





NMFMA Fall 2018 QGIS Workshop

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Part A. Introduction to QGIS

<u>1. QGIS</u>

- QGIS is a free and open source cross-platform (Windows, Mac OS, Linux, BSD, and Android) Desktop Geographic Information System (GIS)
- QGIS can help users create, edit, visualize, analyze, and publish geospatial data
- QGIS integrates with other open source GIS packages, including but not limited to PostGIS, GRASS GIS, and MapServer
- QGIS supports shapefiles, coverages, <u>personal geodatabases (only feature class)</u>, many raster formats, and many other formats

2. QGIS vs. ArcGIS

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

3. Start to Learn QGIS

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

Part B. Getting Started with QGIS

1. Download QGIS

(1) Go to <u>www.qgis.com</u>.

(2) You will see a webpage looks like this; click "Download Now" to start the download page.

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

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

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2. Install QGIS

(1) Double click the installer you just downloaded; QGIS Setup Wizard should show up, and click Next to start the installation process; you will see the License Agreement, Installation Location, and Components to Install, etc.



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Note: if you are using Mac OS X, click Download for Mac OS X, and then click You can download the installation file (.dmg file) and install it directly. In the past, you have to the QGIS download page <u>http://www.kyngchaos.com/software/qgis</u> to do.

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Note: for Linux please use the following command line sudo add-apt-repository http://qgis.org/debian sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-key CAEB3DC3BDF7FB45 sudo apt update sudo apt install qgis

3. The QGIS Interface and Installing Plugins

(1) Start QGIS Desktop 2.18

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

Status Bar

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



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

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4. Installing Plugins

Many default tools come with QGIS installation. QGIS also has "Plugins" available to help the users with base maps and geoprocessing tools. One of the great benefits of QGIS is the active communities who support it by developing plugins that extend the application's functionality. (1) Click the "Plugins" in the Menu Bar and then go to Manage and Install Plugins



(2) One example is provided to show how to install plugins. In the Plugins dialogue, under the All Plugins, search for XyTools Plugin, and install it.

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		Close Help

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



(4) Some great plugins that you should consider

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

Part C. Working with Vector Data

1. Adding Vector Data

(1) Open QGIS Desktop application.

(2) Navigate to the folder of QGIS_Workshop >>> Part_C >>> FEMA_NFHL.

(3) Click on the S_FLD_HAZ_AR.shp and drag and drop it into your map area; you can also use the Add Vector Layer tool to add the layer; another option is using the Browser Panel to add data. Note: To quickly locate .shp files, use the file type filter.

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

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2. Attribute Table

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

(2) Left-click on Open Attribute Table.

(3) The organization of the attribute table is similar to ArcMap.

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

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



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

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

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(7) Users can also sort a field by right-click on the field name and then select Sort. Another simple way is left-click on the field name then it will automatically sort descending or ascending.
(8) To see the summary statistics of a field, use the "Basic statistics for numerical (or text) fields" tool in Vector >>> Analysis Tools, users can also use the Statist plugin for the same function.
(9) To rearrange the order of the fields, users need to install the Table Manager plugin.

3. Styling Vector Data

(1) Double-click on the S_FLD_HAZ_AR within the Layers Panel to bring up the layer's property dialogue. The default tab is Style.

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(2) Many symbology options are available, including

- Single symbol
- \circ Categorized
- \circ Graduated
- o Rule-based
- Inverted polygons
- o 2.5D.

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

- (3) Select FLD_ZONE for Column.
- (4) Select Random colors for Color ramp.
- (5) Left-click on Classify. The symbols for different categories will display. Click OK.

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V	* X A X AE					A R	
-	- X AD - X D			X Z		a site	
•					CAPP-14	- tota	
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tia .							
18	6						
M2							
. ¥.	Coordinate	-106,962,35.5	17	🏶 Scale 1:393,822 🔹	Hagnifier 100%	0.0 🕄 🗙 Render 🔘 EPSG-4389	q

(6) QGIS can also concatenate two fields (strings) for symbolization. Click the $\boxed{\varepsilon}$ button at the

end of the Column row to start Expression dialog. Repeat previous steps for symbolization.



