# **QGIS Tutorials Documentation**

Release 0.1

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#### 9 Sample Data

Please check out the installation and sample data sections for information on getting QGIS installed and a copy of the sample data I'll be using in the workshop.

Thank you,

Nate

Contents:

## Installation

QGIS can be run on windows, mac, linux, and android. The instructions below are focused on windows users.

Download the QGIS installer from: http://www.qgis.org/en/site/forusers/download.html

Note: for windows users, there's a basic installer and an advanced one. The basic installer will be enough for most of you, but advanced GIS users may want to use the advanced installer because it will be easier to install additional features (like Esri File Geodatabase compatibility and development tools).

## **1.1 Basic Installation**

The basic installation should be fairly straight forward and involves a ~290MB download (for the 64bit version) or a ~340MB download (for the 32bit version). Unless you have a 32bit operating system (which is increasingly uncommon now), I advise that you get the 64bit version.

#### **1.2 Advanced Installation**

- 1. Make sure you've downloaded the OSGeo4W version of the installer. This is a relatively small download because it'll download the components that are needed for your selected options.
- 2. Select the Express Desktop Install

Àr -	OSGeo4W Setup – 🗖 🗙			
	OSGeo4W Net Release Setup Program			
	This setup program is used for the initial installation of the OSGeo4W environment as well as all subsequent updates. Make sure to remember where you saved it.			
	The pages that follow will guide you through the installation. Please note that OSGeo4W consists of a large number of packages spanning a wide variety of purposes. We only install a base set of packages by default. You can always run this program at any time in the future to add, remove, or upgrade packages as necessary.			
	Express Desktop Install			
	C Express Web-GIS Install			
	O Advanced Install			
	< <u>B</u> ack <u>N</u> ext > Cancel			

3. Select the Download Site: http://download.osgeo.org

<b>X</b>	OSGeo4W Setup - Choose Download Site(s) 🛛 - 🗖 🗙
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	Available Download Sites:
	http://download.osgeo.org
User URL:	Add
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4. Choose the applications to install. I suggest leaving the default.

À.	OSGeo4W Setup - Express Package Selection 🛛 – 🗖 🗙
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	✓ QGIS
	✓ GDAL
	Apache Port number:
	🖌 uDig
	OpenEV
	GRASS GIS
	< <u>B</u> ack <u>N</u> ext > Cancel

5. Accept the list of unmet dependencies and allow the installter to install them.

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_	! Unmet Dependencies Found ollowing packages are required but have not been selected.	(	<b>X</b>		
avce00	(2.0.0-1) The AVCE00 commandline utilities for Arc/Info E00 conversion Required by: grass	^			
curl	(7.3.1-1) The CURL HTTP/FTP library and commandline utility. Required by: gdal, netcdf, gdal110dll				
expat	(2.1.0-1) The Expat XML Parser library Required by: gdal, ogdi, gdal110dll, gpsbabel	~			
<	>				
✓ Install these packages to meet dependencies (RECOMMENDED)					
	< <u>B</u> ack <u>N</u> ext >	Can	icel		

6. Accept any of the "Agreements of Restrictive Package" (there may be more than one)

År	OSGeo4W Setup - Agreement of Restrictive Package	- 🗆 🗙
	Non-Open Source License Agreements	Ì
	Please review the license terms of the following packages and indicate accep of it's terms: Oracle Instant Client (oci)	tance
	You agree that neither the programs nor any direct product thereof will be exported, directly, or indirectly, in violation of these laws, or will be used for any purpose prohibited by these laws including, without limitation,	^
	nuclear, chemical, or biological weapons proliferation. Oracle Employees: Under no circumstances are Oracle Employees authorized download software for the purpose of distributing it to customers. Oracle products are available to employees for internal use or demonstration purpose only. In keeping with Oracle's trade compliance obligations under U.S. and applicable multilateral law, failure to comply with this policy could result in disciplinant action up to and including termination	
	✓ I agreed with above license terms	int
	< <u>B</u> ack <u>N</u> ext >	Cancel

7. The needed components will be downloaded and installed.

×.	17% - OSGeo4W Setup	-	□ ×
Progress This pa	ge displays the progress of the download or installation.		Ì
	Downloading libtiff-4.0.3-2.tar.bz2 from http://download.osgeo.org/osgeo4w/		
	54 % (1400k/2576k) 1180.1 kB/s		
	Package:		
	Total:		
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	< <u>B</u> ack <u>N</u> ext >		Cancel

8. Confirm that installation has completed successfully

×.	OSGeo4W Setup - Installation Status and Create Icons 🛛 – 🗖 🗙
In	stallation Status OSGeo4W installation completed successfully.
	Installation Complete
	< <u>B</u> ack Finish Cancel

This will give you an installation of QGIS that is effectively identical to the Basic Installation.

You'll note that you also have a new shortcut in your start menu for the "OSGeo4W Setup". If you open this you'll be able to add or remove individual features. There will also be shortcuts for uDIG (another light weight open source GIS desktop application)

#### 1.2.1 Adding File Geodatabase Access

1. Open the OSGeo4w Setup application and select Advanced Install.

Æ	OSGeo4W Setup	- 0		x
	OSGeo4W Net Release Setup Program	È	>	
	This setup program is used for the initial installation of the OSGeo4W environment well as all subsequent updates. Make sure to remember where you saved it.	as		
	The pages that follow will guide you through the installation. Please note that OSGeo4W consists of a large number of packages spanning a wide variety of purposes. We only install a base set of packages by default. You can always run this program at any time in the future to add, remove, or upgrade packages as necessary.	I		
	O Express Desktop Install			
	O Express Web-GIS Install			
	Advanced Install			
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2. Select "install from Internet"

Æ	OSGeo4W Setup - Choose Installation Type	-		×
Choose	<b>Download Source</b> whether to install or download from the internet, or install from files in directory.		È	
	<ul> <li>Install from Internet (downloaded files will be kept for future re-use)</li> <li>Download Without Installing</li> </ul>			
	◯ Install from <u>L</u> ocal Directory			
	< <u>B</u> ack <u>N</u> ext >		Cance	1

3. Accept the default root install directory, unless you changed it as part of an earlier installation.

SGeo4W Setup - 0	Choose Installation Directory 🗧 🗖 🗙					
Select Root Install Directory Select the directory where you want to install OSGeo4W. Also choose a few installation parameters.						
Root Directory						
C:\OSGeo4W64	Browse					
<ul> <li>Install For</li> <li>All Users (RECOMMENDED) OSGeo4W will be available to all users of the system.</li> <li>Just Me OSGeo4W will only be available to the current user. Only select this if you lack Admin. privileges or you have specific needs.</li> </ul>	<ul> <li>Create icon on <u>D</u>esktop</li> <li>✓ Add icon to <u>S</u>tart Menu</li> </ul>					
	< <u>B</u> ack <u>N</u> ext > Cancel					

4. Accept the default local package directory, internet connection settings, and download site.

🔄 OSGeo4W Setup - Select Local Package Directory – 🗖	x
Select Local Package Directory Select a directory where you want Setup to store the installation files it downloads. The directory will be created if it does not already exist.	7
Local Package Directory C:\Users\roth\Downloads Browse	
Start menu name	
OSGeo4W	
< <u>B</u> ack <u>N</u> ext > Cancel	

<u>ک</u> ر ک	OSGeo4W Setup - Select Connection Type 🛛 🗕 🗙
Setup n	ur Internet Connection eeds to know how you want it to connect to the internet. Choose ropriate settings below.
	Direct Connection     Use IE5 Settings     Use HTTP/FTP Proxy:     Proxy Host
	Port 80
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۶.	OSGeo4W Setup - Choose Download Site(s) 🛛 – 🗖 🗙
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	Available Download Sites:
	http://download.osgeo.org
User URL:	Add
	< <u>B</u> ack <u>N</u> ext > Cancel

5. You'll then see the Select Packages dialog.

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6. Locate the feature you wish to install. In this example we'll find the Esri geodatabase libraries. They're in the "Libs" section. Expand the "Libs" section by clicking on the + sign next to it.

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🗄 Desktop 🅄							
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		🚯 Skip	n/a	n/a		boost-devel: The Boost library (compile time libraries).	
		Skip	n/a	n/a	5,901k	boost-libs: The Boost library (runtime libraries).	
		Skip	n/a	n/a	909k	cairo: Cairo library	
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		😯 Skip	ηία	n/a	528k	eigen: The Eigen library.	
	2.1.0-1	Keep	n/a		77k	expat: The Expat XML Parser library	
		😯 Skip	n/a	n/a	38k	fcgi: FastCGI Library	
		🚯 Skip	n/a	n/a	13,629k	ffmpeg: ffmpeg	
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7. Scroll down until you find "gdal-filegdb" under the Package column.

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	1.11.2-1	• •	n/a - /-	n/a		gdal-autotest: The GDAL/OGR Auto Test suite gdal-ecw: ECW Raster Plugin for GDAL
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		Keep	n/a			gdal-mrsid: MrSID Raster Plugin for GDAL
	1.11.2-1	Keep	ηία			gdal-oracle: OGR OCI and GDAL Geo Raster Plugins for Oracle
	1.11.2-1	Keep	ηία			gdal-python: The GDAL/OGR Python Bindings and Scripts
	1.11.2-1	😯 Кеер	ηία			gdal-sosi: OGR SOSI Driver
	1.10.1-1	Keep	ηία	n/a		gdal110dll: The GDAL/OGR 1.10 DLL (backward compability package)
	3.4.2-1	Keep	ηία			geos: The GEOS geometry library
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8. Click on the "Skip" under the "New" column and it will change to show the version to be installed. Then click "Next" at the bottom of the screen.

<u>S</u> earch		<u>C</u> lear				<u>K</u> eep <u>P</u> rev <b>⊙</b> <u>C</u> urr <u>V</u> iew Category
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		Keep	n/a			gdal-oracle: OGR OCI and GDAL GeoRaster Plugins for Oracle
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	1.11.2-1	😯 Кеер	n/a			gdal-sosi: OGR SOSI Driver
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	3.4.2-1	😯 Кеер	ηία			geos: The GEOS geometry library
		Skip	n/a	n/a		glew: The OpenGL Extension Wrangler Library
		Skip	n/a	n/a		glext: OpenGL API and Extension Header Files
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9. Your feature will be downloaded and installed.

