GEODATABASES AND QUERIES

Introduction to GIS| Winter 2015

Table relationships in ArcGIS

How can I add attributes to my features?

- Database design guidelines promote organizing your database into multiple tables
- Each focuses on a specific topic
- Replaces one large table containing all the necessary fields

Table

cnty26.csv

Practice	Year	State	County	Stfips	District	CoFips
Total For Crop	1996	AL	COLBERT	1	10	33
Total For Crop	1996	AL	LAUDERDALE	1	10	77
Total For Crop	1996	AL	LAWRENCE	1	10	79
Total For Crop	1996	AL	LIMESTONE	1	10	83
Total For Crop	1996	AL	MADISON	1	10	89
Total For Crop	1996	AL	MARION	1	10	93
Total For Crop	1996	AL	MORGAN	1	10	103
Total For Crop	1996	AL	D10 COMBINED COUNTIES	1	10	888
Total For Crop	1996	AL	D10 NORTHERN VALLEY	1	10	999
Total For Crop	1996	AL	BLOUNT	1	20	9
Total For Crop	1996	AL	CALHOUN	1	20	15
Total For Crop	1996	AL	CHEROKEE	1	20	19
Total For Crop	1996	AL	CULLMAN	1	20	43
Total For Crop	1996	AL	DE KALB	1	20	49
Total For Crop	1996	AL	ETOWAH	1	20	55
Total For Crop	1996	AL	JACKSON	1	20	71
Total For Crop	1996	AL	MARSHALL	1	20	95
Total For Crop	1996	AL	D20 COMBINED COUNTIES	1	20	888
Total For Crop	1996	AL	D20 MOUNTAINS & EASTERN VALLEY	1	20	999
Total For Crop	1996	AL	FAYETTE	1	30	57
Total For Crop	1996	AL	LAMAR	1	30	75
Total For Crop	1996	AL	PICKENS	1	30	107
Total For Crop	1996	AL	RANDOLPH	1	30	111
Total For Crop	1996	AL	SHELBY	1	30	117
Total For Crop	1996	AL	TALLADEGA	1	30	121
Total For Crop	1996	AL	TUSCALOOSA	1	30	125
Total For Crop	1996	AL	D30 COMBINED COUNTIES	1	30	888
Total For Crop	1996	AL	D30 UPPER PLAINS & PEIDMONT	1	30	999
Total For Crop	1996	AL	AUTAUGA	1	40	1
Total For Crop	1996	AL	DALLAS	1	40	47

Table

lwr48

PERIMETER	CO99_D00_	CO99_D00_I	STATE	COUNTY	NAM
4.254051	115	114	27	077	Lake of the W
5.326881	116	115	53	073	Whatcom
0.17436	117	116	53	073	Whatcom
8.658548	118	117	30	029	Flathead
5.614212	119	118	30	053	Lincoln
2.966526	120	119	16	021	Boundary
5.517993	121	120	30	005	Blaine
5.26467	122	121	53	065	Stevens
7.113642	123	122	53	047	Okanogan
2.588276	124	123	38	067	Pembina
2.690605	125	124	27	069	Kittson
4.565654	126	125	30	041	Hill
3.05848	127	126	38	019	Cavalier
4.153222	128	127	53	019	Ferry
3.095887	129	128	53	051	Pend Oreille
6.881427	130	129	30	071	Phillips
2.368617	131	130	38	095	Towner
3.606592	132	131	27	135	Roseau
6.450189	133	132	30	105	Valley
3.240687	134	133	30	091	Sheridan
3.058245	135	134	38	023	Divide
3.22946	136	135	30	019	Daniels
3.002155	137	136	38	075	Renville
3.785731	138	137	38	009	Bottineau
2.741471	139	138	38	013	Burke
2.288815	140	139	38	079	Rolette
3.480705	141	140	30	101	Toole
5.438828	142	141	30	035	Glacier

How to bring different tables together

- Use a Join or Relate table connection
- Based on an Key Attribute field
- What key connects these two tables?

STATE	COUNTY
27	077
53	073
53	073
30	029
30	053
16	021
30	005
53	065
53	047
38	067
27	069
30	041

Stfips	District	CoFips
1	10	33
1	10	77
1	10	79
1	10	83
1	10	89
1	10	93
1	10	103
1	10	888
1	10	999
1	20	9
1	20	15
1	20	19
1	20	43

What if attribute keys do not match?

