Learning Objectives in this chapter:

* Understand the different file types and extensions recognized and used by ArcMap
* Where does MoDOT get its data
* Where is MoDOT’s GIS inventory housed

# Geographic Information Systems Data

**2.1 Overview**

This chapter will discuss the file types and locations of MoDOT’s data, where and how to access it. Transportation Planning oversees and edits the locations and GIS information that is available for use at MoDOT. Some divisions also have their own GIS data available to them that can be accessed via their public J drives.

**2.2 MoDOT Data Locations**

C:\Users\hoskir\Desktop\Untitled-1.jpgSome in house ArcGIS data can be found using the on the TMS toolbar in ArcMap. Information on design specific features such as boundary lines, hydrology, public land, urban information, cultural and environmental information, etc. may be found at this location.

*TMS Toolbar*

 As you can see, there are many and various file types on the TMS Toolbar. We will discuss these different file types later in the chapter.

**TMSPROD- MoDOT GIS Data**

With Windows 7 and ArcGIS 10, Transportation Planning has transferred most of MoDOT’s GIS data into a spatial database engine (ArcSDE). This is an enterprise geodatabase specifically designed to house an organization’s data, and can comprise of many different large databases which also allow multiple users to make connections and pull information onto their desktop machines. ArcSDE allows MoDOT’s transportation planning group to seamlessly integrate web services. The main database that we will need to connect to in order to retrieve GIS data is called TMSPROD. ArcSDE requires a connection from within ArcCatalog to the database that houses the TMS data.

Files in the ArcSDE database

*Database Connections in ArcCatalog*



**Plan Sheets**

Scanned plan sheets that were originally created in Microstation can be found at ***\\gharan02\storage4***. This can be saved as your ‘Q’ drive. Under the ‘Plan Sheets’ folder you will find .pdfs representing scanned files from Microstation. In order for these to be utilized in ArcMap, they will need to be saved as jpegs and brought into ArcMap. Be aware that if they are brought into ArcMap as an image, there is no intelligence behind it to place it in the correct location. Georeferencing can be done to place it in the approximate location, but this will not be exact and is to be used only as a reference.

**Microstation Files**

Microstation drawings can be exported out of Projectwise and saved to a local drive in order for use within ArcMap. The DGN’s can be brought directly into ArcMap, and converted into a GIS file format called a shapefile. There are some specific things that must be done once the file is outside of Projectwise and ArcMap. Borders and unnecessary line work must be deleted and the file compressed before being brought into ArcMap.

**Rag Maps**

Archival Maps for each county can be found via Transportation Planning’s intranet site. ***http://wwwi/intranet/tp/products/projecthistory/projecthistorymaps.htm***

These ‘Rag Maps’ are scans of the original maps that engineers added updates to as projects were created. Traditionally, they were created on paper and just added to as maintenance or changes were made to a specific stretch of roadway. In the digital age, these old maps have been scanned and are available as .pdf for reference. Similar to the Microstation plan sheets, these images would need to be saved as jpegs and georeferenced into ArcMap. Again, this would result in less than exact location data and should only be used as reference or visualization only.

**State Image Server**

GIS server connections can be created within ArcMap. The location of the Missouri State Image server is ***http://moimagery.missouri.edu/arcgis/services***. Aerial photography, DOQQ’s and Quad sheets can be found on this server. MoDOT is not responsible for maintaining this service. It is managed through the Missouri Department of Administration.

**2.3 Data Types in ArcCatalog**

Data in ArcGIS is known as spatial data. There are several formats discussed here that are available in ArcGIS. Shapefiles, ArcINFO Coverages, Geodatabases, IMS (Internet Map Service), grids, various image formats, tables, and CAD files are all types of data they can be read into your GIS project seamlessly.

**Shapefiles**

Shapefiles are vector-type data files that store location and attribute information of points, lines (polyline), or areas (polygon). Points, polylines, and polygons are also known as feature classes. Each shapefile can only contain one feature class. Therefore, you may have a shapefile containing points, containing polylines, or containing polygons, but you can’t have a shapefile that contains points and polylines, or polylines and polygons, or polygons and points…etc.

