

The Learning Process of Migrating to ArcGIS and the Geodatabase

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Abstract: *In 2002, Florida's Turnpike Enterprise migrated to ArcGIS and the Geodatabase. Through trial and error, we developed a successful GIS structure. We learned how to create a Geodatabase, create users for the Geodatabase, proper backup techniques, how to create, update, and distribute metadata, and the process of managing a day-to-day Geodatabase. We also learned of numerous capabilities in ArcMap that addressed several mapping issues we had while using ArcView 3.2a.*

Introduction

In 2002, Florida's Turnpike Enterprise had just over 100 data layers contained in both ArcInfo Librarian and ArcView Shapefile format. Today, there are over 250 layers stored in a Geodatabase using ArcSDE 8.3 and SQL Server 2000. Not only has our database more than doubled, our storage and map production software has changed. The migration was not an easy task, and errors were made, but today we have a successful, robust, complete, and streamlined GIS database.

Creating the Geodatabase

When the Turnpike began the migration process, our GIS database was in both ArcInfo Librarian and ArcView Shapefile format. We designed our Geodatabase structure using the same general format of our Librarian structure, which organizes the data by type, such as environmental or census data. After each SDE Feature Dataset was created, we imported the SDE Feature Classes. We thought the conversion was complete; however this is where we ran into our first error.

We had created the Geodatabase and loaded the data using the SDE Administrator connection. After completing the migration however we learned that ESRI does not recommend using the SDE Administrator to load data. Management and data security are the two main reasons ESRI does not recommend using the SDE Administrator.

The first problem is that the SDE Administrator owns the Geodatabase schema. The Geodatabase schema describes the definitions, integrity rules, and behavior for each geographic data set. If you load data as the SDE Administrator it is hard to differentiate between the schema tables and your data tables. If you inadvertently delete a table from the schema it will render the entire Geodatabase inoperable. Secondly, if the SDE Administrator is used by more than one individual the database will be more vulnerable to potential human error.

After learning this, we created three permission levels for our Geodatabase (Figure 1). The first level is the general user; at this permission level the user is able to view the data for map production and analysis. The second level is the GIS Administrator, this user owns and creates the Geodatabase and makes updates, edits, and changes to the Geodatabase. The final level is the SDE Administrator. This level allows the user to

Compress the Geodatabase after edits have been made. The GIS Administrator connection is the only connection used to load data and manage data in the Geodatabase. At Florida's Turnpike there is only one data manager assigned to this permission level.

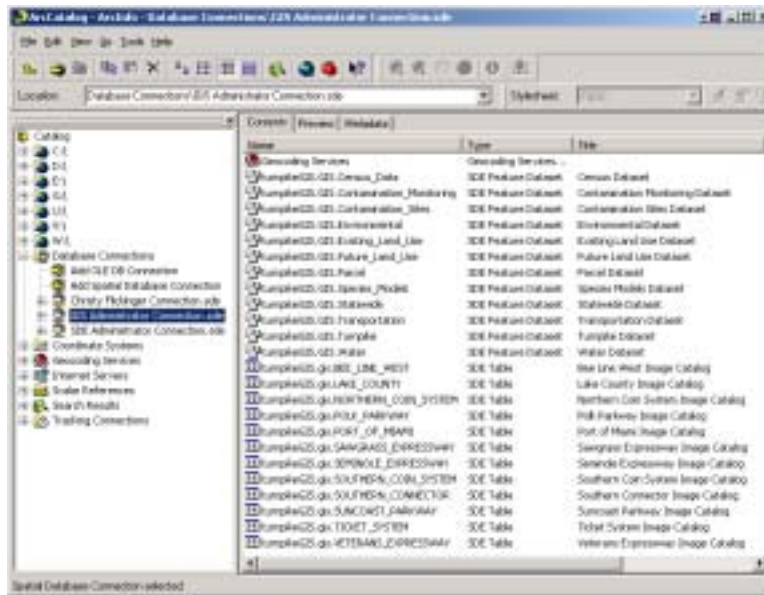


Figure 1. The three permission levels of the Turnpike Geodatabase.

