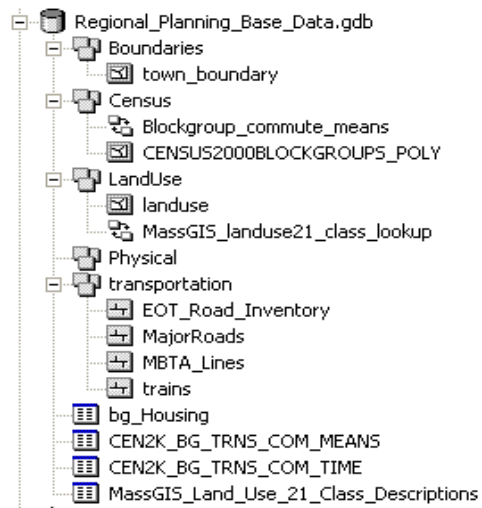


Creating a File Geodatabase

Updated by Thomas Stieve January 06, 2012



This exercise demonstrates how to create a file geodatabase in ArcGIS 10; how to import existing data into the geodatabase, and how to create relationship classes. For this example, we will create a file geodatabase to support regional base mapping that would eventually be used for analysis of land use and transportation. The base data sets we will use include data from the 2010 census, land use layers, transportation layers, and physical features like floodplains.

Digital Resources

Within ArcGIS: ArcGIS Desktop Help – Professional Library- Data Management-Managing Geodatabases-An Overview of the Geodatabase

Online:

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What_is_a_geodatabase/003n000000100000/

and

<http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html///003n000000200000>




Geodatabase concepts: Modeling Our World, ch 4 <http://library.tufts.edu/record=b1585695~S1>

Step-by-Step: How to create geodatabases, feature datasets, and feature classes

Online Tutorial – Geodatabases

(http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/ArcGIS_tutorials/00v2000000t000000/-scroll down to find tutorial) – the data for this tutorial is located on the Tufts GIS Center in S:\Tutorials\ESRI\ArcMap 10\ArcTutor\BuildingaGeodatabase.

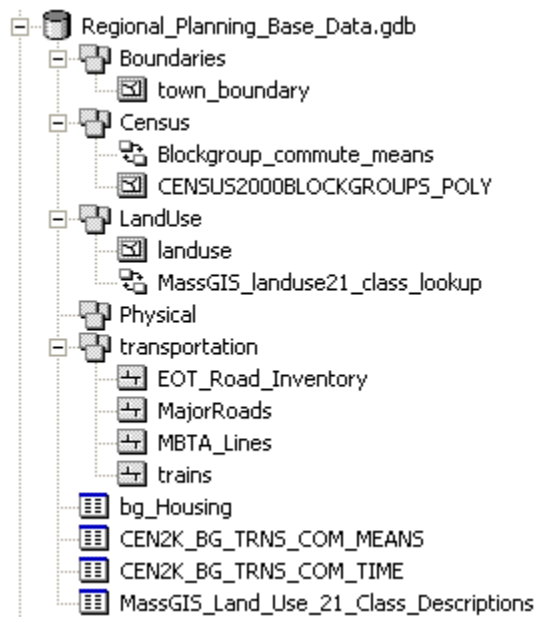
Important terms:

- **Feature dataset** – collection of feature classes (e.g., transportation contains roads, railroads, airports) organized into a group, all of which share a common coordinate system 
- **Feature class** – a collection of features with the same type of geometry: point, line, or polygon (e.g., roads) 
- **Relationship Class** – an item in a geodatabase that stores information about relationships between tables (e.g., a parcel polygon layer might be related to a property owner table by the parcel ID) 

Later in the course we will be looking at other elements of the geodatabase like **topology** and **geometric networks**.

Geodatabase example: Regional_Planning_Base_Data.gdb

Feature datasets are Census, LandUse, Physical, and Transportation – each Feature Dataset has associated Feature Classes. In addition there are a number of tables in the file geodatabase associated with the census, plus a table delineating land use code descriptions. Finally there is a relationship class defining the relationship between the land use attribute table and the land use description lookup table. We will also be creating relationship classes between the census tables and census geography.



Part 1: Creating a new Geodatabase

You will create and build your geodatabase in ArcCatalog. **Note:** Within ArcCatalog, create the geodatabase to the desktop because your H drive probably won't have enough space.

