**Joining Tables to Maps**

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| --- |
| 1. Create a folder called **Table\_join** somewhere under your personal directory (e.g. C:\Users\jdoe\Documents\Tutorials\Table\_join). 2. [Download the data](Joining_tables_files/Table_join.zip) for this exercise then [uncompress](Opening_zip_files.htm) the **Table\_join.zip** file to your newly created **Table\_join** directory. |

Note: If you are working with Excel data files, you may need to install the [2007 Office System Driver](http://www.microsoft.com/downloads/en/confirmation.aspx?familyid=7554f536-8c28-4598-9b72-ef94e038c891&displaylang=en) (this driver is already installed on GIS lab PCs).

This exercise will introduce you to joining (non-spatial) data tables to existing GIS data files. You will join two data table type: an Excel file and a CSV file.

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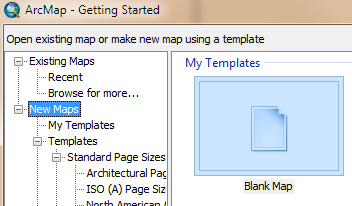
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1. Create a new map document

You will create a new ArcMap document where you will load the Maine counties layer.

From the **Windows** menu , open **ArcGIS >> ArcMap 10.x**.

In the **ArcMap – Getting** **Started** window, select **New Maps** and **Blank Map** as the template.

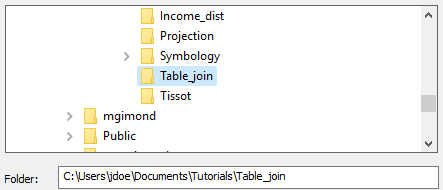


Click **OK**.

Next, you will load a new layer. The following step assumes that you don’t have a folder connection to this project’s workspace.

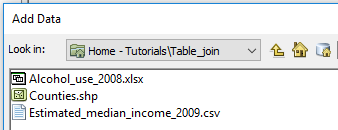
Click on the **Add** **Data** button .

If a folder connection to your workplace does not yet exist, click on the **Connect to Folder** button  then select your **Table\_join** folder.



Click **OK** to close the **Connect to Folder** window.

You should now see a list of data elements in the new folder connection.



Select **Counties** then click on the **Add** button.

1. A note about field names if using version 10.3 or older

Both CSV files and Excel files can be read into an ArcMap document. However, if you are using a version of ArcMap 10.3 or older, read the following warning box.

|  |  |
| --- | --- |
| **!!** | If you are using ArcMap **10.3** or older, the software has [strict guidelines](https://support.esri.com/en/technical-article/000005588) when it comes to importing tables into ArcMap. Table field names cannot contain non-alphanumeric characters such percent signs. It also cannot contain spaces, even at the beginning or end of the field name. ArcMap will accept underscores ‘\_’ as a space substitute. A summary of field name requirements follow:   * Field names need to start with a letter. * Field names should only include alphanumeric characters or underscores.   + None of these: `~@#$%^&\*()-+=|\\,<>?/{}.!'[]:;   + No spaces (That includes before the field name, in the middle, or after it. * Field names will be cut off after 64 characters * There are certain reserved words that should be avoided. You can see the complete list [**here**](http://support.microsoft.com/kb/286335). |

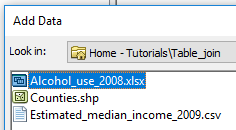
1. Joining an Excel table to a layer

Now that you have a new map document open, you will add a table to your map. The data file Alcohol\_use\_2008.xlsx is an Excel file that tabulates the percentage of students between grades 6 and 12 who have consumed alcohol at least once. More information about the data can be found [here](http://www.maine.gov/maineosa/survey/home.php).

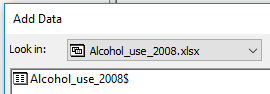
In ArcMap click on the **Add Data** button .

Excel files can store multiple sheets (tabs) however, ArcMap will read just one sheet at a time. This Excel file has a single sheet .

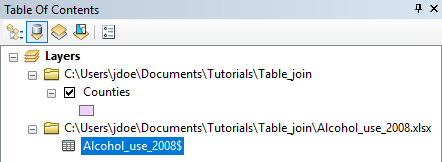
In theTable\_join project folder **double-click** on **Alcohol\_use\_2008.xlsx** to expose its datasheet.

