

Deep dive: vector data



Peter Galante

Biodiversity Informatics Scientist

Center for Biodiversity and Conservation

American Museum of Natural History

Vector data

- Classifying vector data by attributes
 - Attribute tables show categories of values (usually)
 - Some columns are necessary for making useful maps
- Attribute data can also be used for labeling
 - Many artistic options for adding labels

ne_10m_admin_1_states_provinces :: Features Total: 4594, Filtered: 4594, Selected: 0

	featurecla	scalerrank	adm1_code	diss_me	iso_3166_2	wikipedia	iso_a2	adm0_sr	name	name_alt
1	Admin-1 sc...	6	ROU-133	133	RO-CT		RO	1	Constanta	Constanța ...
2	Admin-1 sc...	6	ROU-131	131	RO-GR		RO	1	Giurgiu	
3	Admin-1 sc...	6	ROU-127	127	RO-TR		RO	1	Teleorman	
4	Admin-1 sc...	7	BGR-2262	2262	BG-18		BG	1	Ruse	Russe Rušč...
5	Admin-1 sc...	6	ROU-129	129	RO-CL		RO	1	Calarasi	Călărași Ka...
6	Admin-1 sc...	7	BGR-2261	2261	BG-19		BG	1	Silistra	
7	Admin-1 sc...	6	ROU-122	122	RO-DJ		RO	1	Dolj	
8	Admin-1 sc...	6	ROU-124	124	RO-MH		RO	1	Mehedinti	Mehedinți
9	Admin-1 sc...	3	DEU-3488	3488	DE-MV		DE	5	Mecklenbu...	Mecklenbu...
10	Admin-1 sc...	5	POL-3142	3142	PL-ZP		PL	1	West Pome...	Zachodnio...
11	Admin-1 sc...	9	MDA-1621	1621	MD-GL		MD	1	Glodeni	
12	Admin-1 sc...	9	MDA-1617	1617	MD-RI		MD	1	Rîșcani	
13	Admin-1 sc...	9	MDA-1615	1615	MD-ED		MD	1	Edineț	
14	Admin-1 sc...	9	MDA-1613	1613	MD-BR		MD	1	Briceni	
15	Admin-1 sc...	6	ROU-287	287	RO-BT		RO	1	Botosani	Botoșani B...
16	Admin-1 sc...	9	MNE-1497	1497	ME-20		ME	1	Ulcinj	

Show All Features

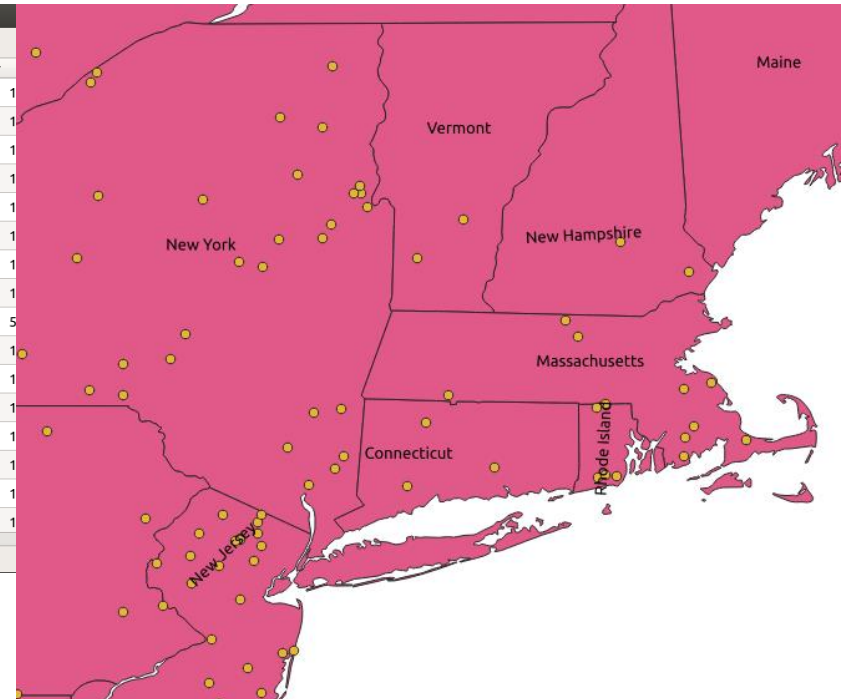
Vector data

- Classifying vector data by attributes
 - Attribute tables show categories of values (usually)
 - Some columns are necessary for making useful maps
- Attribute data can also be used for labeling
 - Many artistic options for adding labels

