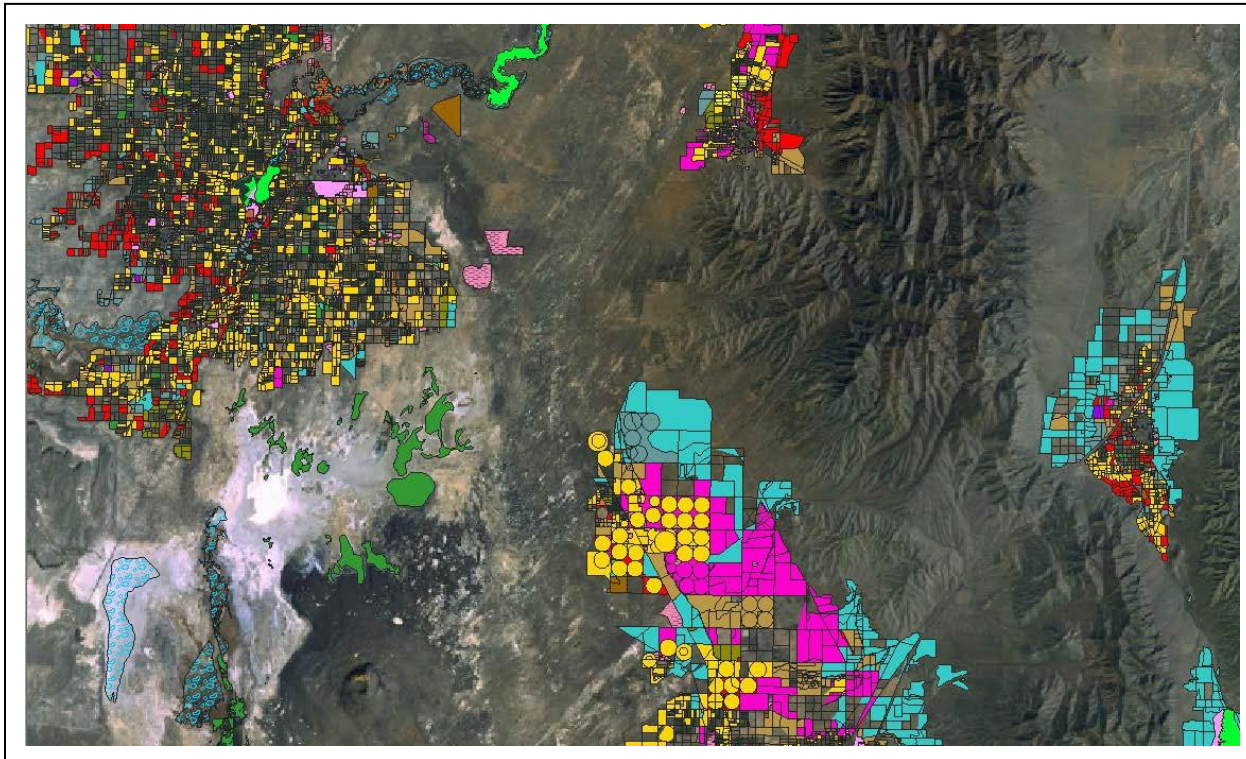*SMS 12.2 Tutorial*
GIS

Objectives

This tutorial demonstrates how to read in GIS data, visualize it, and convert it into SMS coverage data that could be used to build a numeric model. This tutorial will instruct to read in water related land use information acquired from Utah's GIS Portal, found online. However, the concepts can be useful to work with any GIS data in SMS.

Prerequisites
- None

Requirements
- GIS Module
- Map Module
- ArcGis® (Optional)

Time
- 15-20 minutes

AQUAVEO™

1   Getting Started

GIS (Geographic Information System) data can be useful for building models with SMS. This is particularly true for land use or other data that would be time consuming to digitize by hand. GIS data can also be viewed in the background of SMS data.

SMS contains two implementations for working with GIS data:

1. Generic SMS implementation – Reads ArcGIS® shapefiles as well as MapInfo MIF/MID formats. Includes tools for selecting, viewing table data, and converting data to coverages and scatter sets.