4. Labeling Vector Data

(1) Double-click on the S_FLD_HAZ_AR within the Layers Panel to bring up the layer's property dialogue. Select Labels.

(2) Select "Show labels for this layer."

(3) Label with "FLD_ZONE."

🧭 Layer Properties - S_FLD_HAZ_AR Labels	? *
General General	s layer 💌 🐟
Style Label with abc FLD_Z	DNE E
▼ Text/Buffer sam	ple
Fields	
V Rendering	
Display	
Actions	Text Font MS Shell Dlg 2
Diagrams	Style Normal
Metadata Metadata Metadata Metadata Metadata	U E E E I E Size 8.2500 € E I E
	Points
	Color 📮
	Transparency 🖓 👘 💭
	Type case No change
Style 🔻	OK Cancel Apply Help
V QUES 2.18.16 Project 555 Sieve Laver Settings Blagins Wolgr Baster	Catabase Web Propensing tels Catabase Web Propensing tels 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이
1.1日常后*常友自*6	
Va C Y If O	
	MIX AD
8 	Scale 1:3,941 ● Magnifer 100% Rotation 0.0 X Rander C EPSG:4269

5. Creating New Vector Layers

(1) Click the New Shapefile Layer button; make sure the current selection is New Shapefile Layer because this tool can also be used to create New SpatiaLite Layer, New GeoPackage Layer, and New Temporary Scratch Layer. The New Shapefile Layer dialogue should display. Fill in the Name for the New Field, Type, and other information. Click Add to fields list. Click OK.

	New Shapefile La New SpatiaLite La New GeoPackage New Temporary S New Temporary S AO	yer C ayer Layer Scratch Layer	Layers Panel			
🥖 New Sh	apefile Layer			8		
Туре						
O Poin	it (🔾 Line	• P	blygon		Select the type for the new shapefile.
File encodi	ng	System			-	
Selected	CRS (EPSG:4326, WC	GS 84)		•	٠	
New fie	ld					
Name	Area					
Туре	Decimal number				-	
Length	20	Precision 7				
		16	Add to fields l	ist		
-Fields li	ct.					
				1	_	
Name	Type	r 10	ith	Precision	_	
SiteNa	me String	. 10				
•				•		
				膭 Remove field		This can be used
						to remove fields.
		OK	Cano	ei Help		

(6) The Save layer as dialogue will display. Type in Study_Sites as the layer name. Make sure the layer will be saved in QGIS_Workshop >>> Part_C >>> FEMA_NFHL folder.

💋 Save layer as						X
QGIS_W	/orkshop 🕨 l	Part_C FEMA_NFHL		•	Search FEMA_NF	HL 👂
Organize 🔻 New fol	der					₩= ▼ (?)
Favorites		S_BASE_INDEX SHP File 2.62 KB	S_BFE SHP File 148 KB		S_FIRM_PAN SHP File 211 KB	
 Dropbox Google Drive 		S_FLD_HAZ_AR SHP File 13.8 MB	SHP File 7.16 MB		SHP File 91.3 KB	
ScanSnap Fold		S_LABEL_LD SHP File 6.58 KB	S_LABEL_PT SHP File 13.1 KB		S_LEVEE SHP File 28.6 KB	E
Documents		S_LOMR SHP File 30.3 KB	S_NODES SHP File 240 bytes		S_POL_AR SHP File 0.98 MB	
Music Pictures Subversion		S_PROFIL_BASLN SHP File 477 KB	S_STN_START SHP File 604 bytes		S_SUBMITTAL_INFO SHP File 21.7 KB	
Videos 👻		S WTR LN	s xs			-
File <u>n</u> ame: Stud	dy_Sites		 			
Save as <u>t</u> ype: ESRI	Shapefile [O	GR] (*.shp *.SHP)				•
Hide Folders					Save	Cancel