#### **Basics**

Much of QGIS should be familiar to those of you with existing GIS experience. Learning to work with QGIS will be largely a matter of learning where tools are located and possibly alternate names for them. The concepts are all the same, and much of the functionality is as well.

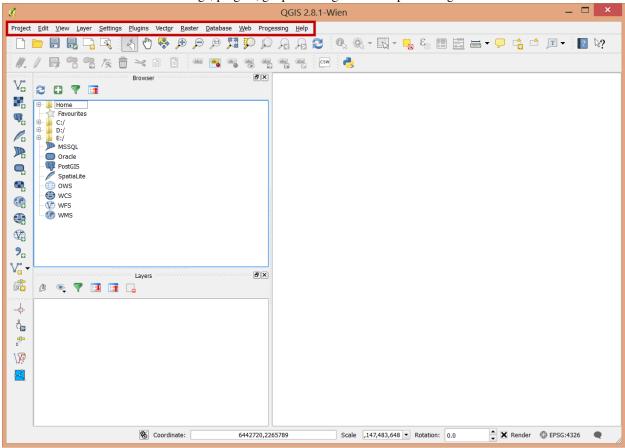
There are some places where QGIS is better, or more flexible than ArcGIS, some places where you can accomplish tasks in QGIS freely that require higher level licenses in ArcGIS, and others where ArcGIS is the better tool (Cartography and map production).

## 2.1 Anatomy of QGIS

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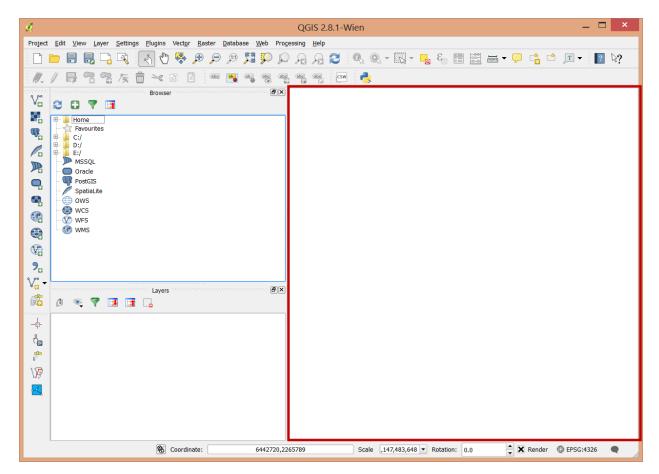
The anatomy of QGIS is very similar to ArcMap

Many of the toolbars and windows are dockable so they may move around depending on how you set things up. Here's a view of my version.



The Main Menu with access to settings, plugins, geoprocessing and raster processing menus.

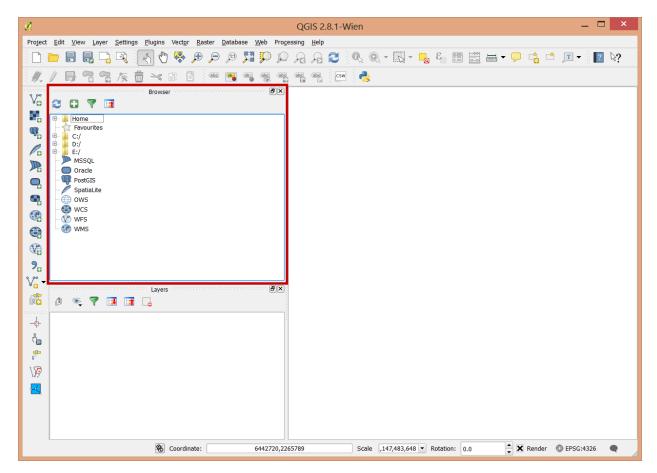
The map.



Tools for adding data to the map. Vector data (shapefiles, PostGIS, Spatial Lite), Raster Data (GeoTIFF, img,...), WMS, WFS, CSV, and a very wide variety of other data formats that can be translated by the OGR toolkit into a compatible format.

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A browser that is very similar to the catalog component of ArcGIS.



A Table of contents that can display layers by order or by source.

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Project Management. A project in QGIS is roughly analogous to a map document (.mxd) in ArcGIS.

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Map navigation. Zoom, pan, and scaling tools.

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## 2.2 Layers

Once you've added a layer to the table of contents you can double click on it to get into it's properties.

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Fields	Data source encoding System 👻	
🞸 Rendering	Coordinate reference system	
🧭 Display	Selected CRS (EPSG:2227, NAD83 / California zone 3 (ftUS))	2
Actions	Create spatial index Update extents	
• Joins	Scale dependent visibility	
💹 Diagrams	Minimum (exclusive)	
🥡 Metadata	(exclusive) * (inclusive) *	
	Feature subset	
		51
	Query Builde	ar i
	Style	

The tabs along the side allow access to different aspcts of the layer. These are very similar in function to ArcGIS. These include:

- General: Layer name, coorinate reference system, visibility and feature subsets
- Style: Feature symbology
- Labels: Feature labeling
- Fields: The display and types of fields
- Rendering: Simplification of features for display purposes
- Display: Setting popup and default identify behavior
- Actions: User defined layer actions, such as showing an image when a feature is clicked on.
- Joins: Add or remove table joins
- Diagrams: Create charts or diagrams based on the the layer's attributes.
- Metadata: Edit metadata for the layer.

Probably the most notable difference is in how symbology is specified in QGIS.

A	Layer P	roperties - parcels   Style	? ×
🔀 General	🔁 Single Symbol 🔻		
Style Cabels Fields		Unit Millimeter  Transparency 0% Color	
🞸 Rendering		Symbols in group	▼ Open Library
<ul> <li>Display</li> <li>Actions</li> <li>Joins</li> <li>Diagrams</li> <li>Hetadata</li> </ul>	Simple fill	corners diagon; dotted green land water wine	
	Save		Advanced 🔻
	▼ Layer rendering		
	Layer transparency C Layer blending mode Normal	▼ Feature blending mode Normal	
	Style 🔻	OK Cancel Apply	Help

There are seven types of symbology for vector layers:

- Single symbol, Categorized, and Graduated. These first three behave much as you'd expect.
- Rule-based allows you to specify individual rules for displaying features.
- Point displacement is for specifying the displacement of points based on feature attributes.
- Inverted Polygons, styles everything outside of the features. This is useful for drop shadows or area boundaries.
- The Heatmap renderer generates dynamic heatmaps for point or multipoint layers.

Setting the symbols takes some getting used to. You'll need to specify the fill and the boundary. "No Pen" and "No Brush" are use to indicate that there is either no fill or no outline on features.

	Layer Pr	operties - parcels	s   Style		? ×
🔀 General	🝷 Single Symbol 🔻				
😻 Style		Symbol layer type		Simple fill	-
(abc Labels		Colors Fill	•	Border	ļ
Fields		Fill style	Solid		• 🗣
≼ Rendering		Border style	- Solid Line		• 4
두 Display	Simple fill	Join style 🔗 B	Bevel		• 🗣
Actions		Border width 0.260		-	Millimeter 🔻
• ┥ Joins		Offset X,Y 0.000		0.000000	Millimeter 🔻
🕅 Diagrams					
🥡 Metadata					
	Save	]			
	▼ Layer rendering				
	Layer transparency				0 🗘
	Layer blending mode Normal		Feature blending mode	Normal	
	Style 🔻		ОК	Cancel Apply	Help

Building color ramps takes an extra step that will be described elsewhere.

# Projections

Projections take a bit of getting used to in QGIS if you're used to ArcGIS. Most projections are dealt with through specifying their EPSG codes.

QGIS does have a very useful set of tools for searching for and specifying projections and unlike ArcGIS we can turn reprojection on the fly on and off easily.

# 3.1 Project on-the-fly

General	Enable 'on the fly' CRS transformation	
CRS	Filter	
Identify layers	Recently used coordinate reference systems	
Identity idyers	Coordinate Reference System	Authority ID
Default styles	* Generated CRS (+proj=lcc +lat_1=37.0666666666666667 +lat_2=38	. USER:100000
WS server	WGS 84 / Pseudo Mercator WGS 84	EPSG:3857 EPSG:4326
	NAD83 / California Albers	EPSG:3310
'OS	NAD83 / California zone 3 (ftUS)	EPSG:2227
ons		
	Coordinate reference systems of the world	Hide deprecated CRS
	Coordinate Reference System	Authority ID
		EPSG:4756
	Vanua Levu 1915	EPSG:4748
	Venus 2000	IAU2000:29900
	···· Vientiane 1982	EPSG:4676
	···· Viti Levu 1912	EPSG:4752
	···· Viti Levu 1916	EPSG:4731
	···· Voirol 1875	EPSG:4304
	···· Voirol 1875 (Paris)	EPSG:4811
	···· Voirol 1879	EPSG:4671
	···· Voirol 1879 (Paris)	EPSG:4821
	WGS 66	EPSG:4760
	WGS 72	EPSG:4322
	···· WGS 72BE	EPSG:4324
	WGS 84	EPSG:4326
		IGNE-W/GSZ2G

Reproject on the fly is not active by default in QGIS. You need to specify a projection for your project and then turn it on in order to use it. I like this feature. It is useful for figuring out projections that are either not specified (missing .prj), or incorrectly specified.

You can access the project's spatial reference settings either through the main menu, or the button at the bottom right of the screen that shows the EPSG code.

