JOINS AND RELATES

Sandeep Talasila, GISP

TABLE BASICS

TABLES

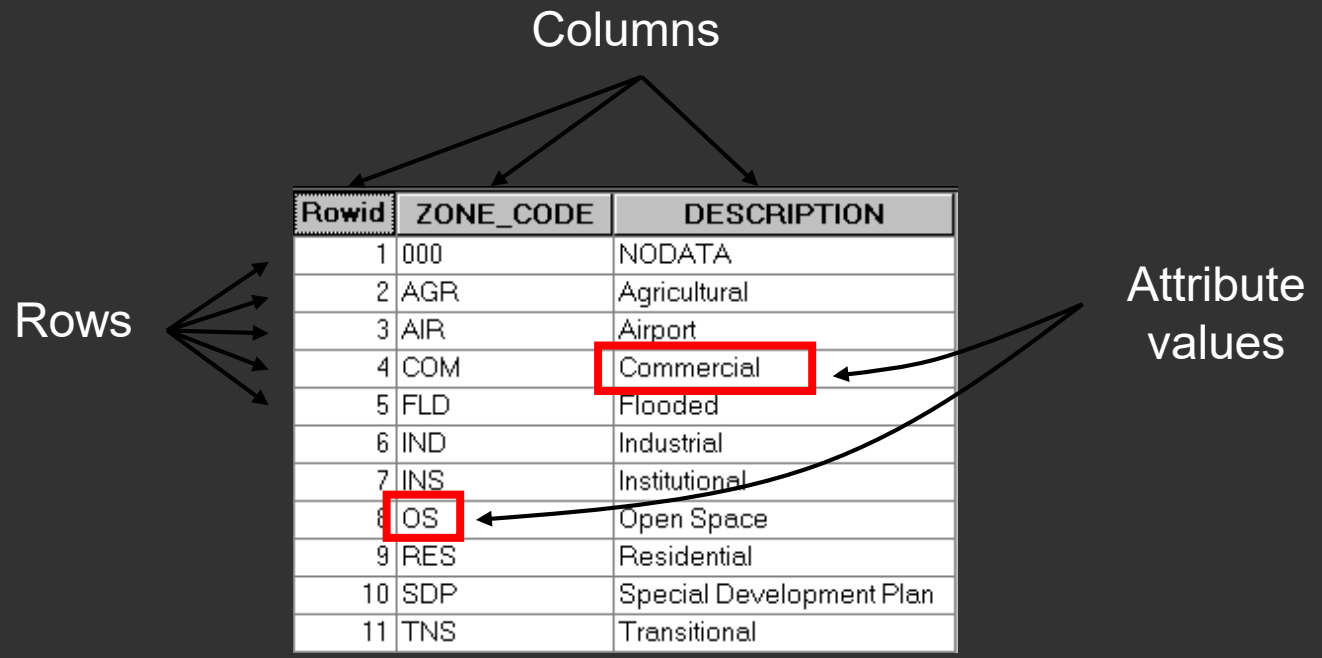
- Attribute tables:
  - Each feature class has an attribute table
  - Contain descriptive information about features
  - One row for each geographic feature
- Stand-alone tables:
  - Does not contain features
  - May contain descriptive information about features, but requires a table association to be useful
  - Certain types of GIS analysis produce stand-alone tables

ARCGIS TABULAR FORMATS

- Shapefile: DBF
- Geodatabase: RDBMS
- Microsoft Excel
- Text, CSV, ASCII
- In practice, the most common tabular format to use when importing tables into ArcGIS is DBF

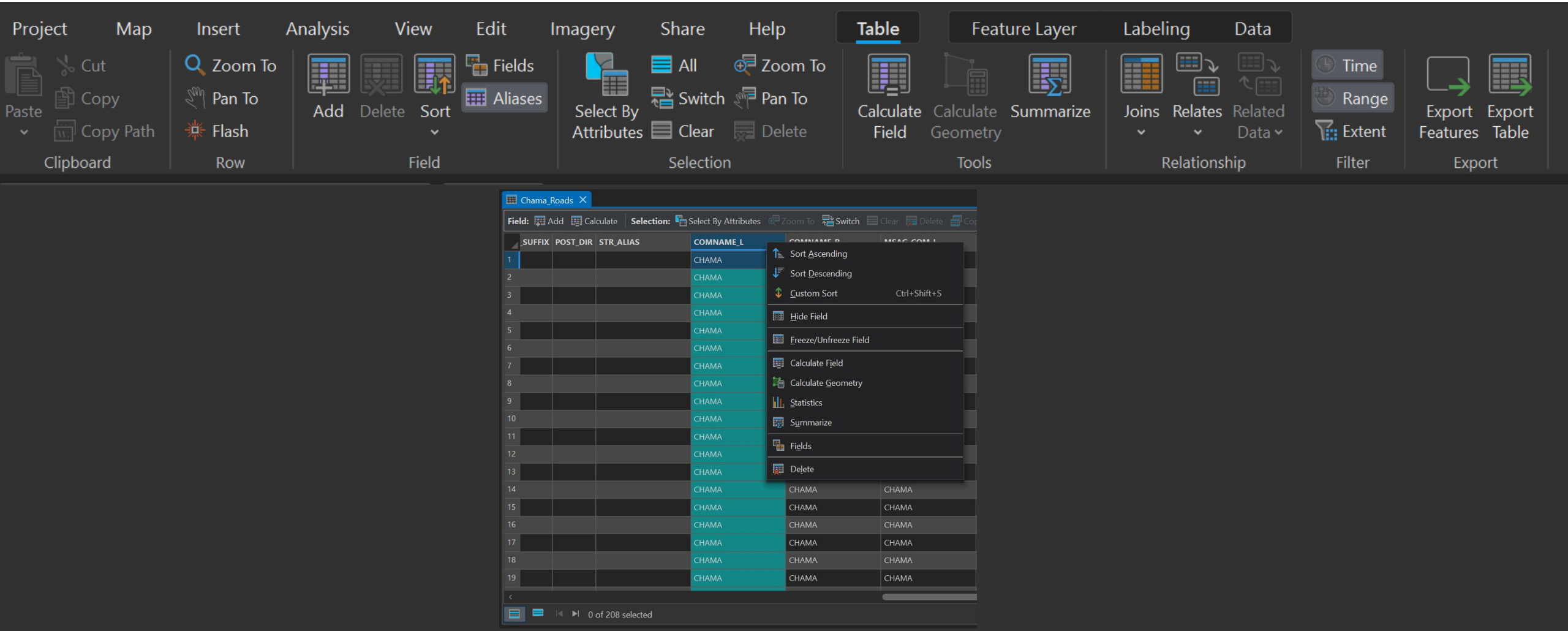
TABLE ANATOMY

- Records/rows and fields/columns
- Column types can store numbers, text, dates
- Unique column names are required



