Introduction to Quantum GIS

- http://www.qgis.org
- http://www.osgeo.org

Agenda

- Overview of GIS
- Introduction to Quantum GIS
- Vector Data
- Raster Data
- Plugins
- Fields and Attribution
- Creating Data
- Map Layout

1. Overview of GIS

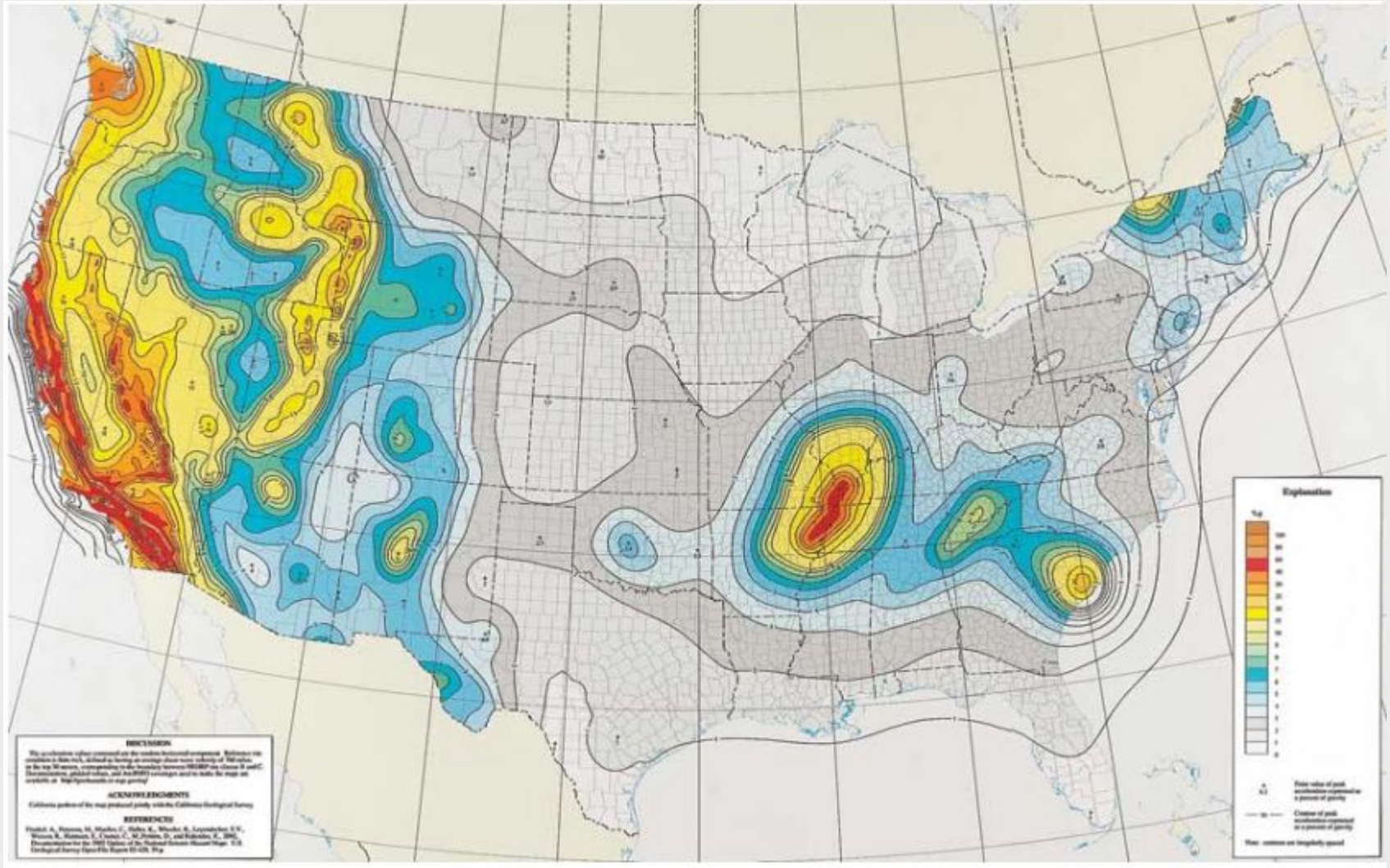
- Geographic Information System
- Wikipedia definition - it is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographically referenced data.
- It is used in many applications: Small municipalities, forestry, military, commercial businesses, etc., etc.,
- What do you do with it?

GIS

- Easily measure distances
- Easily measure areas
- Find overlap between features
- Proximity

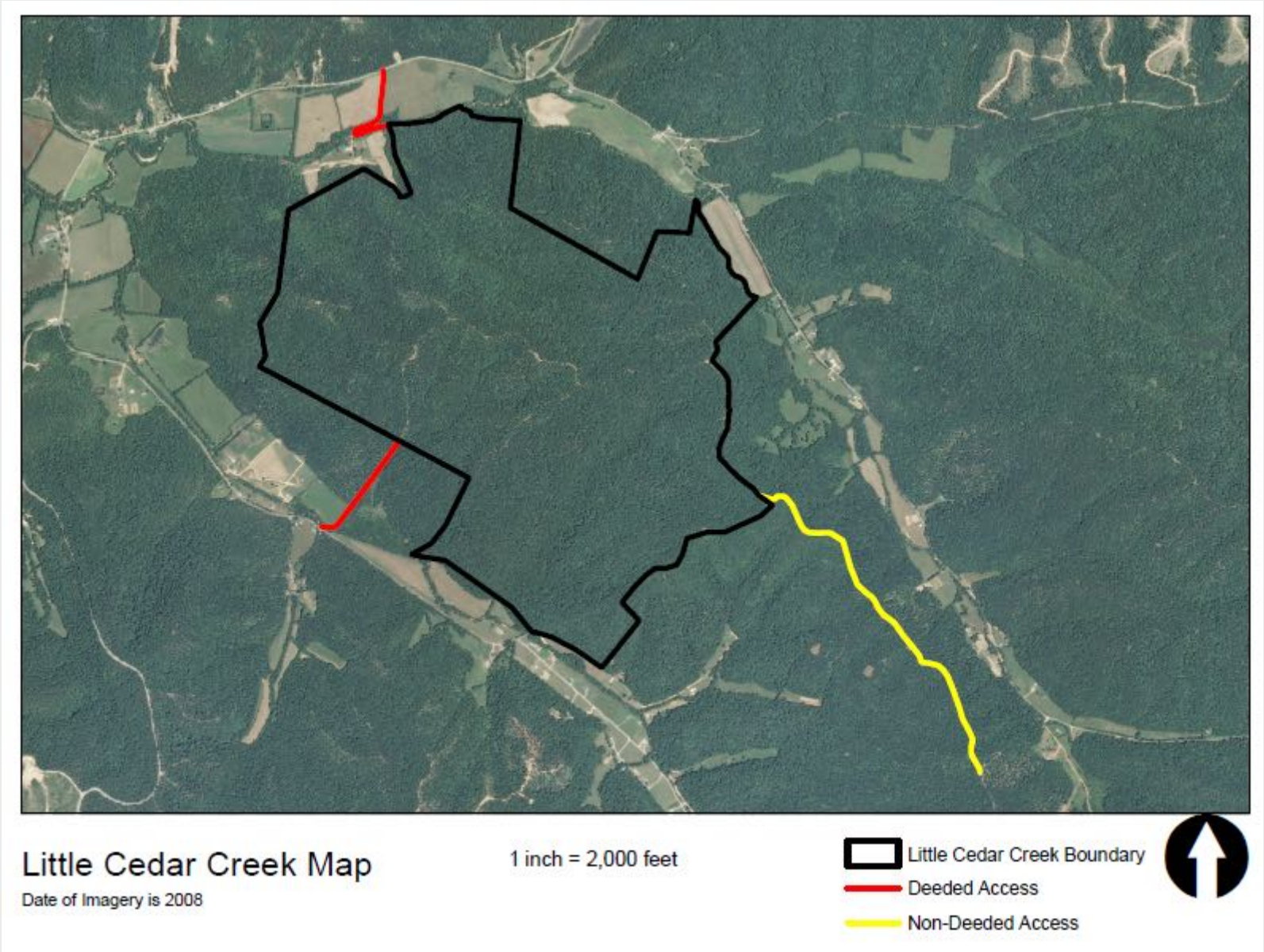
- Everything is related by location.
  - Tobler's Law

USGS Earthquake Zones



http://earthquake.usgs.gov

Simple Maps


Little Cedar Creek Map
Date of Imagery is 2008
1 inch = 2,000 feet
Little Cedar Creek Boundary
Deeded Access
Non-Deeded Access

Outputs from a GIS

- Maps
  - Printed
- Digital (PDF, JPEG
- Spreadsheets
- Databases
- Files
  - Shapefiles
  - KML

2. Introduction to Quantum GIS

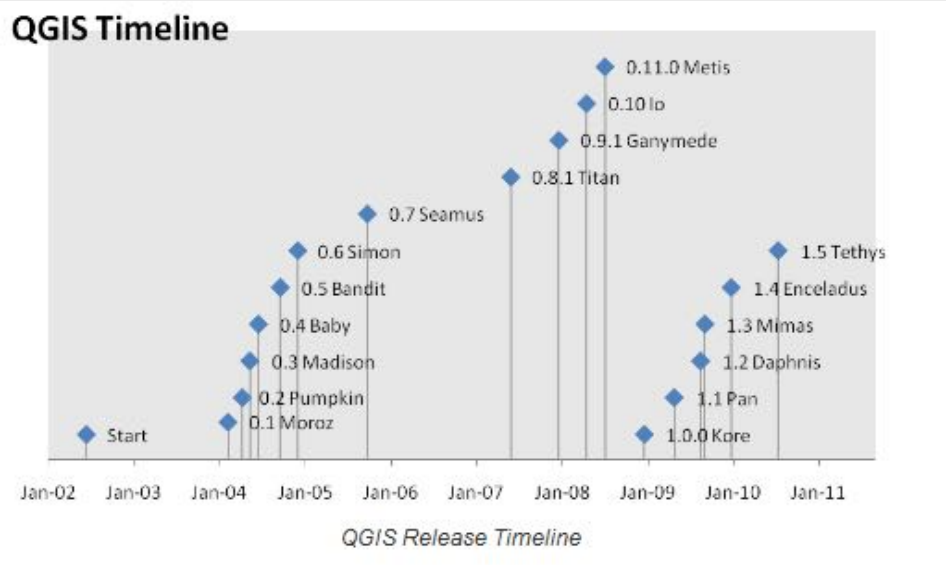
- Open Source – It comes with the right to download, run, copy, alter, and redistribute the software.
- With source code users have the option
  - Suggest improvements
  - Make improvements themselves
  - Hire a professional to make the changes
  - Save software from abandonment

Common OS Licensing

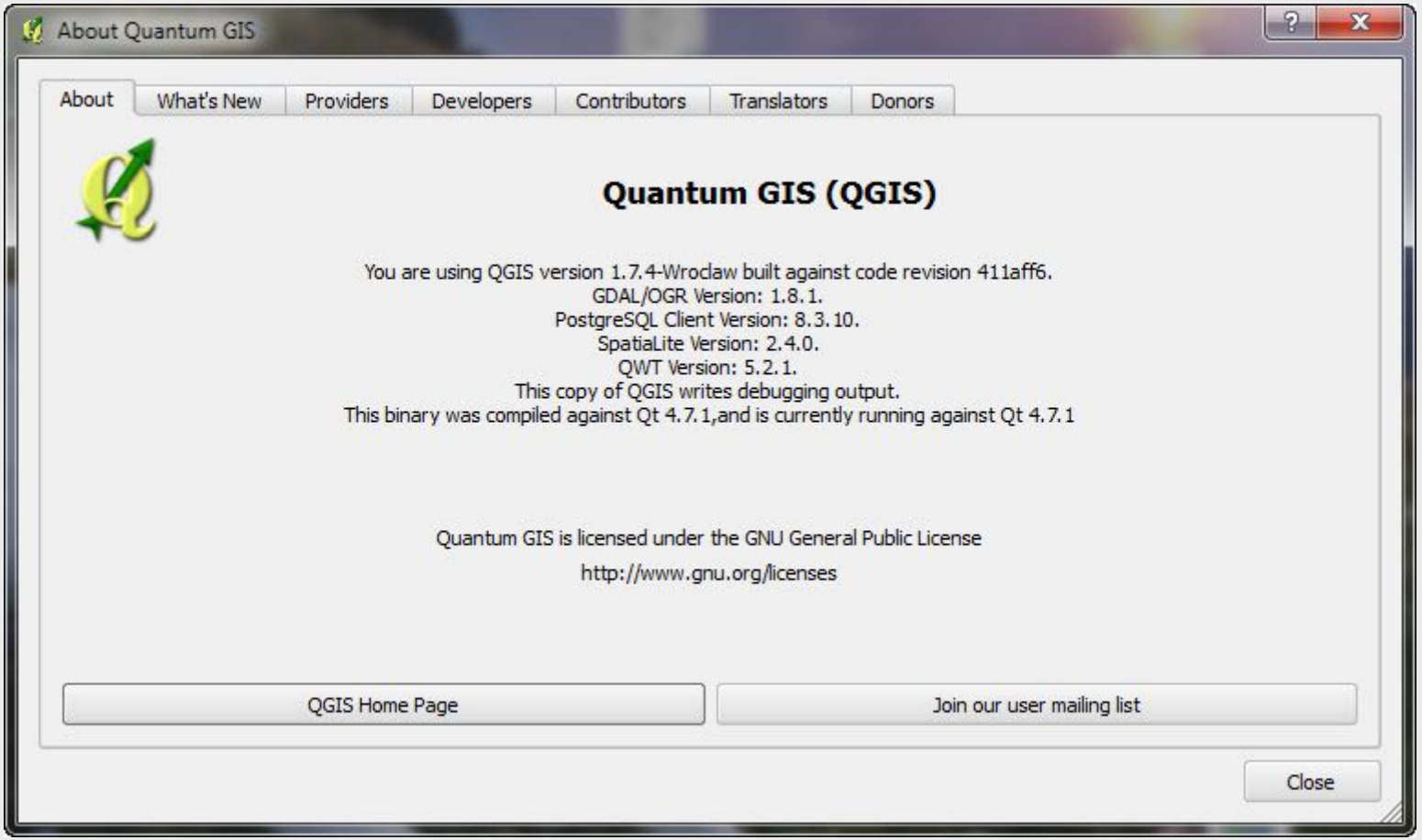
- Licenses to run in both open and proprietary systems
  - Apache Software License
  - BSD (Berkeley Software Distribution)
  - MIT (Massachusetts Institute of Technology)
- License to run in open environments
  - GPL (General Public License)
  - LPGL (Lesser General Public License)
  - MPL (Mozilla Public License)

QGIS

- The QGIS project began in February, 2002
- Produced by a Development team
  - Gary Sherman, Founder
- The first release was in July of that year
- The first version supported only PostGIS and had no map navigation tools or layer control.



QGIS is GPL


About Quantum GIS
About
What's New
Providers
Developers
Contributors
Translators
Donors
Quantum GIS (QGIS)
You are using QGIS version 1.7.4-Wroclaw built against code revision 411aff6.
GDAL/OGR Version: 1.8.1.
PostgreSQL Client Version: 8.3.10.
SpatiaLite Version: 2.4.0.
QWT Version: 5.2.1.
This copy of QGIS writes debugging output.
This binary was compiled against Qt 4.7.1,and is currently running against Qt 4.7.1
Quantum GIS is licensed under the GNU General Public License
http://www.gnu.org/licenses
QGIS Home Page
Join our user mailing list
Close

Installing Quantum

- http://www.qgis.org
- I am going to stick with Windows and Linux Installs.
  - OSX - http://www.kyngchaos.com/software/qgis
- Linux – depending on your distribution of choice you'll have a Debian or RPM install.
  - Most systems with a large user base have a GIS repository
  - Ubuntu, Debian, Fedora

Windows

- Windows Installer Method
  - Standalone Installer (recommended for new users)
  - Installs Quantum (Currently 1.8)
    - Also installs Current Release of GRASS
    - Also installs python 2.7 that runs inside of QGIS
- Updates uninstall and reinstall the software and save your settings. Must be done manually

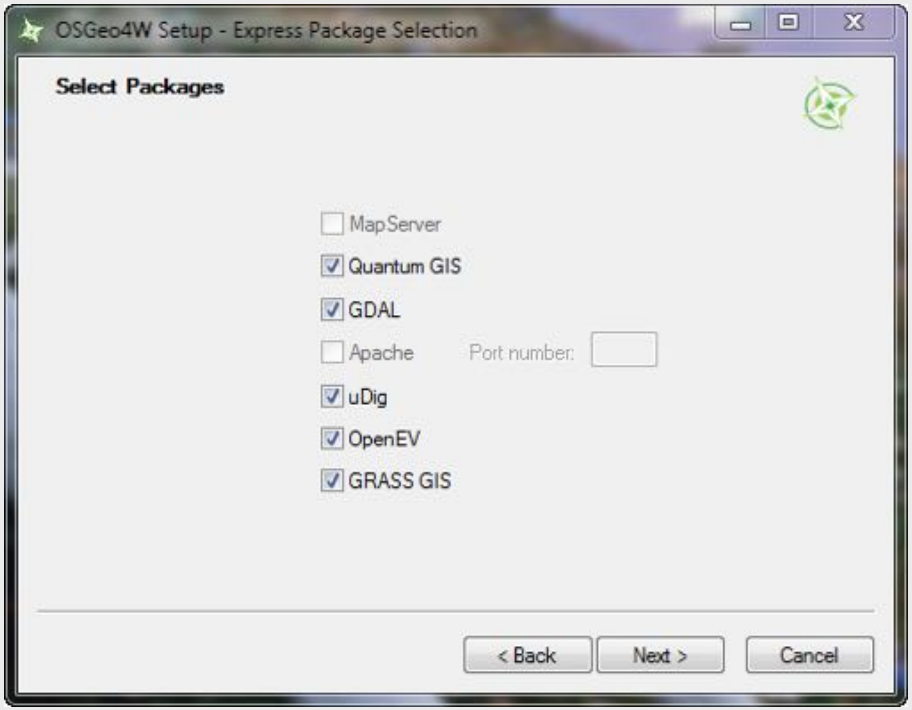
Windows Installer cont'

- Standalone Method
  - Geographic Data Abstraction Library
  - Installs libraries for SID and ECW
  - SID and ECW are proprietary formats that have special agreements to be used with GDAL
  - http://www.gdal.org/

OSGEO Install

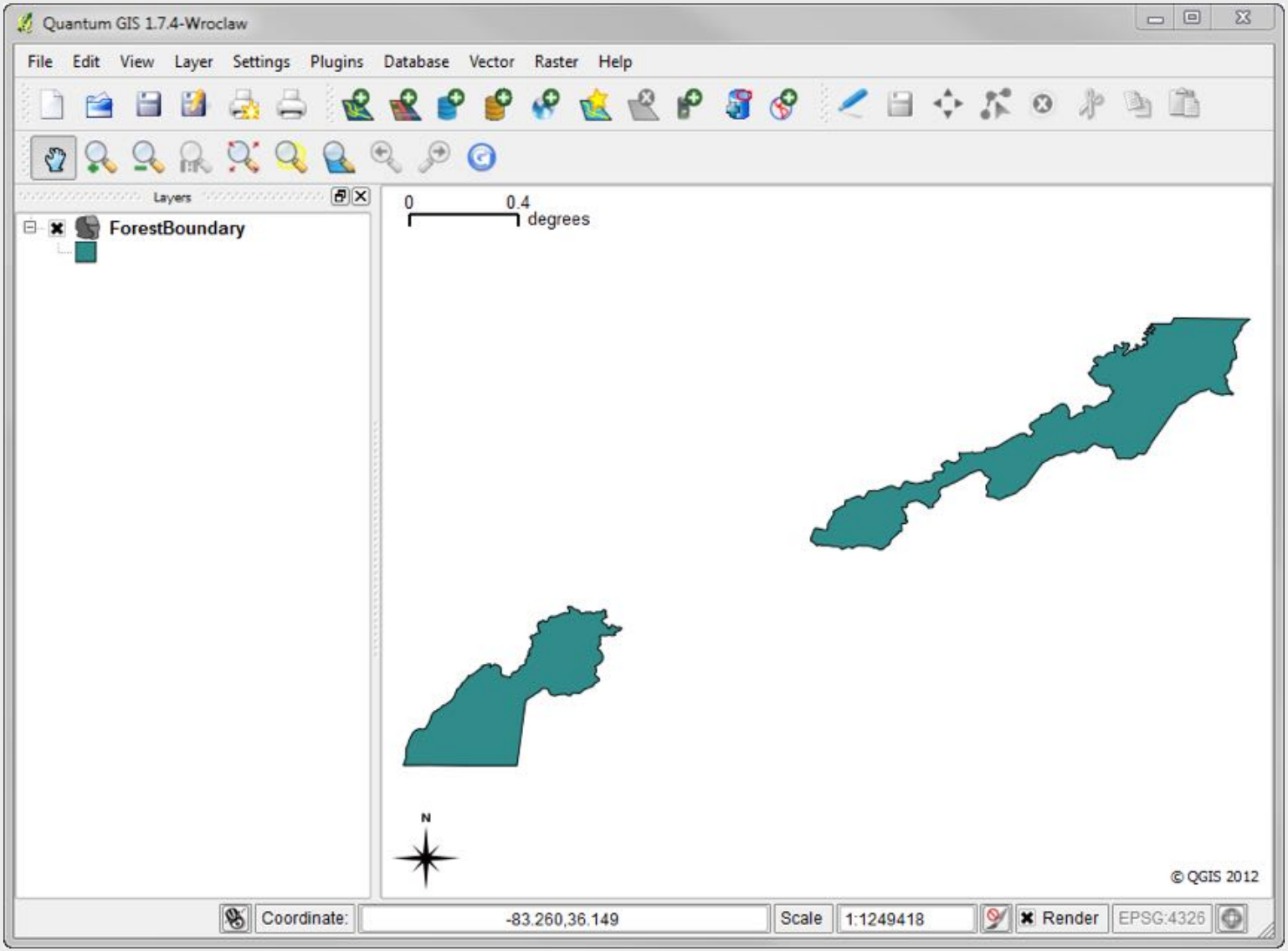
- OSGeo provides an installer that provides everything.
  - Runs in a “cygwin” type environment
  - Cygwin provides unix commands and environments on windows machines.
  - Provides a means to an easy(ier) upgrade path between releases.
  - Isn't “installed” on your computer.

OSGEO Installer Cont'

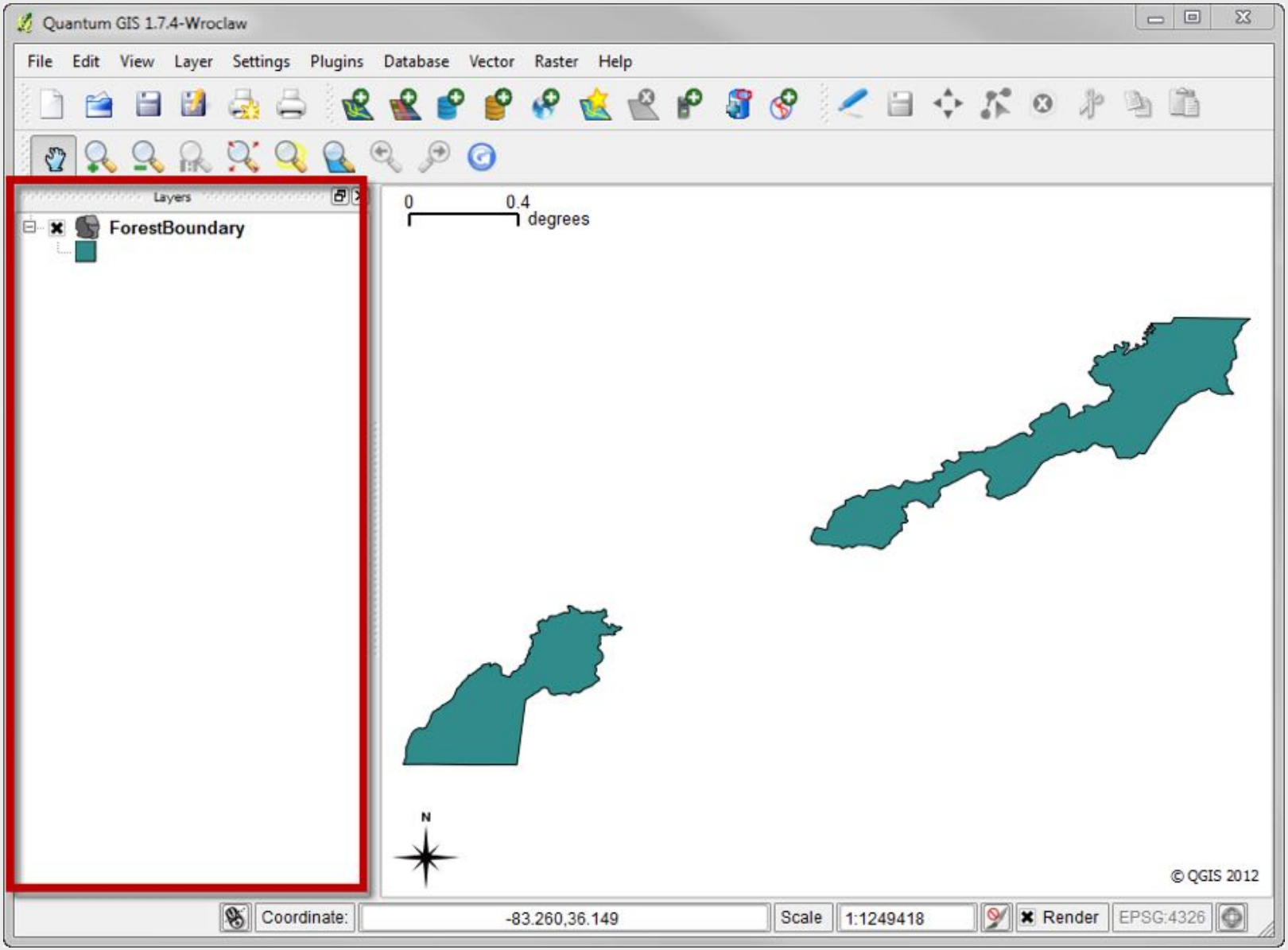


- Quantum GIS
- GDAL
- GRASS
- OpenEV
- And UDIG (a great data viewer).

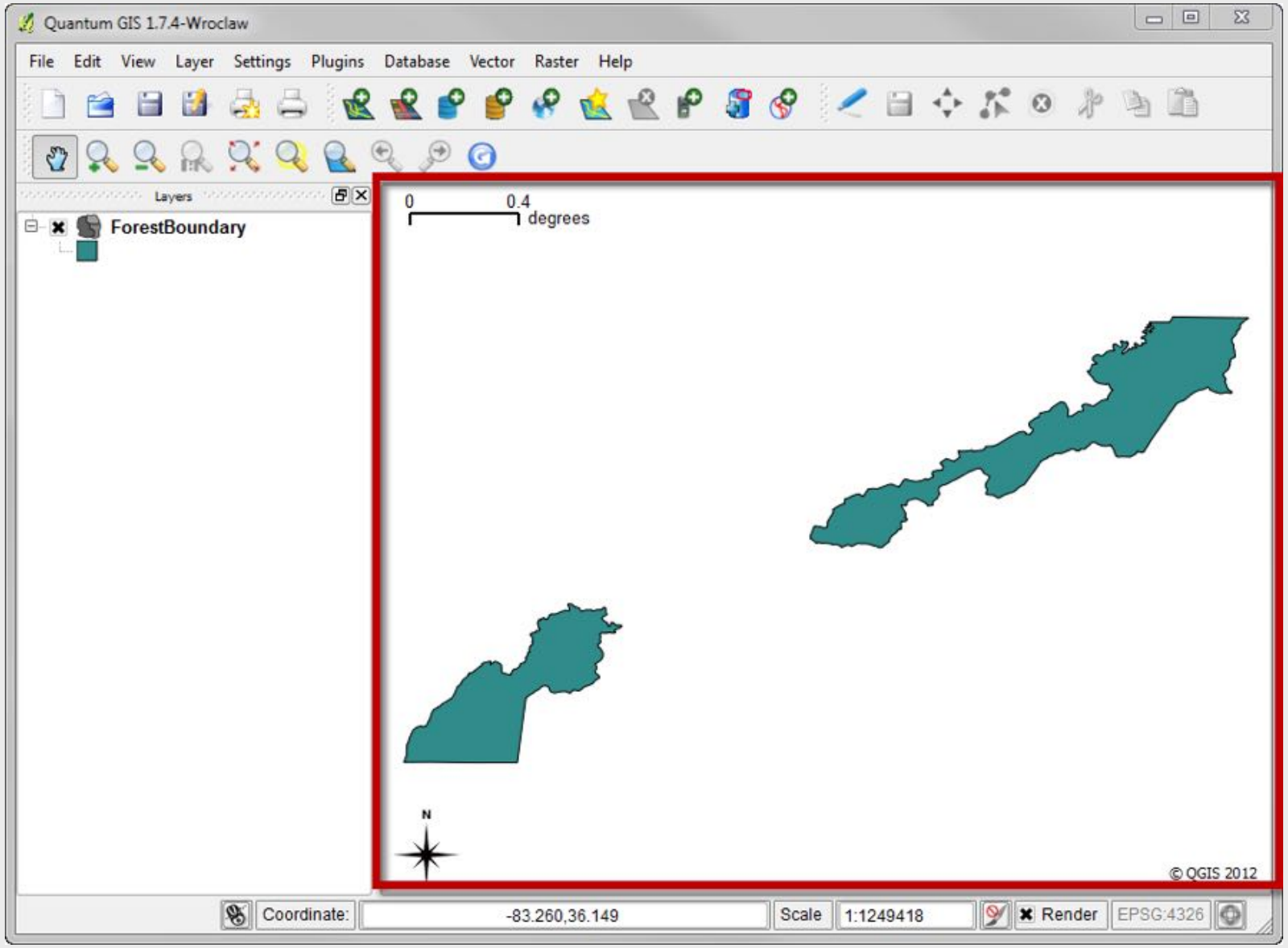
3. Quantum GIS Interface



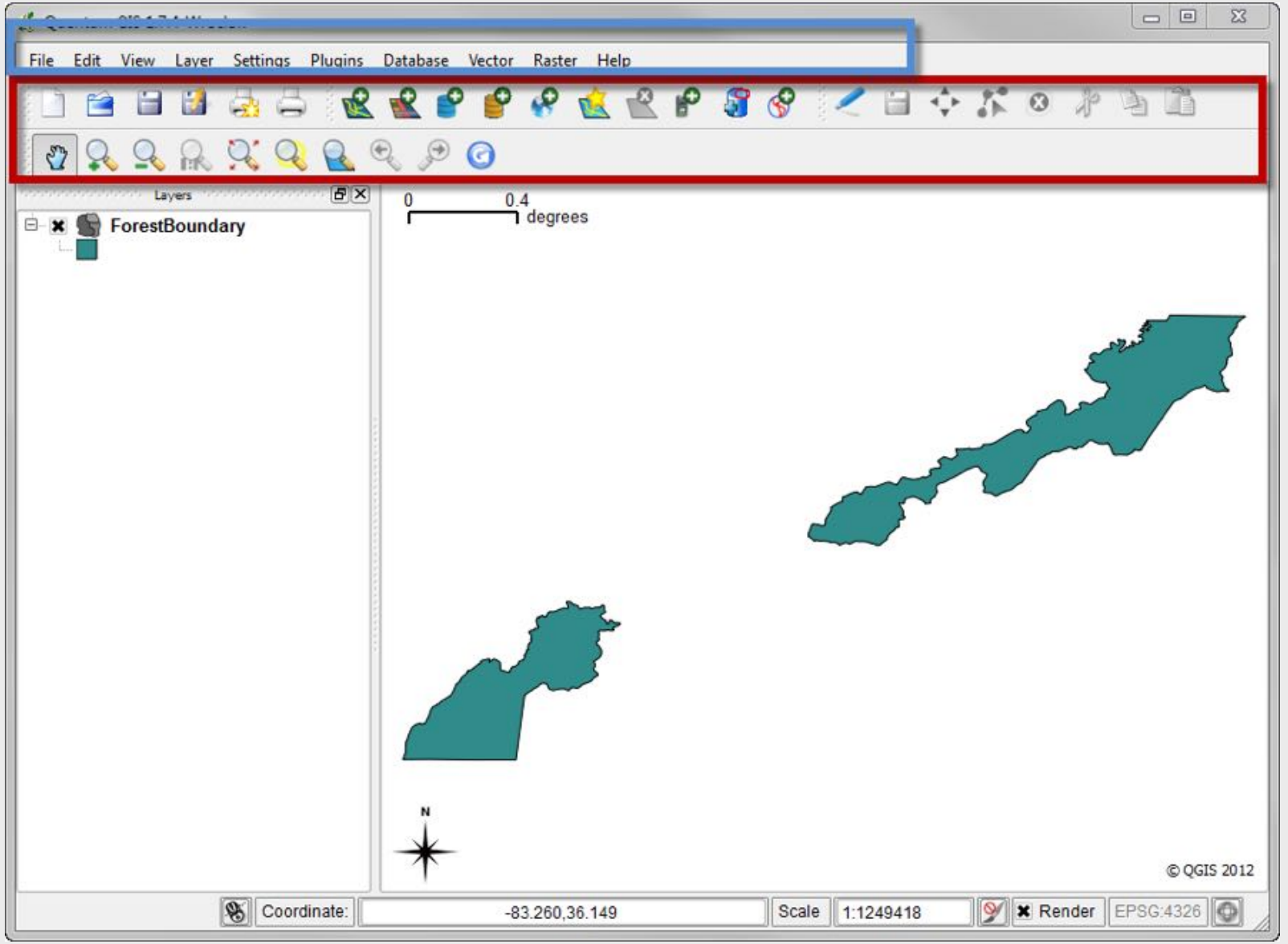
Layer Window



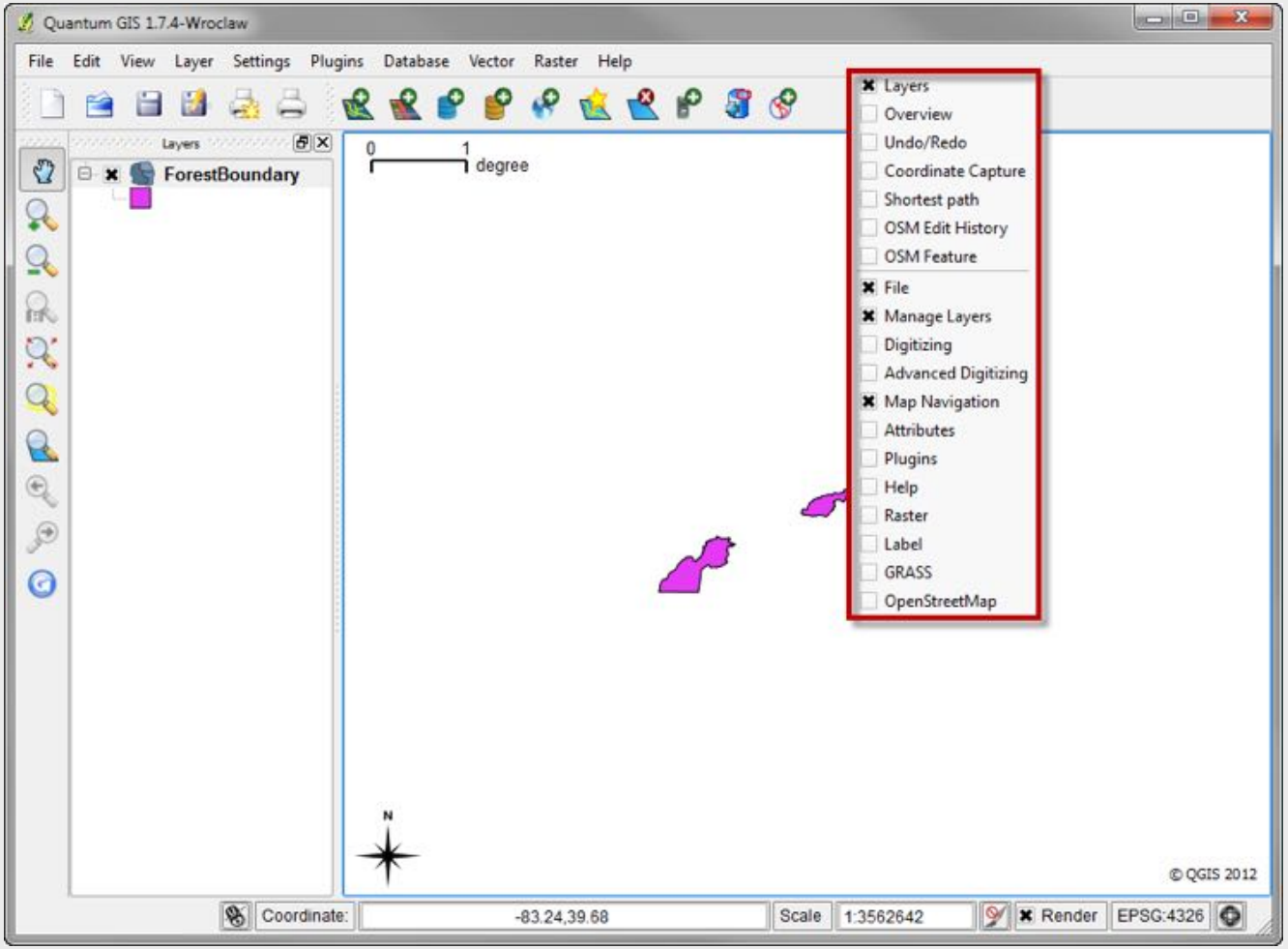
Map Canvas


Quantum GIS 1.7.4-Wroclaw
File Edit View Layer Settings Plugins Database Vector Raster Help
Layers
ForestBoundary
0
0.4
degrees
N
© QGIS 2012
Coordinate:
-83.260,36.149
Scale
1:1249418
Render
EPSG:4326

Menus and Toolbars



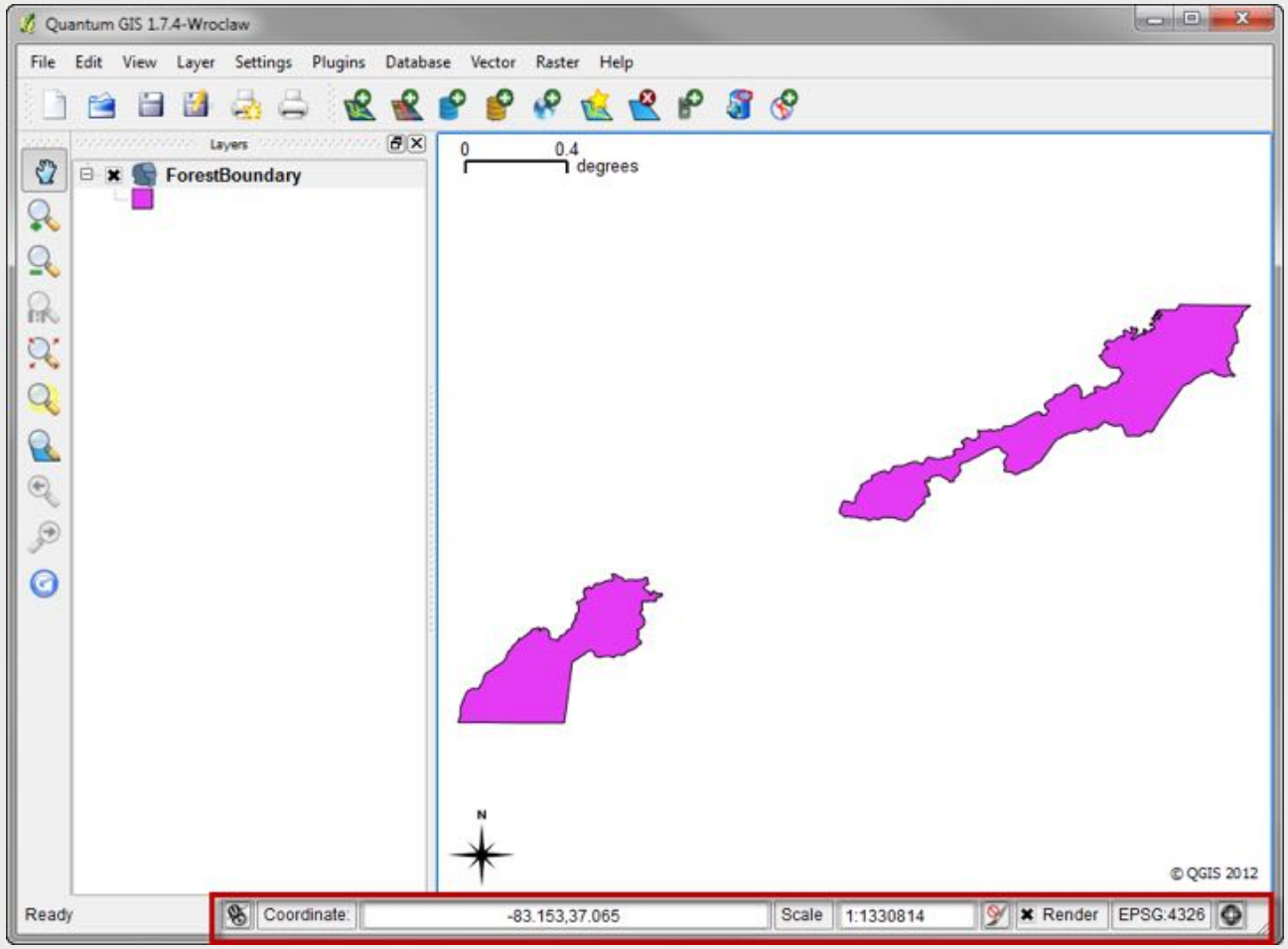
Toolbars and Panels



- Right Click in menu Area
- Add Panels
- Add Toolbars.