Maintaining the Geodatabase

After the Geodatabase was recreated using the GIS Administrator connection, we found several functions required to maintain a Geodatabase. For example, when updates or changes are made to a dataset you must use the *Register As Versioned* command (Figure 2). This allows the feature class or table to be multiversioned. You must also run the *Analyze* command on your data to update the RDBMS internal files (Figure 2). By right-clicking in ArcCatalog most of the tools are easily accessible.

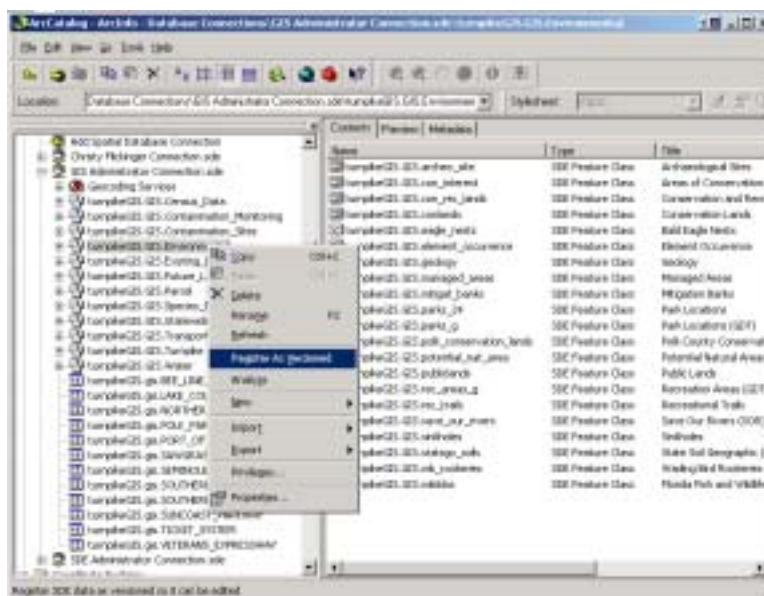


Figure 2. The Register As Versioned and Analyze commands.

There is one additional command which is essential to the Geodatabase that we discovered through trial and error. We became aware of this command when we encountered a problem with our Geodatabase and ArcIMS connection. The GIS Administrator made several changes to attributes in one of the datasets. All users of the ArcGIS applications were able to see the attribute changes, but our ArcIMS intranet mapping application was unable to see the changes. After searching the ESRI website and ArcGIS Desktop Help, we found that the SDE Administrator needed to run the *Compress* command for ArcIMS to see the changes. *Compress* removes all unreferenced database states and redundant rows. The *Compress* command must be added to the context menu from the list of available commands in order to be used (Figure 3).

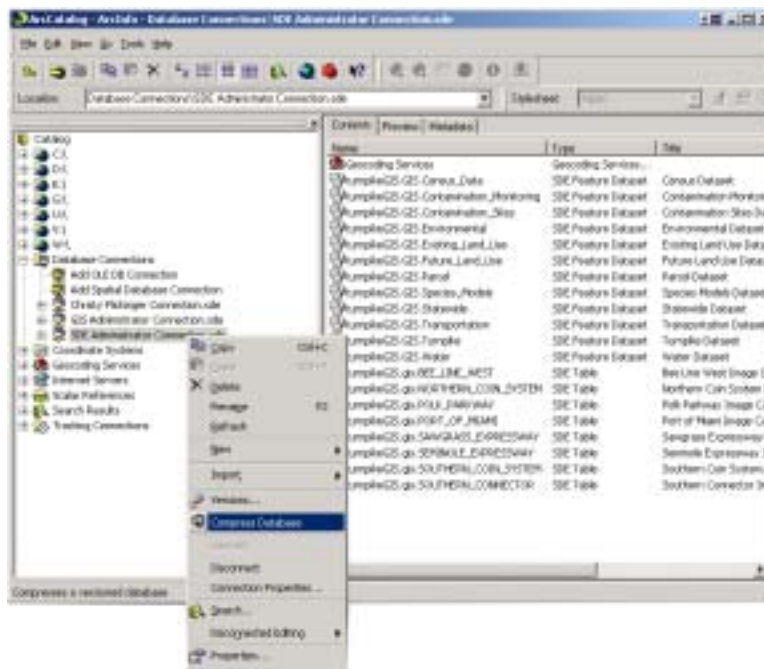


Figure 3. The Compress command.

