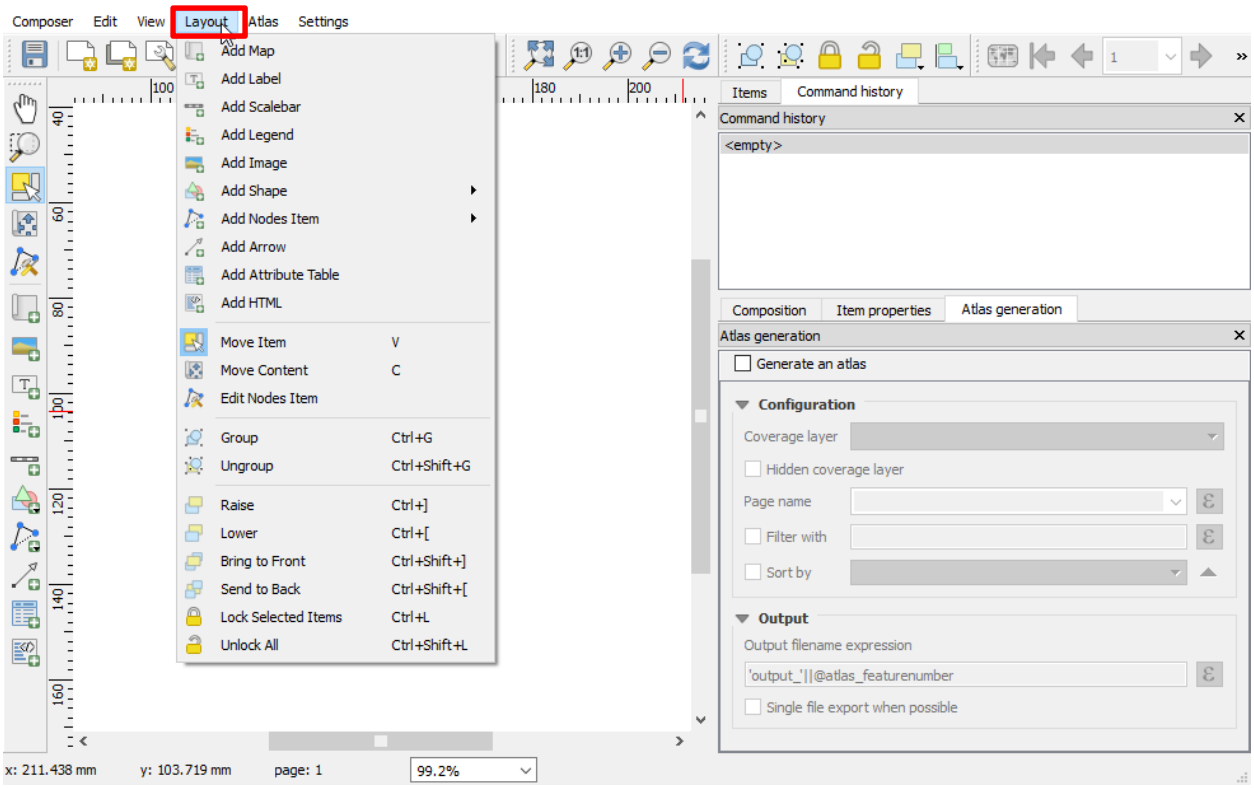
3. Click on Project

4. Click on New Print Composer

5. Type in a name for your composer



6. The composition panel should display, Click Layout and then click Add map

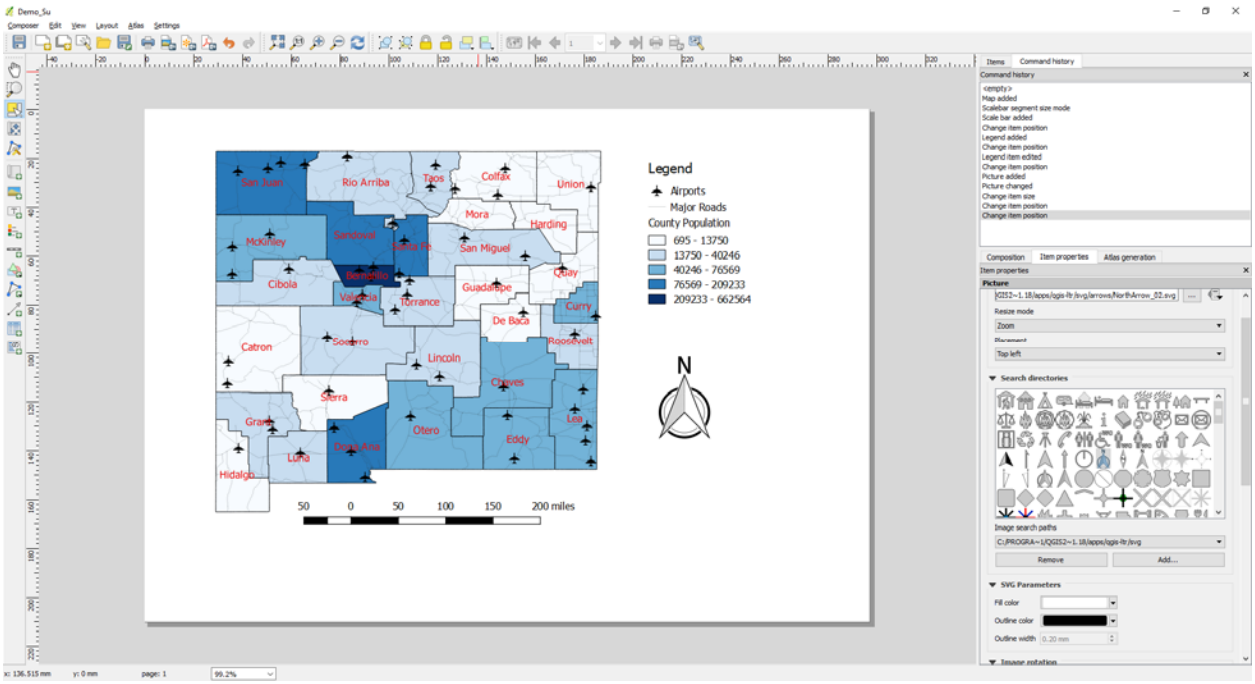


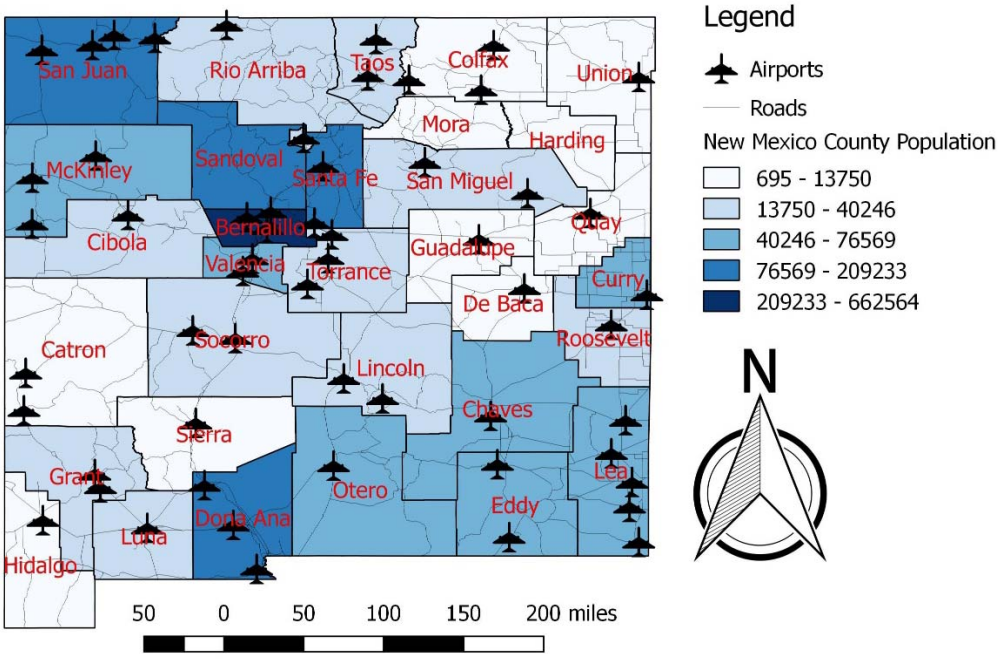
7. Use mouse pointer to select the area on the canvas of the composer for adding the map