2. ArcGIS® Implementation (ArcObjects®) – Uses ESRI code to read in, manage, and display GIS data. To use ArcObjects® there must be a license of ArcGIS® on the computer being used. ArcObjects® implementation has more options for displaying ArcGIS® data (it uses the same layer settings functionalities that exist in ArcGIS®).

This tutorial uses the generic SMS implementation. The ArcObjects® implementation can be used but there will be some differences which are not shown here.

By default SMS starts up in the generic implementation.

2   Opening an Existing GIS Data File and Viewing Attributes

Start by opening the shapefile in the generic SMS implemented mode. Opening a shapefile with ArcObjects® implementation requires a different procedure which is not covered in this tutorial.

To open a shapefile in the generic SMS implemented mode:

1. Select *File* | **Open** to bring up the *Open* dialog.

2. Find the file "SGID_U024_WaterRelatedLanduse.shp" in the data files folder for this tutorial. Select **Open**.

   - There are two of files with this name. One is a shapefile, and the other is an XML Document. The shapefile is the one that should be read in.

3. Make the *GIS* 🌐 module active then click the GIS **Get Attributes** ℹ️ tool. An *Info* dialog will appear. Move the dialog to the side, then select inside the lake polygon located in the middle of the display.

4. The *Info* dialog should appear showing the attributes for the lake including a description of the land use, the land cover designation, the year the GIS data was acquired, the total polygonal area in acres, and its length in feet.

5. Close the *Info* dialog by clicking on another tool in the toolbar.

6. Right-click on the "SGID_U024_WaterRelatedLanduse.shp" file and select the **Open Attribute Table** command. The *Attributes* dialog will appear.

7. The *Attributes* dialog should show the same information as the *Info* dialog, but with information listed for each and every polygon in the domain of the shapefile. Note the total number of records as found in the bottom-left corner of the dialog.

8. Click **OK** to close the *Attributes* dialog.

3   Mapping the Shape File to an Active Coverage

In order to incorporate data into models, the GIS data needs to be converted into native SMS data. Generally, GIS data is converted into Map coverages which are similar to GIS layers.

Data converted from GIS layers into Map coverages are put into the active coverage. Therefore, it is important to create the type of coverage wanted and make it active before the conversion process.

Follow the steps below to convert the landuse data into an area property coverage with designated materials. These steps are the same for the generic and ArcObject® implementations.

1. Right-click on the default "Area Property" coverage and select **Rename**.

2. Rename the coverage "Landuse".

3. Right-click on the "Landuse" coverage and make sure that the *Type* is *Generic |* **Area Property**.

4. In the GIS module and with the Landuse coverage active, select *Mapping |* **Shapes → Feature Objects**.

5.   In the dialog that appears, click **Yes** to use all the shapes in the visible shapefiles for mapping. The *GIS to Feature Objects Wizard* should appear.

    • Note: If there are any number of shapes selected in the shapefile, SMS will not prompt to use all shapes in visible shapefiles. Instead, it will only convert those selected shapes into feature objects. This is useful if only planning on using a few selected shapes from a large shapefile.

6. Click **Next** to bring up the *GIS Feature Objects Wizard* table. In the *Description* column select "Material" from the *Mapping* drop-down box. SMS will assign the polygon description to each polygon mapped to the active coverage.

7. Click **Next,** then **Finish** to close the *GIS to Feature Objects Wizard*.

8. Turn off the GIS coverage by clicking the checkbox next to it.

4   Map Module Display Options

The landuse data has now been copied to an area property coverage in SMS. Area property coverages can be used to define materials for numeric models. Each polygon is assigned a material based upon the description column that was mapped early.

To see the landuse information in the SMS map module, it's necessary to change the visualization setting. To do this:

1. Open the *Display Options* dialog by selecting *Display* | **Display Options**. The *Display Options* dialog will appear.