1. Start **ArcCatalog** and find your desktop in the Catalog Tree under *Folder connections* - C:\Documents and Settings\yourUTLNname\Desktop

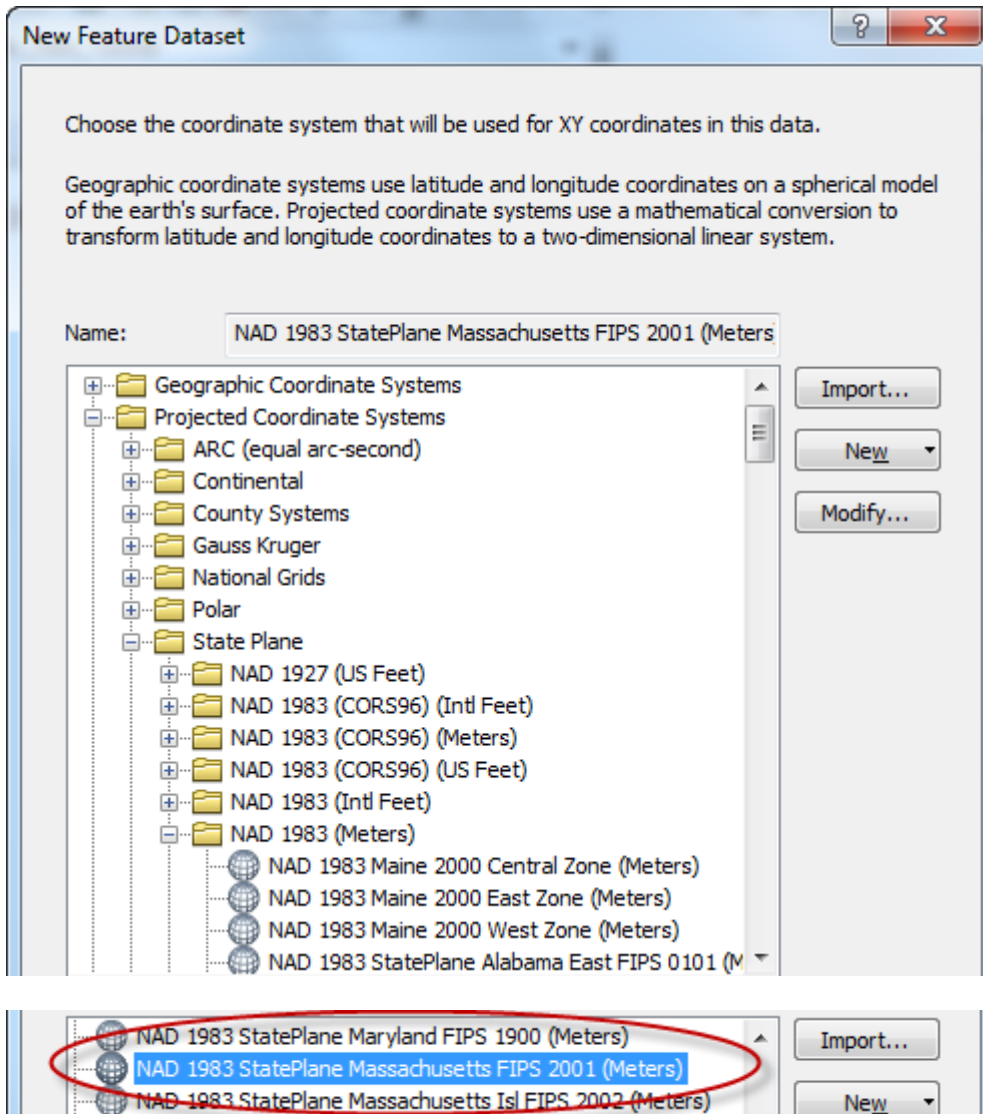
2. Right click on the *Desktop* and choose **New - File Geodatabase**. A new geodatabase folder will be created with the extension *.gdb*
3. Rename this geodatabase, e.g., *Regional_Planning_Base_Data*

Part 2: Creating a new feature dataset for transportation layers

A feature dataset is a collection of features that have the same spatial reference (coordinate system). In this example, we might have four different feature datasets for our regional planning base data – transportation, land use, census data, physical (for things like floodplains). Each one of these datasets can have several feature classes – e.g., transportation could have roads, railroads, airports.

All the feature classes in a feature data set will have the same coordinates. Once you define your coordinate system for a feature dataset, any feature class you import into it will automatically be converted to the coordinate system of the feature dataset.

1. To create a new feature dataset, right-click on the geodatabase and choose **New – Feature Dataset**
2. In the dialog box, **name** the feature dataset *transportation* – you can't have spaces.
3. Click **Next**
4. Select the coordinate system that this *Feature Dataset* will use, or Import it from an existing GIS file. In this example, the coordinate system will be the *Massachusetts State Plane, NAD83 Mainland (meters)* – you can import it from an existing MassGIS data layer or select it by drilling down as seen in the graphic below, getting finally all the way to and selecting *NAD 1983 State Plane Massachusetts Mainland FIPS 2001*.



5. Click **Next**
6. The transportation data set will not have a vertical coordinate system, so leave this at **None**. (A vertical coordinate system is important if you are modeling heights and elevations)
7. For *XY Tolerance*, accept the **defaults**, but read about it using the button option available.
8. Click **Finish** to finish creating the feature dataset

Note: As noted above, with the feature datasets' coordinate system set, any geographic data layer that you import will automatically be converted to the feature dataset's coordinate system during the import process, which is a very useful function. But be aware that the same does not hold true if you were simply importing a feature class into the general geodatabase (rather than into an existing feature dataset) – in that case the feature class maintains its original coordinate system.

