IGIC 2017 - QGIS WORKSHOP

1

Short Presentation Before getting started! <u>Find workshop Materials zip file here.</u> Link to most recent version of this document.

QGIS features referred to will be in a purple font. Files in "qgis_igic2017" directory referred to will be in a red font.

"Tip Stops," or <u>helpful notes</u>, will appear in a grey box like this one.

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1. Introduction to GUI



Plug Ins:

This one was created by Justin!

🕺 Plugins All (6	(646)		?	×
all 💫	Search indiana			
Installed Not installed Upgradeable Settings	✓ Indiana Open Data Plugn Indiana Open Data Plugn Provides access to approximately 300 vector layers Elevation data Provides access to approximately 300 vector layers Elevation data Indiana, Open, Data, IndianaMap, LiDAR, WMS More info: homepage bug tracker code repositor Author: Justin P. Peters Installed version: 0.1 (in C:\Users\Jacob\.ogis2\pyth Available version: 0.1 (in QGIS Official Plugin Reposition) Available version: 0.1 (in QGIS Official Plugin Reposition) Upgrade all Upgrade all Unretail	gin rector layers a d Elevation da and 30 TB imager 5, ISDP 2, hon\plugins\Indian tory)	and 30 Ita for Ty, LiDA IaMap)	D TB • the R, and
		Close	He	əlp

Time Manager Plugin (8:05)

<u>To View Session History & Errors</u> View>>>Panels>>>Log Messages Panel (just discovered this recently!)

2. Loading & Exploring A Map

A. Loading Data/Layers

>>> Click Add Vector Layer icon:

	This window shou	ld pop up:		
💋 Add vector layer			?	×
Source type				
• File O Director	y 🕜 Databa	ase 🔿 Pi	rotocol	
Encoding UTF-8				-
Source				
Dataset			Brows	e
		<u> </u>	1	
	Open	Cancel	He	elp

>>>Be sure that Source type File is selected.

>>>Click Browse and select: shapefiles/roads.shp from the "Indy" Dataset. >>>Click Open.

>>>Do the same for: buildings.shp,

natural.shp, places.shp, and Stream.shp.

Tip Stop: you can drag the shapefiles into QGIS!

B. Exploring Layer Attributes

				DE DE 104 CE					
		- <u>-</u>		16 16 📖 🕾		1 1		1	1
osm_id	name	highway	waterway	aerialway	barrier	man_made	z_order	other_tags	
17430952	Central Court	residential					3	"tiger:cfcc"=>	
17430963	Crooked Cree	residential					3	"tiger:cfcc"=>	
17430980	Pamona Circle	residential					3	"tiger:cfcc"=>	
17431047	Luzzane Lane	residential		· · · · · · · · · · · · · · · · · · ·			3	"tiger:cfcc"=>	
17431056	Luzzane Lane	residential					3	"tiger:cfcc"=>	
17431061	Luzzane Lane	residential					3	"tiger:cfcc"=>	
17431237		motorway_link					29	"bridge"=>"y	-
17431247		residential					3	"tiger:cfcc"=>	
17431250		service		<u></u>			0	"access"=>"p	
17431276		motorway_link					9	"oneway"=>"	
17431287		residential					3	"tiger:cfcc"=>	
17431466		residential					3	"tiger:cfcc"=>	-
17431471		residential					3	"tiger:cfcc"=>	
17431651		residential					3	"tiger:cfcc"=>	
17431696		unclassified					3	"oneway"=>"	-
17431741	North West St	motorway link					9	"oneway"=>"	-

Bonus: What is another way of getting to the Attribute Table?

Tip Stop: You can make selections from inside the table, add/delete fields, and much more.

C. Identifying Features



>>>Click Open Identify Features icon:

Your cursor will change and will have an "i" attached to the pointer. >>>In the Layers Panel, select the layer you want to investigate. >>>Click on any feature in the selected layer.

Feature	Value
🖻 roads	
🖻 name	West 63rd Street
🕀 (Derived)	
🕀 (Actions)	
i osm_id	17451213
name	West 63rd Street
highway	residential
waterway	
aerialway	
barrier	
naue	2
other_tags	"tiger:cfcc"=>"A41","tiger:c
Mode Current layer	Auto open form

D. Feature Selection/Querying

Feature selection in QGIS will be familiar for those who have experienced it in ArcGIS. It works basically the same way. There are many ways to select data from layers. We will go over a few.

>>>In the Layers Panel, click on the layer of interest.

>>>From the menu bar, click Select Feature by Area: >>>Try clicking on individual features in the selected layer. >>>By holding down the shift or ctrl key, you can select multiple features! >>>You can also draw a rectangle which selects all of the features within it.

