Joining Tabular Data

Table joins are used to append data from one table or layer to another. In this way we can extend existing map data or map new data by combining raw table information with a map layer.

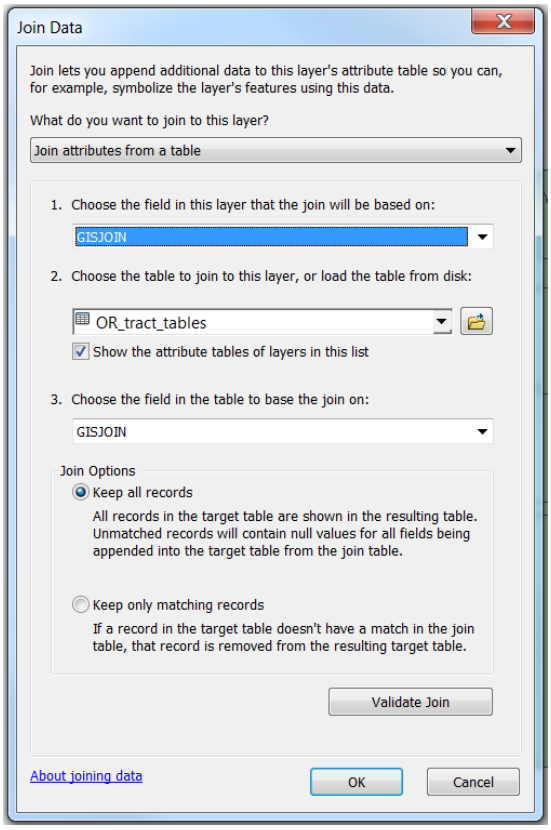
Before starting any work we want to first inspect our tables and geometry to understand what's in them and how they can be combined. Start by opening the *Joins_and_Relates_Map.mxd* in your copy of the workshop folder.

- Right click on the *OR_tract_2010* and select **Open Attribute Table**
- Examine the table contents and take note of the **GISJOIN** field
- Now make a new folder connection to your copy of the workshop data and add **OR_tract_tables** from **Joins_and_Relates.gdb**
- Right click and open the new table and inspect its contents, note the same **GISJOIN** heading

Note that although the **OR_tract_2010** table has several identification columns there is no actual attribute information here. This is a census geometry or "cartographic boundary" file. It contains various geographic ids for state, county, tract etc. but no real data.

The **OR_tract_tables** in contrast contains several fields identifying statistics based on race, but no geometry information. This is the statistical data we are interested in appending to our geometry in order to map it. The key to that association is the GISJOIN field common to each table.

ArcGIS uses those unique ids and appends the records from one table to another anywhere it finds two ids in common (based on how we set the join up).



Creating a simple join (one-to-one)

Let's start by creating a simple, one-to-one join. For every record in the OR_tract2010 layer there is a single corresponding record in the OR_tract_table.

- Right click on the **OR_tract_2010** layer and select *Joins and Relates > Join…*
- In the window that opens the top drop down should read *Join attributes from a table.* In drop down box 1 select the **GISJOIN** field.

- Drop down box 2 should be set to the table your will append data from, **OR_tract_tables**
- Drop down box 3 will be set to **GISJOIN.** Leave Join options set to *Keep all records*.
- Press *OK* (you may get a message about indexing your table, you may select NO).
- Right click on the **OR_tract_2010** geometry layer and open the attribute table again. Scroll to the right to inspect the newly appended data.

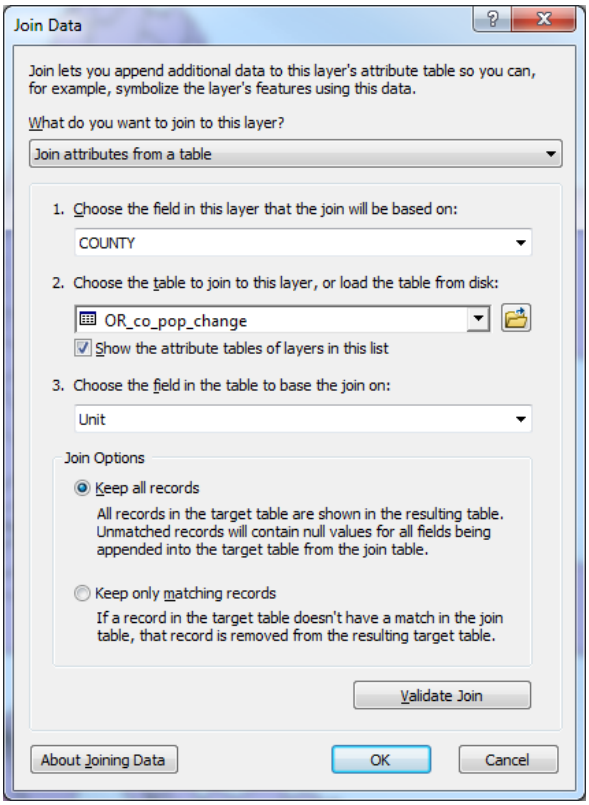
Note that you did not create a new layer when making this join. Instead this is a dynamic join between the geometry feature class and the census table. It is not permanent and exists only in this map document.