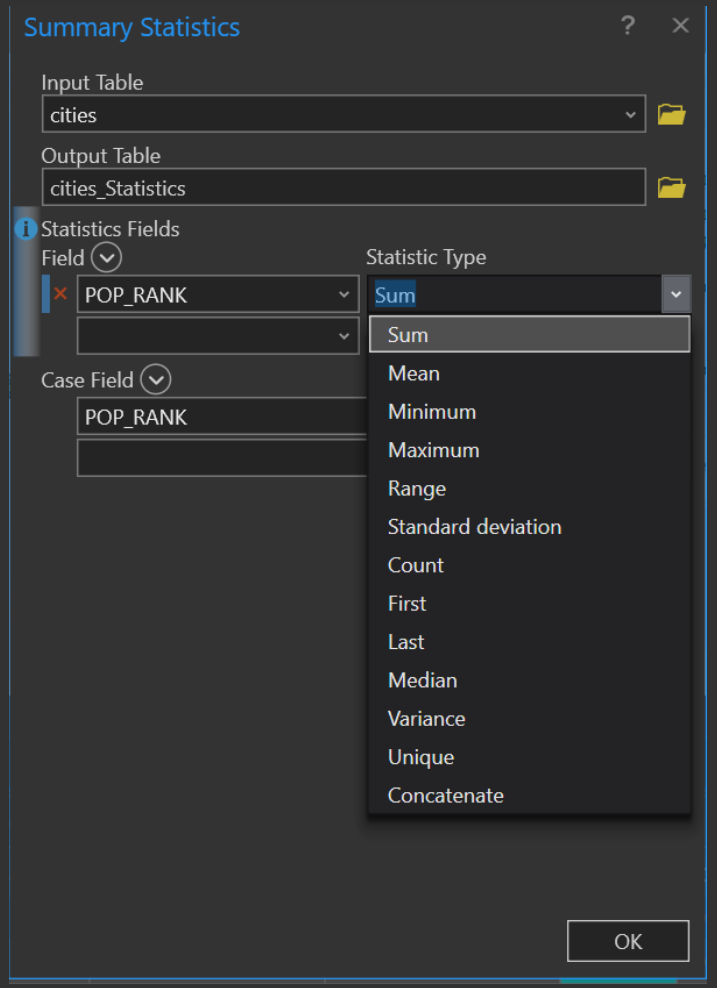
Rowid	ZONE_CODE	DESCRIPTION
1	000	NODATA
2	AGR	Agricultural
3	AIR	Airport
4	COM	Commercial
5	FLD	Flooded
6	IND	Industrial
7	INS	Institutional
8	OS	Open Space
9	RES	Residential
10	SDP	Special Development Plan
11	TNS	Transitional

TABLE TOOLS

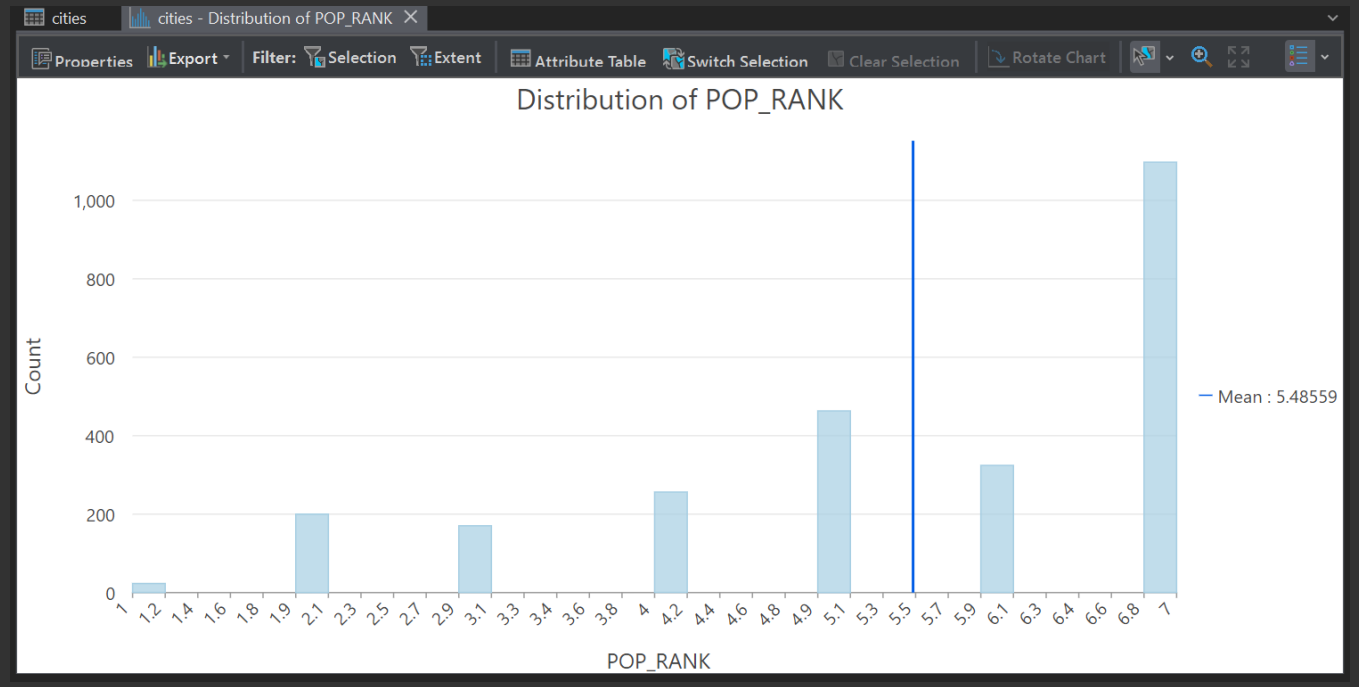

Project
Map
Insert
Analysis
View
Edit
Imagery
Share
Help
Table
Feature Layer
Labeling
Data
Paste
Cut
Copy
Copy Path
Clipboard
Zoom To
Pan To
Flash
Row
Add
Delete
Sort
Fields
Aliases
Field
Select By Attributes
All
Switch
Clear
Zoom To
Pan To
Delete
Selection
Calculate Field
Calculate Geometry
Summarize
Tools
Joins
Relates
Related Data
Relationship
Time
Range
Extent
Filter
Export Features
Export Table
Export
Chama_Roads
Field: Add Calculate
Selection: Select By Attributes Zoom To Switch Clear Delete
SUFFIX POST_DIR STR_ALIAS COMNAME_L
CHAMA
Sort Ascending
Sort Descending
Custom Sort Ctrl+Shift+S
Hide Field
Freeze/Unfreeze Field
Calculate Field
Calculate Geometry
Statistics
Summarize
Fields
Delete
0 of 208 selected

SUMMARIZE

- Export table with summary statistics using another field/column
- Adds a Count Field showing number of values
- NULL values are excluded from statistical calculations



STATISTICS


cities
cities - Distribution of POP_RANK
Properties
Export
Filter:
Selection
Extent
Attribute Table
Switch Selection
Clear Selection
Rotate Chart
Distribution of POP_RANK
Count
1,000
800
600
400
200
0
Mean : 5.48559
POP_RANK

