

Michigan Technological University
School of Forest Resources and Environmental Science
Geographic Information Systems and Remote Sensing Technologies for
Natural Resource Management
Spring Semester 2009

Laboratory Exercise 1
Introduction to ArcGIS, Spatial Data and Map Coordinate Systems

Introduction

The purpose of this lab exercise is to become familiar with the ESRI ArcGIS software, to explore the different types of geodata available, to learn basic database operations, and to learn about the different types of map projections.

The specific objectives include:

1. Learn the basic operations of the ArcGIS software.
2. Explore geodata – vector (polyline and polygon), raster (image), and the relationship of spatial and attribute components of geodata.
3. Explore coordinate systems and map projections.

Prepare Your Directory

Before downloading and importing any data, create a class directory in your H:\ drive. Next make a “lab1intro” folder directory in your class directory. Then copy the data from the class directory found on the P:drive.

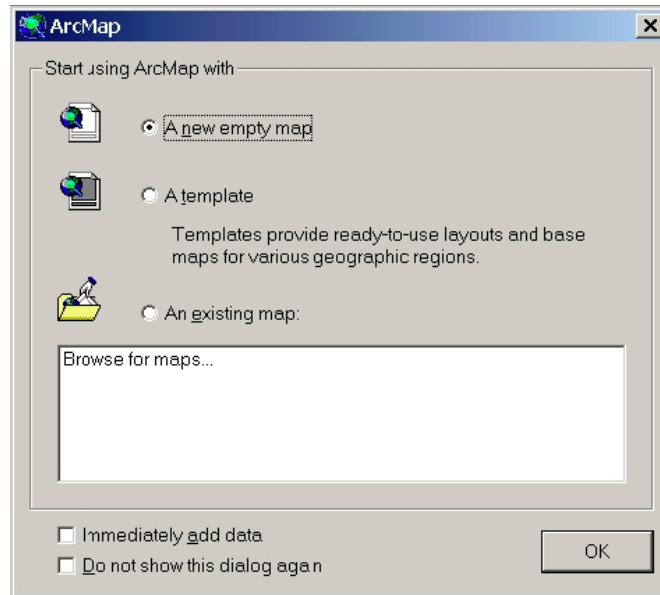
The data sets are located at P:\FW3540\Lab1 and include data for Houghton County. Each of the data sets is referred to as a thematic layer and represents a different feature found on the landscape. This data set includes an outline of Houghton County, roads, railroads, rivers and streams, lakes, city boundaries and school district boundaries.



In addition there are four orthophotos in the directory labeled Chassell_NE, Chassell_NW, Chassell_SE and Chassell_SW.

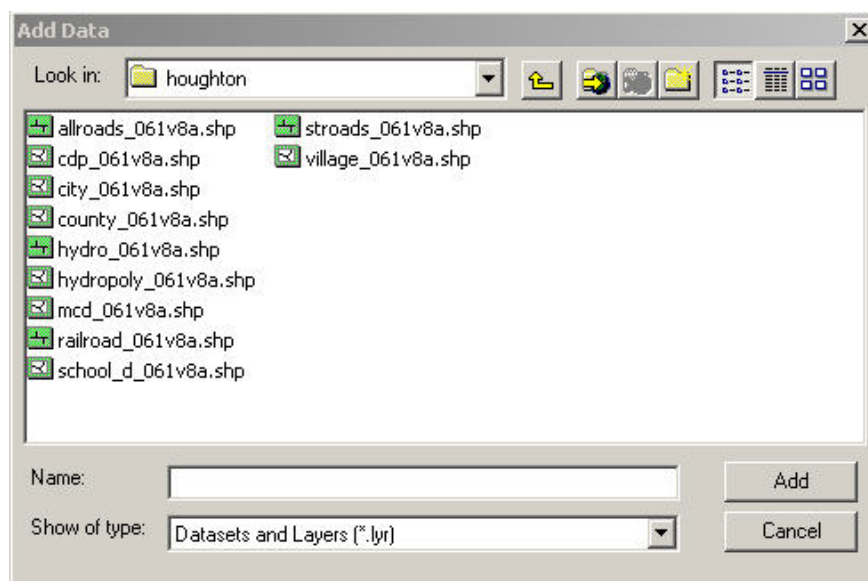
Do not store data on the local hard drive (C:\), except for temporary use. It might be lost once you logout.

