

Preliminaries:

-- vector, raster, shapefiles, feature classes



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Mapping Tabular Data

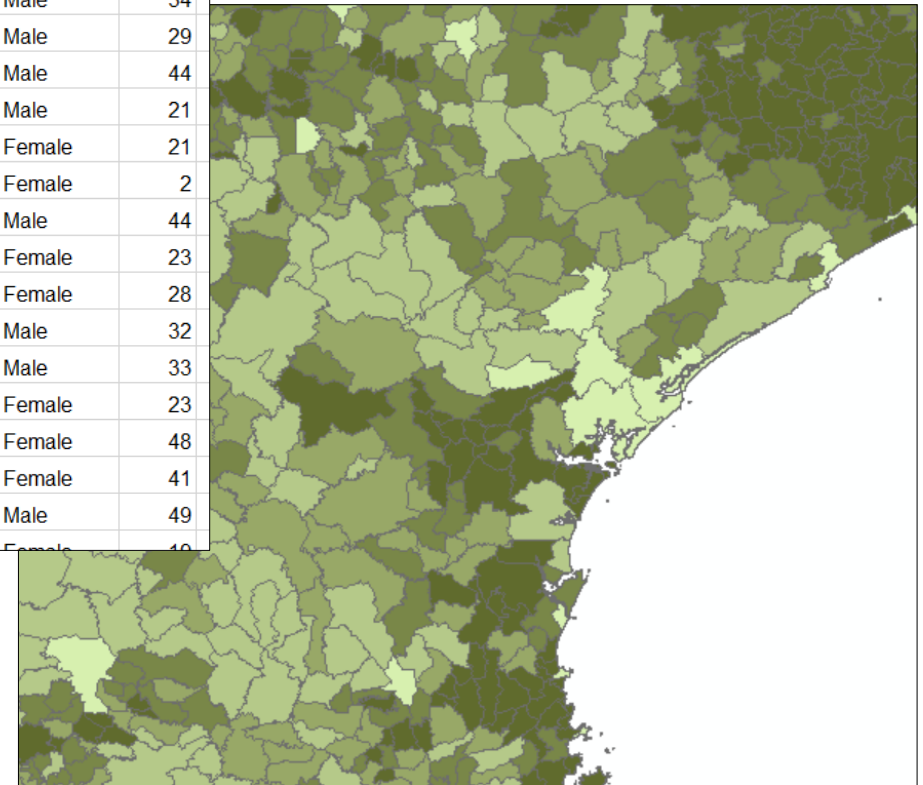
Problem: The available data is somehow not in the right form to create the map you want.

YearStart	YearEnd	LocationAbbr	LocationDesc
2001	2001	ME	Maine
2001	2001	MI	Michigan
2001	2001	MN	Minnesota
2001	2001	MO	Missouri
2001	2001	MS	Mississippi
2001	2001	MT	Montana
2001	2001	NC	North Carolina
2001	2001	ND	North Dakota
2001	2001	NE	Nebraska
2001	2001	NH	New Hampshire

shape	dseconds	location	gender	age
sk	240	Spokane,Wa	Female	28
circle	5	Las Vegas,Nv	Male	31
oval	120	Charlotte,Nc	Male	34
light	30	Seattle,Wa	Male	29
light	30	Cotati,Ca	Male	44
angle	900	Phoenix,Az	Male	21
neuron	360	Yuma,Az	Female	21
chevron	360	Yuma,Az	Female	2
circle	30	Little Rock,Ar	Male	44
light	900	Bolingbrook,Il	Female	23
sphere	600	Phoenix,Az	Female	28
light	20	Denver,Co	Male	32
oval	300	Memphis,Tn	Male	33
triangle	120	Orlando,Fl	Female	23
other	240	Bellevue,Wa	Female	48
light	900	Atlanta,Ga	Female	41
other	3	Seattle,Wa	Male	49
light	300	Murle Beach,Sc	Female	40

Too much irrelevant data?

- Data is not spatial?
- has coordinates?
 - has addresses?
 - has neither, but



Spatial data is on the wrong spatial units or you need to combine two spatial datasets?

Data Prep Techniques

YearStart	YearEnd	LocationAbbr	LocationDesc
2001	2001	ME	Maine
2001	2001	MI	Michigan
2001	2001	MN	Minnesota
2001	2001	MO	Missouri
2001	2001	MS	Mississippi
2001	2001	MT	Montana
2001	2001	NC	North Carolina
2001	2001	ND	North Dakota
2001	2001	NE	Nebraska
2001	2001	NH	New Hampshire

Too much irrelevant data?

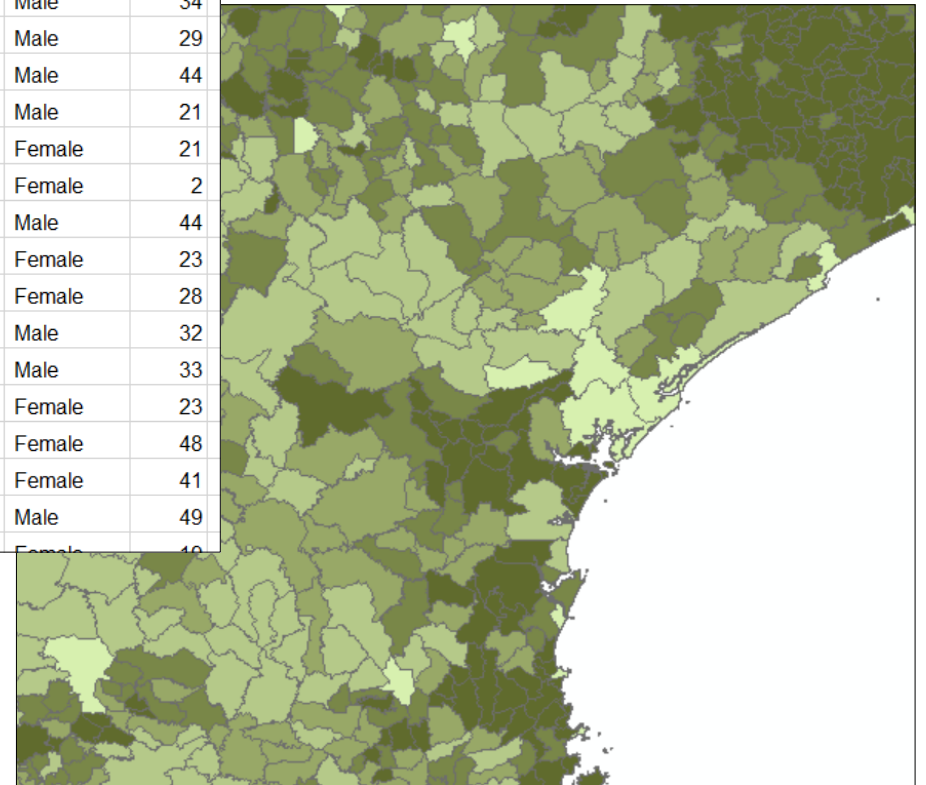
query or "select" a subset of the data

ufoshape	dseconds	location	gender	age
disk	240	Spokane,Wa	Female	28
circle	5	Las Vegas,Nv	Male	31
oval	120	Charlotte,Nc	Male	34
light	30	Seattle,Wa	Male	29
light	30	Cotati,Ca	Male	44
triangle	900	Phoenix,Az	Male	21
chevron	360	Yuma,Az	Female	21
chevron	360	Yuma,Az	Female	2
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light	900	Bolingbrook,Il	Female	23
sphere	600	Phoenix,Az	Female	28
light	20	Denver,Co	Male	32
oval	300	Memphis,Tn	Male	33
triangle	120	Orlando,Fl	Female	23
other	240	Bellevue,Wa	Female	48
light	900	Atlanta,Ga	Female	41
other	3	Seattle,Wa	Male	49
light	200	Mudle Beach,Sc	Female	40

Data table is not spatial?