Backing-up the Geodatabase

The most important process you can perform on your database is backing-up your data. When we first began creating our Geodatabase we had a backup plan in place to protect our Geodatabase. The Turnpike Enterprise uses Veritas Backup Exec 9.0 for Windows Servers. We thought we needed the Veritas SQL Server Agent to backup our Geodatabase because it was being stored in SQL Server.

We performed the backup process for several weeks, assuming it was functioning properly. We then experienced a server crash and had to rebuild the server and restore data. When we performed the restore process on our SQL server tables, all information appeared to have been restored. However, when we viewed our Geodatabase from any of the ArcGIS applications, only data tables were available; no geographic information had been restored. We had to rebuild our Geodatabase and rethink our backup strategy.

After contacting ESRI and reviewing documentation, we found that the best process to backup the Geodatabase was to manually backup the tables from Microsoft SQL Server Enterprise Manager (Figure 4). We perform a backup of these databases each Friday and these backup files are stored on backup tapes. This procedure has proven successful at restoring the Geodatabase properly.

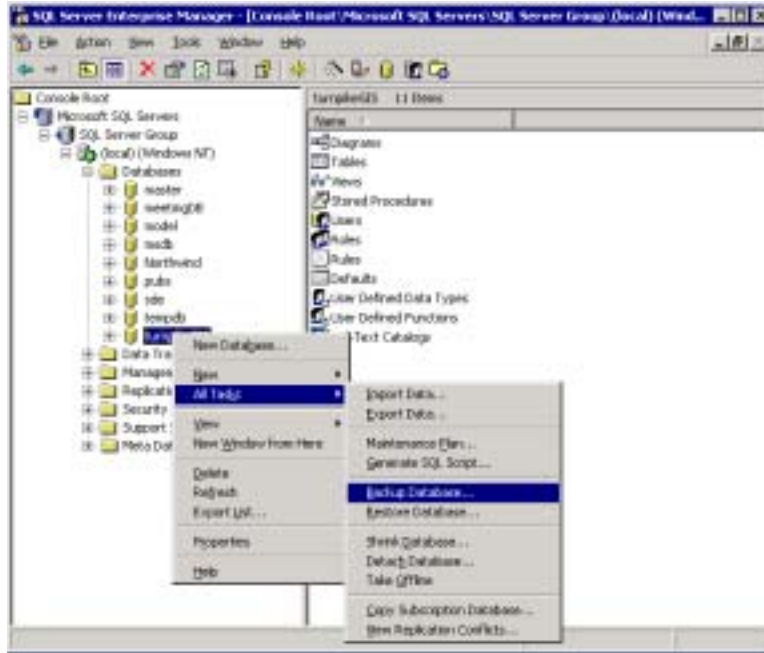


Figure 4. Backing-up the Geodatabase in SQL Server.

Metadata

Prior to converting to ArcGIS, the Turnpike Enterprise did have a metadata procedure in place. However, the format of the metadata was individual to the Turnpike and did not comply with Federal Geographic Data Committee (FGDC) Metadata Standards. A large quantity of information was absent from our metadata structure. Once we converted to the Geodatabase and ArcGIS, we were able to utilize the metadata tools in ArcCatalog to create consistent, complete, and compliant metadata for our data layers.

We create our metadata using ArcCatalog. In addition, we publish this information to our GIS Metadata intranet site. When we first began using ArcCatalog in the creation of our metadata, we used the FGDC ESRI metadata format. This format worked well and had a nice look for web distribution; however we found that a great deal of the information in the metadata file was not being shown in this format. Because of this, we changed to the FGDC format (Figure 5). This allows all information stored in the file to be displayed in ArcCatalog and our intranet site. In addition to the metadata, we use thumbnail images to add to the usefulness and understanding of our metadata.