Í.	QGIS 2.8.1-Wien – 🗖	×
Project	Edit <u>V</u> iew Layer <u>S</u> ettings <u>P</u> lugins Vect <u>o</u> r <u>R</u> aster <u>D</u> atabase <u>W</u> eb Pro <u>c</u> essing <u>H</u> elp	
	╘ 🖥 🖓 🖓 🖑 🖏 🕫 🔎 🖉 🎾 💭 🖓 🤉 🖉 🍕 🛠 🎕 - 🖾 - 🗁 🖏 - 🦕 📬 🖆 📧 - 🦕	
i //	/ 🖶 🔧 📆 🌾 💼 🛰 🗈 🖺 📟 🝓 🧠 🧠 🧠 🗠 🗠 🦂	
372	Browser	
_	- '32 Favourites ⊕- '22 C:/ ⊕- '22 D:/	
l la	B = 1 E:/ → MssqL	
Pa Q	Oracle     Oracle     PostGIS	
- - -	- 🎽 SpatiaLite - 🌐 OWS	
	→ ⊕ wcs → ∰ wFs	
	WMS	
<b>%</b>		
V: -	Layers	
-\$>		
ĉe P		
₽° \∕₽		
l	Scale ,147,483,648 ▼ Rotation: 0.0 ♀ X Render @ EPSG:4326 ♥	

# 3.2 Layer Projections

Layers give you a similar dialogue for identifying the projection. This can be accessed through the "General" tab on the layer properties. The spatial reference selector remembers your commonly used projections.

Coordinate Reference Sys	tem Selector ? ×
Filter	
Recently used coordinate reference systems	
Coordinate Reference System	Authority ID
* Generated CRS (+proj=lcc +lat_1=37.0666666666666667 WGS 84 / Pseudo Mercator	USER:100000 EPSG:3857
WGS 84	EPSG:4326
NAD83 / California Albers	EPSG:3310
NAD83 / California zone 3 (ftUS)	EPSG:2227
Coordinate reference systems of the world	Hide deprecated CRSs
Coordinate Reference System	Authority ID
MAD83 / California zone 1	EPSG:26941
MAD83 / California zone 1 (ftUS)	EPSG:2225
MAD83 / California zone 2	EPSG:26942
MAD83 / California zone 2 (ftUS)	EPSG:2226
MAD83 / California zone 3	EPSG:26943
MAD83 / California zone 3 (ftUS)	EPSG:2227
Selected CRS: NAD83 / California zone 3 (ftUS)	
+proj=lcc +lat_1=38.433333333333333333333333333333333333	
ок	Cancel Help

# 3.3 Reprojecting Data

To reproject vector layers that are in your table of contents, simply right click on the layer name, select "Save As" and in the save as dialogue, specify the projection to use through the spatial reference selection dialog.

Coordinate Reference Syst	em Selector ? ×
Filter	
Recently used coordinate reference systems	
Coordinate Reference System	Authority ID
* Generated CRS (+proj=lcc +lat_1=37.066666666666667 WGS 84 / Pseudo Mercator	USER:100000 EPSG:3857
WGS 84	EPSG:4326
NAD83 / California Albers NAD83 / California zone 3 (ftUS)	EPSG:3310 EPSG:2227
•	
Coordinate reference systems of the world	Hide deprecated CRSs
Coordinate Reference System	Authority ID
- NAD83 / California zone 1	EPSG:26941
- NAD83 / California zone 1 (ftUS)	EPSG:2225
- NAD83 / California zone 2	EPSG:26942
MAD83 / California zone 2 (ftUS)	EPSG:2226
···· NAD83 / California zone 3	EPSG:26943
- NAD83 / California zone 3 (ftUS)	EPSG:2227
Selected CRS: NAD83 / California zone 3 (ftUS)	
+proj=lcc +lat_1=38.433333333333333333333333333333333333	
ОК	Cancel Help

Rasters should be reprojected using the GDAL Warp tools under the *Raster* menu to specify resampling methods and cell sizes.

# 3.4 EPSG Codes

A very useful site: http://spatialreference.org/

Commonly used EPSG codes: (at least commonly used by me)

- 3857: Web Mercator
- 4326: WGS84 (Lat-Long)
- 4269: NAD83 (Lat-Long)
- 3310: California Albers NAD83

- 3309: California Albers NAD27
- 2225: NAD83, California State Plane Zone 1(US Feet)
- 2226: NAD83, California State Plane Zone 2(US Feet)
- 2227: NAD83, California State Plane Zone 3(US Feet)
- 2228: NAD83, California State Plane Zone 4(US Feet)
- 2229: NAD83, California State Plane Zone 5(US Feet)
- 2230: NAD83, California State Plane Zone 6(US Feet)

#### **Tables**

Tables work very similarly to ArcGIS

The data used below is available at: Link

# 4.1 Adding the Data

Add the parcels layer to your QGIS project using the Add Vector Layer button.

<b>10</b>		Add vector layer		? ×
Source type				]
	Directory System	<ul> <li>Database</li> </ul>	O Protocol	•
Source Dataset				Browse
		Open	Cancel	Help

Use the brows button to find the shapefile.

<b>%</b>		Add vector layer		? ×
-Source typ	e			
• File		<ul> <li>Database</li> </ul>	O Protocol	
Encoding	System			-
-Source				
Dataset	C:\Users\nate\wor	kspace\qgis_demo\parcels.shp	В	rowse
		Open	Cancel	Help

Also add the land use lookup table (lu\_lut.dbf), you can do this through the add vector layers button if you then select "All Files(\*).(.)" in the bottom right.

<b>%</b>		Open a	n OGR Supporte	d Vector Layer			×
🛞 🏵 🔻 🕇 🚺 🕨 Librari	es ⊧ workspace	▶ workspace ▶ qgis	_demo		~ ¢	Search qgis_demo	م
Organize 👻 New folder							• 🔲 🔞
<ul> <li>Desktop</li> <li>Documents</li> <li>Downloads</li> <li>Music</li> <li>Pictures</li> <li>Videos</li> <li>OS (C:)</li> <li>DVD RW Drive (D</li> <li>Libraries</li> <li>Documents</li> <li>Music</li> <li>Pictures</li> <li>Pictures</li> <li>Public Document</li> <li>Public Pictures</li> <li>Videos</li> <li>workspace</li> <li>Network</li> </ul>	dem_4269.tif	Iu_lut.dbf	parcels.dbf	parcels.prj	parcels.shp	parcels.shx	parcels2.qpj
File <u>n</u> ame	lu_lut.dbf				¥	All files (*) (*.*)	¥
						<u>O</u> pen	Cancel:

#### 4.2 Inspect the Data

Right click on both the parcels shapefile and the look up table and for each select "Open Attribute Table". Look at what is in them. The parcel dataset is just a small portion of a county, and I've reduced the number of fields to keep it small and manageable. There's an APN field, the land and structural value fields, and a land use code.

<b>(</b>					Attribute ta	ble - parcels ::	Features total: 7	620, filtered: 76	620, selected: 0	
/	B 🔒 🕹	-	🏶 🗭 🔋 🚺	🗮						
	APN V	TAXABILITY	TAXYEAR	LANDVALUE	STRCTVALUE	LANDUSE1	ACERAGE	Shape_area	Shape_len	
0	50017063	050	2013	116189	0	7960	95.01743458	4138959.450339	11907.29557190	
1	50017038	000	2013	25337	0	7000	21.45902510	934755.1337510	6534.257019170	
2	50016129	000	2013	41264	7997	7000	5.46872564	238217.6891269	2218.400765900	
3	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446320	2751.383407770	
4	50016130	800	2013	55000	242000	7100	5.66533526	246782.0043620	2096.740161040	
5	50016059	000	2013	76380	146401	7100	10.73739052	467720.7314890	2909.506985750	
6	50017061	050	2013	104301	0	7960	83.60904555	3642010.024480	8811.521463800	
7	50017010	800	2013	55000	127000	7100	6.50460897	283340.7667290	2183.194826050	
в	50017043	050	2013	4375	211510	9999	6.45386124	281130.1959739	2126.447993080	
9	50017044	050	2013	16364	0	7900	63.59046378	2770000.602369	8677.44070629000	
10	50017058	050	2013	6765	0	7922	31.47009007	1370837.123690	6219.882865490	
11	50017060	000	2013	155065	0	7200	61.48081571	2678104.332549	. 7518.842050780	
12	50071007	800	2013	55000	87000	7101	5.34853810	232982.3199040	2447.93978719000	
13	50071006	800	2013	55000	146000	1100	5.78246580	251884.2104089	2366.748592870	
14	50071005	000	2013	55000	208000	7100	5.83624500	254226.8325290	2217.12556875000	
15	50071004	800	2013	55000	0	7000	5.10145041	222219.1801020	2095.966634380	
16	50017039	000	2013	25337	120507	7100	20.88740730	909855.4620049	4060.824968820	
17	50080006	000	2013	45206	0	7000	5.02070133	218701.7501720	1970.323488490	
18	50080005	000	2013	45206	0	7000	5.02812386	219025.0753590	2035.360317100	
19	50080004	000	2013	45206	0	7000	5.00256531	217911.7451979	2411.669848120	
20	50080007	000	2013	55000	232000	7000	4.95639478	215900.5567380	2507.62092350000	
21	50080003	000	2013	45206	0	7000	5.01138453	218295.9103039	1965.995071010	
22	50080008	000	2013	45206	0	7000	5.00798289	218147.7347320	1953.342106890	
23	50080002	000	2013	45206	0	7000	4.99855408	217737.0159820	1950.560887110	
24	50080009	000	2013	45206	0	7000	5.00263182	217914.6423220	1916.473960520	
25	50080001	000	2013	52822	0	7000	5.00074888	217832.6213259	. 1943.118679430	
26	50079009	000	2013	45206	0	7000	5.02920243	219072.0579309	2018.617330500	
27	50079008	000	2013	45206	0	7000	5.00932360	218206.1364379	2141.709354220	
28	46017029	000	2013	33079	0	9999	19.16581670	834862.9756950	4502.805758700	
29	46017116	800	2013	55000	82000	1300	6.60691176	287797.0762990	2435.180797410	
30	46017117	000	2013	61378	0	1300	9.32090070	406018.4345859	3573.477586370	
31	48021009	800	2013	85000	86000	7102	15.92640379	693754.1494849	3321.424745620	
32	48080033	800	2013	55000	7841	7100	5.95701345	259487.5060520	2297.19578244000	
33	48080034	800	2013	55000	199000	7100	5.27383707	229728.3428140	2115.384033290	
34	50017006	050	2013	68925	167716	7922	33.92648209	1477837.560109	5463.645066770	
35	50017059	800	2013	85000	103000	7100	8.45701703	368387.6620710	2591.914389170	

The lookup table has a pair of land use code fields that can link to the parcel dataset (we're only going to use one), and another set of land use codes that crosswalks the assessor's land use codes into a standardized land use code that could be used across county borders.