Step 3: Importing shapefiles into your geodatabase

In this step you will import existing GIS data layers from MassGIS.

1. Right-click on your new feature data set and choose **–IMPORT- Feature Class - single or multiple**. (**Single** if you have only one layer to load, **multiple** if more than one).
2. For the **Input Features**, click on the folder icon and go to the location of the shape files you want to import (in this case, go to *M:\state\MA\MassGIS\infrastructure*, or download it directly from MassGIS if not in the GIS Lab)
3. Select the *EOTMajRoads_Arc.shp* and click on **Add**
4. Give the new layer a name in the **Output Feature Class** box (e.g., MajorRoads - no spaces!) The output location should default to the feature data set which is what you want – make sure it is NOT specifying a shapefile!
5. You can modify field names if you like.
6. Click **OK**

For practice, import other transportation layers into this feature dataset – e.g., MBTA lines, trains, airports.

Creating other feature datasets

Now create the other Feature Datasets in your geodatabase. Make sure they all have the Massachusetts State Plane NAD 83 Mainland coordinate system (which has a horizontal unit of meters). Create a feature dataset for each of these types of data sets – and remember, you can't have spaces in the Feature Dataset name or the individual feature class names.

- Census
- Land use
- Physical
- Boundaries

Import shape files into your feature datasets

Follow similar steps as detailed above to import existing shape files into your geodatabase feature datasets.

Census:

Import census blockgroups (add from *M:\State\MA\MassGIS\Census_2000* or download from MassGIS) - look for *CENSUS2000BLOCKGROUPS_POLY.shp*

Land Use:

Import the *landuse_poly.shp* file from *M:\State\MA\MassGIS\Physical_Resources* or download it from MassGIS. (Make sure you are not using *landuse2005_poly.shp*)

Boundaries

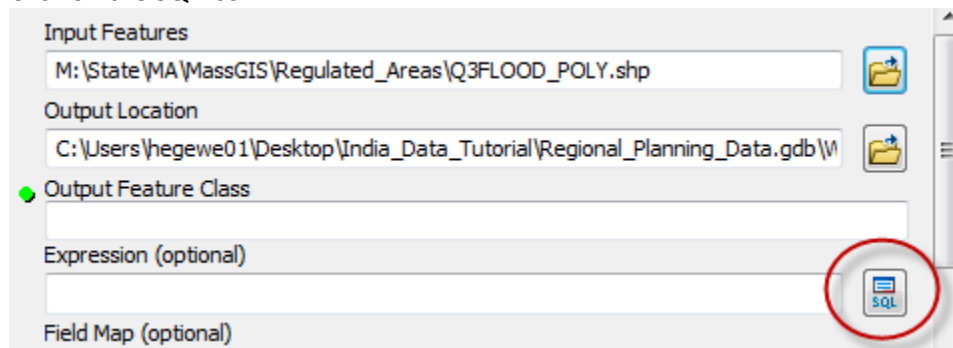
Import town boundary data from M:\State\MA\MassGIS\Political_Boundaries (TOWNS_POLY.shp) or download it from MassGIS.

Physical:

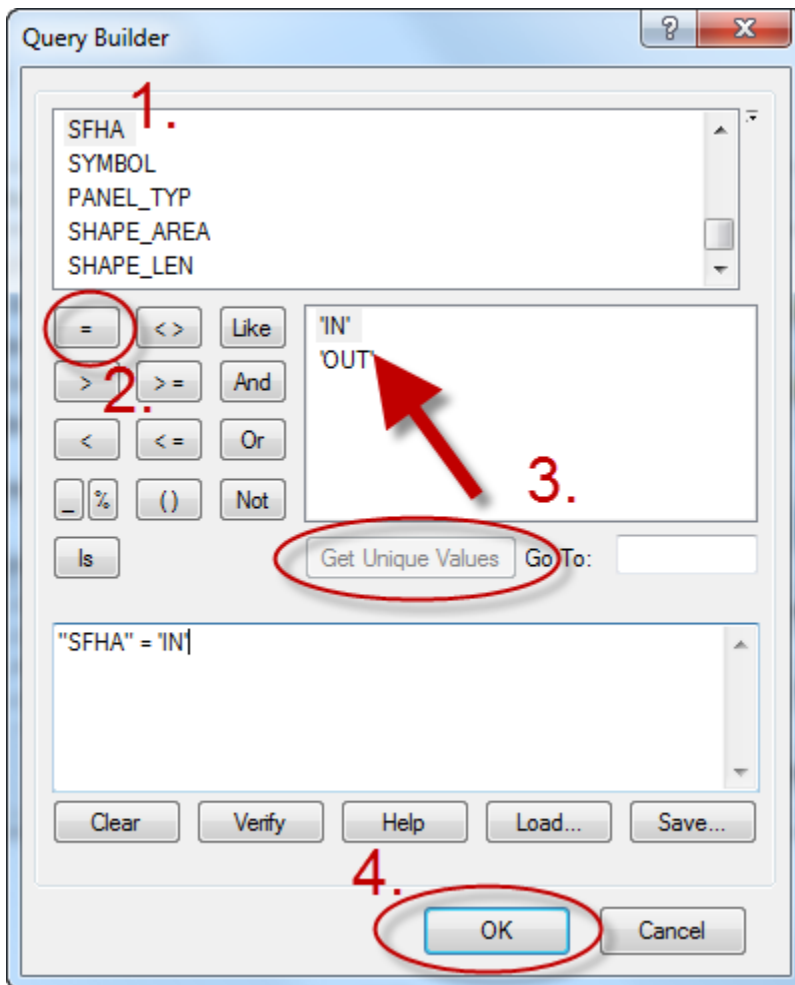
Import floodplain data from M:\State\MA\MassGIS\Regulated_Areas (Q3FLOOD_POLY.shp) or download from MassGIS. But follow these steps for importing only the 100 year floodplains:

When you import a feature class you have the option of using an SQL expression to import certain selected features. In the Q3 flood data layer, you can select out and import just the features representing the 100-year floodplain. To do this, use the Expression area of the dialog window.

1. Click on the SQL icon



2. There is a field in the Q3 data called "SFHA" for Special Flood Hazard Zone, so double click this field in the query dialog box set the value equal to "and fill the box in as seen in the next graphic:



3. Then click **OK** again on the *Feature Class Import* box.

Importing Tables into the Geodatabase

Tables don't go inside a feature dataset, but they can be imported to the larger geodatabase.

Import tables by **right-clicking on the geodatabase** itself and **choosing Import – Table (single)**.

Import each of the following tables dealing with transportation (from

M:\State\MA\MassGIS\Census_2000 or download from MassGIS):

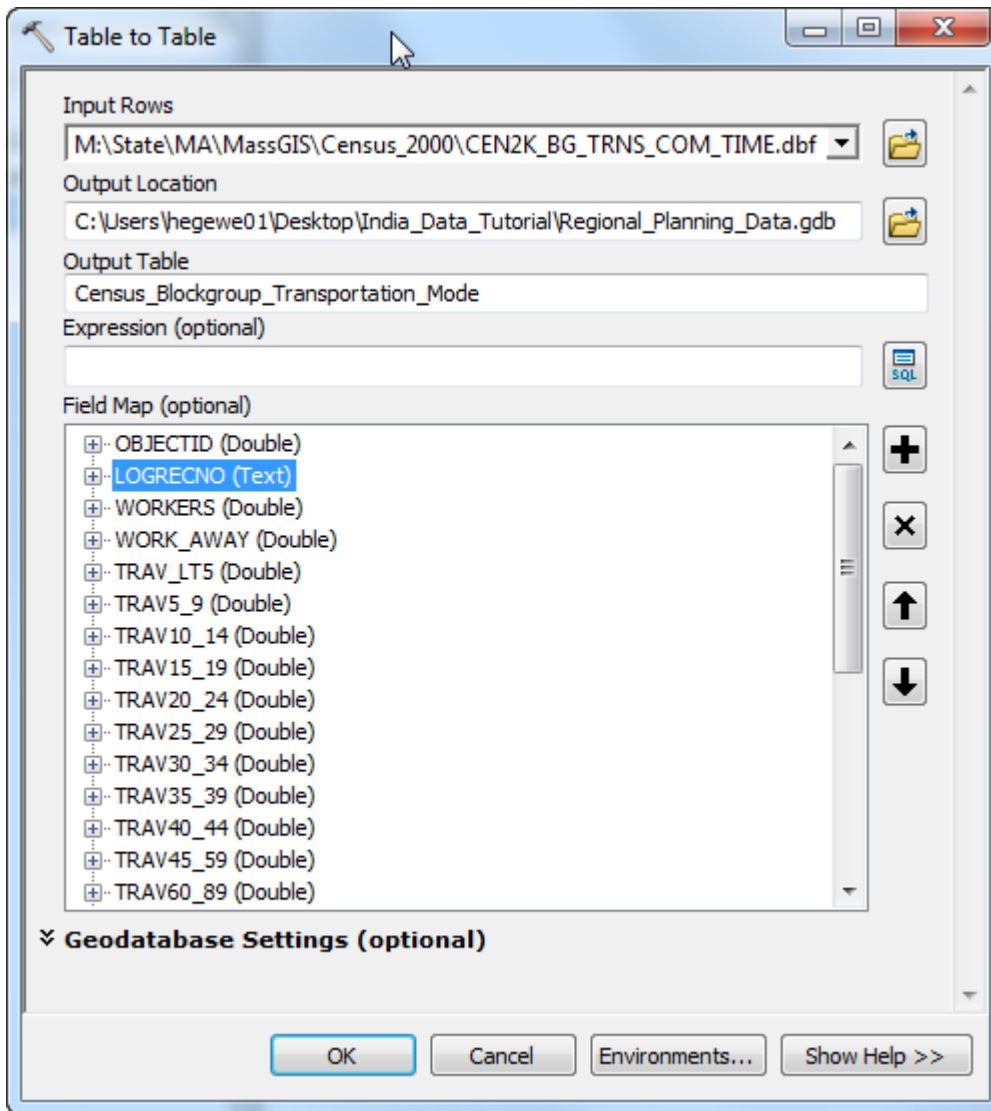
CEN2K_BG_TRNS_COM_MEANS.dbf

CEN2K_BG_TRNS_COM_TIME.dbf

You will need to specify your input table, the output target (your geodatabase), and a new name for the table in the geodatabase (no spaces!) – see the graphic below and click on Show Help so that you understand each part of the import dialog box.