A few more ways to select:



>>>Click on the arrow next to the Select Feature by Area button: >>>Try Select Features by Polygon. >>>Draw your own polygon and right click to close it. >>>Explore Select Features by Freehand and Select Features by Radius

```
Tip Stop: The default selection color is bright yellow. If you wish to
change this, go to:
```

Project > Project Properties > General > Selection color

Tip Stop: If you wish to pan around the map while in "selection mode," and if you're using a mouse, you can hold down the middle scroll bar and panaway!

Item of interest: Selection Sets plugin

3. Labeling

For Buildings, what field should we use to label?

A. Using & Changing Labels



>>>Move through the Label editing tabs and explore different ways to change labels.



B. Road Labels



>>>Be sure to have "Live Updates" Checked

C. Scale-Based Labeling



4.Symbology (aka Styling)

A. Changing Colors

>>> Set it to any color of your choice!



B. Draw Effects

Outline style	Solid	Line		\$ A statement of the s
Join style	Bevel			\$ e,
Outline width	0.260000		Millimeter	\$ €.
	0.000000		Millimeter	\$
Onser A, I	0.000000			



C. Rule-Based Symbology: Polygon Layer



₿%/6·% k i × i I 🛅 🗱 Σ 🚠 🗕 🌄 🕶 🅎 🔤 abc ang // / 0 ab abc abc S 🛛 🖧 R R R R 🕷 🗱 🕸 R R 🕸 🖑 Layer Styling Scie Harlos House Ø Nort o Buildi Law Lane buildings \$ B Edit rule Edit rule builder window abc abel Dorms Test Iter U cription 0 Scale range 5 lice Street 🕺 Expression string builder ? X 1:1,000 ~ N3 t 8th Street Dood Expression Function Editor = + - / * ^ II () 'v' "fuilding" = 'dormitory group Field Double click to add field name to expression string. Right-Click on field name to open context menu sample value loading options. Notes Loading field values from WFS layers isn't supported, before the layer is actually inserted, ie. when building queries. 3. Click equal sign button. \blacksquare Simple fill \$ • Values Search kommercial' detached' dormitory' garage' hospital' house' 'industrial' 'mantachure' 'mental_health_clinic' toffice' yubilic' yubilic' 6 -5. Double Click 'Dormitory' • 🖶 - craft - geological - historic - land_area - landuse - landuse - leisure - man_made - military - natural - office - place • ¢ 🗐 🕈 Millimeter 🗢 🚭 6. Click 'OK' -Millimeter 🖨 • . Load values All unique 10 samples Output preview: 0 4. Click "all unique" Cancel Live update Apply 20 -C EF Scale 1:7,860 Rotation • 3857 (OTF) Magnifier Coordinate -9630111,4746030

>>>Double-Click on the 'Dorms' rule to open editing dialog.

A good example of using rule-based symbology.

D. Preset Symbols



E. Rule-Based Symbology: Line Layer

In this lesson, we will edit the symbology in the **roads layer** in order to <u>distinguish between</u> **roads** and **paths**.

>>>Proceed as outlined in <u>lesson 4C</u>. Name existing rule **'Roads.'** Add a rule and name it **'Paths**.'

>>>Change the transparency of the 'Roads' rule to 65% (right-click and select "Change Transparency).

>>>Filter the 'Paths' rule with the following expression: "highway" = 'footway'
>>>Under Simple Line, change the color to any shade of red.
>>>Change the Pen style to 'Dot line'

Check out another way to style layers: Geometry Generator Symbol Layers. (Tapered Rivers)

5. Map Composer

Now we can make a map with QGIS's Map Composer!

A. Basic Composition

Project > New Print Composer

<mark>Project</mark> <u>E</u> dit ⊻iew <u>L</u>	ayer <u>S</u> ettings	_ <u>P</u> lugins	Vector	<u>R</u> aster	<u>D</u> ata
] <u>N</u> ew <u>O</u> pen New From Template Open <u>R</u> ecent	Ctrl+N Ctrl+O •	× ®	· <u>R</u>	- € ₹	- <mark>-</mark>
 Save Save <u>A</u>s Save as <u>I</u>mage DXF Export DWG/DXF Import 	Ctrl+S Ctrl+Shift+S				
A Project Properties	Ctrl+Shift+P				
New Print Composer Composer Manager Print Composers	Ctrl+P				
0 Exit QGIS	Ctrl+Q				
4	6				

(Or Ctrl + P.)

>>>Name the Composer

>>>A new window will open

>>>Click the Add new map icon

>>>Drag the cursor across the canvas to the extent you want the map to appear.