- has coordinates? **plot XY coordinates**
- has addresses? **geocoding**
- has neither, but

"join" data table to a matching shapefile



Spatial data is on the wrong spatial units or you need to combine two spatial datasets?

"spatial join" two GIS layers based on location



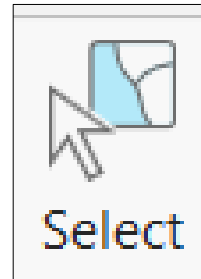
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GIS Data Queries

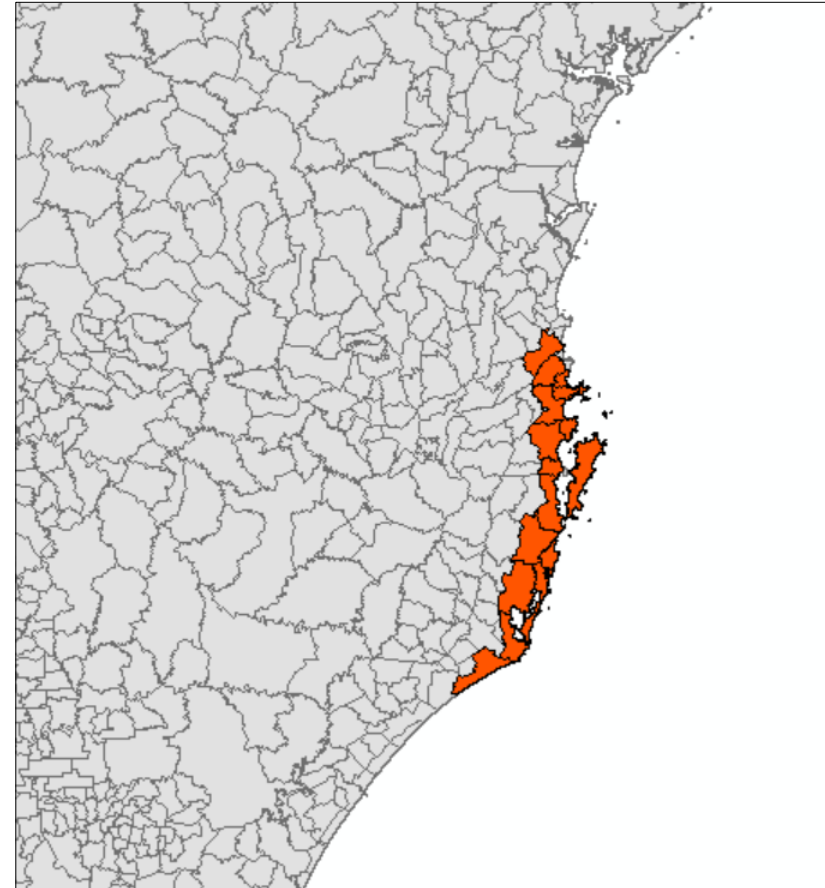
Why subset? Your answer will help decide on a method.

- Geographic extent is greater than needed for a small study area.
- Highlight a subregion for cartographic purposes.
- Perform analysis on a subregion.

→ Use simple point and click select.



→ Shift-click allows you to draw a box and select its contents. Control-click lets you choose several separated features.



Point and click Select also works in the attribute table.

Records (each corresponds to a feature)

fields (attributes)

FID	Shape	ToiletID	Name	Address1	State	Male	Female	Unisex
0	Point	1	Sandy Beach Reserve	West Road	Western Australia	True	True	False
1	Point	2	Point Reserve	North Road	Western Australia	True	True	False
2	Point	3	Success Hill Reserve	Off Seventh Avenue	Western Australia	True	True	False
3	Point	4	Jubilee Reserve	Robinson Road	Western Australia	True	True	False
4	Point	5	Ashfield Reserve	Guildford Road	Western Australia	True	True	False
5	Point	6	Old Perth Road & Ja...	Corner of Old Perth R...	Western Australia	True	True	False
6	Point	7	Mary Crescent Reserve	Mary Crescent	Western Australia	True	True	False

0 of 19,014 selected

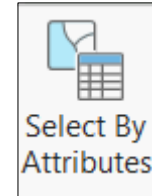
field values

how many selected records

Records can be sorted according to the values in a field.

- Subset based on attributes instead of physical location.
 - limit to certain years
 - limit to certain populations
 - include or remove features with certain characteristics
 - eliminate bad values
- Subset based on a combination of attributes.

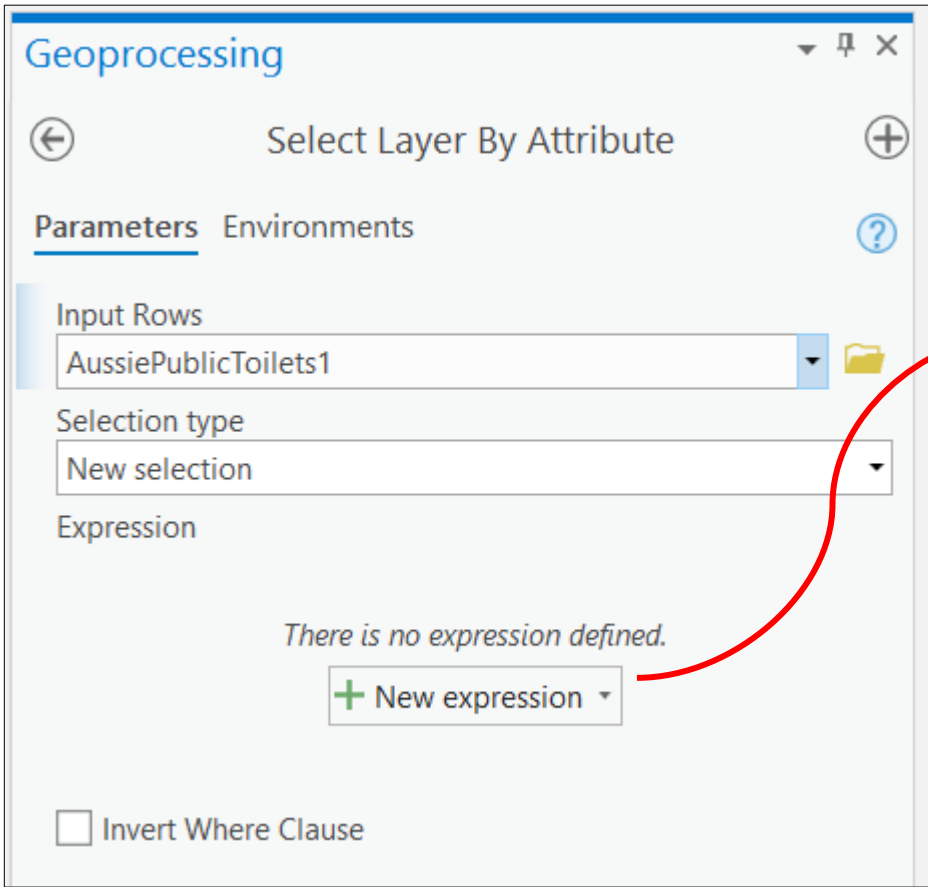
→ Use “Select by Attribute” in the Map Ribbon.