Using ArcGIS/Geodata set

1. Start ArcGIS. Select ArcMap from the ArcGIS program group.
2. After the program loads, the startup dialog box will pop up. This will allow you to elect either a new blank map, a template, or open an existing map. See the pop-up window on the next page.
3. Check "*A new empty map*" and "*Immediately add data*", and click **OK**.



4. The **Add Data**  dialog box is similar to Windows Explorer. However, it may not list all the contents (drives or folders) in your system. If you do not find the data directory in the **Add Data** dialog box, you will need to use “**Connect To Folder**”  button to find the data directory. To connect to a specific folder, click on the “**Connect To Folder**” button, and navigate to the data folder. In this lab exercise, you will need to connect to where you have saved the data on your H: drive.

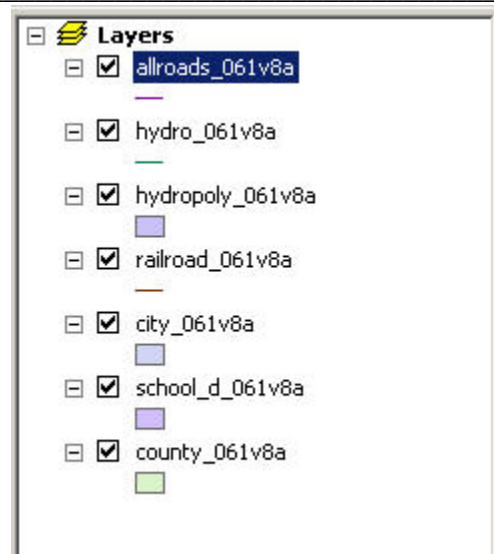


5. In the **Add Data** dialog, add the following data: allroads.shp, hyrdo.shp, railroad.shp, county.shp, hydropoly.shp, city.shp and school_district.shp

6. In the Table of Contents, turn off all the layers (uncheck the dataset), and rearrange the layers to the following order, from top to bottom: allroads.shp, hydro.shp, hydropoly, , railroad.shp,

city.shp, school_distric.shp and county.shp. Why polygons files placed at the bottom of the listing? _____

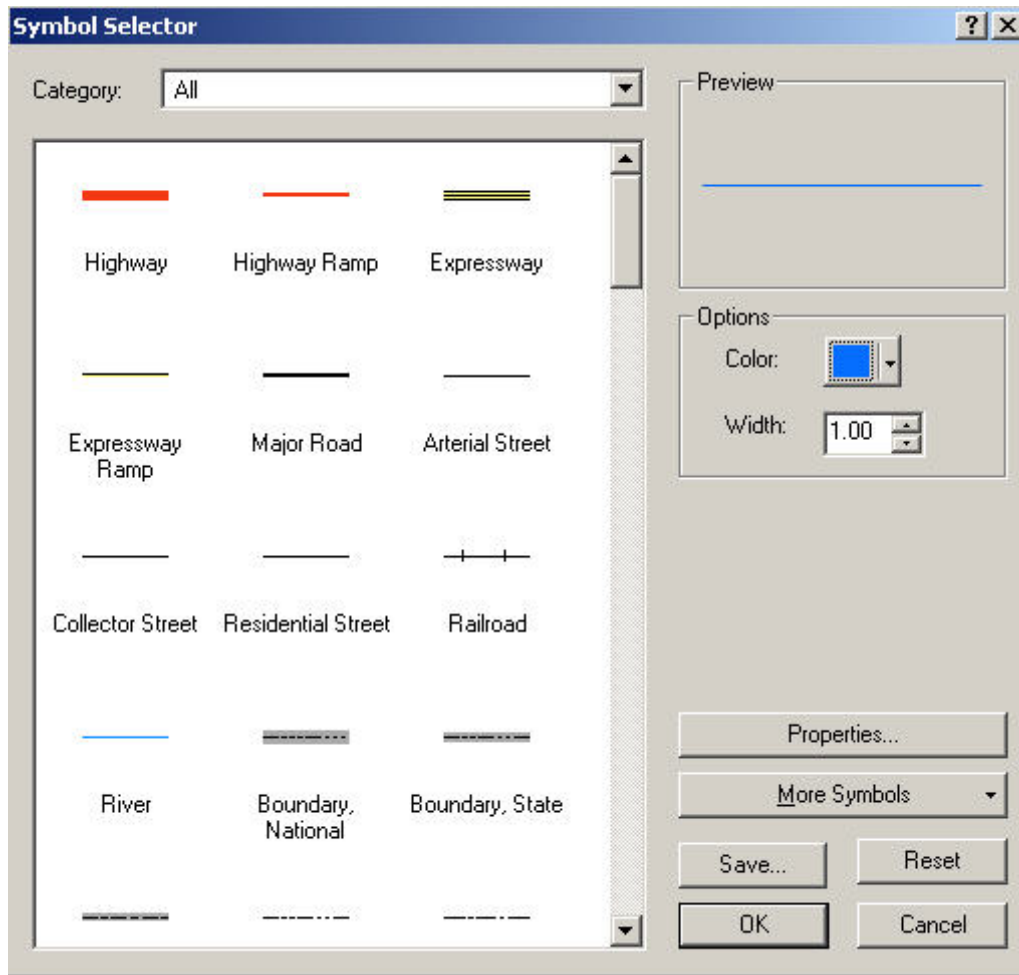
Does it matter what order the polygon files are listed in the table of contents, why or why not? _____