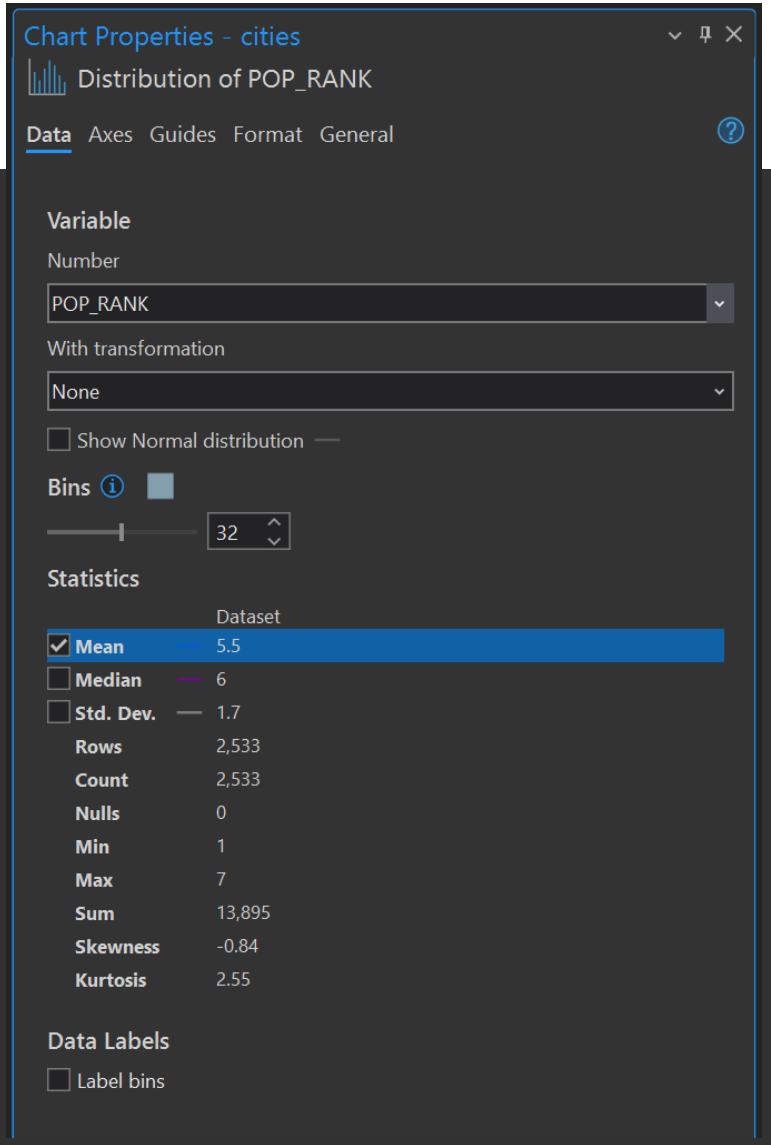
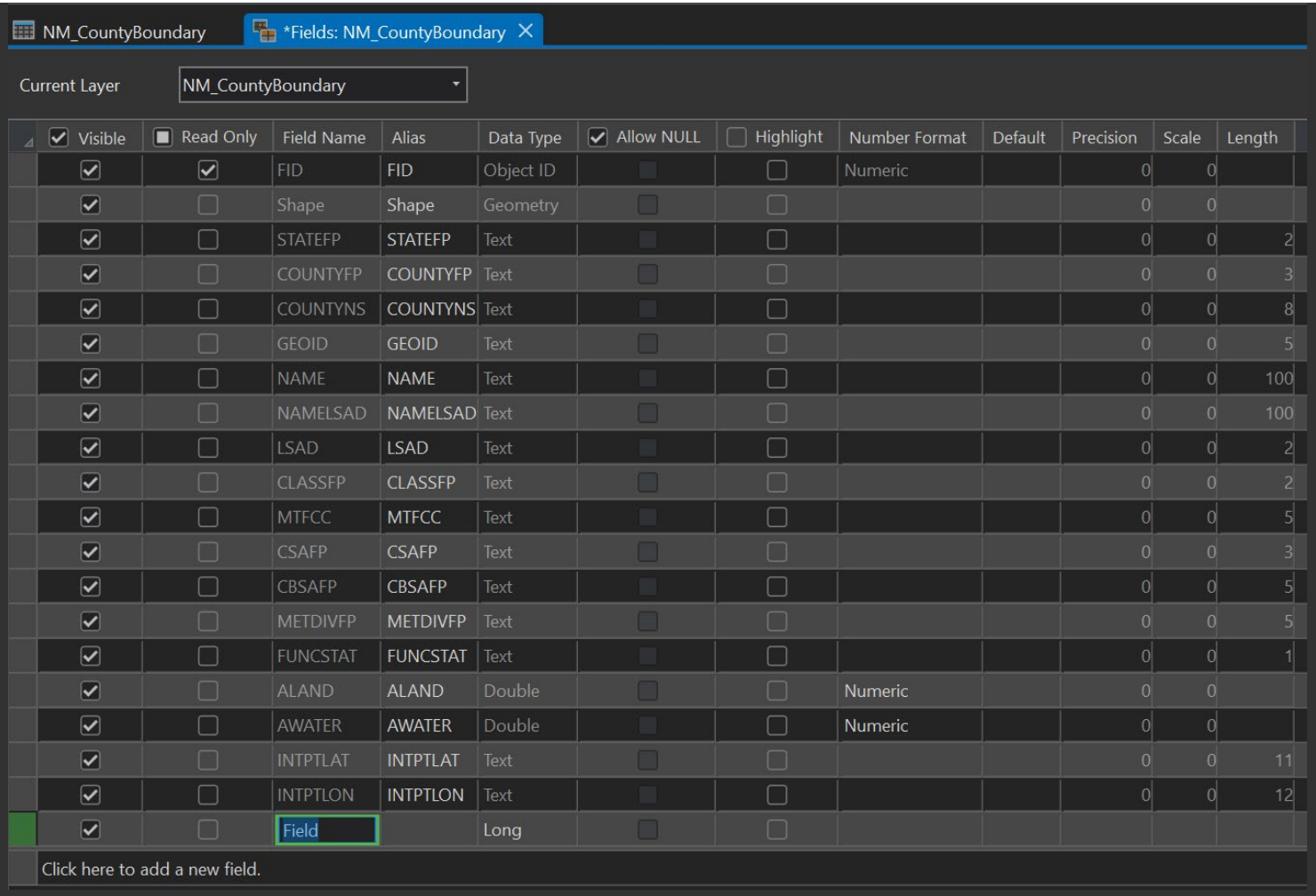


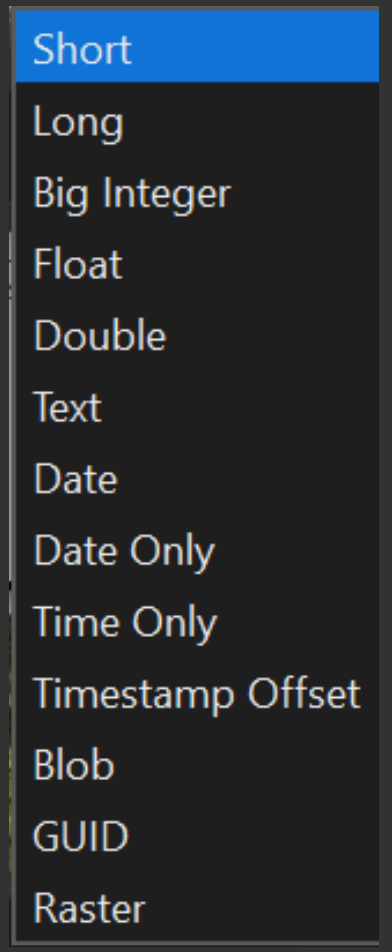
Chart Properties - cities
Distribution of POP_RANK
Data
Axes
Guides
Format
General
Variable
Number
POP_RANK
With transformation
None
Show Normal distribution
Bins
32
Statistics
Dataset
Mean 5.5
Median 6
Std. Dev. 1.7
Rows 2,533
Count 2,533
Nulls 0
Min 1
Max 7
Sum 13,895
Skewness -0.84
Kurtosis 2.55
Data Labels
Label bins

ADD FIELD


NM_CountyBoundary
*Fields: NM_CountyBoundary
Current Layer
NM_CountyBoundary
Visible
Read Only
Field Name
Alias
Data Type
Allow NULL
Highlight
Number Format
Default
Precision
Scale
Length
FID FID Object ID Numeric
Shape Shape Geometry
STATEFP STATEFP Text
COUNTYFP COUNTYFP Text
COUNTYNS COUNTYNS Text
GEOID GEOID Text
NAME NAME Text
NAMELSAD NAMELSAD Text
LSAD LSAD Text
CLASSFP CLASSFP Text
MTFCC MTFCC Text
CSAFP CSAFP Text
CBSAFP CBSAFP Text
METDIVFP METDIVFP Text
FUNCSTAT FUNCSTAT Text
ALAND ALAND Double Numeric
AWATER AWATER Double Numeric
INTPTLAT INTPTLAT Text
INTPTLON INTPTLON Text
Field Long
Click here to add a new field.