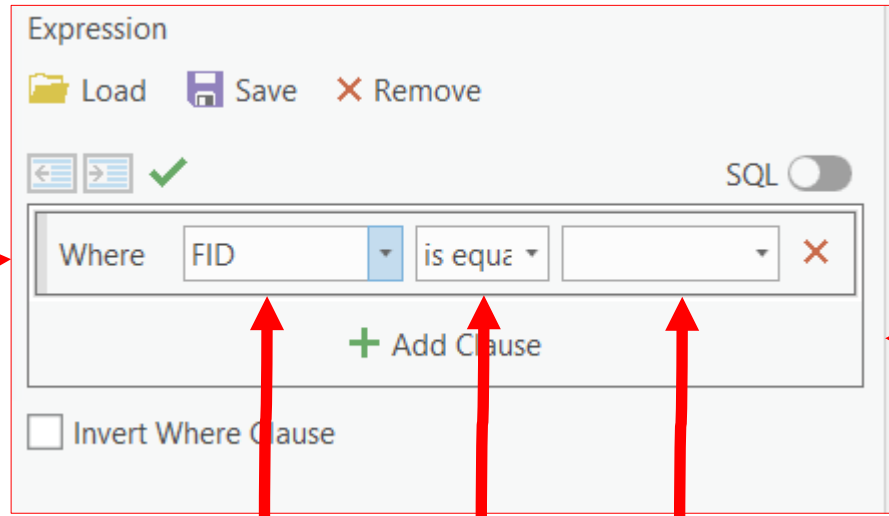
FID	Shape	ToiletID	Name	Address1	State	Male	Female	Unisex
0	Point	1	Sandy Beach Reserve	West Road	Western Australia	True	True	False
1	Point	2	Point Reserve	North Road	Western Australia	True	True	False
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3	Point	4	Jubilee Reserve	Robinson Road	Western Australia	True	True	False
4	Point	5	Ashfield Reserve	Guildford Road	Western Australia	True	True	False
5	Point	6	Old Perth Road & Ja...	Corner of Old Perth R...	Western Australia	True	True	False
6	Point	7	Mary Crescent Reserve	Mary Crescent	Western Australia	True	True	False

0 of 19,014 selected

Filters: 100%



Compose an expression.



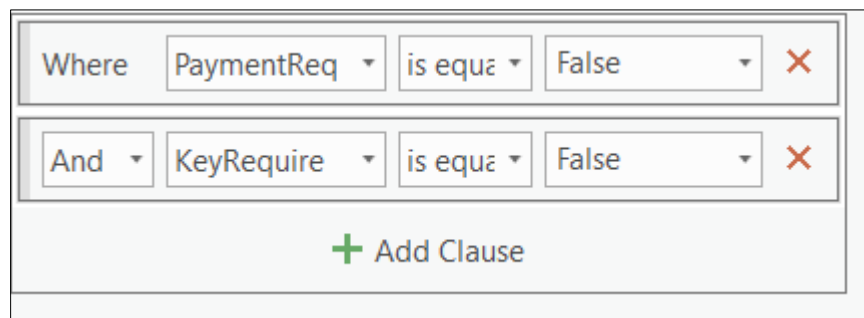
list of field names

list of relations

list of possible values

We can have more than one condition joined by logical operators like AND and OR.

For example, this combination will find all the records where neither a payment nor a key is required.

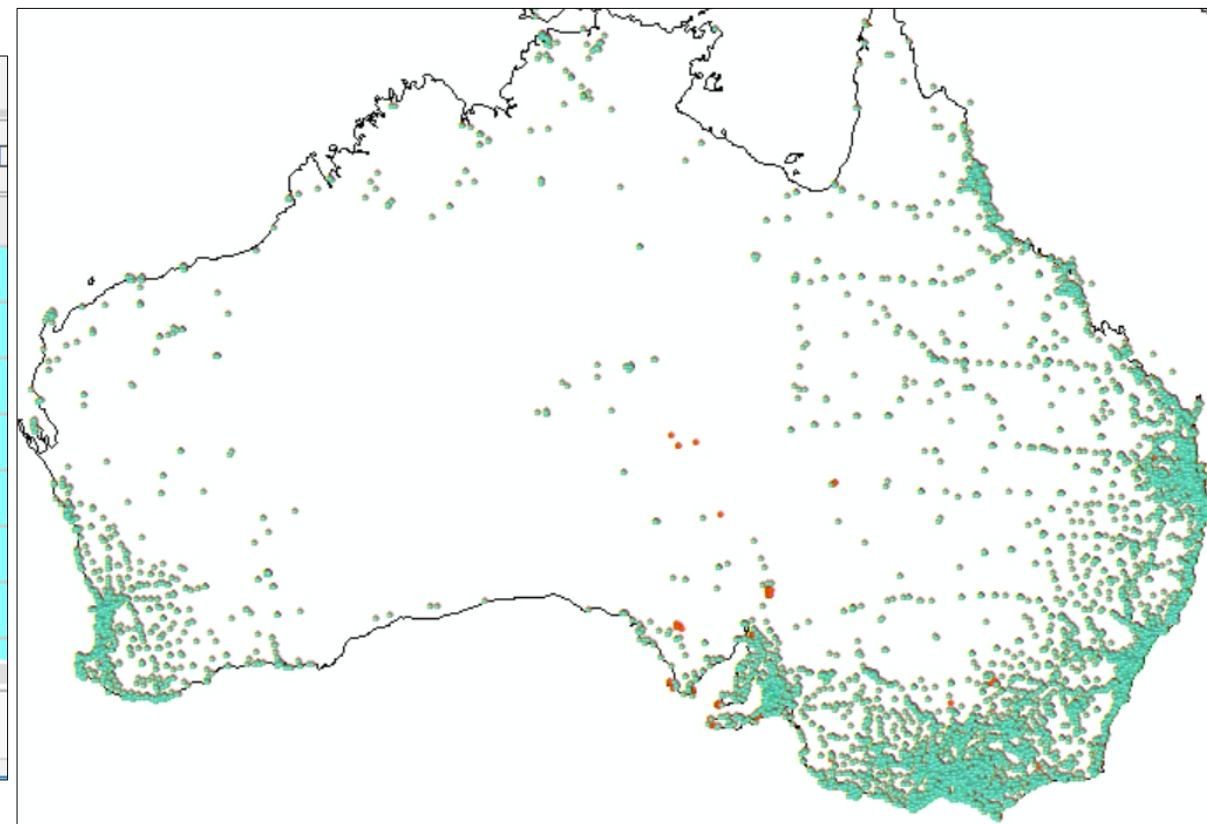


AussiePublicToilets1

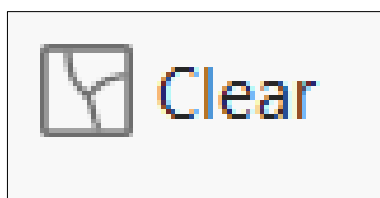
Field: Add Delete Calculate Selection: Zoom To Switch Clear

FID	Shape	ToiletID	Name	Address1	State
0	Point	1	Sandy Beach Reserve	West Road	Western Australia
1	Point	2	Point Reserve	North Road	Western Australia
2	Point	3	Success Hill Reserve	Off Seventh Avenue	Western Australia
3	Point	4	Jubilee Reserve	Robinson Road	Western Australia
4	Point	5	Ashfield Reserve	Guildford Road	Western Australia
5	Point	6	Old Perth Road & Ja...	Corner of Old Perth R...	Western Australia
6	Point	7	Mary Crescent Reserve	Mary Crescent	Western Australia

18,440 of 19,014 selected



Select by Attribute screened out any bathrooms that required a key or payment.



You can easily clear selected features.

If a selection is active, tools will only run on the selected features.

Data selection is ephemeral .

While the selection is active, tools run on the layer will only operate on the selected features.

