

### 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?

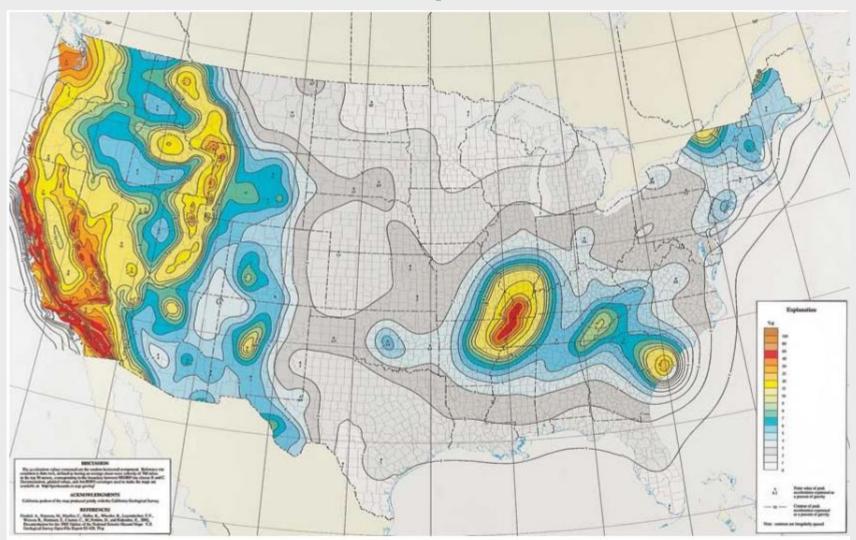


## GIS

- Easily measure distances
- Easily measure areas
- Find overlap between features
- Proximity
- Everything is related by location.
   o Tobler's Law



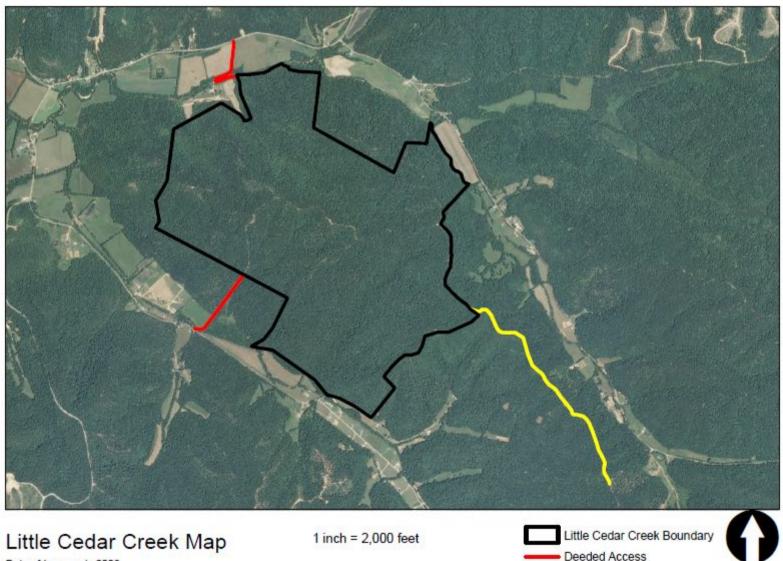
#### **USGS** Earthquake Zones



#### http://earthquake.usgs.gov



#### Simple Maps



Date of Imagery is 2008

Non-Deeded Access



## Outputs from a GIS

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



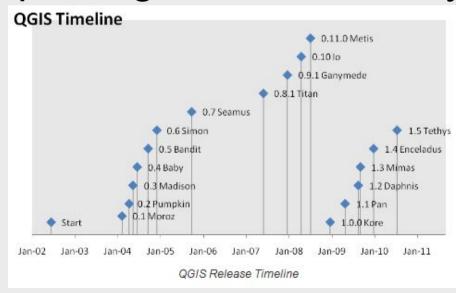
## Common OS Licensing

- 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)





- 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 Tra	inslators Donors
Quantum	GIS (QGIS)
You are using QGIS version 1.7.4-Wrodaw by GDAL/OGR Version PostgreSQL Client Versi SpatiaLite Version: QWT Version: 5. This copy of QGIS writes de This binary was compiled against Qt 4.7.1,and i	:: 1.8.1. ion: 8.3.10. : 2.4.0. .2.1. ebugging output.
Quantum GIS is licensed under the G	NU General Public License
http://www.gnu.org	
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
  - o 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
  - o 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.



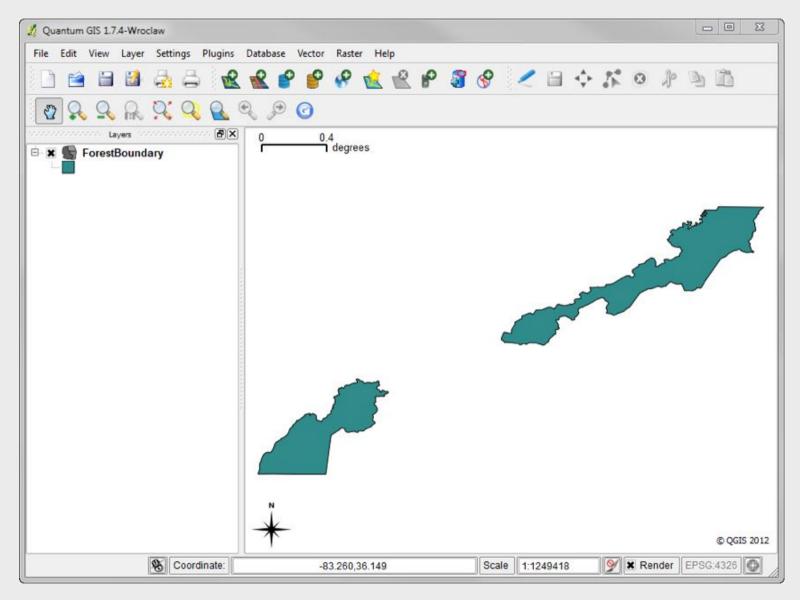
## **OSGEO Installer Cont'**

🗽 OSGeo4W Setup - Express Package Selecti	on 🗖 🗖 🗶
Select Packages	È
<ul> <li>MapServer</li> <li>✓ Quantum GIS</li> <li>✓ GDAL</li> <li>Apache</li> <li>✓ uDig</li> <li>✓ OpenEV</li> <li>✓ GRASS GIS</li> </ul>	
	< Back Next > Cancel