****

**Select** the **worksheet** and click **Add**.



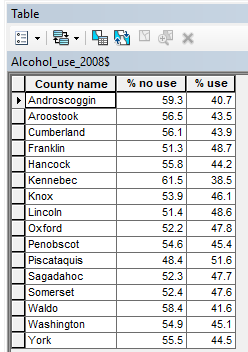
You should now see the table in the TOC.



You may notice that the TOC environment has changed. Since tables cannot be viewed in the standard **List By Drawing Order**  environment, ArcMap switched the TOC to the **List By Source** environment . Don’t forget that you can toggle back and forth between these TOC views by clicking on the appropriate button near the top of the TOC window pane.

**Right-click** on the **Alcohol\_use\_2008** table and select **Open**.

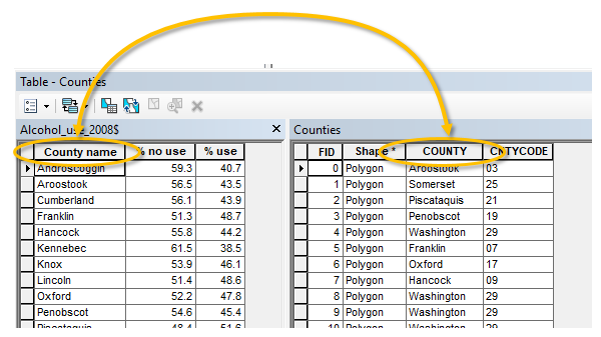
The table should look just as it does in Excel.



Next, we will join this table to the existing data layer (Counties) in the ArcMap document. To join a table, to an existing layer, a field common to both tables must exist. Let’s view the Counties layer’s attribute table.

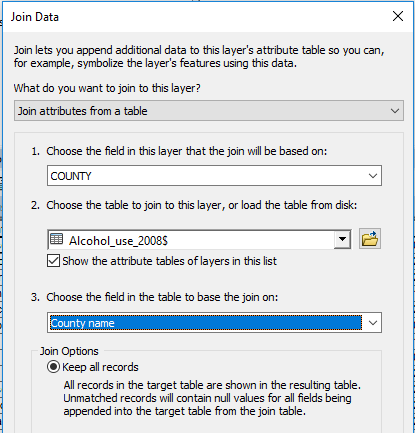
In the **TOC**, right-click on **Counties** and select Open Attribute Table.

The Counties layer has an attribute called **COUNTY** that will be keyed to Excel’s **County\_name** field. Note that a successful join requires that all records in both tables be identical--character for character. This means that a discrepancy as benign as a character’s case (upper case vs lower case) will result in an unsuccessful join. Note too that you do not need to have the same number of records in both tables. The join can be one-to-many (i.e. one record in the Excel file can be joined to multiple records in the data layer).



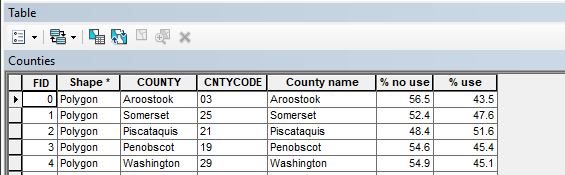
In the **TOC**, **right-click** on the **Counties** layer and select **Joins and Relates >> Join**.

In the **Join Data** window select **Join attributes from a table** in the first pull-down menu, **COUNTY** in the first field, **Alcohol\_use\_2008** in the second field and **County name** in the third field (see graphic below).



Click **OK** to close the **Join Data** window.

In the Counties attribute table you should see the attribute columns from the Excel appended to the end of the Counties attribute table.



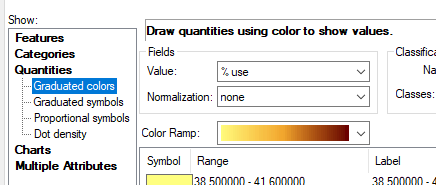
At this point, you can work with the appended attributes as though they belonged to the original Counties layer.

In the **TOC**, **right-click** on the **Counties** layer and select **Properties**.

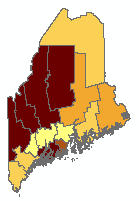
In the **Layer Properties** window, select the **Symbology** tab.