8. In Layout click on add Scale bar, Add Legend, and Add Image (for North Arrow)

10. In Layout click on Add Shape and then click Add Rectangular to add neatline (optional)

9. Click Composer and then click Export as Image




San Juan
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Santa Fe
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Valencia
Torrance
Curry
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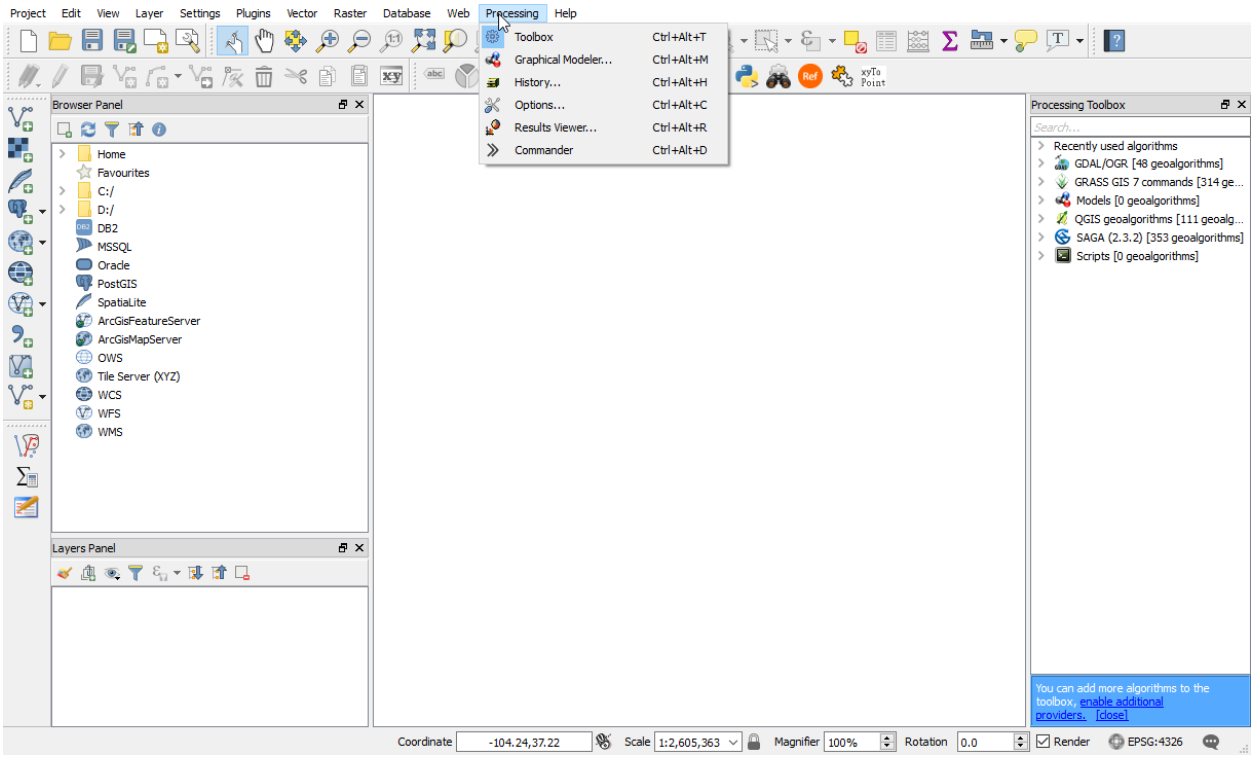
76569 - 209233
209233 - 662564
N

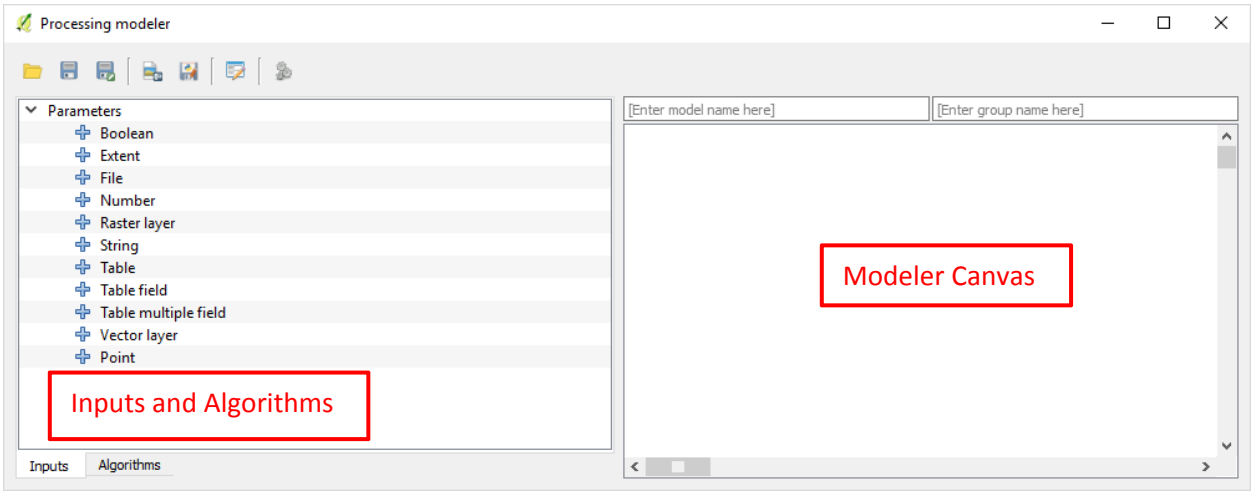
Part F. Working with the Graphical Modeler

A typical spatial analysis involves a series of GIS operations, with the output of one operation as the input for the next one, until the final result is generated. Using the Graphical Modeler, users can combine these individual steps into a single process. Thee interface of Graphical Modeler allows users to visually draw inputs, GIS algorithms, and output. A major benefits of this approach is that the completed analytical workflow can be modified and rerun.

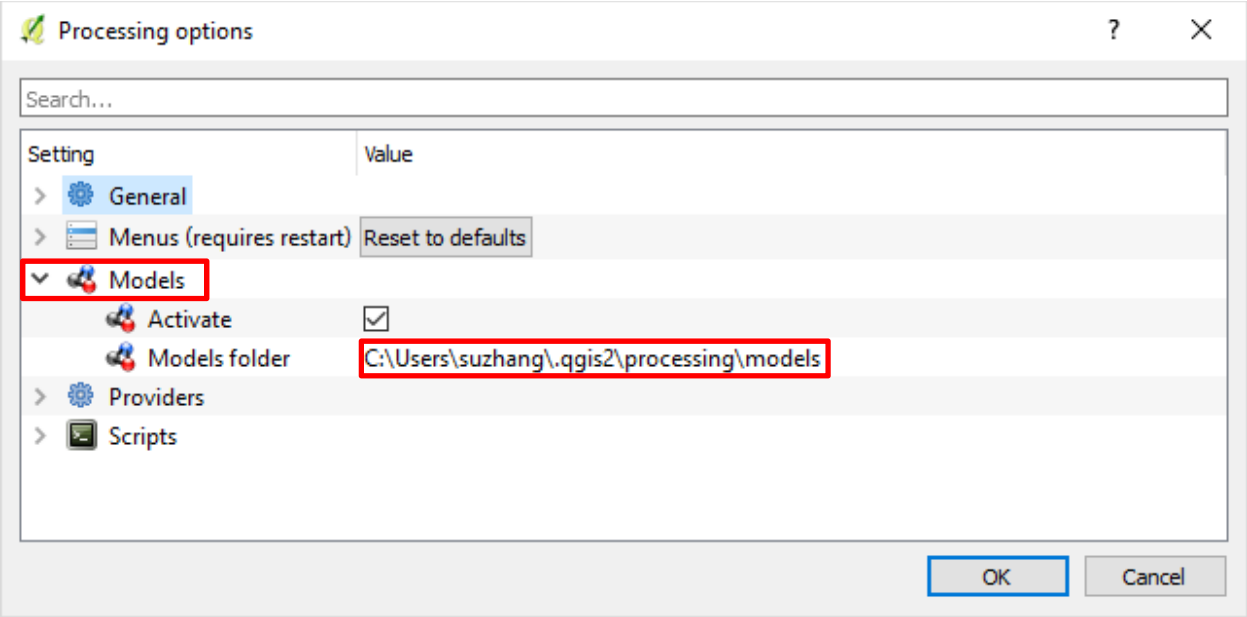
1. Click on Processing and then click on Graphical Modeler



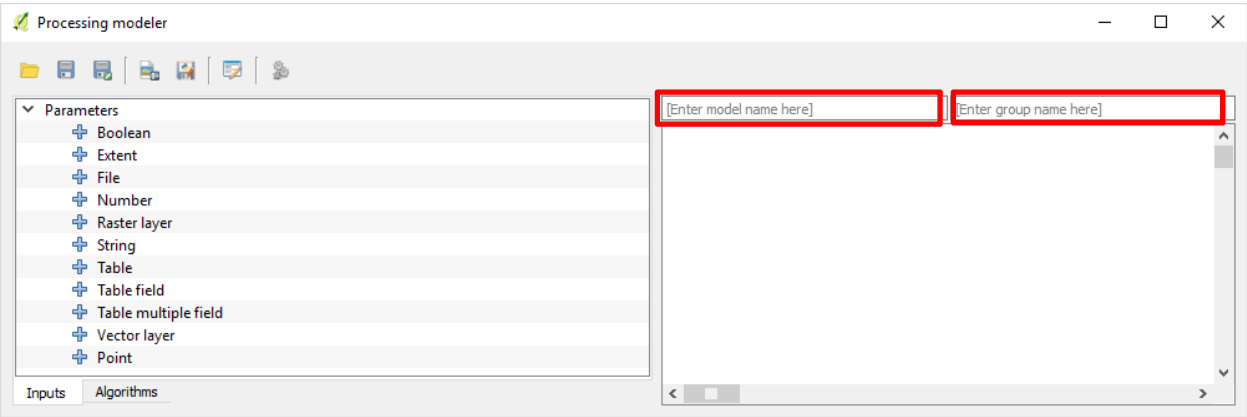
2. The processing modeler opens as a new window; on the left-hand side of the window, there are two tabs: **Inputs** and **Algorithms**; these are used to add both types of element to the modeler canvas that takes up the remainder of the window