To make several different selections or to set a symbology for a selection, you can “create layer from selected features” by **Right-Click > Selection > Make Layer from Selected Features**

To keep a permanent copy of the selected subset for re-use, export it as a shapefile by **Right-Click > Data > Export Features**





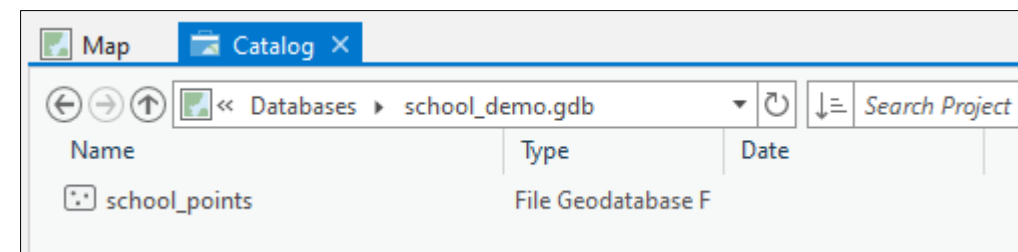
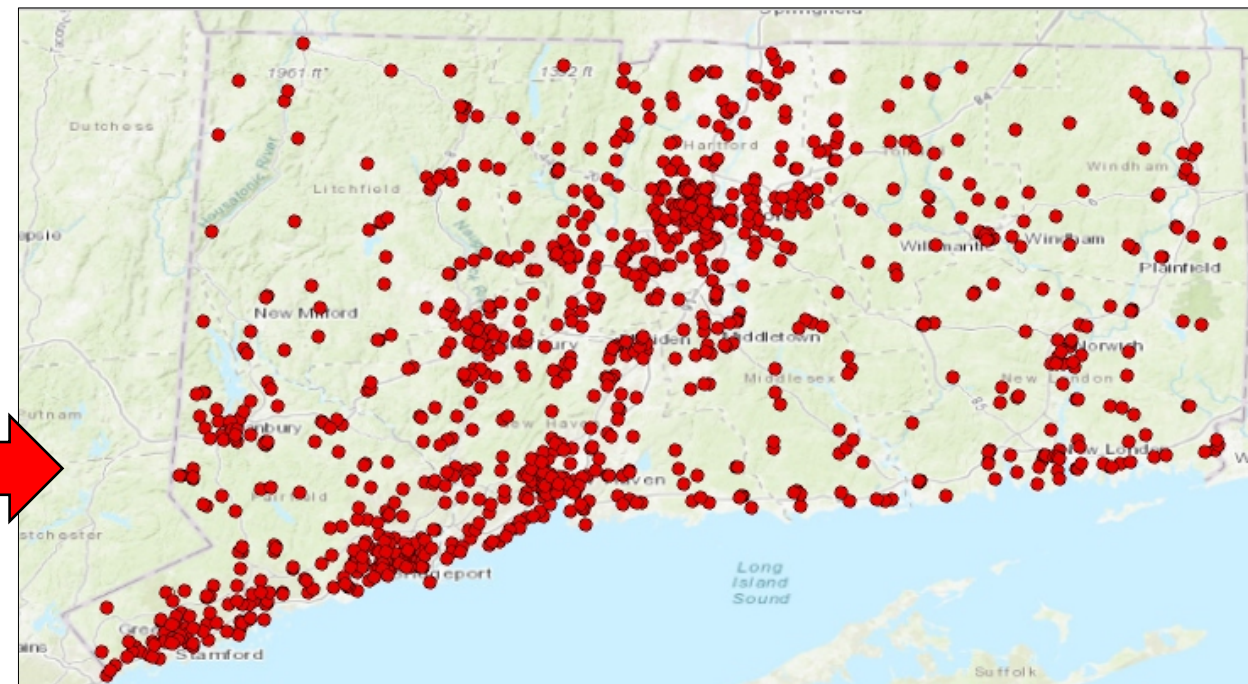
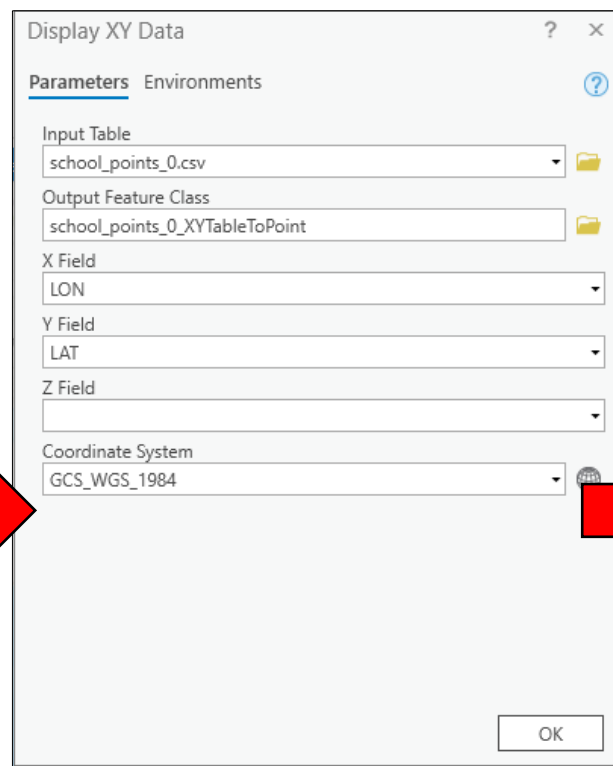
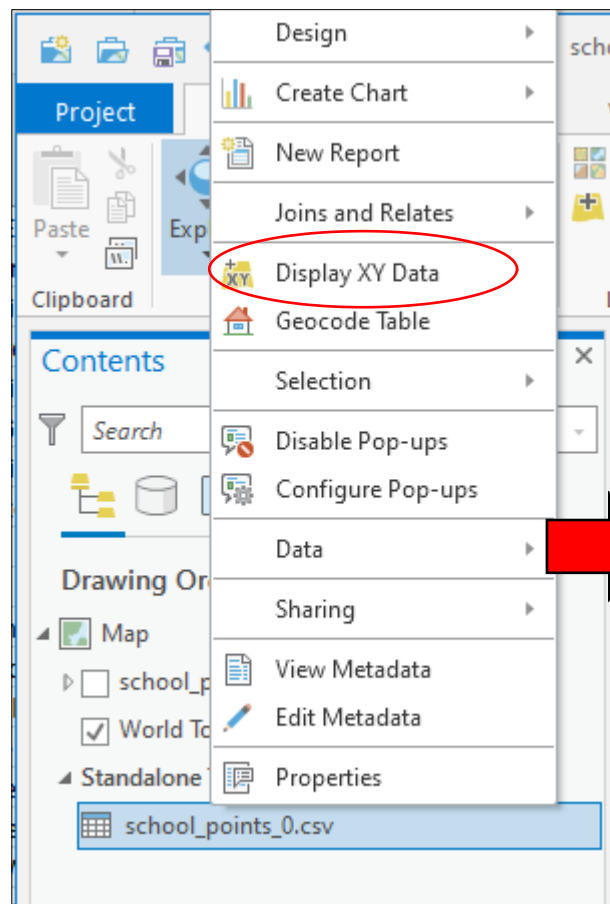
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Mapping Nonspatial Data

Some interesting data are not available as GIS shapefiles or feature classes. The most common format is .csv – a simple text list with values separated by commas. If the file has fields for latitude and longitude (or X and Y coordinates), we can map the records as points.