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

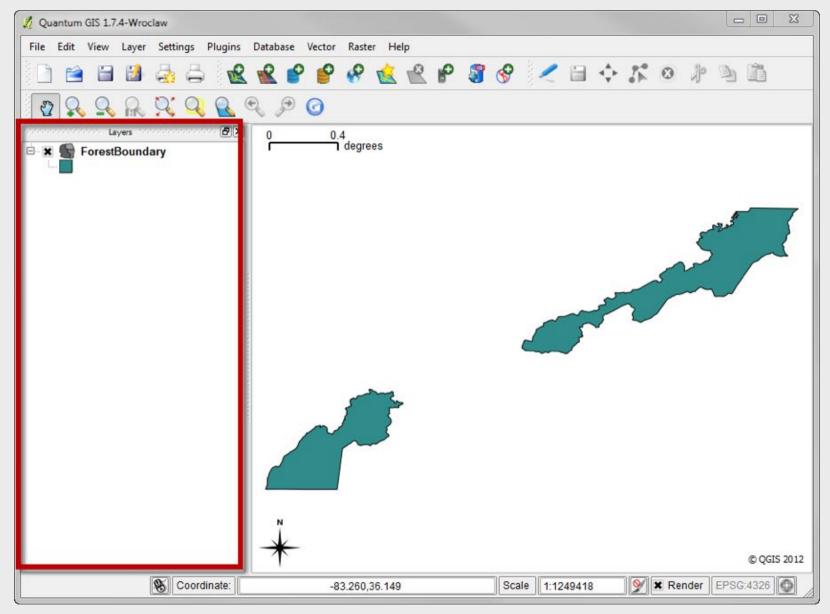


### 3. Quantum GIS Interface



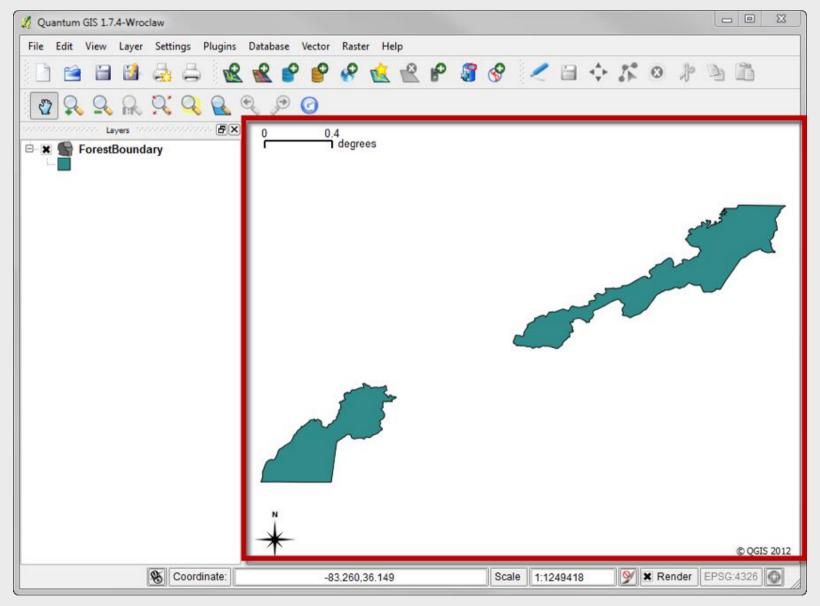


#### Layer Window



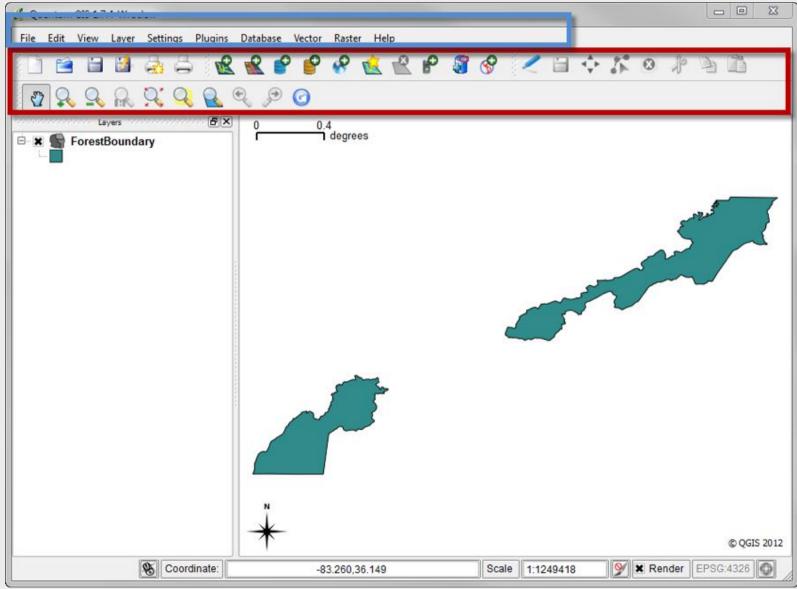


#### Map Canvas



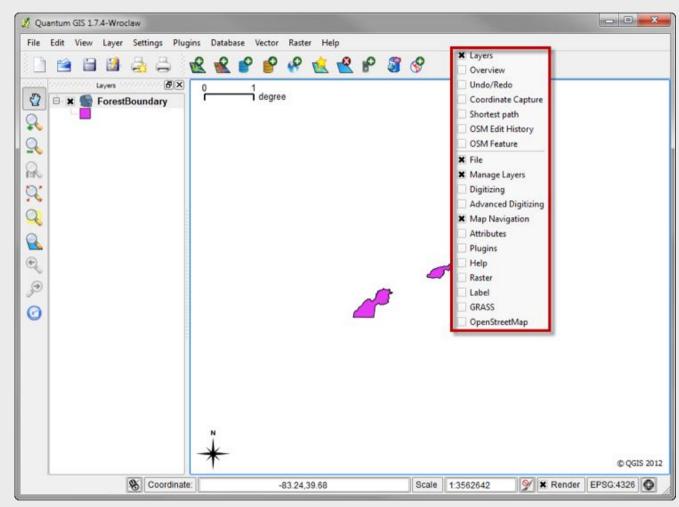


#### Menus and Toolbars





#### **Toolbars and Panels**

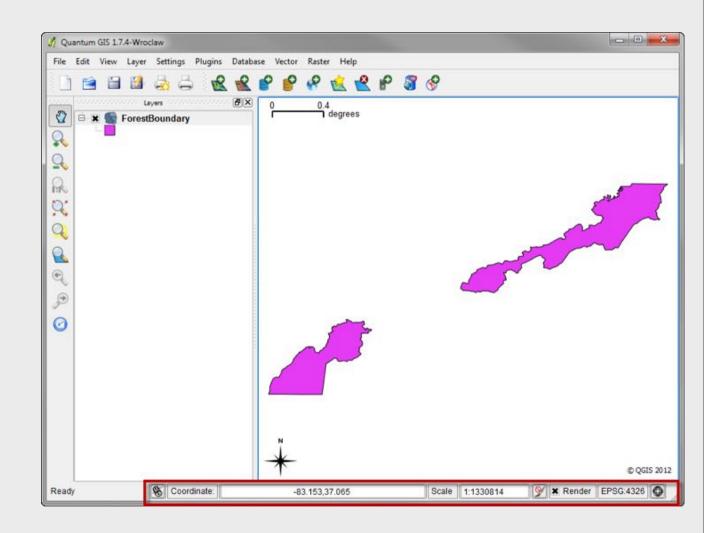


- Right Click in menu Area
- Add Panels
- Add Toolbars.



#### 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

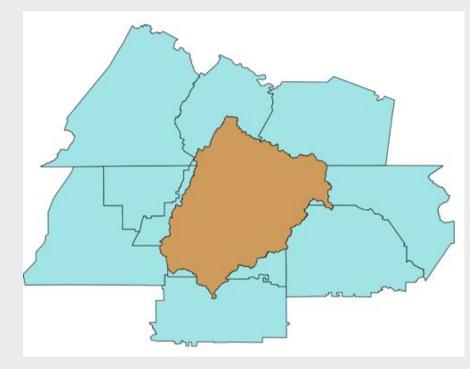
💋 Quantum GIS 1.7.4-Wroclaw	
File       Edit       View       Layer       Settings       Plugins       Database         Image: Setting Pan Map         Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map         Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map         Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map         Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map       Image: Setting Pan Map         Image: Setting Pan Map       Image: Setting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map         Image: Setting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map         Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map         Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map         Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map       Image: Seting Pan Map	Vector Raster Help
Map Tips     New Bookmark Ctrl+B     Show Bookmarks Ctrl+Shift+B     Refresh Ctrl+R     Tile scale slider     Live GPS tracking	
Panels     >       Toolbars     ,       Toggle Full Screen Mode     Ctrl+F       C     Image: Comparison of the second s	Layers         Overview         GPS Information         Undo/Redo         Coordinate Capture         OSM Edit History         OSM Feature
Coordinate:	36.247,36.432 Scale 1:1901292 🖉 🗙 Render EPSG:4326 🥥

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.

-	· · · ·		•
e name:		ESRI Shapefiles [C	)GR] (*.shp *.S 🔻
		Open	Cancel



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

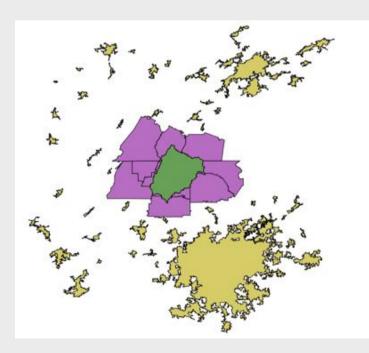
Tennessee

6. Add the 2010 Urban Areas Shapefile.

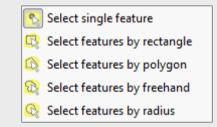
What is the biggest Urban Area within the CountyBoundaries Shapefile?

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!



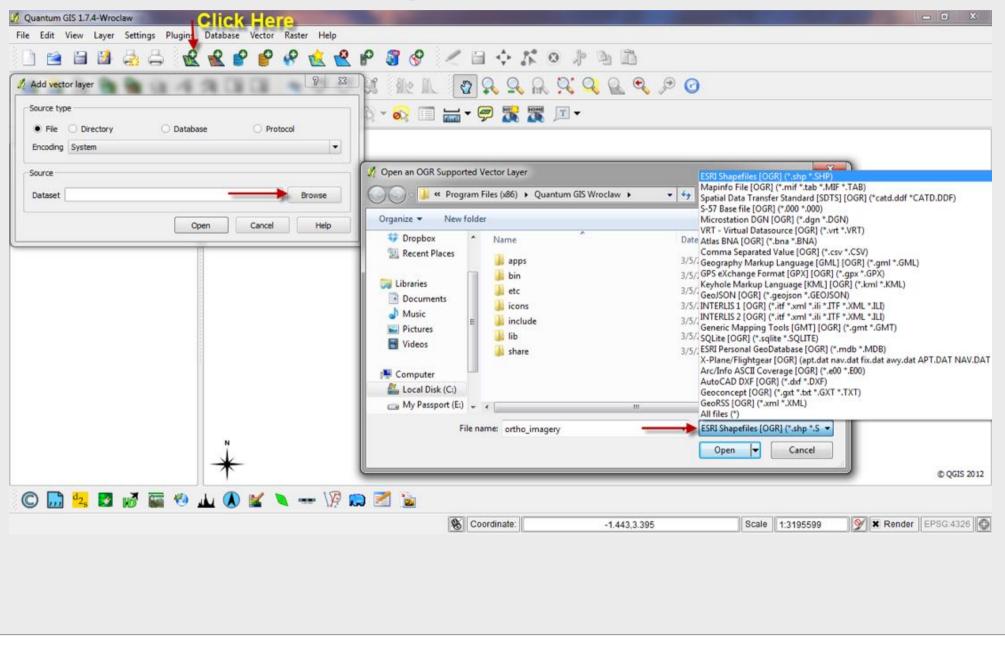


# 3. Adding Vector Data

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

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File Edit View Layer Settings Plugins Database Vector Raster Help	
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🖌 Layer Properties - Watershed	
🖉 😺 Style 📄 Labels 📰 Fields 🕺 General 🍈 Metadata 🐢 Actions	
Symbol levels Old symbology Unit Milimeter  Transparency 50% Color Change	
Advanced * Save as style	ALL TREAMER
Saved styles Style manager	
Restore Default Style         Save As Default         Load Style         Save Style           OK         Cancel         Apply         Help	© QG75 2012
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## Style

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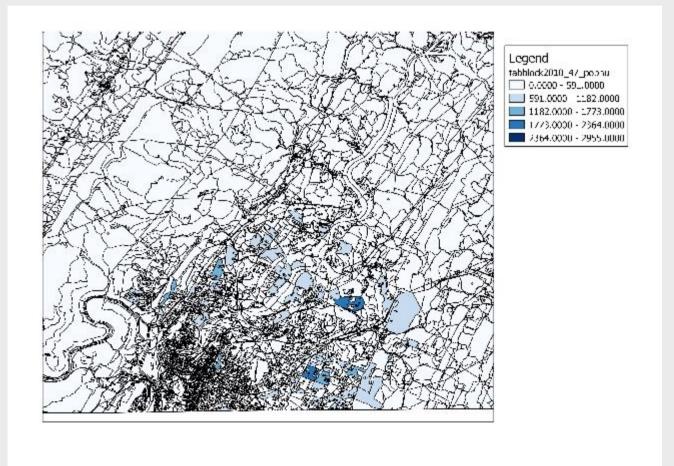
## Styles

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



## Equal Interval

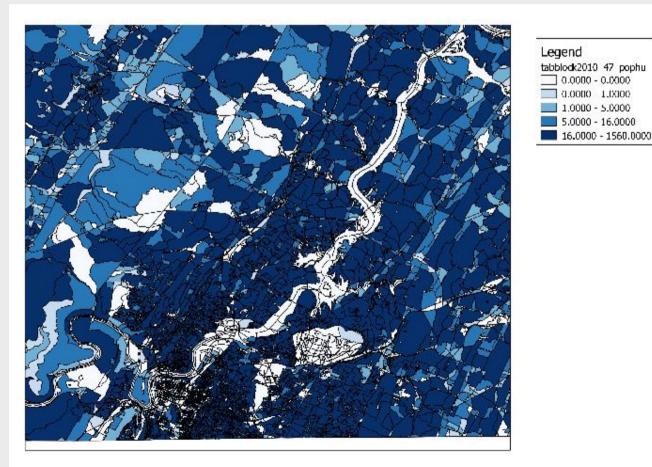
Equal Interval groups values into equal sized ranges.