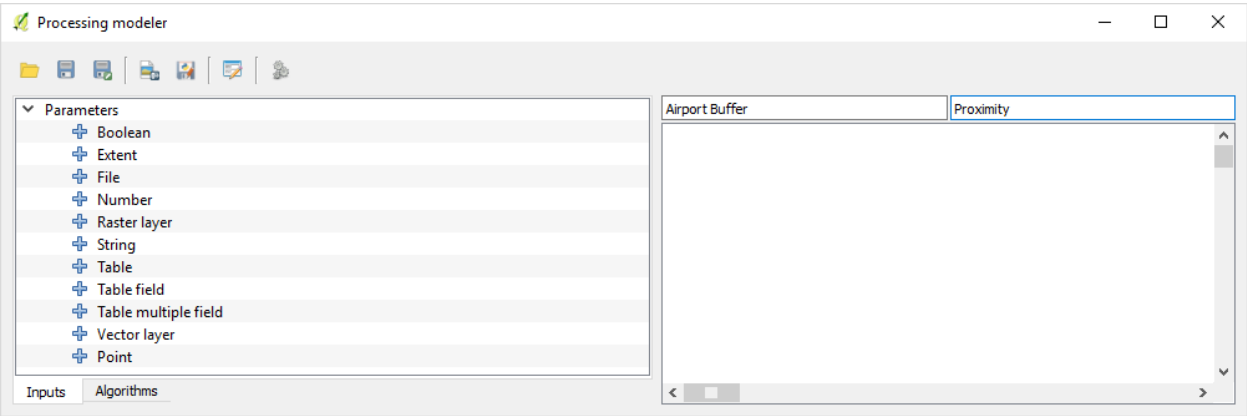


3. Before creating a model, it is always a good practice to configure the modeler; models ae saved as JSON files with a .model extension; when users save a model, QGIS will prompt the users to save the model file to the **Models** folder; users can set the location of the **Models** folder by navigating to Processing >>> Options

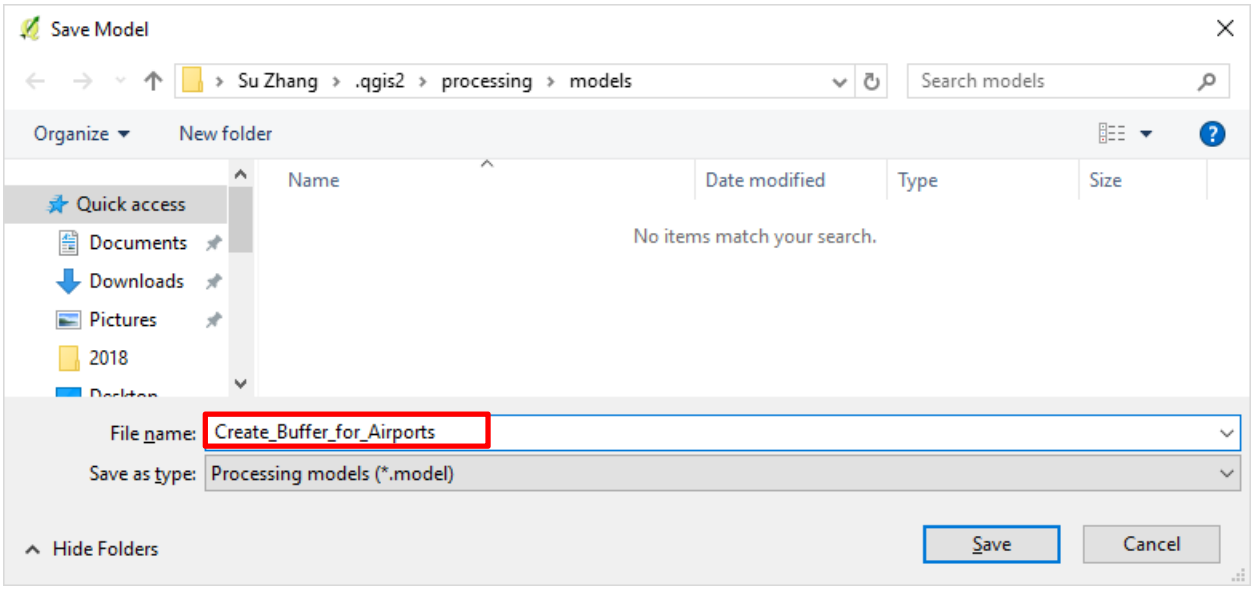


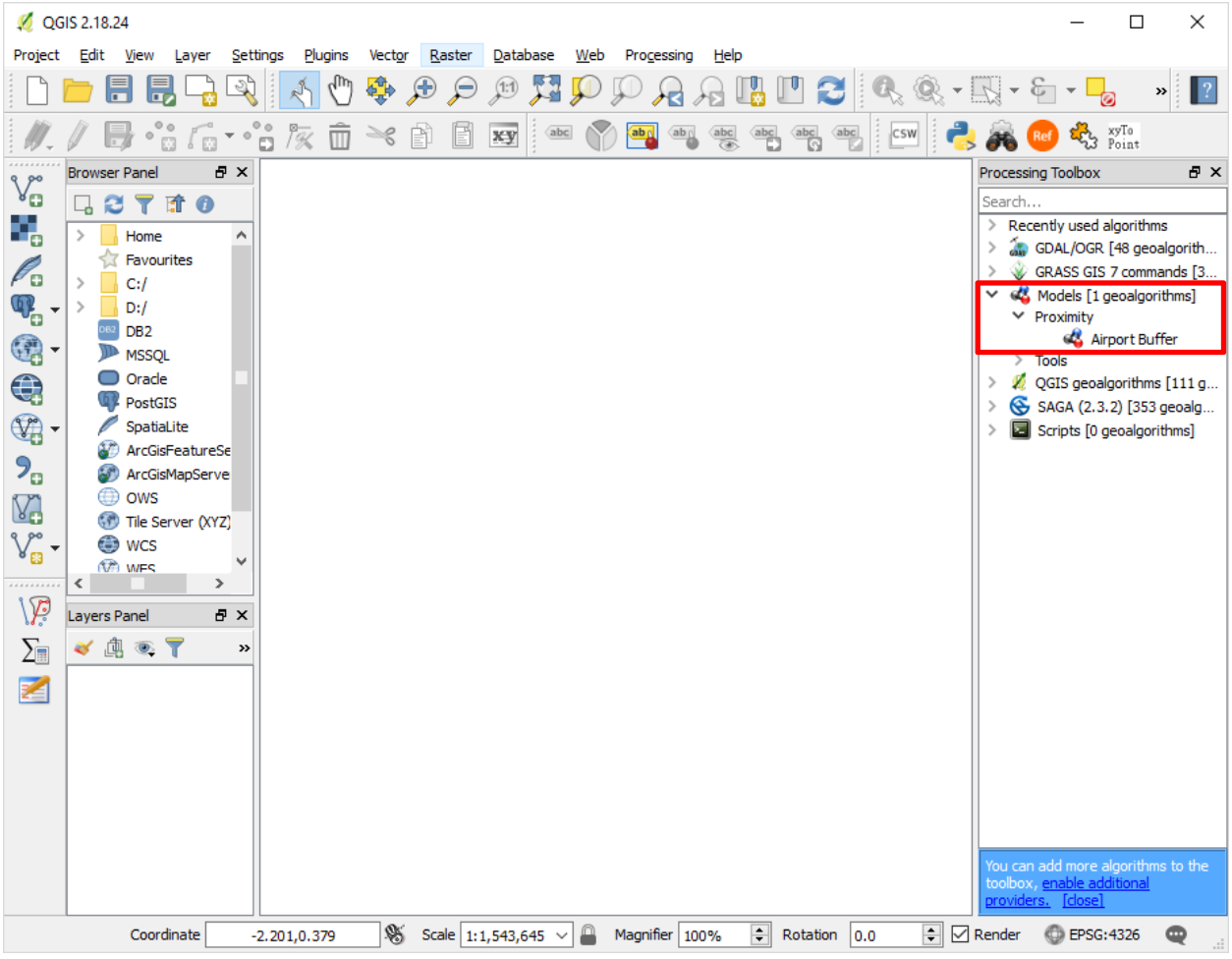
4. Create a new model; type in Airport Buffer in “Enter model name here”, and type in Proximity in “Enter group name here”; click on the save button and the Save Model dialog will open