- With the table open and scrolled to the right, right click on the geometry layer and select *Joins and Relates > Remove Join(s) > OR_tract_tables.* The appended information disappears.

We'll go over making a join permanent later in this lab, for now **reestablish your join** and move on to the next section.

Many-to-One join

The above join was an example of a one-to-one (1:1) join in which there is a 1:1 relationship between the attributes being joined. In our case there was only one instance of each unique **GISJOIN** id in each table meaning there was only one set of census statistics for each census tract. But we often have data that applies to multiple locations or features where for each new record there are many features that share the same identity. This is a many-to-one (M:1) relationship.



In our case we have a table of population change values by county representing the growth or decline in population between the 2000 census and 2010 census. We want to add this information to the tracts by county so each tract has a record of pop change from its county.

- Add the **OR_co_pop_change** table to your map document and open the table. Note the name of the field containing the county name and the number of records (Unit, 37 records).
- Right click on the **OR_tract_2010** layer and select *Joins and Relates > Join…*
- Choose ***COUNTY*** for box 1

Note: without our first join between the tract geometry and tract table there would be no COUNTY field for this join, this is an example of a compound join, utilizing a series of joins to get at the geography to data relationship your analysis requires.

If you don't see COUNTY in your drop down, go back reestablish the first join above.

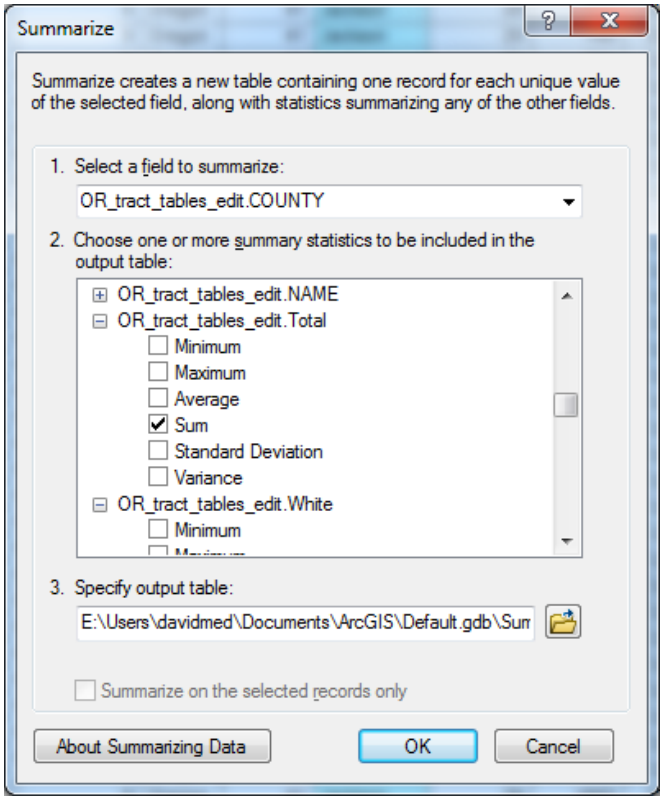
- Select the **OR_co_pop_change** table for box 2.
- Choose the *Unit* field for box 3.
- Select *Keep all records* and hit OK.
- Open the **OR_tract_2010** attribute table again and inspect the new records. You will see that the new county data repeats for every unique tract that shares that county identity.