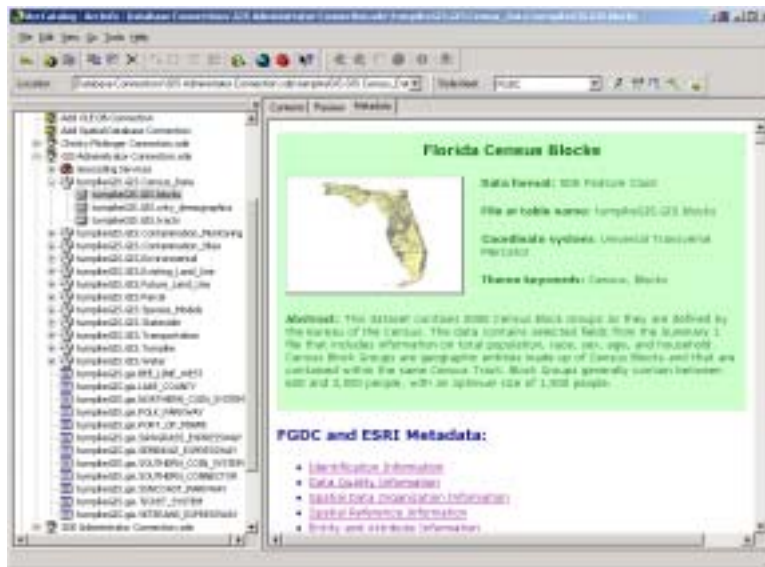


Figure 5. The FGDC Metadata format.

Once our metadata has been created in ArcCatalog, we export the metadata in html format and publish to the Turnpike intranet. We have also found it useful to export the xml file format, to reduce metadata creation time. Turnpike updates its GIS layers annually, so when we replace a data layer, it is easier to import the xml file to have existing metadata to work with instead of starting from scratch.

Map Production

The GIS Division of Florida's Turnpike Enterprise produces a large number of hardcopy map products. Because of this demand it is imperative that we are able to create these maps in the shortest possible amount of time. With high-demand and short turnaround time, it was essential that we learn ArcMap and be as proficient with the software as possible in the shortest amount of time.

There are many features in ArcMap and Geodatabase tools in ArcCatalog that allowed us to keep our map creation time to a minimum. One of the most important aspects of our production is staying consistent with our map appearance. In ArcMap, we were able to use our existing ArcView legend files to create new ArcMap layer files for our map creation. This greatly reduces the amount of time to create a map because the user does not have to recreate the symbology for each layer in each map. This also allows all maps to have the same color scheme which makes map interpretation easier for the user when comparing one map to another. ArcMap layer files are also able to keep label settings; this is a great feature available in ArcMap that was not available in ArcView 3.2a.

In ArcCatalog, we were able to create an alias name for our Feature Classes in our Geodatabase. This allowed us to make our Table of Contents window in ArcMap more useful and create legends in minimal time. For example, in our Geodatabase we have over 120 Feature Classes in our Species Models Dataset. It is difficult for a user to remember the common species name from the abbreviated file name; it is also difficult to remember if the species is endangered (E), threatened (T), a species of special concern (SSC), or not included on any list (N) (Figure 6). By having an alias name, the user is

able to see the common species name and, by using abbreviations, the user can identify which list the species may be on (Figure 7).

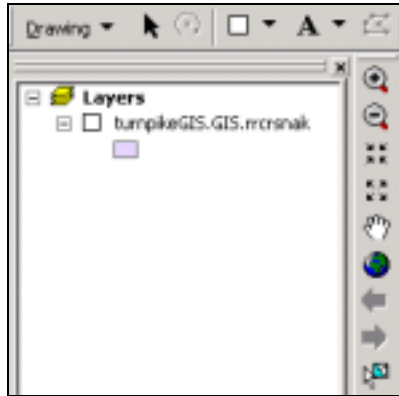


Figure 6. Feature Class without an alias name.

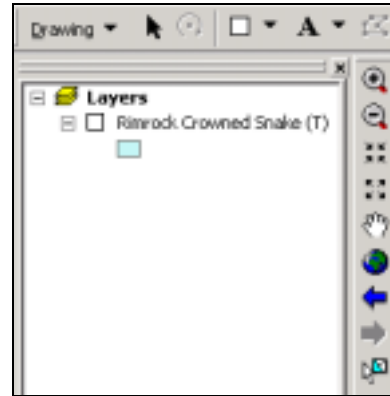


Figure 7. Feature Class with an alias name.

In addition, by having the alias name in the ArcMap Table of Contents, the legend is easily created in the Layout. In ArcView 3.2a a user could create a legend but the file name would be displayed, not a real-world name for the layer (Figure 8). Because of this, the user would have to simplify the legend, ungroup the legend, and then replace the file name with the common name of the layer. With ArcMap 8.3 the Feature Class is brought in with the alias name. Therefore, when the user creates the legend, the real-world name is displayed (Figure 9).