Status Bar

- Projection of the QGIS project
- Scale
- Coordinates



Basic Buttons

- Hover mouse over them they will pop up a text message telling the user their purpose.

- Pan
- Zoom In
- Zoom Out
- Pixel Resolution
- Zoom to Extent
- Zoom to Selection
- Zoom to Layer
- Zoom to Last Extent
- Zoom to Previous Extent
- Refresh

- Add vector Layer
- Add Raster Layer
- PostGIS Layer
- Spatialite Layer
- WMS Layer
- New Shapefile Layer
- Remove Layer
- Oracle Raster Layer
- WFS Layer

Attribution, Selection, Measurements

- Identify
- Select
- Deselect
- Attribute Table
- Measure
- Maptips
- Add BookMark
- Show Bookmark
- Annotation

Saving a Project

- As you are working with QGIS periodically save your datasets.
- QGIS creates a .gqs file
- XML based
- Can be edited in your favorite text editor.

Exercises

- Open QGIS
- Explore the Toolbars.
- Add some data to the Map Display
- Use the Identify Features tool to show attribute to some data layers.

Exercise 2

The Exercises are going to be an actual project completed by North River Geographic Systems, Inc in 2009. We are going to cover the Conasauga River Watershed. The watershed is located on the border of Tennessee and Georgia. The data is made up of ESRI Shapefiles. That is the easiest data format to work with for these exercises.

1. If you haven't already, open QGIS. There should be an icon on your desktop or on your start menu (or both).

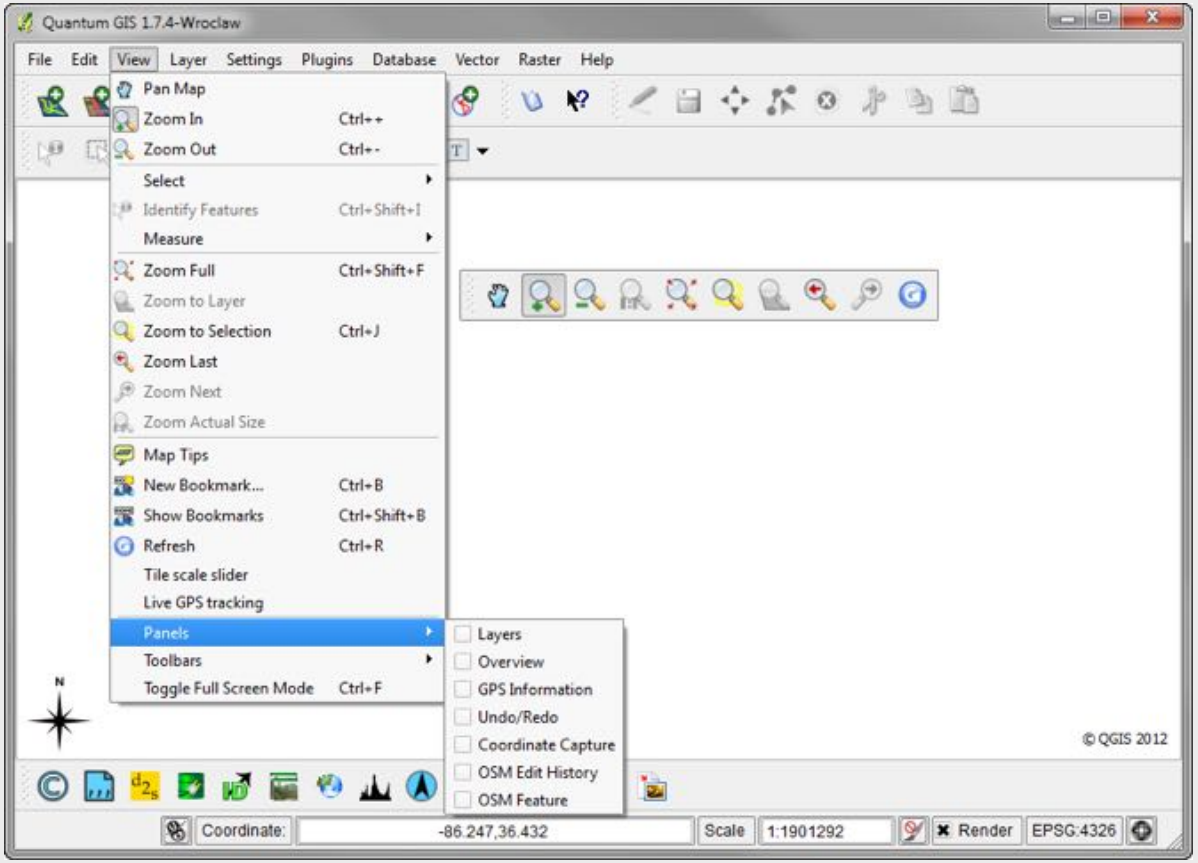
Once QGIS has opened right click with your mouse in the toolbar area.

How Many Toolbars are in the Default Installation

How many Panels are in the default Installation?

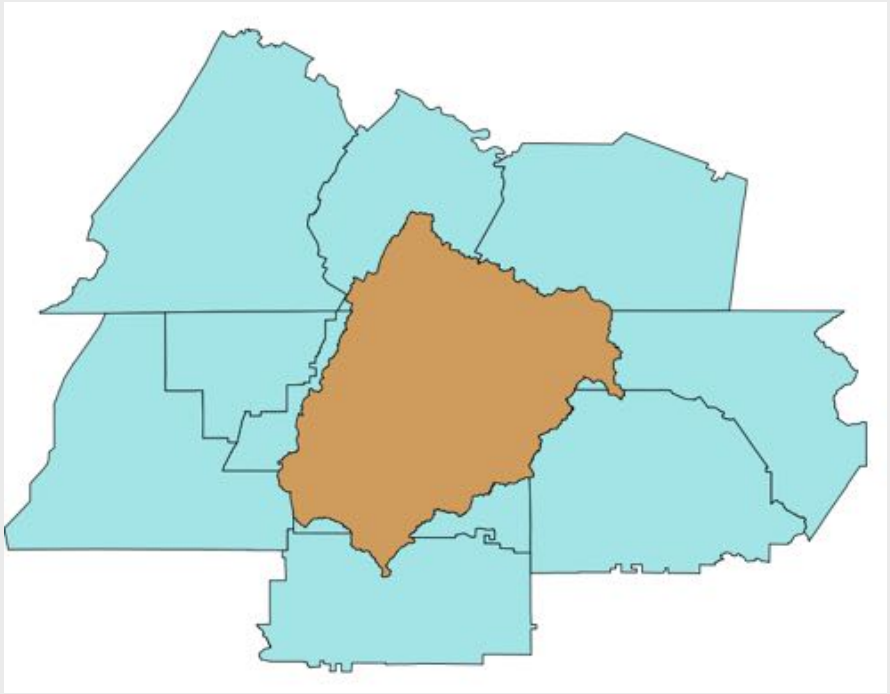
Turn off your Managed Layers toolbar. Turn Off your Map Navigation Toolbar. They have disappeared from the interface. Now turn them back on. If you want you can move them from their default location by grabbing the left corner of the toolbar and moving it.

2. Turn your Layers Panel off. Now turn it on by navigating from the View Menu at the top of QGIS



3. Click your ***Add Vector Data*** button at the top. Browse to your data folder located under c: \gisdata\QGIStraining\data . Add the CountyBoundaries.shp shapefile to your map. If you do not see any data please be sure to check that you are adding shapefiles.

4. Click your add vector data button at the top and add the subbasin.shp file. You should have something that looks like:



5. Using your identify features tool list all the counties in Georgia and the Counties in Tennessee. In order to identify a feature you must have that layer selected in your layer window.

Georgia

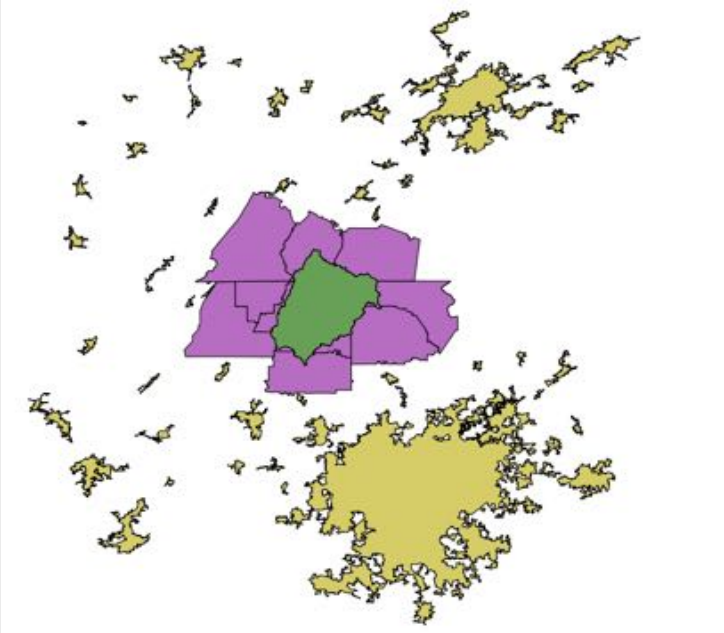
Tennessee

6. Add the 2010 Urban Areas Shapefile.

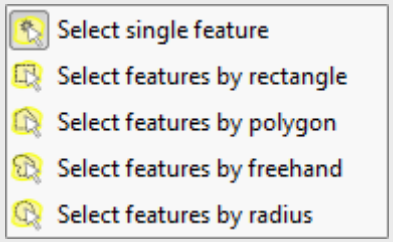
What is the biggest Urban Area within the CountyBoundaries Shapefile?

What are the three biggest Urban Areas that touch/are within the Watershed?

7. Using your navigation tools Zoom to the full extent of all the data layers. You should see something similiar to the graphic below.



8. Click on the Subbasin shapefile in your Layers Panel and zoom to the extent of that layer. Note you have several ways to make a selection.



9. Select Whitfield County. Zoom to the extent of the selection.

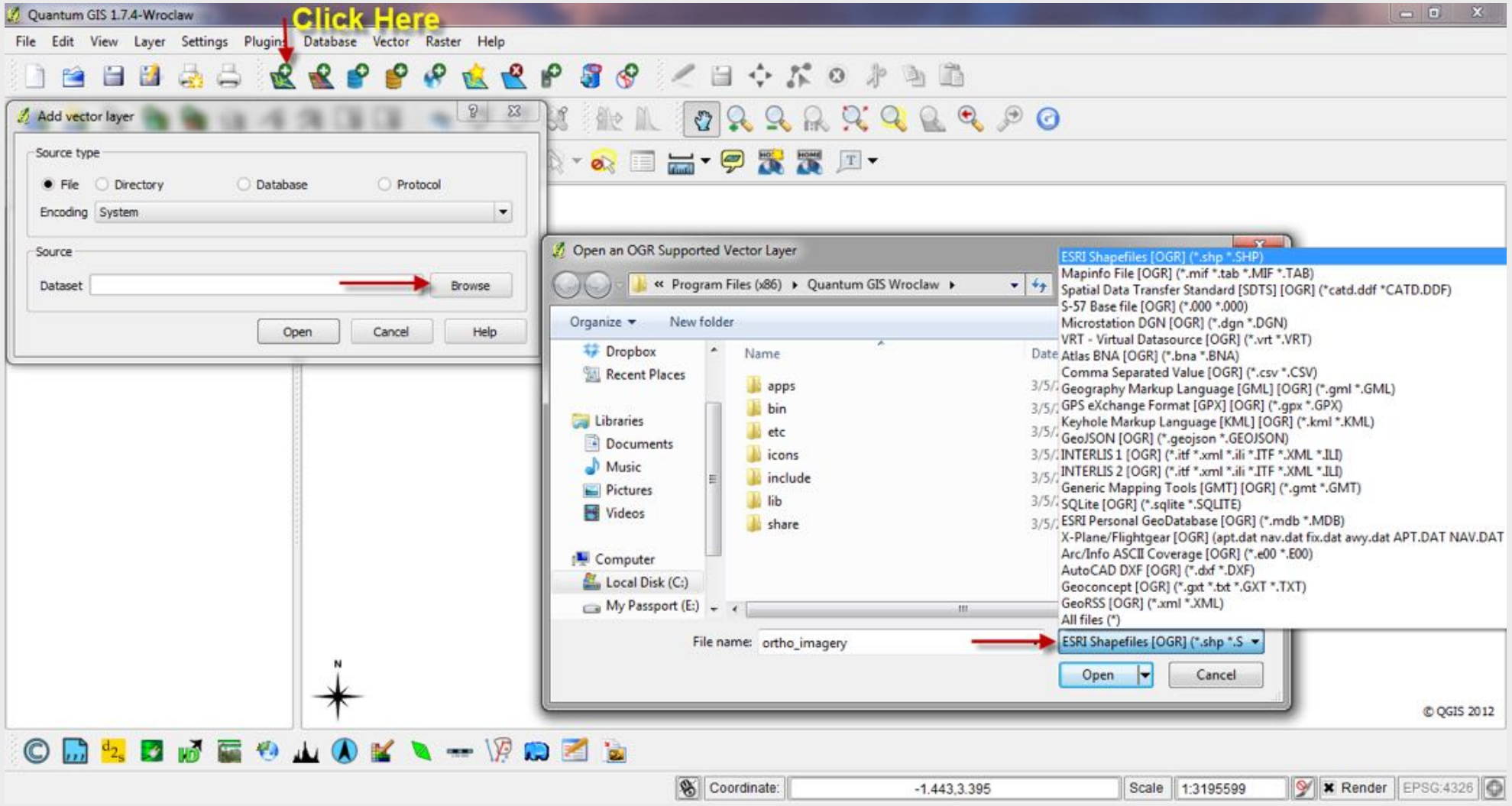
10. Clear the selection.

11. Save your project in the Exercise 2 Directory!

3. Adding Vector Data

- Supports OGR vector Formats
  - Shapefiles
  - KML
  - CSV
  - Microstation
  - MapINFO

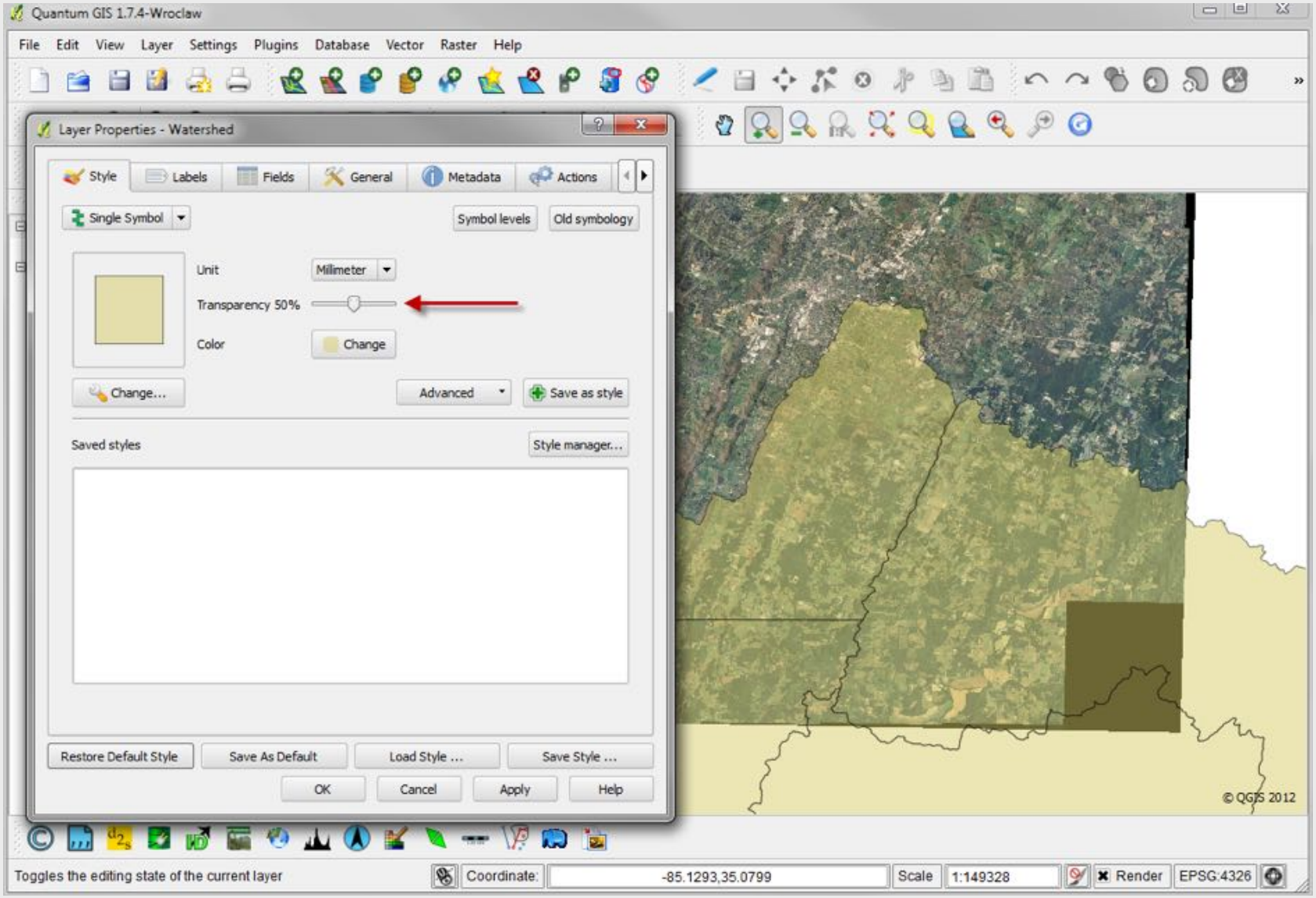
Adding Vector Data



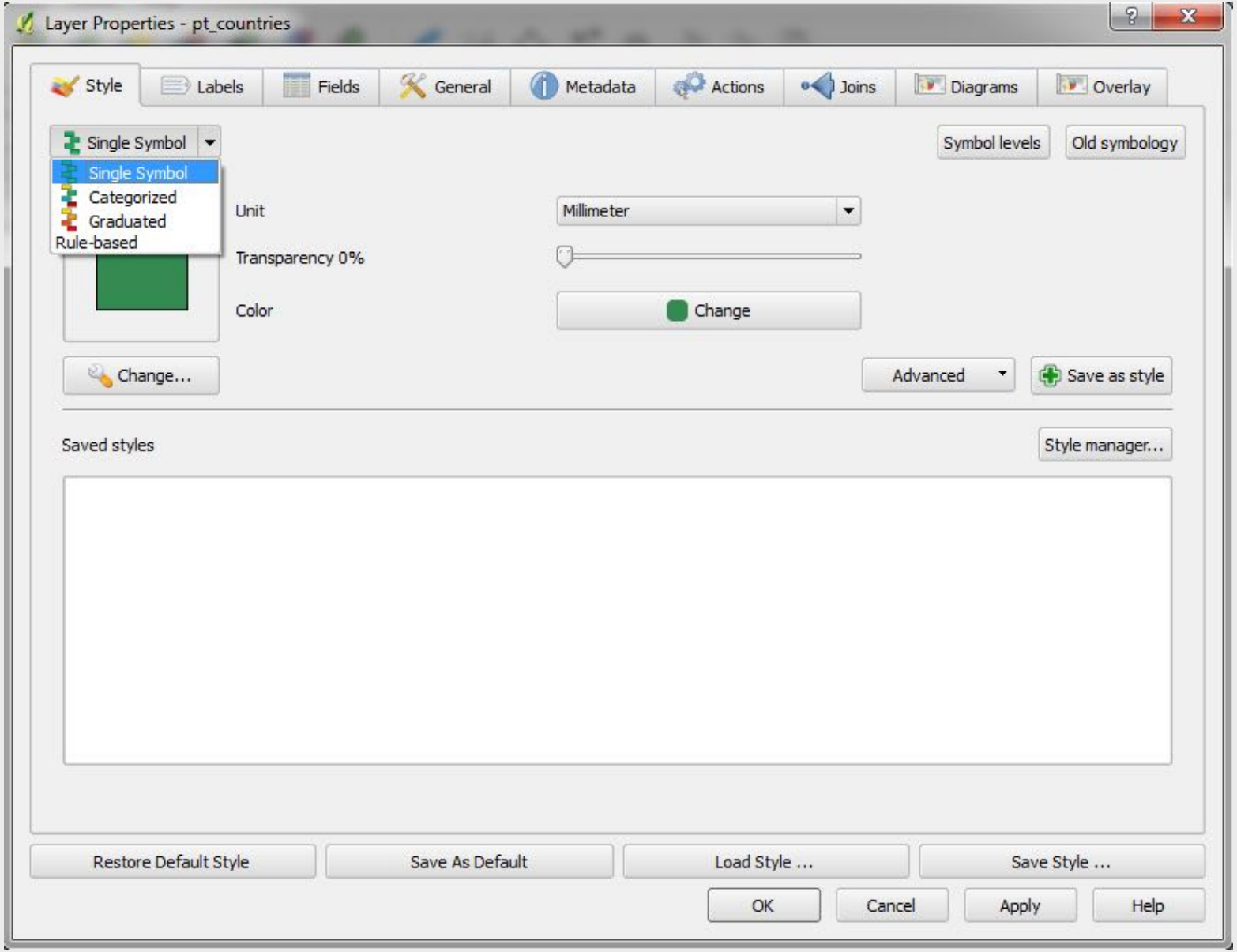
Properties

- Once Data is added – Right Click and Select Properties
- There are different Tabs to help with Vector Data
  - Style, Label, Fields, General, Metadata, Action Joins, Digrams, Overlay
  - Style sets the symbology of the Layer.
  - Symbology can be saved as a qml file

Transparency



Style

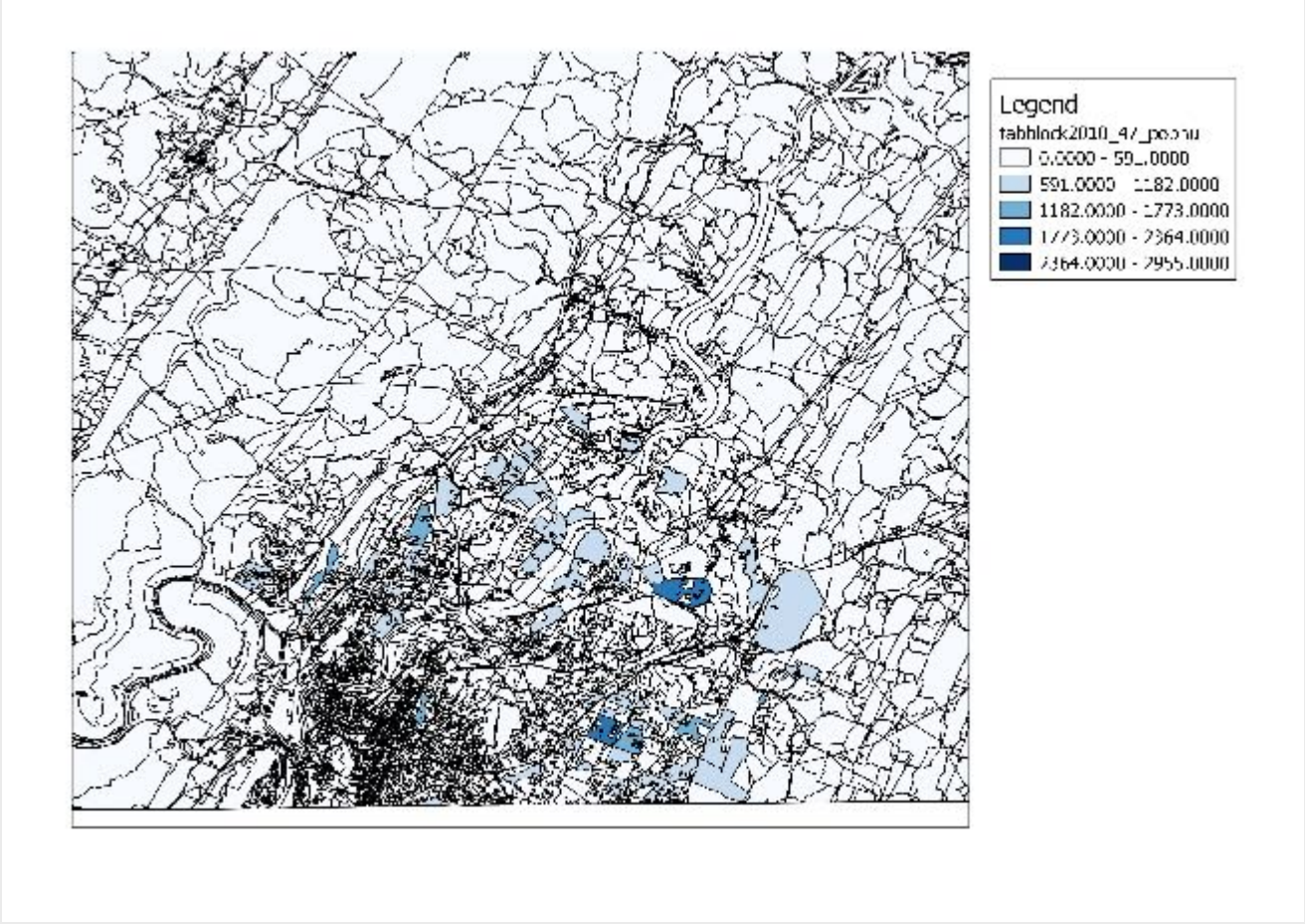

Layer Properties - pt_countries
Style
Labels
Fields
General
Metadata
Actions
Joins
Diagrams
Overlay
Single Symbol
Single Symbol
Categorized
Graduated
Rule-based
Symbol levels
Old symbology
Unit
Millimeter
Transparency 0%
Color
Change
Change...
Advanced
Save as style
Saved styles
Style manager...
Restore Default Style
Save As Default
Load Style ...
Save Style ...
OK
Cancel
Apply
Help

Styles

- Set by Fields
- Symbolized
  - Single
  - Categorized
  - Graduated
- Graduated
  - Equal Interval, Quantile, Natural Breaks, Standard Deviation, Pretty Breaks

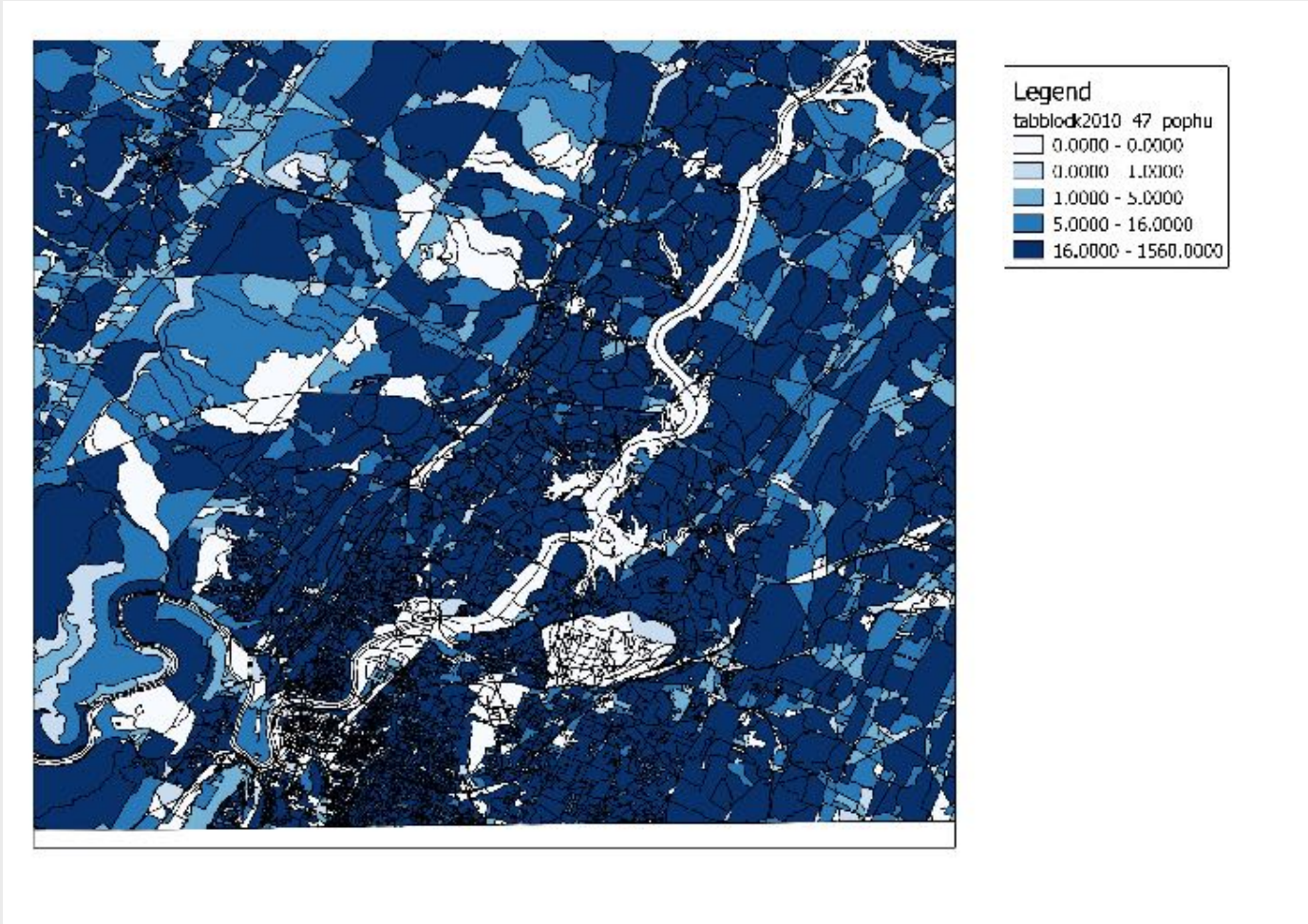
Equal Interval

- Equal Interval groups values into equal sized ranges.



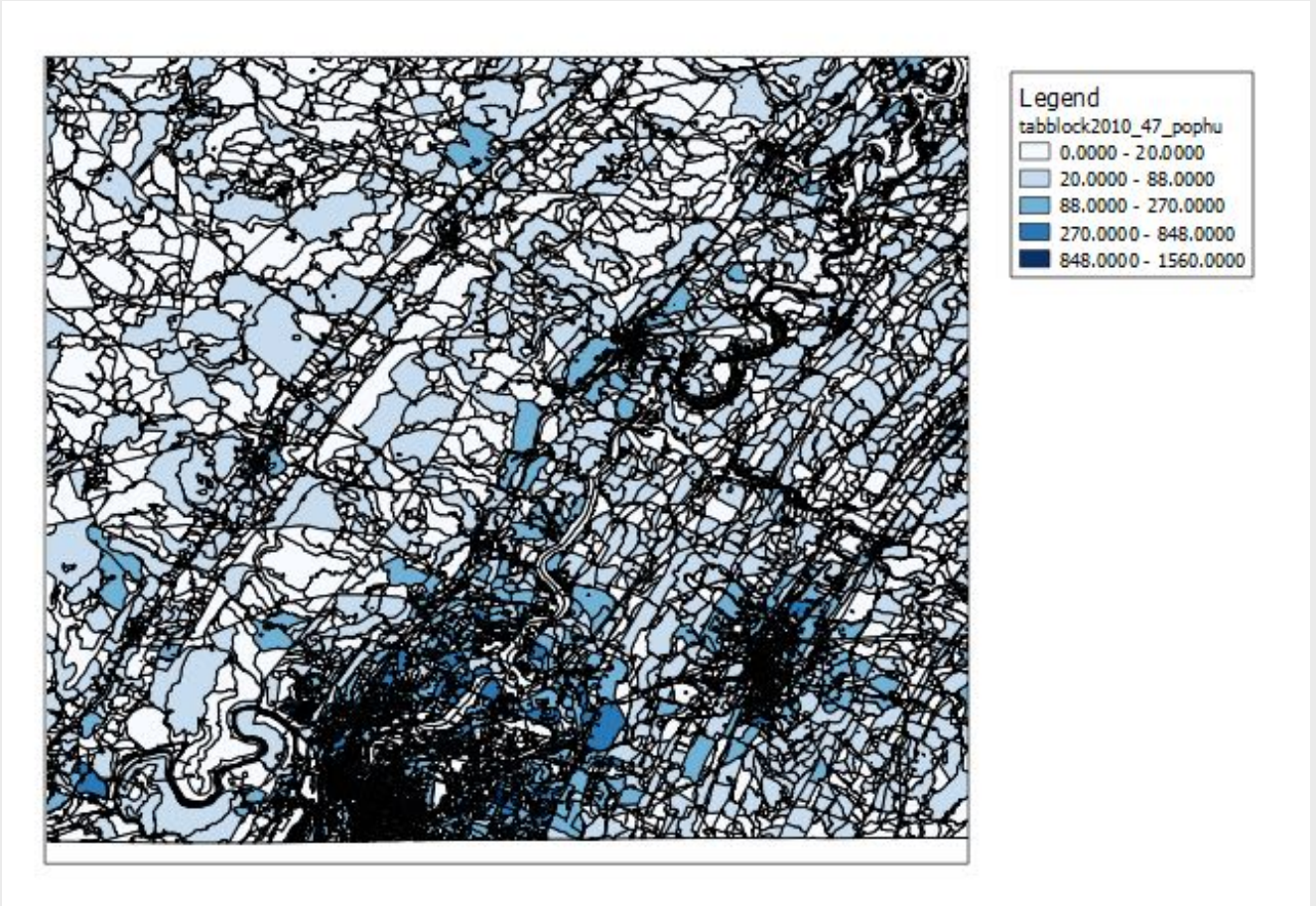
Quantile

- Each class contains an equal number of features



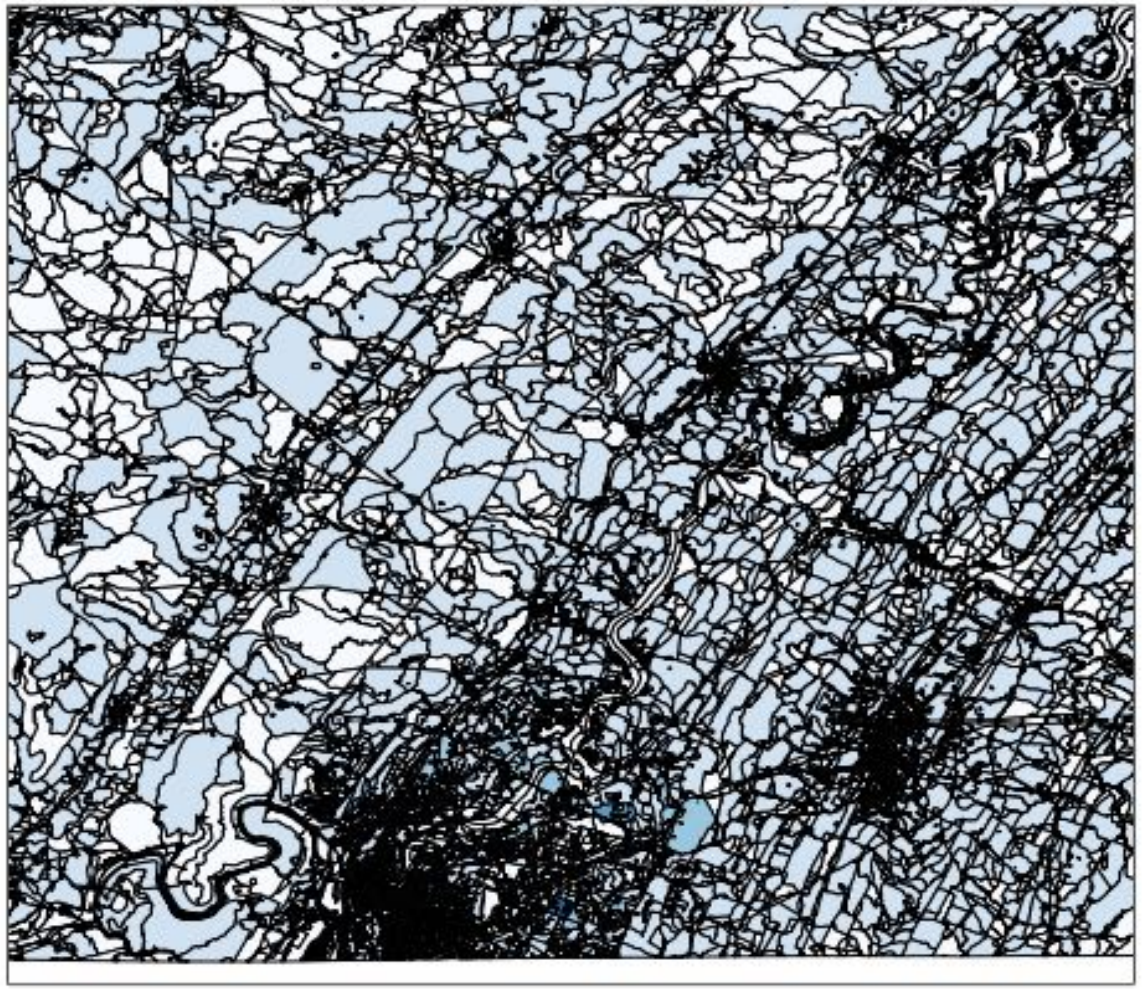
Natural Breaks

- Natural Breaks classes are based on natural groupings of the data.