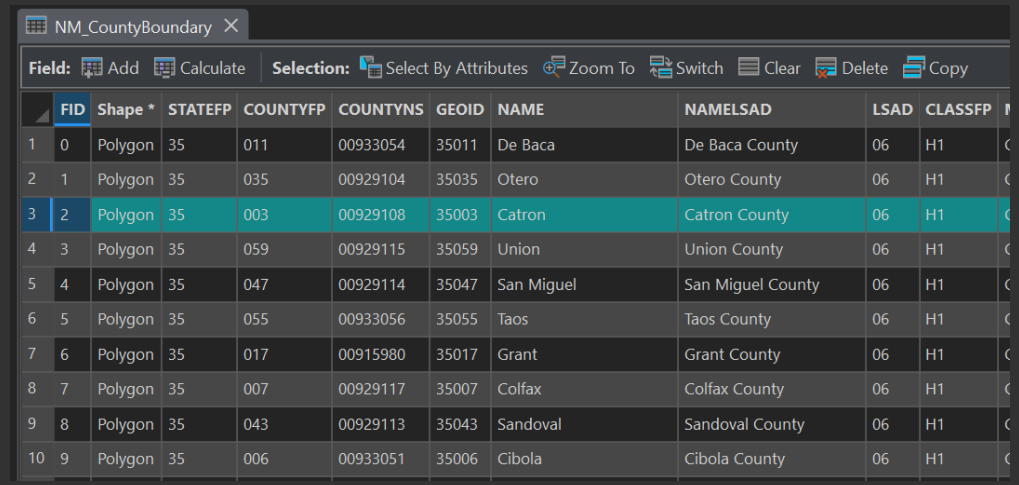
DATA FIELD TYPES

- Different field types store different kinds of values
- Choose the right field type for the right value



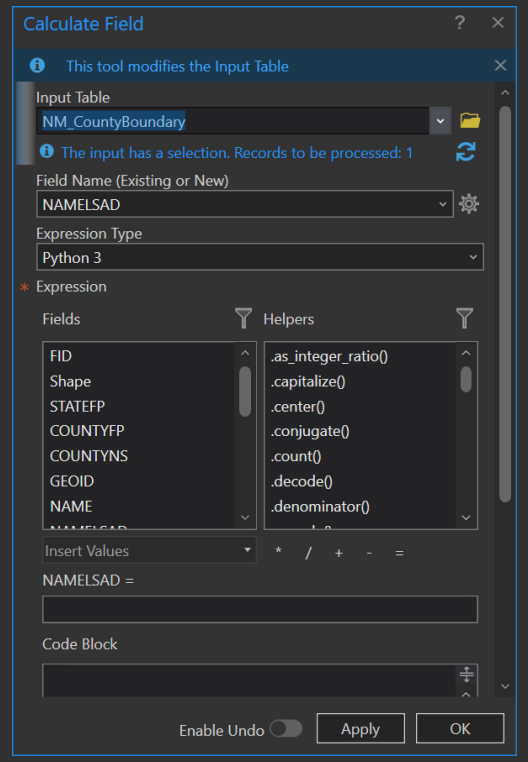
EDITING AND CALCULATING FIELDS

Edit Mode

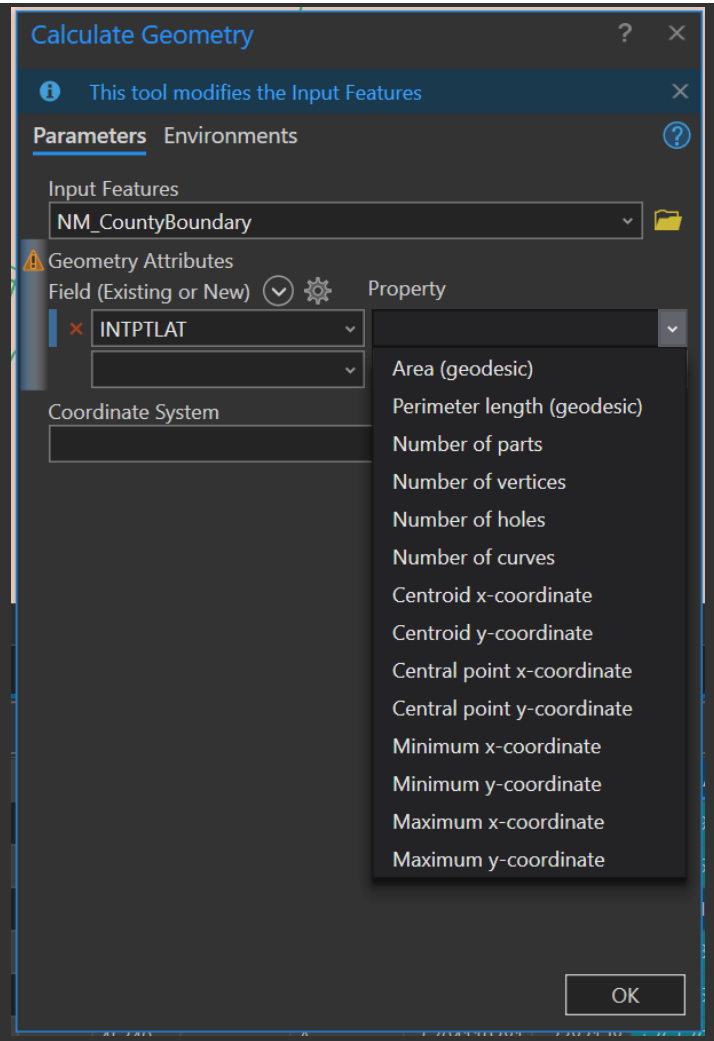


	FID	Shape *	STATEFP	COUNTYFP	COUNTYNS	GEOID	NAME	NAMELSAD	LSAD	CLASSFP
1	0	Polygon	35	011	00933054	35011	De Baca	De Baca County	06	H1
2	1	Polygon	35	035	00929104	35035	Otero	Otero County	06	H1
3	2	Polygon	35	003	00929108	35003	Catron	Catron County	06	H1
4	3	Polygon	35	059	00929115	35059	Union	Union County	06	H1
5	4	Polygon	35	047	00929114	35047	San Miguel	San Miguel County	06	H1
6	5	Polygon	35	055	00933056	35055	Taos	Taos County	06	H1
7	6	Polygon	35	017	00915980	35017	Grant	Grant County	06	H1
8	7	Polygon	35	007	00929117	35007	Colfax	Colfax County	06	H1
9	8	Polygon	35	043	00929113	35043	Sandoval	Sandoval County	06	H1
10	9	Polygon	35	006	00933051	35006	Cibola	Cibola County	06	H1