ne_10m_admin_1_states_provinces :: Features Total: 4594, Filtered: 4594, Selected: 0

	featurecla	scalerank	adm1_code	diss_me	iso_3166_2	wikipedia	iso_a2	adm0_sr
1	Admin-1 sc...	6	ROU-133	133	RO-CT		RO	1
2	Admin-1 sc...	6	ROU-131	131	RO-GR		RO	1
3	Admin-1 sc...	6	ROU-127	127	RO-TR		RO	1
4	Admin-1 sc...	7	BGR-2262	2262	BG-18		BG	1
5	Admin-1 sc...	6	ROU-129	129	RO-CL		RO	1
6	Admin-1 sc...	7	BGR-2261	2261	BG-19		BG	1
7	Admin-1 sc...	6	ROU-122	122	RO-DJ		RO	1
8	Admin-1 sc...	6	ROU-124	124	RO-MH		RO	1
9	Admin-1 sc...	3	DEU-3488	3488	DE-MV		DE	5
10	Admin-1 sc...	5	POL-3142	3142	PL-ZP		PL	1
11	Admin-1 sc...	9	MDA-1621	1621	MD-GL		MD	1
12	Admin-1 sc...	9	MDA-1617	1617	MD-RI		MD	1
13	Admin-1 sc...	9	MDA-1615	1615	MD-ED		MD	1
14	Admin-1 sc...	9	MDA-1613	1613	MD-BR		MD	1
15	Admin-1 sc...	6	ROU-287	287	RO-BT		RO	1
16	Admin-1 sc...	9	MNE-1497	1497	ME-20		ME	1

Show All Features



Vector data

- Vector data types:
 - 1. Whole number (integer) (1,2,3)
 - 2. Whole number (64 bit integer) (1,2,3)
 - 3. Decimal number (real) (1.00, 2.00, 3.00)
 - 4. Text (string) (One, Two, Three)
 - 5. Date (2/1/21, 2-1-21, 1 February 2021)
 - 6. Date & Time (2/1/21 18:10)
- Set the length (number of significant digits, etc.)

Vector data

ne_10m_admin_1_states_provinces :: Features Total: 4594, Filtered: 1024, Selected: 0

abc featurecla = [Symbol] [Dropdown] [Update All] [Update Selected]

	name_id	name_it	name_ja	name_ko	name_nl	name_pl	name_pt	name_ru	name_sv	name_tr
1085										
1086										
1087	Cavite	Provincia d...	カヴィテ州	카비테 주	Cavite	Prowincja ...	Província d...	Кавите	Provins Cav...	Cavite
1088	Batangas	Provincia d...	バタンガス	바탕가스 주	Batangas	Batangas	Batangas	Батангас	Batangas	Batangas
1089										
1090	Sorsogon	Provincia d...	ソルソゴン州	소르소곤 주	Sorsogon	Sorsogon	Sorsogon	Сорсогон	Sorsogon	Sorsogon
1091	Albay	Provincia d...	アルバイ州	알바이 주	Albay	Albay	Albay	Албай	Albay	Albay
1092	Camarines ...	Provincia d...	南カマリネ...	남카마리네...	Camarines ...	Camarines ...	Camarines ...	Южный Ка...	Camarines ...	Camarines ...
1093	Camarines ...	Provincia d...	北カマリネ...	북카마리네...	Camarines ...	Camarines ...	Camarines ...	Северный ...	Camarines ...	Camarines ...
1094	Quezon	Provincia d...	ケソン州	케손 주	Quezon	Quezon	Quezon	Кесон	Quezon	Quezon
1095	Aurora	Provincia d...	アウロラ州	아우로라 주	Aurora	Aurora	Aurora	Аурора	Aurora	Aurora
1096	Departeme...	dipartimen...	グランダン...	그랑당스 주	Grand'Anse	Departame...	Grande Ens...	Гранд-Анс	Grand'Anse	Grand'Anse
1097	Colima	Colima	コリマ州	콜리마 주	Colima	Colima	Colima	Колима	Colima	Colima
1098	Departeme...	dipartimen...	リトラル県	리토랄 주	Littoral	Departame...	Littoral	Литораль	Littoral	Littoral De...
1099	Nayarit	Nayarit	ナヤリット州	나야리트 주	Nayarit	Nayarit	Nayarit	Наярит	Nayarit	Nayarit