Select **Quantities** in the **Show** window on the left side of the **Layer Properties** window.

Select **% use** for the **Value** field.



Click **OK** to close the **Layer Properties** window.



It’s always good practice to save your map document on a regular basis. Now is a good time to do so.

From the **File** pull-down menu, select **File >> Save As**.

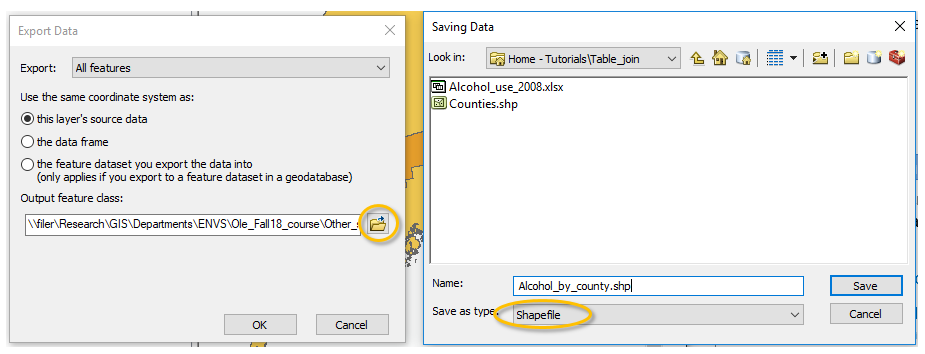
In the **Save As** window, navigate to the Table\_join folder and save the document as **Join\_exercise.mxd**.

1. Exporting a join to a new shapefile

The join that you have created so far is only temporary and exists “virtually” within the current ArcMap session. In other words, if you were to load the Counties layer into a new MXD document, the join would be gone. To make the join permanent, you need to export the layer (and its joined table) to a new feature.

In the **TOC**, **right-click** on the **Counties** layer and select **Data >> Export Data**.

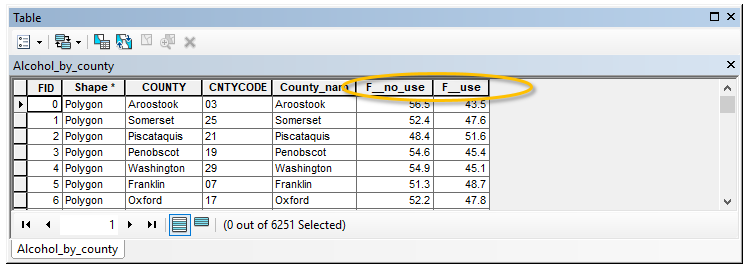
In the **Export Data** window select **All features** from the **Export** pull-down menu and name the output **Alcohol\_by\_county.shp** (make sure to save it as a shapefile and not a geodatabase file).



Click **OK** to save the file.

When prompted to add the exported data to the map, click **Yes**.

Note: when exporting to a shapefile, field names longer than 10 characters will be truncated to the first ten characters. Also, spaces and non-alphanumeric characters get converted to underscores and letters.

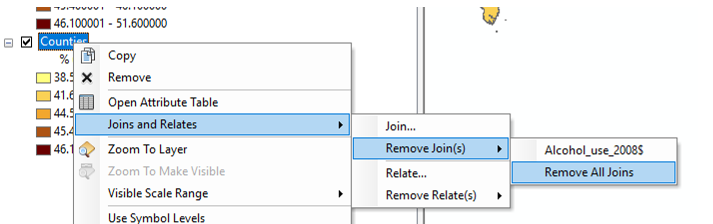


It’s usually good practice to import tables with simple field names as outlined in Step 2 even though it will not impede an ArcMap workflow.

Go ahead and symbolize the new layer as you did with the original one near the end of step 3. You will use the **F\_\_use** attribute for the field value.

Next, you will remove the join from the original Counties layer.

In the **TOC**, right-click on **Counties** and select **Joins and Relates >> Remove Join(s) >> Remove All Joins**.



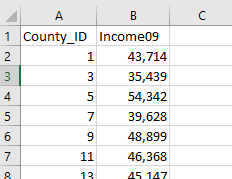
Save the document by clicking on the **Save** button .