# Quantile

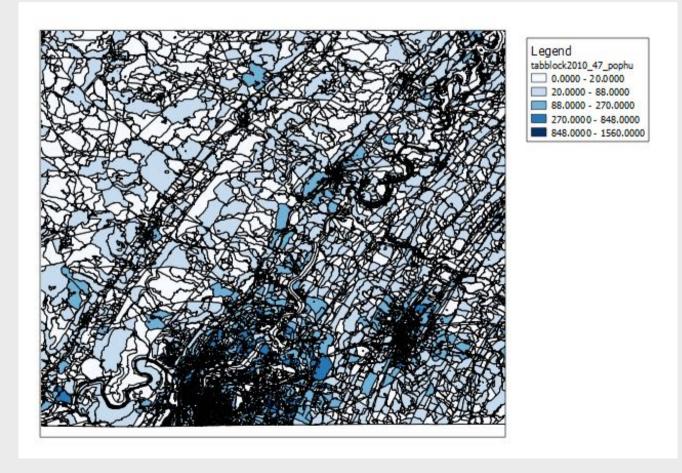
 Each class contains an equal number of features





### Natural Breaks

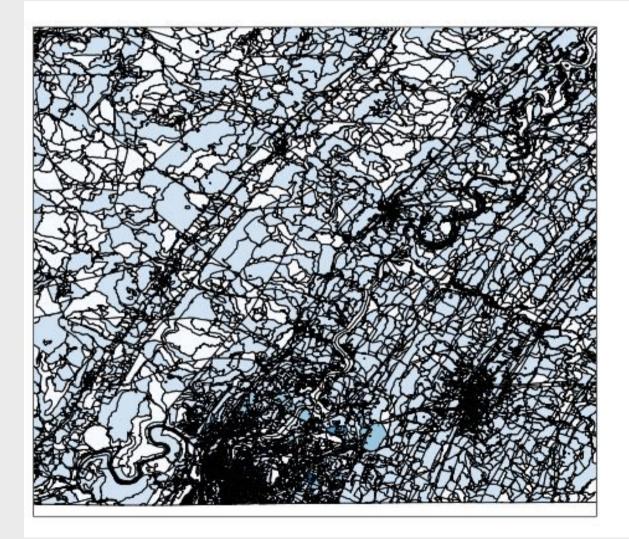
Natural Breaks classes are based on natural groupings of the data.

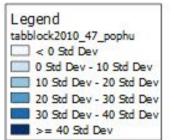




### **Standard Deviation**

Show Variation from the average value

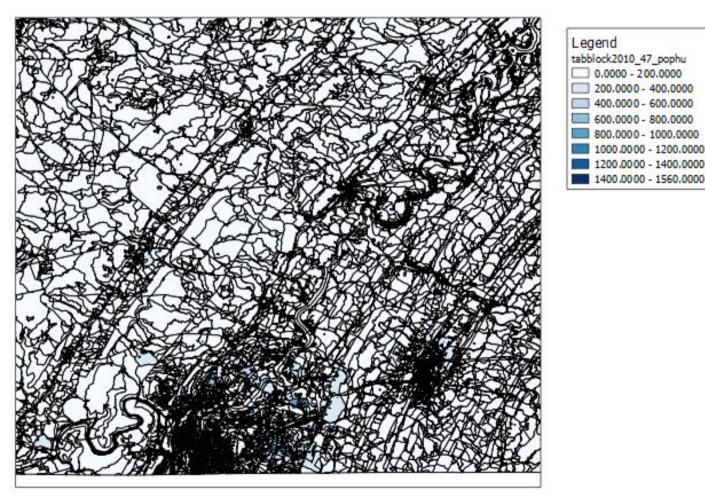






## **Pretty Breaks**

Data symbolized for non-statisticians





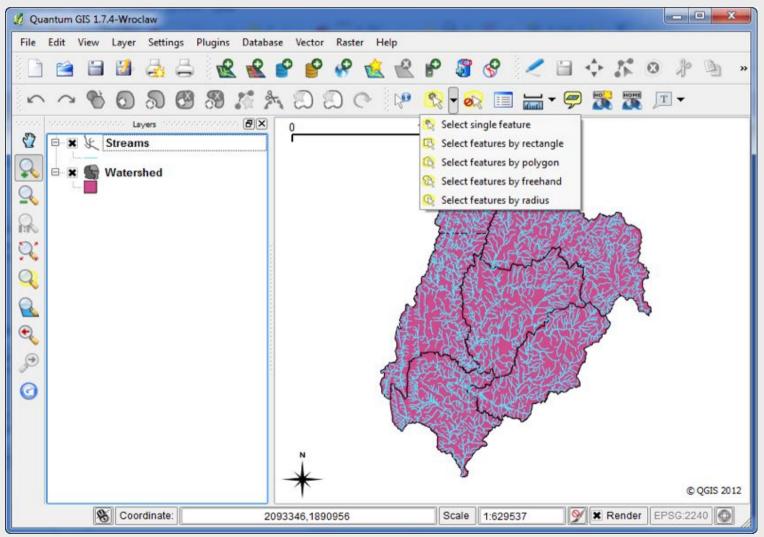
### Labels

💋 Layer Properties - pt_count	ries		-		-			? ×
😻 Style 📄 Labels	Fields 🆇	🔇 General	() Metadata	🐢 Actions	• Joins	🕅 Diagra	ams 🕅 Ov	verlay
X Display labels								
Label Properties Adv	anced							
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 featur	es				
Placement								
O Above Left		O Abov	e	(	O Above Right			
⊖ Left		Over		(	Right			
O Below Left		O Below	l i	(	Below Right			
Use scale depender	nt rendering							
Preview:								
QGIS Rocks!								
Restore Default Style		Save As Defa	ult	Load Styl	e		Save Style	
				ОК	Can	cel	Apply	Help



# Selecting Vector Data

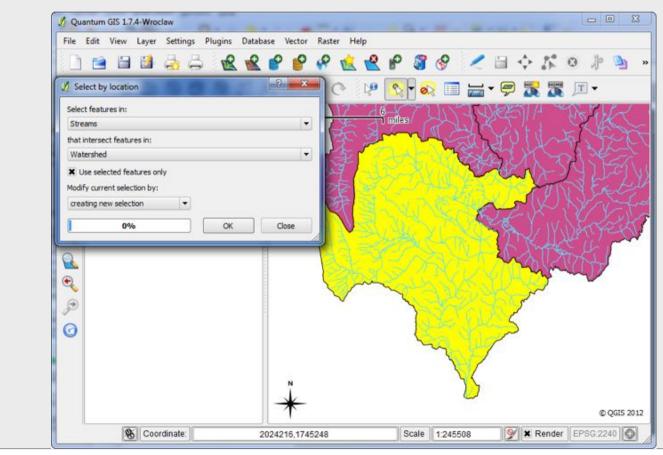
Selections can be manual





# Selecting Vector Data

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





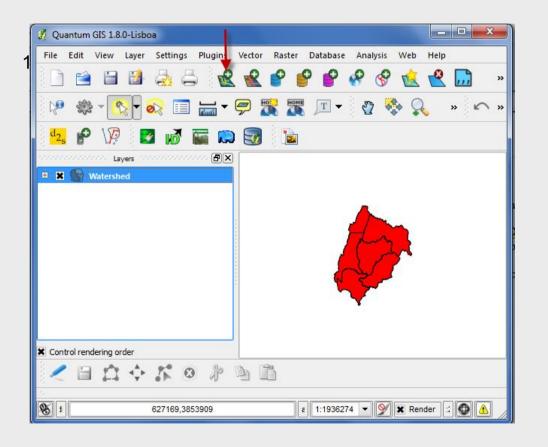
### Exercises

- 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 Koahull-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

🧹 Style ≹ Single S		Fields 🕺	General 👔	Metadata	Actions	1	Diac +	orange.
C Ch	Unit Transp Color ange	varency 0%	Milmeter	Change	Advanced 🝷	🕀 Save (	is style	
Saved styl	es					Style mar	vager	s
								4

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

🧹 Style ≹ Single S		Fields 🕺	General 👔	Metadata	Actions	1	Diac +	orange.
C Ch	Unit Transp Color ange	varency 0%	Milmeter	Change	Advanced 🝷	🕀 Save (	is style	
Saved styl	es					Style mar	vager	s
								4

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.

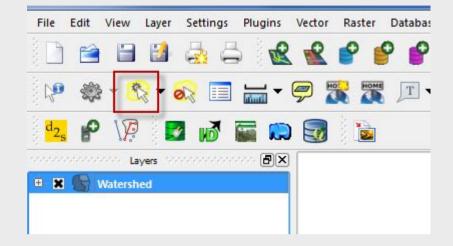
🥰 Style 📃 📃	Labels Fields	兴 General	Metadata	Actions	┥ Joins 🛛 🕅 Diaç
Single Symbol	Unit Transparency 0% Color	Milm	eter		Old symbolog
Saved styles				Advanced	Save as style     Style manager

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.