The *Field Map* portion of the dialog box can be very useful. When importing tables to a geodatabase, you can change field names, add aliases (more descriptive field name

information), change data type (e.g., numeric to text), and delete or add fields during the import process. Use the *Field Map* portion of the dialog box to do this (right-click on a field to access its properties.)

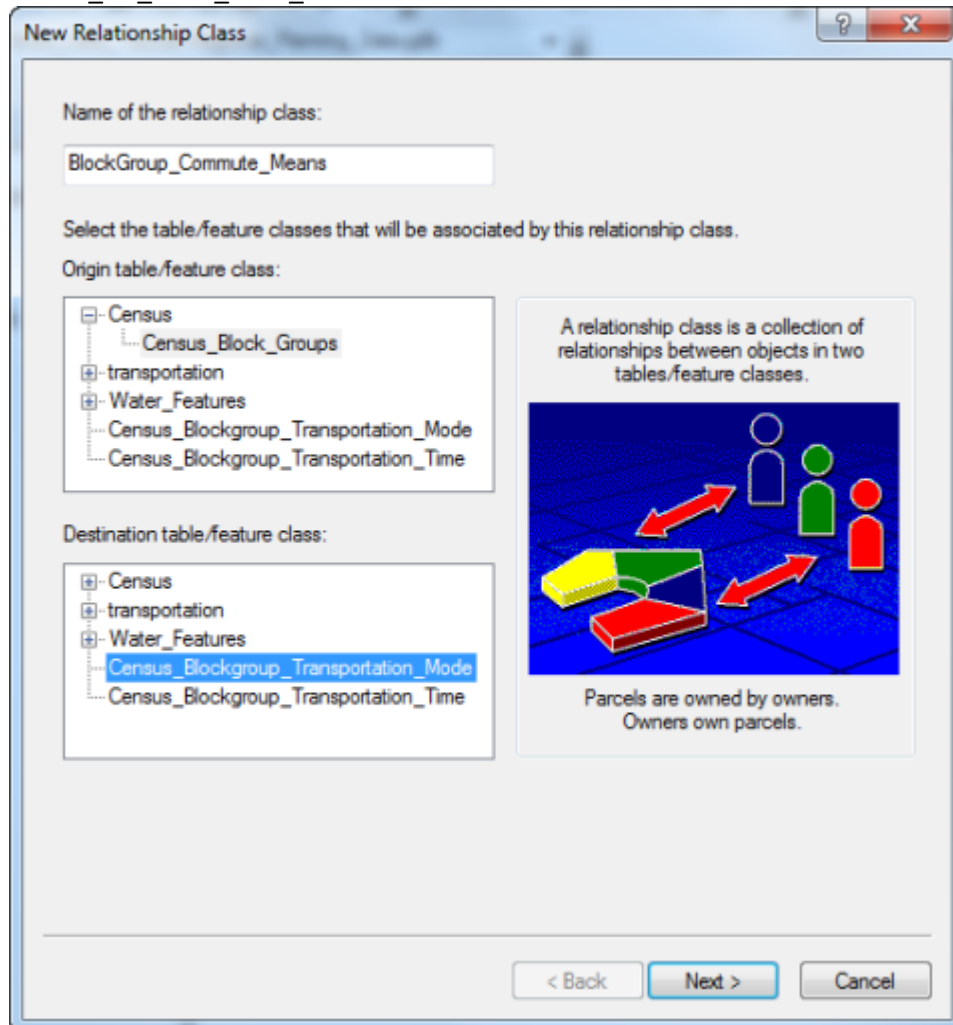


Creating a Relationship Class

The census blockgroup polygons contain a few basic attributes regarding each blockgroup. However, most of the census data from MassGIS is stored in separate tables. You added two tables that have data about transportation modes and commute times. These tables can be related to the attribute table of census blockgroup polygons via a commonly shared field called "LOGRECNO" (see the MassGIS Census BlockGroup web page for more information (http://www.mass.gov/mgis/cen2000_blockgroups.htm)). You are probably familiar with creating a join between tables based on an attribute field in ArcMap. But inside a geodatabase, you can define this relationship more explicitly, and it will then always be available.

In the following steps, you will define a relationship between the Census Blockgroup polygon layer and the table with information on commute mode (CEN2K_BG_TRNS_COM_MEANS).