>>>Under Main properties, click "Set to map canvas extent" to sync composer with map

B. Title & Legend

>>Add new label
>>Add new legend

C. Exporting



Inspiration! Gallery of QGIS Cartography

6. Classification & Joins

For this section, we will move to a different dataset - IndianaMap County Census Data.

A. Ratio Classification

We will look at population density in Indiana counties.

>>>New Project

>>>Import shapefile from IN Census Data folder

Change Layer Styling:



The layer is going to "disappear"! But don't be frightened, as I was the first time. It will be invisible until we classify it. See below!

Layer Styling
Census_County_TIGER00_IN
🥪 🚍 Graduated 🗧 🕈
Column "POP2000" / "AREA" ▼ €
Symbol Change
Legend Format 1 - %2 Precision 6 🖨 🗌 Trim
Method Color 🔷
Color ramp [source] Edit Invert
Symbol A Values Legend
▼ 0.00003828 - 0.00003522 0.00000352 0.0000070 ▼ 0.00003522 - 0.0000569 0.000070 0.000070 ▼ 0.00005669 - 0.00015089 0.000070 - 0.000151 ▼ 0.00015089 - 0.00029901 0.000151 - 0.000299 ▼ 0.00029901 - 0.00082513 0.000299 - 0.000825
Mcde Natural Breaks (Jenks) Classes 5 Classify Classify Delete all Advanced
✓ Link class boundaries

Set desired parameters and click "Classify":

Tip Stop: You can also do rule-based, like we did in the Symbology section.

B. Join Tabular Data to Shapefile

I found a great scraped dataset of 2016 Presidential voting data by county:

votes_dem	votes_gop	total_votes	per_dem	per_gop	diff	per_point_diff	state_abbr	county_name	combined_fips
93003.0	130413.0	246588.0	0.37715947248	0.528870018006	37,410	15.17%	AK	Alaska	2013
93003.0	130413.0	246588.0	0.37715947248	0.528870018006	37,410	15.17%	AK	Alaska	2016

I am interested in visualizing the "**per_point_diff**" field. This will show us which counties were more split in the election than others. I grabbed all of Indiana's 92 counties.

***The problem is that <u>when a csv is imported into QGIS</u>, each field is assumed to have a <u>"string"</u> data type. We need to create a sidecar ('buddy') file to accompany the csv. This file will specify the data type of each field. To simplify things, I just kept three fields: **county, fips,** and **per_point_diff.**

This is what the buddy file looks like:

	🤹 🎯	# ¹ 2	9 ¢	k de le	B 6		0
				csvt 🔀	_results_indiana	6_election_	2
	eal"	, "	əger	"int	ring",	"st	

>>>From the Layers Panel on the left, select Add Delimited Text Layer

>>>Specify parameters like so:

				0.]
Laye	er name 2016_elec	tion_result	ts_indiana		Encoding UTF-8
File	format 💽	CSV (com	nma separated value	es) O Custom delimiters	 Regular expression delimiter
	ord ontions Nu	mber of he	ader lines to discard	d 🚺 🚔 🗹 First record has field	d names
Reo	d ontions	Trim field	la 🔲 Discord amor	tu fielde . 💭 Decimal constator is co	
Rec Field	d options	Trim field	ls 📃 Discard emp	ty fields Decimal separator is co	omm a
Rec Fielc Geo	d options in ition	Trim field Point coor	ls 📃 Discard emp rdinates	ty fields Decimal separator is co	omm a No geometry (attribute only table)
Rec Fiel(Geo	d options	Trim field	ls 📃 Discard emp rdinates	oty fields Decimal separator is co	omma No geometry (attribute only tabl
Rec Fiel(Geo Laye	Id options Nu Id options Imetry definition er settings	Trim field Point coor	ls 📃 Discard emp rdinates al index	ity fields Decimal separator is co Well known text (WKT)	omma No geometry (attribute only tabl Watch file
Rec Field Geo Laye	Id options Ind metry definition O er settings county	Trim field Point coor Use spatia	ls Discard emp rdinates al index per_point_diff	ity fields Decimal separator is co Well known text (WKT)	omma No geometry (attribute only tabl
Rec Field Geo Laye	d options nu metry definition o er settings county Adams County	Trim field Point coor Use spatia fips 18001	Is Discard empr rdinates al index per_point_diff 0.52	ity fields Decimal separator is co Well known text (WKT)	omma No geometry (attribute only tabl Watch file
Rec Fiel Geo Laye	Id options Ind ometry definition O er settings County Adams County Allen County	Trim field Point coor Use spatia fips 18001 18003	ls Discard emp rdinates al index per_point_diff 0.52 0.2	ity fields Decimal separator is co Well known text (WKT)	omma No geometry (attribute only tabl Watch file

>>>Let's check the layer's data types. Layer Properties>Fields. >>>Try to drag the csv in and look at the data types. They're all strings!