92					Attribute
/	66	ε 🧧 🖭	📡 🌺 🎾	) <b>I</b>	200
	FREQUENCY 🔽	PARUSECODE	PARUSEDESC	ANDCODE	ANDNAME
151		7900	AG PRESERVE		Agriculture
152	1	7920	ORCHARD - VAC	2210	Orchard (Fruits &
153		7922	ORCHARD- WAL		Orchard (Fruits &
154		7931	ORCHARD- C HE		Orchard (Fruits &
155		7960	GRAZING		Private Grazing
156		7970	VINEYARD- VAC		Vacant Agricultur
157		7971	VINEYARD-PLAN		Vineyard (Table o
158	1	7990	COMPATIBLE US		Retail Stores and
159		7992	COMPATIBLE US		Rural Residential
160		8000	MINERAL RIGHTS		Mines, Mineral, a
161	15	8100	MINING- VACANT		Mines, Mineral, a
162	4	8200	MINING- IMPROV	3200	Mines, Mineral, a
163	3	8300	QUARRY	3210	Aggregate
164	2	8400	AIRPORT	1417	Airports
165	5	8500	LANDFILL/TRANS	1432	Solid Waste Disp
166	1	8600	TELECOMMUNIC	1420	Communication F
167	7	8700	HISTORICAL BUI	1000	Urban and Built-up
168	3	8800	CONSERVATION	3100	Land Trusts and
169	314	8900	TPZ	2500	Private Timber
170	223	9000	COMMON AREA/	1190	Residential Com
171	1	9010	COMMON AREA/	1300	Industrial
172	16	9020	COMMON AREA/	1200	Commercial and
173	45	9200	SBE ASSESSED	1430	Utility Facilities
174	7	9300	UTILITIES NOT S	1430	Utility Facilities
175	6	9320	WATER	1430	Utility Facilities
176	5	9330	SEWER	1433	Water Disposal/T
177	1	9360	TELEPHONE	1420	Communication F
178	16	9400	PRIVATE WATER	1430	Utility Facilities
179	1	9600	WATER RIGHTS	1418	Harbor Facilities
180	50	9700	ROADS NOT CO	1411	Roads
181	28	9710	ROAD PRIVATE	1411	Roads
182	2	9720	ROADS PUBLIC	1411	Roads
183	2	9730	RIGHT OF WAY	1411	Roads
184	84	9800	TAXABLE GOVER	4000	Publicly Owned O
185	5	9900	TRA SPLIT REMA	3320	Privately Owned
186	48	9910	TRA SPLIT REMA	1100	Residential
_	Show All Features				

# 4.3 Joining Tables

, <b>K</b>			Layer Properti	es - parcels   Joins ?	×
General	Join layer	Join field	Target field	Memory cache	
😽 Style					
(abc Labels					
Fields					
Kendering					
🧭 Display					
Actions					
• Joins					
Diagrams					
🧃 Metadata					
	•				
	Style 🔻			OK Cancel Apply	Help

Double click on the parcel layer to open the layer's properties, and then click on the "Joins" tab on the left side.

Now click on the little green plus sign near the bottom. Fill out the menu:

- Join Layer: lu\_lut
- Join Field: PARUSECODE
- Target Field: LANDUSE1

×6	Add vector join		?	×
Join layer Join field Target field Cache join layer in virtual memory Create attribute index on join field Choose which fields are joined Custom field name prefix				
		OK	Can	cel

Now use "Open Attribute Table" on the parcels layer again. If you scroll to the right you'll see the additional fields.

# 4.4 Symbolize

ø		Layer Properties - parcels   Style	? ×
🤆 General	🔁 Single Symbol 🔻		
Style		Unit Millimeter  Transparency 0%  Color	
Fields		Symbols in group	Open Library
🞸 Rendering 💭 Display	Fill Simple fill		
Actions		corners diagonal dotted green land water wir	
• Joins			
Diagrams			
🕡 Metadata			
		Save	Advanced 💌
	<ul> <li>Layer rendering</li> <li>Layer transparency</li> </ul>	0	- 0 -
	Layer blending mode	Normal   Feature blending mode Normal	
	Style 🔹	OK Cancel Apply	Help

Let's symbolize the parcels layer based on one of the fields we just joined in.

Double click on it again to open the properties and go to the "Style" tab.

Then, select the Categorized style type at the top.

Set the Column to "lu\_lut\_ANDNAME"

And finally click the "Classify" button below the open window. You'll now have a list of all of the entries in the lu\_lut\_ANDCODE field and will have random colors assigned to them.

ø	Layer Properties - parcels   Style	? ×
General	Categorized V	
😻 Style		
(abc) Labels	Symbol Change Color ramp Random colors	▼ Invert
Fields  Fields	Symbol     Value     Legend       Aggregate     Aggregate       Agriculture     Agriculture       Airports     Airports       Cemeteries     Cemeteries       Colleges a     Colleges and Universities       Commerci     Commercial and Services       Communic     Commercial Storage (Public Storage)       Communic     Communication Facilities       Duplexes,     Duplexes, Triplexes and 2- or 3-nit Condominiums and Townhouses       Elementar     Elementary Schools       Fire Stations     General Office Use       Golf Cours     Golf Courses       Harbor Fa     Harbor Facilities	
	Heavy Ind Heavy Industrial         Hotels an Hotels and Motels         Industrial         Industrial         Land Trust         Land Trust         Layer rendering         Layer transparency         Layer blending mode         Normal         Style         OK         Cancel	Advanced • 0 • Help

If you now click "OK" you'll have a (probably) garishly colored map of land uses.

Those colors can be cleaned up through the same user interface by clicking the colors and changing them. If you edited them to get a color scheme that you liked, you could save it using the "Style" button at the very bottom of the screen which will open to reveal a "Save Style" option.

#### Editing

Editing in QGIS uses an edit session much like ArcGIS does. Both attributes and geometries can be edited.

#### 5.1 Calculating an Attribute

Add the parcel data to the project if it isn't already there. If you're continuing on from the last example, remove any joins using the layer properties to keep things simple.

Open the **parcels** attribute table.

Click on the little	pencil at the top	p left of the attribute	table to start an	edit session.
---------------------	-------------------	-------------------------	-------------------	---------------

<b>%</b>					Attribute tal	ole - parcels ::	Features total: 7	620, filtered: 76	520, selected: 0	_ 🗆	×
//	ع 🔓 🗟 😼	<b>-</b> 🗈 怪	🏶 🎾 🗈 🚺	L L 📰							
APN	3 = •									▼ Update All Update S	Select
	APN 🗸	TAXABILITY	TAXYEAR	LANDVALUE	STRCTVALUE	LANDUSE1	ACERAGE	Shape_area	Shape_len		
)	50017063	050	2013	116189	0	7960	95.01743458	4138959.450339	11907.29557190		
L	50017038	000	2013	25337	0	7000	21.45902510	934755.1337510	6534.257019170		
2	50016129	000	2013	41264	7997	7000	5.46872564	238217.6891269	2218.400765900		
3	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446320	2751.383407770		
ŧ	50016130	800	2013	55000	242000	7100	5.66533526	246782.0043620	2096.740161040		
	50016059	000	2013	76380	146401	7100	10.73739052	467720.7314890	2909.506985750		
	50017061	050	2013	104301	0	7960	83.60904555	3642010.024480	8811.521463800		
	50017010	800	2013	55000	127000	7100	6.50460897	283340.7667290	2183, 194826050		
8	50017043	050	2013	4375	211510	9999	6.45386124	281130.1959739	2126.447993080		
)	50017044	050	2013	16364	0	7900	63.59046378	2770000.602369	8677.44070629000		
.0	50017058	050	2013	6765	0	7922	31.47009007	1370837.123690	6219.882865490		
1	50017060	000	2013	155065	0	7200	61.48081571	2678104.332549	7518.842050780		
12	50071007	800	2013	55000	87000	7101	5.34853810	232982.3199040	2447.93978719000		
13	50071006	800	2013	55000	146000	1100	5.78246580	251884.2104089	2366.748592870		
L4	50071005	000	2013	55000	208000	7100	5.83624500	254226.8325290	2217.12556875000		
15	50071004	800	2013	55000	0	7000	5.10145041	222219.1801020	2095.966634380		
16	50017039	000	2013	25337	120507	7100	20.88740730	909855.4620049	4060.824968820		
17	50080006	000	2013	45206	0	7000	5.02070133	218701.7501720	1970.323488490		
18	50080005	000	2013	45206	0	7000	5.02812386	219025.0753590	2035.360317100		
.9	50080004	000	2013	45206	0	7000	5.00256531	217911.7451979	2411.669848120		
20	50080007	000	2013	55000	232000	7000	4.95639478	215900.5567380	2507.62092350000		
21	50080003	000	2013	45206	0	7000	5.01138453	218295.9103039	1965.995071010		
22	50080008	000	2013	45206	0	7000	5.00798289	218147.7347320	1953.342106890		
23	50080002	000	2013	45206	0	7000	4.99855408	217737.0159820	1950.560887110		
24	50080009	000	2013	45206	0	7000	5.00263182	217914.6423220	1916.473960520		
25	50080001	000	2013	52822	0	7000	5.00074888	217832.6213259	1943.118679430		
26	50079009	000	2013	45206	0	7000	5.02920243	219072.0579309	2018.617330500		
27	50079008	000	2013	45206	0	7000	5.00932360	218206.1364379	2141.709354220		
28	46017029	000	2013	33079	0	9999	19.16581670	834862.9756950	4502.805758700		
29	46017116	800	2013	55000	82000	1300	6.60691176	287797.0762990	2435.180797410		
30	46017117	000	2013	61378	0	1300	9.32090070	406018.4345859	3573.477586370		
31	48021009	800	2013	85000	86000	7102	15.92640379	693754.1494849	3321.424745620		
32	48080033	800	2013	55000	7841	7100	5.95701345	259487.5060520	2297.19578244000		
33	48080034	800	2013	55000	199000	7100	5.27383707	229728.3428140	2115.384033290		
											=
UI SI	now All Features										1

Click on the Abacus icon at the far right of the top toolbar to open the calculate field dialog box.