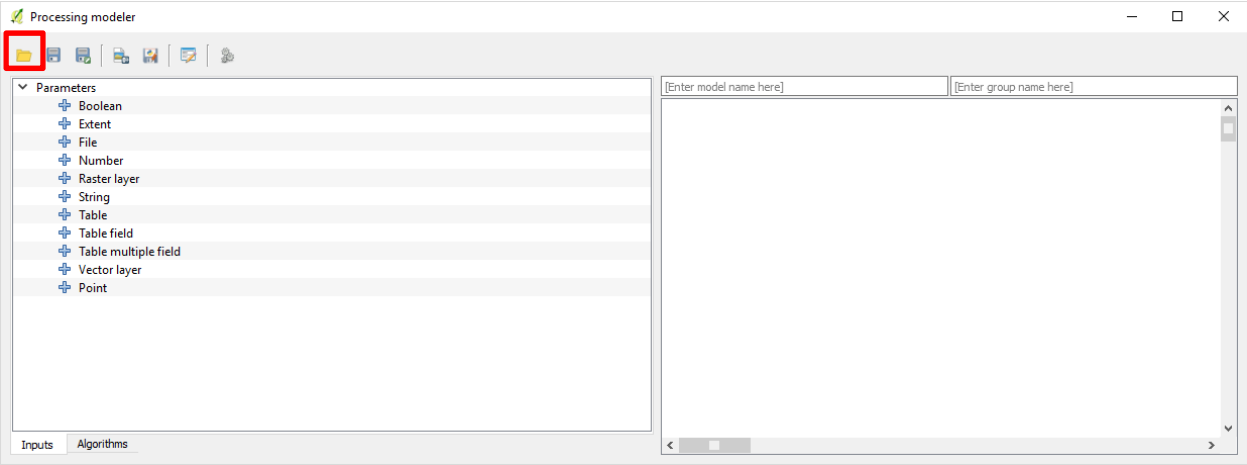


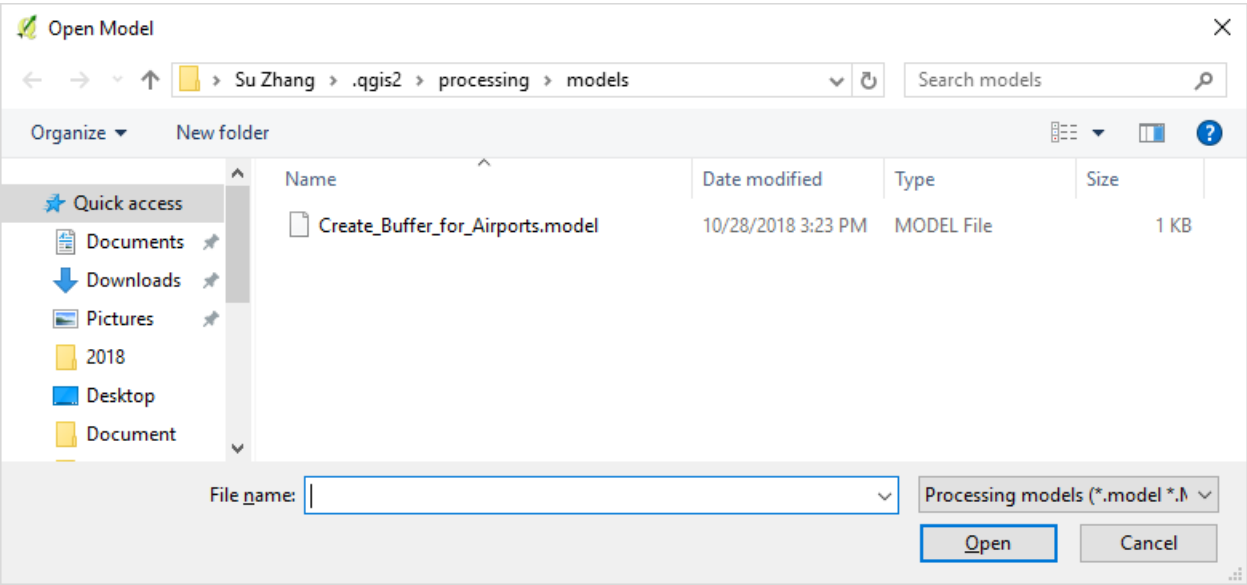
5. In the **Save Model** dialog, type in a name for your model file; the following figure shows the **Save Model** dialog; if models are saved to the **Models** folder, they will appear as model tools in the **Processing Toolbox** panel; the model will appear with the name that was entered into the graphical modeler as opposed to the name of the *.model file. Models can be saved outside the **Models** folder, but they will not appear in the **Processing Box** panel





6. To open a saved model, in the **Processing modeler** dialog, click on the  button to open the **Open Model** dialog and then navigate to the location where you model has been saved



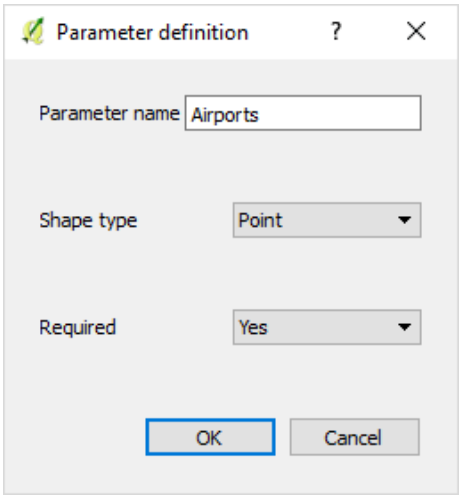


7. To begin the creation of a model, users will need to define the inputs. The graphical modeler will accept the followings as input:

- Boolean
- Extent
- File
- Number
- Raster layer
- String
- Table
- Table field
- Vector layer

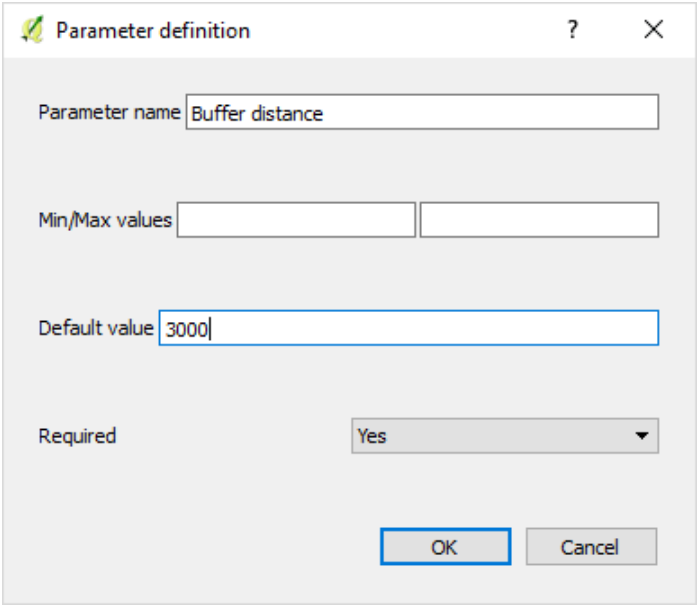
8. To add an input, either double-click on the appropriate category from the Inputs tab or drag the input onto the modeler canvas; the Parameter definition dialog will open; give the parameter a name and fill in any other details, which change depending on the input that is selected; when an input parameter is defined and added to the model, it is essentially a conceptual parameter; it is not actually be connected to a data layer until you are ready to run the model

9. For this exercise, we will add a vector layer; we will specify the geometry of the vector data and select it as a required parameter:

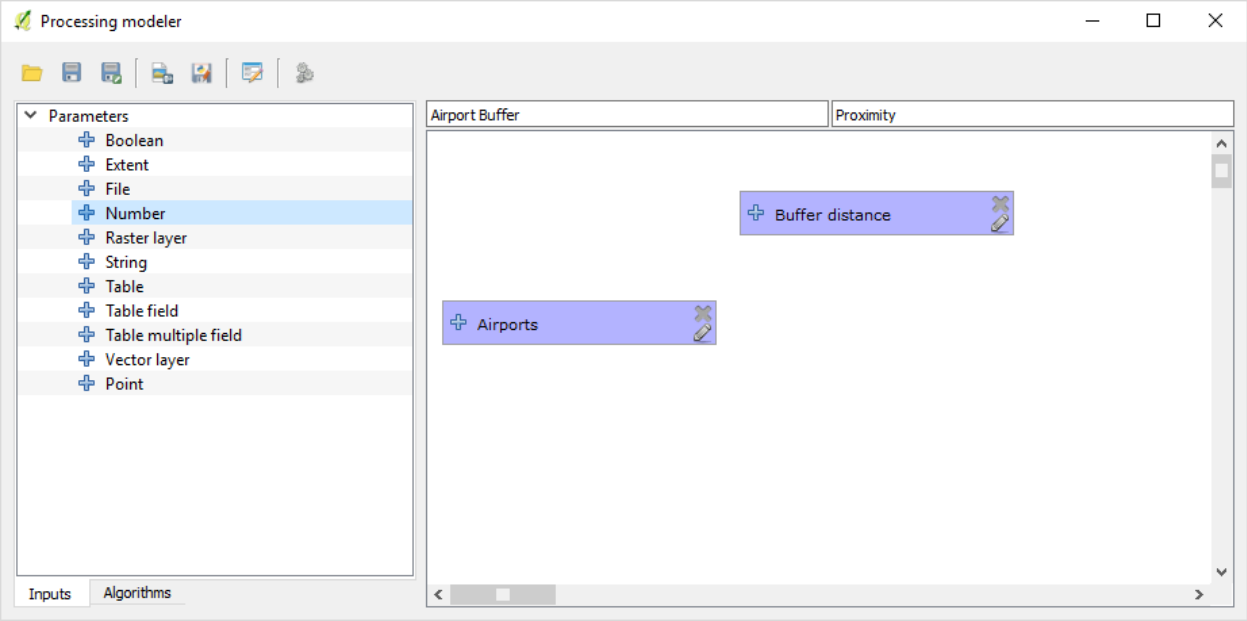


10. Once you click on OK, the input object will be added to the modeler canvas; all the objects in the modeler canvas can be selected with a mouse click and dragged to reposition; click on the pencil icon of an input will open the Parameter definition dialog to make changes

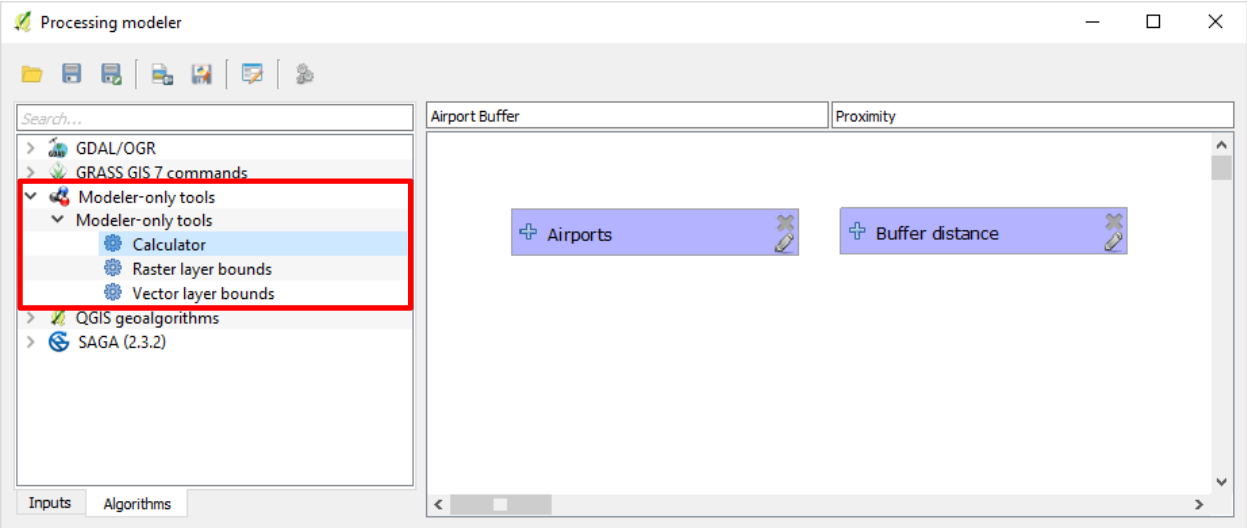
11. We will also add a number input, which allows us to expose the buffer distance value as an input that can be changed when the model is executed; it will be named “Buffer distance” and it will be given a Default value of 3000, since 3000 it the distance that we initially want to use Note: in the graphical modeler, distances are expressed in current project’s coordinate system units

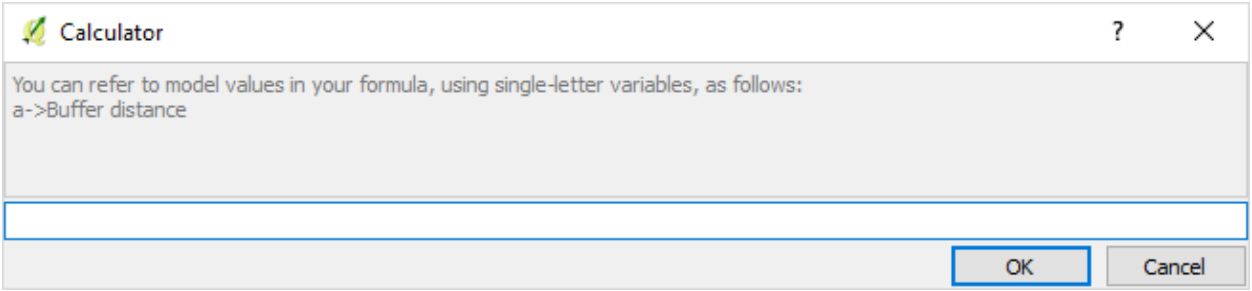


12. The following screenshot shows the model with a vector layer input and a number input

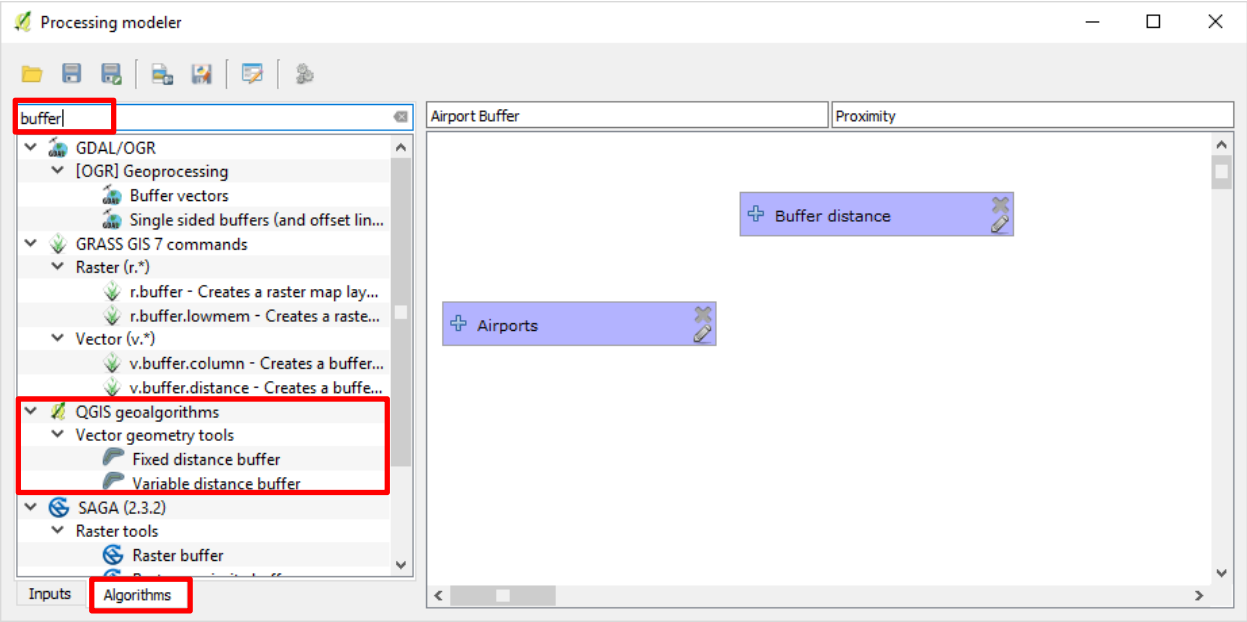


13. Algorithms are added to the graphical modeler in the same way as inputs; click on the "Algorithms" tab; in the Algorithms tab, there is a special category named Modeler-only tools, and there are three tools, including Calculator, Raster layer bounds, and Vector layer bounds; they are tools that can only be used in the graphical modeler