>>>Now Look at the csv's Attribute Table.

>>>Will the "county" field be the easiest to join? If not, which one would be better?

🕅 🖑 🜠 Layer Properties - Census_County_TIGER00_IN Joins ? 🗙 🕫	P
General Join layer Join field Target field Memory cache Prefix Joined fields	
📚 Style	
Add vector join ? ×	
Fields Join layer 2. specify join	
Join field and target	
Actions Target field layer.	
Joins	
Diagrams Dia	
Metadata Custom field name prefix	
Variables	
3 Click okl	
1. Click '+' sign to add a join	
Style - Style - Style -	

>>>Go to the census data's Layer Properties and to the Joins section.

Now apply graduated symbology technique for the "**per_point_diff**" field! The lighter the county, the more even the political field.

7. Creating Vector Data

Let's see how easy it is to create our own shapefiles!

>>>New Project

>>>Create a Shapefile:

🕺 QGIS 2.18.4		1. Create New Layer
Project Edit View	Layer Settings Plugins Vector Raster P Add Layer > Add Layer > Add from Layers and Groups Add from Layer Definition File > Copy style Paste style > Open Attribute Table F6 > Toggle Editing Save Layer Edits > Qurrent Edits > > Save As Save As Save As Save As Layer Definition File > Remove Layer/Group CtrI+D Duplicate Layer(s) Set Scale Visibility of Layer(s) Set CRS of Layer(s) CtrI+Shift+C	Patabase Web AequilibraE Progessing Help New Shapefile Layer New GeoPackage Layer New Temporary Scratch Layer Oreate new GPX layer Image: Content of the second sec
	Set Project CRS from Layer Properties Filter Ctrl+F Labeling Add to Overview Remove All from Overview Show All Layers Hide All Layers Hide Selected Layers Hide Selected Layers	Type Text data Length 80 Precision Fields list Fields list Fields list Fields list Remove field Fields Cancel Fields Length Fields Length Fields

>>>Name the file whatever you want and save it in the "Vector Creation" folder. >>>Open the attribute table. Oh, nothing there!

>>>Import the IN2014_31001430_06.tif file into QGIS from the Vector Creation>Bloomington Aerial folder. This is a small section of Bloomington. File courtesy of Indiana Spatial Data Portal.

Let's trace some buildings!

>>>Click on the Toggle Editing button to enable the feature editing tool.

>>>Trace a building using the add feature icon **Right click** when you want to finish the polygon.

>>>Fill in the fields as you desire!

>>>Repeat the process for one or two more buildings.

>>>Now use the move feature(s) icon to reposition your polygons.

>>>If you want to a more fine-tuned edit of your polygon select the Node tool . Select a node and move it around as you wish.

>>>Click with to save your layer edits.

>>>You can also copy, paste and cut features! 🛰 🖹 📋

Neat Sidenote

Add OSM roads layer. What's up with Vernal Pike?! <u>Tiff is from 2014!</u> OSM is quick! (Vernal Pike on <u>Google Maps</u>!)

8. Feature Topology

This section will go over **basic topology editing in QGIS**. The software has many advanced features in this area and deserves much more exploration.

A. Snapping

Sometimes we may want to Edit topological features already created. The first step in properly doing so is enabling feature **Snapping**.

First, add in all of the OSM layers from earlier.

Enable Snapping:



Be sure you have the Digitizing Toolbar visible. If not, go to View>>>Toolbar and Select Digitizing Toolbar.



Enable editing on landuse layer and click on the Node Tool, like so:

Now you can edit the polygons by moving the nodes. They will <u>snap</u> more easily to other features. <u>Double-click</u> anywhere on the polygon border to create additional nodes.

B. Advanced Digitizing Toolbar

Right-click in toolbar area. Under Toolbars select 'Advanced Digitizing Toolbar' Rotate Feature:



Simplify Feature:



Notice how the # of nodes decreases as the tolerance goes up. This is a very neat feature!

C. Add Part

Use the Add Part button () to add to an existing polygon.

Tip Stop: Remember, a right click closes the polygon.

D. Split & Merge Features

>>>Be sure snapping is enabled for the landuse layer.

>>>Click Split Features - . - and cut a polygon by selecting two nodes across from one another. You will now see two distinct polygon where there was only one before.