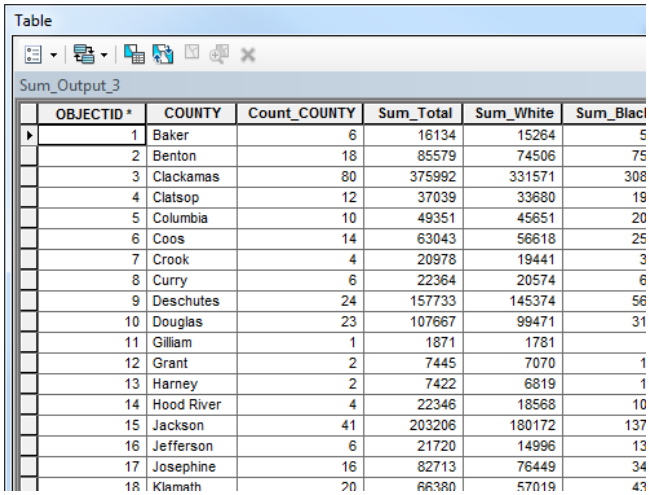
Aggregating Data

In some cases you may have data from a number of smaller areas that need to be aggregated into a larger geographic area. For instance, combing data by census tract into a county layer.

You can aggregate your smaller information by summarizing it on the identity of the larger area.

- Add the **OR_county_2010** layer to your map document.
- Open **OR_tract_tables** and right click on the ***COUNTY*** field heading and select *Summarize*…
- Select your summary statistics (e.g. Sum the values for total pop, Sum or Average values for population by race etc.).
- Hit *OK* and add the new table to the map when complete.
- If you open this new table you should see that all of the tract records have now been aggregated by county with a count of the number of records that went into each aggregation.





Table

Sum_Output_3

OBJECTID *	COUNTY	Count_COUNTY	Sum_Total	Sum_White	Sum_Blac
1	Baker	6	16134	15264	5
2	Benton	18	85579	74506	75
3	Clackamas	80	375992	331571	308
4	Clatsop	12	37039	33680	19
5	Columbia	10	49351	45651	20
6	Coos	14	63043	56618	25
7	Crook	4	20978	19441	3
8	Curry	6	22364	20574	6
9	Deschutes	24	157733	145374	56
10	Douglas	23	107667	99471	31
11	Gilliam	1	1871	1781	
12	Grant	2	7445	7070	1
13	Harney	2	7422	6819	1
14	Hood River	4	22346	18568	10
15	Jackson	41	203206	180172	137
16	Jefferson	6	21720	14996	13
17	Josephine	16	82713	76449	34
18	Klamath	20	66380	57019	43

Following the join instructions from the first part of this tutorial, make a new join between the OR_county_2010 layer and your newly summarized table.

Making a join permanent

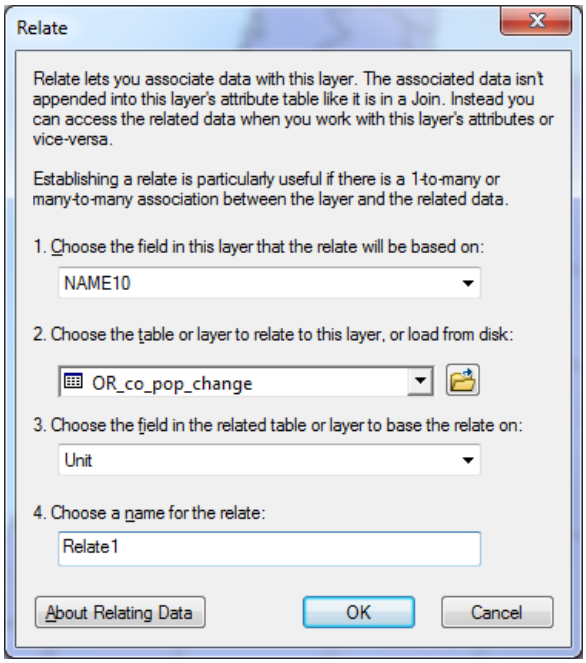
Joins created in an ArcMap document are dynamic and must be exported to make them permanent. You can create a permanent copy of your join by right clicking the layer name and selecting *Data>Export Data…*

Try this: Export your **OR_county_2010** layer to a new feature class in your copy of the **Join_and_Relates.gdb** (give it a better name than *Export_Output* please!).

Open a new blank arc map document. Bring in the original **OR_county_2010** layer and your newly exported copy. Open both attribute tables and compare. You should see that only the exported copy has retained the joined attribute information.