1. Attempting a join (and failing)

Next, you will join another table to the Counties layer. The table to be joined contains estimated median income data for 2009 (src: US Census). The table is in a CSV file. A CSV stores data that are separated by commas.

In the Windows file management window, double-click on the **Estimated\_median\_income\_2009** file located in the Table\_join folder.

The file should open in an Excel application. You’ll first notice that the file stores clean field names that do not risk being modified following a joined layer export as in Step 4. You’ll also notice that the table does not have county names listed, instead, the table identifies the county by ID. This is OK since the Counties layer in the ArcMap document has a county code column called **CNTYCODE**.



**Close** the Excel file. If prompted to save click **Don’t Save**.

NOTE: always make sure to close a data file that is open inside an Excel application before opening it in ArcMap. If you don’t, ArcMap will not properly open the file because of a file lock placed on the file by the Excel application.

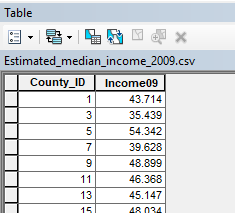
In ArcMap, click on the **Add Data** button .

In the **Add Data** window, select **Estimated\_median\_income\_2009.csv**.

Click **Add** to add the data.

You now should see the median income table in the table of content. At this point, it’s always good practice to open the contents of the table to make sure that all data have been properly read.

In the TOC, **right-click** on the **Estimated\_median\_income\_2009** table and select **Open**.

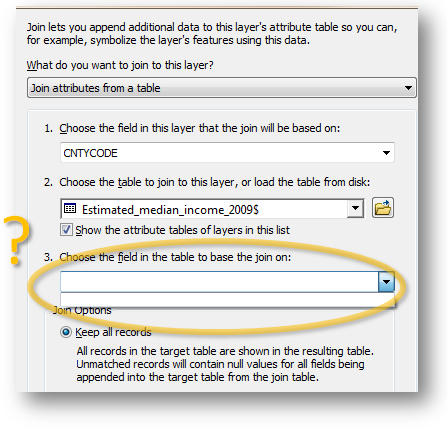


It seems that all data and headers were properly imported. Now let’s try the join. Remember that this time around, we will join the data table to the Counties table using the County IDs instead of the County names.

In the TOC, **right-click** on the **Counties** layer and select **Joins and Relates >> Joins**.

In the Join Data window, select **Join attributes from a table** from the first pull-down option, then **CNTYCODE** from the second pull-down menu (this is the column from the Counties layer that is used to join the table with) and select **Estimated\_median\_income\_2009** in the third pull-down menu.

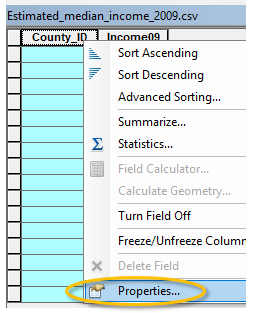
Now try selecting a field from the **Choose the fields in the table to base the join on** pull-down menu. The options should be blank.

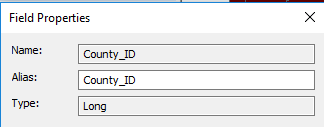


So what happened? Why is ArcMap not letting us select any columns from the Excel table? Well not only do the records between both tables need to match character for character, but they also need to match by **data type**. So we need to figure out the data types for each table.

If the data table’s attribute table is not opened, go ahead and open it. (e.g. in the TOC, right-click on the table layer and select **open**).

In the attribute table, **right-click** on the County\_ID header and select **Properties.**



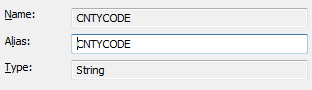
In the Field Properties window, note the data type. The CSV column was read as a **Long** data type (which is a numeric data type). 

Click **OK** to close the **Field Properties** window.

In the TOC, **right-click** on the **Counties** layer and select **Open Attribute Table**.

In the Table window, **right-click** on the **CNTYCODE** column header and select **Properties**.

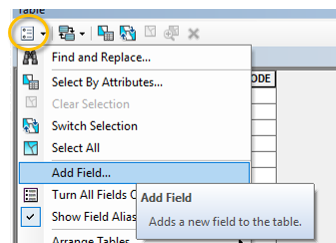
In this table, the county ID is treated as a **String** (which is a text or character format) and not a numeric field. Because the data types between both tables do not match, we cannot join the tables. There are several solutions to this problem one of which involves converting the string to a number in ArcMap.