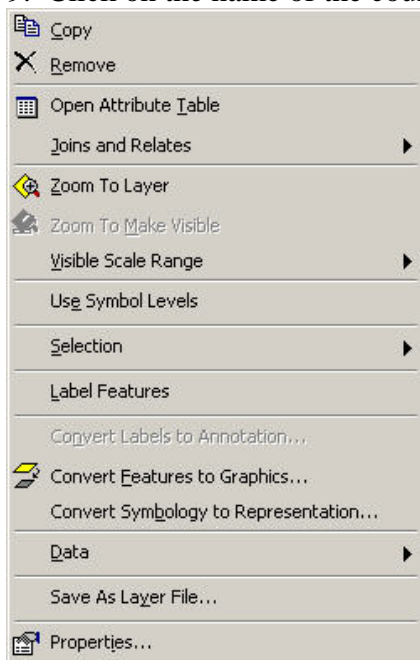
Does it matter what order the vector files are listed in the table of contents, why or why not? _____

7. Turn on the layers one by one (check the dataset), and carefully examine all the data layers from bottom to top, using zoom/pan functions to see the details of the data. Each time you zoom in the magnification is increased by 2.

8. Click on the roads symbol. The Symbol Selector menu will open (see illustration at top of next page). Select the Arterial Street Symbol to color the roads black. Take a minute and slide the bar down and note the wide range of symbols available. Color each thematic layer. Make the water layers blue, the city boundaries red, the school district boundaries light green and the county boundary a pale yellow, and use the railroad symbol for the railroad. You have effectively created a map legend.



9. Click on the name of the county layer in the table of contents so it is highlighted blue.



Right mouse click. The drop down menu shown on the left will appear. Click on Open Attribute Table. The information shown is referred to as attribute information which is descriptive information associated with spatial data. How many polygons are associated with the country thematic layer? _____. Close this attribute table.

Repeat the procedure for the school district thematic layer. How many polygons are associated with this layer? _____ Why is there more than 1 polygon? _____

Open the attribute table for the roads layers. Why are there multiple polylines with the same road? _____

10. Add the 4 digital orthophotos to the Table of Contents. They should be listed at the bottom of the table of contents. These are raster files instead of vector based polyline and polygons files.