STATE	COUNTY
27	077
53	073
53	073
30	029
30	053
16	021
30	005
53	065
53	047
38	067
27	069
30	041

Stfips	District	CoFips
1	10	33
1	10	77
1	10	79
1	10	83
1	10	89
1	10	93
1	10	103
1	10	[illegible]
1	10	999
1	20	9
1	20	15
1	20	19
1	20	43

Sta_Count	OID_	Sta_Coun_1
270077	0	0
530073	2253	530073
530073	2253	530073
300029	0	0
300053	0	0
160021	0	0
300005	1213	300005
530065	0	0
530047	0	0
380067	1552	380067
270069	993	270069
300041	0	0
380019	1529	380019

Join | table connection

- Appends fields of one table to another
  - To add as a supplement or appendix

Countries

CNTRY_NAME	LONG_	ISOSHRTN	UNSH	LO	LOC	STAT	P	SQKM	SQMI	CO	NAME
Croatia	Republi	Croatia	Croati	Hrv	Repu	UN Me	4	53541.31	20672.3	3	Croatia
Italy	Italian R	Italy	Italy	Itali	Repu	UN Me	5	301101.38	116255.25	4	<Null>
Macedonia	The For	Macedonia,	The Fo	Mak	Repu	UN Me	2	25272.36	9757.66	3	<Null>
Malta	Republi	Malta	Malta	Malt	Repu	UN Me	3	211.5	81.66	2	<Null>
San Marino	Republi	San Marino	San M	San	Repu	UN Me	2	32.78	12.65	4	<Null>
Serbia & Montenegro	Serbia	Serbia and	Serbia		Srbija	UN Me	1	102666.83	39639.65	1	<Null>
Vatican City	The Hol	Holy See (V	Holy S	San	Santa	The Cit	9	0.32	0.12	1	<Null>
Bulgaria	Republi	Bulgaria	Bulgari			UN Me	7	110522.95	42672.93	8	Bulgaria
Cyprus	Republi	Cyprus	Cypru			UN Me	7	9894.22	3820.16	7	<Null>
Egypt	Arab R	Egypt	Egypt	Mis	Jumh	UN Me	7	1000941.5	386463.72	1	Egypt
Georgia	Georgia	Georgia	Georgi	Sak		UN Me	4	69676.67	26902.16	5	Georgia
Greece	Hellenic	Greece	Greec	Ella	Elliniki	UN Me	1	125514.83	48461.27	5	<Null>
Lebanon	Lebane	Lebanon	Leban	Lub	Al Ju	UN Me	3	10807.67	4172.84	2	Lebanon
Syria	Syrian	Syrian Arab	Syrian	Suri	Al Ju	UN Me	1	190030.31	73370.7	8	Syria
Turkey	Republi	Turkey	Turkey	Tur	Turki	UN Me	6	778601.81	300618.16	2	Turkey
Austria	Republi	Austria	Austri	Oe	Repu	UN Me	8	82868.58	31995.56	1	<Null>
Czech Republic	Czech	Czech Repu	Czech	Ces	Cesk	UN Me	1	78281.99	30224.68	3	Czech Republic
Denmark	Kingdo	Denmark	Denma	Dan	Kong	UN Me	5	41103.48	15870.05	6	<Null>
Hungary	Republi	Hungary	Hunga	Ma	Magy	UN Me	1	92174.04	35588.4	4	Hungary
Poland	Republi	Poland	Poland	Pol	Rzec	UN Me	3	312136.16	120515.79	5	Poland
Slovakia	Slovak	Slovakia	Slovak	Slo	Slove	UN Me	5	48560.4	18749.17	6	<Null>
Slovenia	Republi	Slovenia	Sloven	Slo	Repu	UN Me	2	20625.4	7963.47	2	Slovenia
Svalbard	Svalbar	Svalbard an	Svalba			Norwe	2	60119.17	23212.01	3	<Null>
Belgium	Kingdo	Belgium	Belgiu	Bel	Roya	UN Me	1	30711.36	11857.66	4	<Null>
France	French	France	Franc	Fra	Repu	UN Me	6	546970.19	211185.19	6	<Null>
Germany	Federal	Germany	Germa	Deu	Bund	UN Me	8	355245.97	137160.48	8	Germany
Liechtenstein	Principa	Liechtenstei	Liecht	Lie	Fuers	UN Me	3	111.56	43.07	7	<Null>
Luxembourg	Grand	Luxembourg	Luxem	Lux	Gran	UN Me	4	2578.1	995.4	1	<Null>