K Field calcu	ulator	? ×
Only update 0 selected features		
Create a new field Update existing	g field	
Create virtual field		
Output field name		-
Output field type Whole number (integer) 🔻		
Output field width 10 🗬 Precision 0 📥		
Expression Function Editor		
Expression Fu	Inctions	
= + - / * ^    ( )	Search	
Image: Transformed and transfor	<ul> <li>Operators</li> <li>Conditionals</li> <li>Math</li> <li>Conversions</li> <li>Date and Time</li> <li>String</li> <li>Color</li> <li>Geometry</li> <li>Record</li> <li>Fields and Values</li> </ul>	
	OK Cancel	Help

And then fill out the form. We can have it perform the calculation into a new field that will be created to hold the result. An example is shown below.

🧭 Field (	calculator	? ×
Only update 0 selected features         Create a new field       Update e         Create virtual field         Output field name       netvalue         Output field type       Whole number (integer) ▼         Output field width       10 ♀         Precision       0 ♀	xisting field	▼
Expression I	Functions	
<pre>= + - / * ^    ( ) "LANDVALUE" + "STRCTVALUE"  () ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )</pre>	Search	Field       Image: Construct the second
		OK Cancel Help

And click OK to execute the operation.

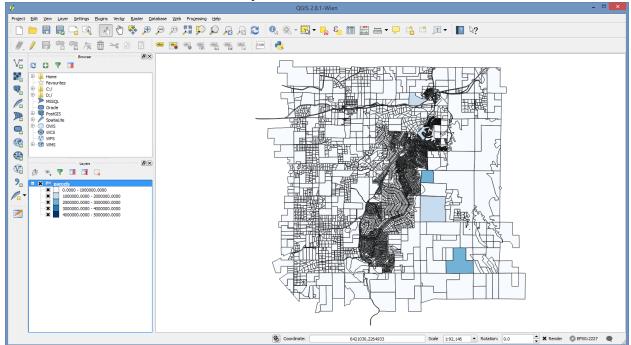
Then click on the "Save Edits" icon just to the left of the Edit toggle to save the changes and then turn off editing using the pencil again.

Finally, let's set up some symbology based on the field we just calculated.

We'll use a graduated symbol on the **netvalue** field we just created. For the moment, just accept the defaults, and click the "Classify" button.

<i>.</i> ¢		l	ayer Properties -	parcels   Style			?	×
General	Graduated	-						
😻 Style	Column	netvalue	•	3				
(abc) Labels	Symbol		Cł	ange		Classes 5		-
Fields	Color ramp	[source]	¥	Invert		Mode Eq	ual Interval	-
	Legend Format	%1 - %2				Precision 0	Trim	
	Symbol 🗸	Values	Legend 0.0000 - 1000000.000	0				
Display	×	1000000.00 - 2000000.00	1000000.0000 - 2000	000.000				
Actions	×	2000000.00 - 3000000.00 3000000.00 - 4000000.00	3000000.0000 - 4000	000.000				
Joins	×	400000.00 - 500000.00	4000000.0000 - 5000	000.0000				
Diagrams								
🥡 Metadata								
	Classify	Add class Del	ete Delete all	X Link class bound	aries		Advance	.d 🔻
	▼ Layer rende	ering						
	Layer transpa		)					
	Layer blendin	g mode	Normal	▼ Feature b	lending mode	Normal		•
	Style 🔻				ок	Cancel Ap	pply Help	

Then click "OK" to view the results on the map.

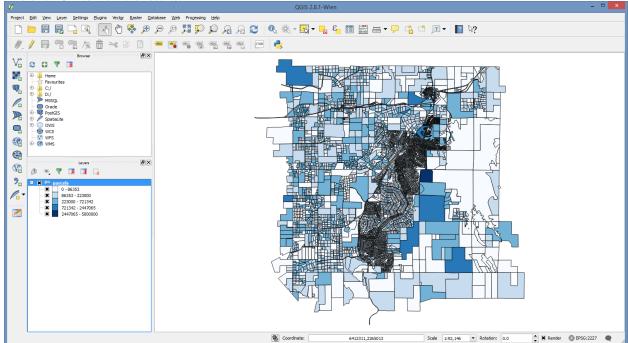


That's really not so interesting to view, so let's fix it a bit. Go back into the Style editor (Layer Properties).

And pick the "Natural Breaks" mode on the right side to use the "Jenks" method for splitting the data into the number of classes selected (default = 5).

ø		Layer Properties - parcels   Style ? 🗙	
General	Graduated		
😻 Style	Column	netvalue   E	
(abc) Labels	Symbol	Classes 5	3
Fields	Color ramp	[source]  V Invert Mode Natural Breaks (Jenks)  V	•
	Legend Format	%1 - %2         Precision         0         Trim	
Rendering     Display     Actions     Joins     Diagrams	Symbol X X X X X X X	Values         Legend           0.00 - 86353.00         0 - 86353           86353.00 - 223000.00         86353 - 223000           223000.00 - 721342.00         223000 - 721342           721342.00 - 2447065.00         721342 - 2447065           2447065.00 - 5000000.00         2447065 - 5000000	
Diagrams	Classify	Add dass     Delete     Delete all     X Link class boundaries     Advanced	•
	<ul> <li>Layer rende</li> <li>Layer transpa</li> <li>Layer blendin</li> <li>Style</li> </ul>		

#### And click OK to view the results.



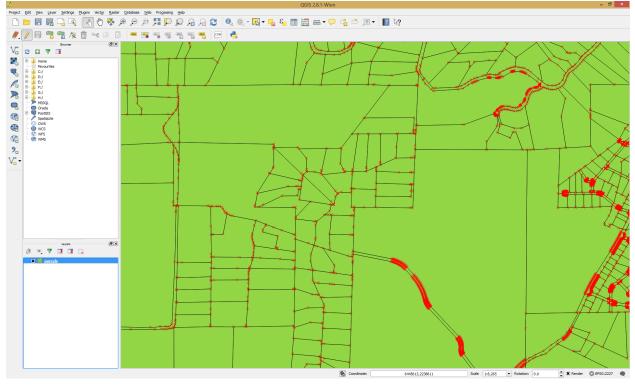
# 5.2 Geometry Editing

Editing geometries should be similar to what you're accustomed to. The feature templates that are available in ArcGIS aren't present in QGIS, but the basic editing tools are available, and highly functional.

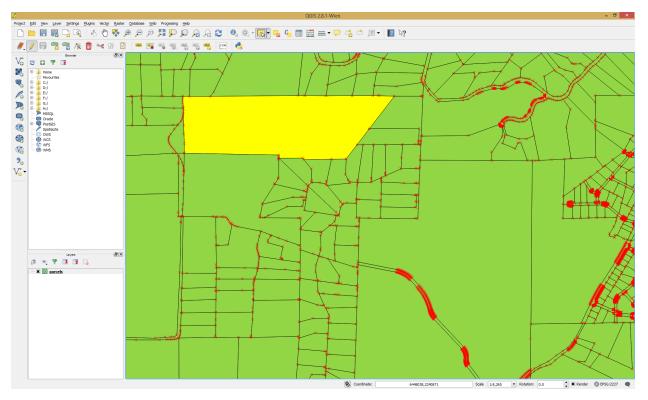
Snapping controls are available through the **Settings** menu.

#### 5.2.1 Splitting a Feature

First toggle editing on using the pencil icon on the editing toolbar. You'll see the vertexes highlighted.

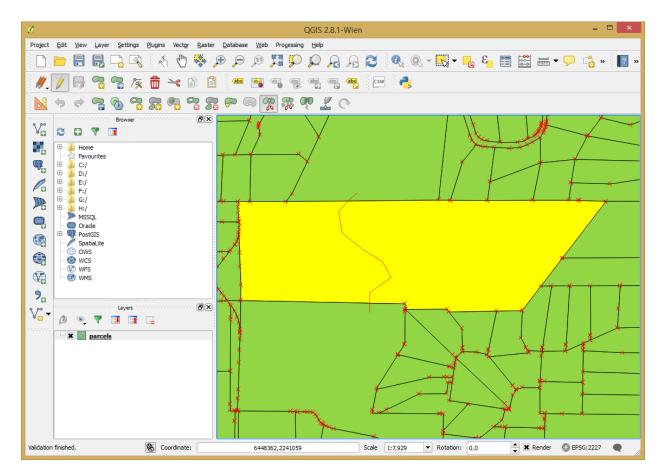


Then select the parcel that you wish to split using the standard selection tools.

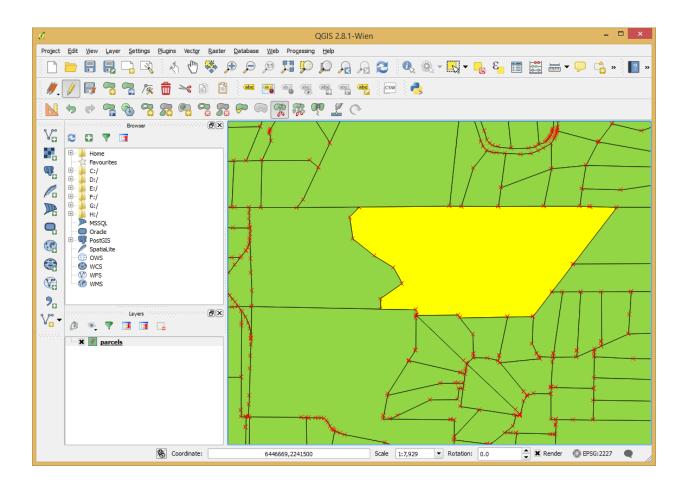


Turn on the Advanced Digitizing toolbar by right clicking in an open space near the menu and turning it's check box on.

Then select the split feature tool. And click to create the line that splits the polygon the way you want to.