Field Calculator

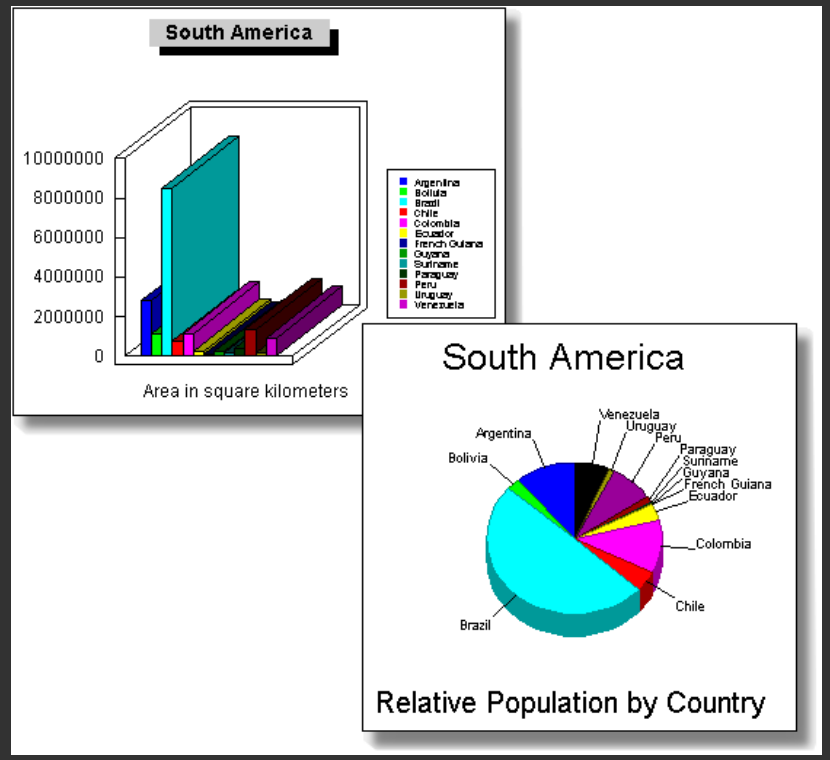


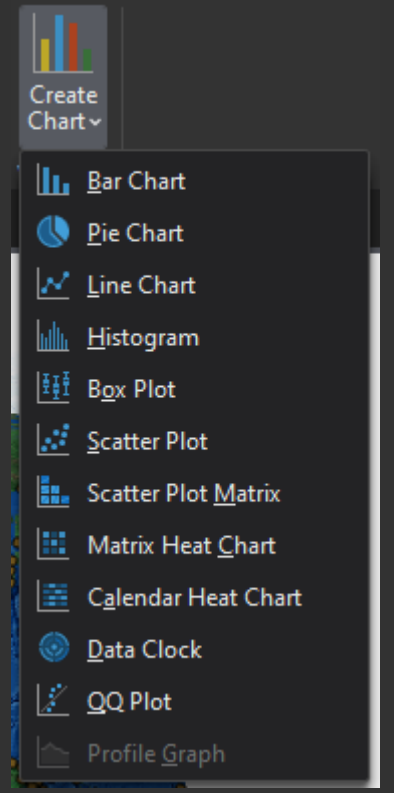
CALCULATE GEOMETRY



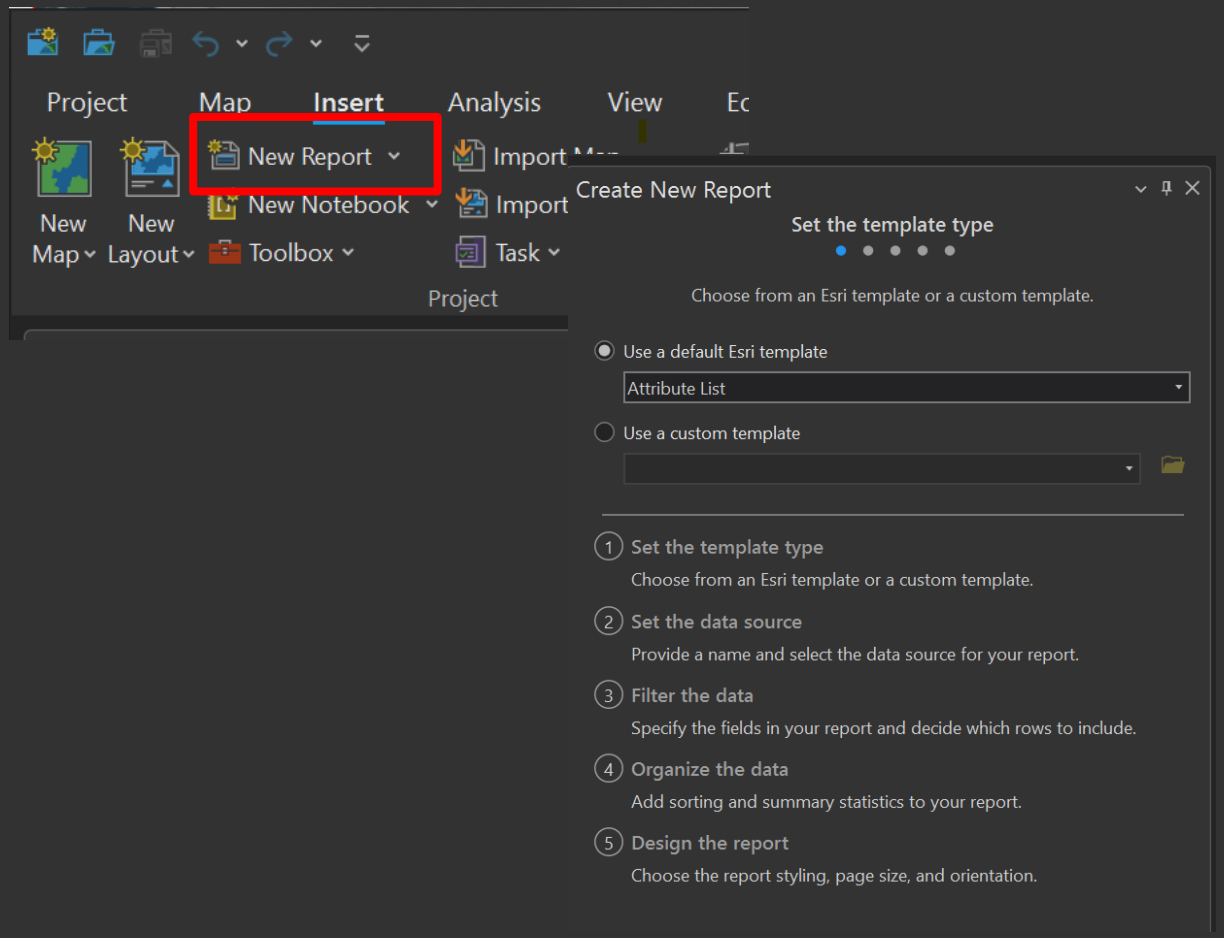
https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/calculate-geometry-attributes.htm

GRAPHS


South America
10000000
8000000
6000000
4000000
2000000
0
Area in square kilometers
Argentina
Bolivia
Brazil
Chile
Colombia
Ecuador
French Guiana
Guyana
Suriname
Paraguay
Peru
Uruguay
Venezuela
South America
Venezuela
Uruguay
Peru
Paraguay
Suriname
Guyana
French Guiana
Ecuador
Argentina
Bolivia
Colombia
Chile
Brazil
Relative Population by Country


Create Chart
Bar Chart
Pie Chart
Line Chart
Histogram
Box Plot
Scatter Plot
Scatter Plot Matrix
Matrix Heat Chart
Calendar Heat Chart
Data Clock
QQ Plot
Profile Graph

REPORTS


Project
Map
Insert
Analysis
View
New Report
New Notebook
Import
Import
Task
Toolbox
New Map
New Layout
Project
Create New Report
Set the template type
Choose from an Esri template or a custom template.
Use a default Esri template
Attribute List
Use a custom template
1 Set the template type
Choose from an Esri template or a custom template.
2 Set the data source
Provide a name and select the data source for your report.
3 Filter the data
Specify the fields in your report and decide which rows to include.
4 Organize the data
Add sorting and summary statistics to your report.
5 Design the report
Choose the report styling, page size, and orientation.

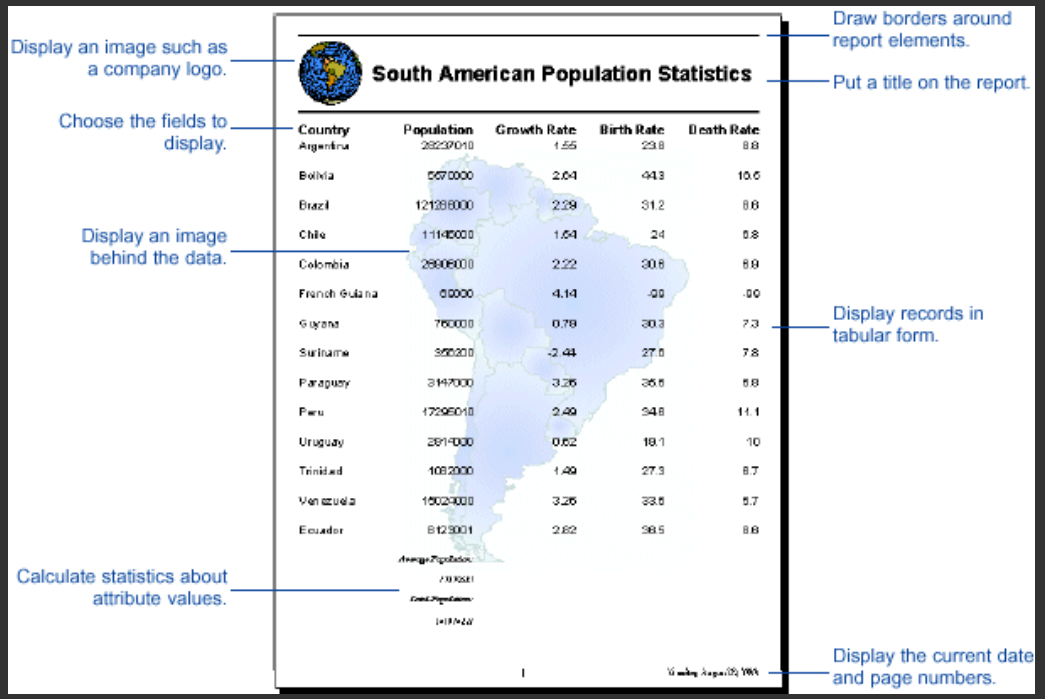

Display an image such as a company logo.
Choose the fields to display.
Display an image behind the data.
Calculate statistics about attribute values.
Draw borders around report elements.
Put a title on the report.
Display records in tabular form.
Display the current date and page numbers.
South American Population Statistics
Country
Population
Growth Rate
Birth Rate
Death Rate