A	B	C	D	E	F	G	H	I	J	x
FID	NAME	STREET	CITY	STATE	LAT	LON	District	School_ID	School_nam	
1	A. I. Prince Technical High School	401 Flatbush Ave.	Hartford	CT	41.74248	-72.7068	Connecticut Technical Ed	3688	A. I. Prince Technical High	
2	Litchfield High School	14 Plumb Hill Road	Litchfield	CT	41.74293	-73.2069	Litchfield School District	2214	Litchfield High School	
3	Bullard-Havens Technical High School	500 Palisade Ave.	Bridgepor	CT	41.19971	-73.164	Connecticut Technical Ed	3684	Bullard-Havens Technical H	
4	Litchfield Intermediate School	35 Plumb Hill Road	Litchfield	CT	41.73989	-73.205	Litchfield School District	2211	Litchfield Intermediate Sc	
5	E. C. Goodwin Technical High School	735 Slater Rd.	New Brita	CT	41.68677	-72.8061	Connecticut Technical Ed	3692	E. C. Goodwin Technical Hi	
6	Litchfield Middle School	14 Plumb Hill Road	Litchfield	CT	41.74293	-73.2069	Litchfield School District	2213	Litchfield Middle School	
7	J. Milton Jeffrey Elementary School	331 Copse Rd.	Madison	CT	41.29501	-72.6159	Madison School District	2216	J. Milton Jeffrey Elementa	
8	David Wooster Middle School	150 Lincoln St.	Stratford	CT	41.21161	-73.1407	Stratford School District	3070	David Wooster Middle Sch	
9	Ella T. Grasso Technical High School	189 Fort Hill Rd.	Groton	CT	41.34212	-72.0167	Connecticut Technical Ed	3700	Ella T. Grasso Technical Hig	
10	Eli Whitney Technical High School	100 Fairview Ave	Hamden	CT	41.34247	-72.9418	Connecticut Technical Ed	3687	Eli Whitney Technical High	
11	Stratford Academy - Victoria Soto School	699 Birdseye Street	Stratford	CT	41.17878	-73.1379	Stratford School District	3066	Stratford Academy - Victor	
12	Daniel Hand High School	286 Green Hill Rd.	Madison	CT	41.29547	-72.6187	Madison School District	2224	Daniel Hand High School	
13	Suffield Middle School	350 Mountain Rd.	Suffield	CT	41.98492	-72.6636	Suffield School District	3077	Suffield Middle School	
14	Emmett O'Brien Technical High School	141 Prindle Ave.	Ansonia	CT	41.33504	-73.0644	Connecticut Technical Ed	3698	Emmett O'Brien Technical	
15	Kathleen H. Ryerson Elementary School	982 Durham Rd.	Madison	CT	41.3404	-72.6258	Madison School District	2219	Kathleen H. Ryerson Elem	
16	H. C. Wilcox Technical High School	298 Oregon Rd.	Meriden	CT	41.52903	-72.8309	Connecticut Technical Ed	3690	H. C. Wilcox Technical High	
17	A. Ward Spaulding School	945 Mountain Rd.	Suffield	CT	41.98512	-72.6869	Suffield School District	3076	A. Ward Spaulding School	
18	Bowers School	141 Princeton St.	Manchest	CT	41.78863	-72.5101	Manchester School Distri	2226	Bowers School	

Decide whether the coordinates are lat/lon or something else. Lat/lon values are between -180 and 180. Large numbers indicate meters or feet.



A permanent feature class is saved in your project geodatabase.

What if there are no latitudes and longitudes given? Or if we don't want the information as points?

→ IF we have a geographic layer (vector)

AND

→ IF the values in some field from the non-spatial table *exactly match* values from a field in the attribute table for the geographic layer

→ THEN we can “join” the two tables.

school_demo - ArcGIS Pro

school_points X

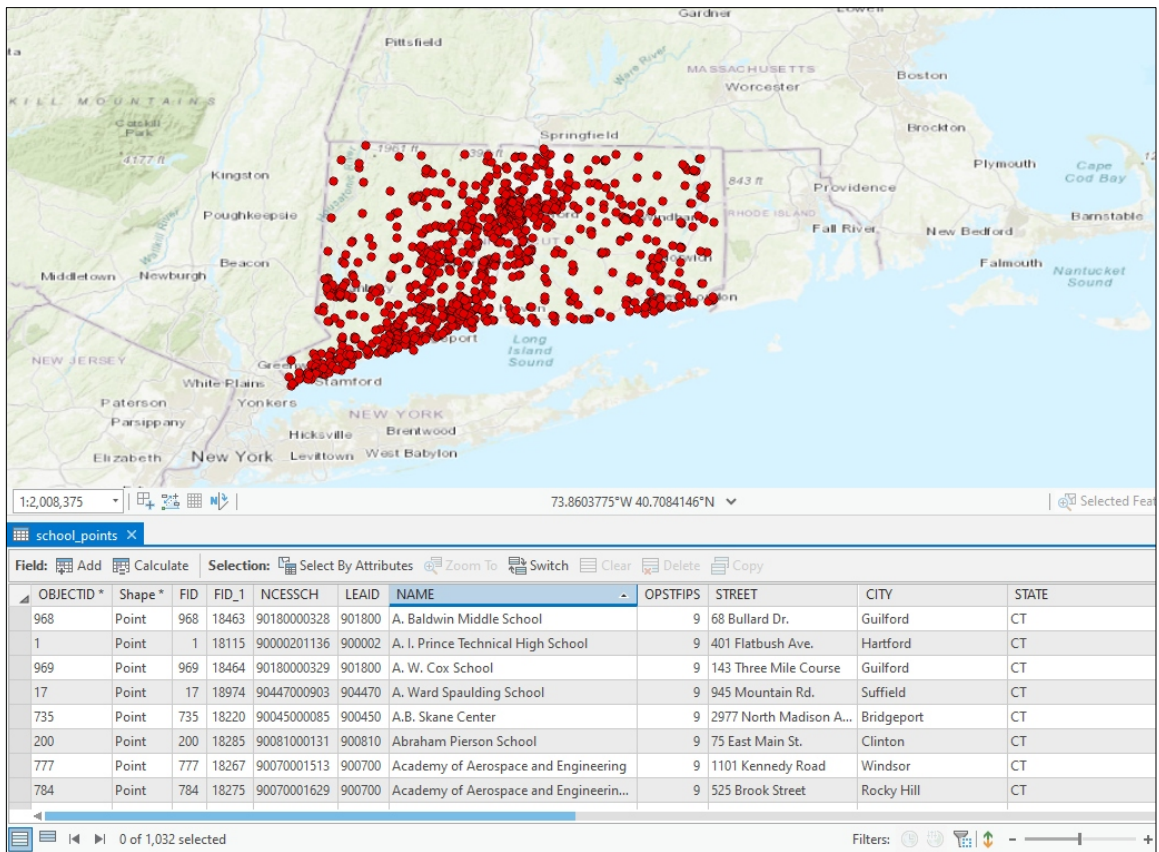
OBJECTID *	Shape *	FID	FID_1	NCESSCH	LEAID	NAME	OPSTFIPS	STREET	CITY
968	Point	968	18463	90180000328	901800	A. Baldwin Middle School	9	68 Bullard Dr.	Guilford
1	Point	1	18115	90000201136	900002	A. I. Prince Technical High School	9	401 Flatbush Ave.	Hartford
969	Point	969	18464	90180000329	901800	A. W. Cox School	9	143 Three Mile Course	Guilford
17	Point	17	18974	90447000903	904470	A. Ward Spaulding School	9	945 Mountain Rd.	Suffield
735	Point	735	18220	90045000085	900450	A.B. Skane Center	9	2977 North Madison A...	Bridgeport
200	Point	200	18285	90081000131	900810	Abraham Pierson School	9	75 East Main St.	Clinton

0 of 1,032 selected

COVID-19_Cases_in_CT...By_School_.csv X

District	School ID	School name	City	School total	Report period	Date updated
Bridgeport School Dist...	1488	A Child's World	Bridgeport	0	12/17/2020-12/23/2020	12/23/2020
Guilford School District	2000	A. Baldwin Middle School	Guilford	<Null>	12/17/2020-12/23/2020	12/23/2020
Connecticut Technical...	3688	A. I. Prince Technical...	Hartford	<Null>	12/17/2020-12/23/2020	12/23/2020
Guilford School District	1999	A. W. Cox School	Guilford	0	12/17/2020-12/23/2020	12/23/2020
Suffield School District	3076	A. Ward Spaulding School	Suffield	0	12/17/2020-12/23/2020	12/23/2020
Bridgeport School Dist...	1558	A.B. Skane Center	Bridgeport	0	12/17/2020-12/23/2020	12/23/2020
Wallingford School Dis...	3194	A.R.T.S. Academy	Wallingford	0	12/17/2020-12/23/2020	12/23/2020

0 of 2,373 selected



When joining data, one table stays intact.