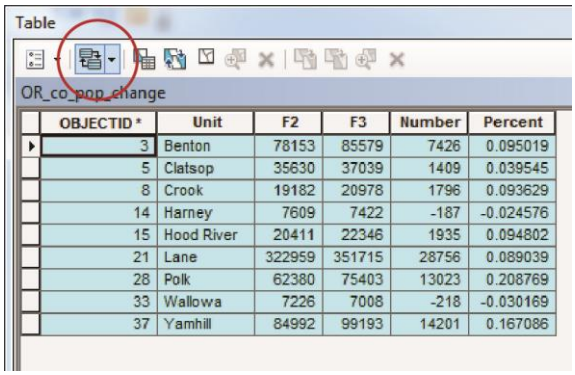
Table Relates

Relating tables simply defines a relationship between two tables. The associated data isn't appended to the layer's attribute table like it is with a join. Instead, you can access the related data when you work with the layer's attributes.

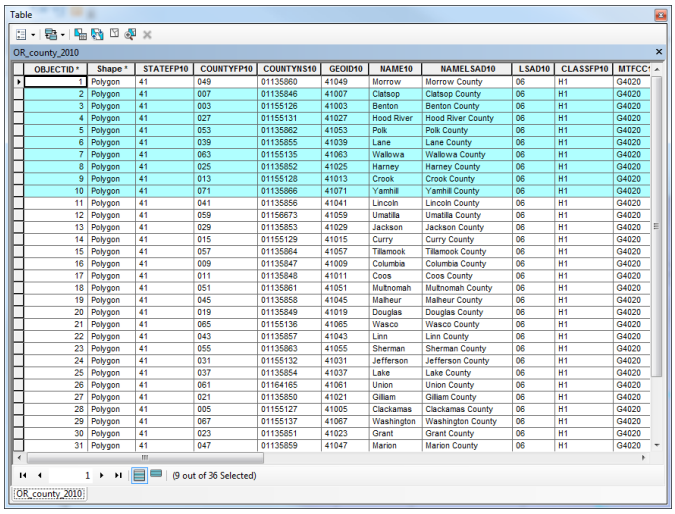


- Open a new blank map document.
- Add the **OR_county_2010** layer and the **OR_co_pop_change** table to you map document.
- Right click on the **OR_county_2010** layer name and choose *Joins and Relates > Relate…*
- Choose ***NAME10*** for the input in box 1. Select **OR_co_pop_change** as the table to relate to, and select ***Unit*** as the matching county name field for box 3. Name your relate and press *OK*.
- Open the attribute table for the county layer. You should see that no extra data has been added to this table.

- Now select a handful of records by shift clicking on the boxes just to the left of OBJECTID in the table.



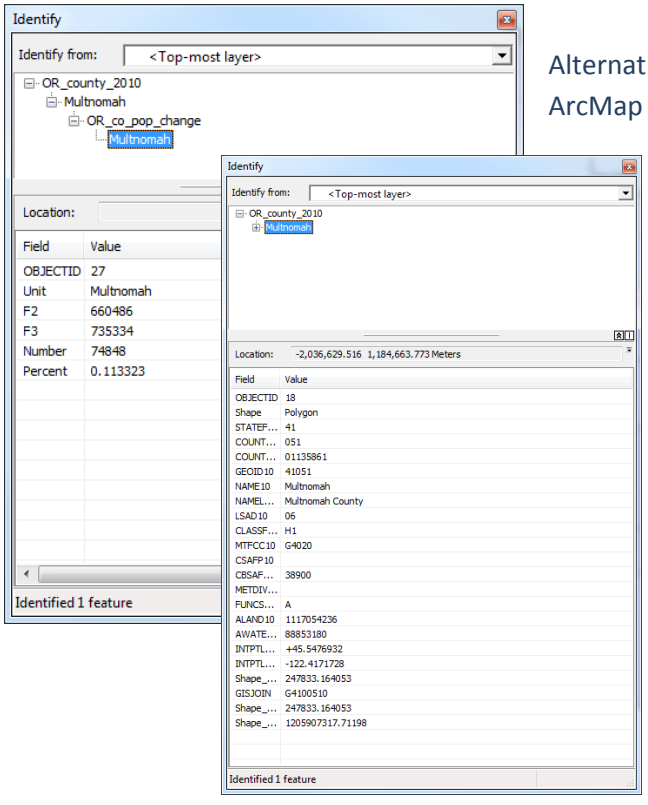
OBJECTID *	Unit	F2	F3	Number	Percent
3	Benton	78153	85579	7426	0.095019
5	Clatsop	35630	37039	1409	0.039545
8	Crook	19182	20978	1796	0.093629
14	Harney	7609	7422	-187	-0.024576
15	Hood River	20411	22346	1935	0.094802
21	Lane	322959	351715	28756	0.089039
28	Polk	62380	75403	13023	0.208769
33	Wallowa	7226	7008	-218	-0.030169
37	Yamhill	84992	99193	14201	0.167086