9. Vector Data Formats & Analysis

All the previous sections have been useful and necessary, but now it's time to actually start <u>answering questions</u>. In this section, we will upload Indiana data layers (from IndianaMap) and perform some vector analysis. Along the way, we will explore a few more vector data formats.

Import the 'Vector Analysis/Street

A. Add a Geodatabase File + Query Builder

	Source type				
		atabase 🔿 Protoc	ol		
	Source		· · · · · · · · · · · · · · · · · · ·	2.0	C 1
	Type UK. NTF2		÷	2. Browse to	r files
	Dataset		Browse	Z	
	Op	en 🎽 🕺 Cancel	Help		
Open Directory 3. Locate file	s in project directory:				×
– 🛶 🗸 🛧 📜 « indy_qgis_igica	1017 > Vector Analysis > Street Cer	nterlines	V 🖸 Sea	arch Street Centerlines	Q
Drganize ▼ New folder				= =	- ?
IGIC Workshop ^ Name	^	Date modified	Туре	Size	
📙 Investing		4/14/2017 11:04 A	File folder		
🧵 Job Search					_
Aaster BookMAI					
Music					
Notes					
Pictures		1			
1. Source Type = 'Directory' Add vector layer Source type File Directory C File Directory C C Ype UK. NTF2 Dataset C Dataset C C C Image: County of the state of the sta					

Go to the layer's Attribute Table to determine <u>which field</u> will help us extract the Monroe County streets:

💋 Co	unty_Street_Cer	nterlines_IDHS_I	Dec2015 Count	y_Street_Center	lines_I —		×
/ 1	B 2 8	= 5 %	7 🔳 🗞 👂	0 0 15	16 🖬 😸		
41	ADDMIN_L	ADDMIN_R	DESCRIPT	ORIGIN 💙	ZIPLEFT	ZIPRIGHT	
394958	100	199	Roads	Monroe County	47408	47408	BL
394959	4649	4000	Roads	Monroe County	47408	47408	BL
394960	1500-99	1414	Roads	Monroe County	47404	47404	BL
394961			Roads	Monroe County	47405	47405	BL
394962			Roads	Monroe County	47405	47405	BL
394963	699	600	Roads	Monroe County	47405	47405	BL
394964	-		Roads	Monroe County	47405	47405	BL
394965	199		Roads	Monroe County	47404	47404	BL
394966	2499	2400	Roads	Monroe County	47408	47408	BL
394967	139	100	Roads	Monroe County	47408	47408	BL
394968			Roads	Monroe County	47405	47405	BL
394969	198	101	Roads	Monroe County	47405	47405	BL
394970	199	100	Roads	Monroe County	47404	47404	BL
394971	199	100	Roads	Monroe County	47408	47408	BL
394972	199	100	Roads	Monroe County	47408	47408	BL
•	299	200	Roads	Monroe County	47408	47408	BI▼
Sho	w All Features				-0		

We will use the 'Origin' field. Go to Layer Properties>>>General

Layer Propertie	es - county_stree_centennies_pons_beczons county_stree_centennies_pons_in_c	Set provider filter on County_Street_Centerlines_IDHS_Dec2015 County_Street_Centerlines_IDHS_IN_Dec2015 MultiLineStrin
General	▼ Layer info	Fields Values
Style	Layer name rlines_IDHS_IN_Dec2015 MultiLineString displayed as rlines_IDHS_IN_D	ADDMAX_R Marion County
	Laver source one inic2017/Vector Analysis/Street Centerlines/County Street Centerlin	LOADDATE Marshall County
Labels	cayer addres (agis_great) (recorr Analysis (of sec containings (county_of sec_containin	ADDMIN_L March County
Fields	Data source encoding UTF-8 \$	DESCRIPT Monroe County
		ORIGIN Montgomery County
Rendering	▼ Coordinate reference system	ZIPRIGHT Newton County
Display	Colorted CRE (EREC (26016_NAD92 (UTM zone 16N)	MUNIRIGHT
	Selected CKS (EFSG.20410, NHD65 / OTM 2018 10N)	MUNILEFT
Actions	Create spatial index Update extents	STATERIGHT Use unfiltered layer
		Operators
Diagrame	💌 🗌 Scale dependent visibility —	
Diagrams	Minimum (exclusive) Maximum (inclusive)	= < > LIKE % IN NOT IN
Metadata		
Variables		
	Provider feature filter	Provider specific filter expression (1)
Legend		"ORIGIN" = 'Monroe County'
		2. Type the following
		or select from above
		S.Click lest to run query
		A Click the 'OKs'
	1. Select 'Query Builder'	The clear Clear Clear
		Ouery Builder B - FLOW
		STE W LL