This is the left-hand table, called the **target layer**.

The other table gets chopped apart and matched to the target layer.

This is the right-hand table, called the **join layer**.

After the join, records from the target layer get extra columns containing the relevant information from the join table.

Drawing Order

- Map
- school_poi
- World Topo
- Standalone Table
- COVID-19

Copy

Remove

Group

Attribute Table

Add Error Layers

Design

Create Chart

New Report

Joins and Relates

- Add Join
- Remove Join
- Remove All Joins
- Spatial Join
- Add Relate
- Remove Relate
- Remove All Relates

Zoom To Layer

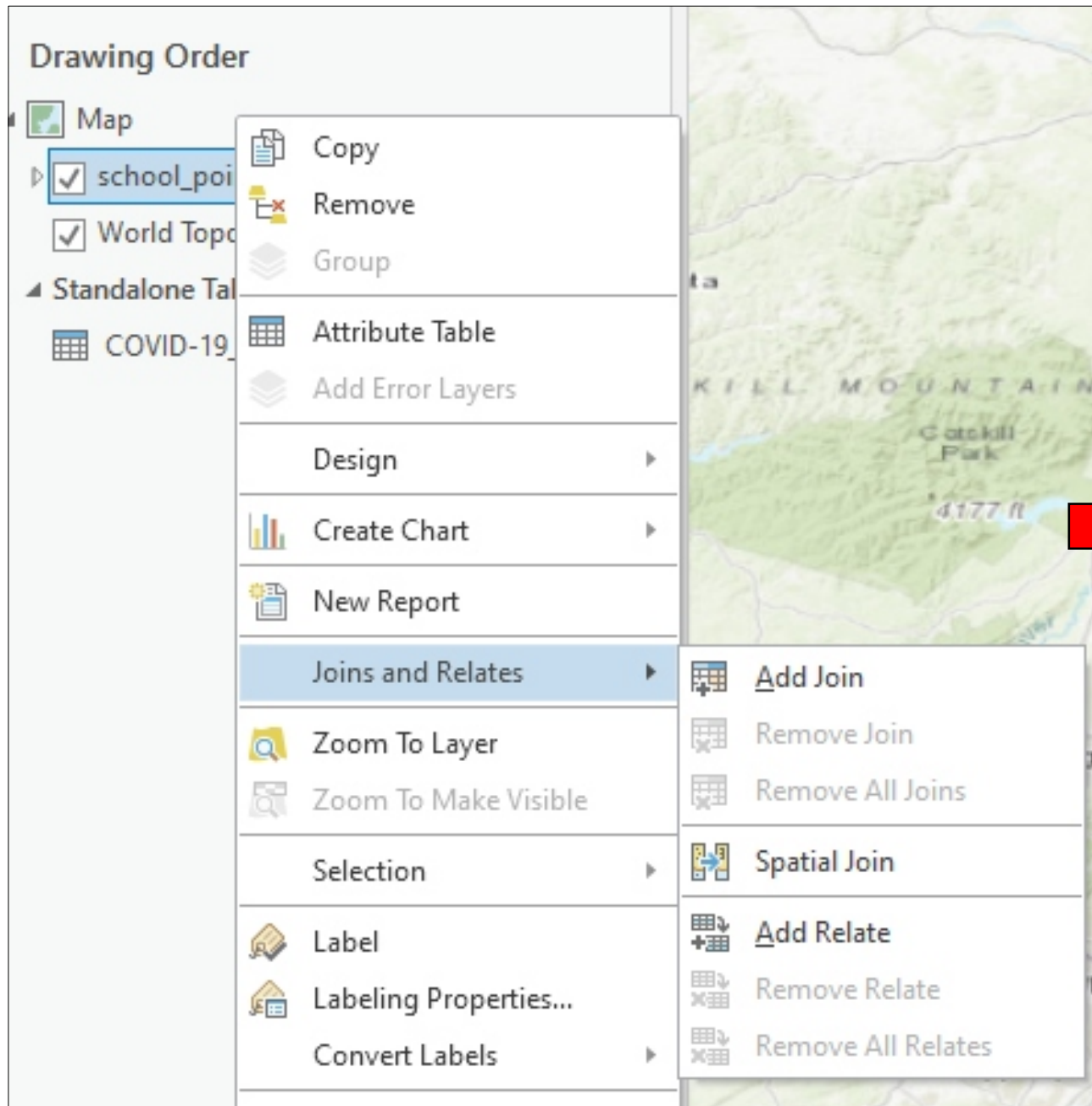
Zoom To Make Visible

Selection

Label

Labeling Properties...

Convert Labels



Add Join

Input Table: school_points

Input Join Field: NAME

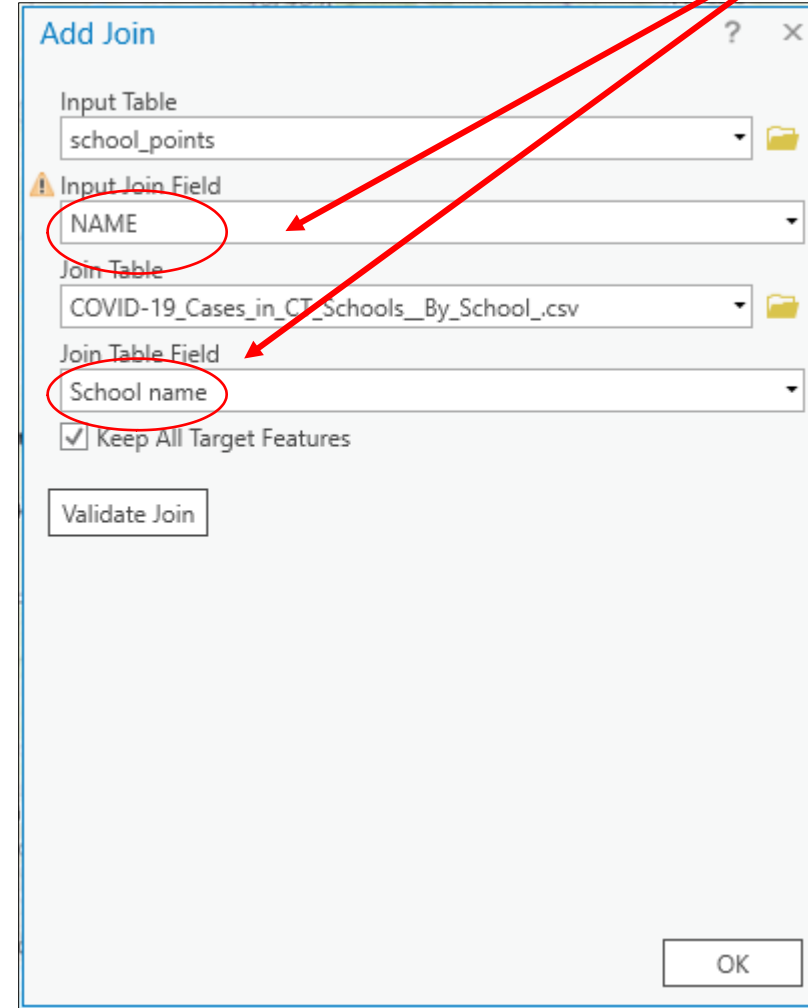
Join Table: COVID-19_Cases_in_CT_Schools_By_School_.csv