	Source	HUC_10	HU_10_Name	Shape_Leng	Shape_Area			
Î	0	0315010101	Upper Conasau	500196.57964	5059578668.74			
ſ	0	0315010102	Middle Conasa	388861.214038	3992366617.46			
ľ	0	0315010103	South Coahulla	443974.325594	3330066287.77			
t	0	0315010104	Holly Creek	356921.038104	3244574459.98			
T	0	0315010105	Lower Coahulla	385553.500904	3039983393.61			
	0	0315010103	North Coahulla	206794.522924	1601203654.98			
						in Cour		Court
		I Q 🗞			ok for	in Sou	rce 💌	Search



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

Name Comment	Acres
T	Decimal number (real)
туре	double
Type Width	en e

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

X     Create a new field       Output field name	Update existing field Source
Function List	Selected Function Help
Search	
Conversions String Geometry Geometry Fields and Values Operators	
= + · / * ^ II	
= + · / * ^ II	



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

💋 Field calculator	? 🗙
Only update selected features  Create a new field Output field name Output field type Whole number (integer)  Acre Output field width 10  Precision 0  V	date existing field
Function List	Selected Function Help
Search Geometry Sarea Sarea Slength Sperimeter	Oops! QGIS can't find help for this function.     The help file for \$area was not found.     If you would like to create it, contact the QGIS development team.
Operators = + - / * ^    ( ) Expression	
\$area /43560	
Output preview: 116151.943726718	OK Cancel Help



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.

Column Acres	5					Old symbolo
Symbol		change	Color rar	np Bl	Jes	-
Symbol	Value	Label				

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  $\rightarrow$  Analysis Tools  $\rightarrow$  Basic Statistics.



# 4. Adding Raster Data

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



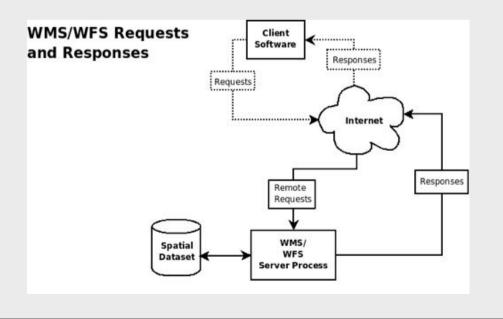
# Geospatial Data Abstraction Library

- Approximately 128 Formats supported
   http://www.gdal.org
- Many command line tools
  - o Convert
  - Reproject
  - $\circ$  Warp
  - o 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





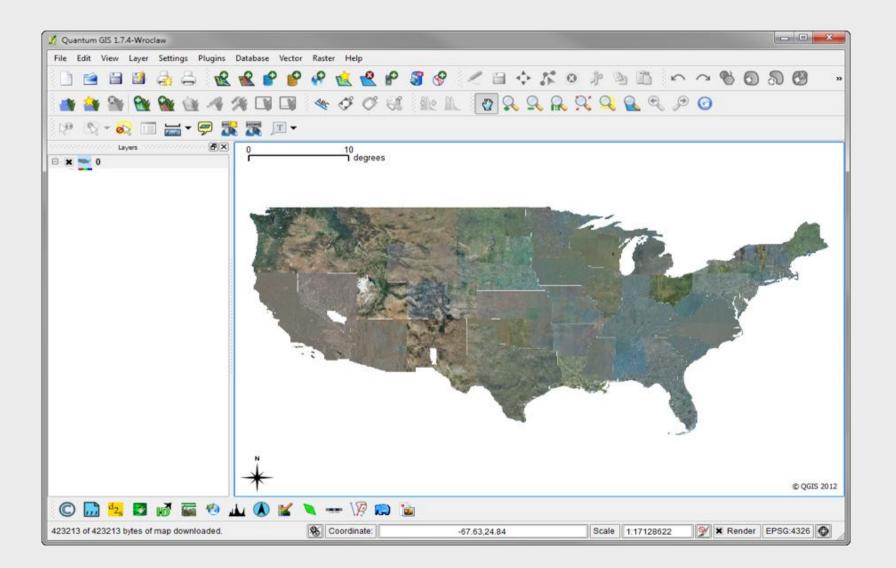
#### WMS Example

http://raster.nationalmap.gov/ArcGIS/services/DRG/ TNM\_Digital\_Raster\_Graphics/MapServer/WMSServer? request=GetCapabilities&service=WMS

Connect	New	Edit De	ete	Load	Save	Add default serve
ID	Name	Title	Abstract			
		🔏 Create a	new WMS connection			2 <mark>- X</mark>
Image encoding		Name URL If the se	USDA NAIP e.cr.usgs.gov/ArcGIS/servi			
Options Layer name			7.0			



### WMS Example





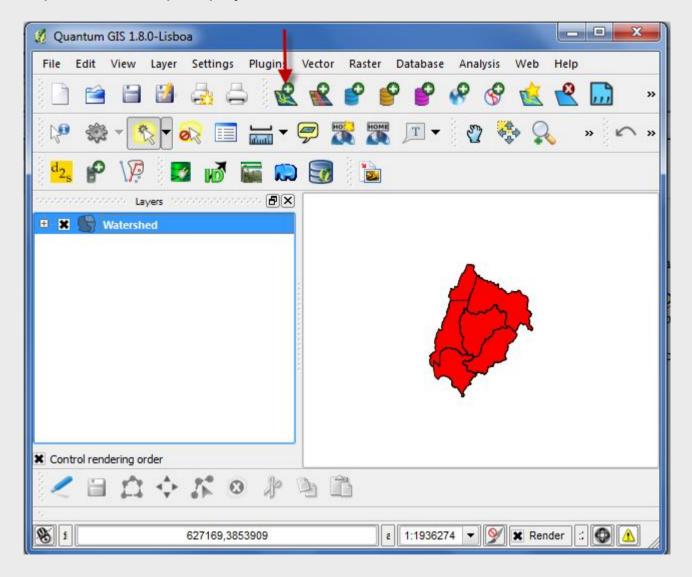
### Exercises

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



#### Exercise Chapter 4

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





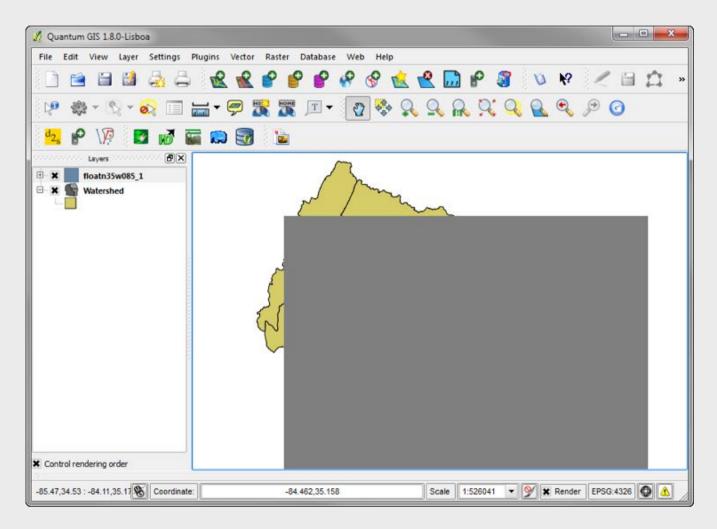
- 2. Add the tif image of Whitfield County to the display. The image name is whitfield\_naip\_tiled\_2009.tif
- 3. Right Click the image layer and select rename. Name it "Whitfield County 2009". Note that it added to top of your layer window. Last thing added gets placed on top of the layers.
- 4. Right click the Whitfield County 2009 layer and go to properties. Set the transparency at 40%.

ayer Properties - Whitfield County 20	09		8 23	
🧹 Style 🛛 🕅 Colormap 🕅 🎦 1	ransparency 🥂 General	Metadata 🖉 P	yramids 🔣 Histogram	
Global transparency	]	No data value		
None 40%	Full	-32768	0	
Custom transparency options		9. 	•	5. Set the Transparency back to 0%
Transparent pixel list				6. Look to the right and set the "No data
Red		Green	Blue Percent Transparent	value" to 0. Click OK.
1 -32768.00	-32768.00		-32768.00 100.00	
				7. What was the result?
Restore Default Style	Save As Default	Load Style	Save Style	
		OK Car		



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 Strates

to Min Max.

	Colormap	Transparency	🔀 General	Metadata	Pyramids	Histogram	
	Grayatan						
⊖ Use st	m min / max values tandard deviation im Maximum values a	re estimates, user defir	ed, or calculated	from the current ex	1997 - 19	Max 1269.33	
	max values from bar ite (faster) (slower)	nd					
O Currer						Load	
	nhancement Stretch To MinMax	• -					
	lo Stretch						

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.



🔏 Quantum GIS 1.8.0-Lisboa		
File Edit View Layer Settings F	lugins Vector Raster Database Web Help	
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Layers		
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7 7	B Raster ⊕ (Derived)	SHE 52 3
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		ACT AND A
	Close Help	
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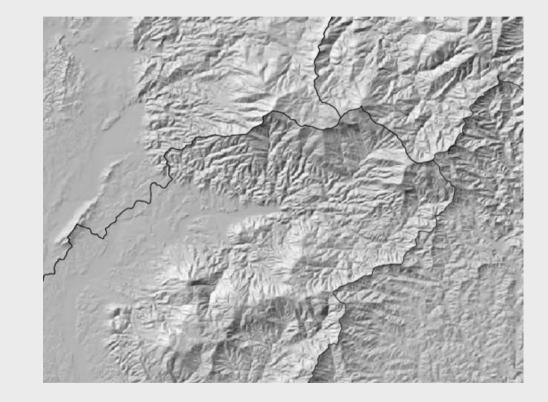
10. Go to the Raster Menu at the top of QGIS. Click on Analysis and then DEM (terrain Models). There is one thing we will need to change before running this command. We will need to set the scale.