Joins | table connections

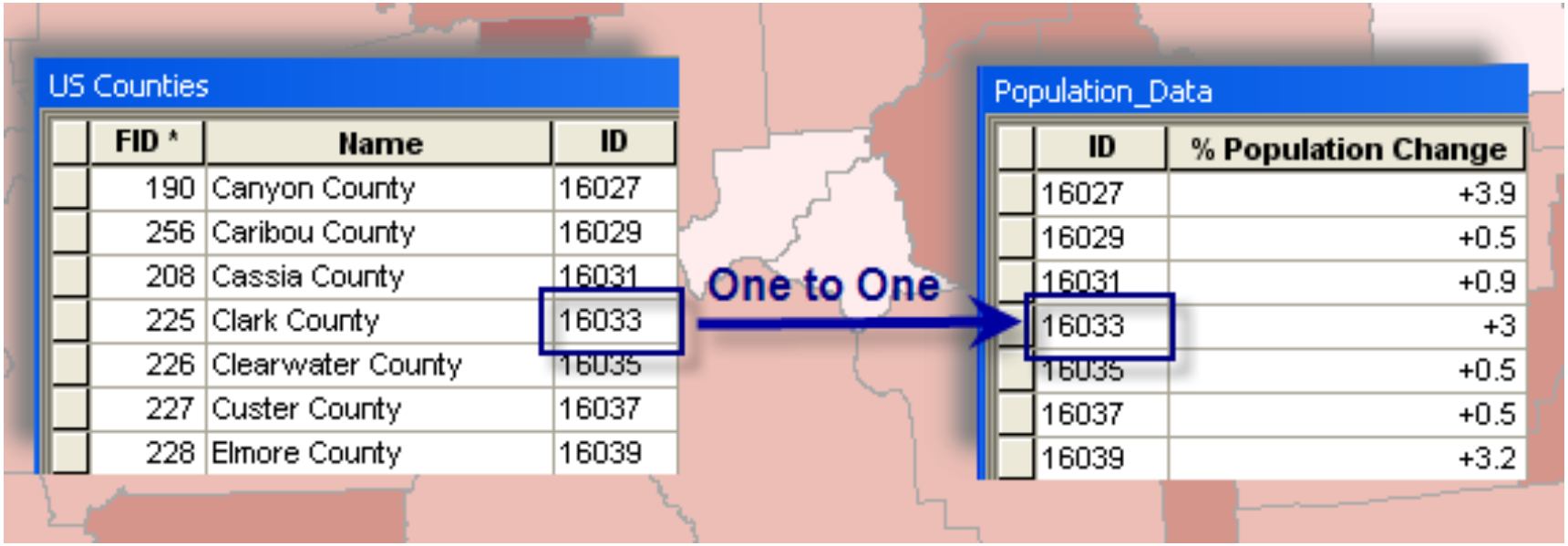
- Output table is a *dynamic view* (does not create a new table
- Contains field from both input tables
- Joins are temporary
  - Uses relative pathways to connect data that may be moved
  - Arc reconnects to join upon start-up
- Make it permanent! Export data to new feature class

Joins | table connections

- Joins are used if relationships between tables is:
  - **One-to-one**
  - **Many-to-one**
- Let's take a look at what I'm talking about…