Join Table Field: School name

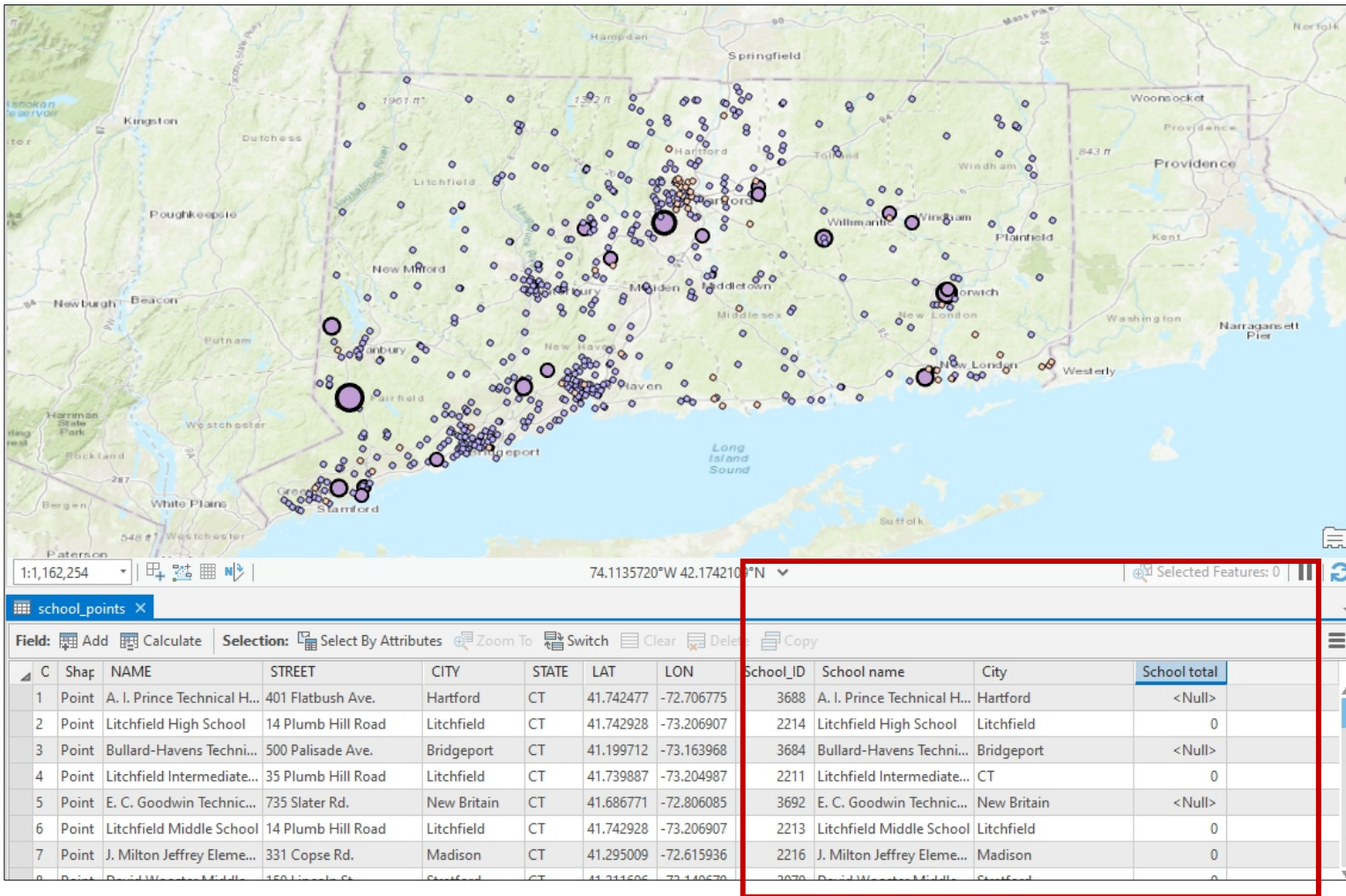
Keep All Target Features

Validate Join

OK



The fields that match exactly are called the join **key**.



New fields from joined table, nulls where there was no match.

Joined tables are ephemeral, and joins are easy to remove. If you will need to use the joined layer a lot, be sure to export.

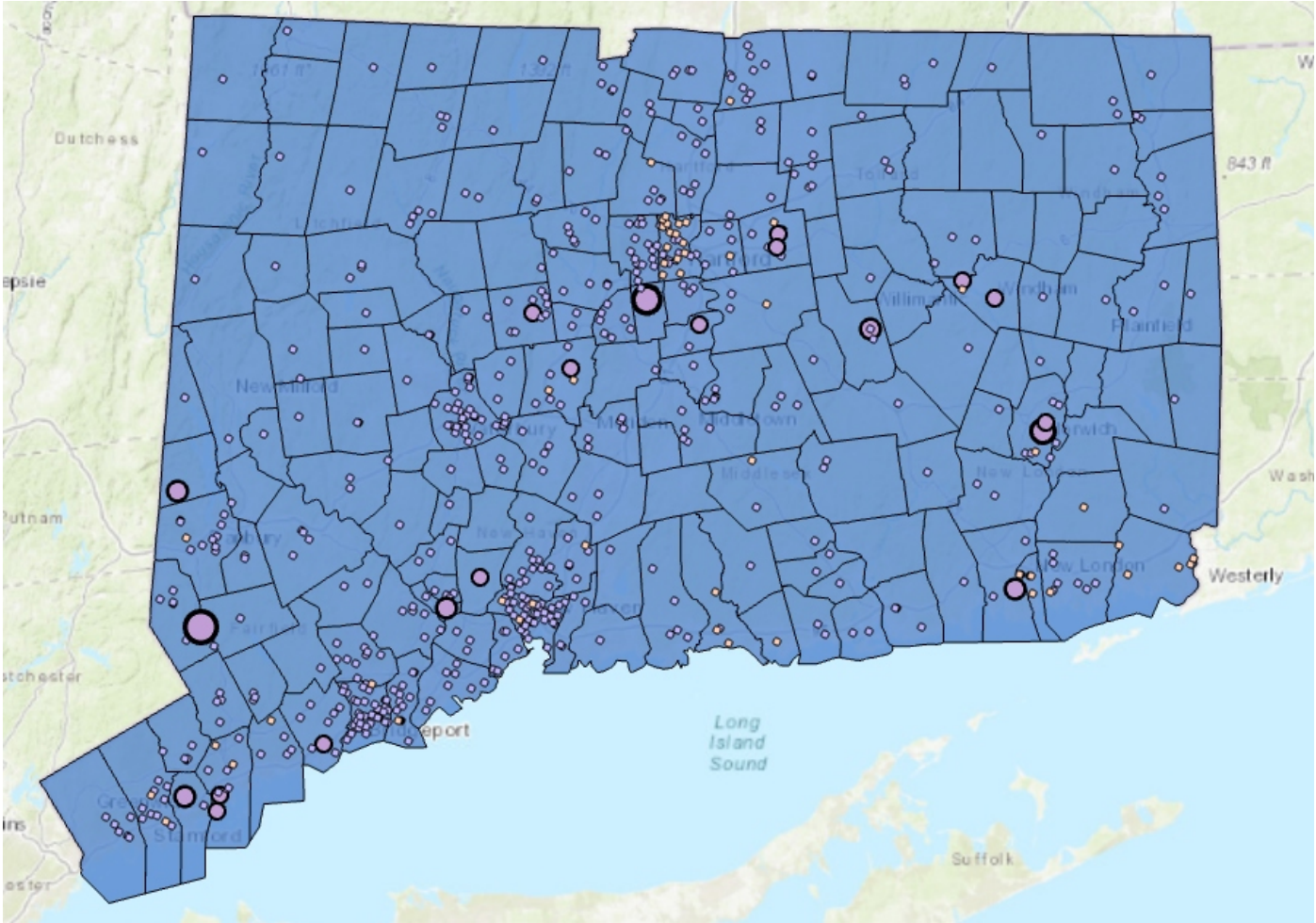


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Spatial Joins

Sometimes it can be helpful to join two spatial layers together, based on the spatial locations of their features.