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.

input file (DEM raster)	floatn35w08	5 1 🔻	Select
	-	-	
Dutput file	5/ExerciseCh	apter4/dem.tif	Election
Band	1		
Compute edges			
Use Zevenbergen&	Thorne formul	a (instead of the I	Horn's one)
1ode	Hillshade		
2			
Z factor (vertical exa	ggeration)	1.00	
Scale (ratio of vert. u	inits to horiz.)	111120.00	
Azimuth of the light		315.0	
Altitude of the light			
-		45.0	
Creation Options	Val		Add
Creation Options	Val		Add
Creation Options			
Creation Options			
Creation Options	n finished Data\Elevatior S/ExerciseCha	ue	Remove



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



# 5. Plugins

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



### **Fetching Plugins**

💋 Quantum GIS 1.7.4-Wroclaw		
File Edit View Layer Settings Plugins Database SEXTANTE Vector Raster	Help	
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Layers		
🔏 Fetching repositories	8 23	
Repository	State	
Carson Farmer's Repository Kappasys Repository Barry Rowlingson's Repository GIS-Lab Repository Aaron Racicot's Repository CatAIS Repository QGIS Official Repository Martin Dobias' Sandbox QGIS Official Repository 2 Faunalia Repository 2 GOIS Contributed Repository Sourcepole Repository Overall progress:	Success Success Success Success Success Success Success Success Success Success Success Success Success Success Success	
N X X Coordinate:	-1.481.1.265 Scale 1:1700405	© QGIS 2012 Render EPSG:4326
Coordinate:	-1.481,1.265 Scale 1:1700405	Render EPSG:4326



## **Plugin Interface**

ilter:		all repositories	<ul> <li>any status</li> </ul>	
Status	Name	Version	Description	<b></b>
invalid	OpenLayers Plugin	?	This plugin is broken	
upgradeable	SEXTANTE	1.0.1 -> 1.0.2	SEXTANTE Geoprocessing platform for QGIS	
new!	qNote	0.1	Save notes in QGIS projects	
not installed	Map Themes Builder	0.1.1	Organize layers in themes for better visibility control	
not installed	SAGA Module interface	0.21	Run the versatile SAGA modules. SAGA must be instal	lled http
not installed	ARPAT plugin	0.3.3	Display of stratigraphy from surveys	
not installed	Save As SLD	0.3.0	Save layer style as Styled Layer Descriptor (SLD)	
not installed	P2P QGis	0.0.9	Connect QGIS by network of type Peer-to-Peer	
not installed	SLD Export	0.0.1	Creates an SLD file using vector style	
not installed	Select features of visible layers	0.3	Select features of visible layers by rectangle	
not installed	HelloWorld	1.0	HelloWorld is just a test plugin which does nothing m	nore tha 🔺
not installed	CSLayer	0.0.1	Plugin for fast access to cadastral surveying layers.	-
•	****			- F
·				
Upgrade all			Install/upgrade plugin Unin	stall plugin

Add Plugins from the Filter Text Box

## Official Plugins and 3rd Party Plugins



Ø	QGIS Python Plug	gin Installer - 216 plugins availabl	e	_ 0	23
ſ	Plugins Reposi	tories Options			
	Status	Name	URL		
	<ul> <li>connected</li> </ul>	Faunalia Repository Carson Farmer's Repository Kappasys Repository Sourcepole Repository Barry Rowlingson's Repository CatAIS Repository QGIS Official Repository Martin Dobias' Sandbox QGIS Official Repository 2 GIS-Lab Repository QGIS Contributed Repository Aaron Racicot's Repository Marco Hugentobler's Repository Volkan Kepoglu's Repository	http://www.faunalia.it/qgis/plugins.xml http://www.ftools.ca/cfarmerQgisRepo.xml http://www.kappasys.org/qgis/plugins.xml http://build.sourcepole.ch/qgis/plugins.xml http://www.maths.lancs.ac.uk/~rowlings/Qgis/Plugins/plugins.xml http://www.catais.org/qgis/plugins.xml http://pyqgis.org/repo/official http://mapserver.sk/~wonder/qgis/plugins-sandbox.xml http://plugins.qgis.org/plugins/plugins.xml http://plugins.qgis.org/plugins/plugins.xml http://gis-lab.info/programs/qgis/qgis-repo.xml http://pyqgis.org/repo/contributed http://qgisplugins.z-pulley.com http://karlinapp.ethz.ch/python_plugins/python_plugins.xml http://ggit.metu.edu.tr/~volkan/plugins.xml	Deleti	2
	Help	The plugins will be installed to ~/.qgi	is/python/plugins	Clo	se



## 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)
    - ог
  - 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
  - o Grass
  - o GDAL Tools
  - OpenStreetMap Plugin
  - o 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

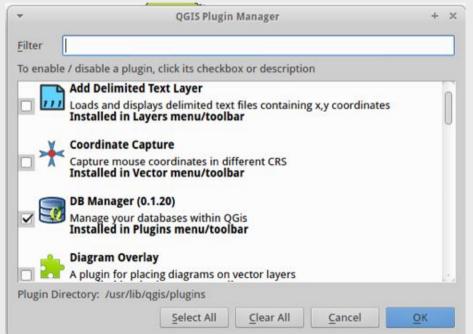
#### Exercise Chapter 5



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.

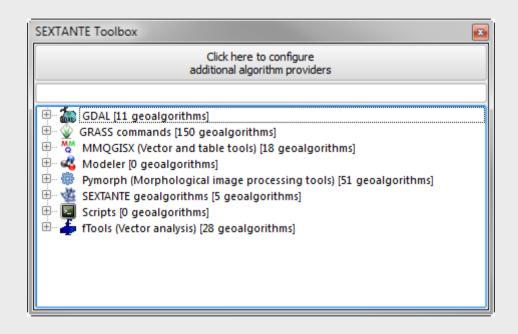
Ø	QGIS Python	Plugin Installer - 234 p	olugins availa	ble		? <mark>×</mark>
Γ	Plugins Re	positories Options				
	Filter: openla			all repositories		▼ any status ▼
	Status	Name	Version	Description		
	not installed	Openlayers Overview	0.1.7	Show area of map in browser with openlayers	s(google maps and others)	
		OpenLayers Plugin	0.93	OpenStreetMap, Google Maps, Bing Maps lay		
	not installed	OpenLayers Export	0.1	To export Web Mapping Services (WMS) and Wel		s added in OGIS proje
	not installed		0.8.6	Export OGR layers to OpenLayers HTML		
	•					4 1
	Upgrade all	]			Install plugin	Uninstall plugin
	Help	The plugins will be in	nstalled to ~/.o	igis/python/plugins		Close

- X Control rendering order OpenLayers Overview BX Google Satellite 2 X Enable map Hide cross in map X Control rendering order OpenLayers Overview 5× Google Satellite X Enable map Hide cross in map
- 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.

	AREA T	PERIMETER	COUNTIES_	COUNTIES_I	STATECTY	CNTYNAME	POLYTYPE	FIPS_ST	FIPS_CO	Shape_Leng	Sha
	1156970000	167636	2	557	13295	WALKER	0	13	295	549994.11208	
ł	751684000	179914	3	554	13313	WHITFIELD	0	13	313	590466.28797	8 80
	898422000	189924	4	553	13213	MURRAY	0	13	213	622877.21625	7 96
	1013820000	182446	5	552	13111	FANNIN	0	13	111	599054.74534	7 10
	1118440000	165956	6	560	13123	GILMER	0	13	123	544641.22780	
	924750000	158926	7	566	13129	GORDON	0	13	129	522059.06428	8 99
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ĸ	CountyBo	oundaries			) de	egrees					
*	CountyBo	undaries	N		1 de	sgrees		3			
×				¥ 🔪		1		3			© QGIS 2



# 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

💋 Att	ribute table - Struct	tures_Point :: 0 / 33	44 feature(s) select	ed			11	-				
	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	2089183.66614	1866444.444	Streams	House	6	NC			
6	1	<sup>429</sup>	70.2880508981	2089207.25527	1866433.50352	Streams	House	7	NC	Field to		
7	1	Vé		2089397.92389	1866336.01072	Streams	House	8	NC	Search 🖻		
8	1	42	65.5436441658	2089372.38753	1866354.22387	Streams	House	9	NC			
8       1       43       65.5436441658       2089372.38753       1866354.22387       Streams       House       9       NC       C         Image: Show selected only       Image: Search selected only												

 As an example a user needs to search for houses



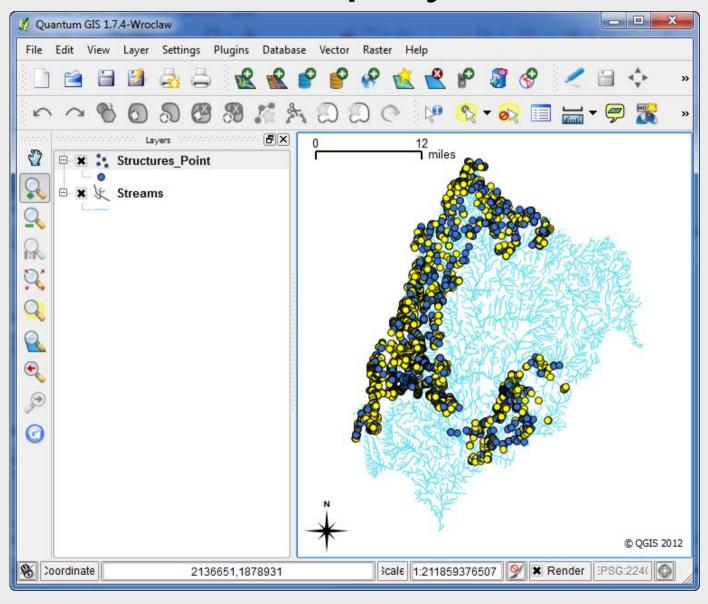
#### Selecting based on Attribute

	Туре 🗸	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	2089207.25527	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

) 89 / E(	Structures_Point			Valu	es			E. F. J. F. K.
t ribute table - S Type	Type NEAR_FID NEAR_DIST NEAR_X NEAR_Y NEAR_FC Descriptio Identifica Watershed				Sample		Al	Watershed NC NC NC NC NC NC NC NC
	Operators							NC
	-	<	>	LIKE	%	IN	NOT IN	NC NC
	<=	>=	!-	ILIKE	AND	OR	NOT	
w selected only	SQL where dause							in Search Advanced search ?
			Clear	Save	Load		Help	00000



# 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

🦸 At	tribute table - Struct	tures_Point :: 0 / 33	44 feature(s) selected	ed	-	lumn ? X	D			
	Type 🔽	NEAR_FID	NEAR_DIST	NEAF	🦉 Add co	lumn	scriptio	Identifica	Watershed	
0	1	2614	90.9622971065	209508	Name			1	NC	
1	1	2614	78.8736476085	209519				2	NC	
2	1	2614	71.7635157944	209424	Comment	ļ,		3	NC	
3	1	2614	71.640000697	209422	Type	Whole number (integer) 🔻		4	NC	
4	3	505	79.5220052674	209408			Home	5	NC	
5	1	429	28.7337581716	208918		integer		6	NC	
6	1	429	70.2880508981	208920	Width	1		7	NC	
7	1	429	63.1421988762	208939	Widdi			8	NC	
8	1	429	65.5436441658	208937	Precision			9	NC	-
She		Search selected only		Look for		OK Cancel			in Advanced (	Search 2
She	ow selected only	Search selected only	y 🗶 Case sensitive	-	<u>l</u>		<u>ر</u>		Advanced :	search ?



