

## ArcGIS – Joining and Relating Tables

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### Basics

In ArcGIS there are generally two types of tables: those associated with spatial data, such as a feature attribute table, and stand-alone tables that have no tie to map features (e.g., non-spatial statistical data). ArcGIS can work with tabular data in a variety of formats including dbf, INFO, tab- or comma-delimited text, and geodatabase. The specific geodatabase format depends on the relational database management system (RDBMS) being used (Access, Oracle, SQL Server, etc.).

Associations between tables can be made if the tables share a field that contains common values. For example, a table containing demographic data collected at the county level may be joined to a county boundary attribute table by county name or FIPS code, making it possible to map and conduct spatial analysis on the demographic data. This document covers how to perform two types of table associations in ArcGIS (joins and relates) and under what conditions you would perform each.

### Table relationships

Before you decide whether to join or relate two tables, you should first identify the relationship between the values in the common, or key, field. The possible relationships are one-to-one, one-to-many, many-to-one, and many-to-many.

In a one-to-one relationship, each record in Table A has one and only one related record in Table B. A good example of a one-to-one relationship is that of states in a States feature attribute table to demographic data in a stand-alone table:

States			2000 Demog		
Shape	STATE_FIPS	STATE_NAME	STATE_FIPS	POP2000	FEMALES
Polygon	01	Alabama	01	4447100	2299151
Polygon	02	Alaska	02	626932	302808
Polygon	04	Arizona	04	5130632	2570447

In a many-to-one relationship, potentially many records in Table A are related to one record in Table B. A good example of a many-to-one relationship is that of land use codes in a land parcel feature attribute table to land use codes in land use lookup table. Lookup tables are often used in GIS to improve storage efficiency and accuracy.

Parcels			Land_Use	
Shape	PARCELID	LU	LU	LU_DESC
Polygon	1-1-1	RES	RES	Residential
Polygon	1-1-2	RES	COMM	Commercial
Polygon	1-1-3	COMM	IND	Industrial
Polygon	1-1-4	COMM		

In a one-to-many relationship, one record in Table A is related to potentially many records in Table B. A good example of a one-to-many relationship is that of buildings to tenants:

Buildings			Tenants	
Shape	BLDGID	VALUE	BLDGID	NAME
Polygon	101	350000	101	Bubba's Bar & Grill
Polygon	102	500000	101	Johnson's Pharmacy
Polygon	103	475000	102	Smith's Hardware
			102	Edie's Hair Salon

In a many-to-many relationship, many records in Table A are related to many records in Table B. A good example of a many-to-many relationship is that of land parcels to owners. A many-to-many relationship is usually implemented using three tables. In the parcel/owner example, one table would store parcels, one would store owners, while a third would store unique parcel-owner combinations.

Parcels		Parcel_Owners		Owners	
Shape	PARCELID	PARCELID	OWNERID	OWNERID	NAME
Polygon	1-1-1	1-1-1	1	1	Donald Trump
Polygon	1-1-2	1-1-1	2	2	Bill Gates
Polygon	1-1-3	1-1-2	2	3	Rupert Murdoch
		1-1-2	3		

### Joining Tables

Tables should be associated using a join when the relationship is one-to-one or many-to-one. A join results in attributes from the source table (the table on the right side of the relationship) being appended to the destination table (the table on the left side of the relationship). A join is established by right-clicking on the layer having the destination table and choosing **Joins and Relates > Join**. In the Join Data dialog box, choose the key field in the destination table in box #1, the source table in box #2, and the key field in the source table in box #3, then click OK. Seemingly nothing happens, but the next time you open the destination table, all of the attributes from the source table will be appended and may be used for mapping and spatial analysis. The field names in the joined table will be prefixed by their original table name to avoid name duplication. If you save the map document and re-open later, the join will be re-established and will reflect the current state of the tables in the event that the tables have been updated.

### Relating Tables

Tables should be associated using a "relate" (referred to as a "link" in ArcView 3.x) when the relationship is one-to-many or many-to-many. If you think about the one-to-many case, you would not want to perform a join because only the first matching record will be appended; any additional matches will be lost. A relate does not append attributes from one table to another; it simply defines a relationship between the tables. For example, if you select records in one table, you can view the related records in the other table. A relate is established by right-clicking on one of the tables and choosing **Joins and Relates > Relate**. In the Relate dialog box, choose the key field in box #1, the second table in box #2, and the key field in the second table in box #3.

### Penn State Resources

Pages 312-320 of Using ArcMap and chapter 9 of Getting to Know ArcGIS Desktop cover joining and relating tables.