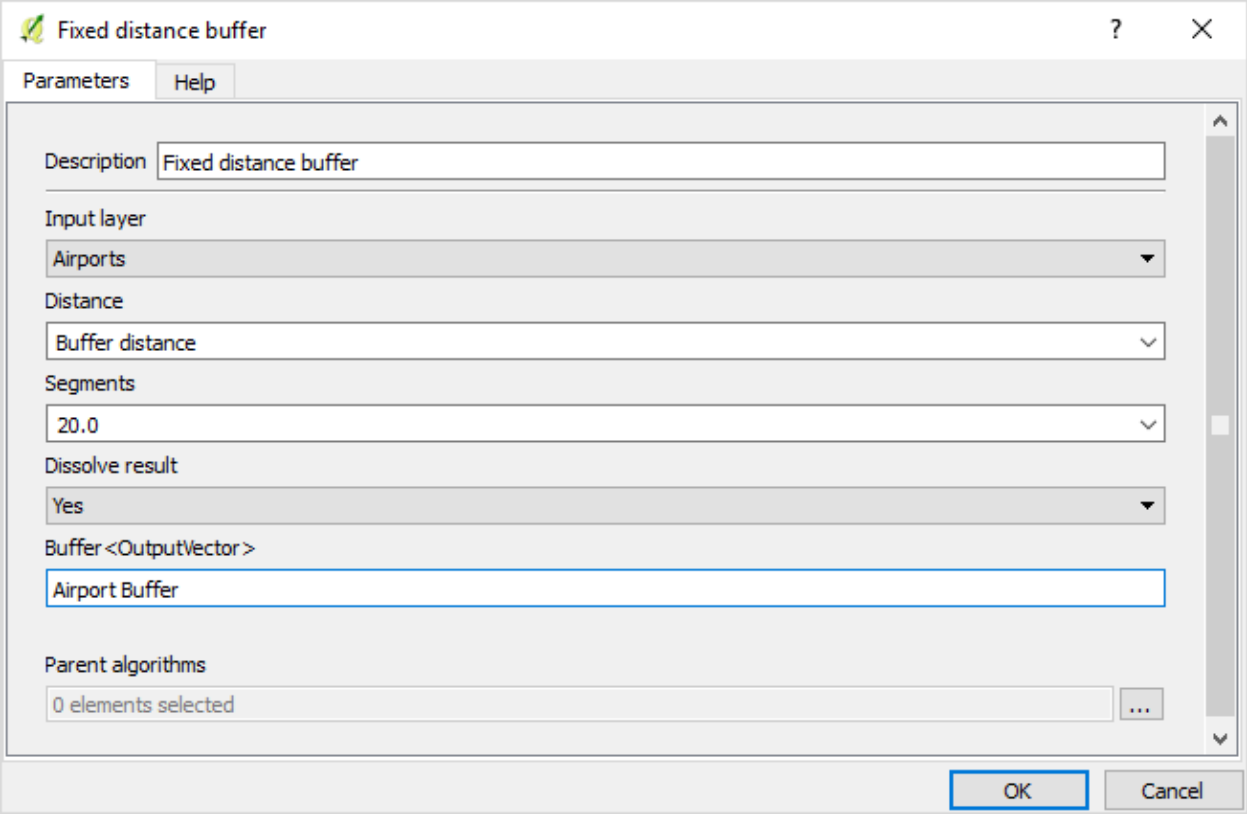




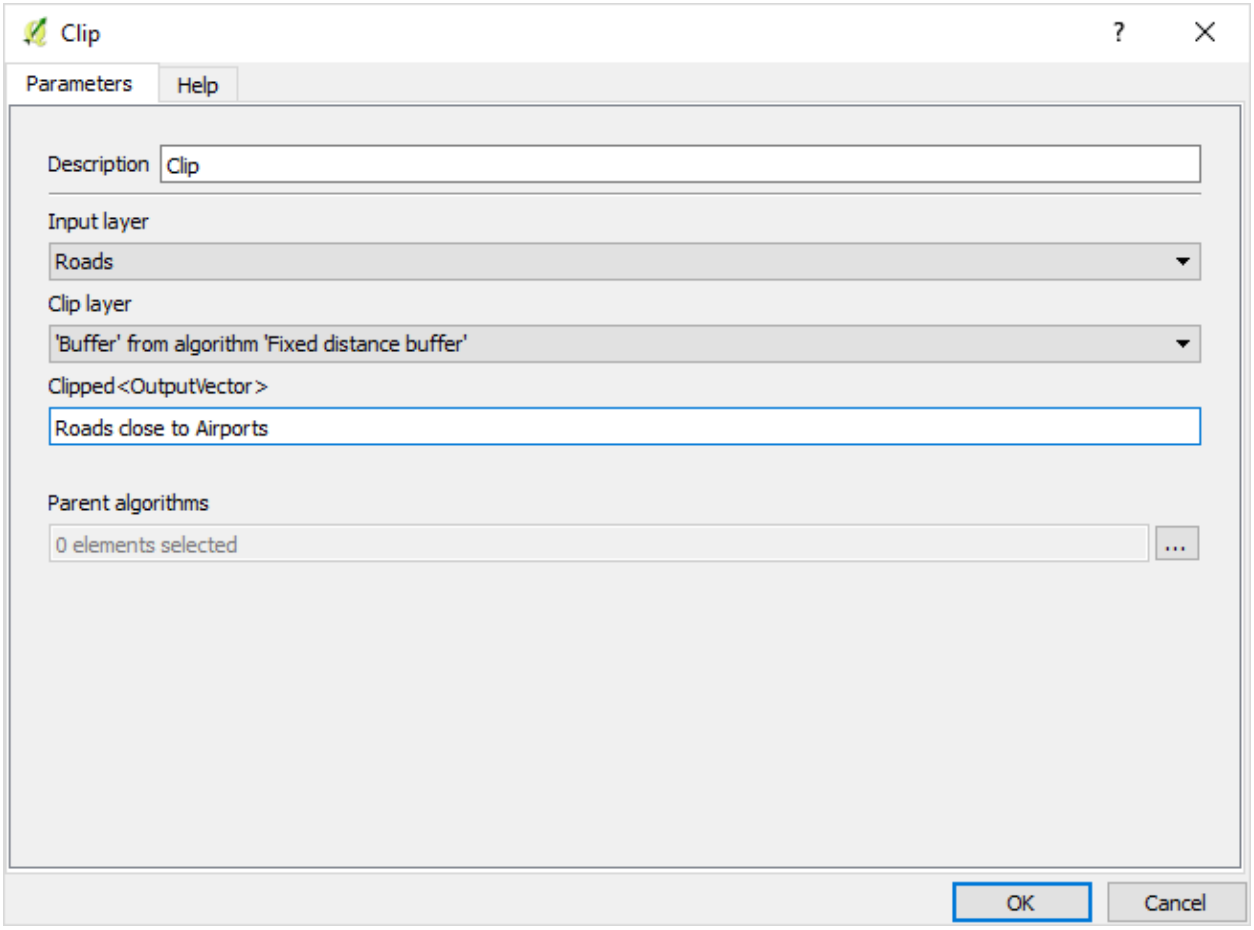
14. In the search bar, type in buffer and many tools show up; click on the “Fixed distance buffer” tool in QGIS geoalgorithms >>> Vector geometry tools

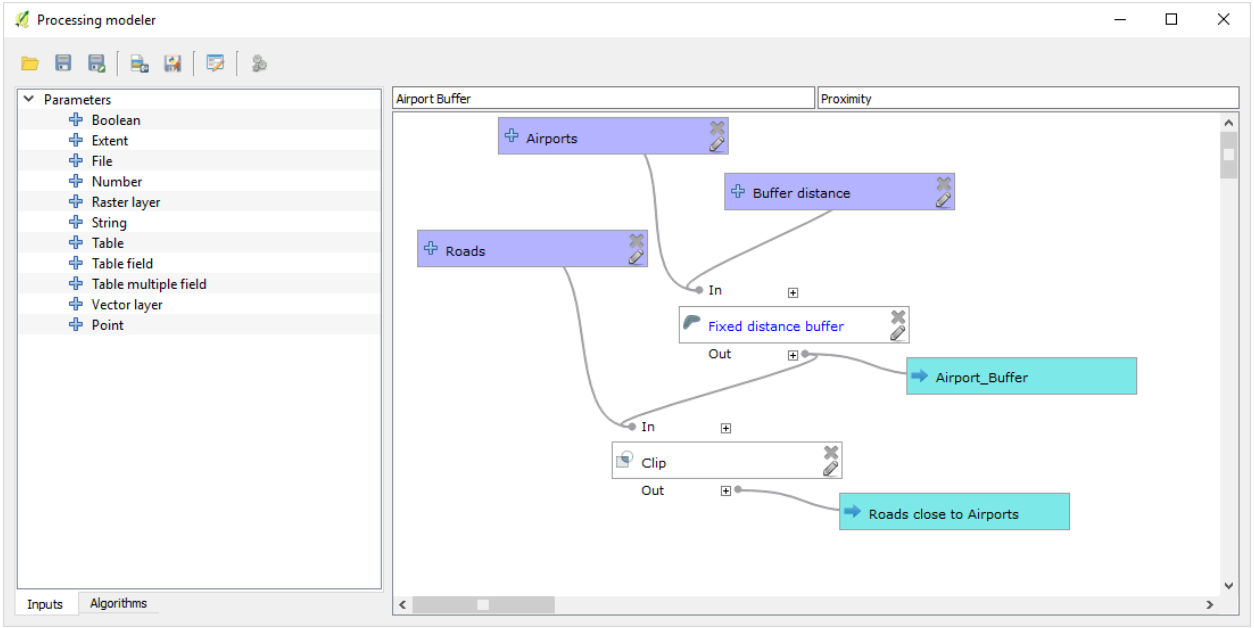


15. Click on the “Fixed distance buffer”, and the Fixed distance buffer dialog open; set up the parameters as below; the **Segments** indicate how many segments that your buffer circle will consist of (the more segments the smoother the circle; default value is 5); output will be Airport Buffer