# **Deleting Columns**

- Toggle Editing
- Click Delete Columns Icon

19       031501010210       NULL       4316.81184383       6.74501850599       82512.393111       Shape_Leng         20       031501010401       NULL       13024.9074041       20.3514178188       111238.72649         21       031501010207       NULL       13059.0420485       23.5297532007       149381.61611         22       031501010305       NULL       14626.3005026       22.6973445354       186224.78470         23       031501010402       NULL       1204.9525411       18.9139883455       136993.80593		Source 🗸	HUC_12	HU_12_Name	Acres	SqMIles	Shape_Leng	🕺 Delete Attributes
1       0       031501010206       NULL       18694.5163644       29.2101818193       177355.388         7       0       031501010307       NULL       15978.1808848       24.9659076326       191550.04945         8       0       031501010209       NULL       7440.25278064       11.6253949697       95999.606076         9       0       031501010210       NULL       13024.9074041       20.3514178188       111238.72649         11       0       031501010207       NULL       15059.0420485       23.5297532007       149381.61611         12       0       031501010305       NULL       14526.3005026       22.6973445354       186224.78470         13       0       031501010402       NULL       13104.9525411       18.9139883455       136993.80593         14       0       031501010211       NULL       1324.9052641       18.9139883455       136993.80593	.4	0	031501010304	NULL	9726.63428863	15.197866076	113888.00491	2
6       0       031501010306       NULL       18694.5163644       29.2101818193       177355.388       HU_12_Name         7       0       031501010307       NULL       15978.1808848       24.9659076326       191550.049455       Acres       SqMIles         8       0       031501010209       NULL       7440.25278064       11.6253949697       95999.606076       Acres       SqMIles         9       0       031501010200       NULL       4316.81184383       6.74501850599       82512.393111       Acres       SqMIles         10       0       031501010207       NULL       13024.9074041       20.3514178188       111238.72649       Shape_Area         11       0       031501010207       NULL       140526.3005026       22.6973445354       186224.78470         12       0       031501010402       NULL       12104.9525411       18.9139883455       136993.80593         14       0       031501010211       NULL       38.3783603       11.778716188       112247.86289	.5	0	031501010208	NULL	7010.2566135	10.9535259586	84054.902666	<b>N</b>
17       0       031501010307       NULL       15978.1808848       24.9659076326       191550.04945       Acres         18       0       031501010209       NULL       7440.25278064       11.6253949697       95999.606076       SqMIles         19       0       031501010210       NULL       4316.81184383       6.74501850599       82512.393111       Acres       SqMIles         20       0       031501010207       NULL       13024.9074041       20.3514178188       111238.72649       Shape_Leng         21       0       031501010207       NULL       15059.0420485       23.5297532007       149381.61611         22       0       031501010305       NULL       14526.3005026       22.6973445354       186224.78470         23       0       031501010402       NULL       13.04.9525411       18.9139883455       136993.80593         24       0       031501010211       NULL       38.3783603       11.778716188       112247.86289	16	0	031501010306	NULL	18694.5163644	29.2101818193	177355.388	
18       0	17	0	031501010307	NULL	15978.1808848	24.9659076326	191550.04945	Acres
19       0       031501010210       NULL       4316.81184383       6.74501850599       82512.393111       Shape_Area         20       0       031501010401       NULL       13024.9074041       20.3514178188       111238.72649       Shape_Area         21       0       031501010207       NULL       13059.0420485       23.5297532007       149381.61611       Shape_Area         22       0       031501010305       NULL       14626.3005026       22.6973445354       186224.78470       Shape_Area         23       0       031501010402       NULL       12104.9525411       18.9139883455       136993.80593       Shape_Area         24       0       031501010211       NULL       38.3783603       11.778716188       112247.86289       Shape_Area	18	0	031501010209	NULL	7440.25278064	11.6253949697	95999.606076	
20       0       031501010401       NULL       13024,9074041       20.3514178188       111238.72649         21       0       031501010207       NULL       13059.0420485       23.5297532007       149381.61611         22       0       031501010305       NULL       14626.3005026       22.6973445354       186224.78470         23       0       031501010402       NULL       12104.9525411       18.9139883455       136993.805933         24       0       031501010211       NULL       38.3783603       11.778716188       112247.86289	19	0	031501010210	NULL	4316.81184383	6.74501850599	82512.393111	
22         0         031501010305         NULL         14526.3005026         22.6973445354         186224.78470           23         0         031501010402         NULL         13104.9525411         18.9139883455         136993.80593           24         0         031501010211         NULL         38.3783603         11.778716188         112247.86289	20	0	031501010401	NULL	13024.9074041	20.3514178188	111238.72649	
23         0         031501010402         NULL         12104.9525411         18.9139883455         136993.80593           24         0         031501010211         NULL         38.3783603         11.778716188         112247.86289	21	0	031501010207	NULL	1:059.0420485	23.5297532007	149381.61611	
24 0 031501010211 NULL 38.3783603 11.778716188 112247.86289	22	0	031501010305	NULL	14526.3005026	22.6973445354	186224.78470	
	23	0	031501010402	NULL	12104.9525411	18.9139883455	136993.80593	
	24	0	031501010211	NULL	38.3783603	11.778716188	112247.86289	
					Look			



#### Calculate Area

 Add Column and use the area calculation in the Field Calculator

🕺 Field calculator	? 🗙
Only update selected features	
Create a new field	sting field
Output field name Output field type Whole number (integer)  Source	<b>↓</b>
Output field width 10 + Precision 0 +	
Function List	Selected Function Help
Search           ①         ①         ①         ●         ○         ●         ●         ○         ●<	Operators Group
⊕ Math     ⊕ Conversions	This group contains operators e.g + - *
⊕- String     ⊕- Geometry     ⊕- Record     ✓	
Operators = + - / * ^    ( )	
Expression	
Output preview:	OK Cancel Help



#### 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".

Q	Attribute table -	Watershed :: 1 / 6 f	eature(s) selected							
Г	Source $ abla$	HUC_10	HU_10_Name	Acres	Shape_Leng	Shape_Area				
0		500196.57964	5059578668.74							
1		0315010102	Middle Conasa	91652.1262044	388861.214038	3992366617.46				
2	0315010103 Lower Coahulla 76447.8027494 443974.325594 3330066287.77									
3	0 0315010104 Holly Creek 74485.1804403 356921.038104 3244574459.5									
4		0315010105	Lower Conasau	69788.4158313	385553.500904	3039983393.61				
5	0 0315010103 Upper Conasau 36758.5779379 206794.522924 1601203654.98									
F										
🔲 💽 🔛 🝳 🗞 🧹 🔚 💿 📰 🗔 📗 Look for 💿 in Source 🔻 Searc										
	Show selected only	y 📃 Search selecte	ed only 🗶 Case ser	Asitive	dvanced search	?	Close			

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

2	Attribute table	e - V	Vatershed :: 1 / 6 fe	ature(s) selected							
Г	Source	$\nabla$	HUC_10	HU_10_Name	Acres	Shape_Leng	Shape_Area				
0		0	0315010101	Upper Conasau	116151.943727	500196.57964	5059578668.74				
1	0315010102 Middle Conasa 91652.1262044 388861.214038 3992366617										
2	0 0315010103 ower Coahulla 76447.8027494 443974.325594 3330066287.77										
3	0 0315010104 Holly Creek 74485.1804403 356921.038104 3244574459.98										
4		0	0315010105	Lower Conasau	69788.4158313	385553.500904	3039983393.61				
5	5	0 0315010103									
F											
	🔲 💽 🛐 Q 🗞 🧪 🔛 🔕 🗔 🔯 Look for 🔤 in Source 🔻 Search										
L	Show selected only Search selected only Case sensitive Advanced search ? Close										

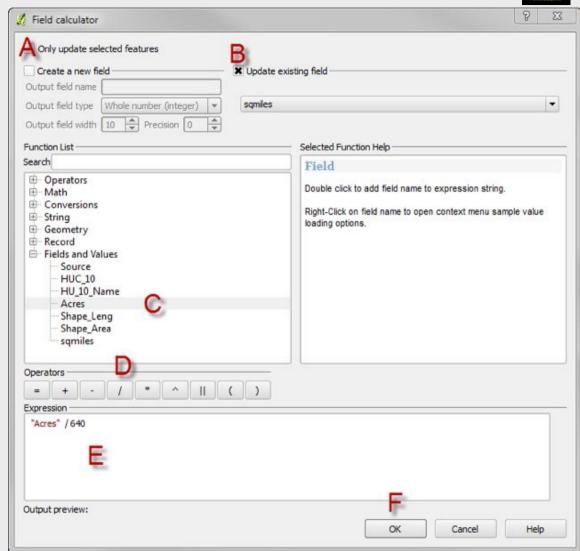


3. Add a column by clicking on the add column icon. Atributtes for the new column depend on the database format being used. In this case we are using dbase (dbf). Make your new column name *sqmiles.* Make the Type *decimal* number. Make the width 6 and the precision (number of decimal places) 4.

L 1	Attribute table - V	Vatershed :: 1 / 0	🕺 Add co	lumn			
Τ	Source 🗸	HUC_10	Name	sgmiles	ng	Shape_Area	
0	0	0315010101	Comment	[	57964	5059578668.74	
1	0	0315010102	Comment		14038	3992366617.46	
2	0	0315010103	Туре	Decimal number (real)	25594	3330066287.77	
3	0	0315010104			38104	3244574459.98	
4	0	0315010105		double	00904	3039983393.61	
5	0	0315010103			22924	1601203654.98	
5	)	🔄 🔍 💸			in So	ource 💌	Search Close

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.