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

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

	 ✓ ▲ ● ▼ 4 	Layers Panel	energieren er	7×
	X Study Site S FLD-HA A A A A A A A A A A A A A A A A A A	 Zoom to Layer Show in Overview Remove Duplicate Set Layer Scale Visibility Set Layer CRS Set Project CRS from Layer Styles Open Attribute Table Toggle Editing Save As Layer Definition File 		
2 . ×		Show Feature Count	-	
Toggles t	he editing state of the Co	Properties Rename	4.891	8

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



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

(11) The Feature Attributes dialogue will display.

(12) Type in the attributes value. For the Area field, just type in a random number for now. Click OK to finish the first feature.

Study_Sites -	Feature Attributes	X
id	1 🚳	
SiteName	Su_Demo 🚳	
Area	50.5	
	OK Cancel	

(13) To calculate the real area for the feature your just create, you need to update the existing area field. To do this, you need to set your current project's coordinate system to a projected coordinate system; otherwise it will give you a "arcsec" value for area.

(14) Go to Project >>> Project Properties >>> CRS >>> select NAD 83 UTM zone 13 N.

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

(16) Select "Update existing field", and then select \$area. Click OK.

🕺 Field calculator		?	×
Only update 0 selected features			
Create a new field	Update existing field		_
Create virtual field			
Output field name			
Output field type Whole number (integer) 💌	Area		•
Output field length 10 🗣 Precision 0 🔦			
Expression Function Editor			
= + - / * ^ () '\n' Sear	dh	function \$area	
\$area /1000000	row_number Aggregates Color Conditionals Conversions Date and Time Fields and Values Fuzzy Matching General Geometry — angle_at_vertex — \$area — area — azimuth — boundary — bounds_height ▼	Returns the area of the current feature. The area calculated by this function respects both the current project's ellipsoid setting and area unit settings. Eg, if an ellipsoid has been set for the project then the calculated area will be ellipsoidal, and if no ellipsoid is set then the calculated area will be planimetric. Syntax \$area Examples • \$area → 42	
	-	or or other	
	L	OK Cancel Hel	p

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

Ø	Study_Sites :: Fea	tures total: 1, filtere	d: 1, selected: 0	- • •
	/ 🗾 📑 😂	🛱 💼 🗧	N 💊 🔫 🛛	🏗 🌺 💭 »
1	23 id 🔻 =	3	▼ Update All	Update Selected
	id	SiteName	Area 🗸	
1	1	Su_Demo	4.2482984	
				-
L				
Ļ				
	Show All Features	•		

(18) When done, click the "Save Layer Edits" button in the Digitizing Toolbar.



6. Editing Features

(1) In editing mode, click the "Node Tool" button in the Digitizing Toolbar.



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



(3) When done, click the "Node Tool" button again to stopping editing.

(4) Click the "Save Layer Edits" button to save your edits.

(5) Like ArcMap, your area geometry value will not be updated automatically. You need to recalculate it after you make changes.

7. Data Query Based on Attributes

(1) Open the attribute table of the $S_FLD_HAZ_AR$ layer.

(2) Click on the "Select features using an expression."

🧖 s	🕺 S_FLD_HAZ_AR :: Features total: 1429, filtered: 1429, selected: 0						
/	7 B 2 B	ê 🗧 🗎	N 💊 🍸 🔳	🗣 🔎 🖻 🖻		-	
	DFIRM_ID	VERSION_ID	FLD_AR_ID	STUDY_TYP	FLD_ZONE	ZONE_SUBTY	SFHA_TF
1	35001C	1.1.1.0	35001C_1	NP	AO		т
2	35001C	1.1.1.0	35001C_2	NP	AO		Т
3	35001C	1.1.1.0	35001C_3	NP	AH		Т
4	35001C	1.1.1.0	35001C_4	NP	AH		Т
5	35001C	1.1.1.0	35001C_269	NP	A		Т
6	35001C	1.1.1.0	35001C_270	NP	AH		т
7	35001C	1.1.1.0	35001C_271	NP	AH		т 🔺
•				1	I		
	T Show All Features						