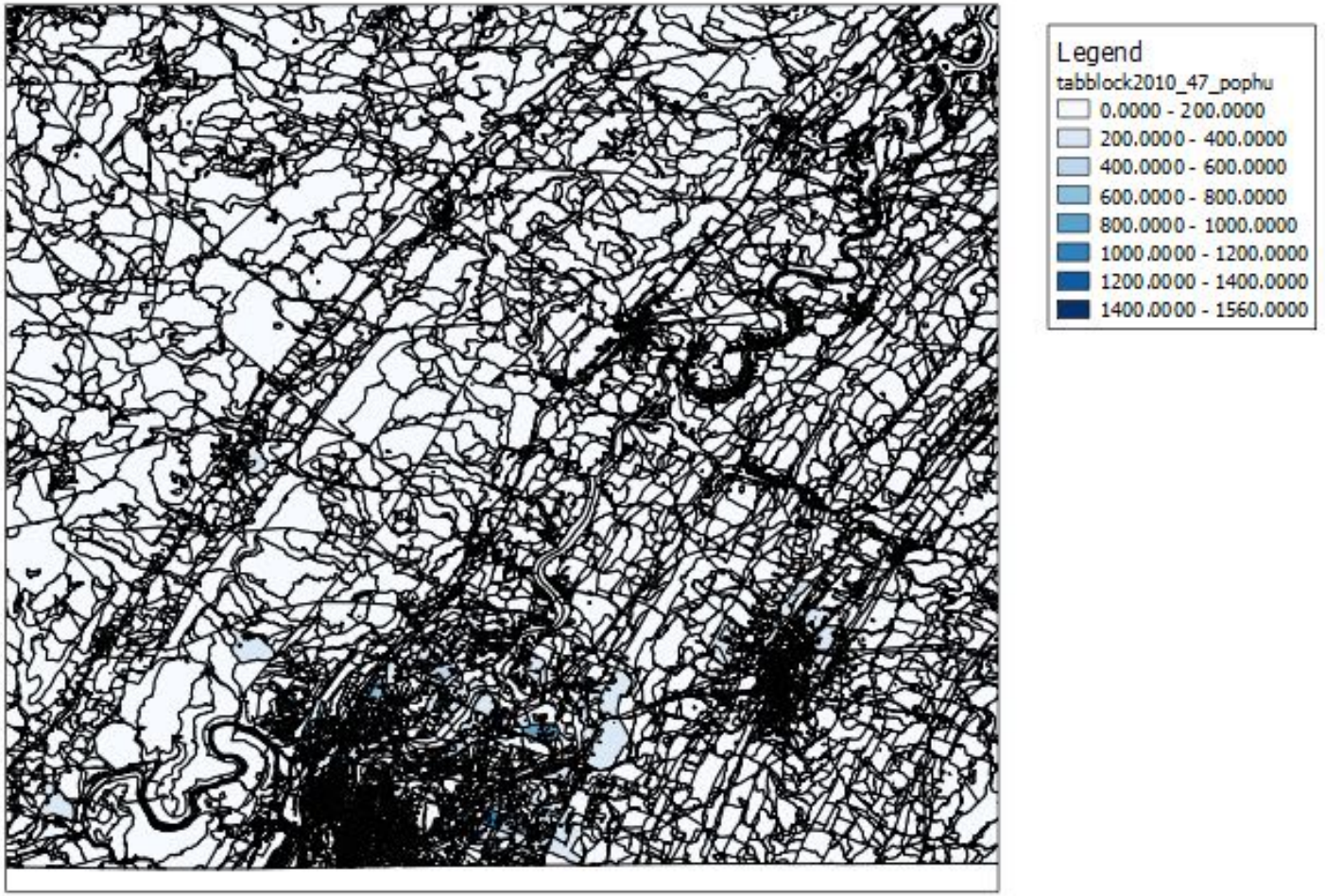
Standard Deviation

- Show Variation from the average value

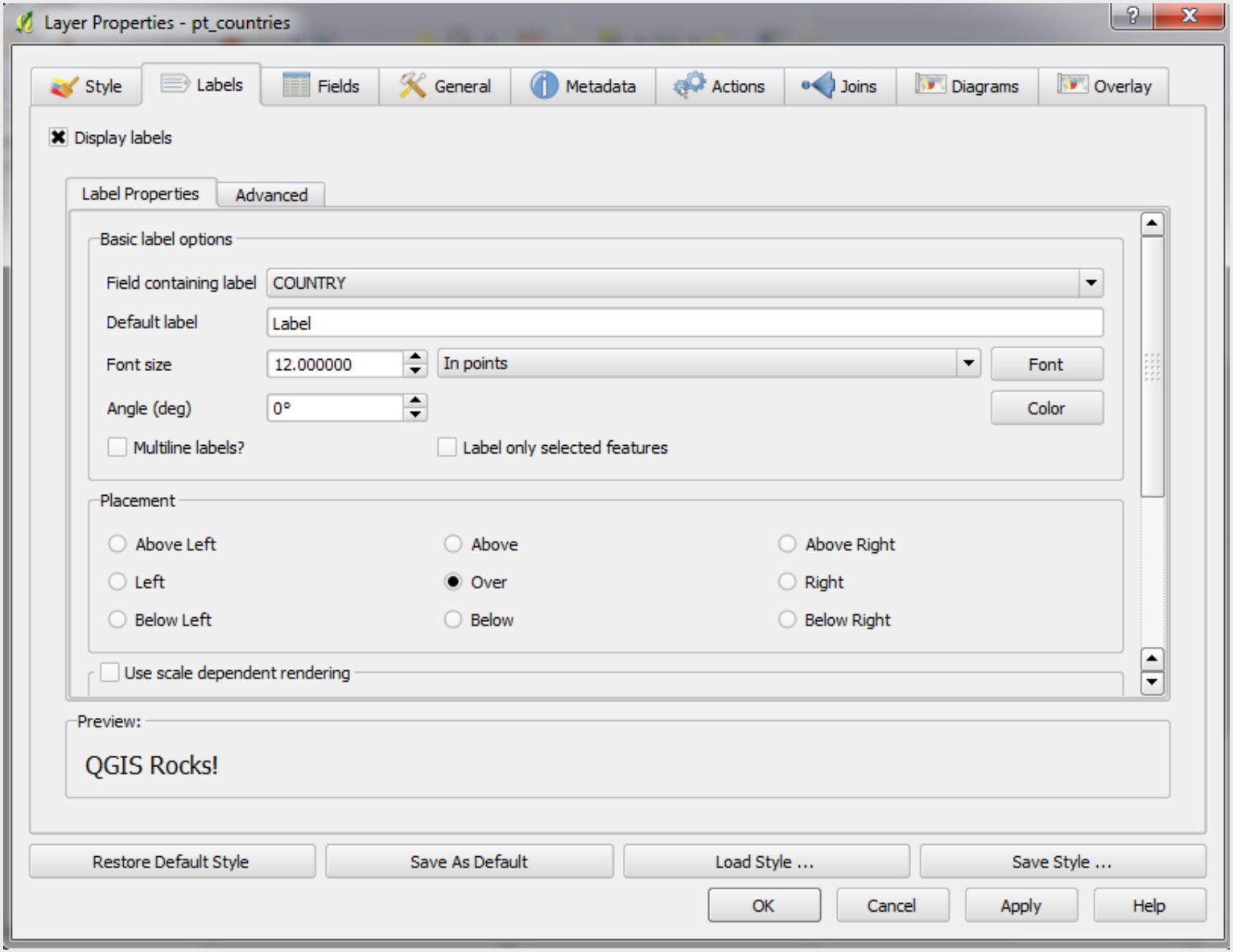


Pretty Breaks

- Data symbolized for non-statisticians

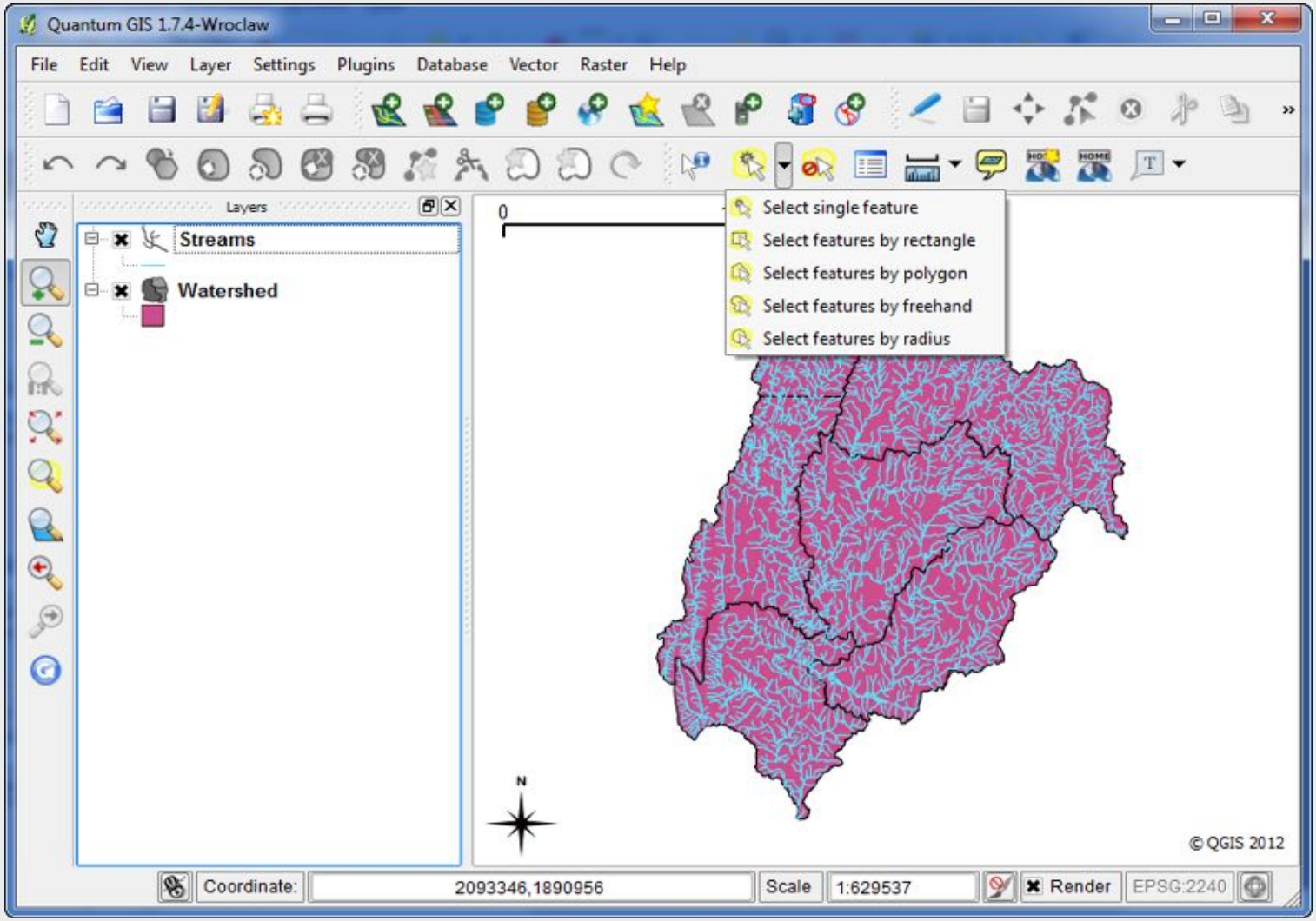


Labels


Layer Properties - pt_countries
Style
Labels
Fields
General
Metadata
Actions
Joins
Diagrams
Overlay
Display labels
Label Properties
Advanced
Basic label options
Field containing label
COUNTRY
Default label
Label
Font size
12.000000
In points
Font
Angle (deg)
0°
Color
Multiline labels?
Label only selected features
Placement
Above Left
Above
Above Right
Left
Over
Right
Below Left
Below
Below Right
Use scale dependent rendering
Preview:
QGIS Rocks!
Restore Default Style
Save As Default
Load Style ...
Save Style ...
OK
Cancel
Apply
Help

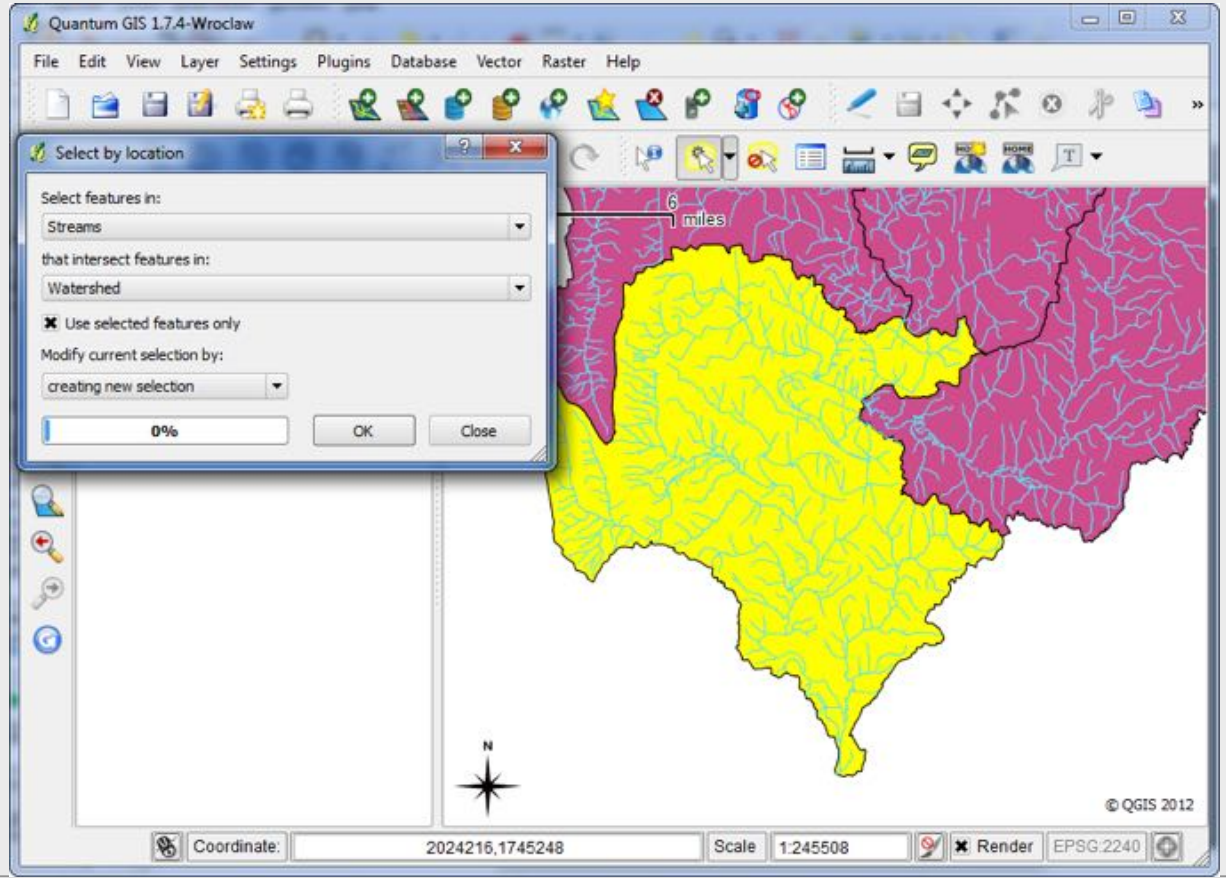
Selecting Vector Data

- Selections can be manual



Selecting Vector Data

- Selections can be by Attributes
- Selections can also be by location (Under Vector Menu - Research)

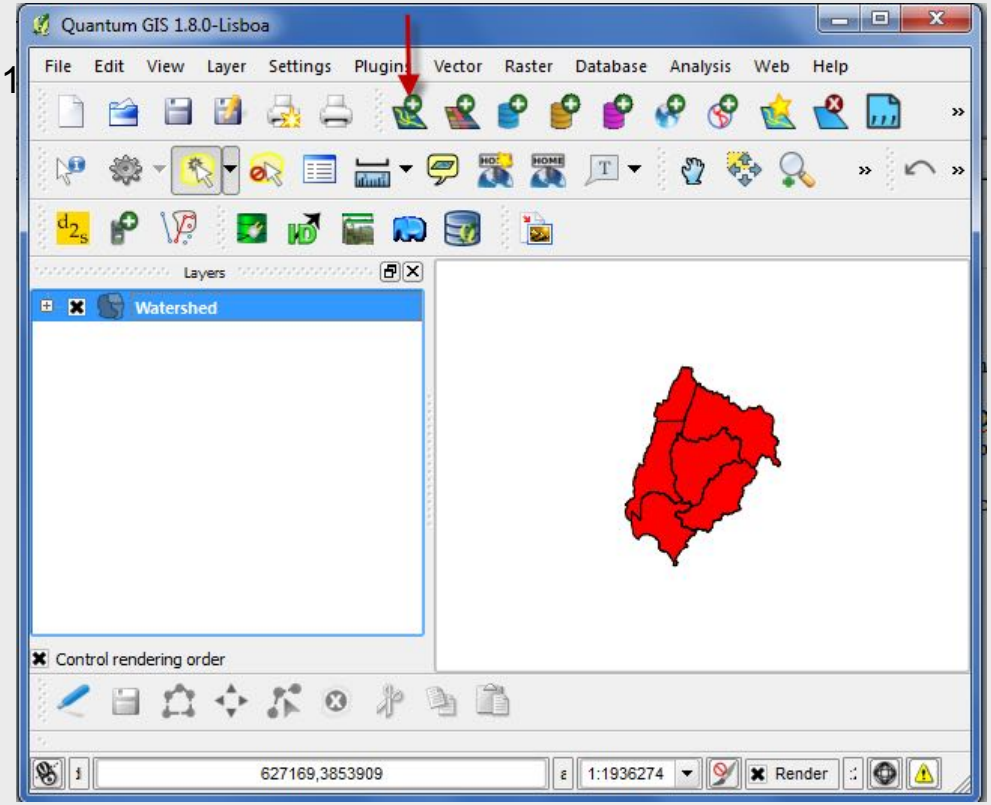


Exercises

- Change the symbology of displayed data
- Label features
- Add a layer and categorize data by that item.

Exercise Ch 3

It's time to start looking at your data and working with it.. Most of the data you will be working with was downloaded from the Census Bureau, the National Hydro Dataset, and the USDA DataGateway. Some of these datasets were built by me during the course of the CRA project.



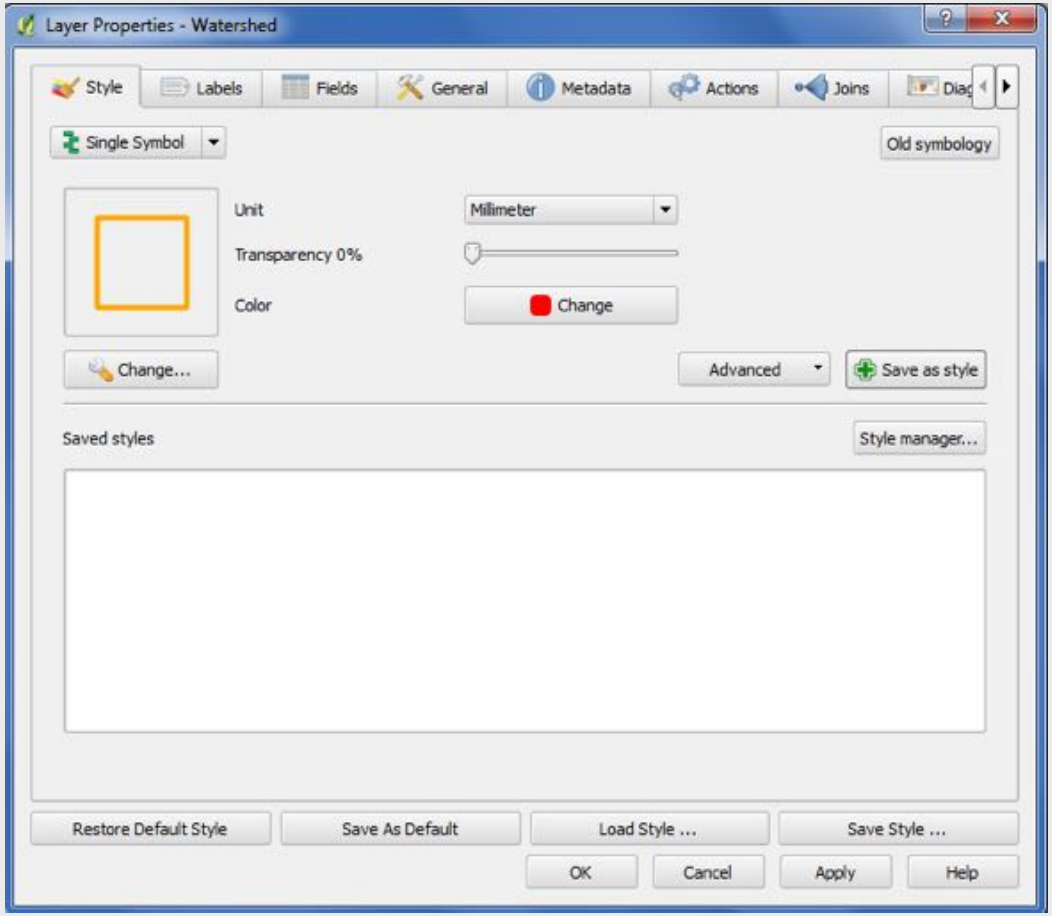
2. How many main watersheds are located in the Conasauga Watershed.

_____

BONUS: Why is the Coahulla (pronounced Koa-hull-ahhhh) split into a north and south section? You might need to add more shapefiles to answer this.

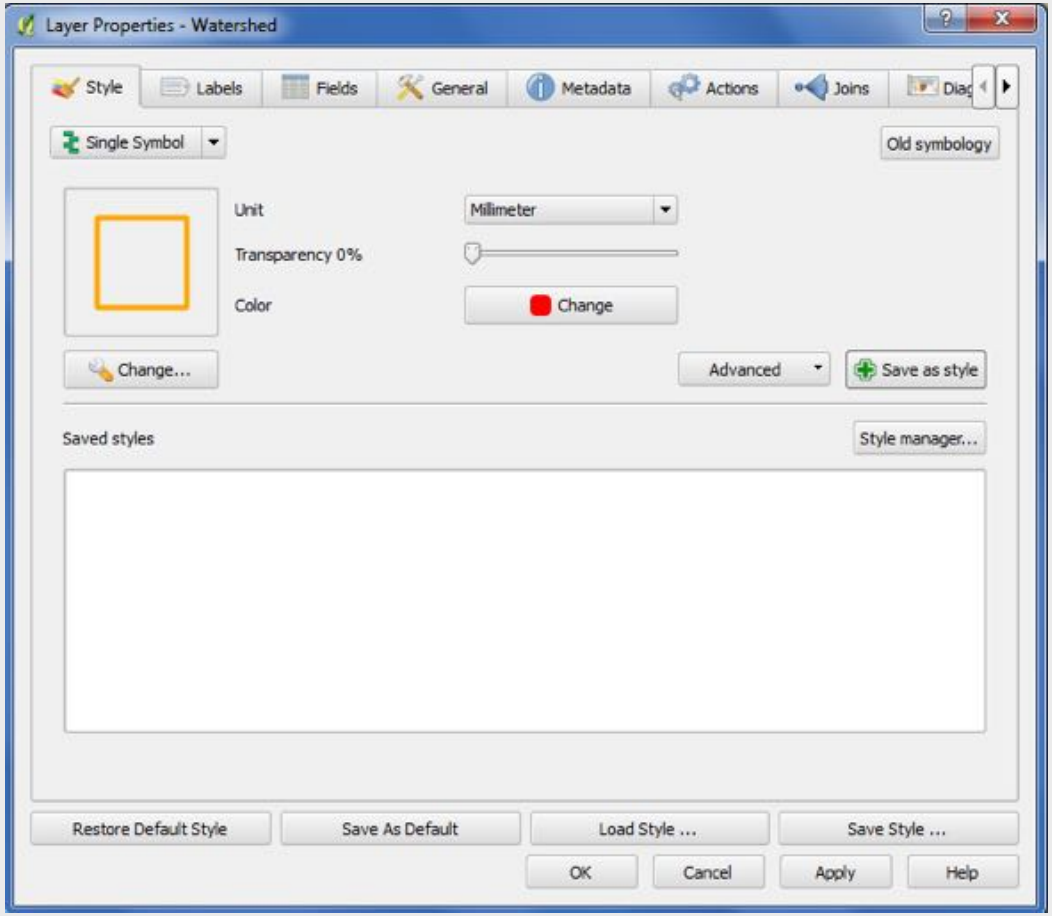
3. Label the Watersheds by name on the map display. Rick click on the shapefile layer and select properties. Select the labeling tab. Check "Display Labels". Under Basic Label Options pick Hu_10_Name

4. Right click on the watershed shapefile and go to properties. Look at the Style tab



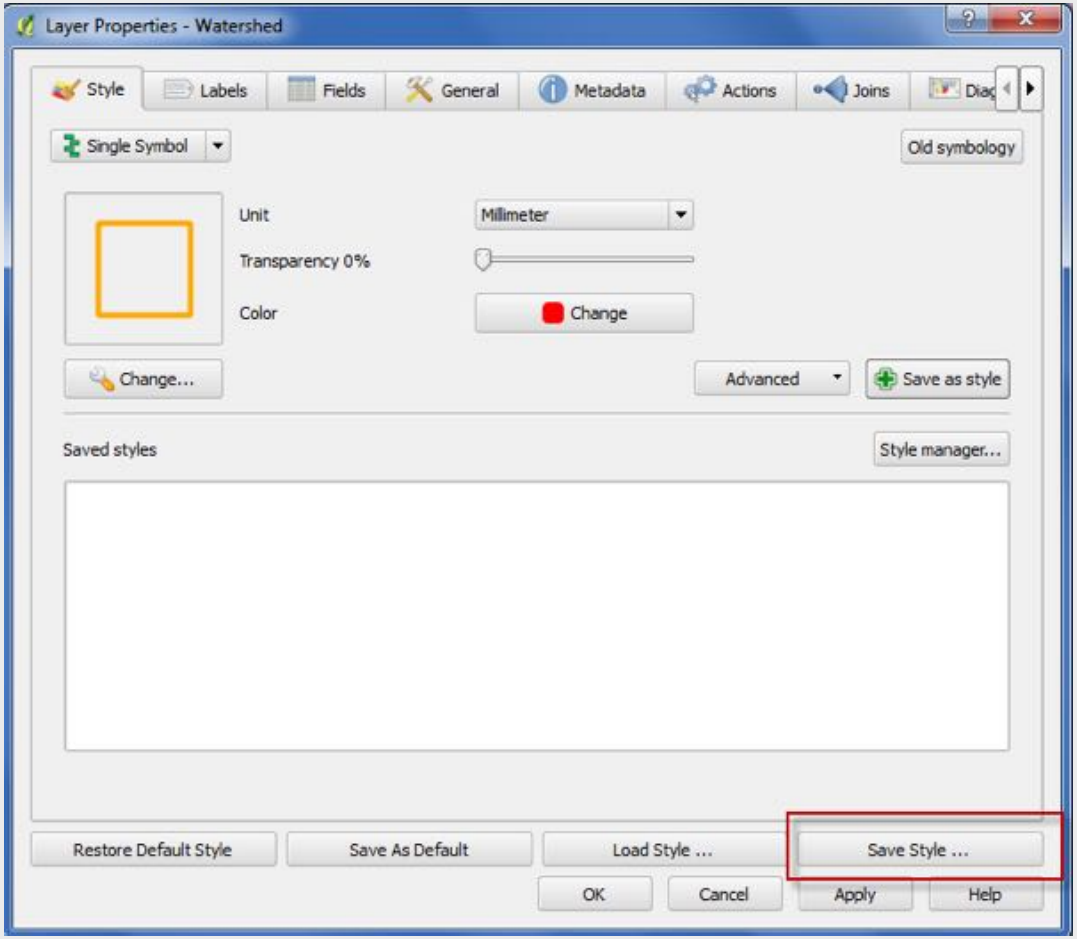
5. Change the style of the data layer. Make the polygon fill clear and the outline color orange.

4. Right click on the watershed shapefile and go to properties. Look at the Style tab



5. Change the style of the data layer. Make the polygon fill clear and the outline color orange.

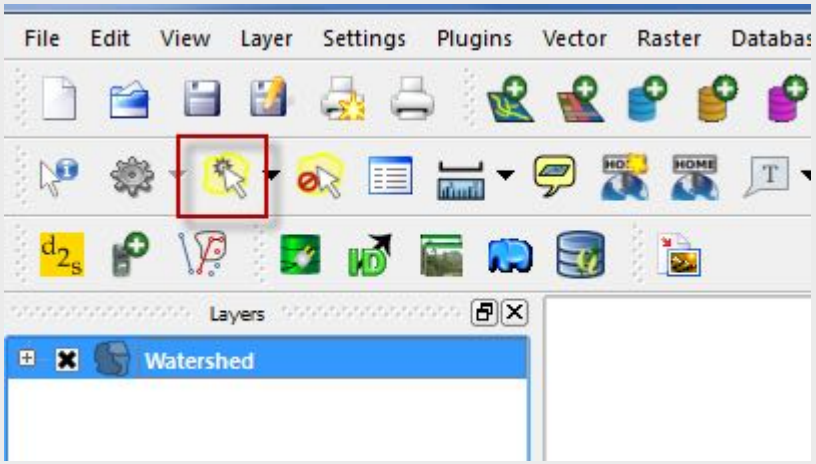
6. Save the Style. Right click on the watershed shapefile and click Save Style.



Save the file as a .qml file.

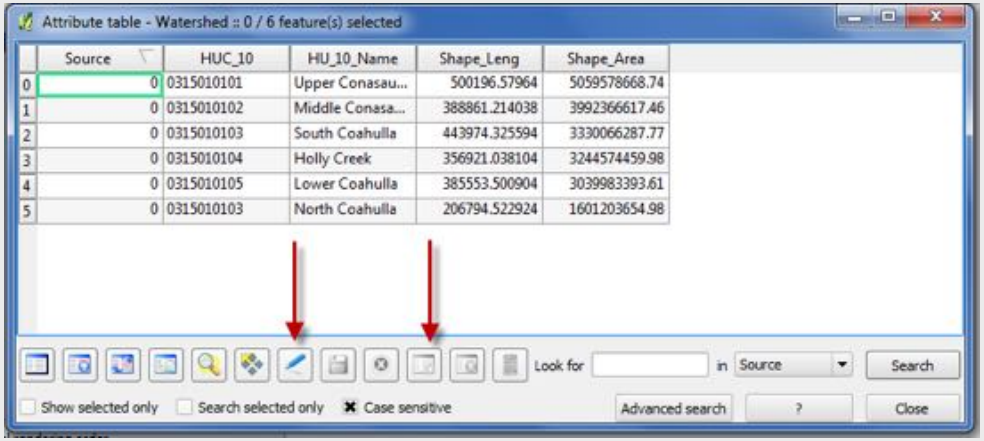
7. Once you have saved it remove the watershed shapefile by right clicking on it and selecting remove. Add it again. Right click and select Load Style. Load the qml file you just saved. All of your original settings for this layer have been restored.

8. Select North Coahulla using the select tool.



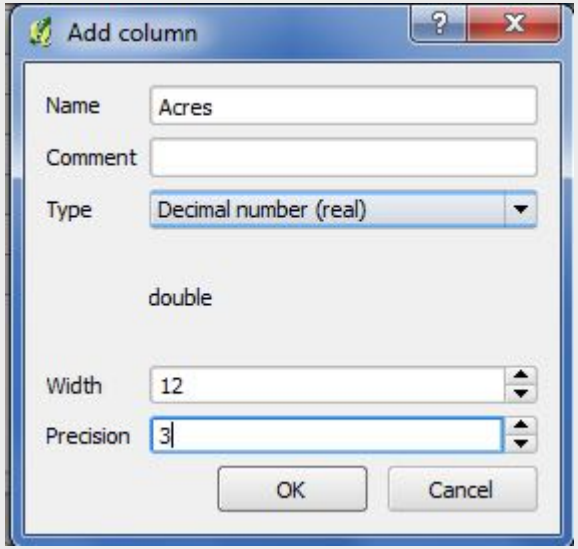
9. Right click and select “Save Selection As”. You have just saved the North Coahulla section of the watershed.

10. Right click watershed.shp and open the Attribute table. We haven't covered this part yet in the class but it's good to know for the purposes of the exercise.

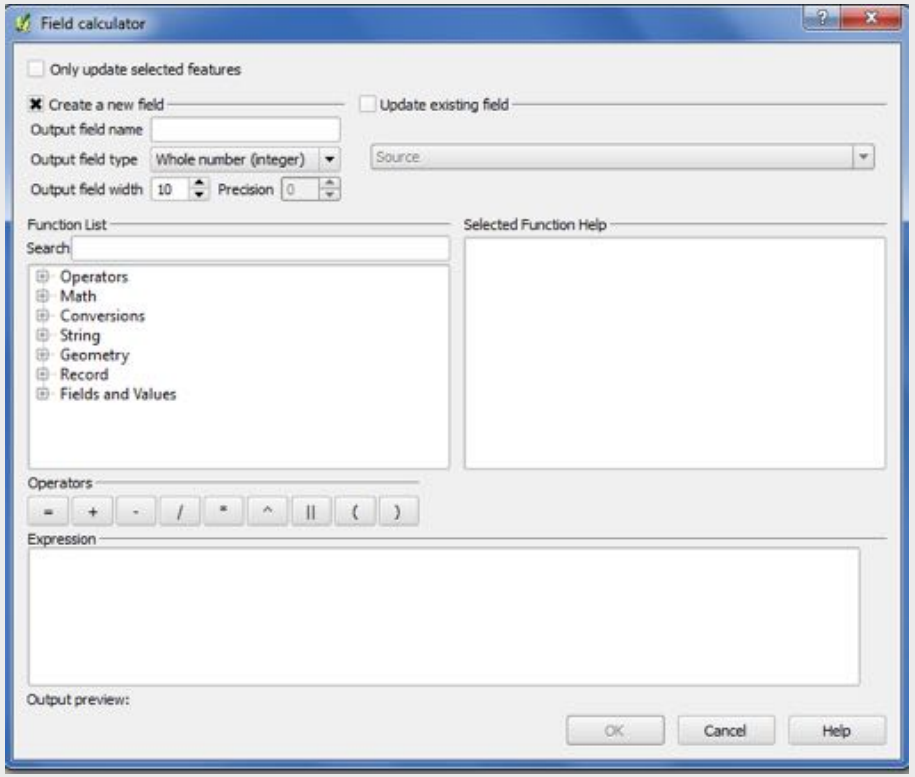


11. Toggle editing on the attribute layer. The Toggle editing Toolbar is a small icon with a pencil located at the bottom of the Attribute Window.