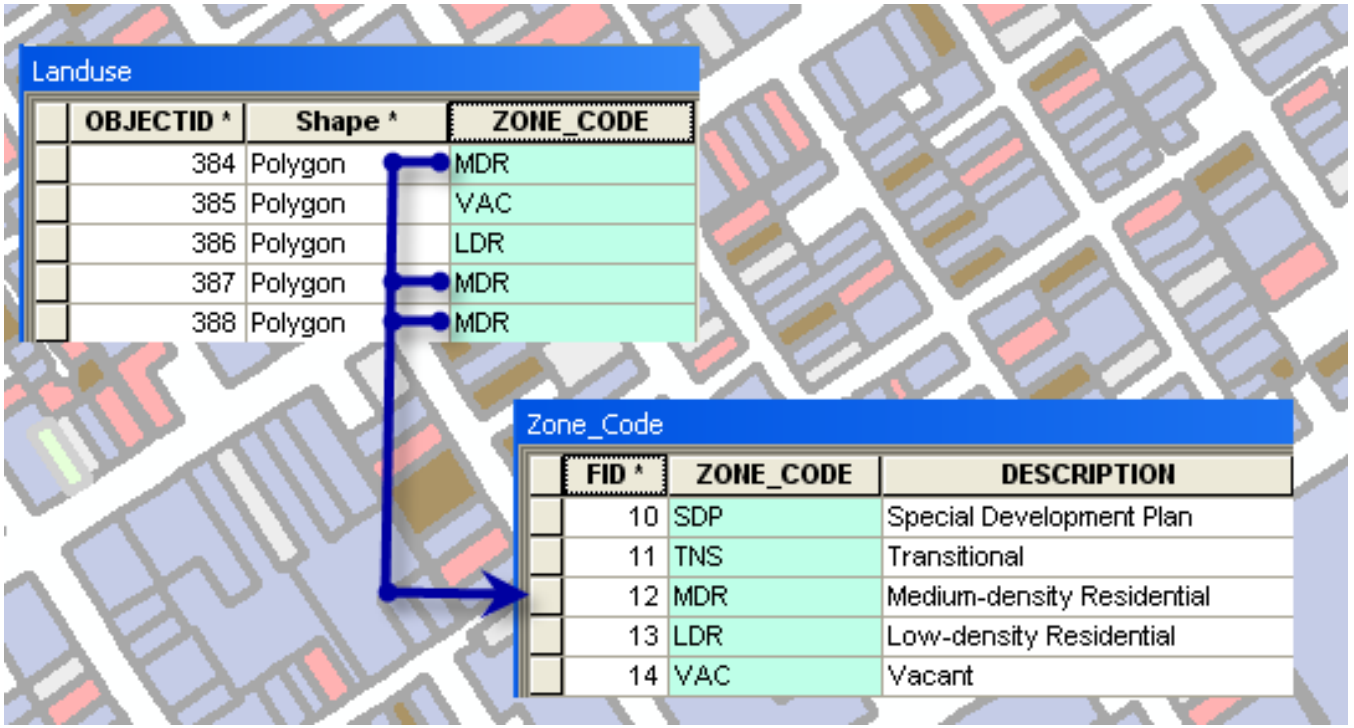
One-to-one relationship

- A record in Table A can match to one and only one possible record in Table B



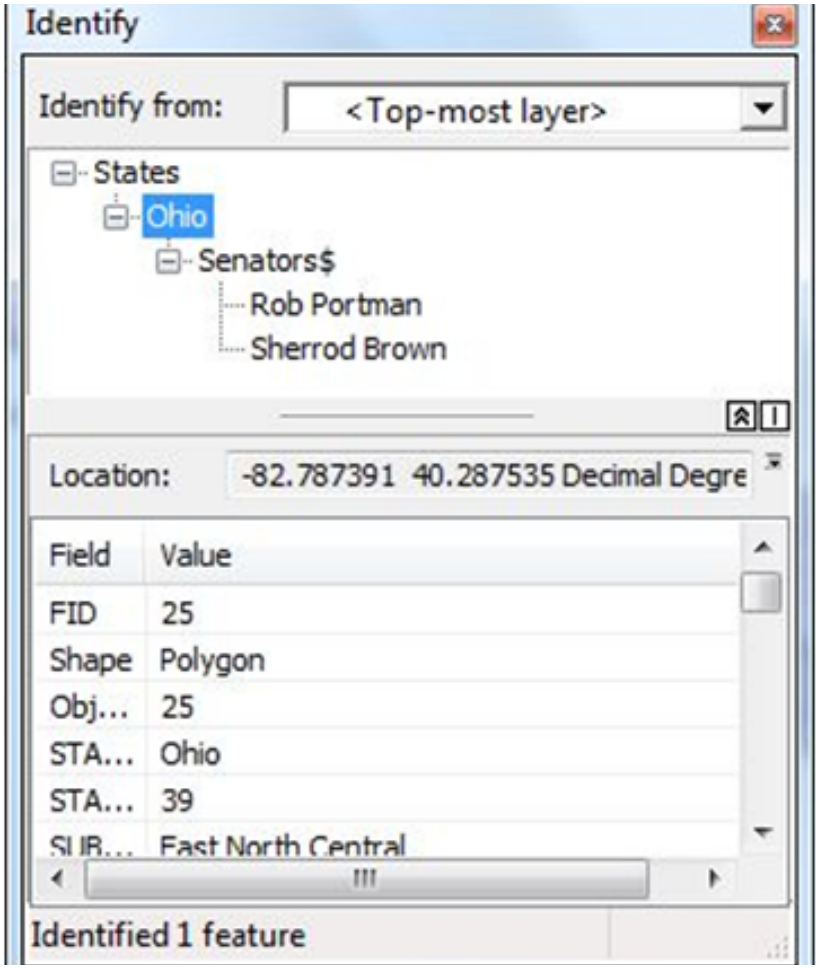
Many-to-one relationships

- Multiple records in the Table A can match to a record in the Table B



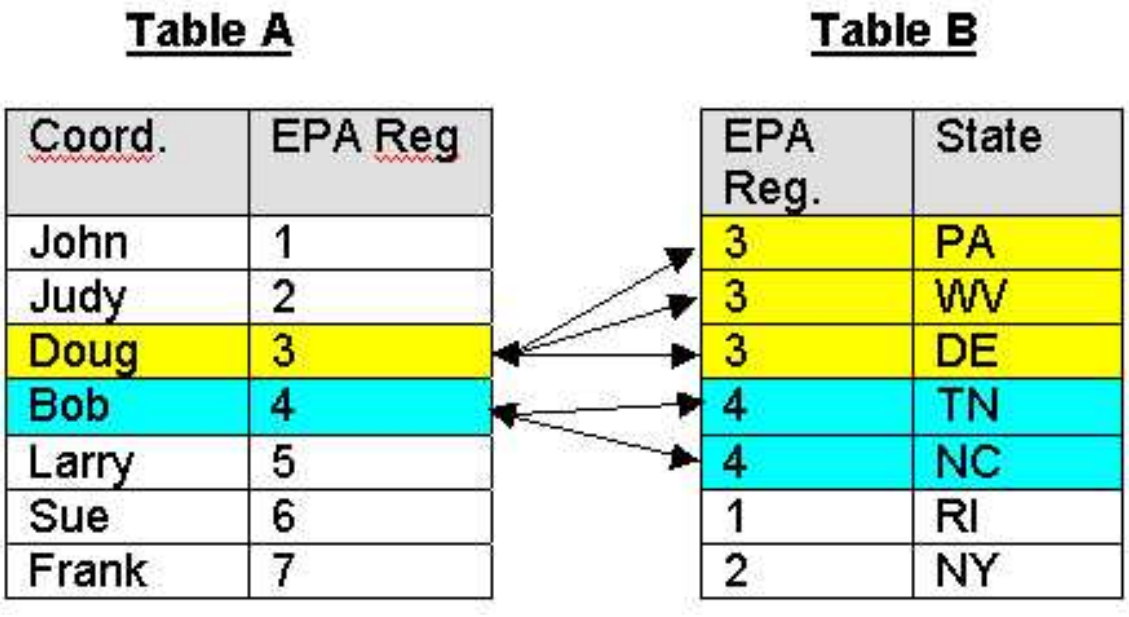
Relate | table connection

- Establishes a temporary connection between two tables
  - Exists behind-the-scenes; unlike join, no output table view created
  - Allows you to view data on a need to know basis