TABLE CARDINALITY

Relationship between features

TABLE RELATIONSHIPS

- How many A objects are related to B objects?
  - Associate tables with common column key values
  - Must know table relationships (cardinality)
- Types of cardinality
  - one to one
  - one to many
  - many to one
  - many to many

Feature attribute table

FID	Shape	AREA	PERIMETER	ZONE#	ZONE-ID	ZONE_CODE
29	Polygon	139761.1	3436.182685761	29	31	RES
30	Polygon	19311.13	1227.994790069	30	25	AIR
31	Polygon	1394.393	269.1558402356	31	35	IND
32	Polygon	10618.05	433.2512163686	32	33	RES
33	Polygon	9529.783	418.2222455404	33	34	RES
34	Polygon	16141.88	812.9035032412	34	38	000
35	Polygon	44579.73	879.9199925836	35	36	IND
36	Polygon	74082.59	1254.269129168	36	37	SDP
37	Polygon	11033.96	439.7286407905	37	39	RES
38	Polygon	9639.264	420.0301261116	38	41	RES
39	Polygon	637314.4	4448.708737875	39	40	AGR

Additional attribute table

Rowid	ZONE_CODE	DESCRIPTION
1	000	NODATA
2	AGR	Agricultural
3	AIR	Airport
4	COM	Commercial
5	FLD	Flooded
6	IND	Industrial
7	INS	Institutional
8	OS	Open Space
9	RES	Residential
10	SDP	Special Development Plan
11	TNS	Transitional

ONE-TO-ONE

Parcel attribute table

Parcel ID	Value ($)	Owner
1	12,000	114
2	13,500	116
3	11,000	117
4	12,800	115
5	10,500	113
6	11,000	120
7	12,500	126
8	11,500	123
9	14,500	118

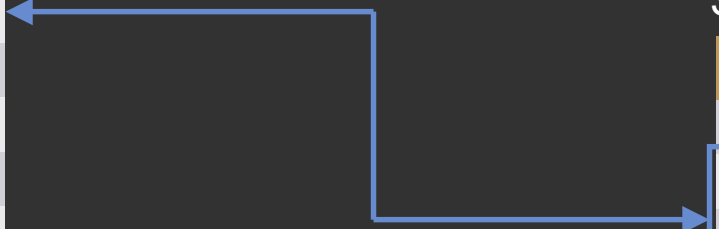
Stand-alone owner table

Owner	Name
113	M. Smith
114	K. Jones
115	L. Longley
116	P. West
117	A. Mess
118	G. Whiz
120	B. Ware
123	H. Mo
126	V. Ling

ONE-TO-MANY

Parcel attribute table

Parcel ID	Value ($)
1	12,000
2	13,500
3	11,000
4	12,800
5	10,500
6	11,000
7	12,500
8	11,500
9	14,500



Stand-alone owner table

Parcel ID	Name
1	M. Smith
2	K. Jones
2	L. Longley
2	P. West
3	A. Mess
3	G. Whiz
4	B. Ware
5	H. Mo
5	V. Ling

MANY-TO-ONE

Parcel attribute table

Parcel ID	Value ($)	Owner
1	12,000	114
2	13,500	116
3	11,000	116
4	12,800	116
5	10,500	113
6	11,000	120
7	12,500	126
8	11,500	120
9	14,500	118

Stand-alone owner table

Owner	Name
113	M. Smith
114	K. Jones
115	L. Longley
116	P. West
117	A. Mess
118	G. Whiz
120	B. Ware
123	H. Mo
126	V. Ling

MANY-TO-MANY

Parcel attribute table

Parcel ID	Value ($)	Owner
1	12,000	114
2	13,500	116
3	11,000	116
4	12,800	116
5	10,500	113
6	11,000	120
7	12,500	126
8	11,500	120
9	14,500	118

Stand-alone owner table

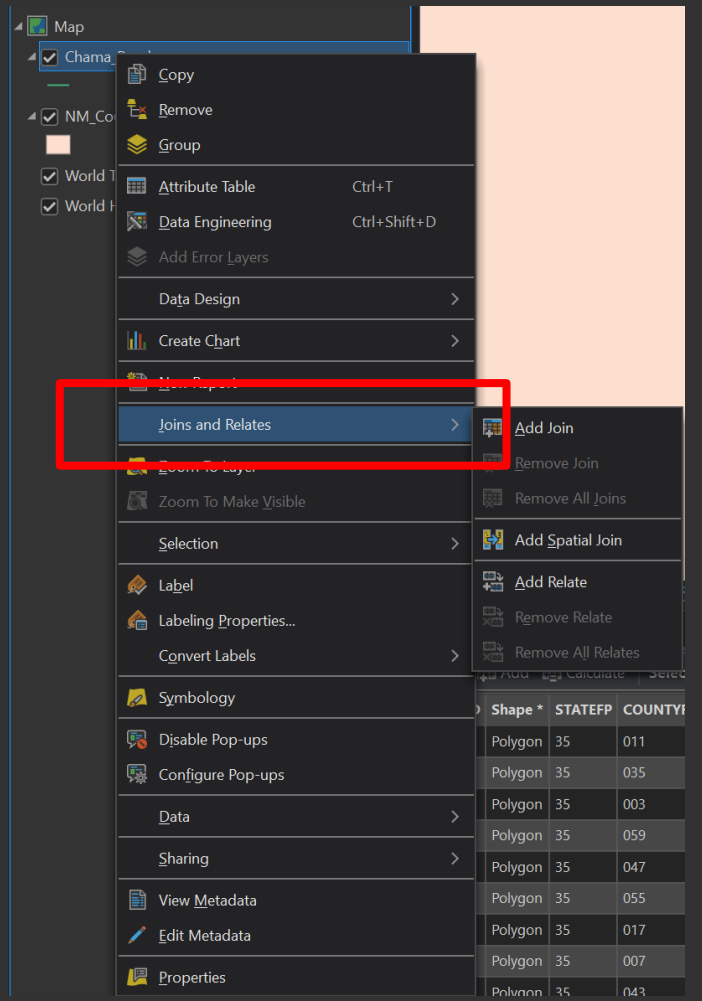
Owner	Name
113	M. Smith
114	K. Jones
115	L. Longley
116	P. West
116	A. Mess
118	G. Whiz
120	B. Ware
123	H. Mo
123	V. Ling