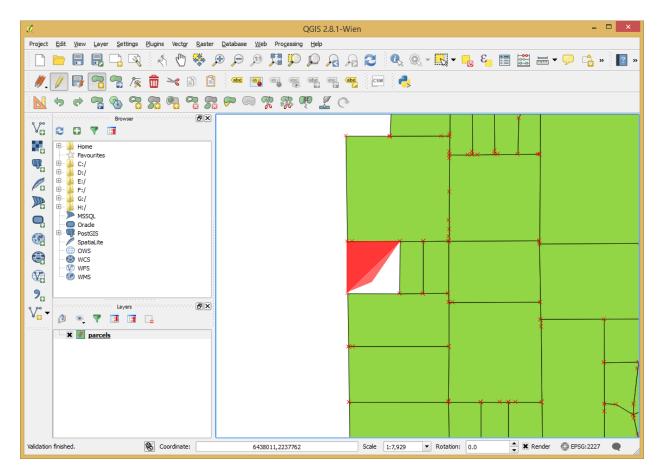
And right click to finish the split.



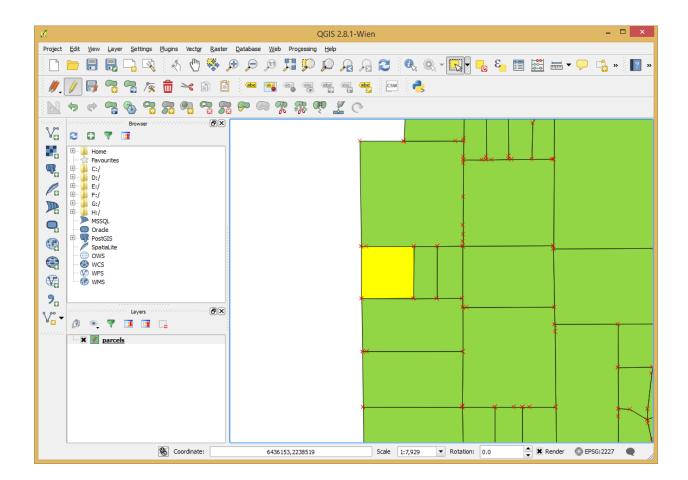
#### 5.2.2 Adding a new feature

Navigate to a location where you can add the a new polygon.

Select the "Add Feature" tool from the "Digitizing" toolbar. Then you can draw in the polygon you want by clicking on each vertex.



Right click to finish the feature and fill in any attributes you need to.



#### 5.2.3 Finishing the Edits

Save the edits and turn off editing to save your edits fully.

#### Geoprocessing

The concepts for geoprocessing are very similar to those you've learned in ArcGIS. All of the common methods are available:

- Intersect
- Union
- Buffer
- Clip
- Difference
- Dissolve

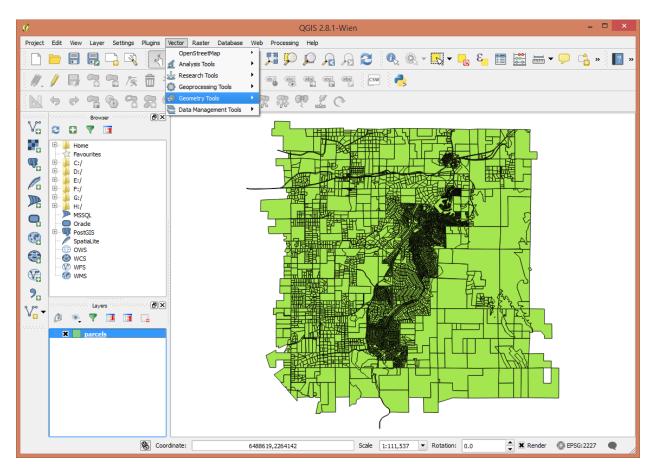
These are all located under the **Vector** menu.

#### 6.1 Create Polygon Centroids

Add the parcels layer to your project.

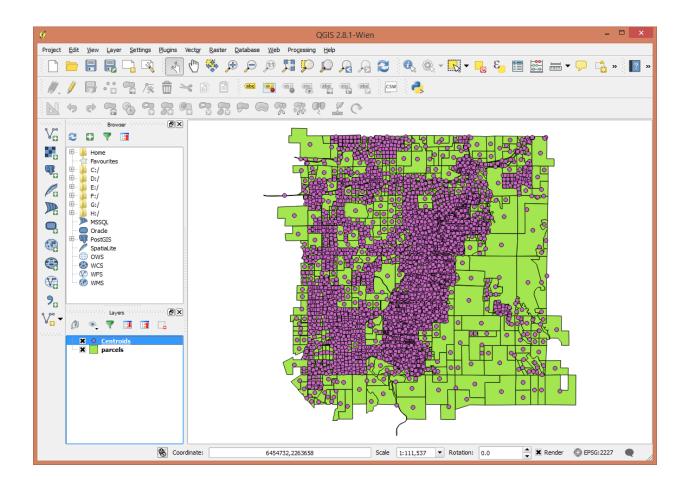
Under Vector select Geometry Tools and then Polygon Centroids.

The image below doesn't show the last portion of menu tree.



Select the layer to create centroids from, and specify the output data set name.

Ø	Polygon centroids	?	×
Input polygon vector	layer		
parcels			-
Output point shapefil	e		
		Brows	e
X Add result to can	vas		
0%	ОК	Close	•



#### 6.2 Buffer

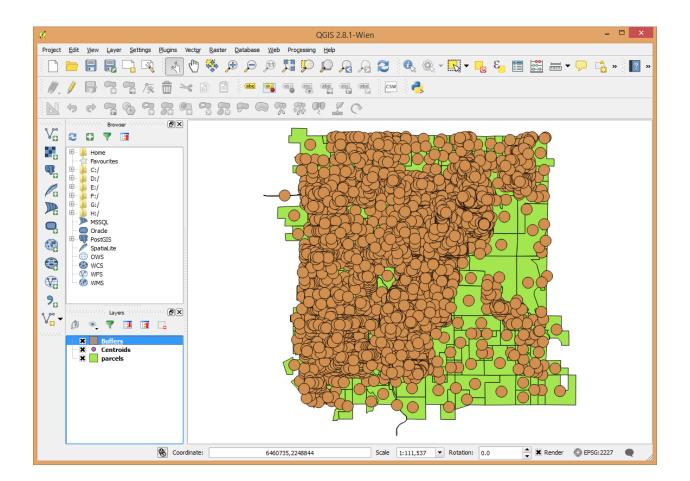
Buffering the centroids by 1000 feet (because the parcel layer is in State Plane Zone 3 (US Feet))

Find the Buffer tool under Vector, Geoprocessing Tools

🧷 Buffer(s)	? ×
Input vector layer	
Centroids	-
Use only selected features	
Segments to approximate 5	-
Buffer distance	
O Buffer distance field	
APN	•
Dissolve buffer results	
Output shapefile	
	Browse
X Add result to canvas	
0% ОК	Close

The "Segments to approximate" setting allows you to "tune" the detail that corners on the buffer have. The higher the number the more and shorter segments are created.

🖉 Buff	ier(s) ? ×
Input vector layer	
Centroids 💌	
Use only selected features	
Segments to approximate	10
Buffer distance	1000
O Buffer distance field	
APN 💌	
Dissolve buffer results	
Output shapefile	
D:/Projects/qgisDemo/Buffers.shp	Browse
X Add result to canvas	
0%	OK Close



#### 6.3 Intersect

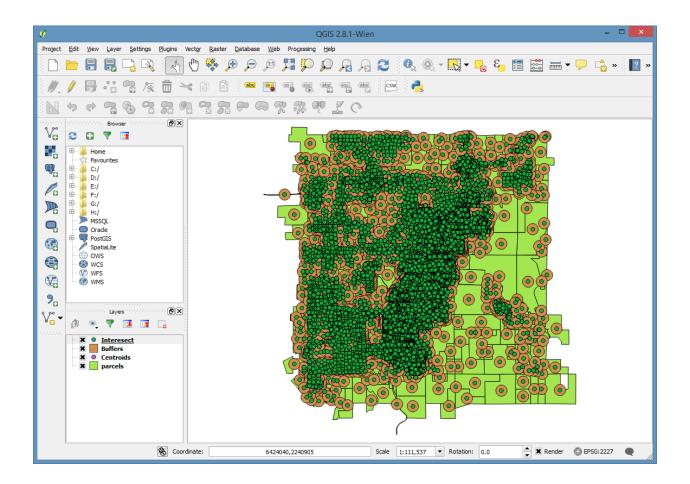
(note I'm going to skip doing this one in the live demo)

Intersecting the centroids with the buffers will start to let us know how many parcels have centroids within 1000 feet of the center of each parcel. This would let us calculate a parcel density, and is a technique that I use frequently when doing summaries of land use.

The Intersect tool is in Vector, Geoprocessing Tools

🧭 Intersect	? ×
Input vector layer Centroids	•
Use only selected features	
Buffers	•
Use only selected features	
Output shapefile	
D:/Projects/qgisDemo/Interesect.shp	Browse
0% ОК	Close

This process takes a bit longer to run because it's an exponential calculation.