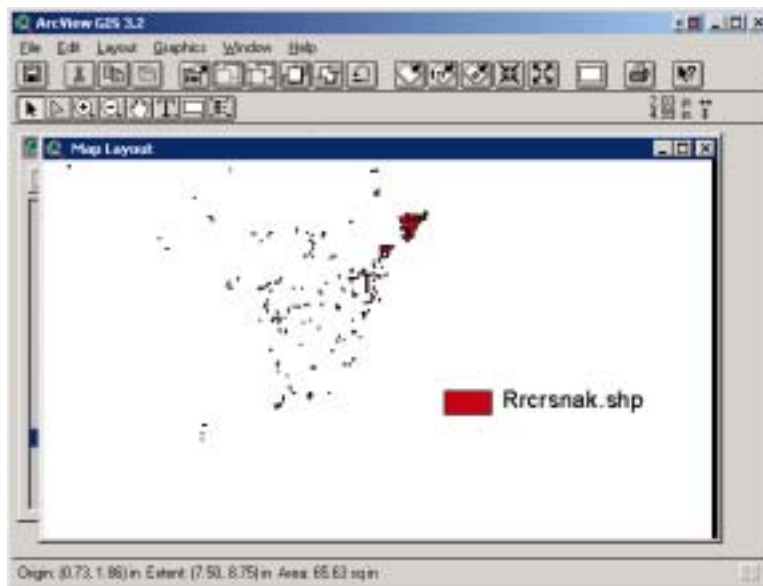


Figure 8. The legend created in ArcView 3.2a.

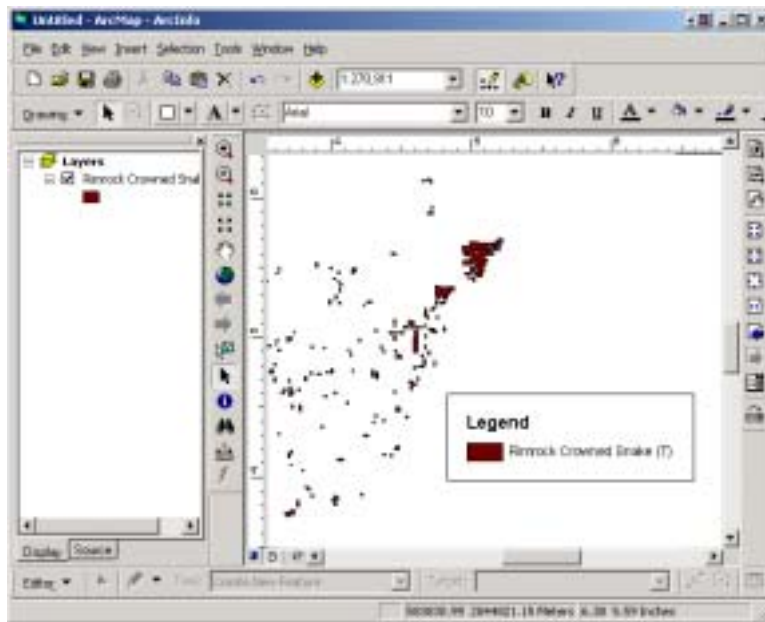


Figure 9. The legend created in ArcMap 8.3.

Another excellent feature of ArcMap is the ability to label features in the Layout View. This allows the user to label features and clearly see how this will look in the final map product. This feature was not available in ArcView 3.2a. This is a feature we use for every map and has greatly reduced our production time.

Conclusion

Although we ran into several issues during our migration, it was a learning process and well worth the experience. Florida's Turnpike Enterprise now has a well developed Geodatabase. In addition, we have gained significant knowledge regarding the Geodatabase.

Our Geodatabase has been created using the appropriate user and process and is maintained with proper procedures. It is backed-up correctly to make certain the data will not be lost and can be easily restored. With all the tools available to us in ArcCatalog we are able to create complete, accurate, and compliant metadata in an easily transferable format. The functions in ArcMap have also reduced the amount of time it takes to create hard-copy map products and added functionality.

This process was challenging, but with increased efficiency and improved products, it was well worth the effort put forth by our team.

About the Authors

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