Relate | table connections

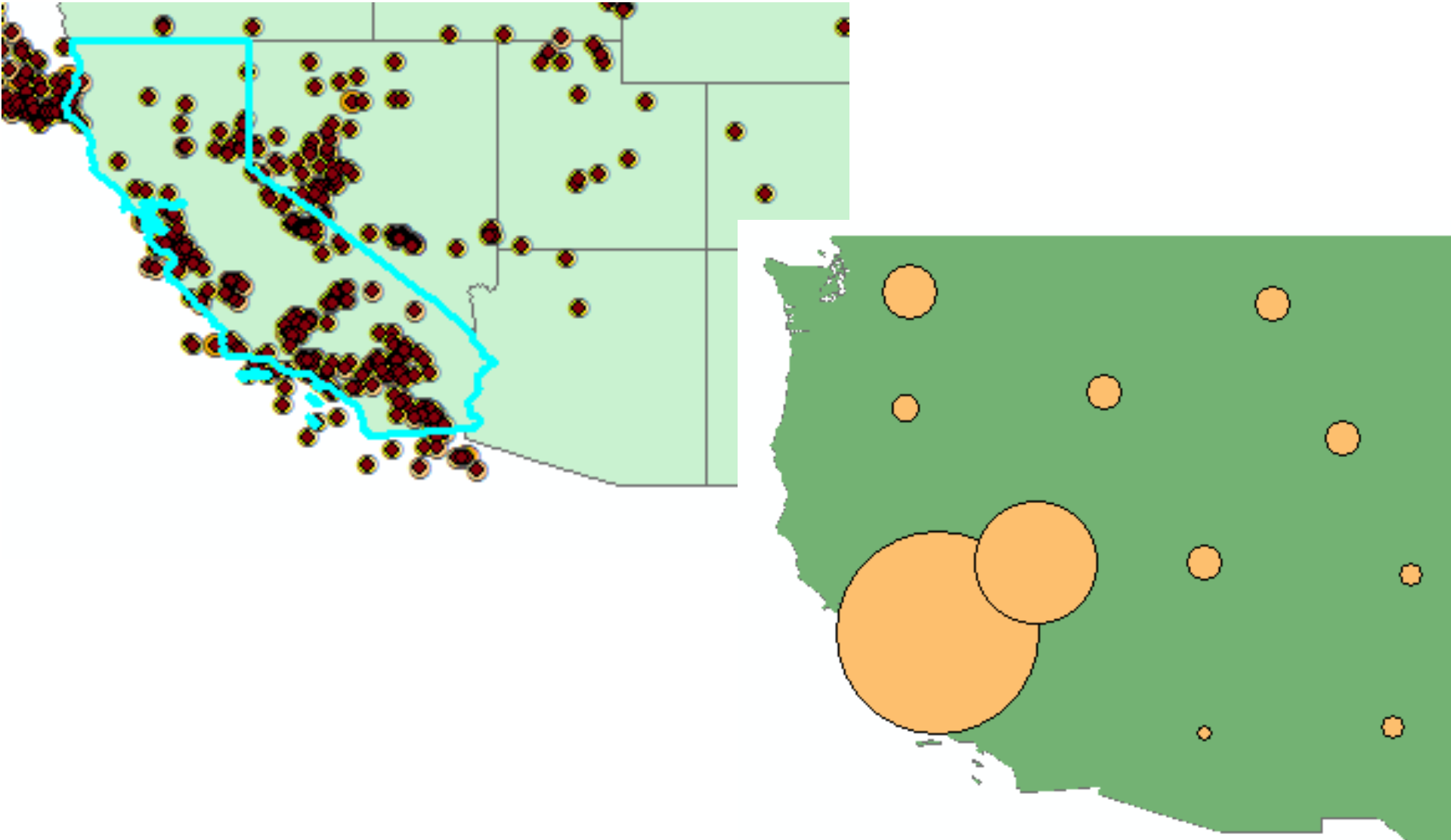
- Use when relationship between tables is:
  - **One-to-many**; i.e. a record in Table A can match to multiple records in Table B
  - **Many-to-many**



Spatial Join

- When the layers on your map don't share a common attribute field, you can join them using a **Spatial Join**
- Connects the attributes of two layers based on the *relative location* of the features in the layers
  - The closest feature to another feature
  - What intersects a feature
  - What is inside a polygon