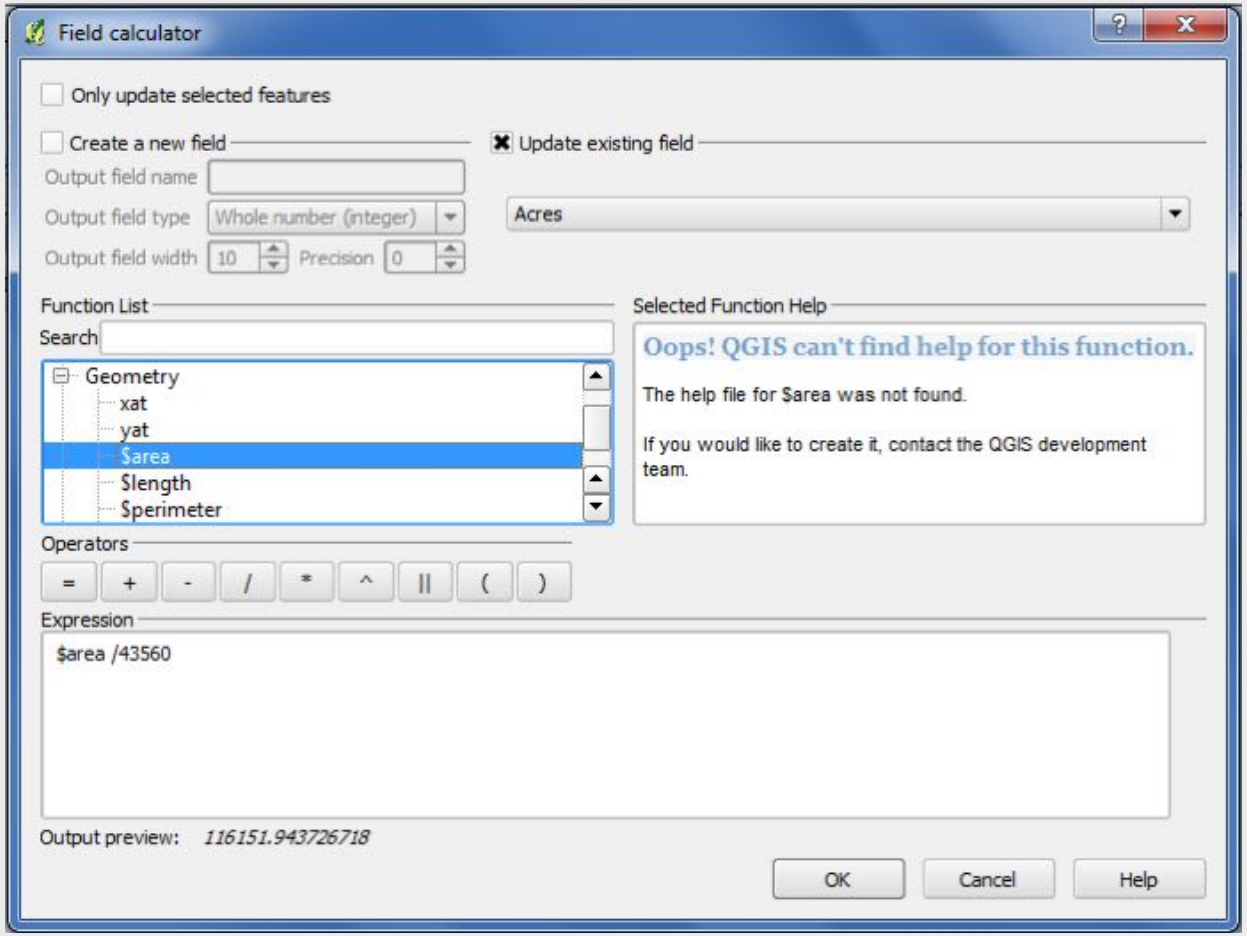
12. Add a field (add a new column) called Acres. Make sure it is a Decimal number



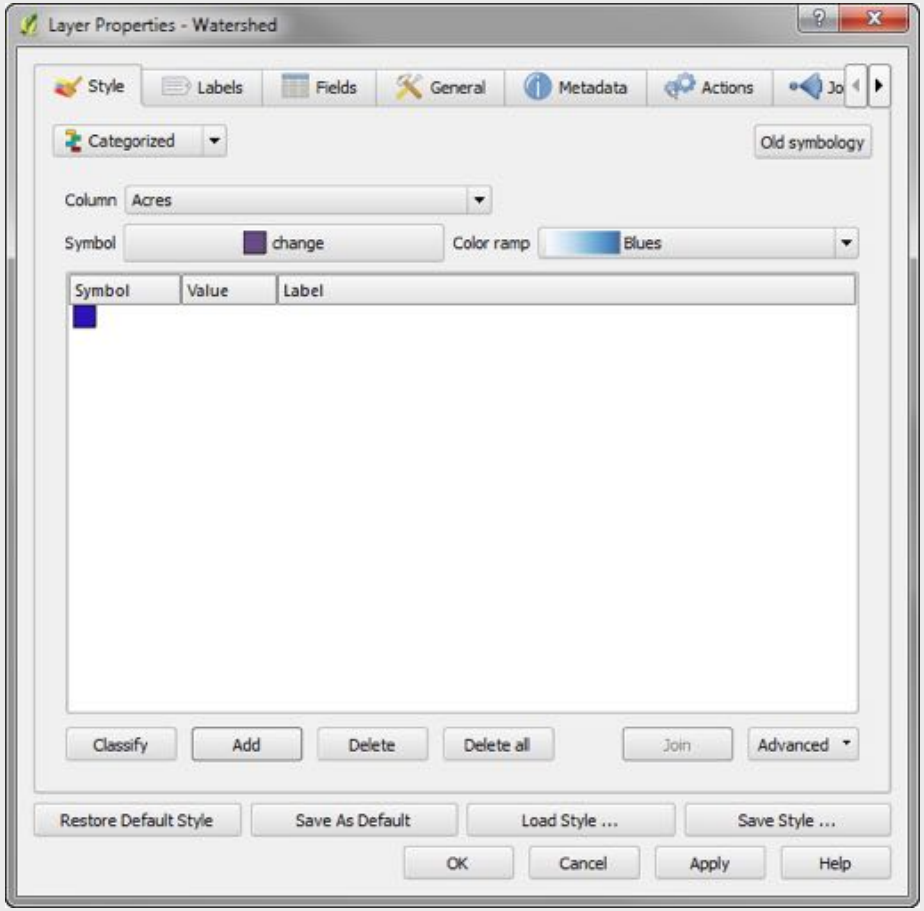
13. Once it has been added open the Field Calculator. It is the last Icon at the bottom of the Attribute Table Menu.



14. Click Update existing field. Under the function list select geometry and double click $area. Add /43560 in the Expression area. Click OK.



15. Right Click the watershed Layer. Go to Properties. Click the style Tab. Change the symbology to Categorized by acres. Click Classify at the bottom left of the menu. Click OK.



16. You have just calculated the Acreage of each watershed. What is the biggest watershed? What is the total size in acres of the Watershed? (HINT Vector Menu → Analysis Tools → Basic Statistics.

4. Adding Raster Data

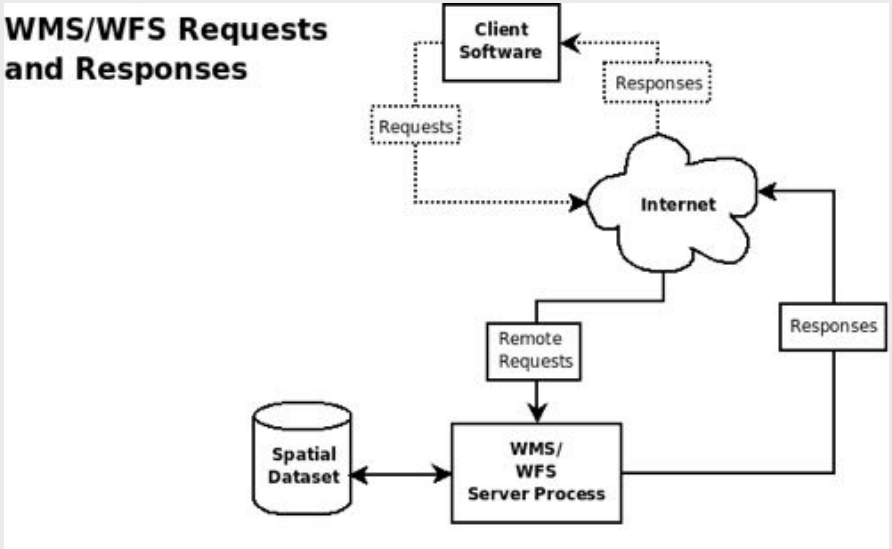
- Supports OGR Raster Formats
  - Geotiff
  - ESRi Grid
  - Jpeg
- Sid & ECW Format
  - Read and not write the format
  - Support must be added
  - Included with standalone installer

Geospatial Data Abstraction Library

- Approximately 128 Formats supported
  - http://www.gdal.org
- Many command line tools
  - Convert
  - Reproject
  - Warp
  - Mosaic

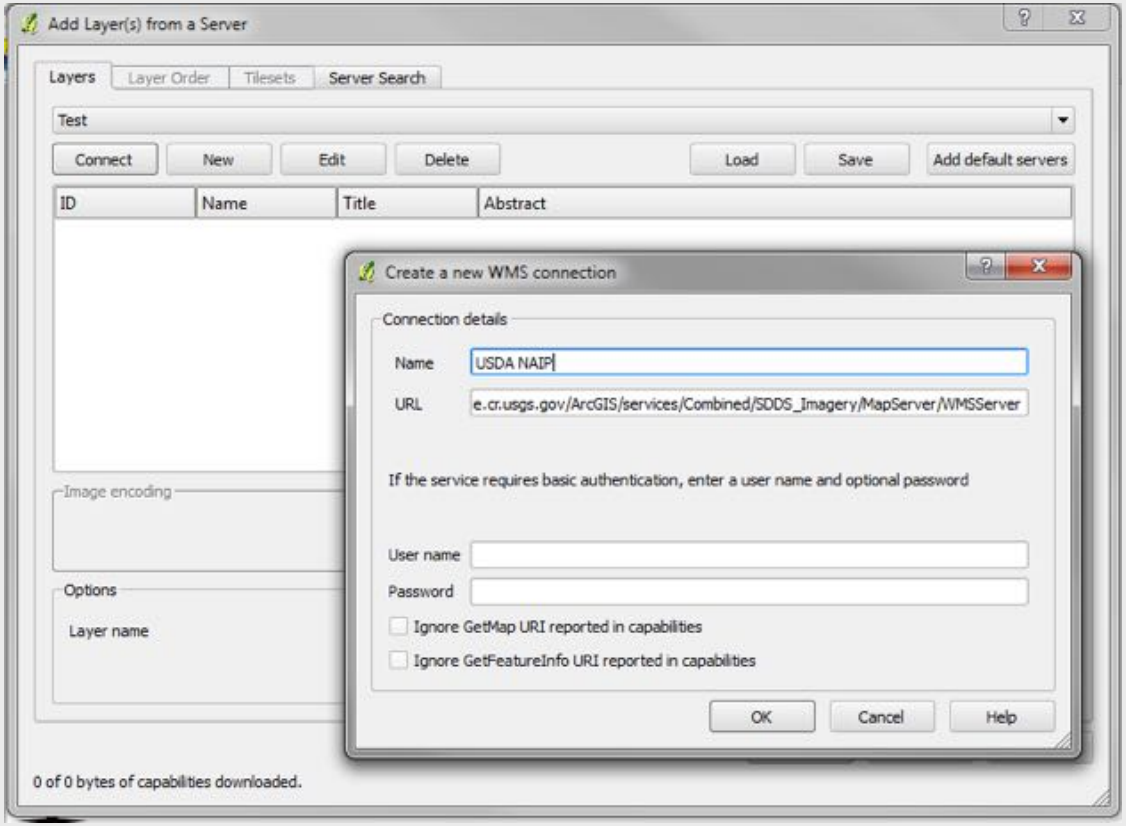
WMS – WFS Standards

- Web mapping service - The OpenGIS Web Map Service Interface Standard (WMS) provides a simple HTTP interface for requesting geo-registered map images from one or more distributed geospatial databases.
- Web Feature Service - Web Feature Service Interface Standard (WFS) provides an interface allowing requests for geographical features across the web using platform-independent calls

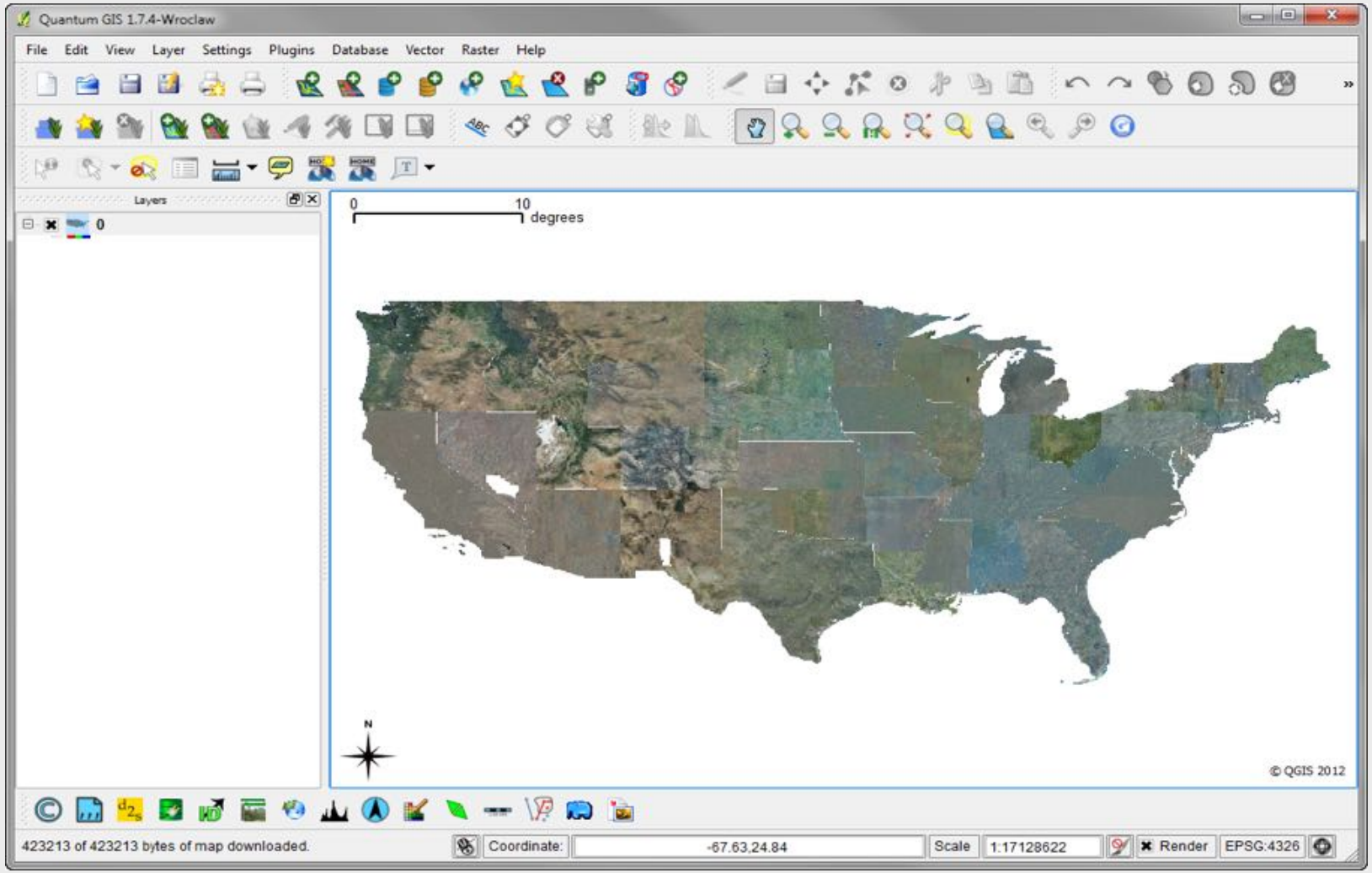


WMS Example

http://raster.nationalmap.gov/ArcGIS/services/DRG/TNM_Digital_Raster_Graphics/MapServer/WMSServer?request=GetCapabilities&service=WMS



WMS Example

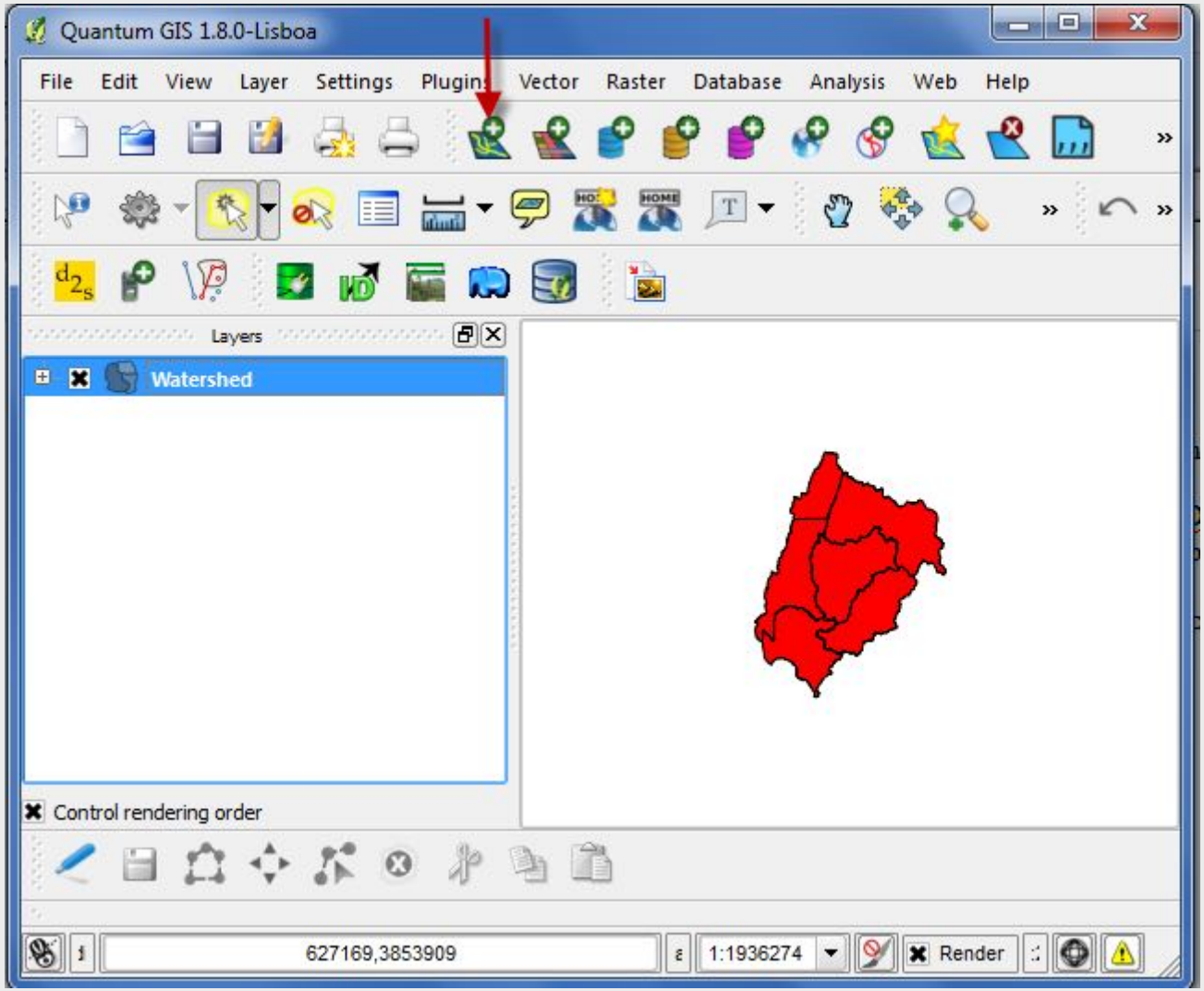

Quantum GIS 1.7.4-Wroclaw
File Edit View Layer Settings Plugins Database Vector Raster Help
Layers
0
0
10
degrees
N
© QGIS 2012
423213 of 423213 bytes of map downloaded.
Coordinate:
-67.63,24.84
Scale
1:17128622
Render
EPSG:4326

Exercises

- Add raster data
- Symbolize Raster Data
- Create a Hillshaded DEM

Exercise Chapter 4

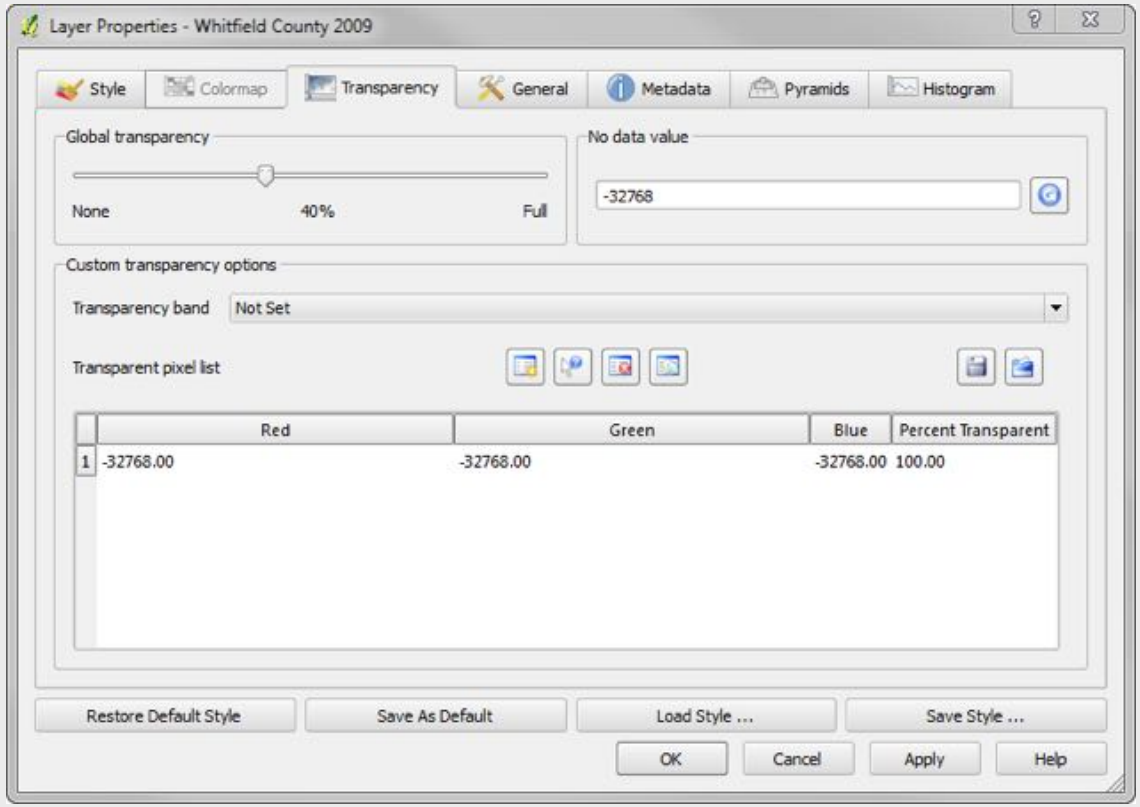
1. Add the Watershed.shp file to the Map Display.



2. Add the tif image of Whitfield County to the display. The image name is whitfield_naip_tiled_2009.tif

3. Right Click the image layer and select rename. Name it “Whitfield County 2009” . Note that it added to top of your layer window. Last thing added gets placed on top of the layers.

4. Right click the Whitfield County 2009 layer and go to properties. Set the transparency at 40%.



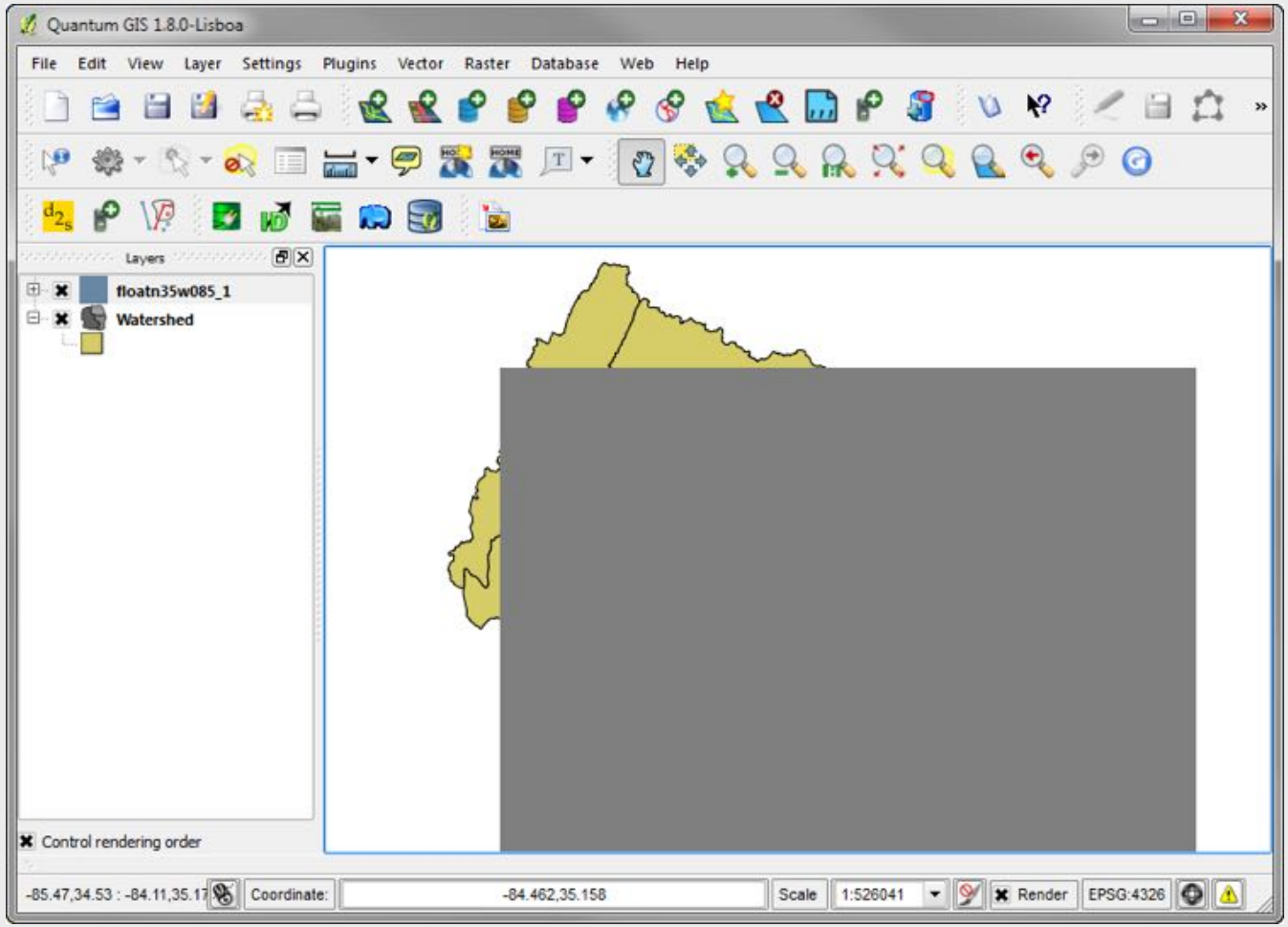
5. Set the Transparency back to 0%

6. Look to the right and set the “No data value” to 0. Click OK.

7. What was the result?

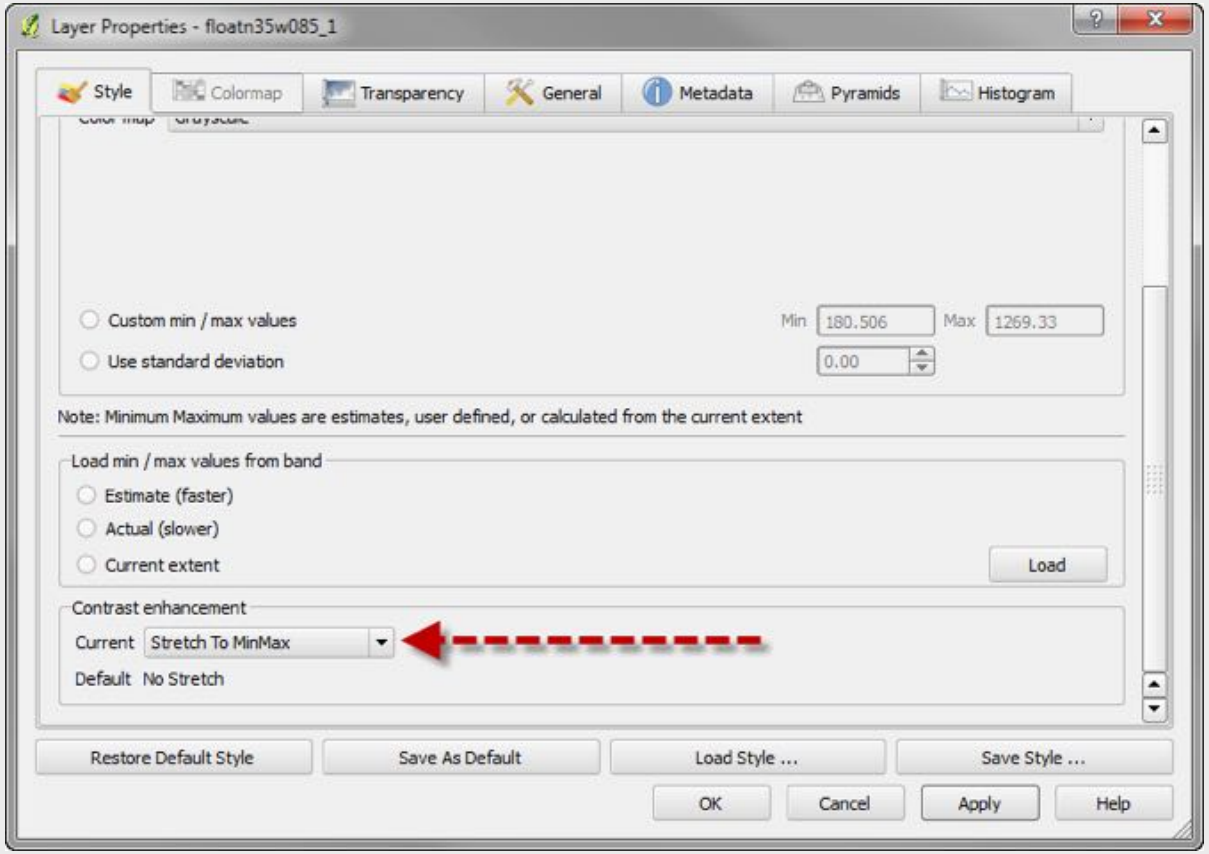
Since this project deals with watersheds you will want to add a digital Elevation model to this project. One was downloaded from http://seamless.usgs.gov. It is an ESRI grid Format.

Add the file float35w085_1.flt from the ElevationModel directory to your display. Note that it is an ESRI Grid format.You will need to use the “Add Raster” button to add the DEM

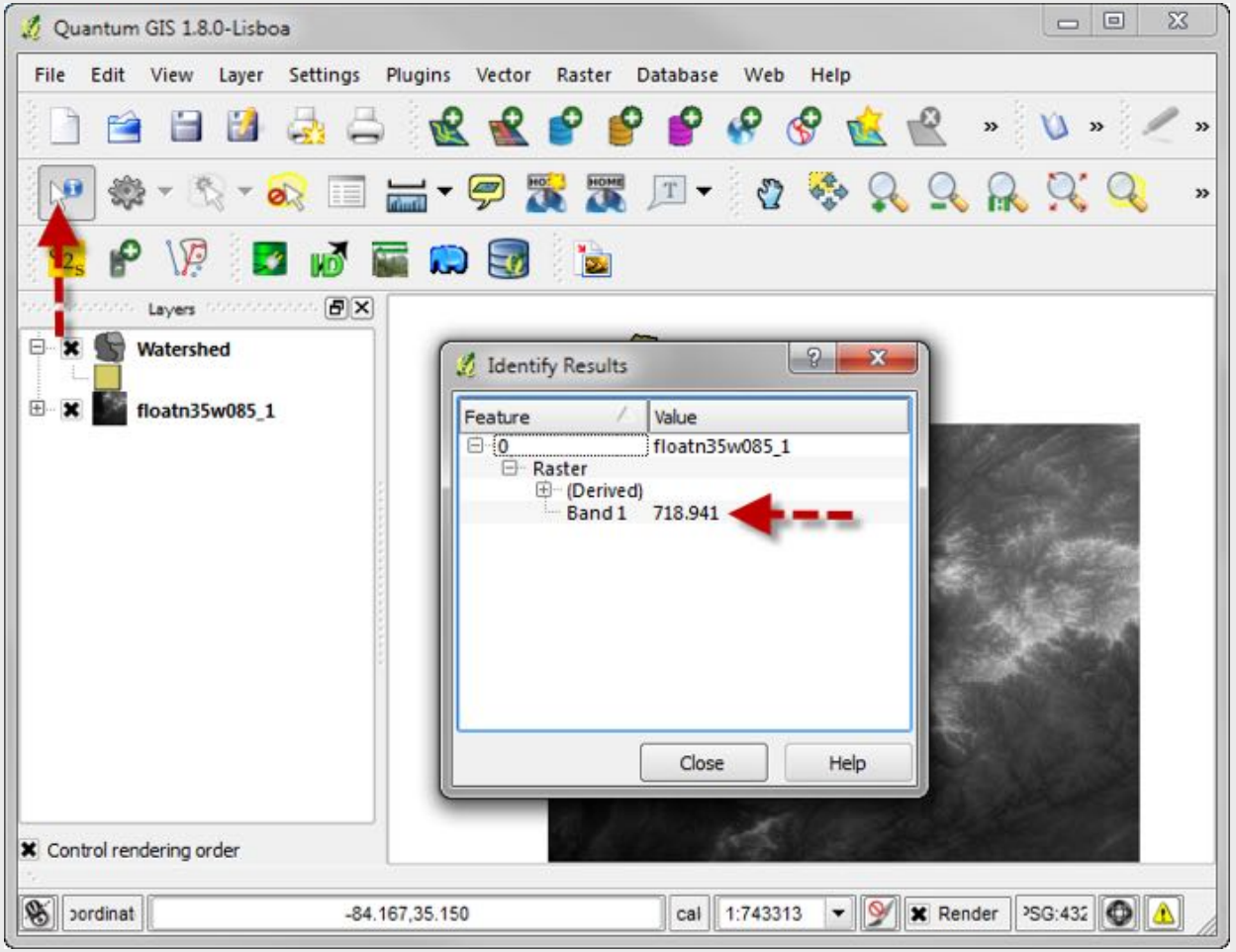


8. Right click on the DEM and go to Properties. Click on the style tab. Change the contrast enhancement to Stretch

to Min Max.



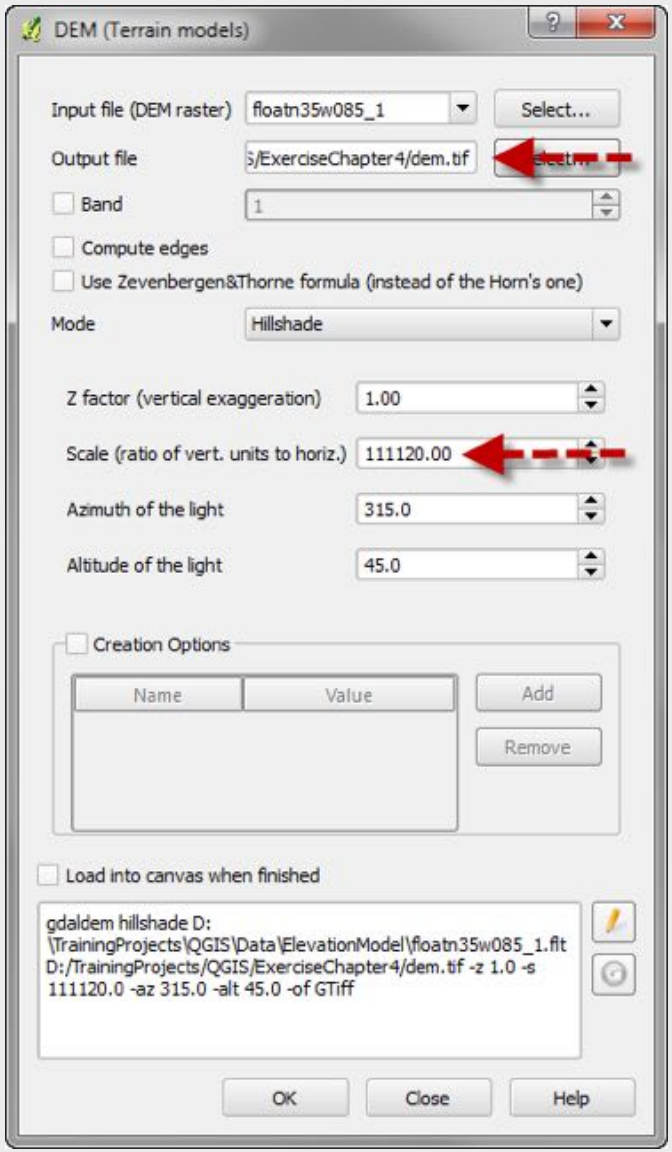
9. You should now see an image that covers the extent of Murray County and also covers a major portion of the watershed. Make the Watershed Transparent. Use the identify features tool to identify elevations on the DEM.

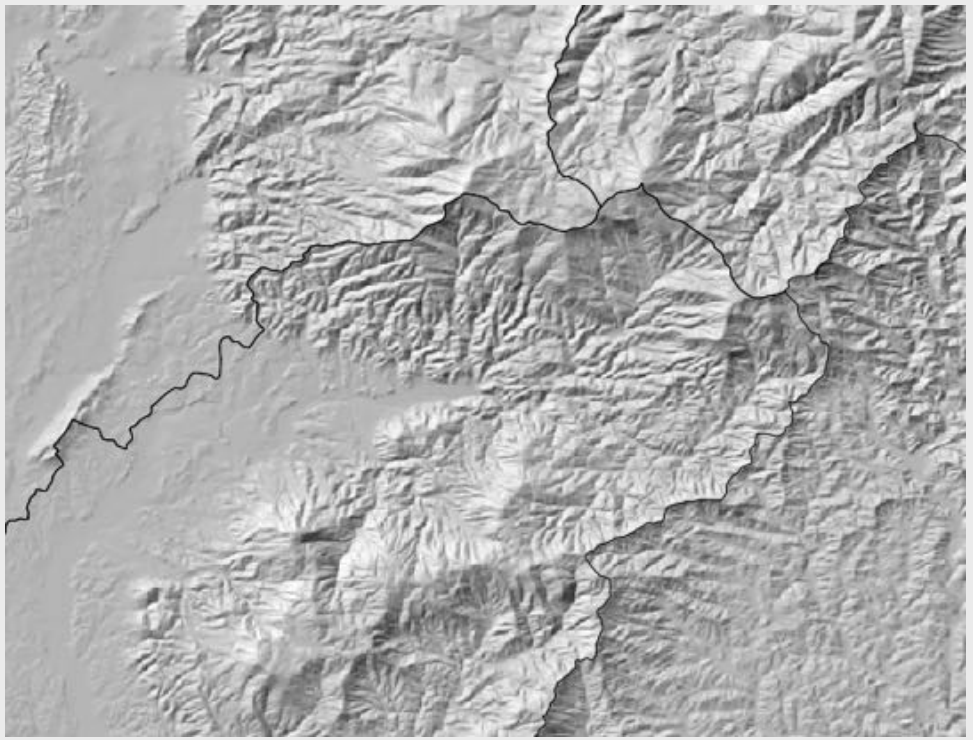


10. Go to the Raster Menu at the top of QGIS. Click on Analysis and then DEM (terrain Models). There is one thing we will need to change before running this command. We will need to set the scale.