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

🕺 Select by e	xpression - S_FLD	_HAZ_AR		? 💌
Expression	Function Editor	1		
=+•/* "FLD_ZONE"	n () ^ - 'A'	Search ⊕ Aggregates ⊕ Color	-	group Field Double click to add field name to expression string.
	••	Conditionals Conversions Conv		Right-Click on field name to open context menu sample value loading options. Notes Values Search 'A' 'AE' 'AH' 'AO' 'D' 'Z' Load values all unique 10 samples
Four options, including Select, Add to selection, Remove from selection, and Select from selection				

- (4) Browse the Fields and Values to select the FLD_ZONE, double-click on it.
- (5) Click the "=" sign under "Expression."
- (6) Click "all unique" next to "Load Values."
- (8) Click on Select
- (9) Go to the mapping area and users can see selected features will be highlighted in yellow color.



8. Data Query Based on Location

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

Note: at least two vector layers are required for this tool.

- (2) The Spatial Query dialogue will display.
- (3) Select S_FLD_HAZ_AR for "Select source features from."

(4) Select Intersects for "Where the feature."

(5) Select Study_Sites for "Reference features of."

Select Create new selection for "And use the result to."

(6) Click Apply.

(7) In the result dialogue, select "Zoom to item" to see the selected feature.

(8) Users can also click on "Create layer with selected" or

"Create layer with listed items" to create a feature layer.

	🕺 Spatial Query 💦 💽
	Select source features from
	∽ S_FLD_HAZ_AR ▼
"	Selected geometries
	Where the feature
	Intersects 👻
	Reference features of
	💬 Study_Sites 💌
	Selected geometries
	And use the result to
	Create new selection
	Close Apply
	? <mark>*</mark>
fea	ture ID's
que	ery 🔻

🔏 Spatial Query	-? <mark>-</mark> ~
Select source features from	Result feature ID's
∽S_FLD_HAZ_AR ▼	Result query 💌
X 1 selected geometries	1185
Where the feature	
Intersects 🔹	
Reference features of	
◯ Study_Sites ▼	
Selected geometries	
And use the result to	Create layer with listed items
Create new selection	Create layer with listed items
Create layer with selected	1 of 1429 identified
Selected features	X Zoom to item
1 of 1429 selected by "Create new selection"	Log messages
	Close Apply

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

Select by location		? ->
Parameters Log	Run as batch process	Select by location
Layer to select from		This algorithm creates a selection in a vector layer.
S_FLD_HAZ_AR [EPSG:4269]	▼ 🄊	The criteria for selecting features is based on the spatial relationship between each feature and the
Additional layer (intersection layer)		features in an additional layer.
Study_Sites [EPSG:4326]	▼ 🔊	
Geometric predicate		
X intersects touches		
contains overlaps		
disjoint within		
equals crosses		
Precision		
0.000000	—	
Modify current selection by		
creating new selection	▼	
	0%	
		Run Close

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



9. Table Join

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

(1) Add the NMCounty_Boundary shapefile located in QGIS_Workshop >>> Part_C >>> NMCounty_Boundary folder.



(2) Add the NMCounty_Population file located in QGIS_Workshop >>> Part_C >>> NMCounty_Population folder. Click "Add Delimited Text Layer" button. In the "Create a Layer from a Delimited Text File" dialogue, browse to the location of the .csv file. Provide a layer name, select CSV for file format, select 7 for Number of header lines to discard, check on First record has field names, and then select No geometry. Click OK.