2. Select *Map* in the tree menu to the left of the dialog.

3. Deselect *Arc* and *Node* and select the *Polygon: Fill* option. Also turn on the *Legend*.

4. Click **OK** to close the *Display Options* dialog.

5. **Zoom** 🔍± into the city located north-east of the lake. This area is farmland and residential as can be seen by observing the color of the polygon and matching it to the legend. Most fields are used for Alfalfa according to the color associated with it. The display should look similar to Figure 1.
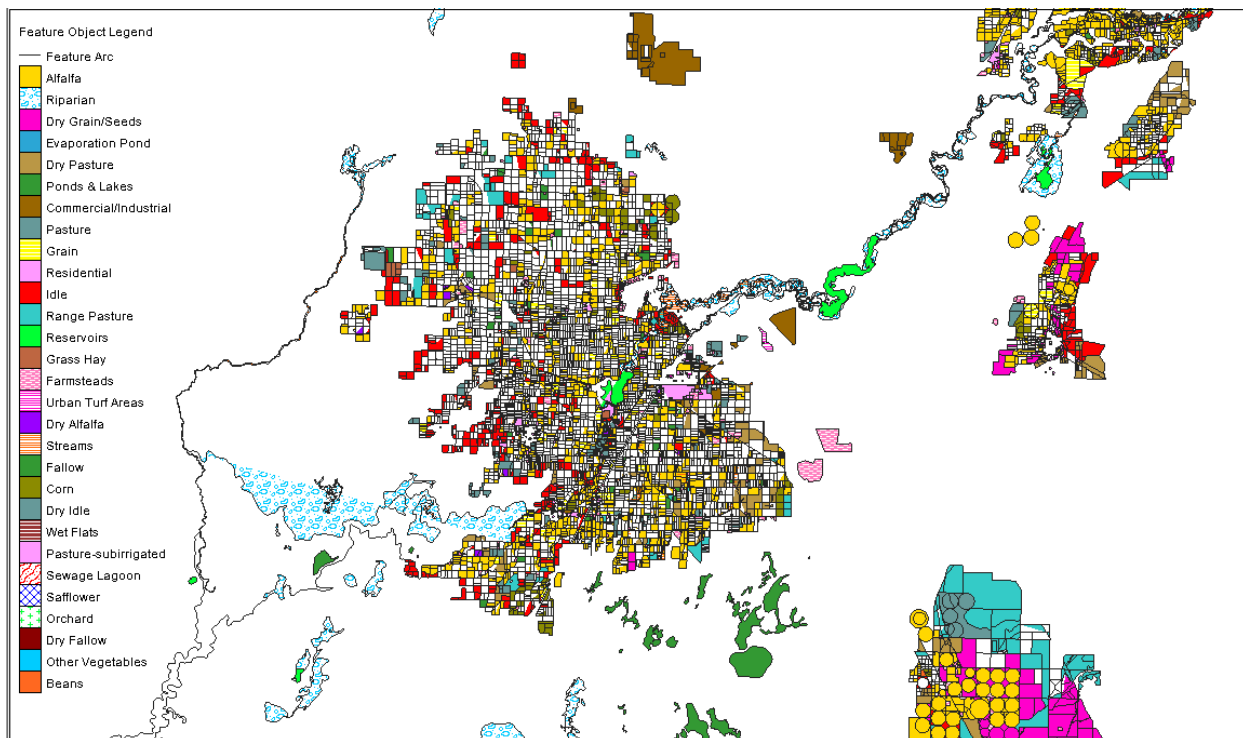

Figure 1   Display of the land use coverage

5   Downloading Aerial Photo

Sometimes it is useful to download an aerial photo in order to supplement the display and for better observations. The "Import from Web" tutorial gives instructions for one method for finding image data online. SMS can also grab image data from Terraserver for a specific geographic area. To grab an image from Terraserver for this area:

1. Use *Display* | **Display Options** again to open the *Display Options* dialog.

2. Turn off the *Polygon: Fill* and turn on the *Arc* options. Turn off the *Vertex* options.

3. Click **OK** to close the *Display Options* dialog. This will make the display a little easier to read.

4. Click on the **Get Data Tool** and select a region within the city. Zoom in until able to distinguish the individual parcels of land clearly. Be sure to select a region by clicking the area and then dragging out a box around it. The *Data Service Options* dialog will appear.