Scale is the ration of vertical units to horizontal. Since the DEM is in a geographic Projection and has vertical units in meters scale will need to be set. If the horizontal unit of the source DEM is degrees (WGS84), you can use scale=111120 if the vertical units are meters or scale=370400 if they are in feet.

11. On the DEM menu name an output file. Make sure the mode is set to hillshade. Make sure the scale is set to 111120.00 . Before clicking OK make sure the Load onto Canvas checkbox is checked.



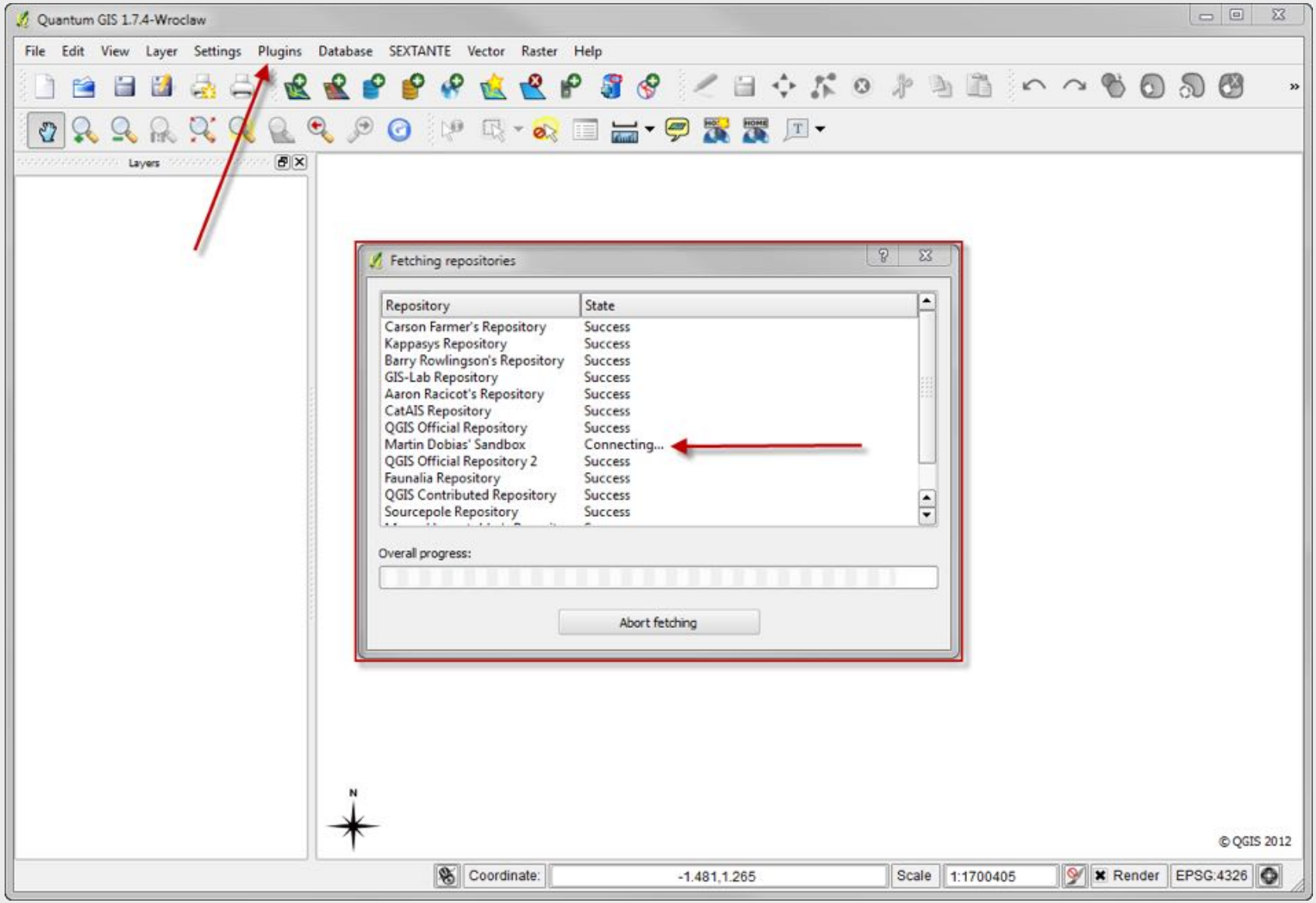


12. Inspect the hillshaded DEM. Once you are happy save your exercise!

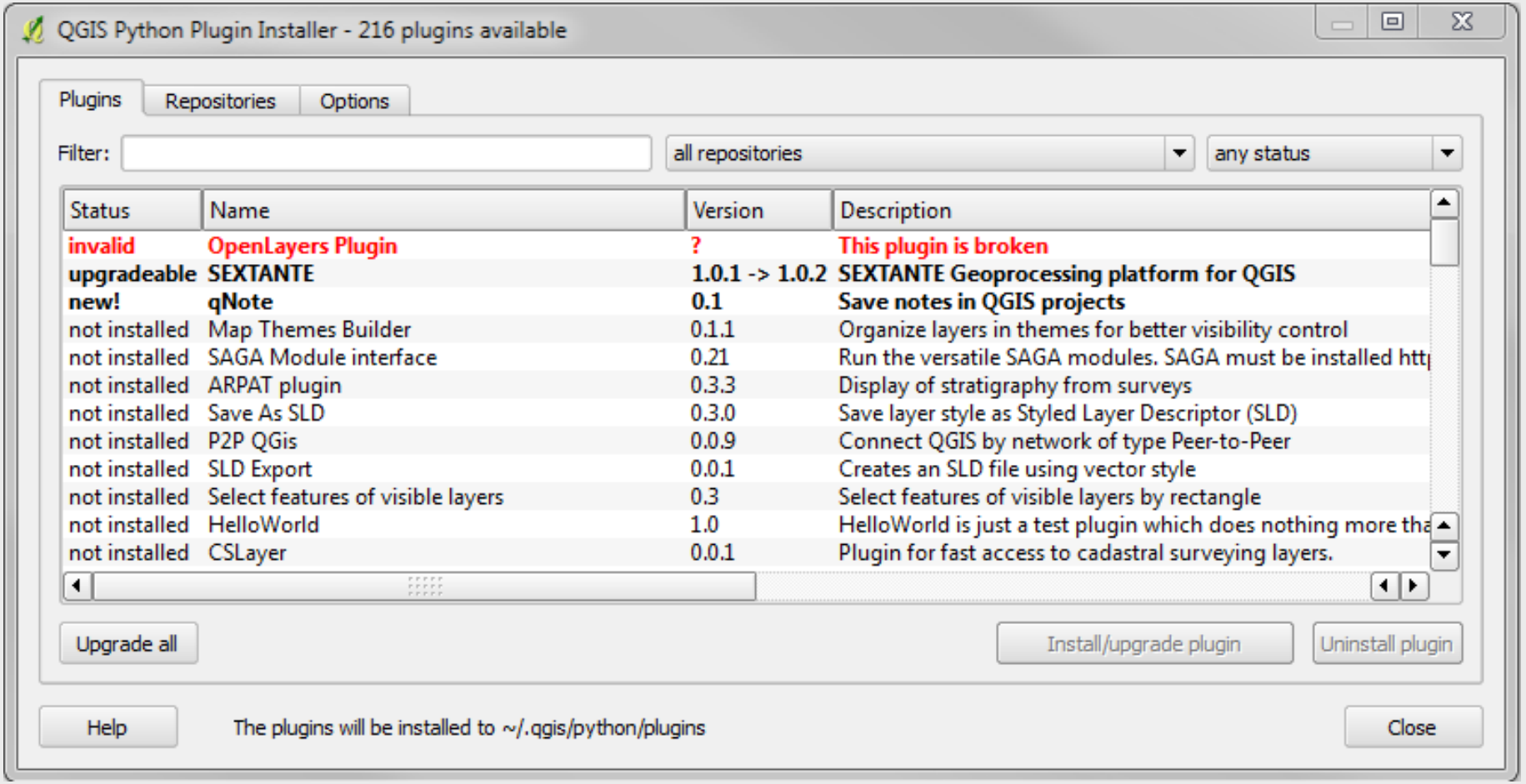
5. Plugins

- QGIS has a standard list of things that it does
  - Buffers
  - Projections
  - Clips
  - Unions
- There are some things that users want it to do that it doesn't.

Fetching Plugins

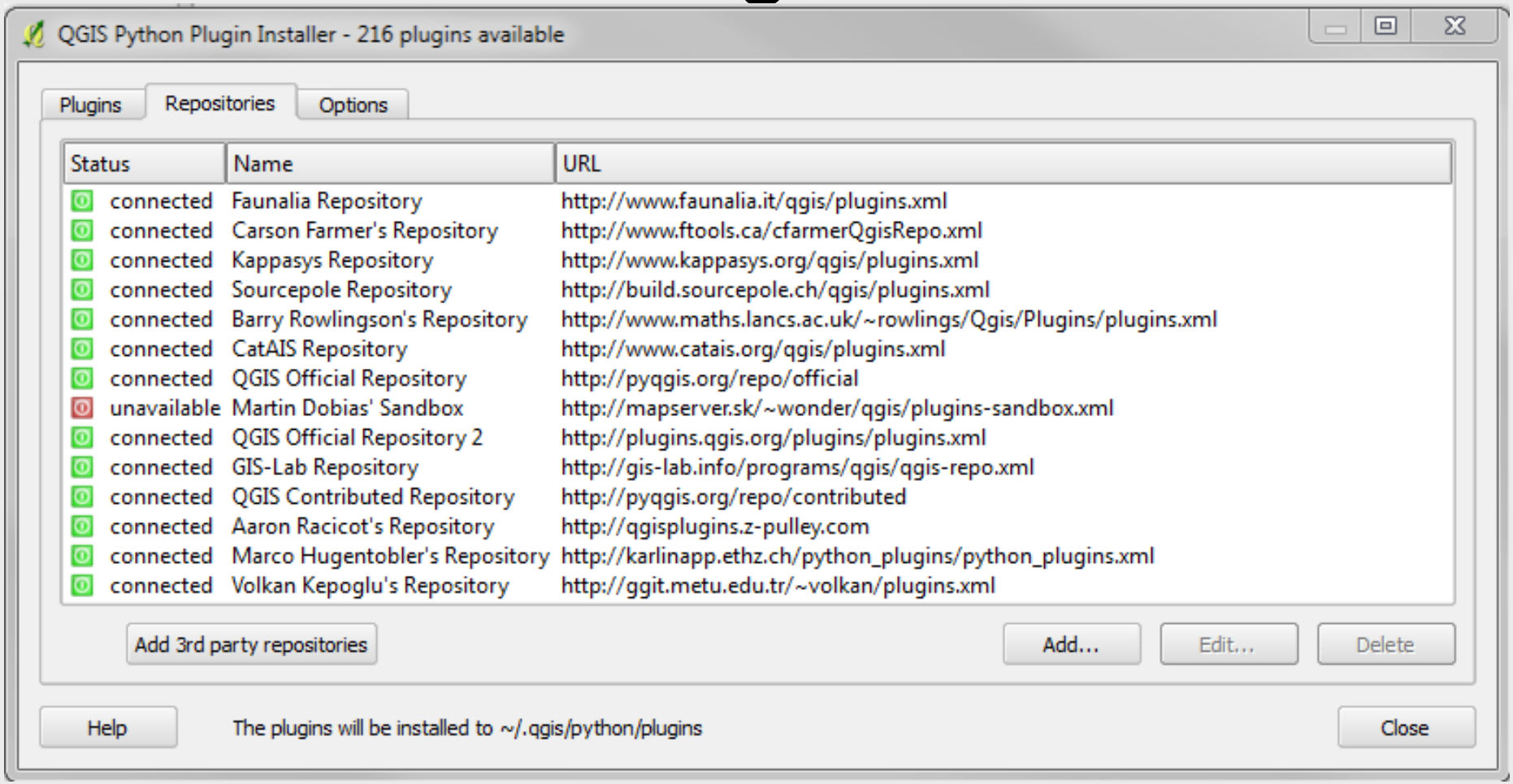


Plugin Interface



Add Plugins from the Filter Text Box

Official Plugins and 3rd Party Plugins



Community approves plugins

Resources for plugin users

- If you've found a bug in one of the plugins, learn how to submit a bug report:

Resources for plugin authors

- The pyQGIS cookbook is an ongoing effort to collect tips and tricks about QGIS python programming.
- The QGIS API is the ultimate reference for plugins creators
- The snippets section of this website contains some segments of python code which you could find useful for yours plugins.

How to add your plugin to this repository

- Go to Qgis plugin repo and click on Share a plugin. The approval procedure takes 2 weeks maximum. If not approved, a e-mail will be sent to you.
- Register your plugin at http://hub.qgis.org/projects/qgis-user-plugins. The user plugin section on hub can show plugin info, let users add issues/tickets for your plugin and to have just ONE repository for all qgis plugins.
- Depending on your plugin/ideas/capabilities, either
    - Put ALL the code in the zip uploaded to the Qgis plugin repo (or create your own)
      or
    - Put code in GIT repo at http://hub.qgis.org
      or/and
    - Put code in github (because it just has more features at this moment)

Manage Plugins

- You can add and remove plugins through the QGIS Plugin Manager
- Plugins I have used
  - Grass
  - GDAL Tools
  - OpenStreetMap Plugin
  - Sextante Plugin

QGIS Plugins 3rd Party

- Use at your own risk
- They can be poorly documented and in may cases not work
- Developers may build plugin for certain platforms
  - Home Range Plugin runs on Linux and not on windows
  - Developer can be paid to make/fix plugins
  - Overall – plugins are awesome.

Exercises

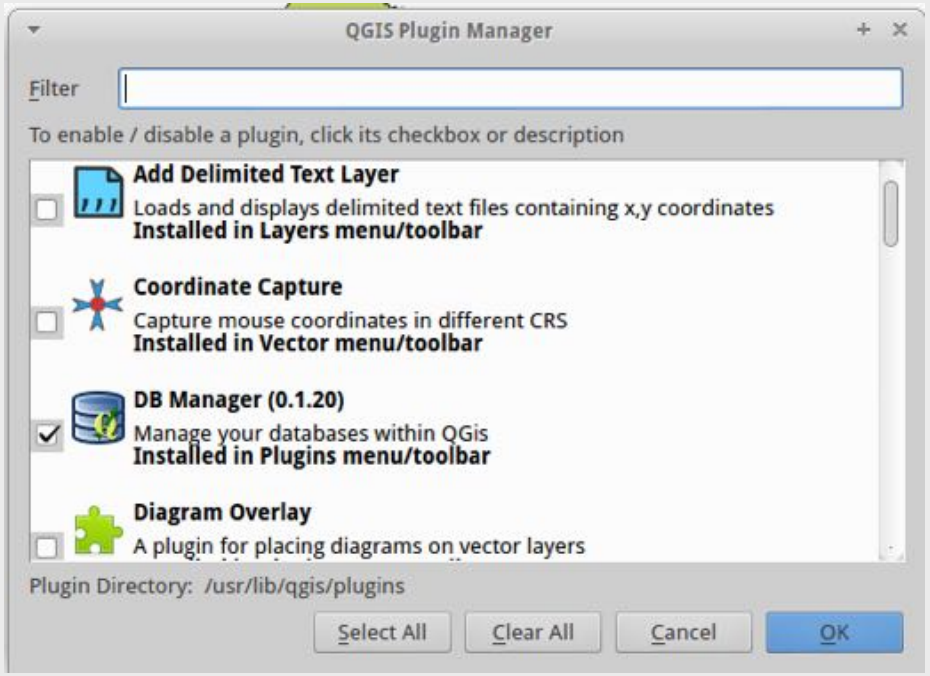
- Explore Plugins and plugins manager
- Work with OpenLayers
- Look at Sextante

Exercise Chapter 5

While you're working on a project you might need access to more functionality. QGIS does a lot, Plugins allow you to do more.

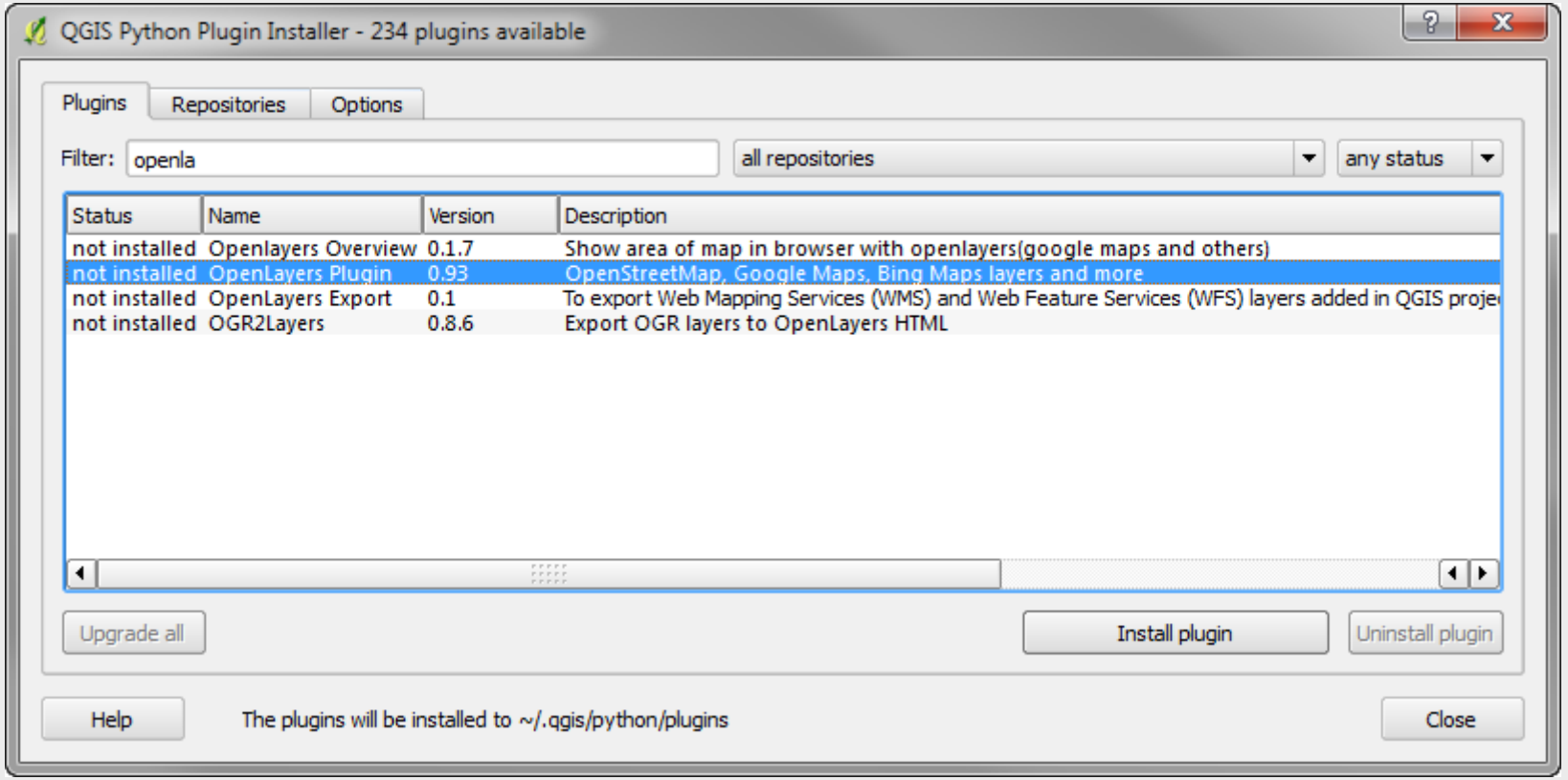
1. Click on the plugins menu at the top of QGIS. Notice you have several choices under the main menu for plugins into QGIS. Python being one of them. Grass being another. Click on the start button in windows and drive to the QGIS folder under installed programs (Programs (x86)). Notice that Grass is installed under the QGIS Folder. What is Grass and how long has it been around? (You can use Google!)

2. Open the QGIS plugin manager. How many default plugins are available to QGIS?



3. Open the QGIS Fetch Python Plugins Menu. How many plugins are available? (acceptable answer can be A Lot)

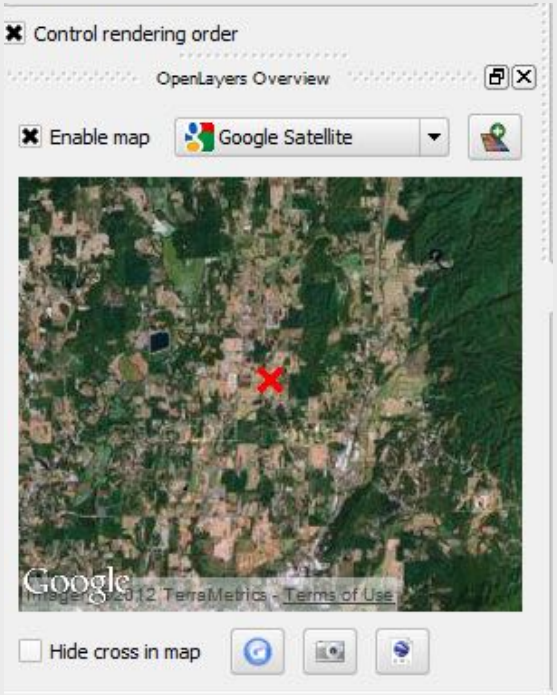
4. Install the OpenLayers Plugin.



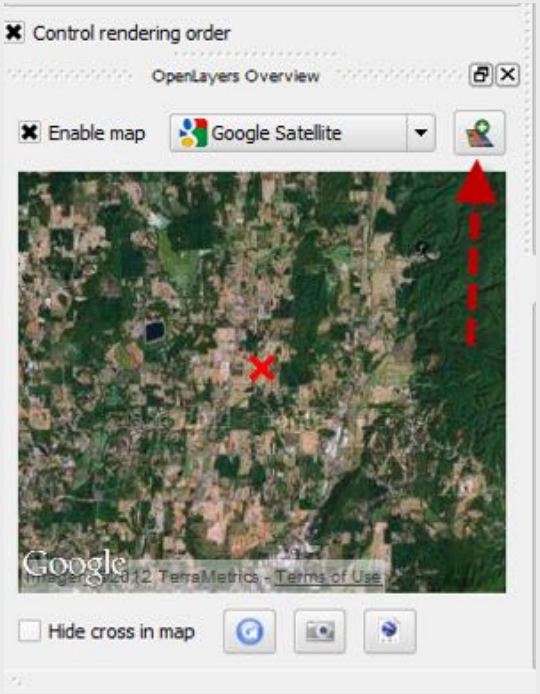
5. Once installed go back to the plugins menu and add the OpenLayers Overview.

6. Add the Watershed Layer to QGIS.

7. On the OpenLayers plugin enable the Google Satellite view.

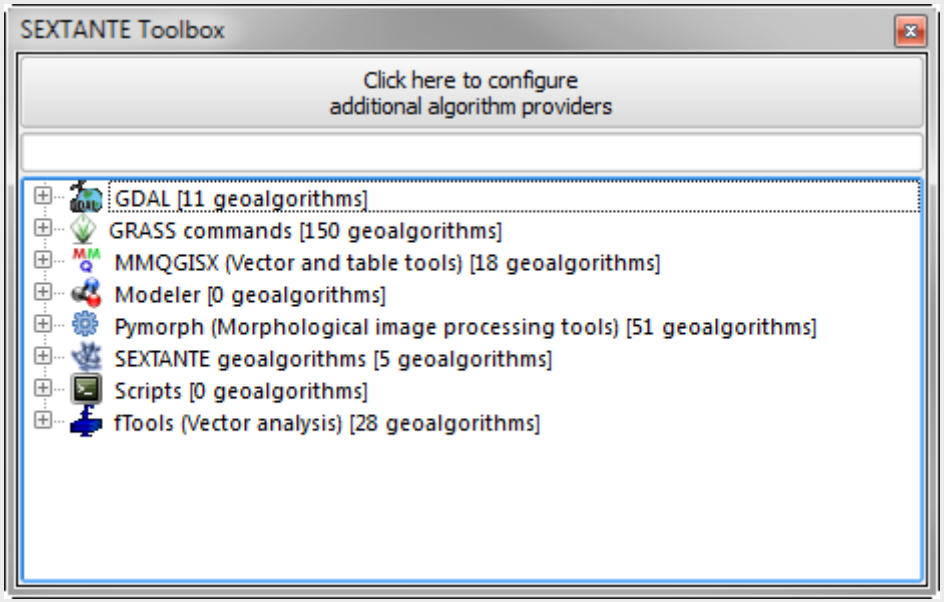


8. Click the add Map icon on the OpenLayers plugin.



9. Add the Sextante plugin. Notice when it is added you will have an Analysis Menu added to the QGIS Interface.
   What is Sextante? What other software package can use Sextante?

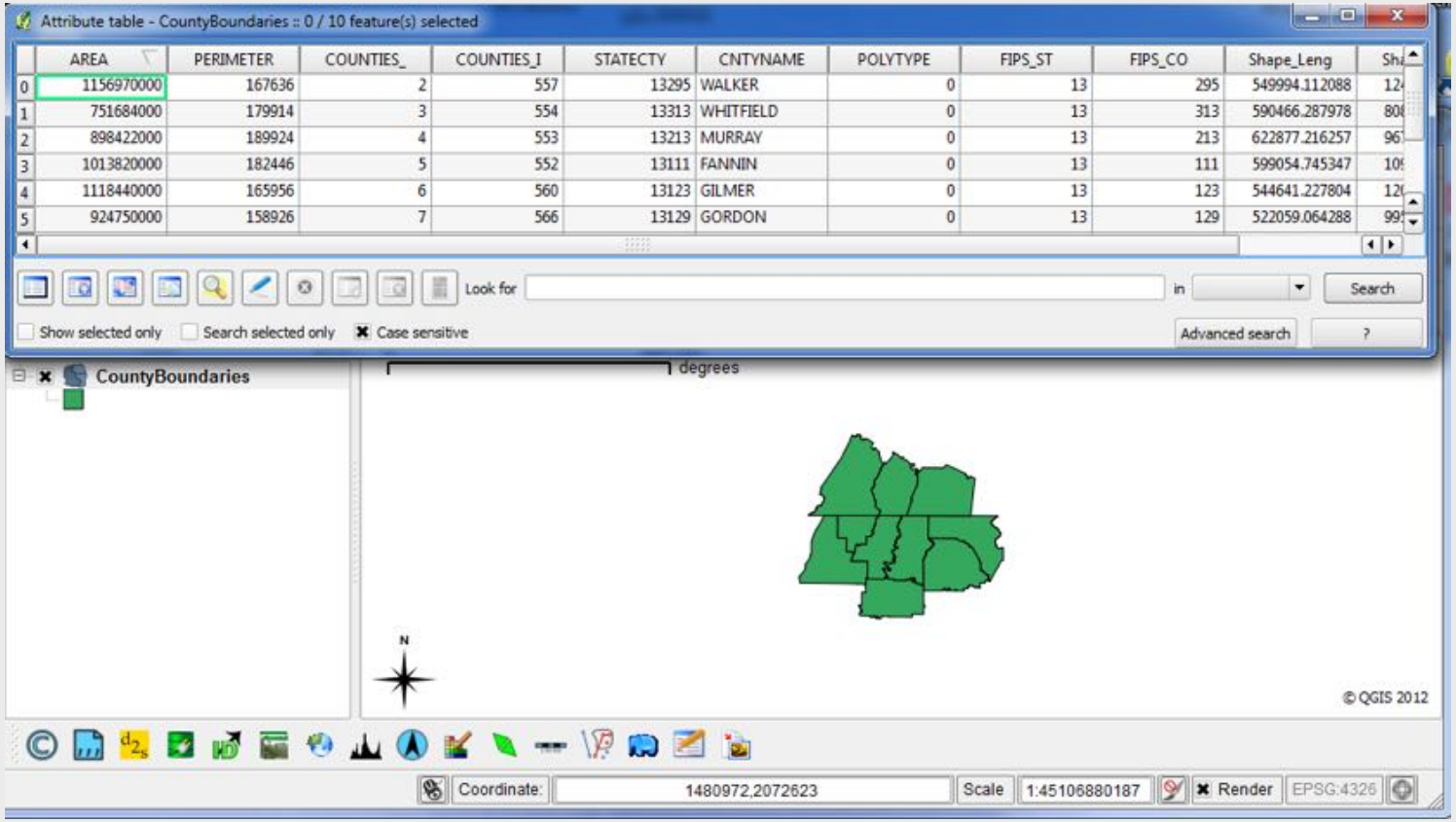
10. Add the Sextante Toolbox.



11. Once you are done looking at the plugins, close QGIS!

6. Attributes

- GIS is more than just Geometry – there are attributes built into the data.

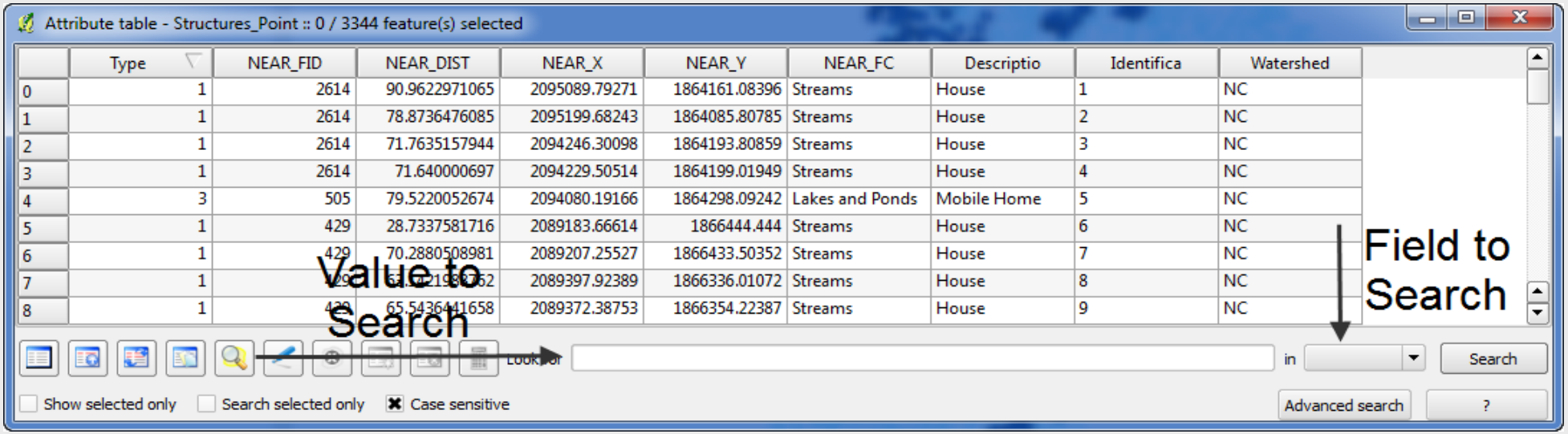


Attribution depends on the database

- We are using Shapefiles
- It also reads PostGIS, SQL Server, ESRI's SDE, Spatialite, etc, etc.

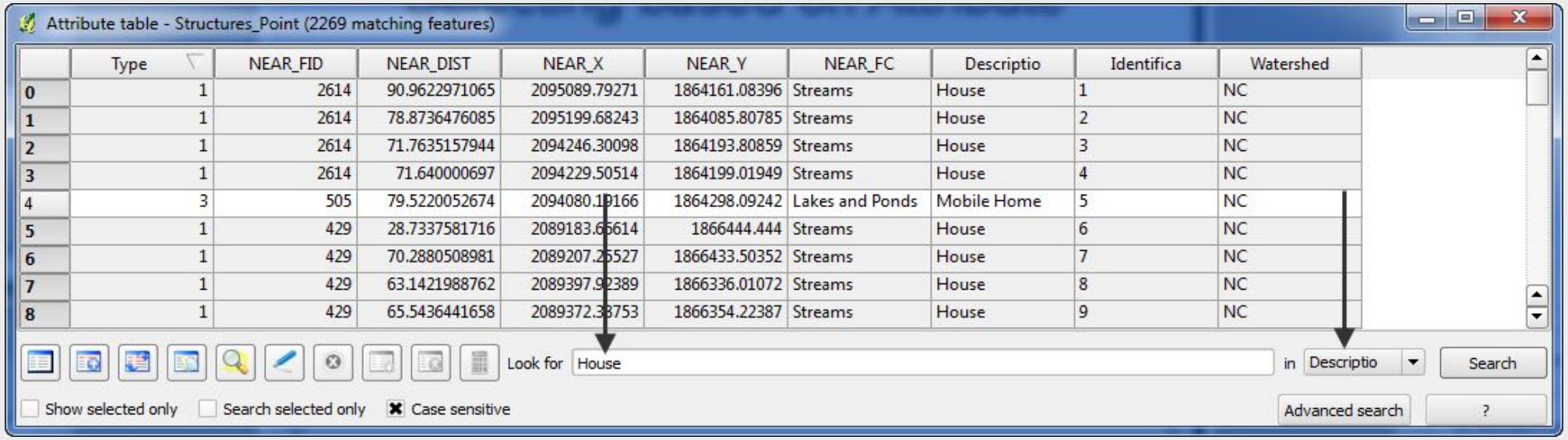
- Pay Attention to Spatialite.
  - http://www.gaia-gis.it/gaia-sins/

Search for Attributes



- As an example a user needs to search for houses

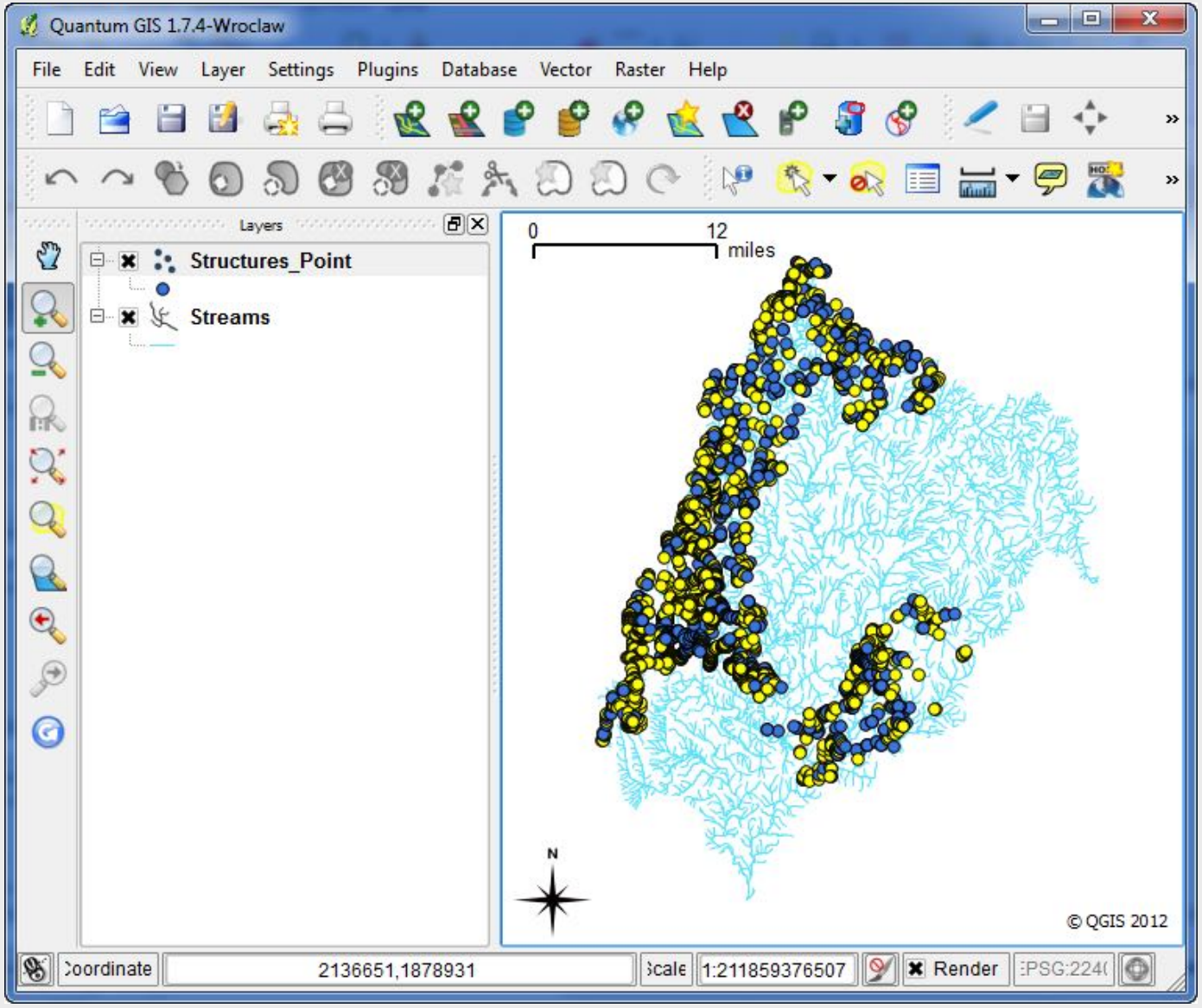
Selecting based on Attribute



	Type	NEAR_FID	NEAR_DIST	NEAR_X	NEAR_Y	NEAR_FC	Descriptio	Identifica	Watershed
0	1	2614	90.9622971065	2095089.79271	1864161.08396	Streams	House	1	NC
1	1	2614	78.8736476085	2095199.68243	1864085.80785	Streams	House	2	NC
2	1	2614	71.7635157944	2094246.30098	1864193.80859	Streams	House	3	NC
3	1	2614	71.640000697	2094229.50514	1864199.01949	Streams	House	4	NC
4	3	505	79.5220052674	2094080.19166	1864298.09242	Lakes and Ponds	Mobile Home	5	NC
5	1	429	28.7337581716	2089183.65614	1866444.444	Streams	House	6	NC
6	1	429	70.2880508981	2089207.26527	1866433.50352	Streams	House	7	NC
7	1	429	63.1421988762	2089397.92389	1866336.01072	Streams	House	8	NC
8	1	429	65.5436441658	2089372.38753	1866354.22387	Streams	House	9	NC