🌠 Ci	reate a Layer fron	n a Delimited Tex	t File			? <mark>×</mark>
File I	Name C:/Users/s	zhang/Desktop/QG	IS_Workshop	/Part_C/NMCounty_Population/NMCoun	ty_Population.csv	Browse
Laye	r name NMCount	ty_Population			Encoding UTF-8	-
File f	format 🛛 🔍	CSV (comma sepa	arated value	s) 🔘 Custom delimiters	Regular expression	delimiter
				_		
Reco	ord options Nu	umber of header lin	es to discard	7 🚔 🗶 First record has field na	mes	
Field	options	Trim fields	iscard empty	fields 🗌 Decimal separator is comma		
Geor	metry definition 🤇	Point coordinates	;	O Well known text (WKT)	No geometry (attribute	only table)
Laye	er settings] Use spatial index		Use subset index	Watch file	
	COUNTY_CODE	COUNTY_NAME	POP2010			
1	35001	Bernalillo	662564			
2	35003	Catron	3725			
3	35005	Chaves	65645			
4	35006	Cibola	27213			
5	35007	Colfax	13750			
6	35009	Curry	48376			-
				OK	Cancel	Help

(3) Right-click on the NMCounty_Boundary layer and then left-click on Open Attribute Table. Browse the table and find the unique IDs for each county (GEOID10).

Ø	N	MCounty_Boundary	/ :: Features total: 3	3, filtered: 33, select	ted: 0				x
/		z 🗟 🔁 🛱	ê 🗧 📔	5 😼 🍸 🔳	🏘 🔎 🖻 🖪		-		
		COUNTYFP 10	CBSAFP 10	STATEFP 10	MTFCC10	GEOID 10	id	INTPTLON 10	P
1	99	021	-9999	35	G4020	35021	18611109	-103.8299311	
2	99	051	-9999	35	G4020	35051	18611110	-107.1881607	
3	99	025	26020	35	G4020	35025	18611111	-103.4132707	
4	99	019	-9999	35	G4020	35019	18611112	-104.7849677	
5	99	057	10740	35	G4020	35057	18611113	-105.8468361	
6	99	017	43500	35	G4020	35017	18611114	-108.3815043	
7	99	035	10460	35	G4020	35035	18611115	-105.7810785	
•	.1	I	I	I	1			••	j
	Sł	how All Features							

(4) Close the attribute table.

(5) Right-click on the NMCounty_Boundary layer and then left-click on Properties. Click Joins on the Layer Properties dialogue. Then click on the Green Plus (+) sign.

🄏 Layer Properties - NMCc	ounty_Boundary Jo	ins					? <mark>×</mark>
🤀 General	Join layer	Join field	Target field	Memory cache	Prefix	Joined fields	
ኛ Style							
(abc Labels							
Fields							
≼ Rendering							
🧭 Display							
Actions							
• Joins							
Diagrams							
🧿 Metadata							
8 Variables	2						
E Legend							
	f = /	7					
	Style 🔹			ОК	Cancel	Apply	Help

(6) In the "Add vector join" dialogue, select NMCounty_Population for "Join layer", select COUNTY_CODE for "Join field", and select GEOID10 for Target field.

🕺 Add vector join	? 💌
Join layer	NMCounty_Population
Join field	123 COUNTY_CODE
Target field	abc GEOID 10 🗸
Cache join layer in virtual memory Create attribute index on join field	
Choose which fields are joined	
Custom field name prefix	
	OK Cancel

(7) Click OK.

(8) In the Layer Properties dialogue, it should show that the layer is appropriately joined. Click Ok to close the dialogue.

🌠 Layer Properties - NM	٥CN	unty_Boundary Joins						? <mark>- x -</mark>
🔀 General	A	Join layer	Join field	Target field	Memory cache	Prefix	Joined fields	
		MCounty_Population	COUNTY_CODE	GEOID 10	~		all	
(abc Labels								
Fields								
🞸 Rendering								
🧭 Display								
Actions		· · ·						
• Joins								
Diagrams		+ - /						
G Metadata	•	Style 🔻			OK	(Cancel Apply	Help

(9) Open the attribute table of the NMCounty_Boundary layer again.