5. In the *Data Service Options* dialog, toggle on *World Imagery* and click **OK** to bring up a save dialog.

6. In the *Save Web Services Data File(s)* dialog, name the file "aerial" and click **Save**.

7. If a dialog appears to confirm saving the file, select **Yes**.

8. In the *Image Pixel Size* dialog, click **OK** to accept the default size.

9. The photo will take a moment to update and display. The image should look similar to Figure 2.
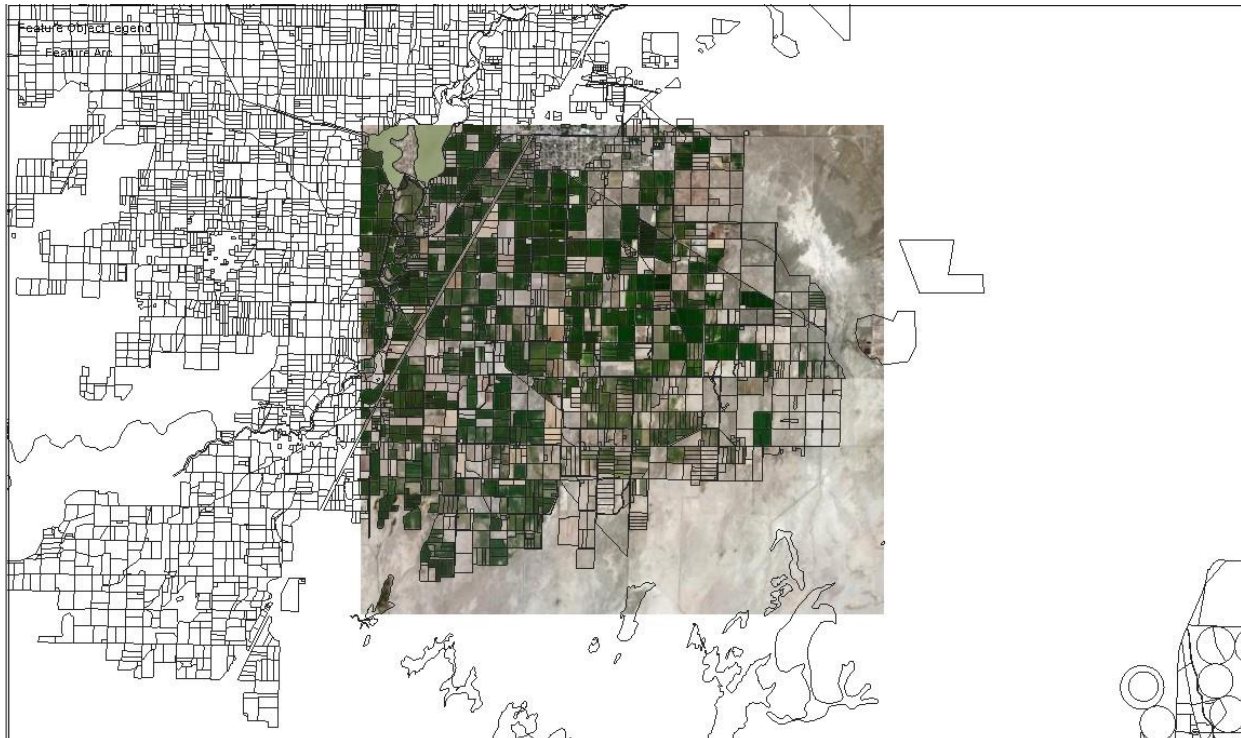

Figure 2   Viewing the aerial photo

If desired, go to the *Display Options* dialog and turn off the *Arcs* display. If using the ArcGIS mode, the previous steps should be the same.

6   Conclusion

This concludes the GIS tutorial. Continue to experiment with shapefiles in SMS by downloading other pertinent GIS data from websites.

The SMS wiki (http://xmswiki.com/xms/GSDA:GSDA) has a page that includes some ideas for places to acquire useful GIS and other spatial data.