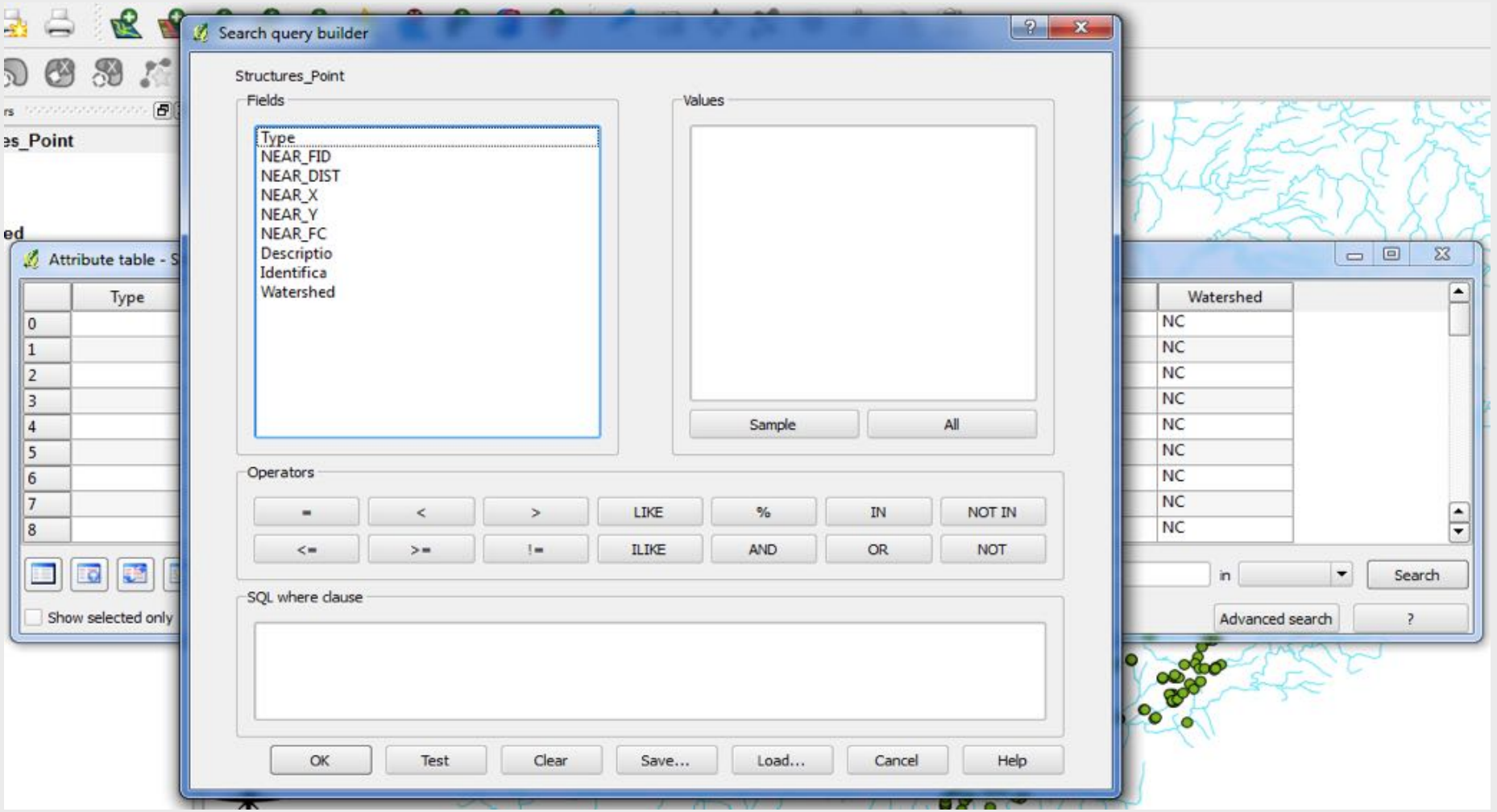
- Note search was on a text field and was not “Quoted”
- Selection set can be saved to a new shapefile file
- Selection set can be saved to the clipboard/excel/notepad

Selections are reflected in the Display



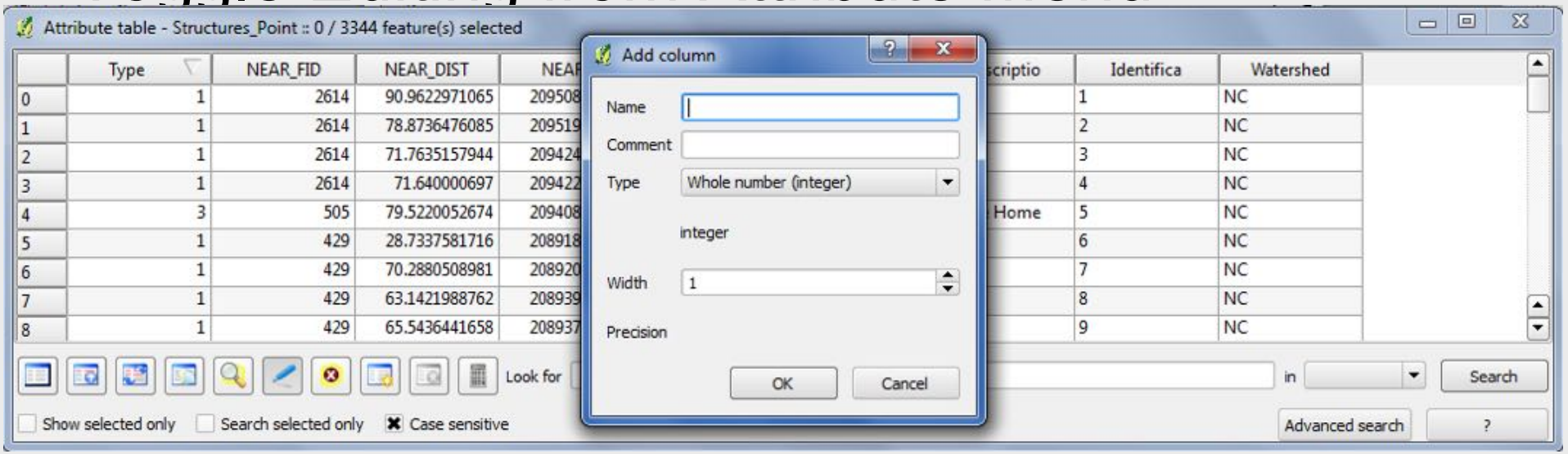
Advanced Search

- SQL Query



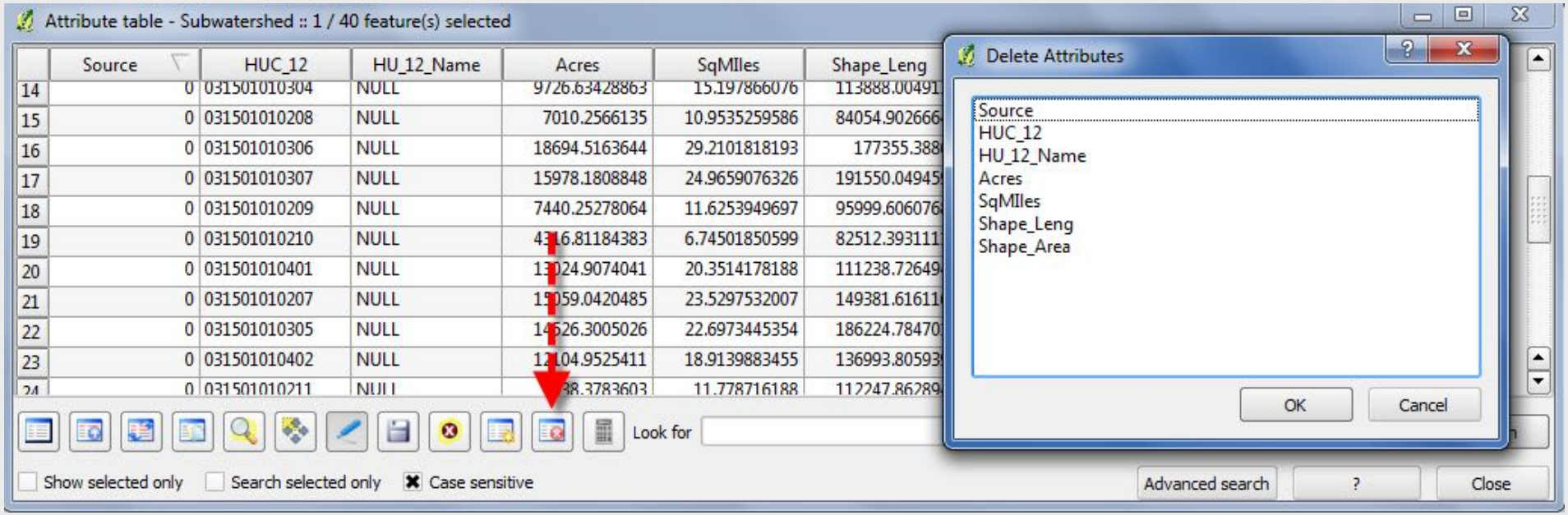
Add and Columns

- Data layer must be editable
- Right click on a data layer and Toggle Editing
- Toggle editing under the Layer Menu
- Toggle Editing from Attribute Menu



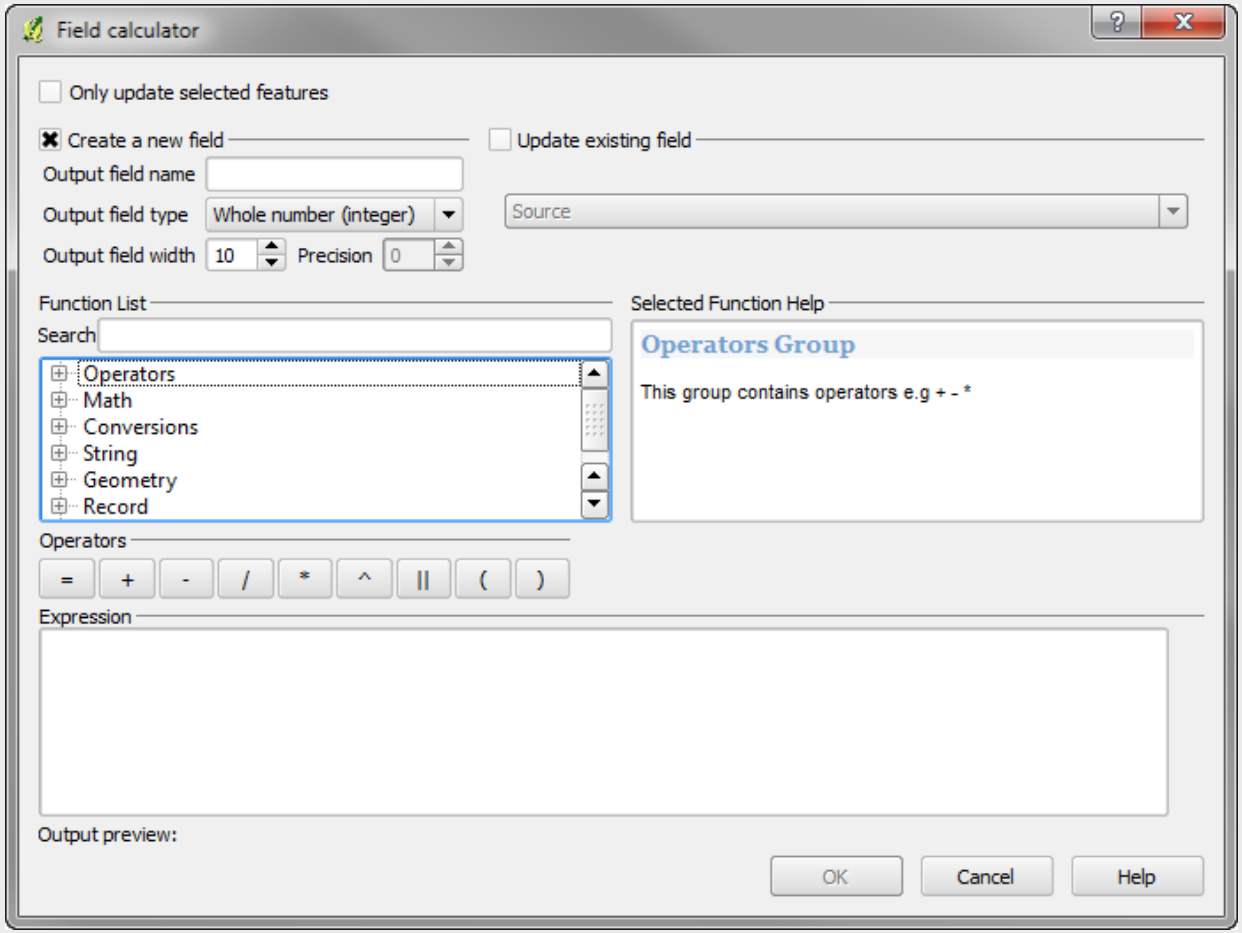
Deleting Columns

- Toggle Editing
- Click Delete Columns Icon



Calculate Area

- Add Column and use the area calculation in the Field Calculator

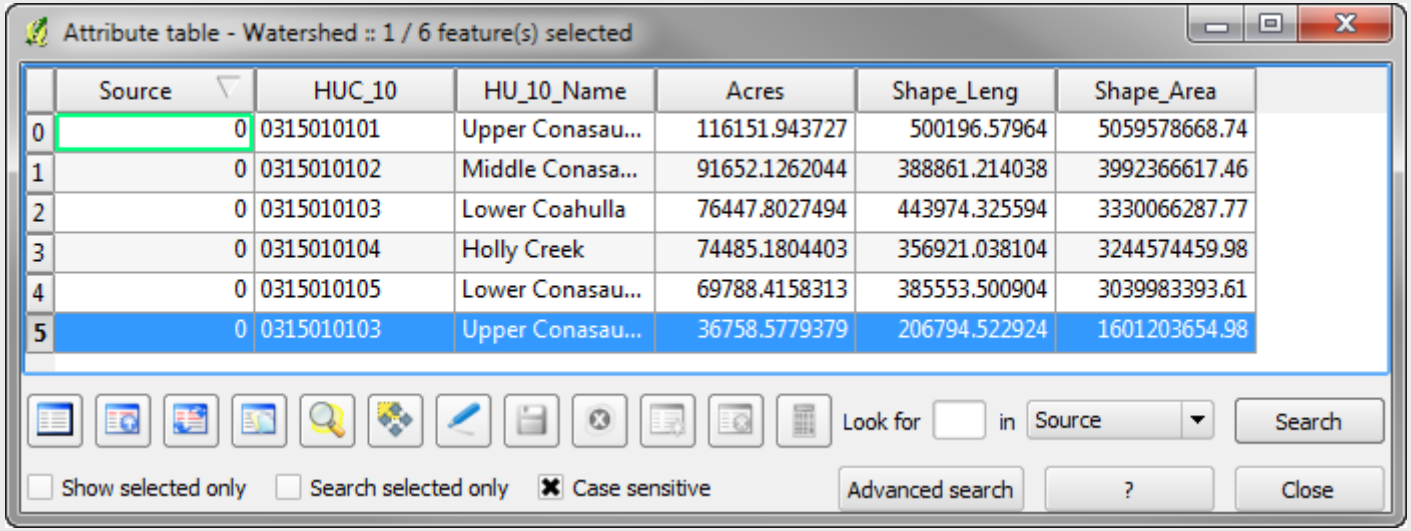


Exercises

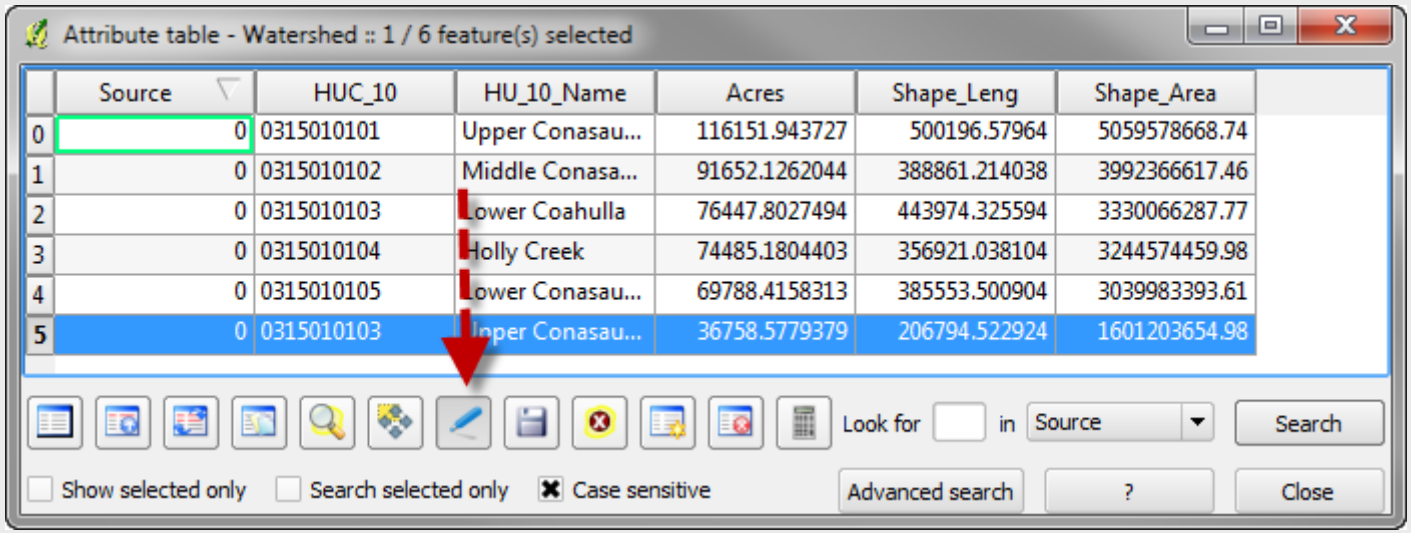
- Add and Delete Fields
- Calculate Field Values
- Select data by attributes

Exercise Ch 6

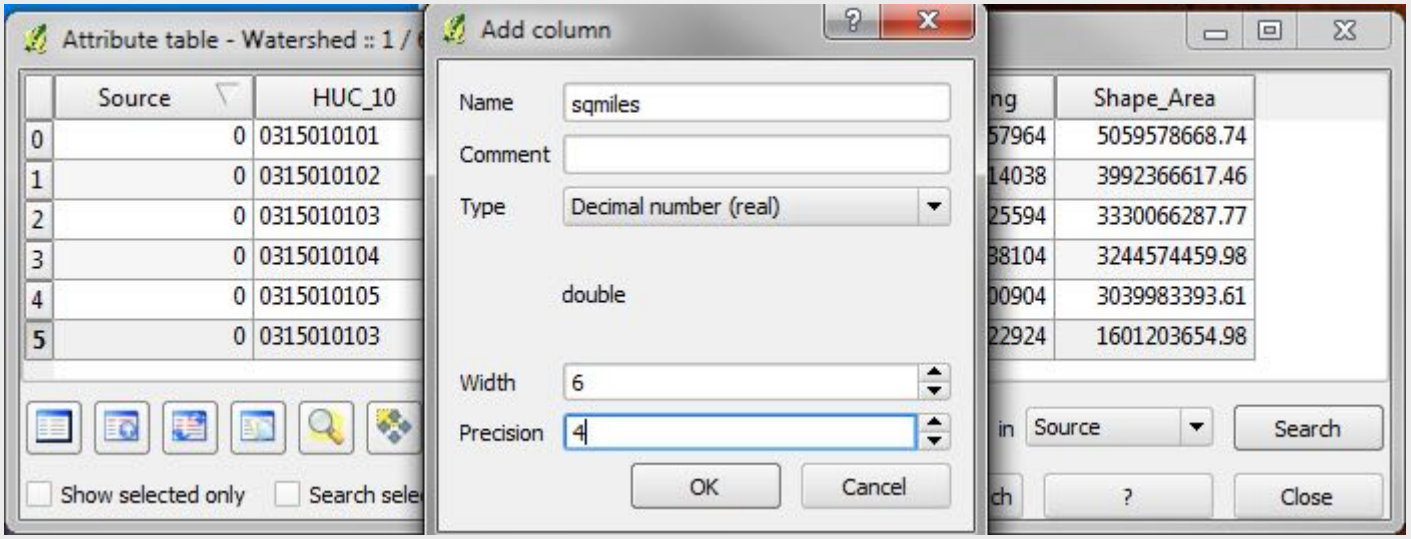
1. Open QGIS and add the Watershed layer to your display. Open the attribute table by right clicking on the layer and clicking “Open Attribute Table”.



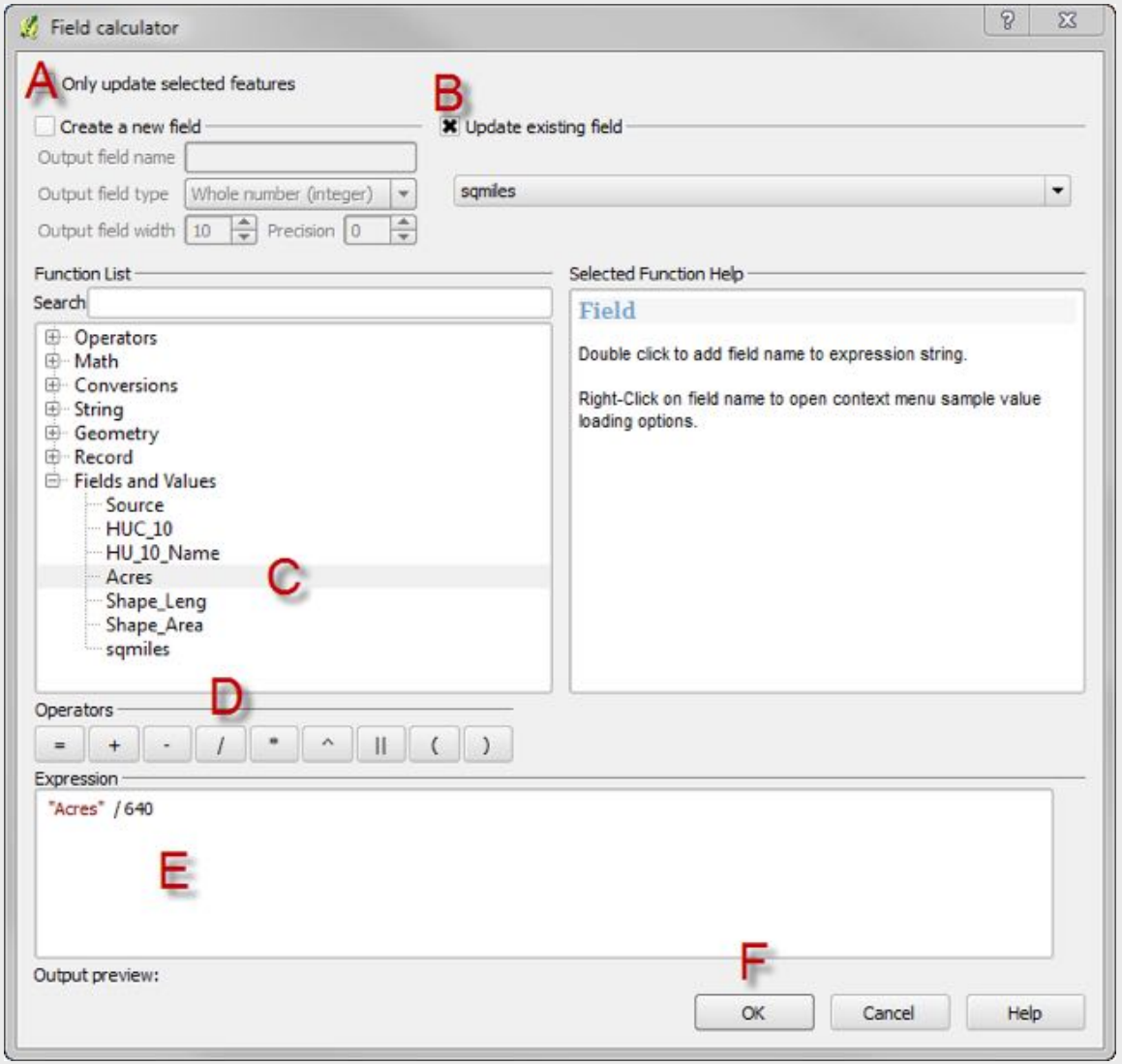
2. You need to calculate the square miles of each watershed. Toggle Editing.



3. Add a column by clicking on the add column icon. Atributtes for the new column depend on the database format being used. In this case we are using dbase (dbf). Make your new column name *sqmiles.* Make the Type *decimal* number. Make the width 6 and the precision (number of decimal places) 4.



4. Since this shapefile is in Georgia West Stateplane NAD 83 US Feet (Projections are coming in a bit), The important thing to know is the Area (Shape_Area) is in Square Feet. There are 640 Acres in a Square Mile.



A. Open the field Calculator. If “Only update selected features” is checked, uncheck it.

B. Check update existing field. Select square miles from the combo both.

C. In the left hand box labeled Function List Click Fields and Values and then double click Acres. Double clicking adds it to the expression box at the bottom.

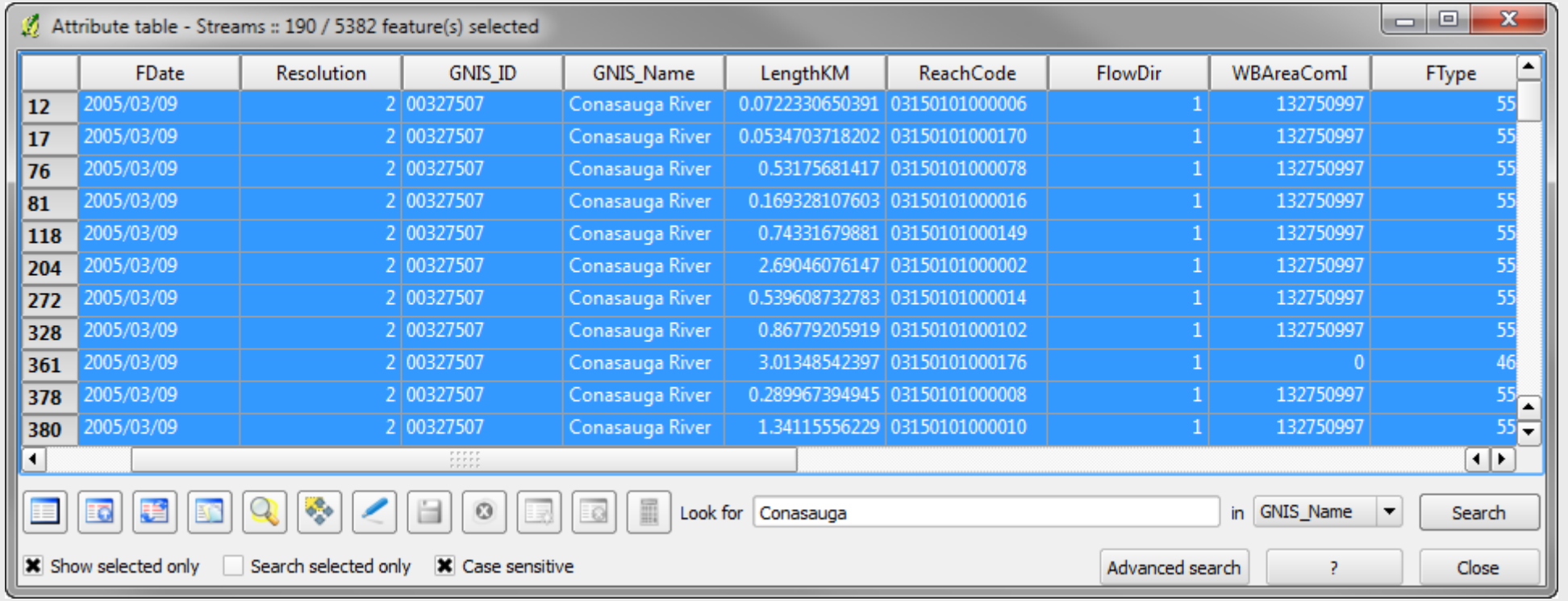
D. Click the division symbol.

E. Type 640 . See if what you have looks like the figure to the Right:

F. Click OK. Click the editing icon and save your edits. Congratulations. You've just calculated Acres for the watershed.

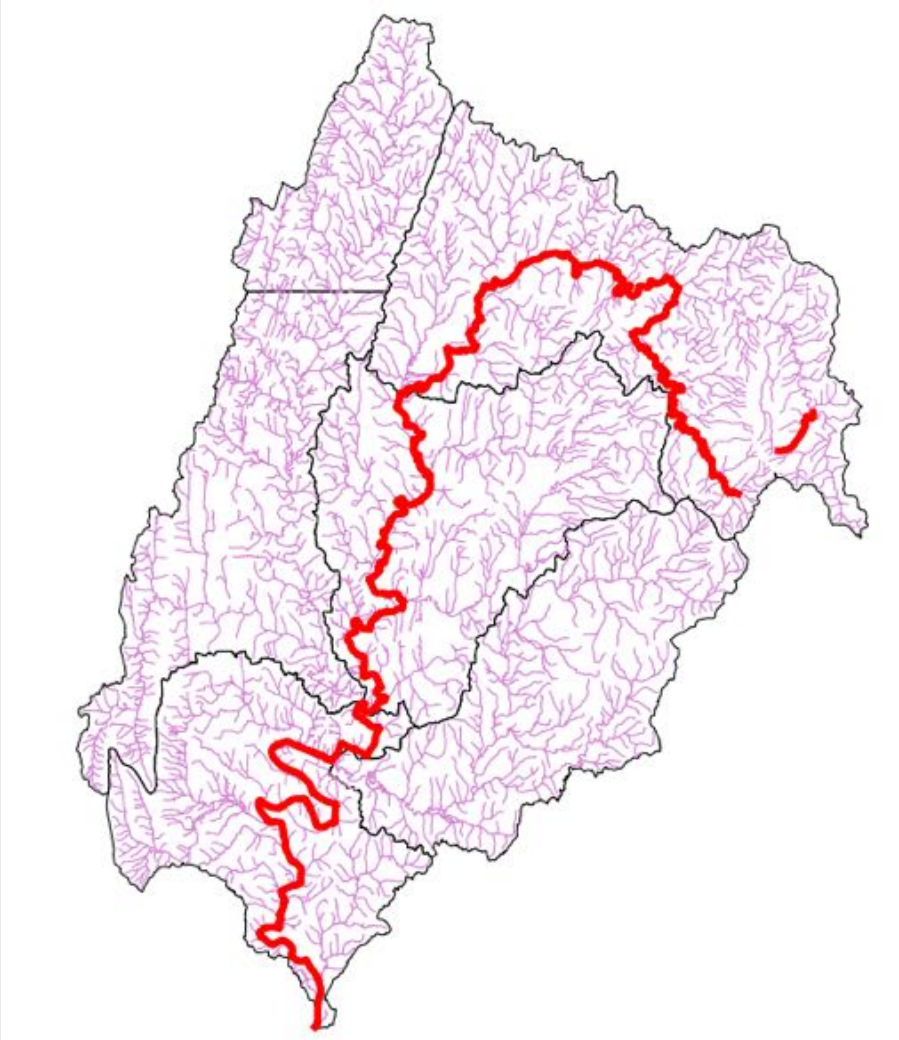
5. Add the Streams shapefile to QGIS. This data came from the National Hydro Dataset and has had more attributes added to it. The Conasauga River is the main River that flows through the watershed.

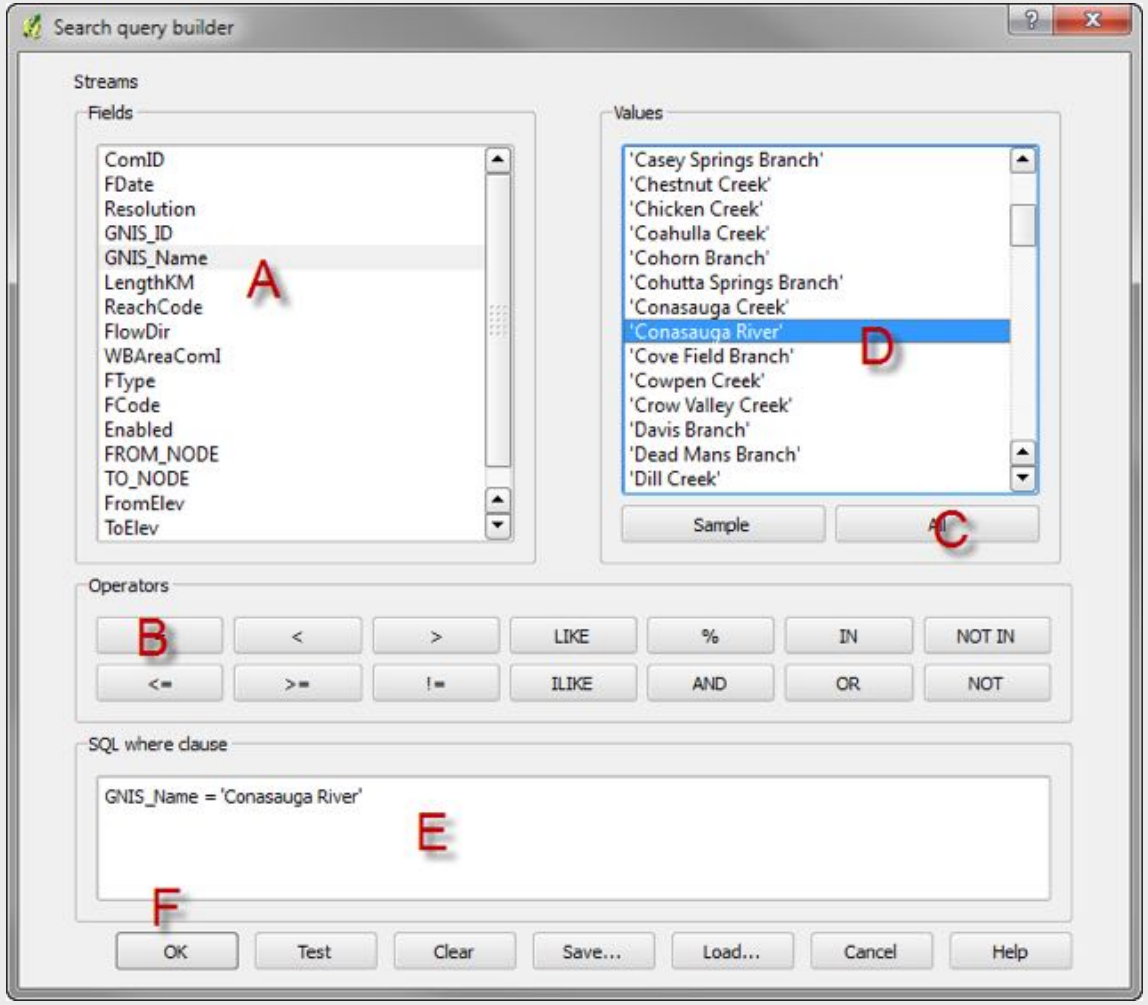
Open the attribute table and search for the Conasauga River using the GNIS_Name as the search field. Type in Conasauga.



	FDate	Resolution	GNIS_ID	GNIS_Name	LengthKM	ReachCode	FlowDir	WBAreaComI	FType
12	2005/03/09	2	00327507	Conasauga River	0.0722330650391	03150101000006	1	132750997	55
17	2005/03/09	2	00327507	Conasauga River	0.0534703718202	03150101000170	1	132750997	55
76	2005/03/09	2	00327507	Conasauga River	0.53175681417	03150101000078	1	132750997	55
81	2005/03/09	2	00327507	Conasauga River	0.169328107603	03150101000016	1	132750997	55
118	2005/03/09	2	00327507	Conasauga River	0.74331679881	03150101000149	1	132750997	55
204	2005/03/09	2	00327507	Conasauga River	2.69046076147	03150101000002	1	132750997	55
272	2005/03/09	2	00327507	Conasauga River	0.539608732783	03150101000014	1	132750997	55
328	2005/03/09	2	00327507	Conasauga River	0.86779205919	03150101000102	1	132750997	55
361	2005/03/09	2	00327507	Conasauga River	3.01348542397	03150101000176	1	0	46
378	2005/03/09	2	00327507	Conasauga River	0.289967394945	03150101000008	1	132750997	55
380	2005/03/09	2	00327507	Conasauga River	1.34115556229	03150101000010	1	132750997	55

Click the Show Selected Only. Notice it did a wild card search by default and looked for the word “Conasauga” in the results. Some results are showing Conasauga Creek while others are showing Conasauga River. Notice the Creek to the north west of the main river.





6. Now we're going to build an SQL Statement using Advanced Search. Click Advanced Search.

A. Double Click GNIS_Name under fields
B. Click the = Sign
C. Under Values Click All.
D. Double Click 'Conasauga River'
E. Check your expression.
F. Click OK.

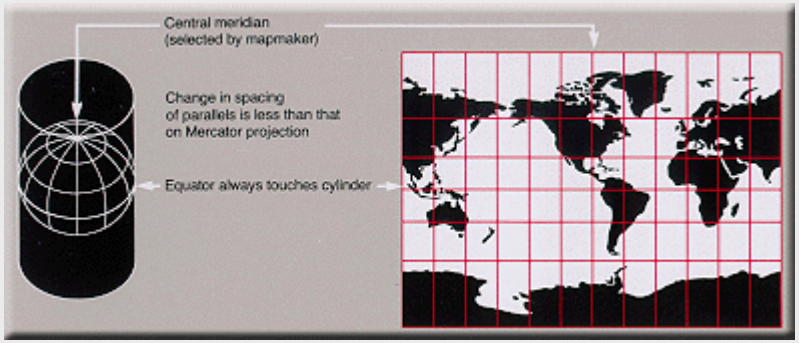
7. Now that you have selected the main stem of the Conasauga River, unselect it using the Unselect Icon on the Attribute table.
8. Remove the following attributes from the Shapefile: Enabled, From_Node, To_Node, fromelev, ToElev. You will have to enable editing and then click the Delete Column icon.
9. Once you have finished, Stop editing by clicking the Editing icon located on the Attribute Menu. You will be prompted to save your edits.