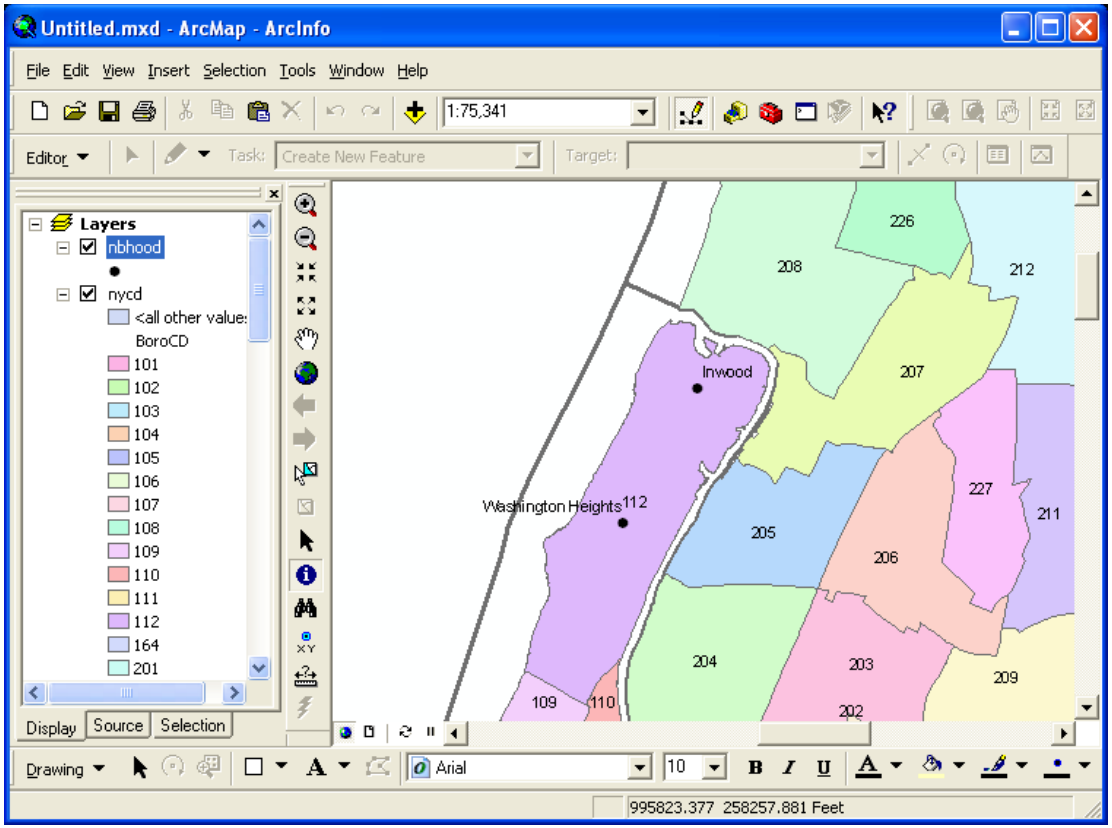
Spatial Join



Spatial Join

- Creates a *new layer* with the *attributes appended* to the new table (not temporarily joined via a dynamic link)
- Allows One-to-one, Many-to-one, or One-to-many joins

- What neighborhoods (points) are inside each borough (polygon)?