(10) You can see that the two fields in the population layer are joined with the boundary layer.

(11) Right-click on the boundary layer and click on "Save As" to permanently save the joined layer (as ArcMap).

10. Vector Data Analysis

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

🕺 Save vector layer as	? 💌
Format ESRI Shapefile File name darv/NMCounty Bi	oundary w Pop.shp Browse
Layer name	
CRS Selected CRS (EPS	G:4326, WGS 84) 🔻 🌏
Encoding	System 🗸
Select fields to export a	and their export options
X Add saved file to map	
Symbology export	No symbology
Scale	1:50000
▼ Geometry	
Geometry type	Automatic 💌
Force multi-type	
Include z-dimension	
Extent (current: laye	er)
Layer Options	
RESIZE NO	▼
SHPT	•
Custom Options	[]
ОК	Cancel Help

Part D. Working with Raster Data

1. Adding Raster Data

(1) Click "Add Raster Layer" button in the "Manage Layers Toolbar."



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

🌠 Open a GDAL Suppor	rted Raste	er Data Source							×
🔾 🗢 🖉 🖉 🖉	S_Worksh	iop ▶ Part_D				▼ ⁴ 7	Search Part_D		٩
Organize 🔻 New	folder								0
🔶 Favorites	^ N	lame	*	Date modified	Туре	Size			
🧮 Desktop		NM_DEM		2/23/2018 6:04 PM	ERDAS IMAGINE d	47,774 KB			
 Downloads Dropbox Google Drive ScanSnap Folde Recent Places 	E								
 □ Libraries □ Documents □ Music □ Pictures □ Subversion ■ Videos 									
1툎 Computer	+ File <u>n</u> ame	NM_DEM				•	Erdas Imagine Images	(*.img * Cancel	• • •

(3) Click Open to open the New Mexico DEM file.



2. Styling Raster Data

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

(2) In the Layers Properties dialogue, click on the Style tab. Change the "Render type" to Singleband pseudocolor. Select Spectral for "Color", and check on Invert. Click OK.

🌠 Layer	Properties - N	IM_DEM Style						? <mark>×</mark>
\mathbf{i}	Band rend	dering						^
*	Render type	Singleband pse	eudocolor 🔻					
1000	Band	Band 1						▼ ##
1993		Min	0		Max		2384	
	Load mir	n/max values						[_]
	Interpolation	Linear						•
	Color	Spe	ctral ·	•	Edit	X Invert]	
÷	Label unit suffix							
	Min / max origin:	Estimated cumul	ative cut of full extent.					
	Value	Color	Label					
I	0 596 1192 1788 2384		0 596 1192 1788 2384					
	Style 🔹				ОК	Cancel	Apply	Help

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

×	Band rend	ering						•
*	Render type	Singleband pseudocolor	•					
	Band	Multiband color Paletted		~			•	
1	Load min	Singleband gray Singleband pseudocolor Hillshade		0	Max	2384		

(5) Users can also create a hillshade from the DEM by selecting Hillshade for "Render type." Change the Z factor to 5 or 10 or even larger to exaggerate the elevation difference.