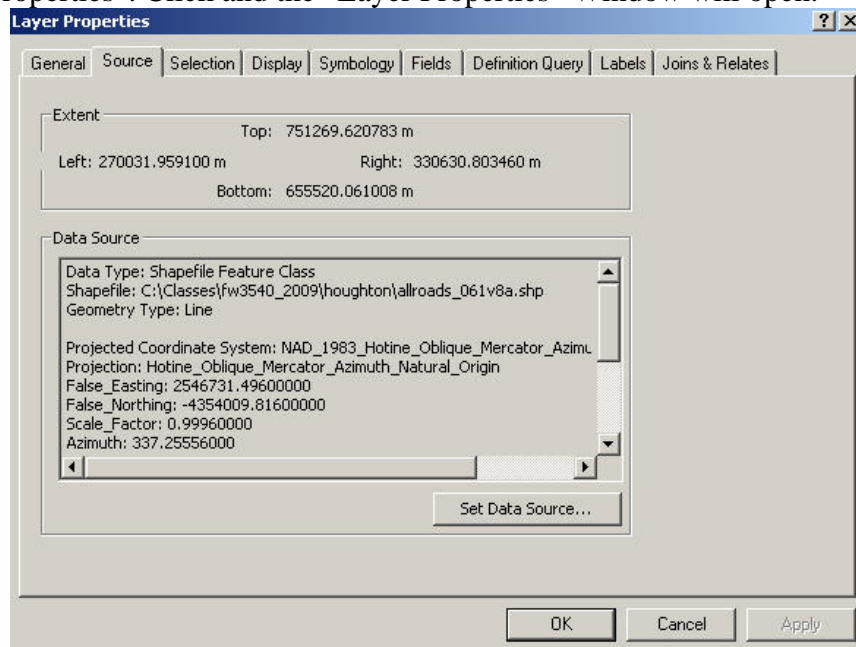


Notice that there are 3 bands listed for each photo. These are 3 dye layers associated with color film. Since we can see the leaves on the trees and the vegetation is actively growing- these are referred to as “leaf on” photography.


The image of the city of Houghton cannot be seen since it is being masked by the red polygon. Change the red polygon to a “hollow” polygon and make the outline red. This allows you to see the photography and at the same time know where the city limits are located.

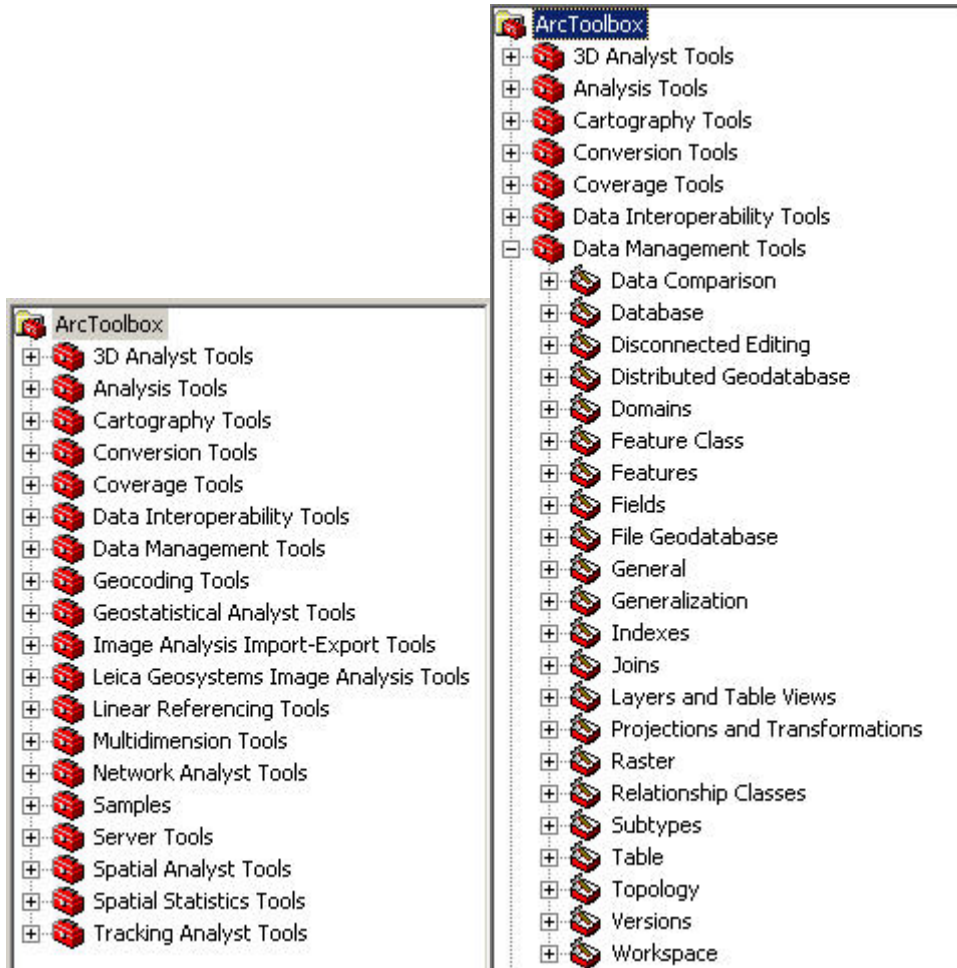
Zoom in to the City of Houghton, and be sure the allroads layers is displayed. Can you see roads that are in vector format, that do not appear on the orthophotos? What does this tell you about the date of the photography vs. the date the roads layer was generated?