1. **Right-click** on the *Census* Feature Dataset and select **New – Relationship Class**
2. Fill in the first dialog box as you see in the graphic below, by giving it a name and making sure that the origin table is Census2000Blockgroups_poly, and the destination table is CEN2K_BG_TRNS_COM_MEANS :



3. Click **Next**
4. In the next dialog box, specify that this is a **COMPOSITE** relationship (if we delete a blockgroup, we will delete the corresponding record in the commute means table).
5. Click **Next**

6. Fill out the next dialog box as you see below:

New Relationship Class

Specify a label for the relationship as it is traversed from the origin table/feature class to the destination table/feature class.

Blockgroup_Commute_Means

Specify a label for the relationship as it is traversed from the destination table/feature class to the origin table/feature class.

Blockgroup

Which direction will messages be propagated between the objects related by this relationship class?

Forward (origin to destination)

Backward (destination to origin)

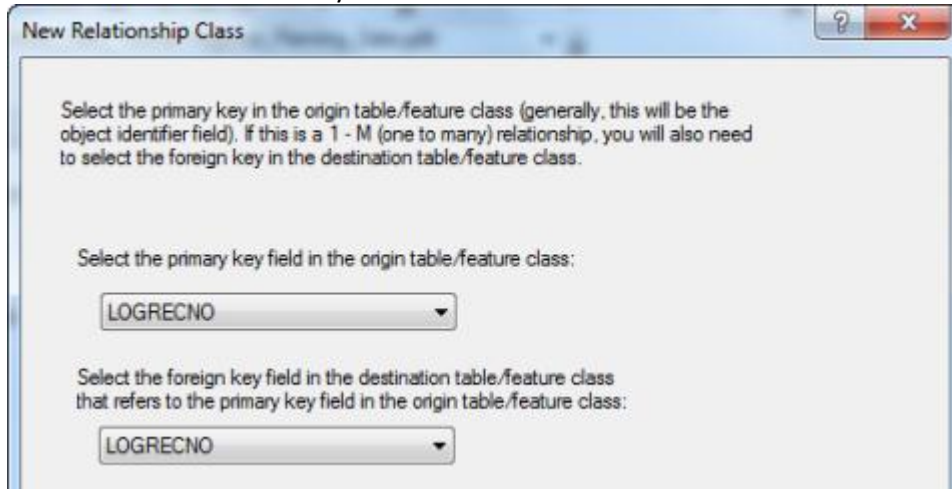
Both

None (no messages propagated)

< Back Next > Cancel


7. In the next dialog box, specify that this is a **1-1 relationship** – there is one row in the Commute Means table for each row in the Blockgroup polygon attribute table.
8. Click **Next**
9. In the next window, specify that you do **NOT want to add attributes** to this relationship class.
10. Click **Next**

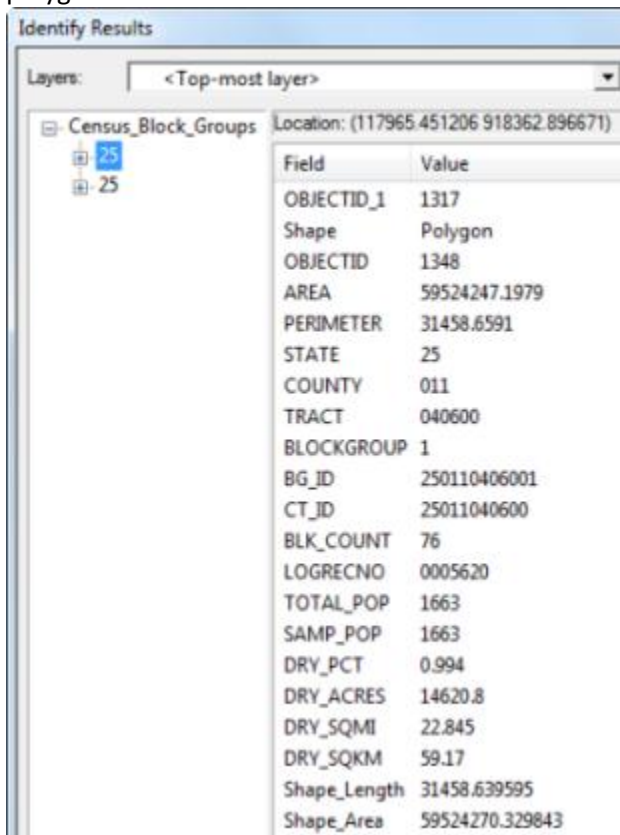
- Fill out the next window as you see below – the LOGRECNO field is the common field:



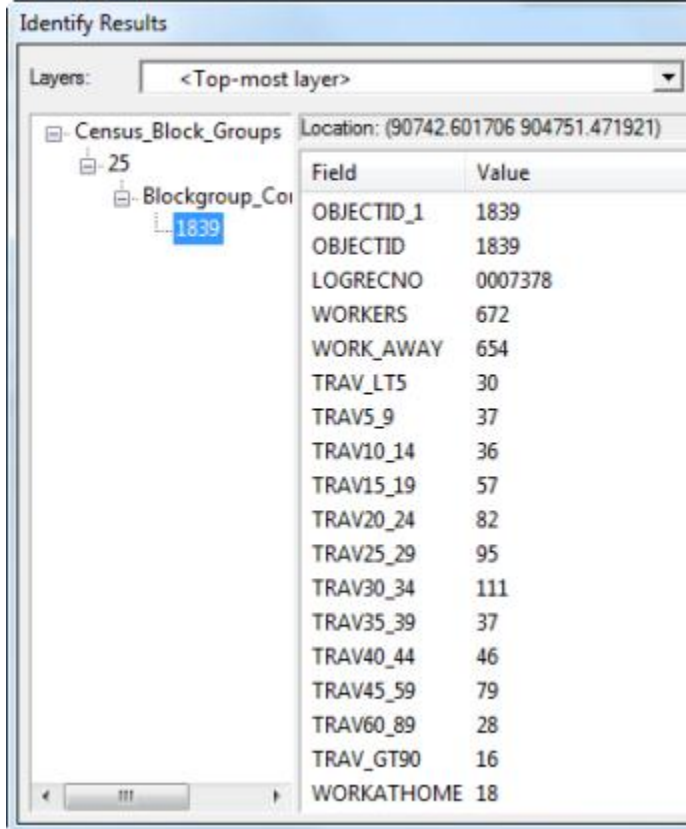
- Click **Next**

- Review the parameters, then click **Finish** - you will see your new relationship class inside the *Census* Feature Dataset.

To see the relationship class in action, select the class, and switch from the Contents to Preview tab. Using on the Identify tool () , click on a blockgroup within the preview map. You will see the Identify window looks like this initially – it shows the information from the blockgroup polygon attribute table:



But drill down by clicking on the + signs and you will eventually see this – the related information for the commute modes:



In ArcMap, you can now easily join the census commute means table to the blockgroup polygon table by using the Join function but specifying that it is based on an existing relationship class.

Now try this:

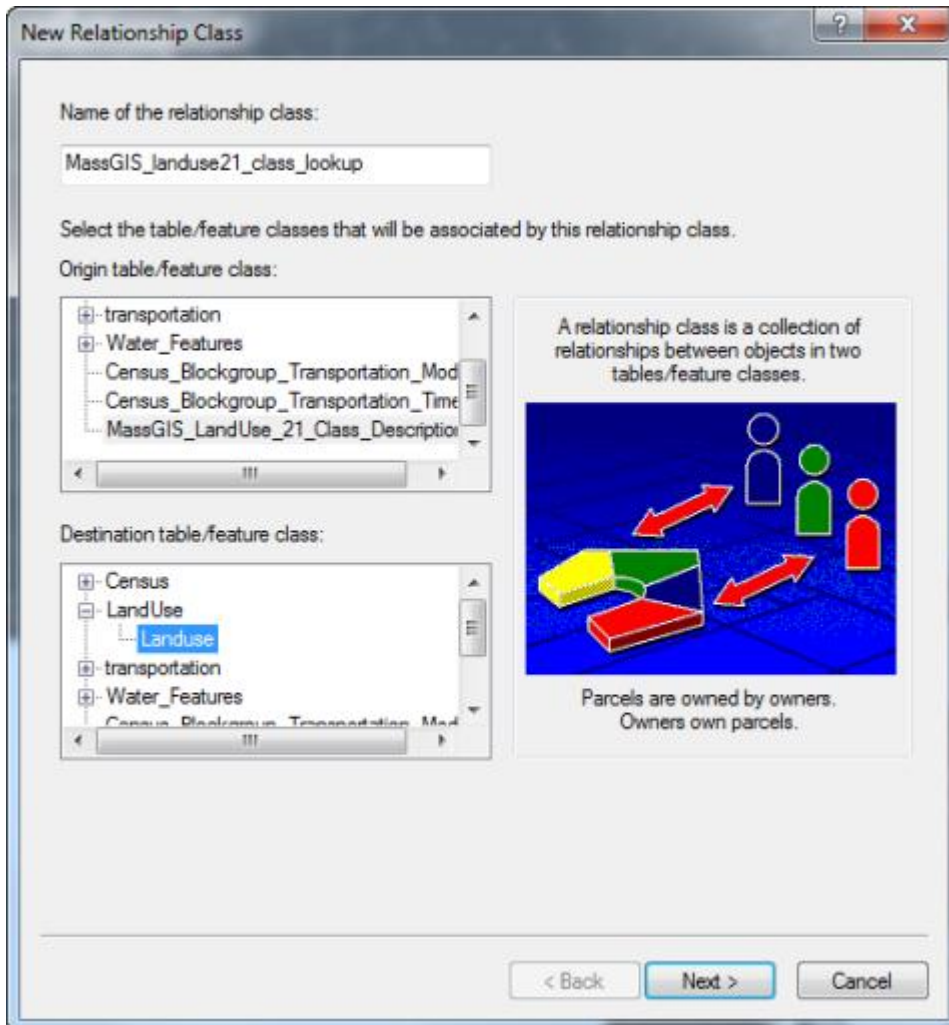
-Make another relationship class for the Commute Time table (CEN2K_BG_TRNS_COM_TIME.dbf) using the same types of parameters as above. Then try looking at it with the identify tool – you will see it is possible to see both related tables.