C:\Program Files\ArcGIS\DeveloperKit10.0\Icons\ShapefileLine32.pngC:\Program Files\ArcGIS\DeveloperKit10.0\Icons\ShapefilePolygon32.pngC:\Program Files\ArcGIS\DeveloperKit10.0\Icons\ShapefilePoint32.png The icons that represent the different types of shapefiles are as follows:

Point Shapefile, Polygon Shapefile, Polyline Shapefile.

The main thing to remember about viewing, moving or copying shapefiles is that when viewed via ArcCatalog, one sees the icon represented by the files contents and can see only one file. However, within the background, each shapefile can have 5-8 files that must be housed together in order for the shapefile to work properly within ArcMap. There is a file for the projection, a file for the database, and many other files with different extensions that have a purpose. Without each one of these files, the shapefile becomes unusable. It is important that anytime you are working with shapefiles, whether it’s moving, copying, deleting, etc. DO NOT DO THIS FROM WITHIN WINDOWS EXPLORER! Always open the ArcCatalog application and do your work from there. It will save you a big headache in the future.

*What one shapefile looks like within Windows Explorer*



*What the same shapefile looks like within ArcCatalog*



**Layer Files**

Layer files will be represented by a diamond shaped symbol in ArcCatalog.

*What a layer file looks like within ArcCatalog*

****

One of the main features of a layer is that it can exist outside your map as a file on disk. This makes it easy for others to access the layers you’ve built. When you save a layer to disk, you save all of the information about the layer. The layer file that is created will reference its data source.

Saving a feature to a layer file:

1. In the table of contents, right-click the layer and click Save As Layer File.
2. Click the Look In drop down arrow and navigate to the location where you want to save the layer.
3. Click Save.

**Layer Packages**

With the release of ArcGIS 9.3.1, layer packages were introduced. Layer packages are different than just a layer because a package includes both the layer properties and the dataset referenced by the layer. With a layer package, you can save and share everything about the layer-its symbolization, labeling, table properties, and the data. The recipient of the package must have either ArcGIS or ArcExplorer installed in order to view the data. (ArcExplorer can be downloaded from the ESRI site for free.)

One can create a layer package within ArcMap to be shared with an individual who can view it within ArcExplorer. Or one can create a layer package in ArcExplorer, and it can be opened within ArcMap. If you have a ArcGIS online account you can even share you layer packages online. (*ArcMap does not yet support importing layer packages via the Add button, This option of using the Add data button will be available in the ArcGIS 10.1 release*.) Before you can create a layer package from ArcMap, you must enter a description of the layer by right clicking on the layer, selecting Properties > General and entering text under description. Multiple layers can be checked on and packaged as one layer package as well.



Layer Packages have the .lpk extension

*Create Layer Package*

**

**Map Documents**

Map Documents can be identified as .mxd files.

*Map Document Icon and file extension*

**

The following items are saved when you save a map document:

* The spatial extent to which the Data Frame was zoomed
* The features present and turned on in the Table of Contents
* The symbology used to portray each feature in the Table of Contents
* Any map layouts you have created
* Path names (file location pointers) to data sources in the Table of Contents

Saving the ArcMap session in a map document does not save any of the spatial data viewed in the Table of Contents; it saves only the settings and pointers to the data. Thus, if you copy a map document to another computer without also copying the data files, ArcGIS will respond that it can't find the data that is part of the map document. You will see red exclamation marks next to the data it cannot find in the Table of Contents.

Now with ArcGIS 10, there is an easier way users can save their map documents for sharing. Map Packages eliminate the lost data sources which is a wonderful addition compared to the previous options in older versions of ArcMap.

**Map Packages**

Map packages (.mpk) make it easy to share complete map documents with others. A map package contains a map document (.mxd) and the data referenced by the layers it contains, packaged into one convenient, portable file. Map packages can be used for easy sharing of maps between colleagues in a work group, across departments in an organization, or with any other ArcGIS users via ArcGIS online. Map packages have other uses, too, such as the ability to create an archive of a particular map that contains a snapshot of the current state of the data used in the map.

*Map Package Icon and file extension*

* *

**Geodatabases**

**

A geodatabase is a physical storage container of geographic information inside a database management system (DBMS).

It is a container that can house several feature datasets. Each geodatabase feature class can only store a single feature type, but you can group them into a feature class collection called a feature dataset as long as they have the same coordinate system.