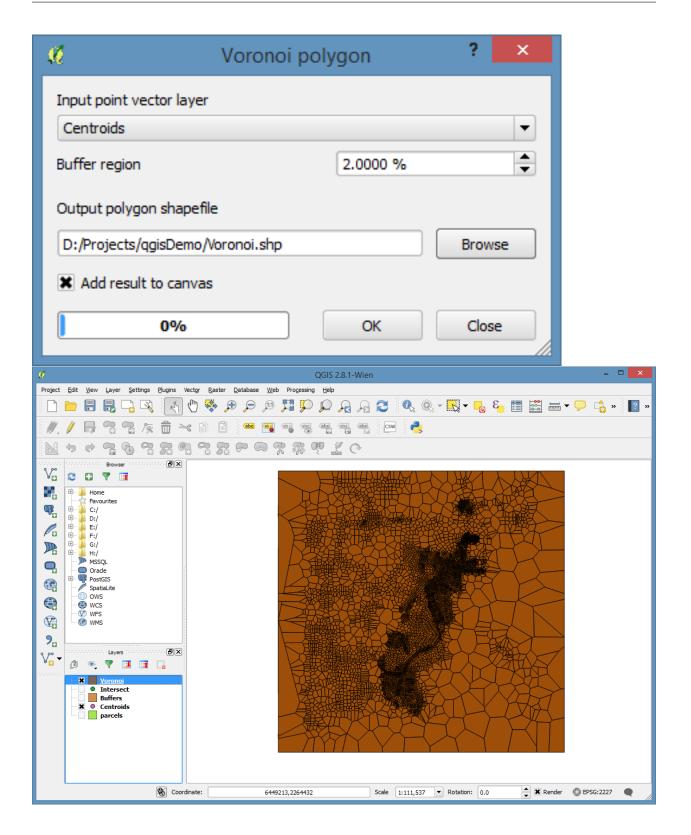


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	50017038	000	2013	25337	0	7000	21.45902510	934755.1337
	50017038	000	2013	25337	0	7000	21.45902510	934755.1337
	50017038	000	2013	25337	0	7000	21.45902510	934755.1337
	50017038	000	2013	25337	0	7000	21.45902510	934755.1337
	50017038	000	2013	25337	0	7000	21.45902510	934755.1337
	50016129	000	2013	41264	7997	7000	5.46872564	238217.6891
	50016129	000	2013	41264	7997	7000	5.46872564	238217.6891
0	50016129	000	2013	41264	7997	7000	5.46872564	238217.6891
1	50016129	000	2013	41264	7997	7000	5.46872564	238217.6891
2	50016129	000	2013	41264	7997	7000	5.46872564	238217.6891
3	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446
4	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446
5	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446
5	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446
7	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446
8	50056022	800	2013	85000	130000	7100	10.58089863	460903.9446
9	50016130	800	2013	55000	242000	7100	5.66533526	246782.0043
0	50016130	800	2013	55000	242000	7100	5.66533526	246782.0043
1	50016130	800	2013	55000	242000	7100	5.66533526	246782.0043
2	50016130	800	2013	55000	242000	7100	5.66533526	246782.0043
1	50046050			76000		7400	40.7070050	

# 6.4 Voronoi Polygons

Voronoi Polygons require an ArcGIS advanced license to create. It can be done within QGIS.

The Voronoi Polygons tool is in Vector



## 6.5 SpatialLite and PostGIS

One of the really powerful features of QGIS is the ability to link directly to SpatialLite and PostGIS databases. This allows the use of complex spatial queries that may take many steps to complete through the linking of individual Geoprocessing steps.

### **Rasters**

All of these examples will start from the dem\_4269.Tif raster in the demo dataset.

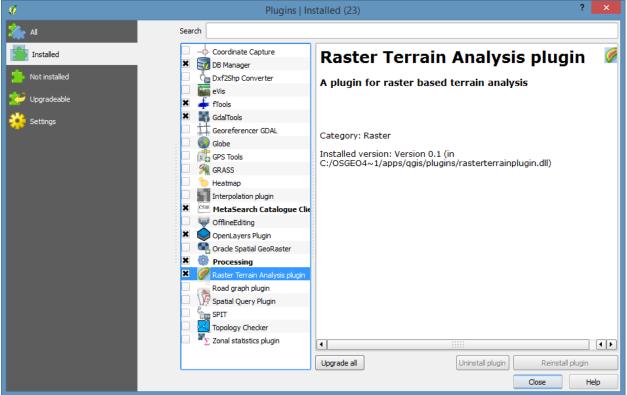
Start by adding dem\_4269.tif to an empty project. Bonus points if you can tell me where it is... Elevation is in meters.

## 7.1 Terrain Processing

### 7.1.1 Add the Terrain Analysis Plugin

#### Go to Plugins, Manage and install plugins

Click on the **Installed** tab on the left. and look for the "Raster Terrain Analysis Plugin", and turn it on with the check box to it's left.



### 7.1.2 Reprojecting a Raster

Reproject from the current geographic projection (NAD83) (EPSG: 4269) into something a little more friendly for doing terrain analysis (without using Z-factors).

Under the Raster menu, go to Projections and select Warp

I'm going to reproject it to California Albers NAD83 (EPSG: 3310) using the cubic convolution resampling method.

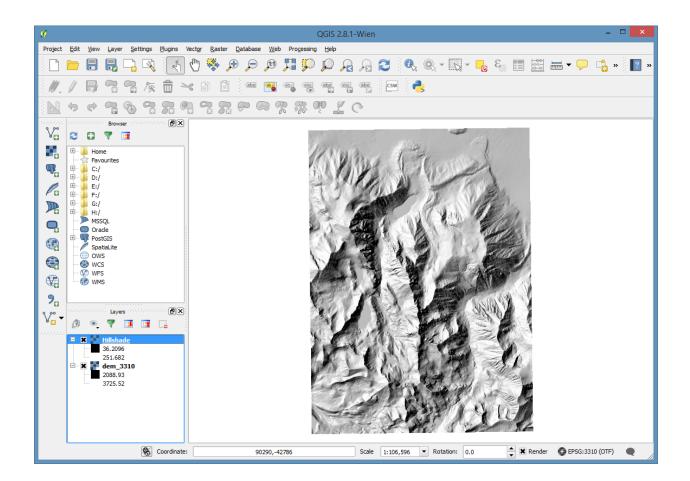
🧭 Warp	(Reproject)	? ×	
Batch mode (for processing	whole directory)		
Input file	dem_4269 💌	Select	
<u>O</u> utput file	Demo/dem_3310.tif	Select	
Source SRS		Select	
X Target SRS	EPSG:3310	Select	
Resampling method	Cubic	•	
No data values	0		
Mask layer	<b></b>	Select	
Memory used for caching	20MB	<b></b>	
Resize			
Width 3000	Height 3000		
Use multithreaded warping	implementation		
🗶 Load into canvas when finish	ed		
gdalwarp -overwrite -t_srs EPSG:3310 -r cubic -of GTiff D: \Projects\qgisDemo\dem_4269.tif D:/Projects/qgisDemo/dem_3310.tif			
ОК	Close	Help	

After the reprojection, I'm going to remove the 4269 dem, and set the project's spatial reference to 3310. Set the spatial reference using the button at the lower right corner of QGIS.

### 7.1.3 Generate a Hillshade

Go to Raster, Terrain Analysis, Hillshade

📢 Hi	llshade ? ×
Elevation layer	dem_3310 🔻
Output layer	ıgisDemo/Hillshade.tif
Output format	GeoTIFF
Z factor	1.0
X Add result to project	
Illumination	
Azimuth (horizontal ang	gle) 300.00 🚔
Vertical angle	40.00
	OK Cancel

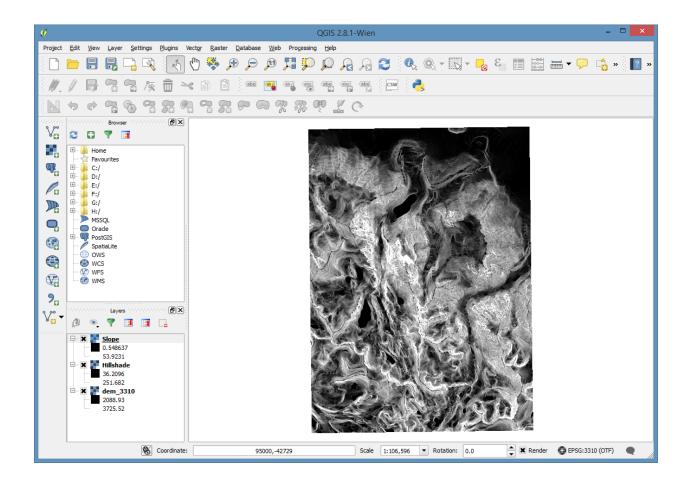


### 7.1.4 Generate a Slope

The slope is calculated in degrees.

#### Go to Raster, Terrain Analysis, Slope

10	Slope ? ×
Elevation layer Output layer	dem_3310 ▼ ts/qgisDemo/Slope.tif
Output format	GeoTIFF 🔹
Z factor X Add result to project	1.0 :t
	OK Cancel



### 7.1.5 Styling

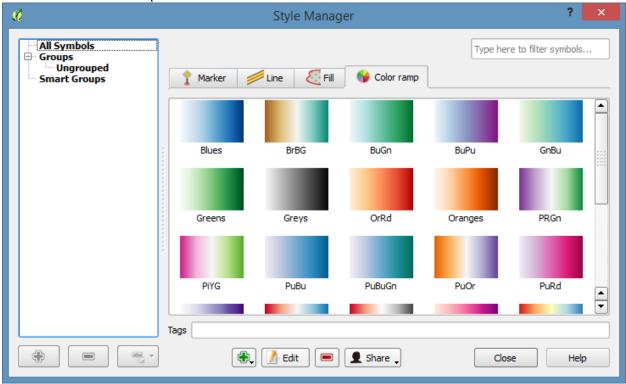
By default many of the best color ramps for displaying terrain aren't turned on.

To turn them on, we'll use the **Style Manager**.

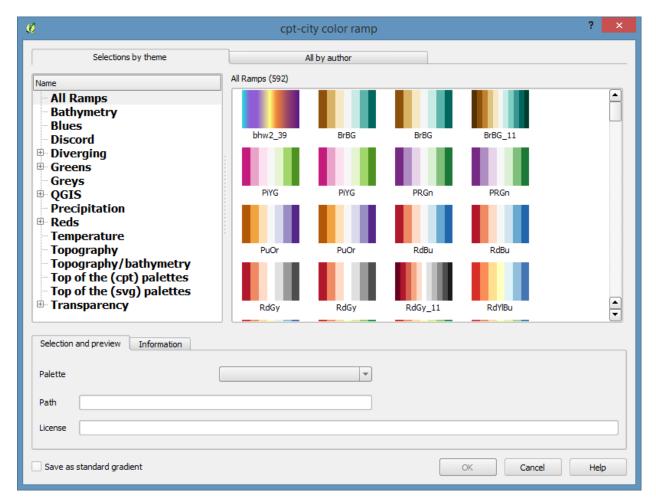
Open the Style Manager by going to the Settings manu, and selecting Style Manager

×.		Style	e Manager				? ×
All Symbols Groups Ungrouped Smart Groups	1 Marker	💋 Line	Fill (	💡 Color ramp	Ту	/pe here to filter s	ymbols
	Ŧ	Î	⊙	0	0	\$	
	airport	arrow	capital	circle	city	diamond	
	0	۲		*	*	*	
	ellipse	pentagon	square	star	star2	star3	
	triangle	triangle2					
	Tags						
		🕀 🚺 Edi	t 🔲 👤	Share 🖵		Close	Help

Then select the "Color Ramp" tab.