You should now just have Monroe county streets. Now we will <u>save this as a shapefile</u>. >>>Right click on the layer and select 'Save As' NOTE: set CRS to EPSG 102674

💋 Save vec	tor layer as		? ×	Save layer as 2. Navigate to "Created I	Layers" folder	
Format	ESRI Shapefile		\$	← → → ↑ 📜 « Vector Anal > Created La	ayers 🗸 🖸 Sea	arch Created Layers 👂
File name		1. Click 'Browse'	Browse	Organize ▼ New folder		= - ?
Layer name CRS	Selected CRS (EPSG:26916, N	AD83 / UTM zone 16N)	+	OneDrive Name Atom Work Bash work	^ No items match your	Date modified Type search.
Encoding Save or Select Add save	nly selected features fields to export and their exp ved file to map	System		Documents Fall 2016 FOR BOX IGIC Workshop		
Scale	export	1:50000	× ×	Investing	3. Save shapefile	as "monroe_roads"
Geometry	r type e multi-type de z-dimension	Automatic	÷ –	Master BookMAI × < File name: monroe_roads Save as type: ESRI Shapefile [OGR] (*.shp *.S	SHP)	
► Ext	ent (current: layer) Dptions			▲ Hide Folders		Save Cancel
Ħ	HIAR No.	Cancel	Help			Layer blendi Feature blen

Delete the County_Street_Centerlines layer, leaving only our new monroe_roads layer.

B. Add a Geojson layer

>>From this link, click Map Service under the "Schools" layer.
>>Under Layers, select "Schools (MHMP)"
>>Look at the Fields in order to decide how to query the layer.
>>Under Supported Operations (bottom the the page), select "Query"

To get a peek at the data, perform a gener	al query to receive all records in the layer:
--	---

Query: Schools (MHMP)	(ID: 0)
Where: 1. Set general "WHERE" clause	1=1
Text:	
Object IDs:	
Time:	
Input Geometry:	
Geometry Type:	Envelope V
Input Spatial Reference:	
Spatial Relationship:	Intersects •
Relation:	
Out Fields: 2. Receive all attributes	*
Return Geometry:	True False A Resure "ISON" is selected below upder "Format"
Return True Curves:	True False

>>>Be sure '**JSON**' is selected as the Format >>>Click Query (Get) on the bottom for the results. Scroll down to the first records/feature to see what information is provided:

"features": [
{
"attributes": {
"SchoolId": "IN061177",
"EfClass": "EFS1",
"Name": "Theodore Potter School 74",
"Address": "1601 E 10th St",
"City": "Indianapolis",
"Zipcode": "46201-1901",
"Contact": "Indianapolis Public Schools",
"PhoneNumbe": "(317) 226-4274",
"YearBuilt": 0,
"NumStories": 0,
"Cost": 515,
"NumStudent": 0,
"District": "5385",
"Comment": "5574",
"OBJECTID_1": 1,
"GlobalID": "{24068EE6-39D7-4B26-918E-1660CF8229CC}"
},
"geometry": {
"x": 574385.14300000016,
"y": 4403839.3834000006
}
},

City seems to be the attribute we want to isolate in our query. We will type **city='Bloomington'** and keep everything else the same:

Query: Schools (MHMP)	(ID: 0)
Where:	city='Bloomington'
Text:	
Object IDs:	
Time:	

>>>Click Query (Get) on the bottom for the results.

>>>Under Add Vector Layer, this time we will choose **Protocol**, rather than File or Directory.

Source t	:ype			
🔿 File	O Directory	🔘 Database	Protocol	
Encoding	System			\$
Type Ge	eoJSON			\$
	to://maps.indiana.e	edu/arcois/rest/services	s/Infrastructure/Criti	cal_Fa

FINALLY: Save the query as a shapefile with the consistent projected coordinate system: **EPSG 102674**

C. On Your Own

Import fire stations shapefile and use the query builder to isolate monroe county fire stations. Save as shapefile with **EPSG 102674** projection.

Tip Stop: For the Fire Stations & Schools layers, use "SVG Marker" instead of "Simple Marker." This can be done in symbology editor. Choose symbols that best represent the entities.

D. Distance Buffer

Let's answer the question: What schools are not within one mile of a fire station?

Here we will use the Fixed distance buffer tool.