OBJECTID *	Shape *	STATEFP10	COUNTYFP10	COUNTYNS10	GEOID10	NAME10	NAMELSAD10	LSAD10	CLASSFP10	MTFCC
1	Polygon	41	049	01135860	41049	Morrow	Morrow County	06	H1	G4020
2	Polygon	41	007	01135846	41007	Clatsop	Clatsop County	06	H1	G4020
3	Polygon	41	003	01155126	41003	Benton	Benton County	06	H1	G4020
4	Polygon	41	027	01155131	41027	Hood River	Hood River County	06	H1	G4020
5	Polygon	41	053	01135862	41053	Polk	Polk County	06	H1	G4020
6	Polygon	41	039	01135855	41039	Lane	Lane County	06	H1	G4020
7	Polygon	41	063	01155135	41063	Wallowa	Wallowa County	06	H1	G4020
8	Polygon	41	025	01135852	41025	Harney	Harney County	06	H1	G4020
9	Polygon	41	013	01155128	41013	Crook	Crook County	06	H1	G4020
10	Polygon	41	071	01135866	41071	Yamhill	Yamhill County	06	H1	G4020
11	Polygon	41	041	01135856	41041	Lincoln	Lincoln County	06	H1	G4020
12	Polygon	41	059	01156673	41059	Umatilla	Umatilla County	06	H1	G4020
13	Polygon	41	029	01135853	41029	Jackson	Jackson County	06	H1	G4020
14	Polygon	41	015	01155129	41015	Curry	Curry County	06	H1	G4020
15	Polygon	41	057	01135864	41057	Tillamook	Tillamook County	06	H1	G4020
16	Polygon	41	009	01135847	41009	Columbia	Columbia County	06	H1	G4020
17	Polygon	41	011	01135848	41011	Coos	Coos County	06	H1	G4020
18	Polygon	41	051	01135861	41051	Multnomah	Multnomah County	06	H1	G4020
19	Polygon	41	045	01135858	41045	Malheur	Malheur County	06	H1	G4020
20	Polygon	41	019	01135849	41019	Douglas	Douglas County	06	H1	G4020
21	Polygon	41	065	01155136	41065	Wasco	Wasco County	06	H1	G4020
22	Polygon	41	043	01135857	41043	Linn	Linn County	06	H1	G4020
23	Polygon	41	055	01135863	41055	Sherman	Sherman County	06	H1	G4020
24	Polygon	41	031	01155132	41031	Jefferson	Jefferson County	06	H1	G4020
25	Polygon	41	037	01135854	41037	Lake	Lake County	06	H1	G4020
26	Polygon	41	061	01164165	41061	Union	Union County	06	H1	G4020
27	Polygon	41	021	01135850	41021	Gilliam	Gilliam County	06	H1	G4020
28	Polygon	41	005	01155127	41005	Clackamas	Clackamas County	06	H1	G4020
29	Polygon	41	067	01155137	41067	Washington	Washington County	06	H1	G4020
30	Polygon	41	023	01135851	41023	Grant	Grant County	06	H1	G4020
31	Polygon	41	047	01135859	41047	Marion	Marion County	06	H1	G4020

- Find the ***Relate Tables*** button on the table menu bar and select your relate.

The related OR_co_pop_change table displayed. should open with the records matching your selection



Alternatively you can use the Identify tool from the main ArcMap tool bar and directly select a polygon in the map. You should initially see a new window with the attribute results for the OR_county-2010 polygon layer. Under the layer name in this window expand the + in front of the county name, then the + in front of the related table name before selecting the county name again. You should now see the related records from the *OR_co_pop_change* table below.