7. Creating new Data and Editing

- You can create new types of data in QGIS
  - Shapefiles
  - Spatialite Layer
- Layers contain basic Geometry shapes
  - Points
  - Lines
  - Polygons

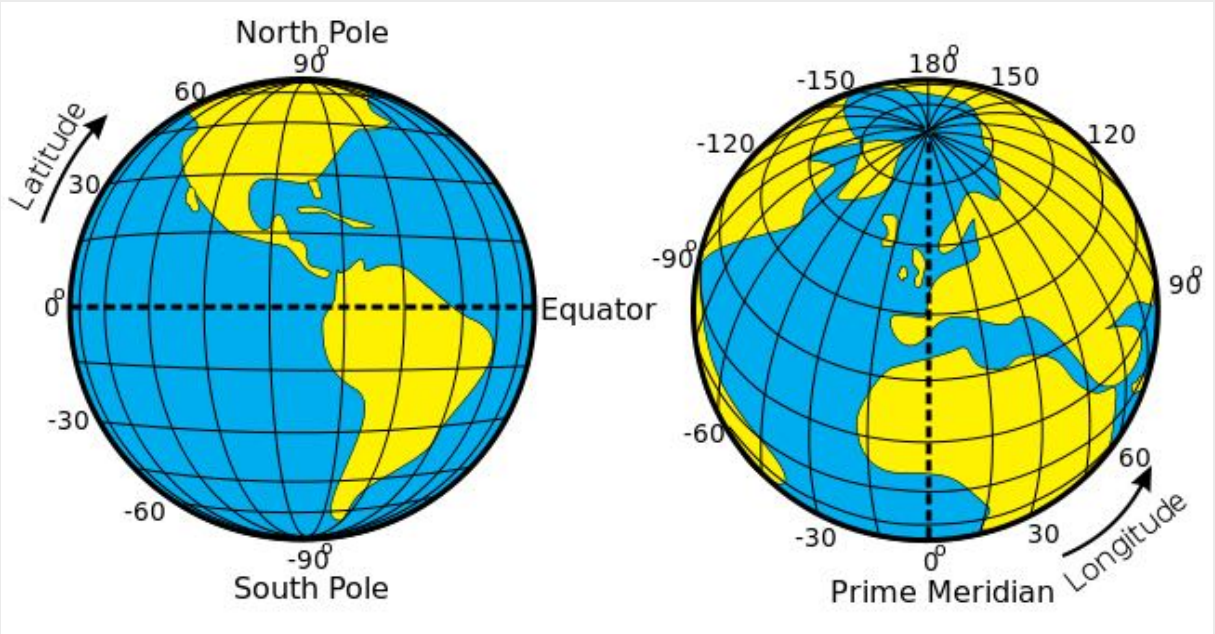
Map Projections

- Geographic Coordinate Systems
  - Defines locations on spherical model of the earth
- Projected Coordinate System
  - Defines locations on flat model of the earth



Geographic Coordinate System

- Defines Locations with Latitude Longitude Values
  - Latitude – north and south of the equator
  - Longitude - east and west of prime meridian
  - Prime meridian is Greenwich



Projected Coordinate System

- Define Locations with map units
  - X and Y measured from a Origin
  - Projected Coordinate system includes
  - Units in feet or meters
  - A Map Projection
  - Underlying Geographic Coordinate System

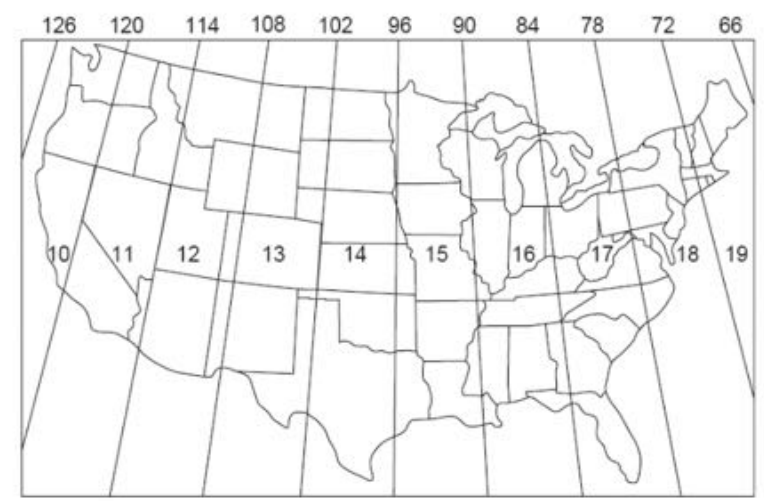


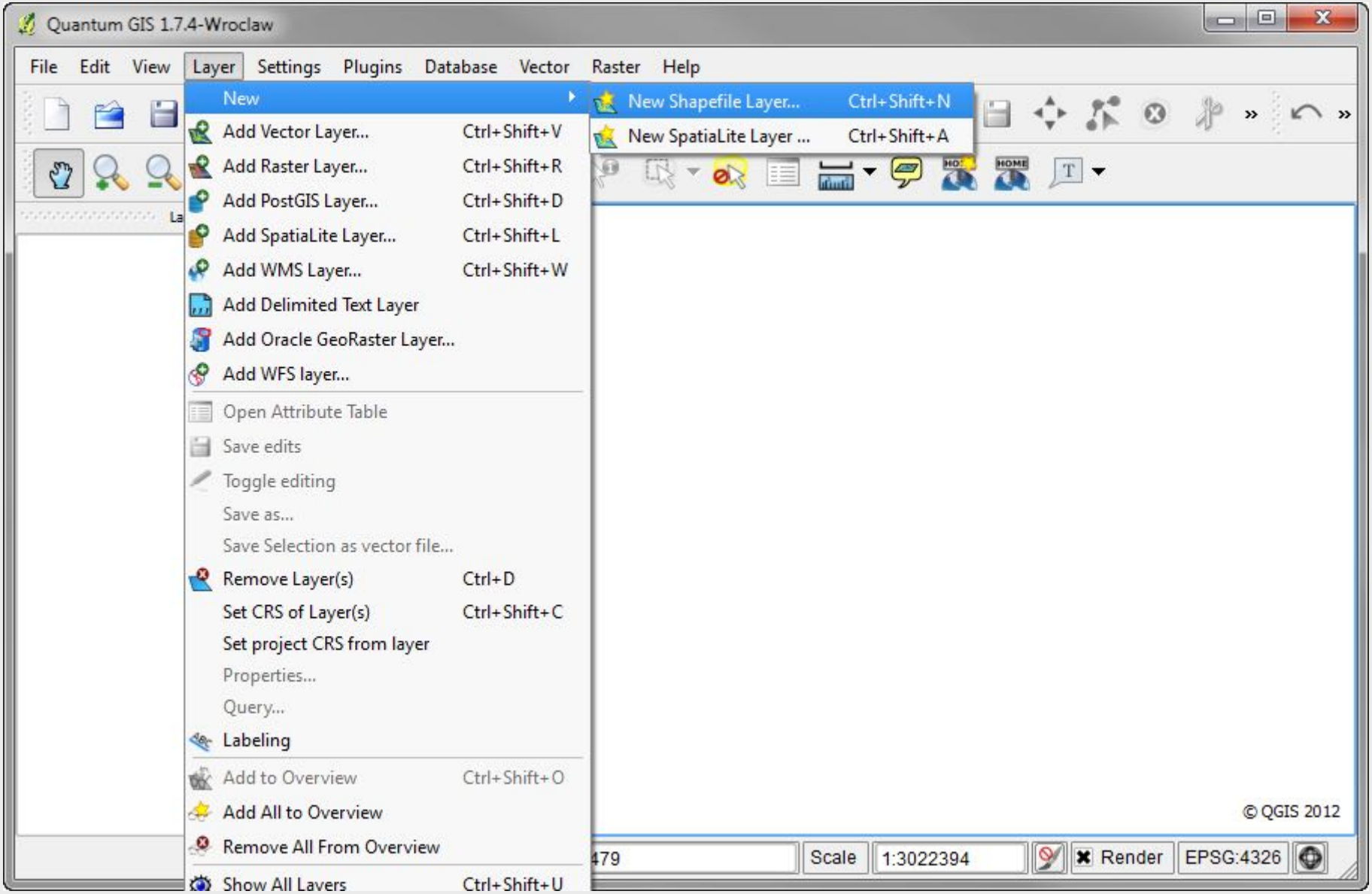
Figure 1. The Universal Transverse Mercator grid that covers the conterminous 48 United States comprises 10 zones—from Zone 10 on the west coast through Zone 19 in New England.

EPSG Geodetic Parameter Registry

- Gatekeepers of Projections
- Also knows as SRIDS (Spatial Reference System Identifier)
- http://www.epsg-registry.org/

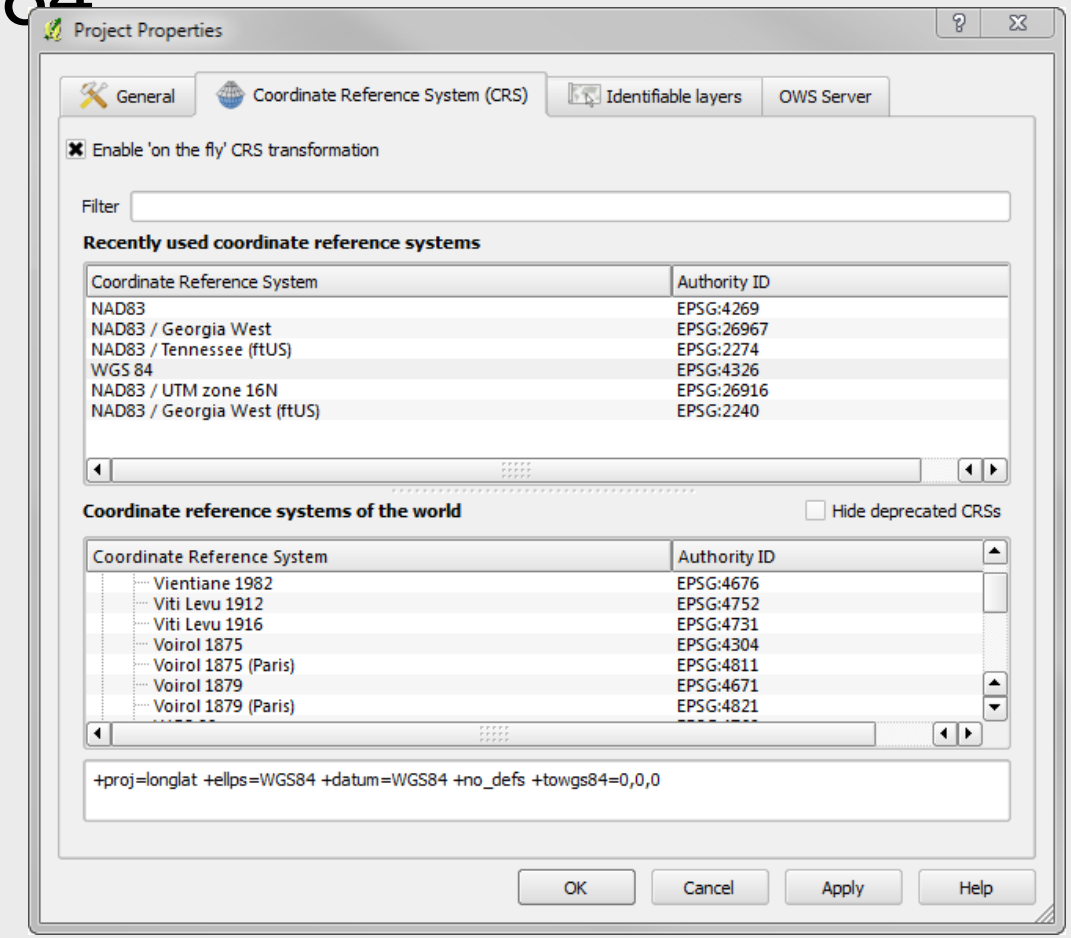
Report	Name	Code	Type	Status
	NAD27 / Tennessee	EPSG::2204	ProjectedCRS	Valid
	NAD83(HARN) / Tennessee	EPSG::2843	ProjectedCRS	Valid
	NAD83(HARN) / Tennessee (ftUS)	EPSG::2915	ProjectedCRS	Valid
	NAD83(NSRS2007) / Tennessee	EPSG::3661	ProjectedCRS	Valid
	NAD83(NSRS2007) / Tennessee (ftUS)	EPSG::3662	ProjectedCRS	Valid
	NAD83 / Tennessee	EPSG::32136	ProjectedCRS	Valid

Create a new shapefile



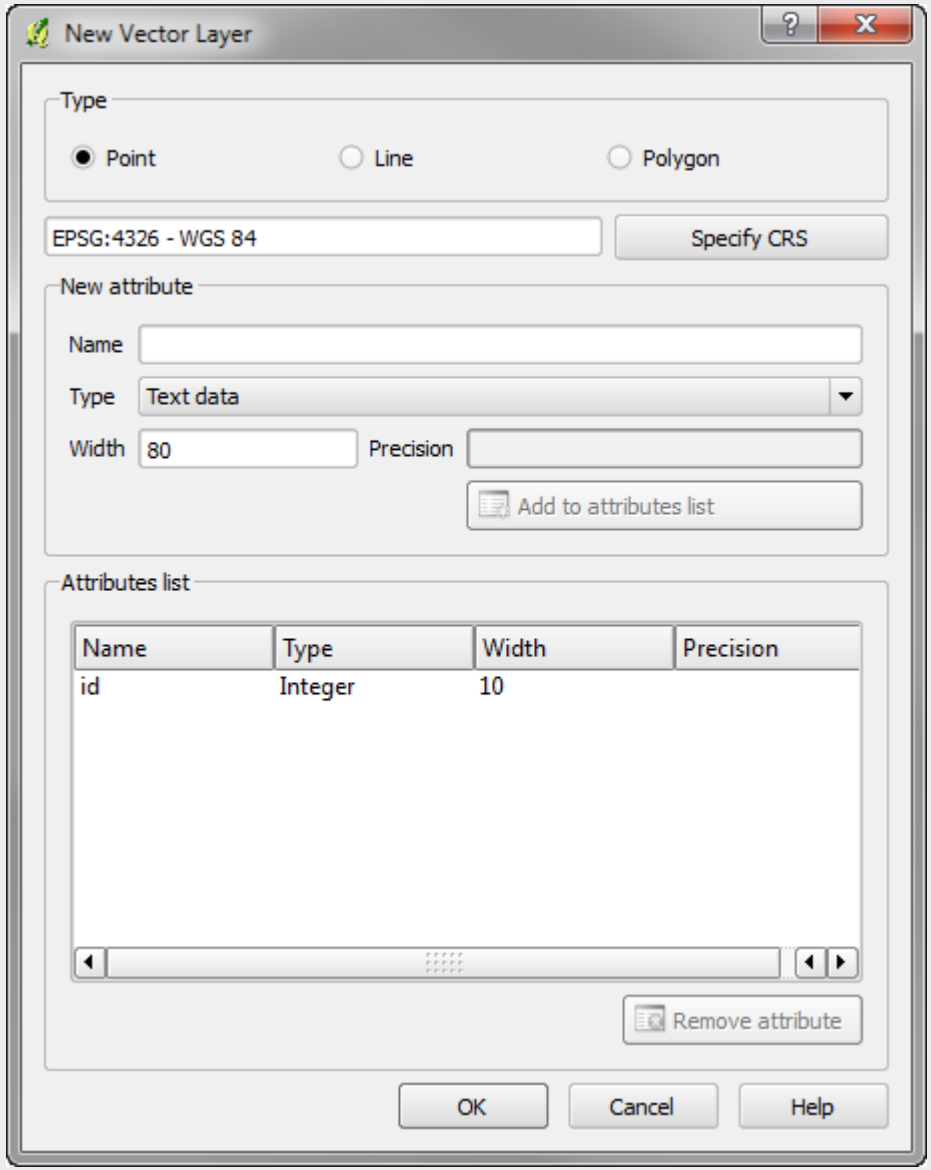
EPSG:4326

- QGIS has 4326 as a Default Projection
  - Which is WGS 84
- It can be changed



Define the Properties of the Shapefile

- Points, Lines, or Polygons
- Projection (Coordinate Reference System)
- Attribution
  - Text
  - Whole Number
  - Decimal Number

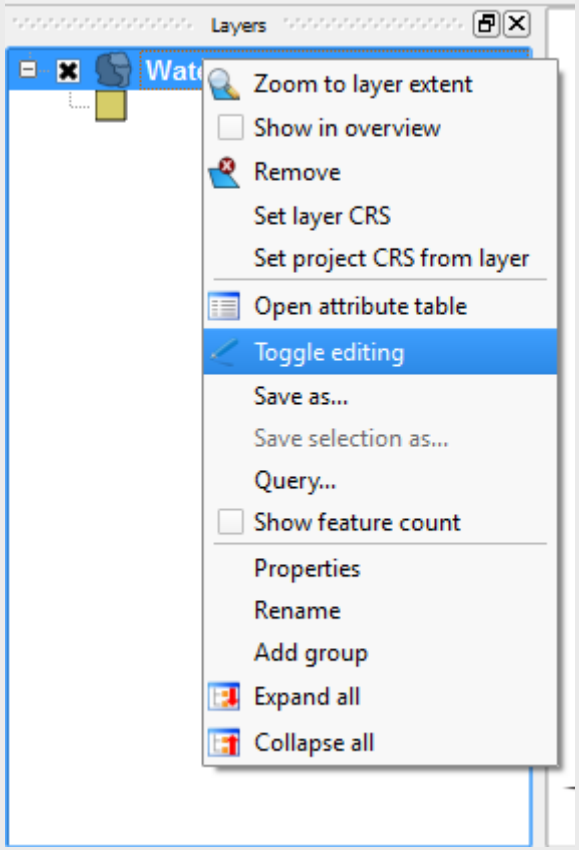


Spatialite

- You can make a spatialite layer
  - Very "similar" to ESRI's Geodatabase Format
  - All files are kept in one file/database
  - Can be accessed from a number of softwares
    - QGIS
    - Python
    - GDAL
    - Mapnik
- Cannot be accessed by ESRI Software.....yet.

Editing Data

- Once data is created or added to the Map View it can be edited two different ways
- Right click on the layer and Toggle Editing
- Go to layer menu and Toggle Editing



Editing Menus

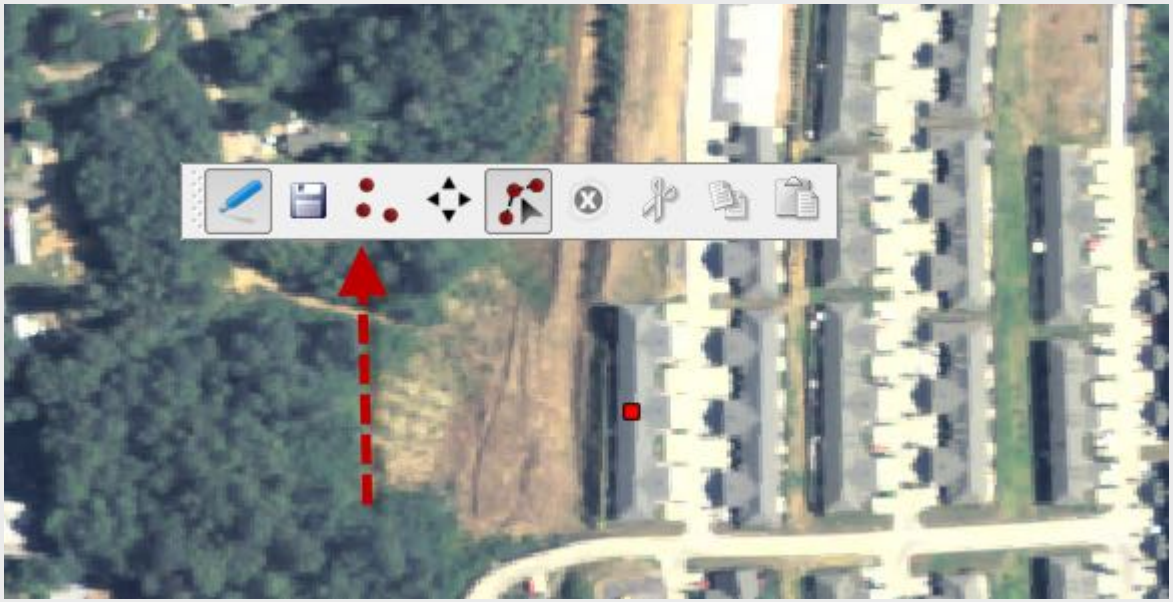
- From Left to Right
  - Toggle Editing
  - Save Edits
  - Capture Feature (in this case polygon)
  - Create and move nodes
  - Delete Feature
  - Cut Feature
  - Copy Feature
  - Past Feature

Advanced Editing

- From left to right
  - Undo
  - Redo
  - Simplify
  - Add ring
  - Add part (multi-feature)
  - Delete Ring
  - Delete Part
  - Reshape Feature
  - Split
  - Merge Features
  - Merge Attributes
  - Rotate Point Symbols

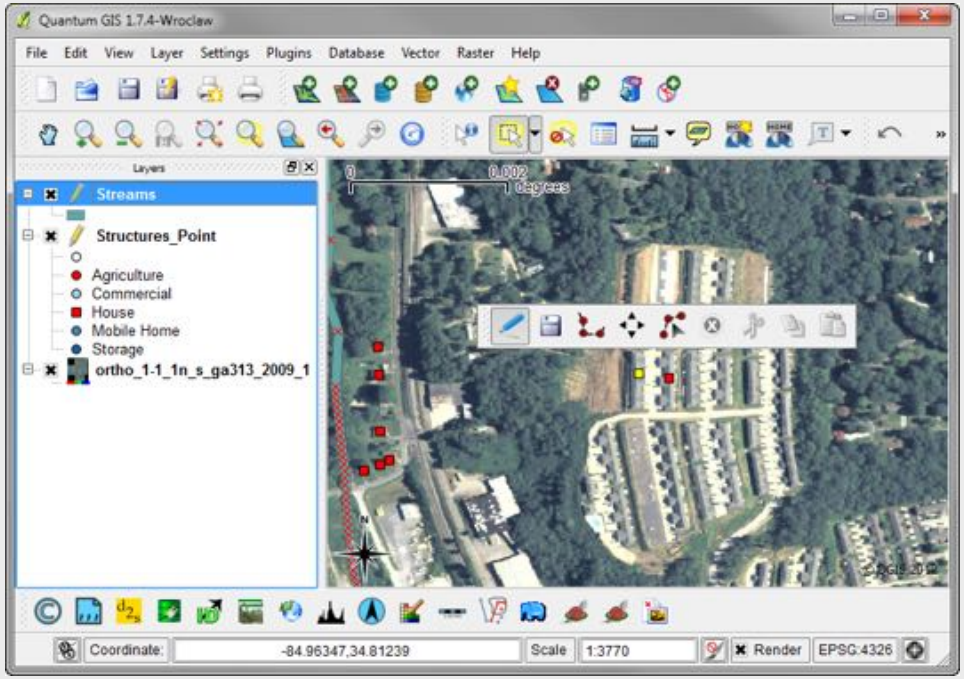
Editing

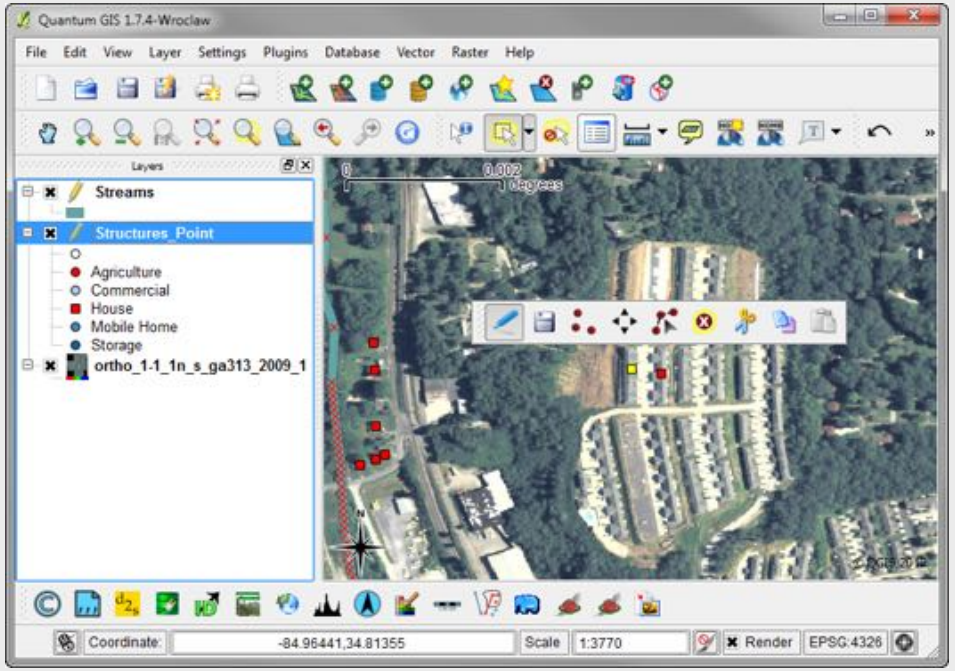
- Note – When you start editing the feature changes on the Editing Toolbar
- Example Editing Points:



Multiple layers can be edited at once

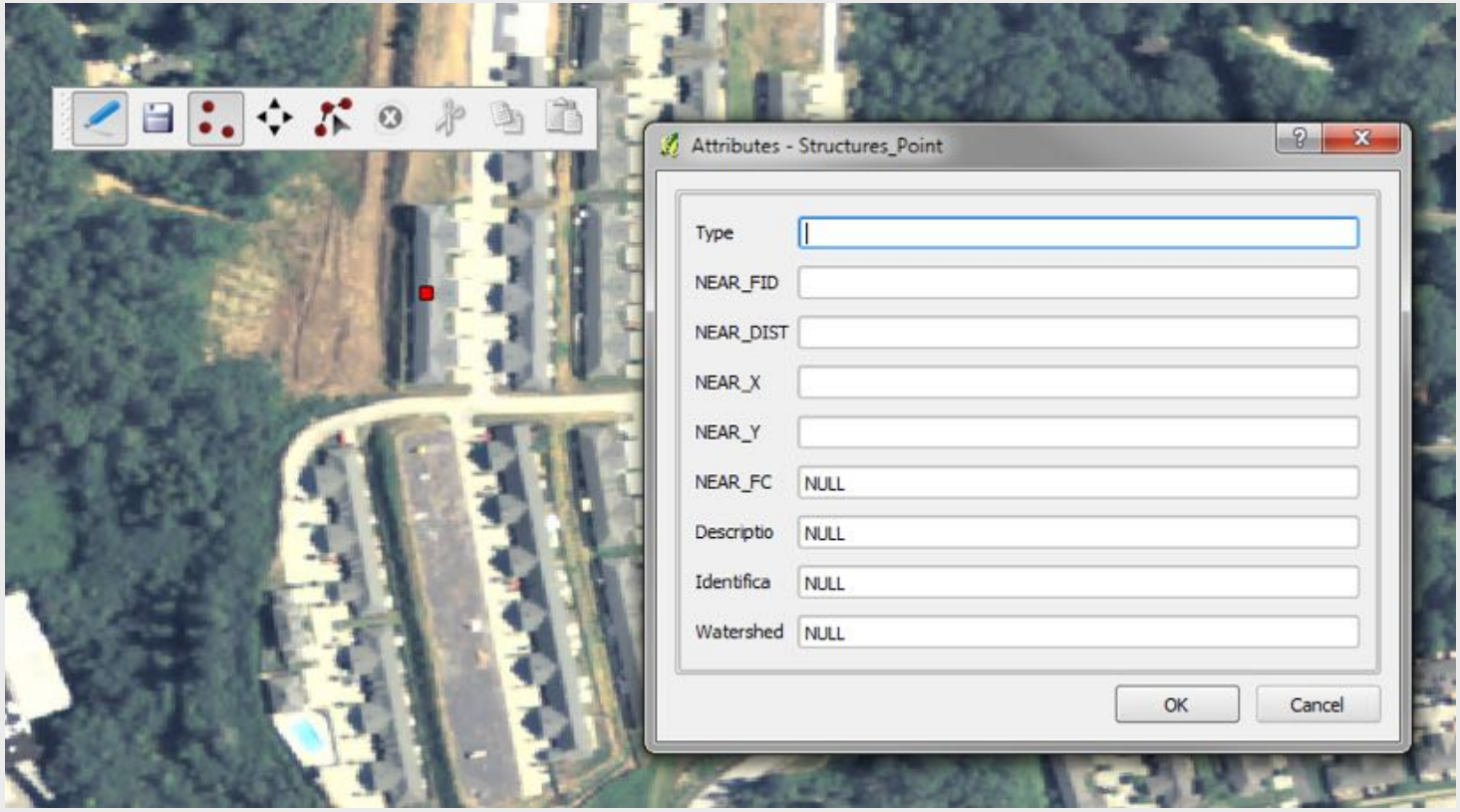
- Example: I need to edit both points and lines
  - Select Dataset
  - Begin Editing





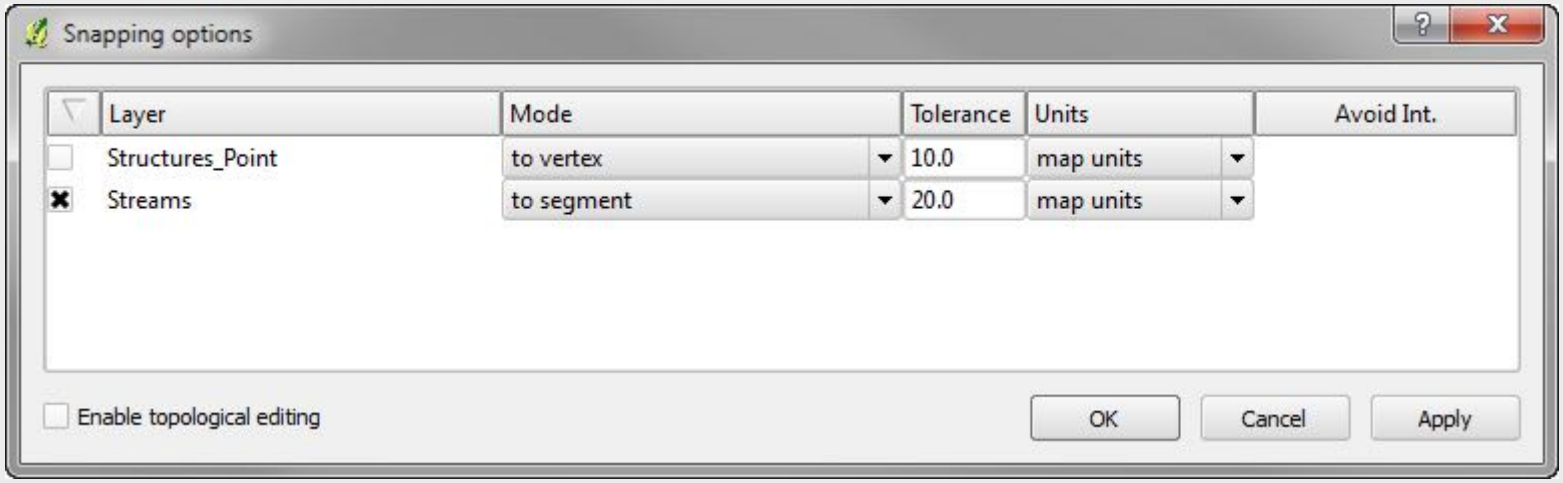
Once a feature is placed: Attribution

- Immediately upon adding a feature you attribute it.



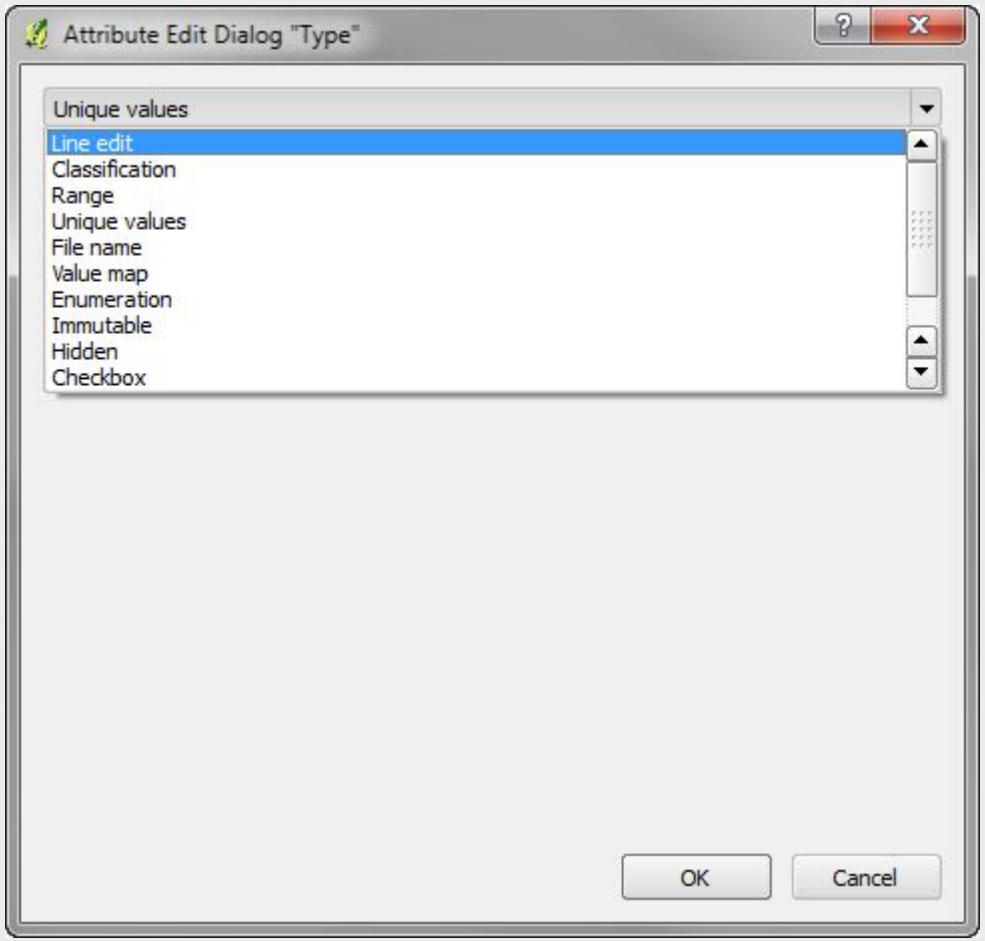
Snapping

- Added features can be snapped to vertex or segment (edge)
- Located under Settings → Snapping Options



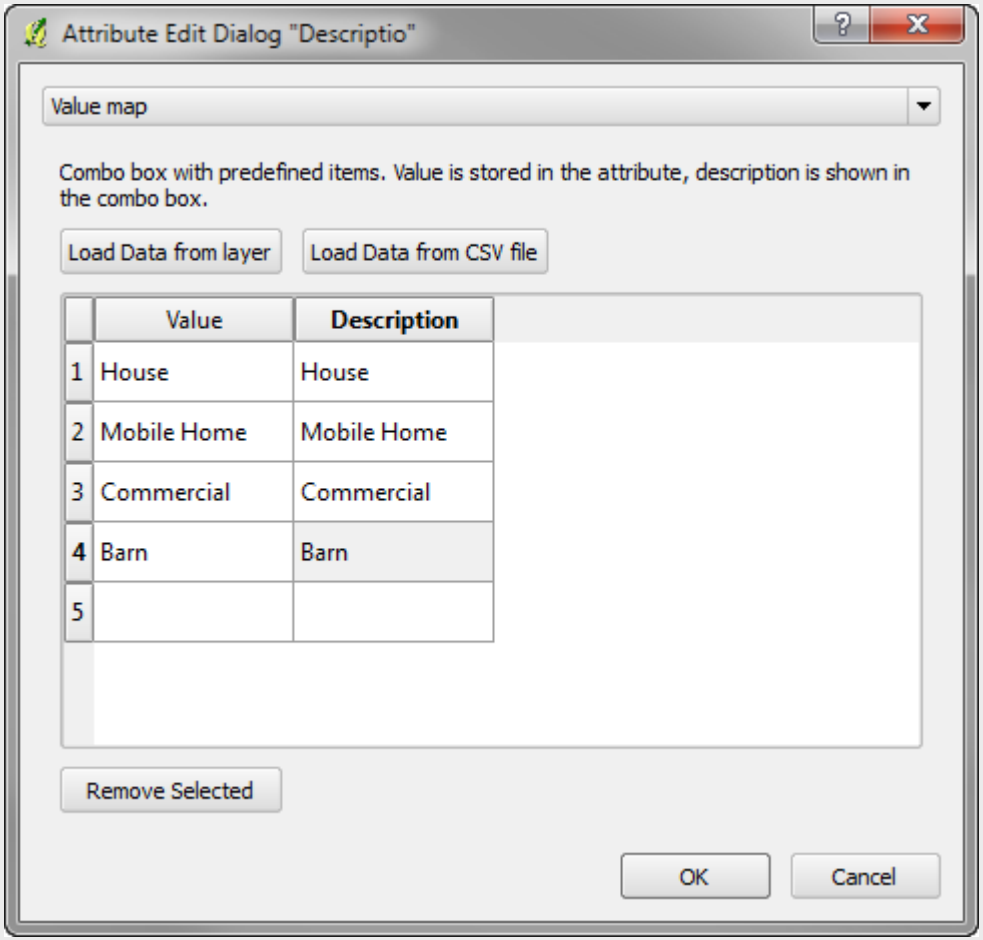
Attribution

- Attribution can be controlled if you have thought out your GIS data input.
- Ranges and Lists can be generated for user input very easily.
  - Known as an edit widget
  - It is found under Layer Properties



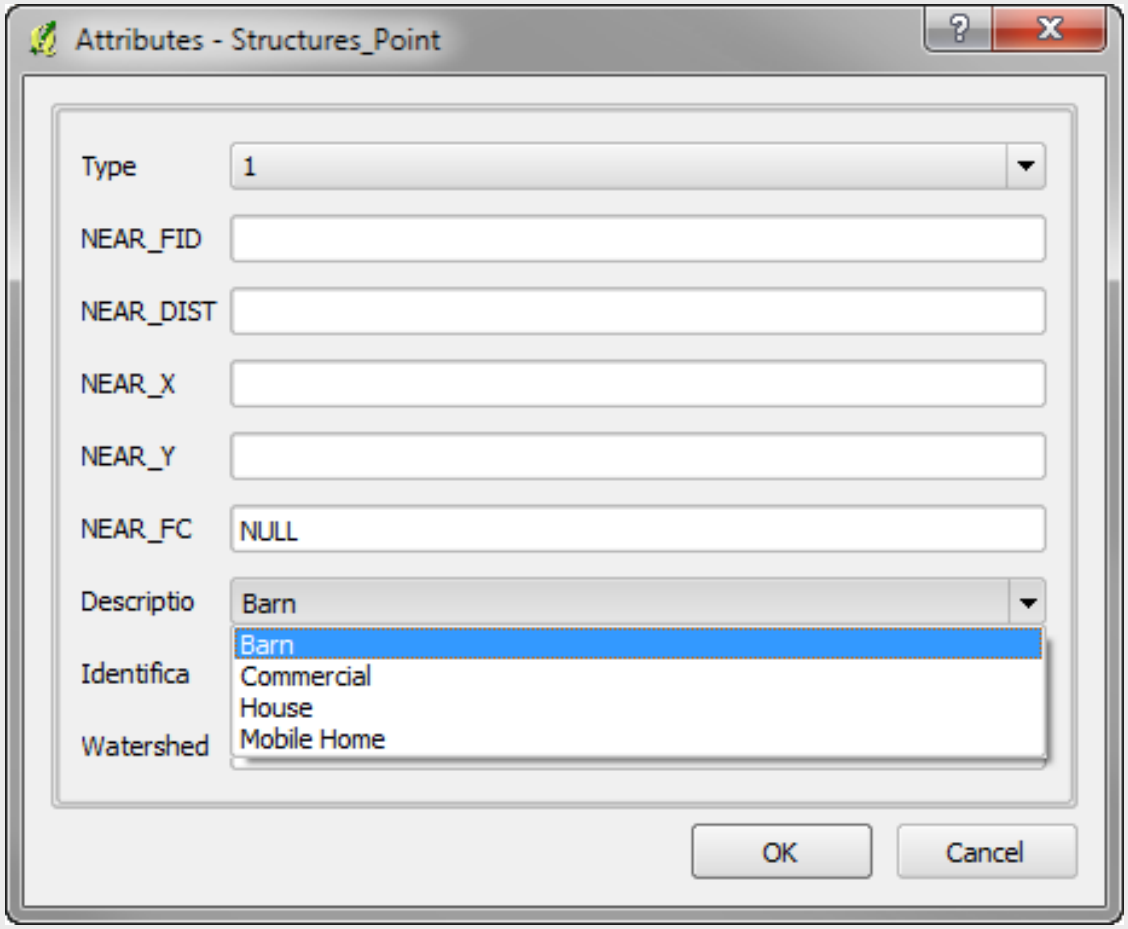
Example

- Value Map for the field “Descriptio”



Once you set a Value Map

- Pick List



Exercises

- Edit data
- Create points and polygons
- Delete Data
- Create an input widget

Exercise 7

Time to start editing. We need to edit some of the vector data to match the raster data.