Show All Features

Vector data

- Field calculator
 - Create/ edit fields using SQL (or the GUI)

The screenshot shows the 'Field Calculator' dialog box in QGIS. It has a title bar with a close button. The main area is divided into two sections: 'Create a new field' (checked) and 'Update existing field' (unchecked). Under 'Create a new field', there is a checkbox for 'Create virtual field' (unchecked). Below this, the 'Output field name' is 'USA', the 'Output field type' is 'Whole number (integer)', and the 'Output field length' is '10' with a 'Precision' of '3'. The 'Expression' tab is selected, showing a text area with the expression `"admin" = 'United States of America'`. To the right of the text area is a 'Function Editor' panel with a search bar and a list of function categories: row_number, Aggregates, Arrays, Color, Conditionals, Conversions, Date and Time, Fields and Values, Fuzzy Matching, General, Geometry, Map Layers, Maps, Math, Operators, Rasters, Record and Attributes, and Strings. A 'Show Help' button is next to the search bar. On the far right, there is a 'group aggregates' section with the text 'Contains functions which aggregate values over layers and fields.' At the bottom, there is an 'Output preview: 0' label, a 'Help' button, and 'Cancel' and 'OK' buttons.

Field Calculator

☒ Only update 1 selected features

☒ Create a new field ☐ Update existing field

☐ Create virtual field

Output field name: USA

Output field type: Whole number (integer)

Output field length: 10 Precision: 3

Expression Function Editor

= + - / * ^ || () '\n'

"admin" = 'United States of America'

Search... Show Help

row_number

- Aggregates
- Arrays
- Color
- Conditionals
- Conversions
- Date and Time
- Fields and Values
- Fuzzy Matching
- General
- Geometry
- Map Layers
- Maps
- Math
- Operators
- Rasters
- Record and Attributes
- Strings

group aggregates

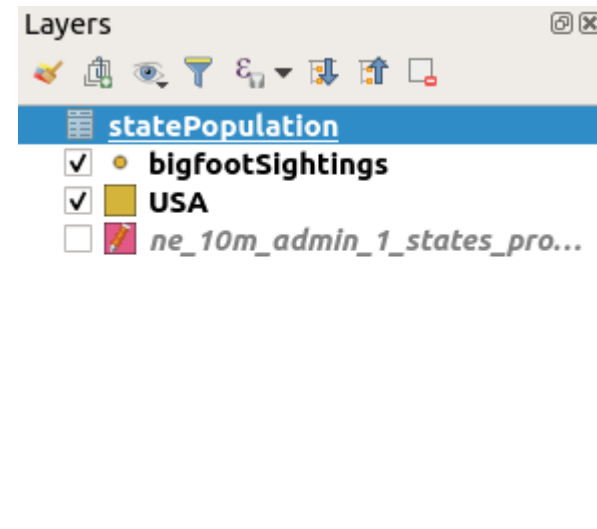
Contains functions which aggregate values over layers and fields.

Output preview: 0

Help Cancel OK

Vector data – follow along

- Joining Tables
 - The United States shapefile does not have an attribute for population
 - Open the population data downloaded from the website. Data are from [Wikipedia](#)
- Add population file as layer to QGIS



Vector data

- Joining Tables
 - In the layer properties of USA layer, go to Joins
 - + sign
 - Select layer, Join field (State), and target field (name)
 - VERY important to have **exactly the same** strings
 - Create new integer field based on new joined field (field calculator)
 - Joined as string instead of integer without .csv file
 - Edit state colors showing population (choropleth)