JOINS & RELATES

Associate records in one table with another table

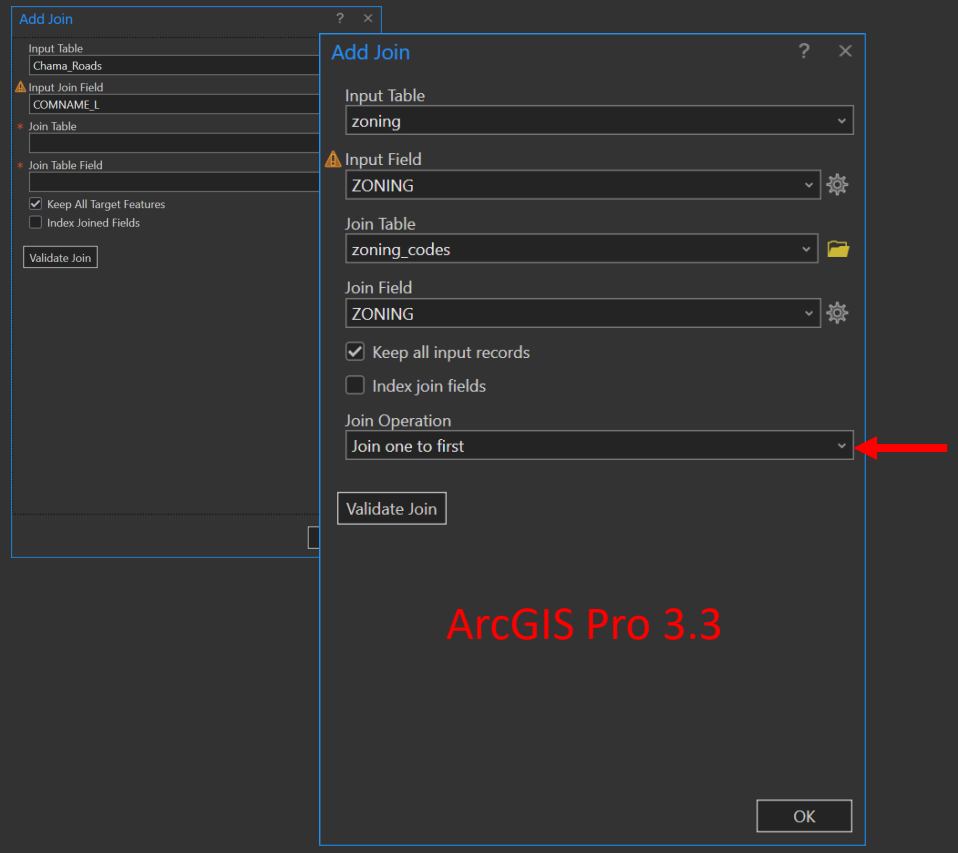
JOINS AND RELATES

- Two methods to associate tables in ArcMap
- Join appends the attributes from one onto the other based on a common field
- Relates define a relationship between two tables
- Cannot use join and relate between same tables at one time

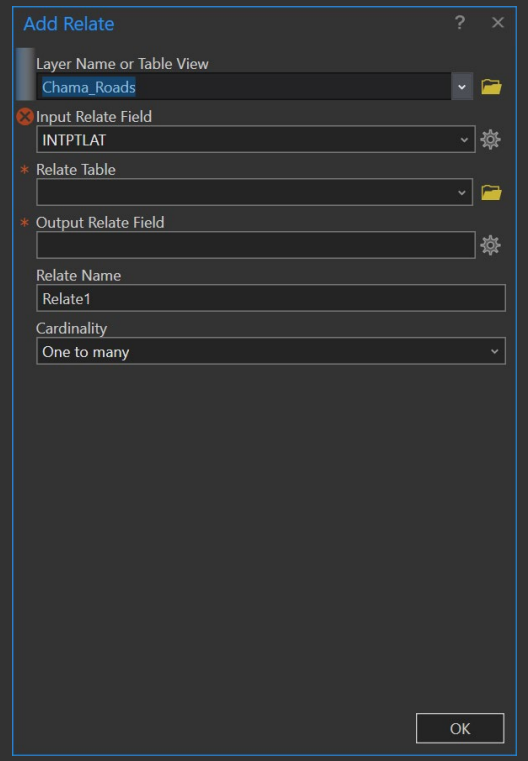


JOINS AND RELATES

Join



Relate



JOIN ATTRIBUTES FROM A TABLE

- Physical connection between two tables
- Appends the attributes of two tables
- Assumes one-to-one or many-to-one cardinality

Soil

Attributes of soil

OBJECTID*	Shape*	SOIL_CODE
1	Polygon	41
2	Polygon	26
3	Polygon	26
4	Polygon	26
5	Po	
6	Po	
7	Po	

Soil_desc

Attributes of soil_desc

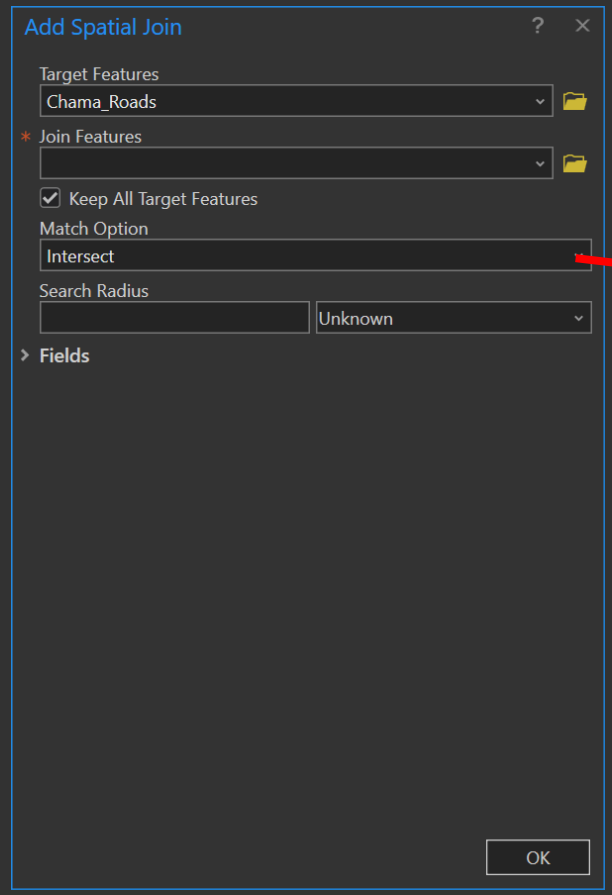
OBJECTID*	SOIL_CODE	SOIL_DESC
1	41	Quary-Gravel pit
2	26	Psamments and Fluvents (freq-flooded)
3	26	Psamments and Fluvents (freq-flooded)
4	26	Psamments and Fluvents (freq-flooded)

Soil

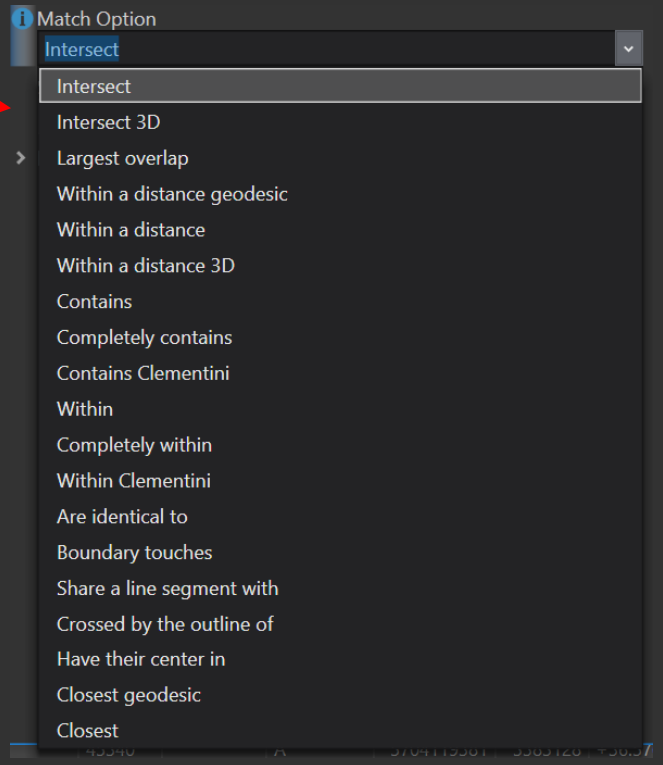
Attributes of soil

OBJECTID	Shape	soil.SOIL_CODE	soil_desc.SOIL_CODE	soil_desc.SOIL_DESC
1	Polygon	41	41	Quary-Gravel pit
2	Polygon	26	26	Psamments and Fluvents (freq-flooded)
3	Polygon	26	26	Psamments and Fluvents (freq-flooded)
4	Polygon	26	26	Psamments and Fluvents (freq-flooded)
5	Polygon	34	34	Soboba stony loamy sand
6	Polygon	50	50	Water