 Band rendering 				
Reider type I slad	ade .	•		
Band	Bond I.			
Attructe (degroups)	45.00			\$
			153	
Azmuth (Jegresi)			mel	
	315-00			
Z Fisctur Multidirectornal	5.0000000			
Color rendering				
Siendrig made Nor	nd .		2	** Roset
bogimes -	- 0	d 1 \$	Contrast	 0 \$
Estantion	-0-	a 🔹	Gravacale Off	
the Od	olorus	bengh		-0 [zers]\$j



2. Raster Data Analysis

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

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

Processing Toolbox	X
r.null - Manages NULL-val	
r.out.gridatb - Exports GR.	
, out.ppm - Converts a ra	
r.out.vrml - Export a rast	
, param, scale - Extracts t	
r.patch - Creates a compo	
🗸 🔬 r.plane - Creates raster pl	
r.profile - Outputs the ras	
🔬 🕺 r quant - Produces the qu	
🗸 🔬 r. quantile - Compute quan	
🚽 🐺 r.random - Creates a rast	
🛛 🔬 r.random.raster - Create	
🛛 🔬 r.random.surface - Gener	
📎 r.redass - Creates a new	
🖳 📎 r.redass.area.lesser - Re	
🖳 🤍 r.recode - Recodes categ	
🖳 📎 r.regression.line - Calculat	
🛛 🧼 r.regression.multi - Calcul	
🛛 🧼 r.relief - Creates shaded r	***
🚽 🤍 r.relief.scaling - Creates s	
🛛 🧼 r.report - Reports statistic	
🚽 🧼 r.resamp.bspline - Perfor	
🛛 💥 r.resamp.filter - Resample	
🗝 💥 r.resamp.interp - Resampl	
🖤 💥 r.resamp.rst - Reinterpola	
🖤 💥 r.resamp.stats - Resampl	
🛛 💥 r.resample - GRASS raster	
🛛 💥 r.rescale - Rescales the ra	
www.www.r.rescale.eq - Rescales his	
🖤 💥 r.rgb - Splits a raster map	
🗸 🦞 r.ros - Generates rate of	
🖤 💥 r.series - Makes each out	
🖤 💥 r.series.accumulate - Mak	÷.
	Ŭ
You can add more algorithms to the toolbox	,
enable additional providers. [close]	

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



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



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

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



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



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

(8) Add the Bernalillo layer in the QGIS_Workshop >>> Part_D folder.

Control Emiliar E <	1.20	
	2	

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

🌠 Clipper		? ×	
Input file (raster) NM Output file Wo	1_DEM	Select	
Cipping mode Extent Mask layer Bernalillo	Mask layer	lect	
Crop the extent o Keep resolution o Load into canvas when	of the target dataset to the extent of the input raster O Set output file resol	e cutline ution	
gdalwarp -dstnodata 0 -(\Users\szhang\Desktop\ 100.0 100.0 -of GTiff C: \Users\szhang\Desktop\ C:/Users/szhang/Desktop	q -cutline C: QGIS_Workshop\Part_D\Bernalillo.shp -1 QGIS_Workshop\Part_D\NM_DEM.img ıp/QGIS_Workshop/Part_D/Bernalillo_DE	tr Ø.tif	Finished EX
	OK Close	Help	ОК

Note: QGIS 2.18.16 has a bug that leads to this tool not working appropriately for .img file. It should be resolved in the future version.



- 1. Add the layers in QGIS_Workshop >>> Part_E folder.
- 2. Table Join population data to county boundary data. Use Graduated for symbolization.
- 3. Click Project
- 4. Click on New Print Composer
- 5. Type in a name for your composer.

🌠 Composer title 🛛 🔋 💌				
Create unique print composer title (title generated if left empty)				
Title already exists!				
Demo QGIS				
OK Cancel				

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

C Demo QGB		0	
	a e	6. B + + - + +	ol -
ر معظ به به به	Iteres Core	mand history Conversed history	×
	 campity> 		
	Composition	Illers properties Afles generation Composition	×
	♥ Poge size	£2	- 1
To 8:	Presets	A4 (210x297 mm)	6
En 1	Height	(2010) (*)	6
	Units	(m)	Ð
12	Orientation	Landscape	6
2a -	▼ Resize p	age to content Top margin (mm) 0.00	
	Lett	0.00 🔹 Right 0.00	В.
*		Batton a.co	

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

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

10. Click Layout and then click Add Shape and then click Add Rectangular to add neatline.