Create a relationship class to relate landuse codes to their description.

1. Import the MassGIS_landuse_21_code_descriptions.dbf from the *S:\Tutorials\Tufts\Tutorial Data\Creating a File Geodatabase\Mass GIS Landuse Code Descriptions* folder into your Geodatabase
2. Examine the table in ArcCatalog by highlighting it and clicking on the **Preview** tab. It is a lookup table that has code descriptions for the land use codes in the MassGIS land use layer (the 21-class code system-see the MassGIS land use data layer description for more information -<http://www.mass.gov/mgis/lus.htm>). This table can be related to the landuse GIS layer to provide descriptions for the numeric codes in that layer. There

is a 1-Many relationship between the lookup table and the landuse GIS layer – that is, there is one record in the lookup table (e.g., code 3 - forest) that relates to many records in the landuse GIS layer (all the polygons of the type “forest”).

3. Create a new relationship class in the landuse feature dataset. Fill in the first window as follows – the code descriptions table must be the ORIGIN table!



4. Specify that it will be a **SIMPLE** (peer to peer) relationship – the two tables can exist independently of each other, and deleting a record in one will not affect the other.

5. Fill out the labels as follows:

New Relationship Class

Specify a label for the relationship as it is traversed from the origin table/feature class to the destination table/feature class.

Landuse Describes Polygon

Specify a label for the relationship as it is traversed from the destination table/feature class to the origin table/feature class.

Polygon has Landuse

Which direction will messages be propagated between the objects related by this relationship class?

Forward (origin to destination)

Backward (destination to origin)

Both

None (no messages propagated)

6. Specify that it is a 1-Many relationship

New Relationship Class

Select the cardinality for this relationship class (origin - destination).

1 - 1 (one to one)

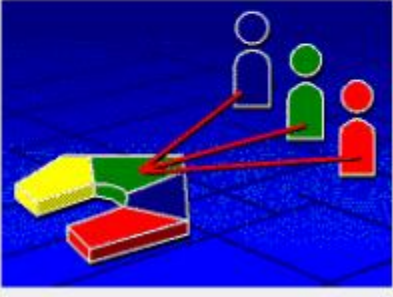
1 - M (one to many)

M - N (many to many)

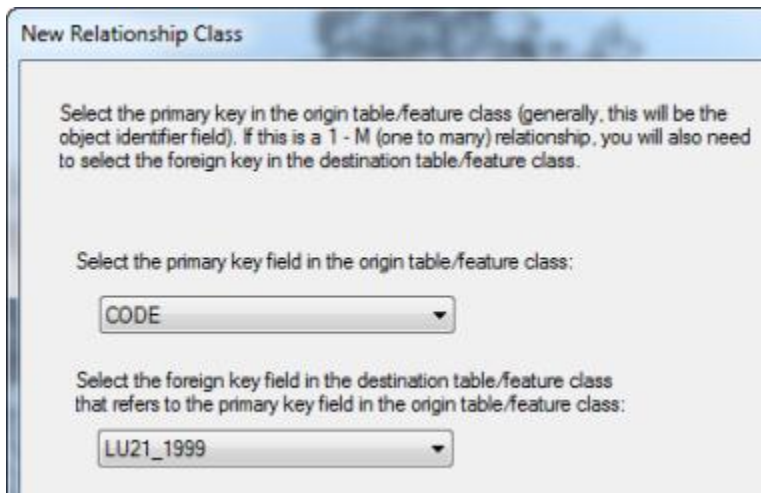
Note: If this is a composite relationship class, then the cardinality must be 1-1 (one-to-one) or 1-M (one-to-many)

In a 1-M (one to many) relationship, each object in the origin table/feature class can be related to multiple objects in the destination table/feature class.

Parcels Table/Feature Class Owners Table/Feature Class



7. You will **NOT** be adding attributes.
8. Fill out the attribute field links as follows:



New Relationship Class

Select the primary key in the origin table/feature class (generally, this will be the object identifier field). If this is a 1 - M (one to many) relationship, you will also need to select the foreign key in the destination table/feature class.

Select the primary key field in the origin table/feature class:

CODE

Select the foreign key field in the destination table/feature class that refers to the primary key field in the origin table/feature class:

LU21_1999

9. Click **Next** and then **Finish** when done.
10. Use the **Identify** icon to see the related data in the *Land Use* preview tab.

You're done with creating a File Geodatabase!

Now you can open the geodatabase in **ArcMap**. If you want to see the joined data via the relationship class, you will still need to create the join (right click on the data layer and choose **Joins and Relates – Join**). But now you can specify that the join will be based on one of your relationship classes.

Other options for geodatabases

We've just done some simple imports in this tutorial. But be aware that you can create new toolboxes and models as part of your geodatabase, and you can create planar and geometric topologies, which will be discussed later in the course. In addition the geodatabase format gives you more sophisticated database design options which we will explore.