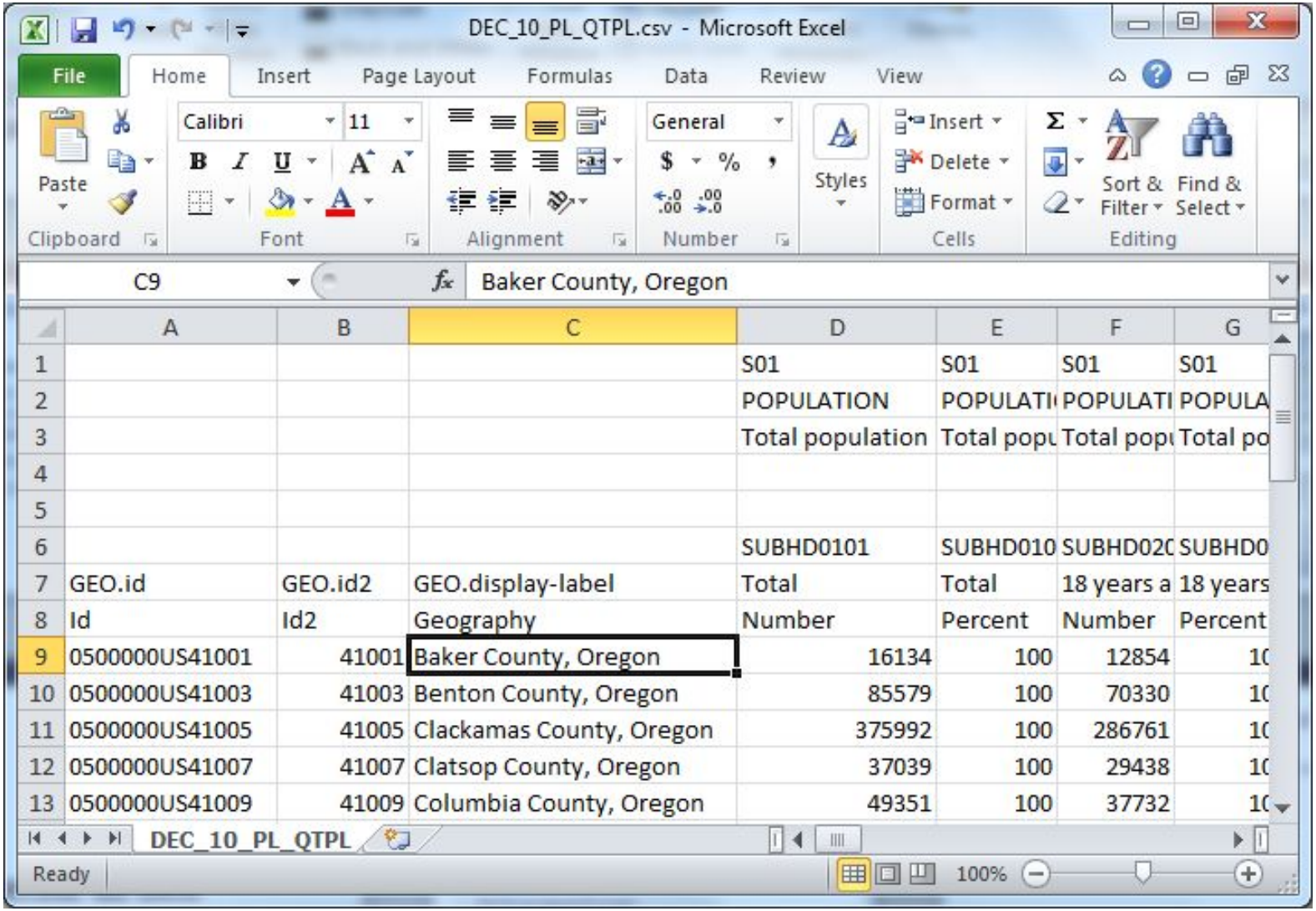


Non-spatial data & ArcGIS

Bringing Non-spatial data into ArcGIS

- Non-spatial data (e.g. MS Excel XLS files) can be used in ArcGIS for data creation, analysis, and mapping
  - e.g. US Census survey results data are stored in many, many stand-along XLS tables
  - **Join** to a feature class containing census block group boundaries
- e.g. Using Google Earth, you created an XLS table listing your favorite bakeries around town, including their latitude-longitude coordinates and other attributes
  - Create a new point feature class using **"Add XY Data"** tool
- *Note: Excel files must be prepared properly before use!*

Downloaded Census attribute file (.CSV format)