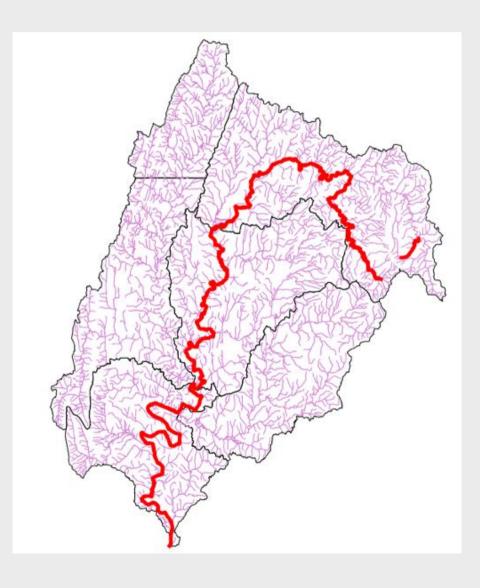
5. Add the Streams shapefile to QGIS. This data came from the National Hydro Dataset and has had more attributes added to it. The Conasauga River is the main River that flows through the watershed.

Open the attribute table and search for the Conasauga River using the GNIS\_Name as the search field. Type in Conasauga.

🖞 At	tribute table - Strea	ams :: 190 / 5382 fe	ature(s) selected						- • ×
	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 🖵
◀									
		2 🗞 <		Look t	for Conasauga			in GNIS_Name	Search
🗶 Sho	ow selected only	Search selected on	ly 🗶 Case sensiti	ve			Advanced sea	rch ?	Close



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.





Fields			Va	lues		
ComID FDate Resolution GNIS_ID GNIS_Name LengthKM ReachCode FlowDir WBAreaComI FType FCode Enabled FROM_NODE TO_NODE FromElev	A			Casey Springs Br. Chestnut Creek' Cohicken Creek' Coahulla Creek' Cohorn Branch' Cohorn Branch' Conasauga Creel Conasauga River Core Field Branc Cove Field Branc Cowpen Creek' Crow Valley Cree Davis Branch' Dead Mans Branc Dill Creek'	Branch' k' h' D	
ToElev Operators		Ŀ		Sample		C
B	<	>	LIKE	%	IN	NOT IN
<=	>=	!=	ILIKE	AND	OR	NOT
SQL where dause - GNIS_Name = 'Co	onasauga River'	E				

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

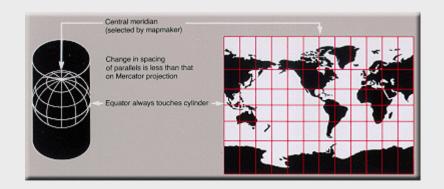
- You can create new types of data in QGIS
  - $\circ$  Shapefiles
  - o Spatialite Layer
- Layers contain basic Geometry shapes
  - o Points
  - o Lines
  - o Polygons



# Map Projections

- Geographic Coordinate Systems
  - $\circ~$  Defines locations on spherical model of the earth
- Projected Coordinate System
  - Defines locations on flat model of the earth

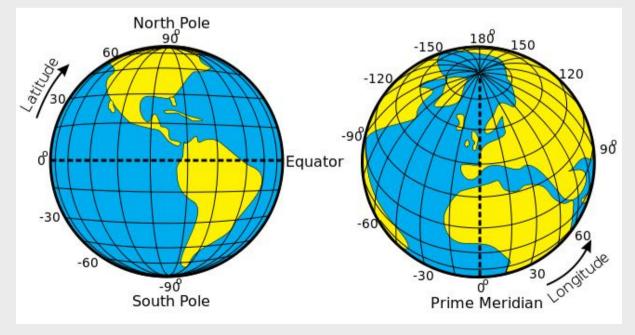






# Geographic Coordinate System

- Defines Locations with Latitude Longitude Values
  - $\circ$  Latitude north and south of the equator
  - $\circ~$  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

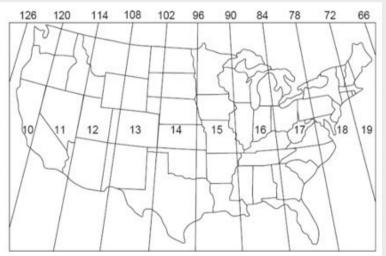


Figure 1. The Universal Transverse Mercator grid that covers the conterminous 48 United States comprises 10 zones—from Zone 10 on the west coast through Zone 19 in New England.



# EPSG Geodetic Parameter Registry

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

Report	Name	Code	Туре	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

🔏 Quant	tum GIS	1.7.4-	Vroclaw									
File Ec	dit Vie	w La	yer Settings	Plugins	Database Vector	Raster	Help		Sec.			
		2	New Add Vector L Add Raster L Add PostGIS Add SpatiaLi Add WMS La Add Delimite Add Oracle ( Add WFS lay	ayer Layer ite Layer ayer ed Text Laye GeoRaster L			ew Shapefile Layer ew SpatiaLite Layer R T ON T	Ctrl+Shift+N Ctrl+Shift+A	日 ↔ ぷ 蒙 厘 <del>-</del>	0	₽ »	ς»
			1	ng	file	_						
		*	Remove Lay Set CRS of La Set project C Properties Query Labeling	ayer(s) CRS from lay	Ctrl+D Ctrl+Shift+C							
1		*	Add to Over Add All to O Remove All I Show All Lay	verview From Overv	Ctrl+Shift+O iew Ctrl+Shift+U	479		Scale 1:302239	4 💓 🕱 Re	ender	© EPSG:43	QGIS 2012 26



#### EPSG:4326

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

Coordinate Reference System     Figle CRS transformation		ntifiable layers OWS			
	:ms				
sed coordinate reference syste	ems				
sed coordinate reference syste	ems				
sed coordinate reference syste	ems				
Reference System		Authority ID			
		EPSG:4269			
orgia West		EPSG:26967			
nnessee (ftUS)		EPSG:2274			
		EPSG:4326			
		EPSG:26916			
				<b>.</b>	
reference systems of the wor			Hide depr	recated CF	RSs
Reference System		Authority ID			
ntiane 1982		EPSG:4676			
Levu 1912		EPSG:4752			
Levu 1916		EPSG:4731			
rol 1875					
rol 1875 (Paris)		EPSG:4811			-
rol 1879		EPSG:4671			
rol 1879 rol 1879 (Paris)		EPSG:4671 EPSG:4821			▲
	nnessee (ftUS) M zone 16N orgia West (ftUS) reference systems of the worl Reference System titane 1982 Levu 1912 Levu 1912 Levu 1916 ol 1875	messee (ftUS) M zone 16N orgia West (ftUS) reference systems of the world Reference System titane 1982 Levu 1912 Levu 1916 ol 1875	orgia West EPSG:26967 Innessee (ftUS) EPSG:2274 EPSG:4326 M zone 16N EPSG:2291  reference systems of the world  Reference System Authority ID Intiane 1982 EPSG:4676 Levu 1912 EPSG:4752 Levu 1916 EPSG:4731 ol 1875 EPSG:4304	orgia West EPSG:26967 Innessee (ftUS) EPSG:2274 EPSG:4326 M zone 16N EPSG:26916 orgia West (ftUS) EPSG:2240   reference systems of the world Intervention Intervention Intervention Reference System Authority ID Intiane 1982 EPSG:4756 Levu 1912 EPSG:4756 Levu 1916 EPSG:4731 ol 1875 EPSG:4304	orgia West EPSG:26967 Innessee (ftUS) EPSG:2274 EPSG:3266 M zone 16N EPSG:26916 orgia West (ftUS) EPSG:2240   reference systems of the world Hide deprecated CF Reference System Authority ID Itiane 1982 EPSG:4766 Levu 1912 EPSG:4752 Levu 1916 EPSG:4731 ol 1875 EPSG:4304

# Define the Properties of the Shapefile

NRGS

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

🖉 New	v Ve	ctor Layer			? <mark>×</mark>
Туре	-				
۲	Poin	t	🔘 Line		lygon
EPSG:	:432	6 - WGS 84			Specify CRS
New	attr	ibute			
Nam	ne (				
Туре	e	Text data			•
Wid	lth [	80	Precision		
				Add to attribute	es list
Attri	bute	s list			
Na	ame		Туре	Width	Precision
id			Integer	10	
•					
					Remove attribute
				OK Cance	I Help
_	_				



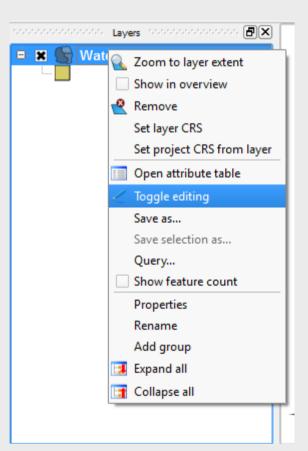
# Spatialite

- You can make a spatialite layer
  - Very "similar" to ESRI's Geodatabase Format
  - All files are kept in one file/database
  - $\circ$   $\,$  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**

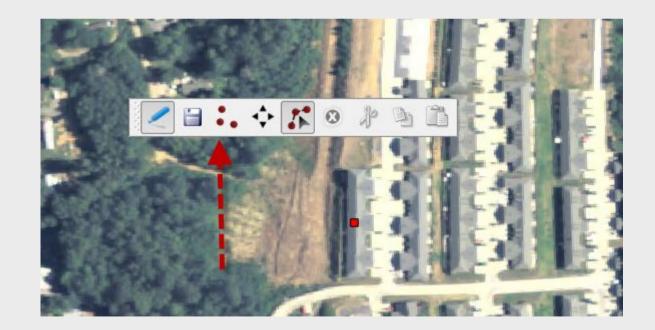


- From left to right
  - $\circ$  Undo
  - o Redo
  - $\circ$  Simplify
  - $\circ \quad \text{Add ring} \quad$
  - Add part (multi-feature)
  - o Delete Ring
  - o Delete Part
  - o Reshape Feature
  - o Split
  - o Merge Features
  - Merge Attributes
  - o Rotate Point Symbols



# Editing

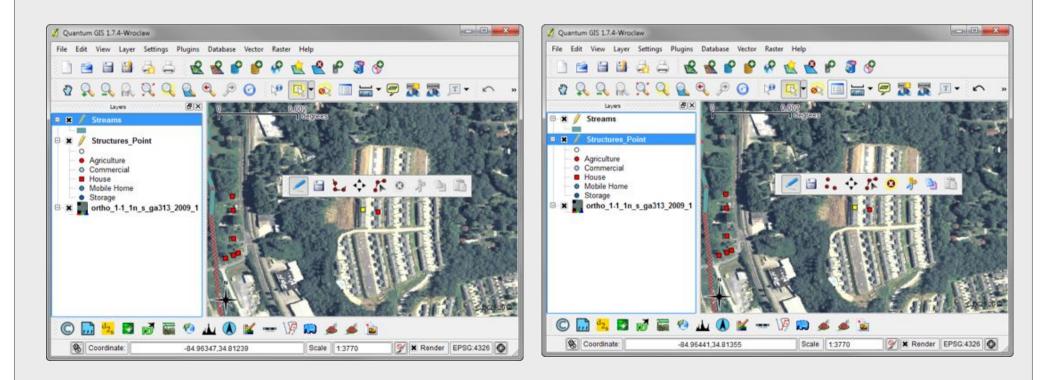
- Note When you start editing the feature changes on the Editing Toolbar
- Example Editing Points:





# Multiple layers can be edited at once

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





### Once a feature is placed: Attribution

Immediately upon adding a feature you attribute it.