ArcGIS supports three types of geodatabases. They are the ArcSDE geodatabase, the file geodatabase and the personal geodatabase.

The personal geodatabase is designed for smaller-scale projects and is stored in an .MDB file. (Microsoft Access File) This type of geodatabase is being phased out. We included it in here in case you come across this type of file in the future.

The ArcSDE geodatabase is designed for larger enterprise GIS applications and databases and is stored in a supported RDBMS format (Oracle, DB2). MoDOT’s main GIS data that Transportation Planning is responsible for, is housed in an ArcSDE geodatabase. When you pull in data from TMS Toolbar, it is pulling from an ArcSDE geodatabase called TMSPROD.

The last type of geodatabase is one that is most commonly used by individuals who want to edit, organize and share their data. A File Geodatabase is stored with a .GDB extension. The file geodatabase, which was introduced with ArcGIS 9.2, is preferred over the personal geodatabase because of the extensive amount of storage it can hold, its compressed size and ease of data sharing. The licensing level is the determining factor on the capabilities of the geodatabase.

*Geodatabase structure*

**

**CAD Files**

With ArcGIS, CAD files can be accessed and read into a GIS project. The whole entire CAD file may be brought in, or individual features, such as lines and shapes. MoDOT uses Microstation that creates a .DGN files. The .DGN file assigns lines and shapes, a certain color, and layer/level. This information will be listed in the attribute table for the feature class that is imported from the CAD drawing. CAD files maybe left in their native format for queries, or can be converted into a coverage or shapefile for manipulation in ArcMap.

*CAD File in ArcCatalog*

**

Importing CAD files is easy in ArcGIS. Simply

find the .DGN file in ArcCatalog and

drag-and-drop it into ArcMap. Make sure

your CAD files are compressed before

importing them.

**Tabular Locations**

In addition to adding data sources, such as shapefiles, you can also add tabular data to your map that contain geographic locations in the form of x,y coordinates.

X,Y coordinates describe discrete locations on the earth’s surface, such as the location of telephone poles along a roadway. You can gather x,y coordinates from surveys of a location or GPS data collection. This table must contain two fields, one for x coordinate and one for y coordinate. Once added to ArcMap, this table will act like a point feature class. An attribute table is created for the x,y coordinate table, and you can join or relate other tables to this coordinate table.

**Excel Files**

Microsoft Excel tables can be added into ArcMap. They can be used for querying, or joining to other tables. When you browse for an Excel file, you will need to choose which table you will want to open. Most Excel tables include 3 or more worksheets, ArcMap will prompt you to choose which worksheet you would like to add.

*Excel Table in ArcCatalog*



**Images and Grids**

Raster images may be used in ArcGIS. As mentioned in Chapter 1, raster datasets use rows and columns of equally spaced cells to model reality. File size is based on the size of these cells. The larger the cell size, the smaller the file. The smaller the cell size, the larger the file will be. Smaller cells allow for clearer images when zoomed in closely to an object. You may use black and white aerial photos, or multispectral containing many bands, layers or colors. Typical formats include TIFF, BMP, SID, JPEG, and ERDAS.

Grids are a type of ESRI, ArcGIS native raster format. Grids can contain attribute tables, and surface information such as land use.

*Raster image file in ArcCatalog*



**KMZ/KML Files**

As mentioned in Chapter 1, KML/KMZ files can now be brought into ArcMap using the KML to Layer tool found under Conversion Tools in ArcToolbox. The tool will prompt you to navigate to the location of the KML or KMZ file and open it.

*KMZ file icon and extension*



**Coverage**

ArcInfo Coverage’s are a collection of data that may contain more than one feature class. An example of this data format may be a land use coverage. This coverage may represent an area feature class containing location boundaries, and a line feature class representing the different breaks in land use. Points and lines may be in the same coverage as well. Points and areas, however, must not reside in the same coverage.

When you bring a coverage into ArcMap, you bring in

*Coverage file in ArcCatalog*

all of the feature classes at once, or you can choose to

bring in only one. That is what makes the coverage

very versatile. They are becoming less common as the geodatabase has replaced this type of file in many instances, but you may come across them occasionally.

These are the main data types that you will see associated with ArcGIS. You will become familiar working with these different types of data as we get into the next few chapters in this manual.