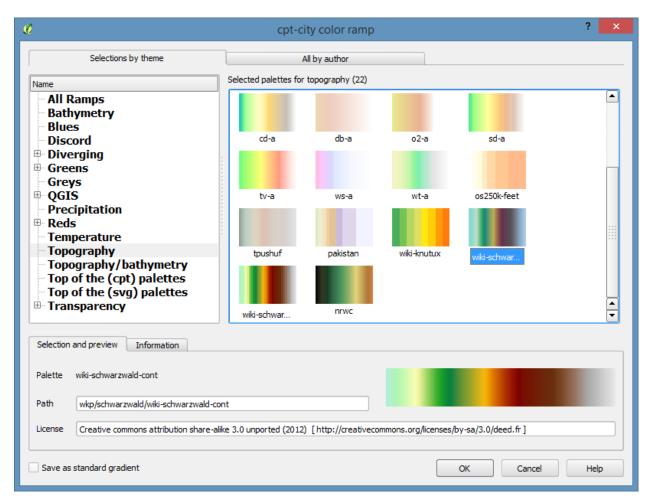


Click on the little green + sign to add a new style and select cpt-city



Then select the **Topography** section.

Scroll down to pick the **wiki-schwartzwald-cont** color ramp.



Then click **OK** and accept the default name for the gradient and close the style manager.

Last, let's apply it to the dem.

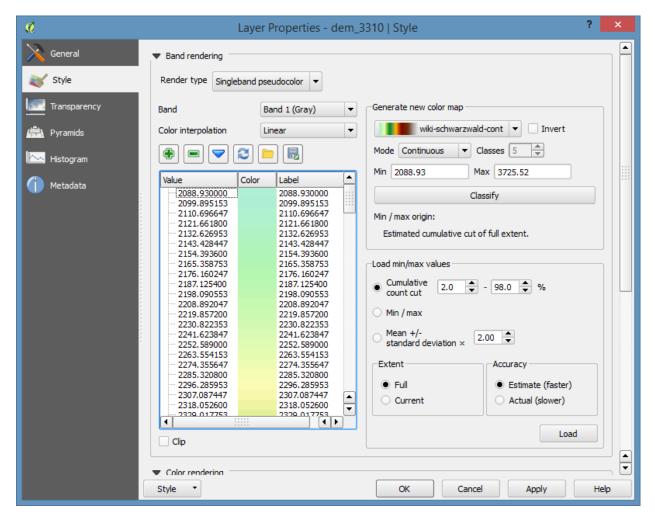
Turn off or reorder the layers so that the dem is visible. I suggest leaving the hillshade on top of the dem.

ø	QGIS 2.8.1-Wien – 🗆	×
Project Edit View Layer Settings Plugins V	Vect <u>or R</u> aster <u>D</u> atabase <u>W</u> eb Processing <u>H</u> elp	
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Browser         VC         Pavourites         P		
Coordinate:	: 89556,-51698 Scale 1:106,596 V Rotation: 0.0 K Render OEPSG:3310 (OTF)	

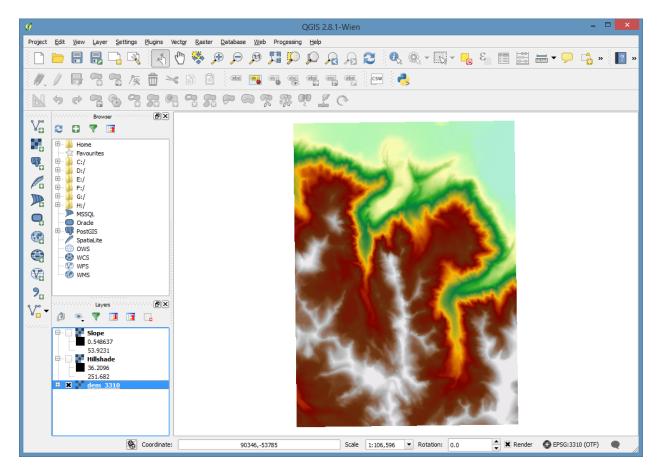
Double click on the dem layer and go to the layer's Style properties page.

Ceneral <ul> <li>Band rendering</li> <li>Render type Singleband gray</li> <li>Gray band</li> <li>Band 1 (Gray)</li> <li>Gray band</li> <li>Gray band</li> <li>Band 1 (Gray)</li> <li>Color gradient</li> <li>Black to white</li> <li>Color gradient</li> <li>Black to white</li> <li>Contrast</li> <li>Contrast</li> <li>Contrast</li> <li>Stretch to MinMax</li> <li>Extent</li> <li>Actual (slower)</li> <li>Load</li> </ul> <li>V Color rendering</li> <li>Blending mode</li> <li>Normal</li> <li>Contrast</li> <li>Contrast</li> <li>Contrast</li> <li>Color rendering</li> <li>V Color rendering</li> <li>Blending mode</li> <li>Normal</li> <li>Contrast</li> <li>Con</li>	. K	Layer Properties - dem_3310   Style	×
Blending mode Normal   Brightness  Contrast  Contrast	Style Transparency Pyramids Mistogram	Render type Singleband gray   Gray band Band 1 (Gray)   Color gradient Black to white   Min 2088.93   Max 3725.52   Contrast Stretch to MinMax   enhancement Stretch to MinMax	
Style   OK Cancel Apply Help		Blending mode Normal   Brightness 0   Saturation 0   Image: Colorize 0   Image: Colorize Image: Colorize   Image: Colorize <td< th=""><th></th></td<>	

Set the **Render type** to **Singleband pseudocolor**, and under "Generate new color map" pick the **wiki-schwartzwald-cont**. Then click the **Classify** button.



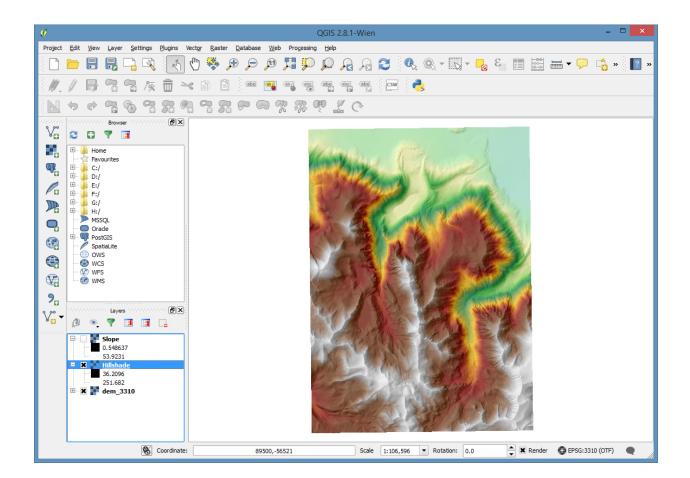
Now, Click OK



One last step. Let's open the properties for the hillshade layer and go to the **Transparancy** settings. Set the transparancy to about 70%

. K	Layer	Properties - Hillsh	ade   Tran	nsparency ? ×
General	Global transparency			▼ No data value
💓 Style				X No data value: -9999
Transparency	None	70%	Full	Additional no data value
	<ul> <li>Custom transparency</li> </ul>	options		
🚔 Pyramids	Transparency band			▼
Kistogram	Transparent pixel list			
() Metadata	From To		Percent	t Transparent
			_	
	Style 🔻			OK Cancel Apply Help

And click **OK** again. Then turn the layer on.



## 7.2 Raster Math

### 7.2.1 Reclassifying Datasets

First, we need to create some reclassified rasters from our existing DEM and Slope layers.

I've prepared some reclass text files to help us with this. Download these and put them in the same folder as your sample data.

DEM Reclass

Slope Reclass

Working through the Slope as an example. The DEM will work exactly the same way.

Open the Processing menu, and select Toolbox

Then at the bottom of the new window that opens select the Simple interface and switch it to Advanced interface.

1.	QGIS 2.8.1-Wien	- 🗆 🗙
Project <u>E</u> dit <u>V</u> iew <u>L</u> ayer <u>S</u> e	ettings <u>P</u> lugins Vect <u>o</u> r <u>R</u> aster <u>D</u> atabase <u>W</u> eb Pro <u>c</u> essing <u>H</u> elp	
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Open the GRASS commands, and the Raster (r.\*) sections and navigate down to r.reclass

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Double click on the tool to open the dialogue. Fill out the settings, making sure to select the correct input layer, reclass file, and set the output file.

🦸 r.reclass - Creates a new map layer whose category values are based up ?	
Parameters Log Help	
Input raster layer	
Slope [EPSG:3310]	
File containing reclass rules [optional]	
D:\Projects\qgisDemo\slope_reclass.txt	
GRASS region extent (xmin, xmax, ymin, ymax)	
[Leave blank to use min covering extent]	
GRASS region cellsize (leave 0 for default)	
0.000000	
Output raster layer	
D:/Projects/qgisDemo/slope_rcl.tif	
X Open output file after running algorithm	
0%	
Run Close	

After clicking OK, the process will run and it will be added to the table of contents. Repeat the process for the DEM using the DEM's reclass file.

For convenience, I've renamed the layers to the file name from the default that names that they have when added to the table of contents.

### 7.2.2 Raster Calculator

Map Algebra is then very simple.

Open the Raster menu and select Raster Calculator

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And build your map algebra function and set the output file.

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Then change the style on the layer to reflect the resulting classes. I used the **Singleband pseudocolor** renderer and added the values individually.

- 11: Low Slope, Low Elevation
- 12: Low Slope, High Elevation
- 21: High Slope, Low Elevation
- 22: High Slope, High Elevation

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### Resources

### 8.1 User Manuals

The official documentation http://www.qgis.org/en/docs/

## 8.2 Other Tutorials

http://docs.qgis.org/2.2/en/docs/training\_manual/ http://www.qgistutorials.com/en/ http://maps.cga.harvard.edu/qgis/

## 8.3 Advanced Materials

QGIS API documentation http://www.qgis.org/api/ PyQGIS Cookbook for python programming in QGIS http://docs.qgis.org/testing/en/docs/pyqgis\_developer\_cookbook/ QGIS Plugin Development http://anitagraser.com/tag/plugin-development/

CHAPTER 9

Sample Data

Sample Data(10.5MB)