	Attributes - Structures Point
	🔏 Attributes - Structures_Point
	Туре [
	NEAR_FID
	NEAR_DIST
	NEAR_X
ALL STREET AND AREAS	NEAR_Y
	NEAR_FC NULL
	Descriptio NULL
	Identifica NULL
	Watershed NULL
	OK Cancel



## Snapping

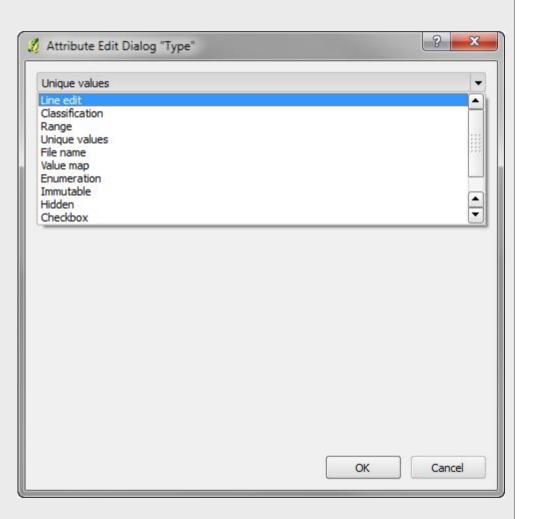
- Added features can be snapped to vertex or segment (edge)
- Located under Settings → Snapping Options

Layer	Mode		Tolerance	Units		Avoid Int.
Structures_Point	to vertex	-	10.0	map units	-	
Streams	to segment	-	20.0	map units	-	



### 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"

	e map		
	nbo box with predefi combo box.	ned items. Value is sto	ored in the attribute, description is shown in
Loi	ad Data from layer	Load Data from CS	V file
	Value	Description	
1	House	House	
2	Mobile Home	Mobile Home	
3	Commercial	Commercial	
4	Barn	Barn	
5			
			1
F	Remove Selected		



### Once you set a Value Map

### Pick List

Q	Attributes -	Structures_Point
ſ		]
	Туре	1
	NEAR_FID	
	NEAR_DIST	
	NEAR_X	
	NEAR_Y	
	NEAR_FC	NULL
	Descriptio	Barn
	Identifica	Barn Commercial House
	Watershed	Mobile Home
		OK Cancel



### 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.

💋 New V	ector Layer					9 X
Type						
Poi	nt	С	Line		O Polygon	
EPSG:22	40 - NAD83 / (	Georgia V	/est (ftUS)		Specify	( CRS
New att	ribute					
Name						
Туре	Text data					•
Width	24		Precision			
				Add to attr	ibutes list	
Attribut	es list					
Name		Туре		Width	Precisio	n
id		Integer		10		
Name		String		24		
•						
					Remove att	ribute
			(	ж	Cancel	Help

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.

2	La	ayer	Prope	rties - Structu	ures						2	23	🔏 Attri Value
	4	<b>6</b>	Style	📄 Labels		Fields	🌾 Ge	neral 🤇	Metadata	🤣 Ac	tions		Com the o
				<									1
		Id		Name	Туре	Length	Precision	Comment	Edit widget	A	lias		2 1
		0	Name		String	24	0		Line edit				
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	R	lesto	re Defa	ault Style	Save	e As Defa	ult	Load St	/le	Save	Style		47 5
							ОК	Cance			Help	_	17. E
L													a

Lo	ad Data from layer	Load Data from CSV file	
	Value	Description	
1	House	Houses	
2	Mobile	Mobile Homes	
3			
		1	

- Click the Line edit Button under dit Widget. This give you the bility to add dropdown lists. Select "Value Map" and add 5 ttributes:
- lome
- *Iobile* Home
- Commercial
- griculture
- arns
- dit 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.
  - o Composer Manager
    - Multiple Map compositions can be stored.
- Map compositions can be exported to several different file formats
  - o PDF
  - o JPG

### o TIFF



### **New Composition**

### • File $\rightarrow$ New Print Composer

File View Layout           File View Layout           Image: Second state           Image: Second state	🔊 🔨 🗐 🛐 🖬 🖉	
	🔊 🔪 🗐 🕼 🚺	* -
General Item		( 🛄 🔅
OCTACIÓN AUGUN	Command history	
Composition	Map 1	*
	· · · · · · · · · · · · · · · · · · ·	
Size		
A4 (210x297 Units	mm)	•
mm		-
Width 297.00	)	•
Height 210.0	0	•
Orientation		
Landscape		-
Quality 300 d		•
Print as ra:	ster	
Snapping		
Snap to gr	id	
Spacing 0.00		•
X offset 0.00		•
Y offset 0.00		•
Pen width 0.5	50	•
	Close	Help



# 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
  - o Landscape/Portrait
  - Grid for drawing features

osition	Map 1	
aper and quality		
Size		
A4 (210x297 mm)		-
Units		
mm		-
Width 297.00		-
Height 210.00		<b></b>
Orientation		
(		
Landscape		•
Quality 300 dpi		• •
Quality 300 dpi Print as raster		
Quality 300 dpi Print as raster		
Quality 300 dpi Print as raster Snapping		
Quality 300 dpi Print as raster Snapping Snap to grid		-
Quality 300 dpi Print as raster Snapping Snap to grid Spacing 0.00		÷
Quality 300 dpi Print as raster Snapping Snap to grid Spacing 0.00 X offset 0.00		
Quality 300 dpi         Print as raster         Snapping         Snap to grid         Spacing 0.00         X offset 0.00         Y offset 0.00		
Quality 300 dpi Print as raster Snapping Snap to grid Spacing 0.00 X offset 0.00 Y offset 0.00 Pen width 0.50		
Quality 300 dpi         Print as raster         Snapping         Snap to grid         Spacing 0.00         X offset 0.00         Y offset 0.00         Pen width 0.50		



## Adding Map Element

- Scale
- Draw
   Extents
- Rotation

🔏 Composer 1	
File View Layout	
🗎 🗟 🗵 🖻 🚔 👯 🔍 🥝 🗠 🗠	🛃 🔤 🍼 🧮 🖬 🐼 🔨 🗐 🐼 👰 💆 🦷
	General Item Command history Map
	Preview
	Cache
	Update preview
P 9	Мар
	Width
	179
a farm	Height
	175
MAR ANN	Scale
LASS OF	374555 Rotation
a contraction of the second se	0.00
No.	Lock layers for map item
	X Draw map canvas items
	Draw map canvas items
	Extents
	Grid
	General options
	Close Help



### Map Elements

- Can be added to your map
  - $\circ~$  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.

 $\cap$ 

### NRGS

## Legend

- Can be customized
- Items can be removed
  - $\circ$  Imagery
  - o 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

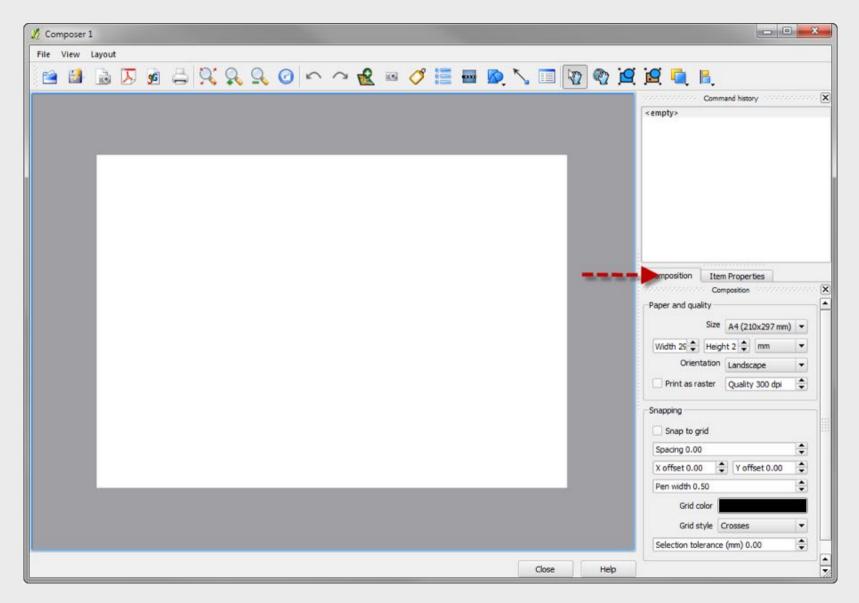
....and you're almost done. Time for the fun stuff. You need to make a map. There will be no screenshots of a map. This one is all up to you. 1. Open QGIS.

- 2. Add the following shapefiles: Watershed Streams, NHDArea, and NHDWaterbody.
- 3. Go to the File Menu and click on New Print Composer.

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	Close Help



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.

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	Orientation Landscape 💌
	🗌 Print as raster 🛛 Quality 300 dpi 🔶
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	Snap to grid
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	Pen width 0.50
	Grid color
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	Selection tolerance (mm) 0.00



- 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.
- 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.

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### Conclusion

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



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