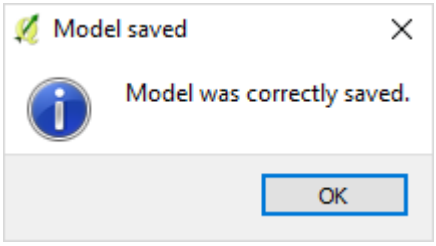


16. Next, add the Roads layer and the Clip tool to the model using the following parameters

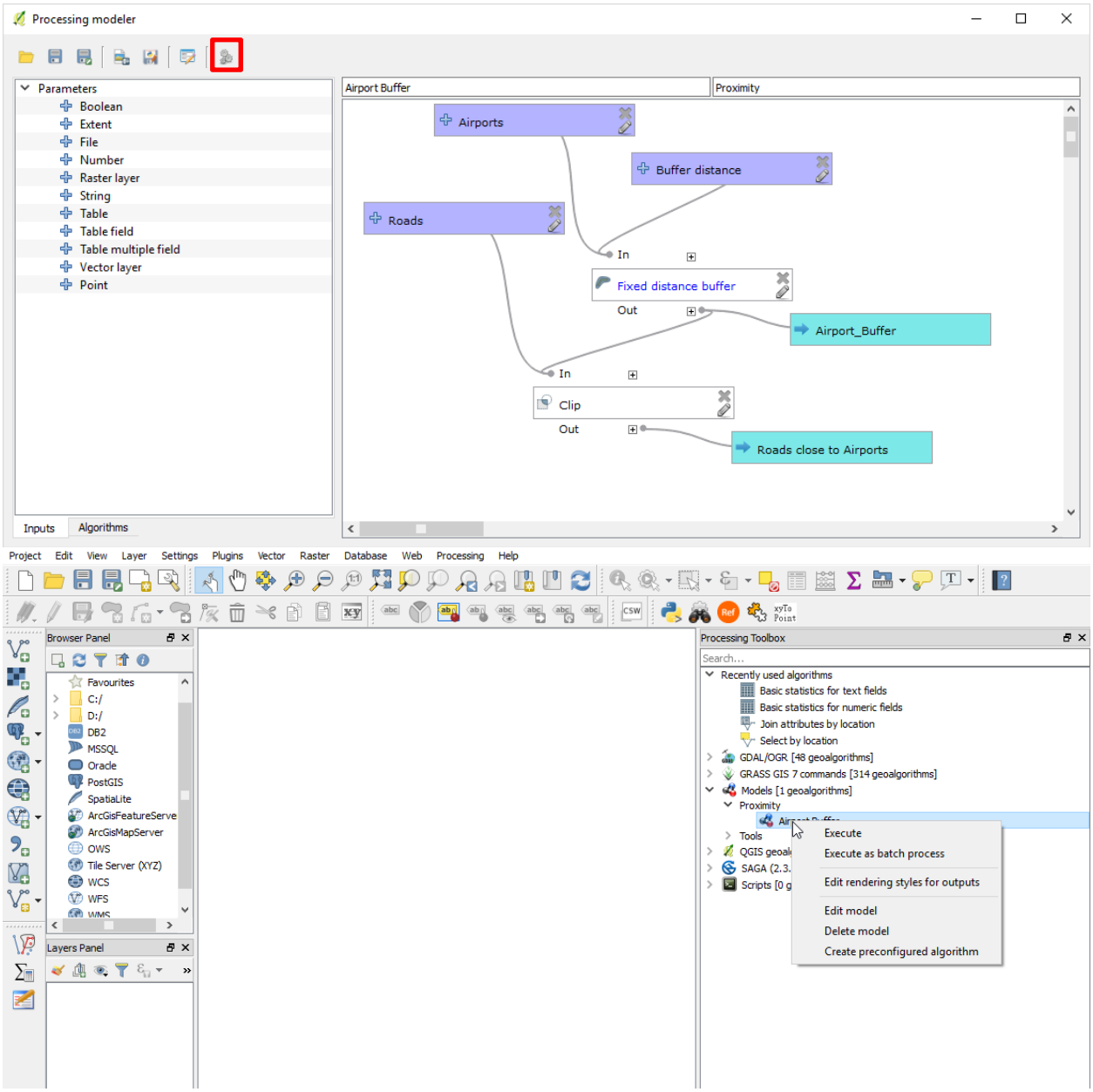




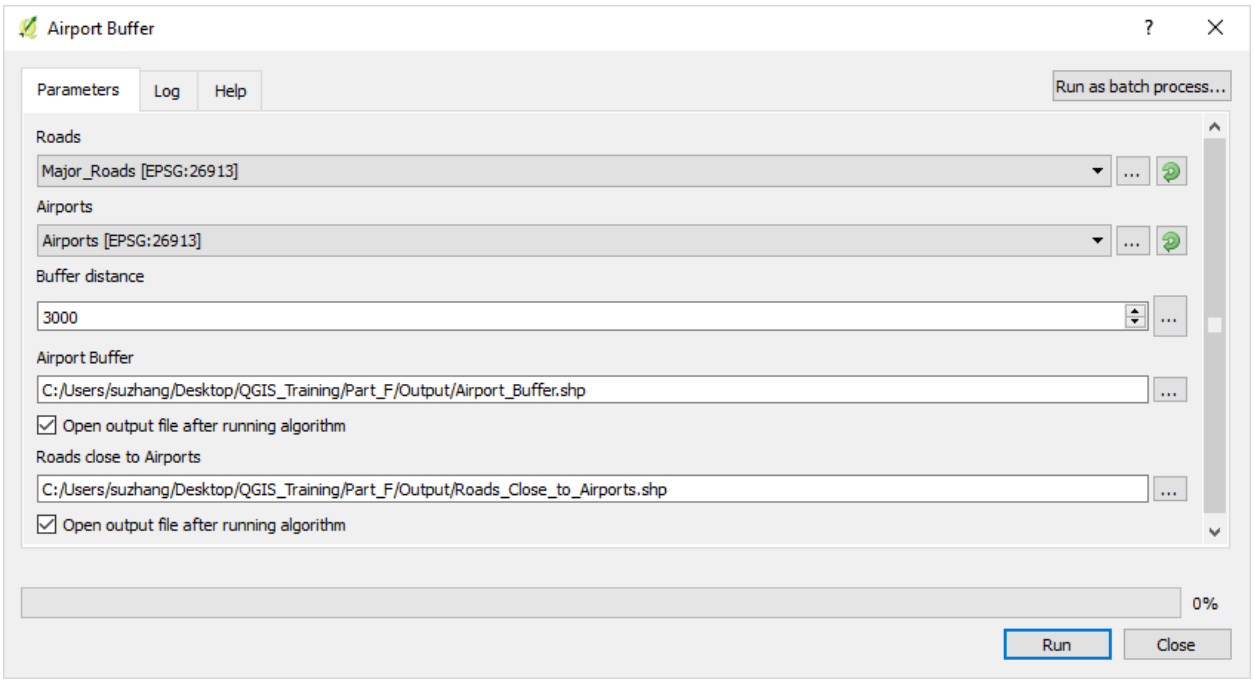
17. Click on the Save button to save your model and then close your model