11. Select the roads layer once again and right click for the drop down menu. At the bottom of the menu is “Properties”. Click and the “Layer Properties” Window will open.



Select the “Source” tab. Notice the coordinate system information displayed on the Data Source window. Listed are the specifications for the Michigan GeoRef coordinate system.

12. Add the Toolbox window to ArcMap by clicking on the red toolbox icon . The tool box will display next to the Table of Contents. Click on “Data Management Tools” to open the drawers.

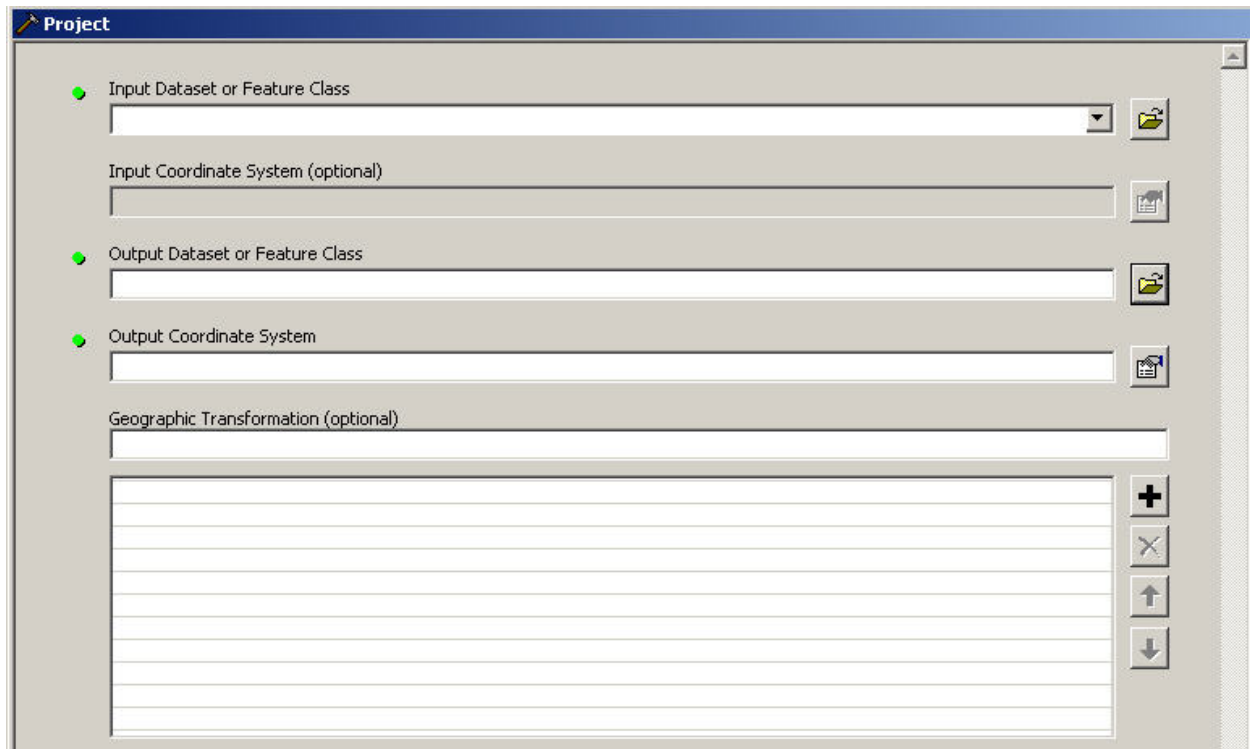



Click on “Projections and Transformations”. Another window will open to show you the tools in this particular drawer.



13. Open the Feature drawer and select the Project tool.

14. The Project window will open.



For input- select the allroads thematic layer. Note the program reads what coordinate system the data is registered to (Michigan GeoRef). Select an appropriate output file name. For the output coordinate system you are going to use UTM, Zone 16N, NAD83. To select this system click on coordinate selection icon .

15. The Spatial Reference Properties window will open. See illustration on next page. Click on select, a browse window will open- click on projected coordinate systems. Why will you not click on Geographic Coordinate Systems? _____

Next, select UTM, followed by NAD 1983, and then NAD 1983, UTM Zone16N.prj. This displays the parameters of the UTM coordinate system in the Spatial Reference Properties window. Click OK. This will reopen the Project window, click OK.

The program will reproject the allroads file from the Michigan GeoRef coordinate system to the UTM coordinate system.

Repeat this process for the remaining shape files.