1. Open exercise 7-.qgs under the Editing directory. Now – when the .qgs project is opened something fun might happen. If the project hasn't been set up with relative path names you might have to reset the project.

2. A utility company has added a storage pond. The digital data doesn't reflect that storage pond. There are three streams that don't belong and at least two ponds. So you need to delete the two ponds that fall within the storage pond and add the storage pond.

3. Right click NHDWaterbody and Toggle Editing.

4. Using your Select Single feature Tool select the pond that falls withing the storage facility and delete it. There are at least two ways to delete this feature. What are they?

5. Delete the second pond that appears on the north east side of the Storage Pond. Delete the stream segments that touch the storage pond.

6. Using the add features icon add the storage pond.

7. Once you finish tracing the pond right click your mouse. You will be prompted to fill in the attributes. Don't worry about filling anything out. Save your edits.

8. Click "Toggle Editing" to stop editing.

9. Save and close Exercise7-1

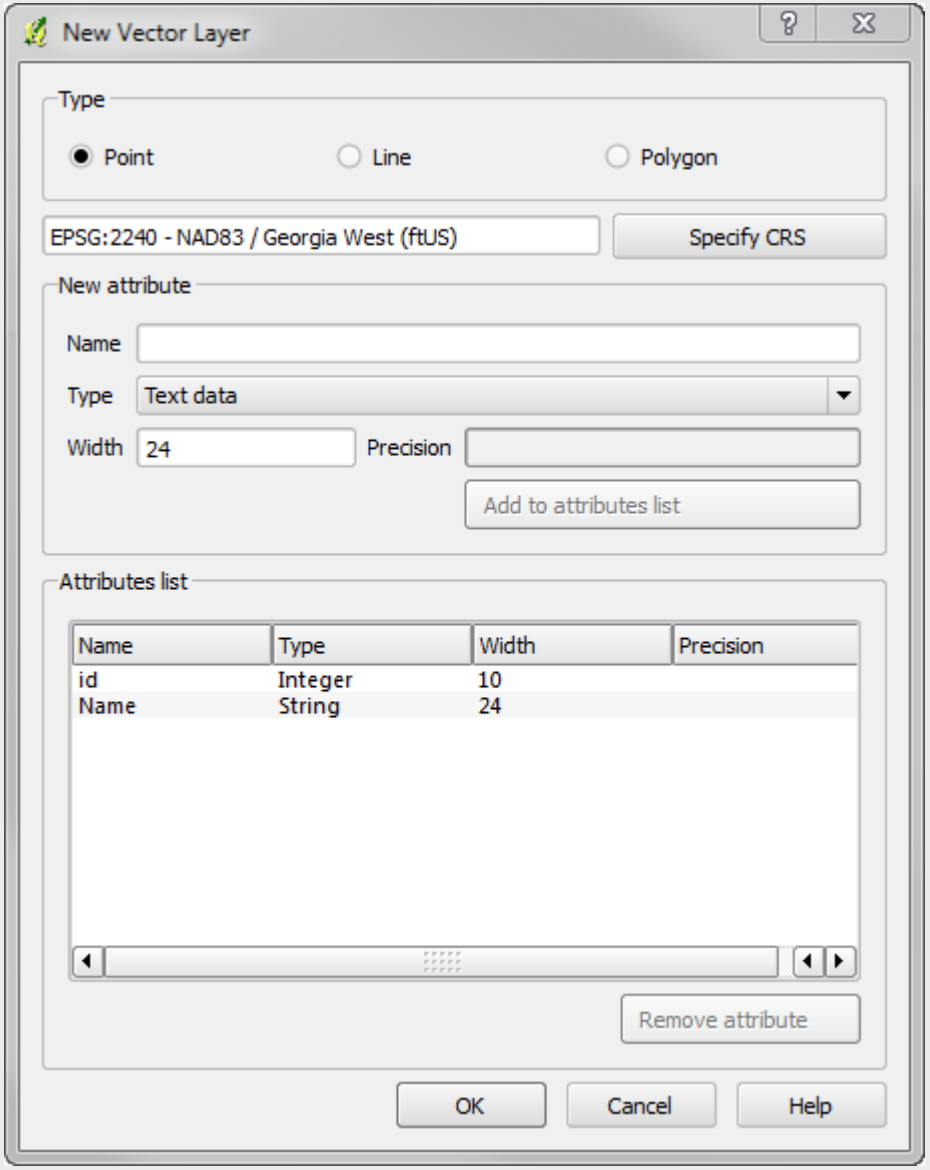
10. Open Exercise7-2.

11. You need to identify houses in this study area. The study area shown to the right is missing. You can create a new study area of interpret from the image. There is a problem with fecal coliform contamination in the streams. There will be 5 types of structures present in the watershed:

- Houses
- Commercial
- Barns
- Agricultural
- Mobile Homes

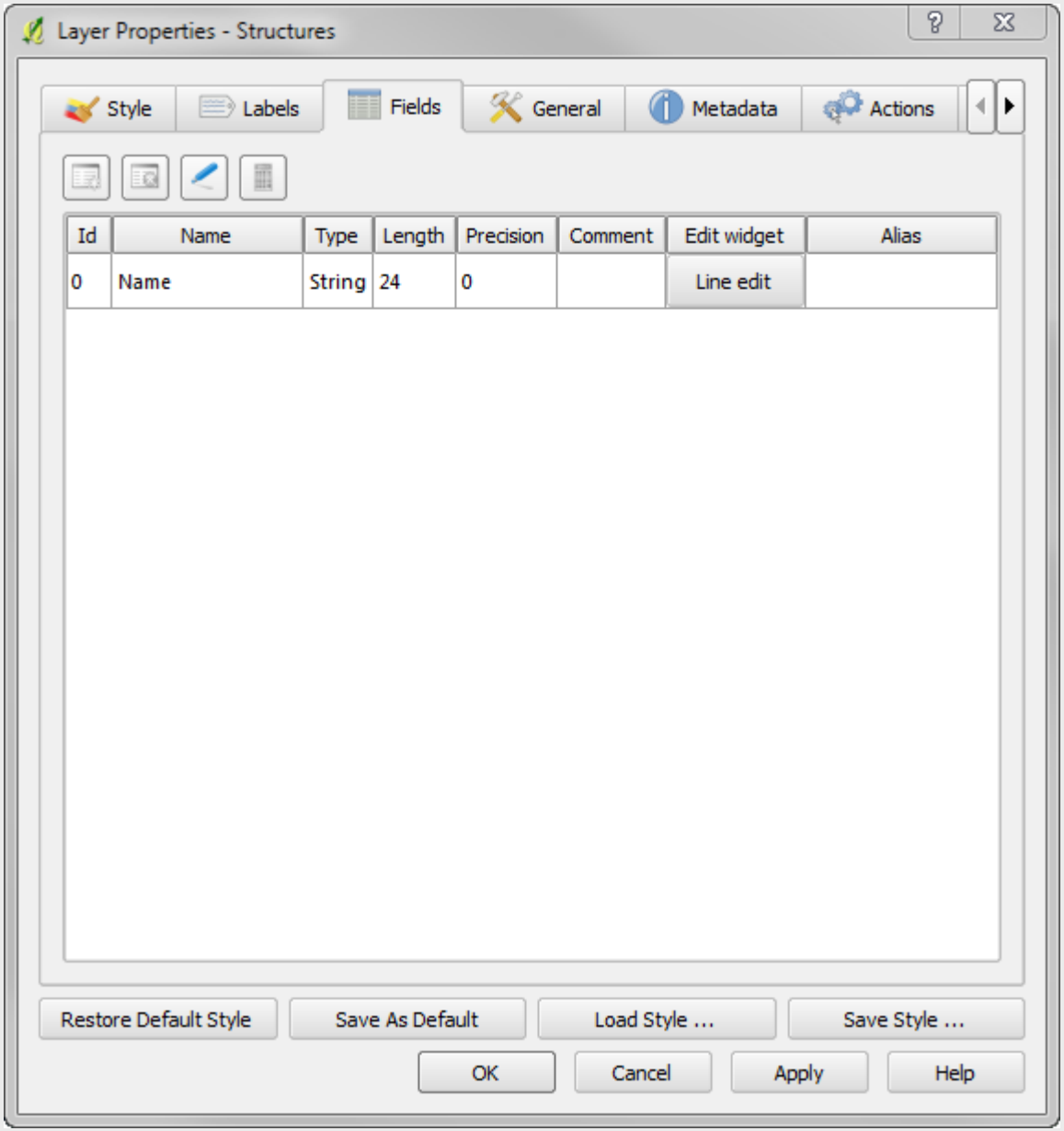
12. You need to create a shapefile to store points. Each structure in this area will get one point as close to the center of the structure as you can.

13. Click on the layer menu and create a new shapefile. Specify the CRS to be Georgia West - NAD83 (ftUS). Add one text attribute called "Name" and make it text with a width of 24. Save the file and call it structures_point.shp in your data directory.



14. Toggle Editing "on" for the structures Shapefile. Start adding points. Notice that after each point is added it prompts you to fill out the attributes. Be sure to label each point as a House, Agriculture, Mobile Home, Commercial, or Barn. Put in about 15 or 20 points. Save. Stop Editing

15. Right click the structures_point.shp and open the properties. Click on the fields tab.



16. Click the Line edit Button under Edit Widget. This give you the ability to add dropdown lists. Select "Value Map" and add 5 attributes:

- Home
- Mobile Home
- Commercial
- Agriculture
- Barns

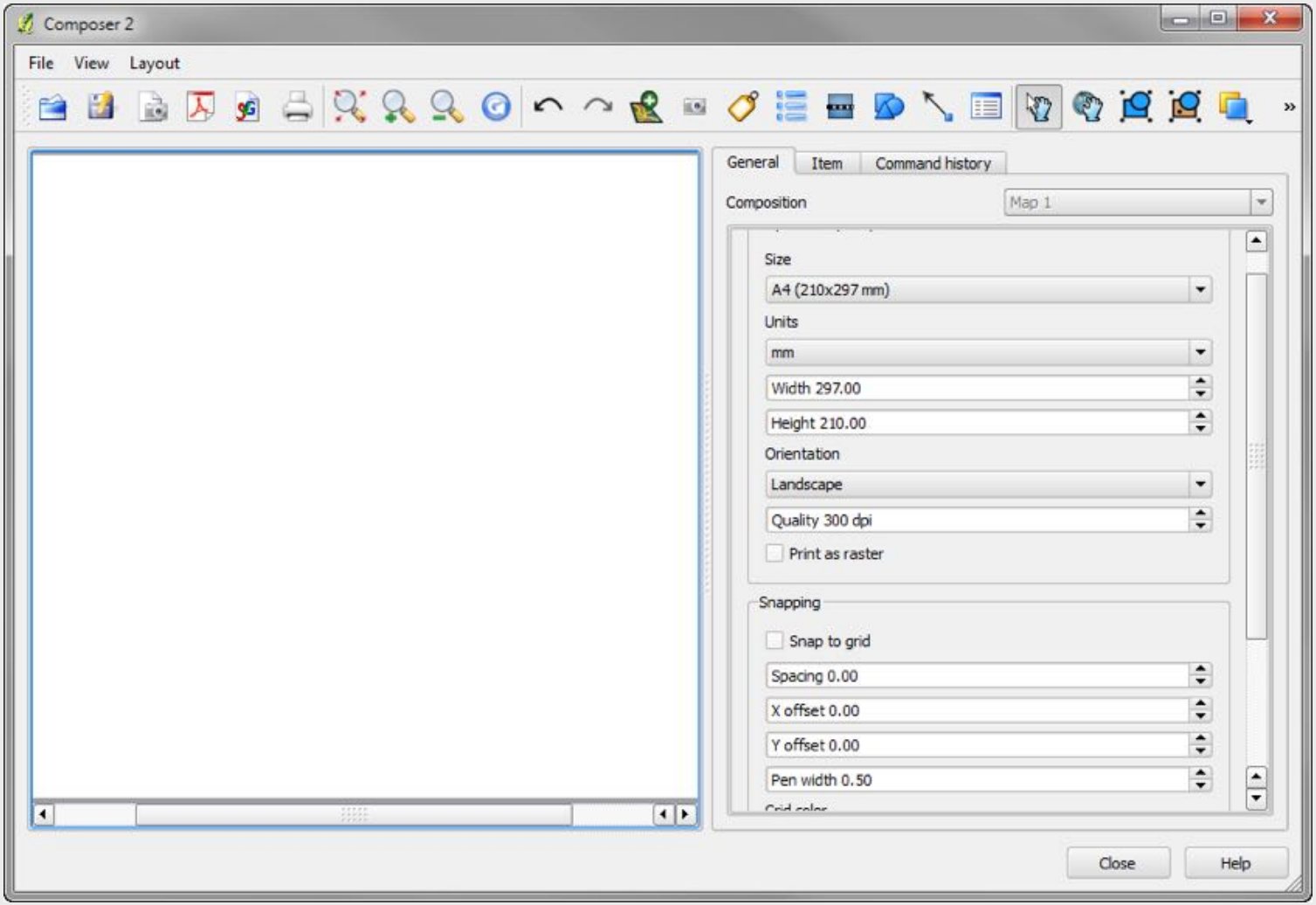
17. Edit the structures shapefile and start putting a point on top of the structures. Notice the drop down list

8. Map Layout

- The Map view can be exported with Map Composer.
  - Composer Manager
    - Multiple Map compositions can be stored.
- Map compositions can be exported to several different file formats
  - PDF
  - JPG
  - TIFF

New Composition

- File → New Print Composer



Map Composer

- Map Compositions can be saved (as a Template)
- Templates can be applied to new Map Compositions
- Compositions can have legend, Pictures, Scale bar.

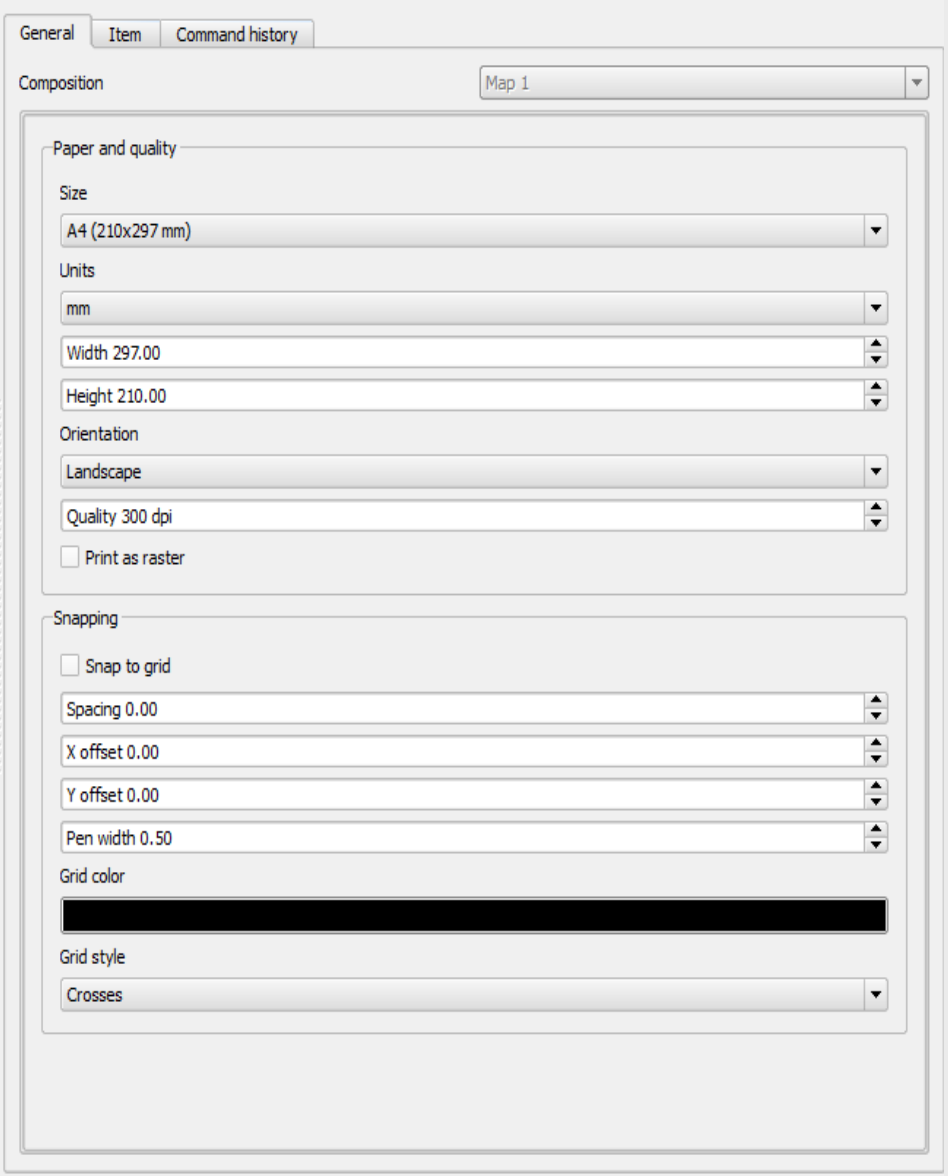
Toolbar for Map Composer

- From left to right

- Open
- Save
- Export to image
- Export to PDF
- Export to SVG
- Print
- Refresh
- Undo
- Redo
- Add map
- Add image
- Add label
- Add Scale
- Add Shape
- Add Arrow
- Move Item
- Move Content
- Group Items
- Ungroup Items
- Raise Selected Items
- Add legend
- Align Selected Items

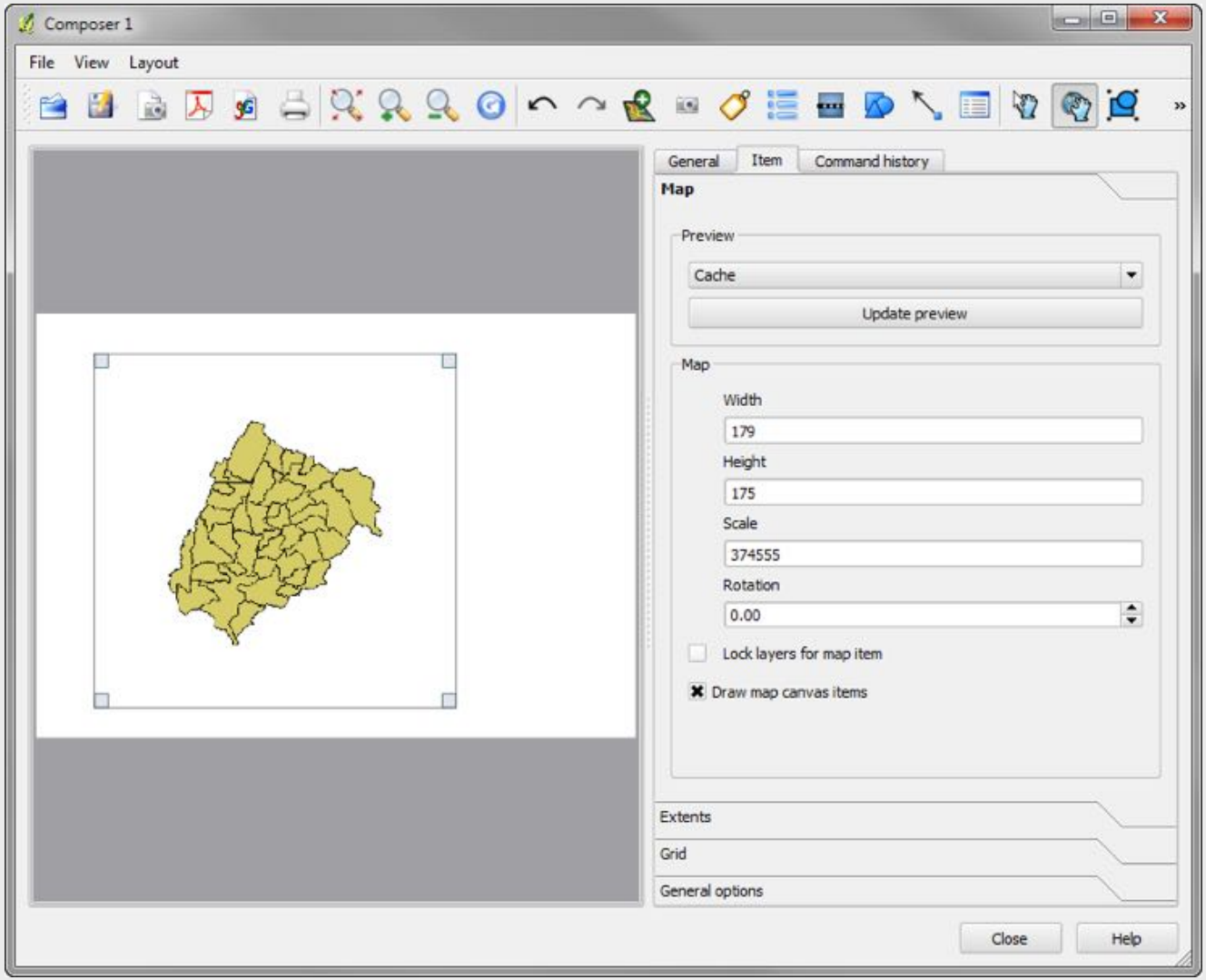
Page Size

- Page options can be set
  - Standard Sizes
  - Custom Sizes
  - Resolution
  - Landscape/Portrait
  - Grid for drawing features



Adding Map Element

- Scale
- Draw Extents
- Rotation



Map Elements

- Can be added to your map
  - Pictures: logos or camera shots
  - North Arrow (needs to be custom)
  - Legend (can be customized
- There is an undo button and redo button so you can back up.

Legend

- Can be customized
- Items can be removed
  - Imagery
  - Base maps that do not need a legend
  - Text can be added next to layer symbology

Export and Print

- Can be exported as Image, PDF, SVG
- Can then be imported into another program
  - GIMP
  - Adobe Photoshop or Adobe Illustrator
  - InkScape

Exercises

- Group Exercise
- Make a map
- Explore Print Composer

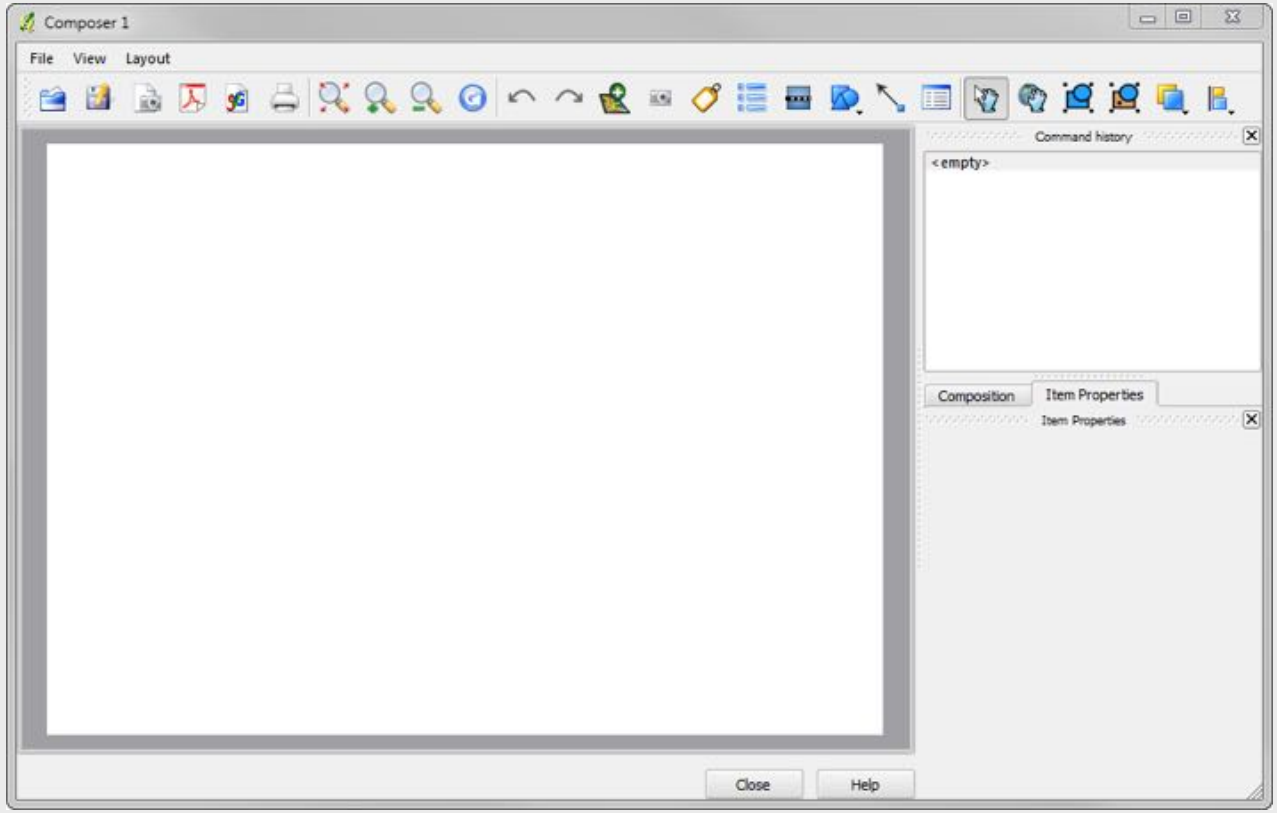
Exercise Ch 8

....and you're almost done. Time for the fun stuff. You need to make a map. There will be no screenshots of a map. This one is all up to you.

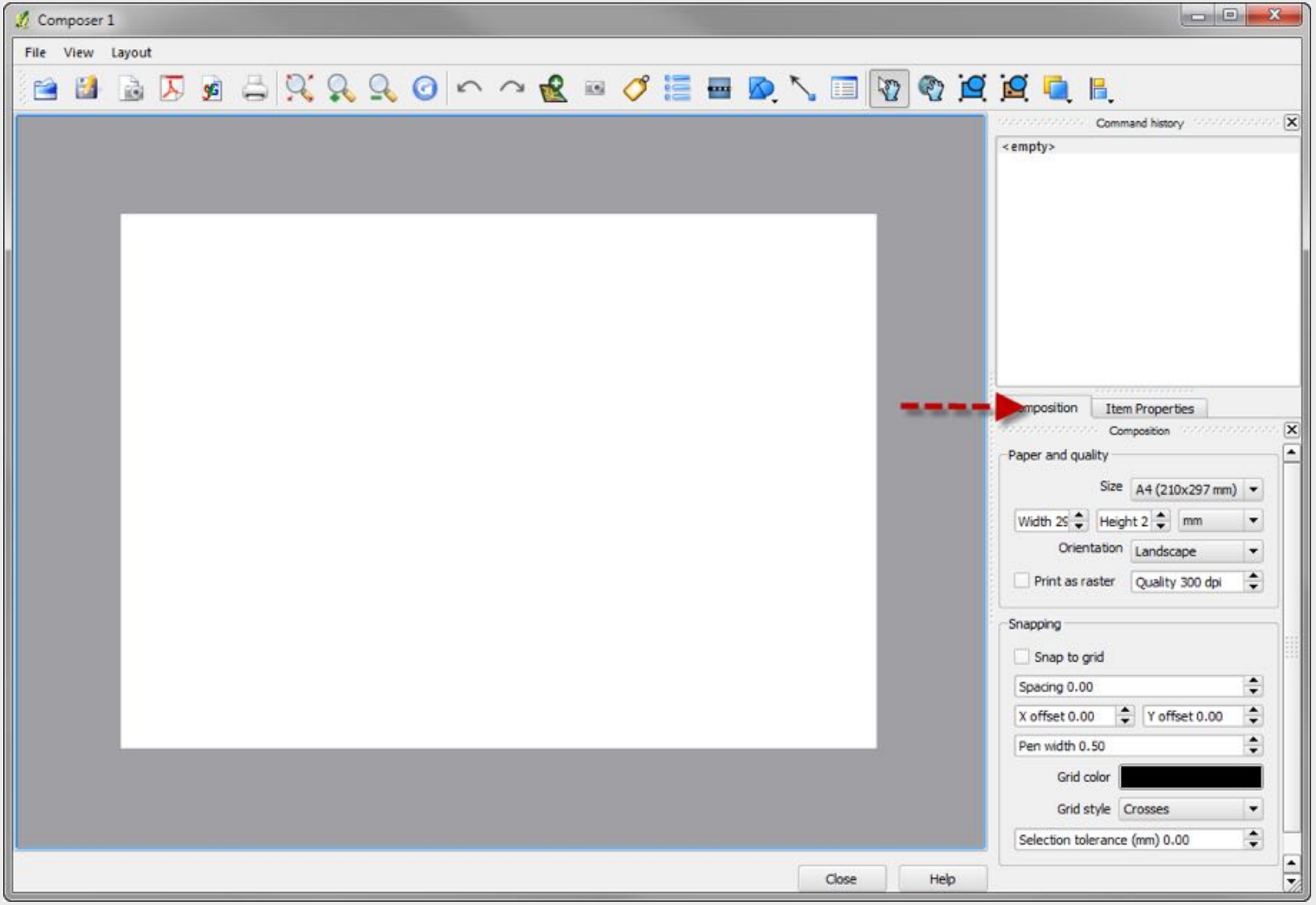
1. Open QGIS.

2. Add the following shapefiles: Watershed Streams, NHDArea, and NHDWaterbody.

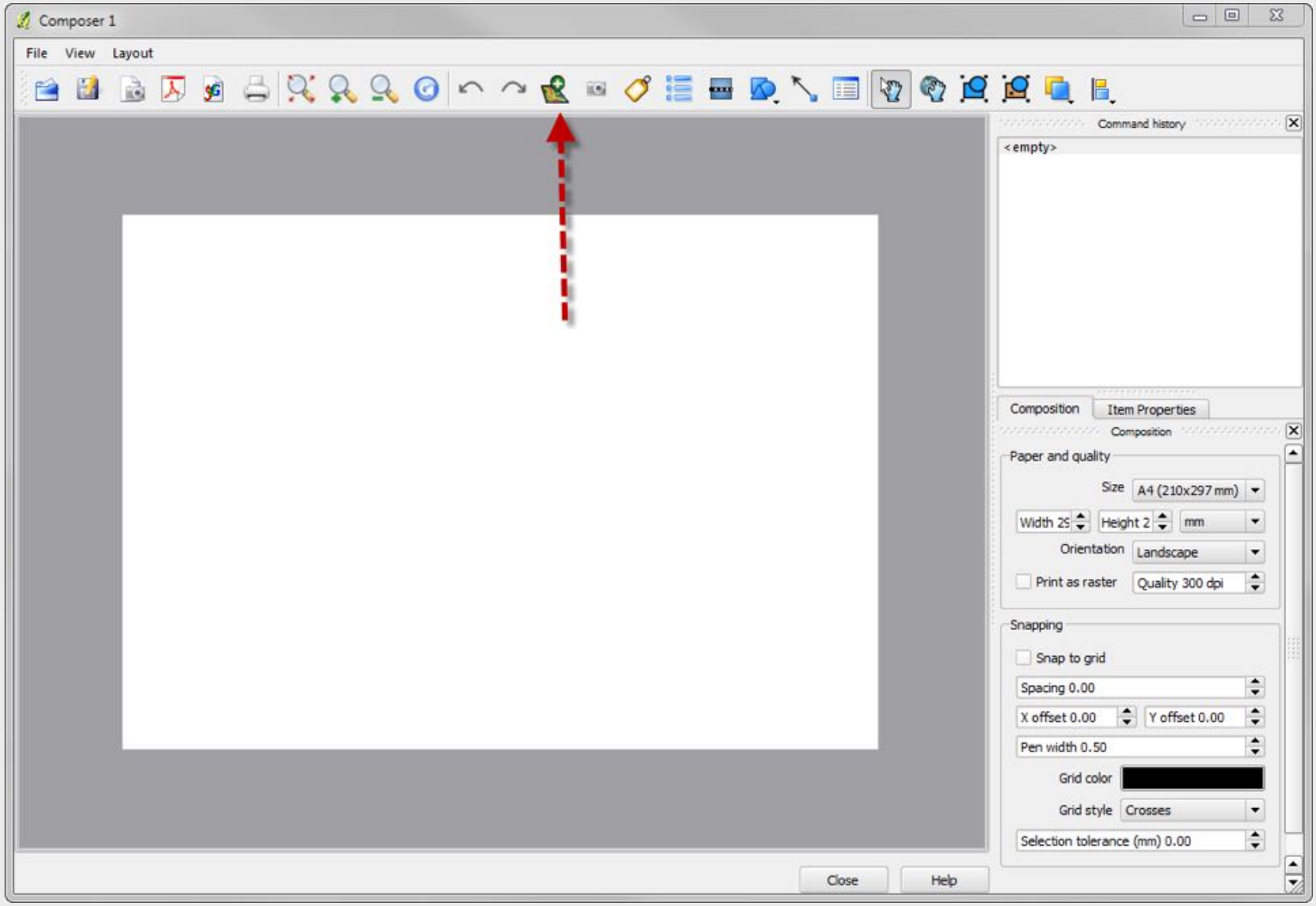
3. Go to the File Menu and click on New Print Composer.



4. Set the Page size for your Map.



5. Click the Add a new map icon and add a new map by dragging a box on your page.



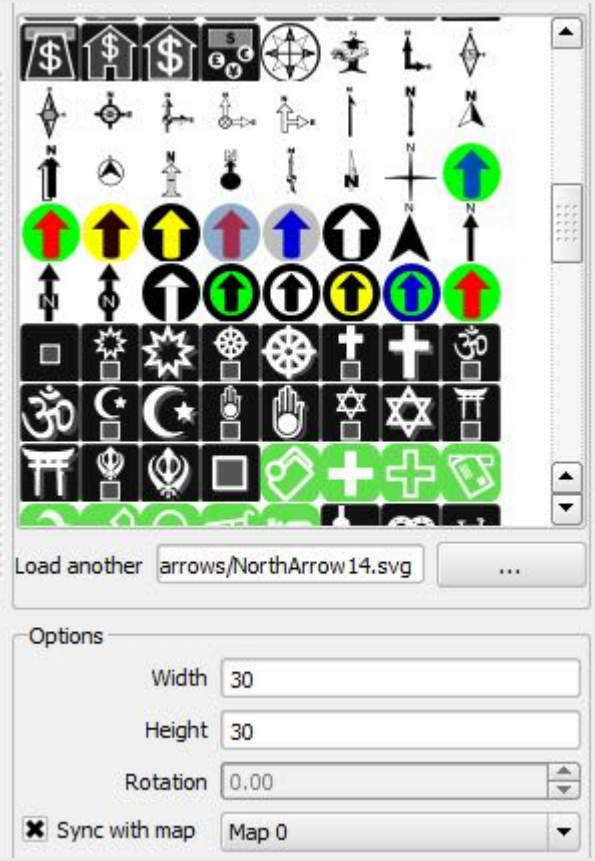
6. Once it has been added click on Item Properties and set a Map Scale and adjust the width and height of your new map item.

7. Add a legend by clicking the legend icon and clicking on your page. Notice how you can customize the Legend by looking at the item properties.

8. Notice you can group, ungroup, and align certain items. You can also add labels.

9. Click on File in the upper left hand corner and look at your export options.

10. Add an image and look at the pre-loaded images. You can add a North Arrow and Sync that with the map. When you sync the North Arrow it will turn if the map turns.



Conclusion

- It is possible to use Freely available GIS Tools to complete small or big projects
  - It's an active community – Join in
  - http://www.qgis.org
  - User Manual - http://qgis.org/en/documentation/manuals.html
  - Wiki - http://qgis.org/en/community.html

Contributors

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