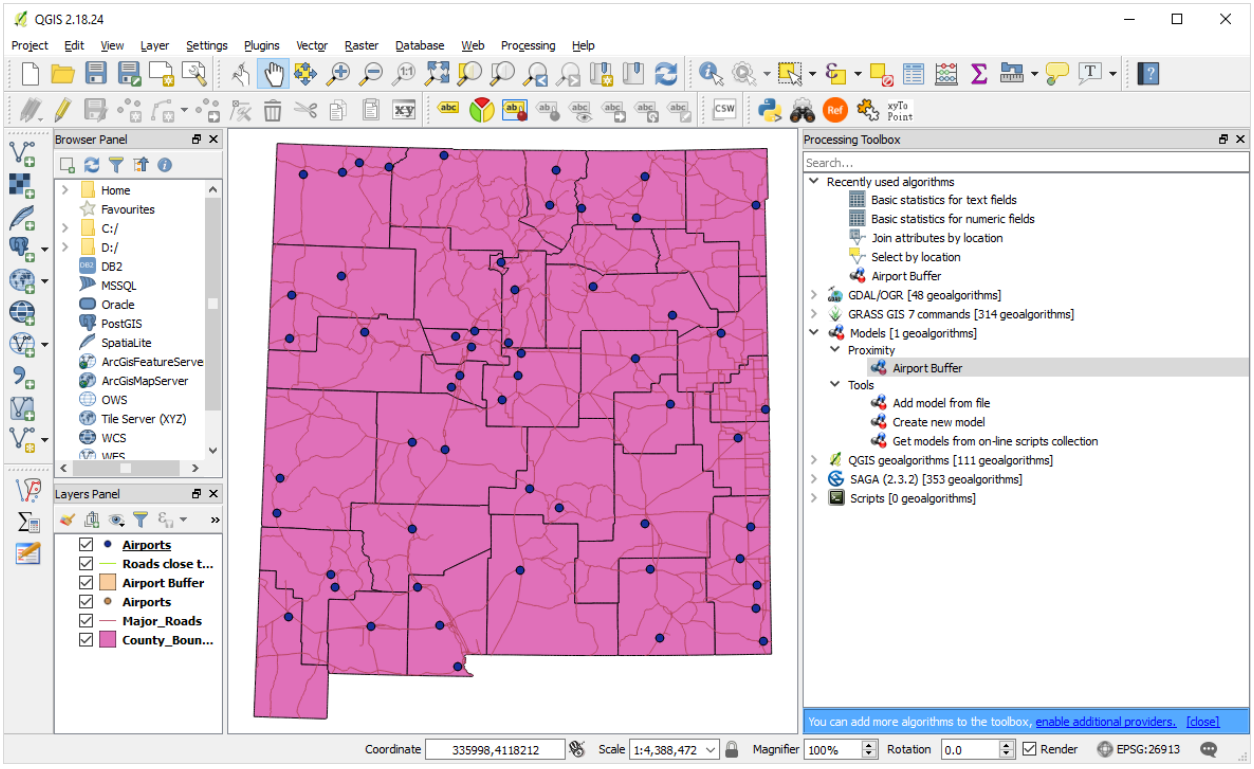


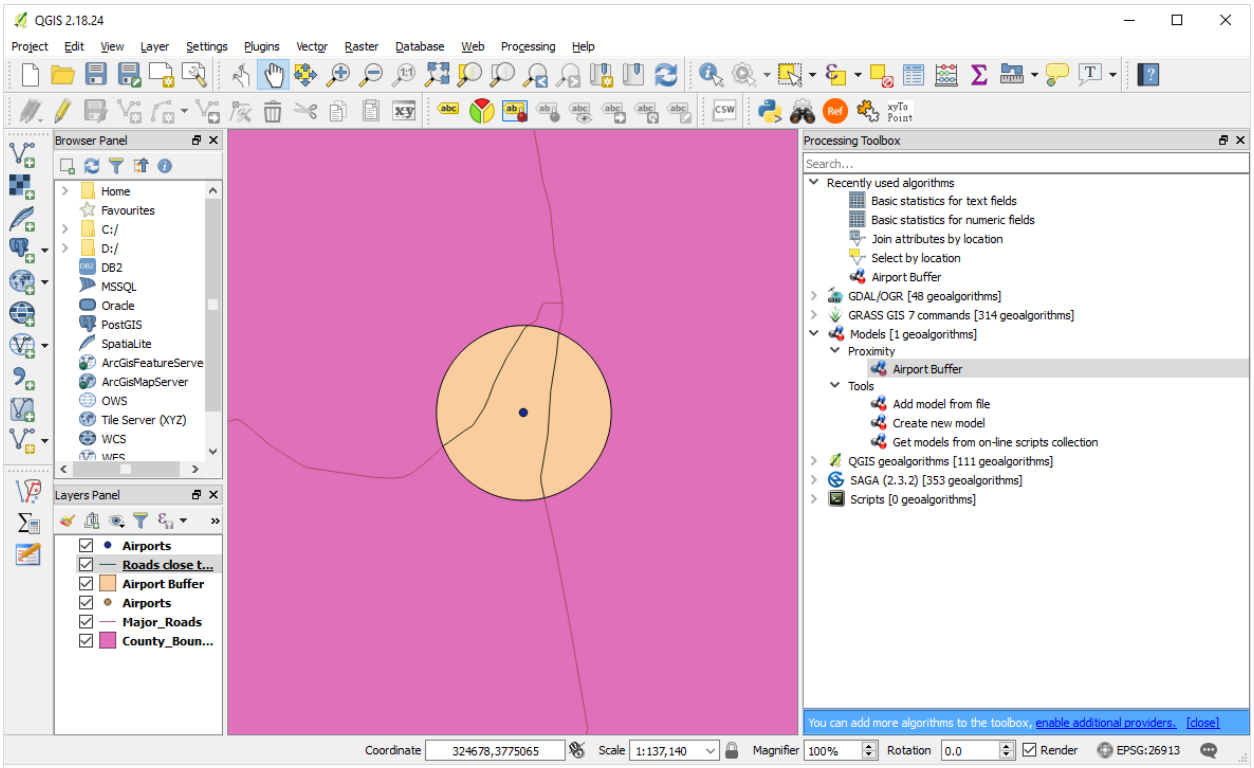
18. The model can be run either from the **Processing modeler** window or from the **Processing Toolbox** panel; in the **Processing modeler** window, click on the **Run model** button ; to run from the **Processing Toolbox**, first save and close the model and then find the model by navigating to model and then right-click on it, and choose **Execute** from the context menu



19. The tool will open with a regular tool interface, fill in the parameters as below and then click on Run; the results will be placed in the folder that you selected



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GRASS GIS 7 commands [314 geoalgorithms]
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Tools
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Scripts [0 geoalgorithms]
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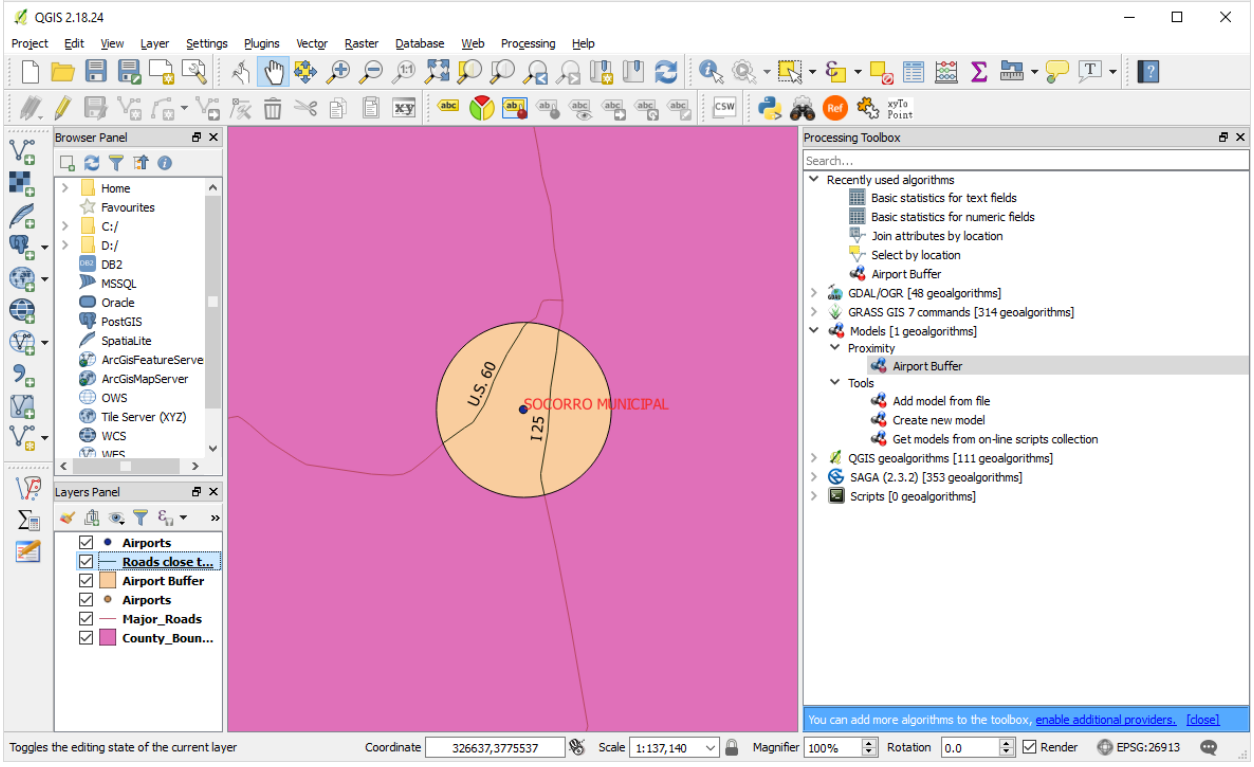
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Basic statistics for numeric fields
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Airport Buffer
GDAL/OGR [48 geoalgorithms]
GRASS GIS 7 commands [314 geoalgorithms]
Models [1 geoalgorithms]
Proximity
Airport Buffer
Tools
Add model from file
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QGIS geoalgorithms [111 geoalgorithms]
SAGA (2.3.2) [353 geoalgorithms]
Scripts [0 geoalgorithms]
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