Click **OK** to close the **Field Properties** window.

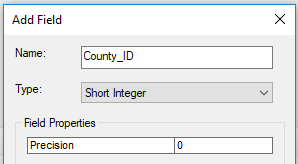
1. Converting text column to numeric column

In the Counties’ layer attribute table, select Add Field.



We’ll assign it the same field name used in the CSV file: **County\_ID**.

Since the value to be converted are small integers, we’ll make this field a **Short Integer**.



Note that the joined tables do not need to match numeric data type exactly (i.e. a long integer will gladly join to a short integer).

Click **OK** to create the new field

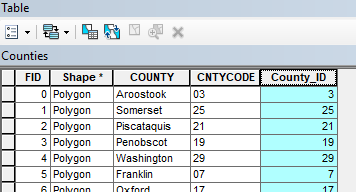
**Right-click** on the **County\_ID** column and select **Field Calculator**. You might be presented with a warning window that you can dismiss.

In the expression box, type [CNTYCODE].



This assigns the values in CNTYCODE to County\_ID. ArcMap will convert the values from text to numbers in the process.

Click **OK**.

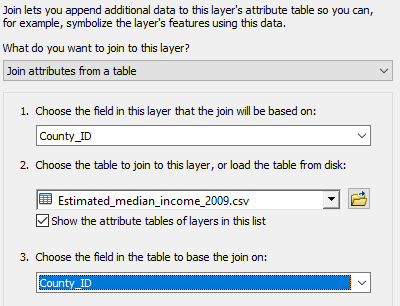


Now that we have matching county ID values between the Counties layer and the CSV table we can proceed with the join.

1. Attempting the join one more time

**Right-click** on the **Counties** layer and select **Joins and Relates >> Joins**.

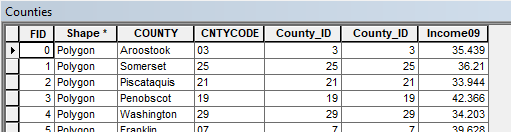
In the Join Data window select the values for each field as shown below:



Click **OK** to close the Join data window.

In the TOC, **right-click** on the **Counties** layer and select **Open Attribute table**.

The median income data is now joined to the Counties layer.



Remember that this join is temporary. If you want it to be permanent, you must export it to a new data file.

Before exporting the joined layer to a new data file we will remove unnecessary/redundant attributes.

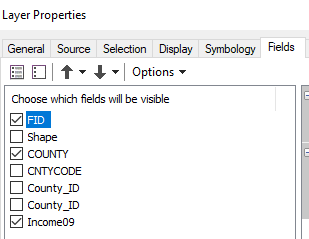
In the **TOC**, right-click the **Counties** layer and select **Properties**.

In the Layer Properties window, select **Fields**.



This option lets you control which attributes will be useable within your map session. It also defines which attributes will be exported in an export process.

You will uncheck the **Shape**, **CountyCode** and **County\_ID** attributes.



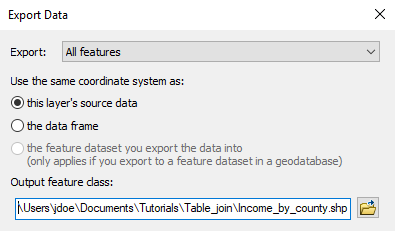
Click **OK** to close the **Layer Properties** window.

If you view the Counties layer attribute table, you should see just three columns.

Now we are ready to export the layer to a new data file.

In the TOC, **right-click** on the **Counties** layer and select **Data >> Export Data**.

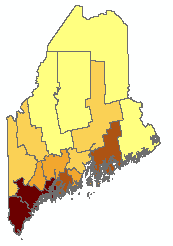
Name the new data file **Income\_by\_county.shp**. Make sure to save it as a shapefile.



Click **OK** to proceed with the export.

When asked if the exported data should be added to the map as a layer, click **Yes**.

Go ahead and symbolize the newly added layer using the **Income09** attribute (this is the estimated median income attribute). If you forgot how to symbolize a layer, see Step 3.



**Save** the MXD file.

This completes the steps for this exercise.

 Manuel Gimond, last modified on 7/12/2018