For example, it might be useful to know which town each school is in and what is the case rate in that town. Or, we might want to know which town have covid cases in their schools and how many.

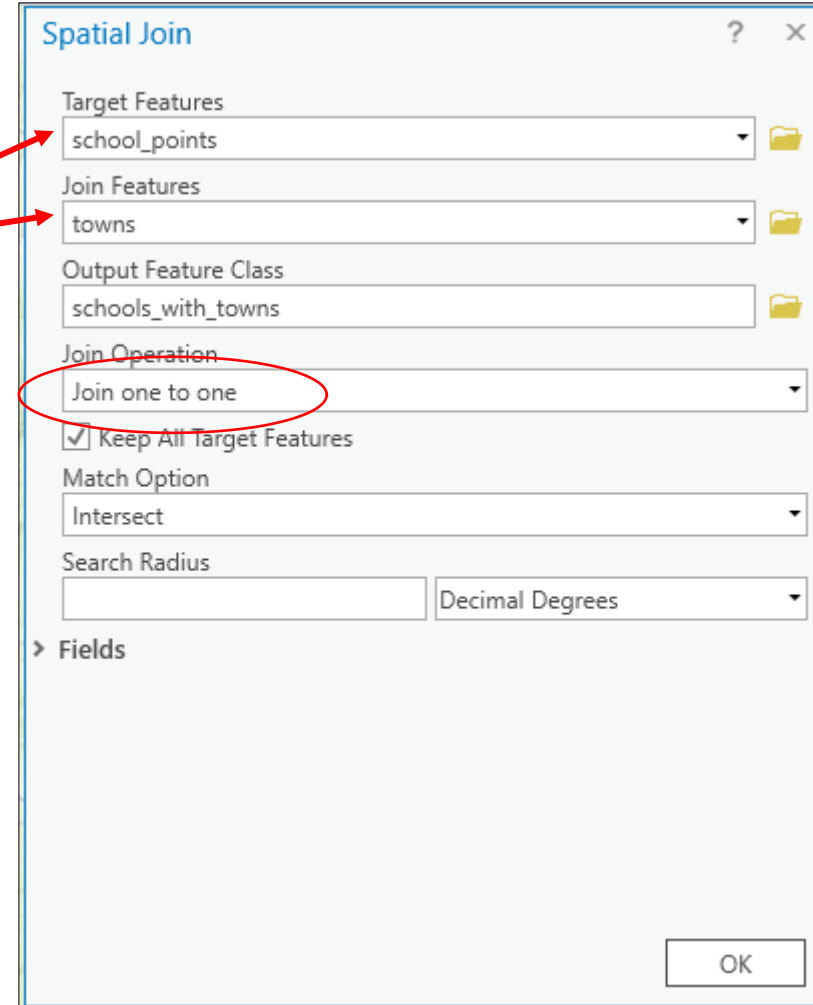


The right-click Joins & Relates menu has a link to the Spatial Join tool.

Be careful to start the join with what you hope to be the right-hand layer. In other words, if you hope to end with polygons, begin with the polygons (towns). But if instead, you hope to end with points, begin with the points (schools).

This run of the Spatial Join tool will result in points whose attributes contain some information about towns.

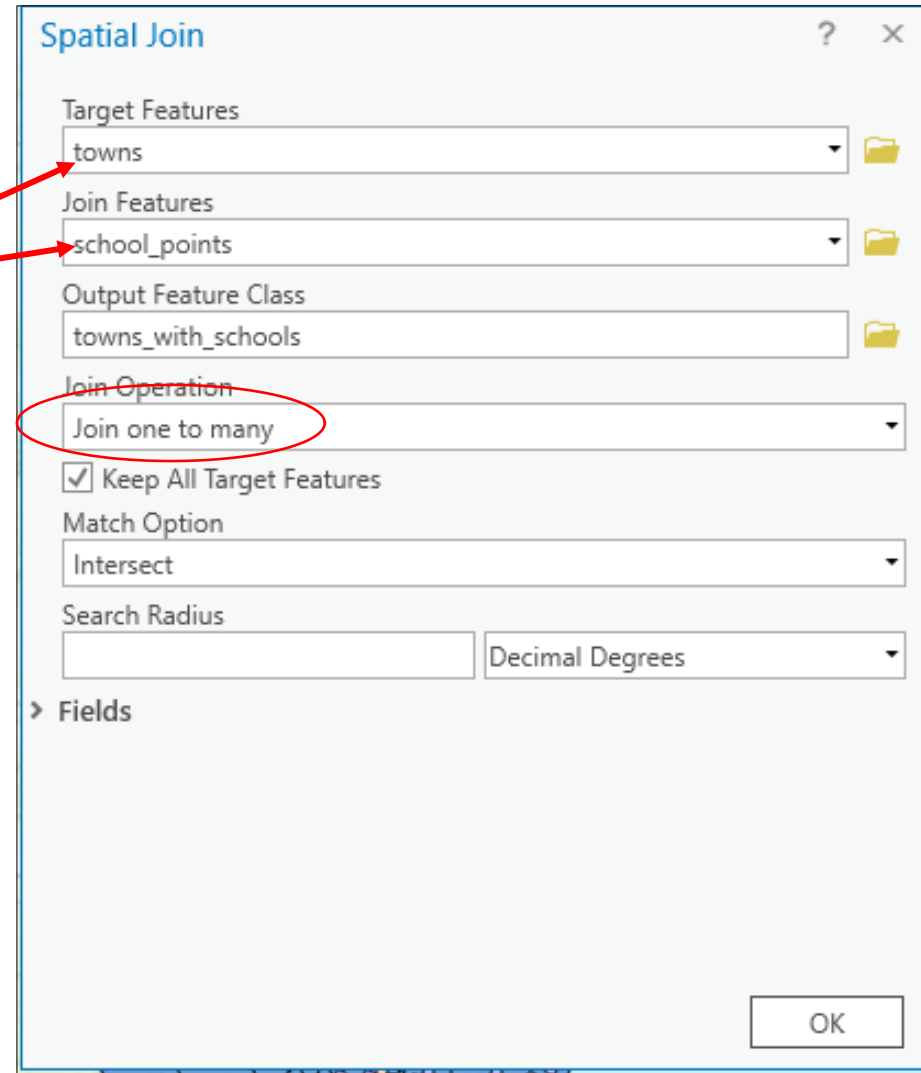
The Join can be one-to-one because each school is only in one town.



This run of the Spatial Join tool will result in polygons whose attributes contain some information about schools.

The Join can be one-to-many because there are many schools for each town

But it will result in many copies of each town, as many copies as there are schools in it.



This run of the Spatial Join tool will also result in polygons whose attributes contain some information about schools.

If we choose a one-to-one join, we have to decide how to summarize information from multiple schools to each town by setting a Merge Rule.