Parameters Log Input layer monroe_fire_stations [EPSG:102674] Distance \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$1 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$1 \$1 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$280 000000 \$1 \$280 000000 \$280 000000 \$280 000000 \$1 \$280 000000 <th>💈 Fixed distance buffer</th> <th></th> <th></th> <th>?</th> <th>></th>	💈 Fixed distance buffer			?	>
Input layer monroe_fire_stations [EPSG:102674] Distance 5280 000000 Segments 5 Dissolve result Buffer [Create temporary layer] Y Open output file after running algorithm	Parameters Log	Run as batch process	Fixed distance	e buffei	r
Segments 5 Image: Dissolve result Buffer [Create temporary layer] Image: Open output file after running algorithm	Input layer monroe_fire_stations [EPSG:102674] Distance		This algorithm computes all the features in an inpu fixed distance.	a buffer are ut layer, usin	ea fo Ig a
5 • ··· Dissolve result Buffer [Create temporary layer] • Open output file after running algorithm	Segments				
[Create temporary layer]	Dissolve result	▼			
	[Create temporary layer]				
					09
			Run	J X∘	los

Now we can use the select by location tool to isolate which schools are <u>not</u> within 1 mile of a fire station. Go to Vector > Research Tools > **Select by location**

Layer to select from monroe_schools [EPSG:102674] Additional layer (intersection layer) Buffer [EPSG:102674] Geometric predicate intersects contains overlaps Gisjoint idisjoint				oolooc by loou doll
equals crosses Precision	Aver to select from monroe_schools [EPSG:102674] Additional layer (intersection layer) Buffer [EPSG:102674] Geometric predicate intersects contains ✓ disjoint	touches		This algorithm creates a selection in a vector layer. The criteria for selecting features is based on the spatial relationship between each feature and th features in an additional layer.
0.000000	Precision	L C USSES		
	0.000000		• · · · · · · · · · · · · · · · · · · ·	
Modify current selection by	Modify current selection by		_	

1	monroe_scho	Jois reatures t	otal. 52, intereu	. 52, selected. I	1		^
1		🛱 🛍 🖗		' 🔳 🗞 👂			
	SchoolId	EfClass	Name	Address	City	Zipcode	Cor 📤
	IN794246						Richland
	IN794247		Edgewood Int	7600 W Reev	Bloomington	47404-0000	Richland
	IN794249	EFS1	Lakeview Ele	9090 S Strain	Bloomington	47401-8413	Monroe
	IN794250	EFS1	Grandview Ele	2300 S Endwr	Bloomington	47403-9222	Monroe
	IN794251	EFS1	Highland Park	900 Park Squ	Bloomington	47403-1726	Monroe
	IN794252	EFS1	Bloomington	1965 S Walnu	Bloomington	47401-6529	Monroe
	IN794253	EFS1	Bloomington	3901 Kinser Pi	Bloomington	47404-0598	Monroe
	IN794254	EFS1	Tri-North Mid	1000 W 15th St	Bloomington	47404-0570	Monroe
	IN794255	EFS1	Lora L Batchel	900 Gordon Pike	Bloomington	47403-7298	Monroe
0	IN794256	EFS1	Binford Eleme	2300 E Secon	Bloomington	47401-5312	Monroe
1	IN794257	EFS1	Arlington Heig	800 Gourley P	Bloomington	47404-0828	Monroe
2	IN794258		Childs Elemen	2211 S High St	Bloomington	47401-8611	Monroe
3	IN794259	EFS1	Clear Creek El	300 Clear Cre	Bloomington	47403-7404	Monroe
4	IN794260	EFS1	Fairview Elem	627 W 8th St	Bloomington	47404-2710	Monroe
5	IN794261	EFS1	Hoosier Hills	3070 Prow Rd	Bloomington	47404-1870	Monroe
r	IN794262	EES1	Marlin Elemen	1655 F Bethel	Bloominaton	47408-9482	Monroe 💌
N	Show All Feat.	res					
7	Show All Featur	es	24		र महर	(E)>	
7	Show Selected F	Features	L(T))>	E G A		Ĭ	
7	Show Features	Visible On Map	V A	1 7 4 2	L DIC	- S.	
r	Show Edited and	d New Features	14	-1	ETAN	Le -	

Click on Open Attribute Table icon and select "Show Selected Features"

E. Shortest Path

>>>Install the "Road Graph" plugin.



F. Spatial Statistics Tools

- Delete all layers
- New Project
- □ Set project CRS: 102674
- □ Add roads layer
- Add Indy tiff
- □ Create convex hull around roads (Vector>>>Geoprocessing Tools)
- □ Edit polygon to fit in tiff (as done above)
- □ "Random points in layers bounds"
- □ Install "Point Sampling tool" Plugin
- Plugins>>>Analyses>>>Point Sampling tool
- Vector>>>Analysis Tools>>>Basic Statistics for numeric fields
- Digitize 3 points to create new layer
- Vector>>>Analysis Tools>>>Distance Matrix
- □ (Summary distance matrix, 1 nearest k target point)
- Vector>>>Analysis Tools>>>Nearest Neighbor Analysis
- Vector>>>Analysis Tools>>>Mean coordinates
- □ To compare point with polygon centroid: Vector>>>Geometry Tools>>>Polygon Centroid
- Go to tiff layer properties>>>Histogram>>>Compute Histogram(if not already there)
- □ You can save the histogram in a # of formats
- □ See more statistics in Metadata
- □ Much more analysis available in Processing>>>Toolbox!!!