SPATIAL JOIN



This creates a temporary join.
To save output use Spatial Join Tool in the ArcToolbox



JOIN HINTS

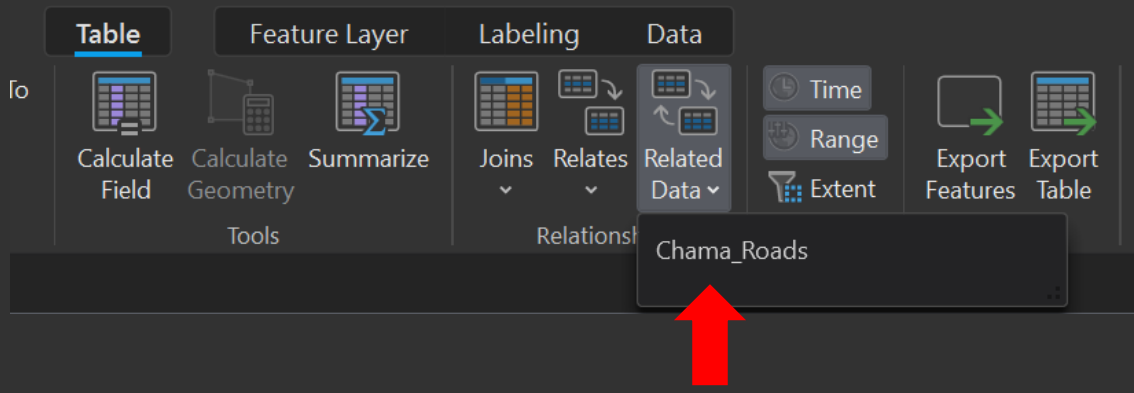
- If values in the Output Join Field are not unique, only the first occurrence of each value will be used.
- To make the join permanent save the joined feature layer to a new feature class
- Reasons joining tables may fail
  - Values in the specified fields for the join do not match.
  - Joins are case sensitive, so be aware of this when using string fields to create a join.
    For example, NEW YORK will not join with New York.
  - The name of the table or feature class, or field names in the table or feature class, include spaces or special characters.

ArcGIS Pro 3.3
Join Operation:
One-to-first joins are not case sensitive; one-to-many joins are case sensitive.

https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/add-join.htm

CONNECTING TABLES WITH RELATES

- Define relationship between two tables
- Tables remain independent
- Cardinality: one to one, one to many, many to many



NM_CountyBoundary | Chama_Roads

Field: Add | Calculate | Selection: Select By Attributes | Zoom To | Switch | Clear | Delete | Copy

	FID	Shape *	STATEFP	COUNTYFP	COUNTYNS	GEOID	NAME	NAMELSAD	LSAD	CLASSFP
16	14	Polygon	35	028	01702366	35028	Los Alamos	Los Alamos County	06	H1
17	23	Polygon	35	029	00933057	35029	Luna	Luna County	06	H1
18	24	Polygon	35	031	00929107	35031	McKinley	McKinley County	06	H1
19	15	Polygon	35	033	01702367	35033	Mora	Mora County	06	H1
20	1	Polygon	35	035	00929104	35035	Otero	Otero County	06	H1
21	29	Polygon	35	037	00929110	35037	Quay	Quay County	06	H1
22	25	Polygon	35	039	01702368	35039	Rio Arriba	Rio Arriba County	06	H1
23	18	Polygon	35	041	01702369	35041	Roosevelt	Roosevelt County	06	H1
24	19	Polygon	35	045	00936844	35045	San Juan	San Juan County	06	H1
25	4	Polygon	35	047	00929114	35047	San Miguel	San Miguel County	06	H1
26	8	Polygon	35	043	00929113	35043	Sandoval	Sandoval County	06	H1
27	28	Polygon	35	049	00933322	35049	Santa Fe	Santa Fe County	06	H1
28	31	Polygon	35	051	01702370	35051	Sierra	Sierra County	06	H1

1 of 33 selected

NM_CountyBoundary | Chama_Roads

Field: Add | Calculate | Selection: Select By Attributes | Zoom To | Switch | Clear | Delete | Copy | Highlighted: Unselect | Resele

	TR_SUFFIX	POST_DIR	..	ROAD_LABEL	COMNAME_L	COMNAME_R	MSAG_COM_L	MSAG_COM_R	COUNTY_L	COUNTY_R
1	T			1ST ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
2	T			1ST ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
3	T			2ND ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
4	T			2ND ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
5	T			3RD ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
6	T			4TH ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
7	T			4TH ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
8	T			4TH ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
9	T			5TH ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
10	VE			MAPLE AVE	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
11	T			5TH ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
12	T			5TH ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba
13	T			6TH ST	CHAMA	CHAMA	CHAMA	CHAMA	Rio Arriba	Rio Arriba

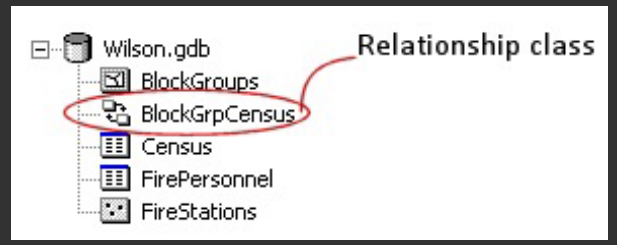
208 of 208 selected

RELATE HINTS

- Relates are bidirectional, therefore both tables involved will be able to use the relate regardless of which table owns the relate. For example, if a relate is created on layer A for table B, the relate will be listed under layer A, but table B will be able to use it to access records in layer A.
- When a selection is made on a table or layer, it is not automatically applied to the related tables. You can use the Related Tables command from the Table window's toolbar to apply ("push") a selection to a related table or layer.
- If you relate to a table that does not have an ObjectID column (such as delimited text files or OLE DB tables), you will not be able to apply selections using the relate.
- Table relates exist in a map or a layer.
- Explore and/or Related Data tools can be used to find related records.

RELATIONSHIP CLASSES

- A relationship class is an object in a geodatabase that stores information about a relationship between two feature classes, between a feature class and a nonspatial table, or between two nonspatial tables.
- Both participants in a relationship class must be stored in the same geodatabase.
- Relationship classes help ensure referential integrity. For example, the deletion or modification of one feature could delete or alter a related feature.



JOIN OR RELATE?

	Relationship classes	On-the-fly relates	Joins
Typical uses	Ensuring data integrity	Editing with low overhead	Labeling, symbology
Scope	Geodatabase	Cross database or data source	Cross database or data source
Framework	Geodatabase data model	Defined in map layer	Geodatabase/Shapefiles - SQL
Composite objects	Yes	No	No
Referential integrity	Yes	No	No
Relationship rules	Yes	No	No
Cardinality	One-to-one, one-to-many, many-to-many	One-to-one, one-to-many, many-to-many	One-to-one, many-to-one
Pros	Manages referential integrity and messaging behavior Edited via ArcMap attributes inspector	No editing overhead, can cross workspace and data source type	No editing overhead; can cross workspace and data source type; can be used for SQL queries, labeling, and symbology
Cons	Incurs editing overhead; must be defined only between tables in same geodatabase; still requires joins for SQL query, labeling, and symbology	No referential integrity; exist only in a layer or map; still requires joins for SQL query, labeling, and symbology	No referential integrity, one-to-many and many-to-many relationships are not supported

USEFUL TABLE INFO

- Essential table and attribute information vocabulary

  https://pro.arcgis.com/en/pro-app/latest/help/data/tables/essential-table-and-attribute-information-vocabulary.htm

- Common tables and attributes tasks

  https://pro.arcgis.com/en/pro-app/latest/help/data/tables/common-table-and-attribute-tasks.htm