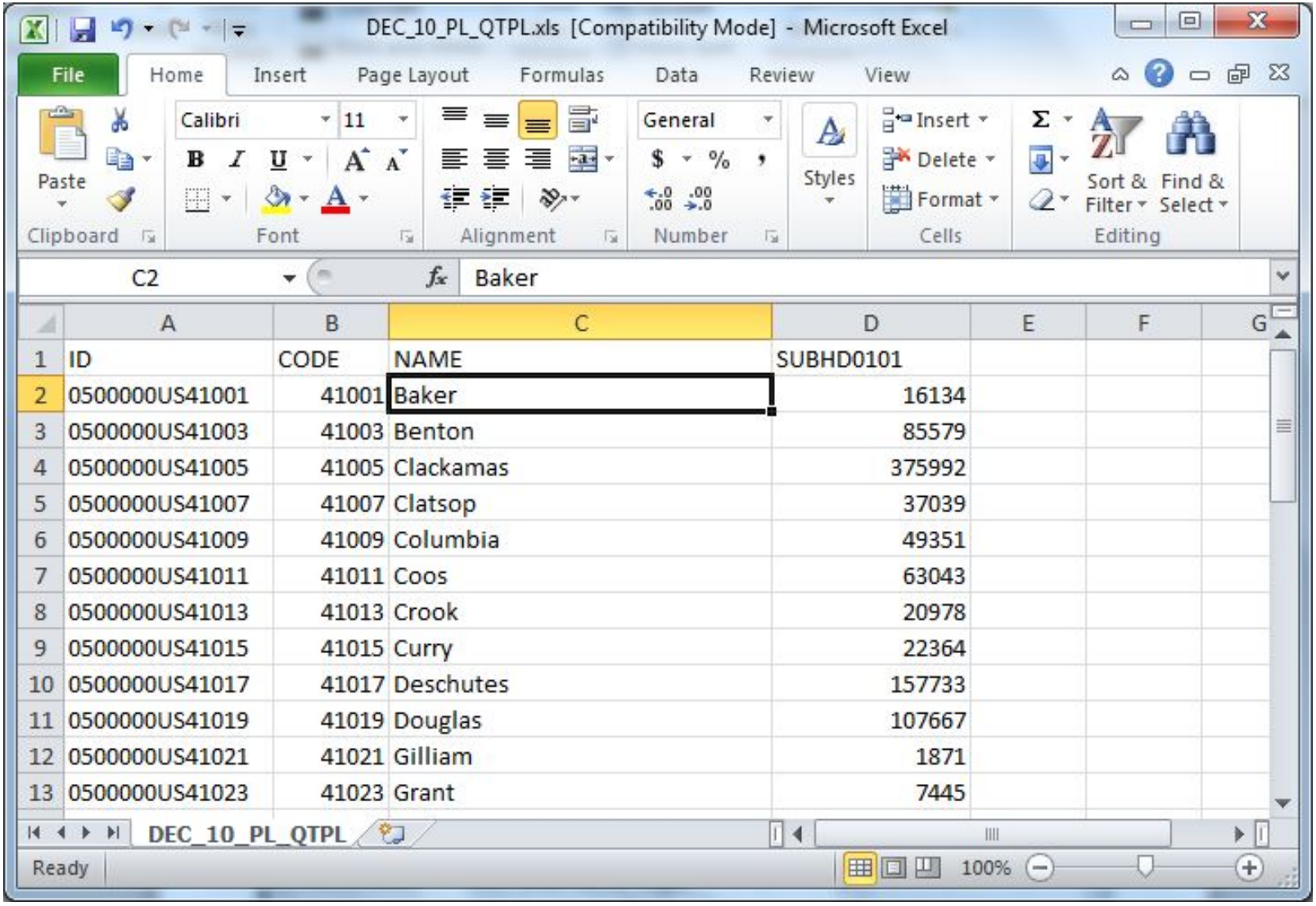


	A	B	C	D	E	F	G
1				S01	S01	S01	S01
2				POPULATION	POPULATI	POPULATI	POPULA
3				Total population	Total popu	Total popu	Total po
4							
5							
6				SUBHD0101	SUBHD010	SUBHD02C	SUBHD0
7	GEO.id	GEO.id2	GEO.display-label	Total	Total	18 years a	18 years
8	Id	Id2	Geography	Number	Percent	Number	Percent
9	0500000US41001	41001	Baker County, Oregon	16134	100	12854	1C
10	0500000US41003	41003	Benton County, Oregon	85579	100	70330	1C
11	0500000US41005	41005	Clackamas County, Oregon	375992	100	286761	1C
12	0500000US41007	41007	Clatsop County, Oregon	37039	100	29438	1C
13	0500000US41009	41009	Columbia County, Oregon	49351	100	37732	1C

Excel data prep tips

- Primary Key fields must contain *identical* data
  - e.g. “Coos County” and “Coos County” (not “Coos”)
- No spaces in file or folder names
- Check for “ghost” spaces in table cells
- Field headings stored in a single row; heading names contain max 13 characters, plus no spaces or symbols
- Columns must be formatted correctly – “Text” format if a text field, “Number” if a numerical field, etc.
- Latitude/Longitude values in *Decimal Degrees* (not DMS)

“Cleaned up” Excel file – ready for Join



	A	B	C	D	E	F	G
1	ID	CODE	NAME	SUBHD0101			
2	0500000US41001	41001	Baker	16134			
3	0500000US41003	41003	Benton	85579			
4	0500000US41005	41005	Clackamas	375992			
5	0500000US41007	41007	Clatsop	37039			
6	0500000US41009	41009	Columbia	49351			
7	0500000US41011	41011	Coos	63043			
8	0500000US41013	41013	Crook	20978			
9	0500000US41015	41015	Curry	22364			
10	0500000US41017	41017	Deschutes	157733			
11	0500000US41019	41019	Douglas	107667			
12	0500000US41021	41021	Gilliam	1871			
13	0500000US41023	41023	Grant	7445			

A join may fail if…

- **Values in field do not match**
  - Values are case-sensitive
  - Beware of words like ‘The’, or extra spaces
- **Name of feature class contains invalid characters**
  - If it’s not alphanumeric or an underscore, forgettaboutit.
- **Field names are reserved words in Access**
  - Data, day, month, table, text, user, when, where, year

Some SQL Query bits and pieces…

- The general rule:
  - <Field_name> <Operator> <Value or String>
  - E.g.: "STATE_NAME" IS 'Arkansas‘
    - Where “STATE_NAME” is field
    - IS, is the operator
    - ‘Arkansas’ is value or string
- For complex queries
  - <Field_name> <Operator> <Value or String> <Connector> <Field_name> <Operator> <Value or String> …

- Use the LIKE operator for a partial string search
- % replaces unknown text
  - E.g.

```
SELECT * FROM Countries_Refugees$ WHERE:
"Countries.CNTRY_NAME" LIKE 'Ma%'
```

CNTRY_NAME	L
Martinique	De
Mali	Re
Mauritania	Isl
Macedonia	Th
Malta	Re
Maldives	Re
Malaysia	Ma
Marshall Is.	Re
Malawi	Re
Madagascar	Re
Mauritius	Re
Mayotte	Te

- _ (underscore) as a wildcard to replace a character
  - E.g.: If you need to find all names that include Jan and Jon
    - You could use: “NAMES” LIKE ‘J_n’

- Subqueries
  - Used to find a string within a string
  - Only supported by GDB queries
    - E.g.: "COUNTRY_NAME" NOT IN (SELECT "COUNTRY_NAME" FROM indep_countries)

Demo. Joins, relates & spatial joins