10. Raster Data Demo

In this section, I rely heavily on tutorials at this site.

A. Vectorizing Land Cover Data with Processing Modeler

- □ MODIS Land Cover 2001 to 2012 Identify Change in Grasslands (ND = 10)
- □ Import both years (Land Cover 2001 to 2012 folder)
- Create a model: Input > Majority Filter > Polygonize > Extract by attribute > Output



- □ Save the model
- □ Under Processing Toolbox, go to "Models" and select the model you want to run
- □ Select parameters (Input and Class Value)

B. Terrain Data Work + Google Earth!

>>>Import city boundary layer (from "OSM Bloomington" folder)

>>>Import indy.tif from "Indy DEM" folder

>>Raster>Extraction>Clipper (name output btowm_clip; clipping mode = mask layer; mask
layer = city boundary)

>>>Delete indy.tif from project

>>>Raster>Extraction>Contour:

🖉 Contour			?	×
Input file (raster)	clip	•	Select.	
Output file for contour lines (vector)			Select.	
Interval between contour lines	10.000			
 Attribute name If not provided, no elevation attribute is attached. Load into canvas when finished 	ELEV			
gdal_contour -a ELEV -i 10.0 "C:/Users/Jacob/OneDri Workshop/indy_qgis_igic2017/Indy DEM/clip.tif"	ve/IGIC			0
СК		Close		Help

>>>Open contour's Attribute Table (each line has an elevation) >>>Select highest elevation (280m = 918 ft!)

>>Zoom to selection >>Raster>Analysis>DEM (mode= "hillshade") >>Save contour layer as KML >>>Double-click on it and view it in Google Earth!

11. BONUS

A. Adding a WMS (Web Map Service) Layer

>>Follow this link to the Indiana Map website.
>>Under Hospitals, click on Map Service
>>At the top of the page, click on WMS
>>Copy the URL

In QGIS, Click on the Add WMS/WMTS Layer icon (

	ayer Order Ti	lesets Serve	r Search		Name	monroe_hospita	als
Connect	New	Edit	Delete	Load Sav	URL	spitals/MapServi	er/WMSServer?request=GetCapabilities&service=WMS
ID	Name 1. Click 'N	Title	Abstract		Auther If the s passwo User na Passwo	ntication Config ervice requires bas ord ame	urations
Image enc	oding				Referer DPI-Mode	all	
Tile size	iit for GetFeatureIi	nfo		10	Version Ignor Ignor	re GetMap/GetTile (re GetFeatureInfo (re axis orientation (JRI reported in capabilities JRI reported in capabilities (WMS 1.3/WMTS)
WGS 84	ntextual WMS Leg	end			Ch Inver	t axis orientation oth pixmap transfor	m
ayer name					3.	Click 'OK'	🥜 ОК 🛛 💥 Сапсе! 💦 Неір

Connect to layer:

Image: Control of the second secon	Connection ? × Connection details
Connect New Edit Delete Load Save ID Name Title Abstract 1. Click 'New'	Name monroe_nospitals URL spitals/MapServer/MMSServer?request=GetCapabilities8.service=WMS Authentication Configurations If the service requires basic authentication, enter a user name and optional password User name Password
Image encoding	Referer DPI-Mode all
Options Tile size Feature limit for GetFeatureInfo 10 WGS 84 Cr Use contextual WMS Legend	Version Ignore GetMap/GetTile URI reported in capabilities Ignore GetFeatureInfo URI reported in capabilities Ignore axis orientation (WMS 1.3/WMTS) Invert axis orientation Smooth pixmap transform
Layer name Add Ready	

B. OpenStreetMap

C. Actions

D. Python Console

E. More Plugins + Other Things

Cloud, geocoding, <u>biological records tool</u>, <u>semi-automatic classification plug-in</u>, <u>qchainage</u> (linear referencin), <u>Topology Checker Plugin</u> -it could be better

Virtual Layers

More to come! This is a working document, so more content will be added periodically. Check back in a couple of months!

If you have any questions regarding QGIS (or any other Open Source GIS topic) please to do hesitate to contact **Jacob Mark**, the author of this document, at <u>jacobaamark@gmail.com</u>.