Iowa DOT GeoMedia Training Manual

Coordinated Transportation Analysis and Management System

July 1998

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- A few technical considerations
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  - Data development

What is GIS?

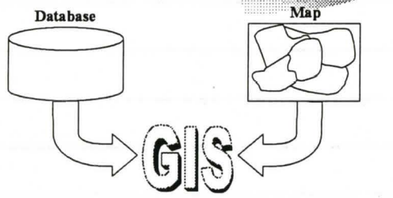
GIS - Geographical Information System

- A geographic information system (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on Earth. - ESRI Web Page
- GIS allows for the integration of data, specifically spatial data, and gives the user the ability to make quicker and better decisions.

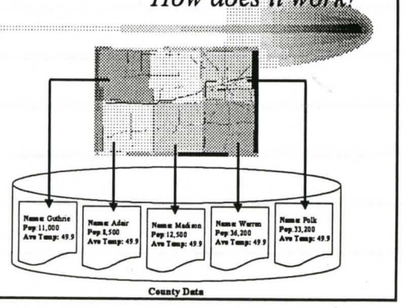
Parts of a GIS

- Map - Representative model of features on the surface of the earth
  - Points (Water well, sign, accident, hydrant,…)
  - Lines (Road, river, stream, utility line,…)
  - Polygons (Wetland, city limits, soil boundaries,…)
- Database - Attribute storage software
  - GIS system information
  - User attribute information
  - Metadata - Data about data (projection, valid values, collection method, accuracy, etc.)

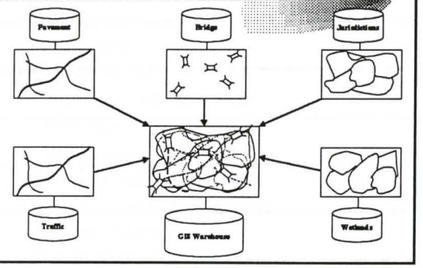
How does it work?



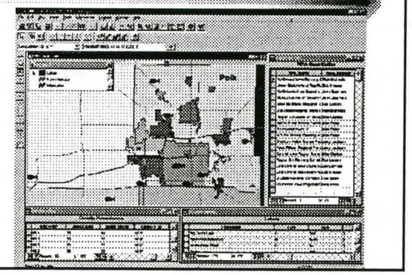
How does it work?



Why use GIS?

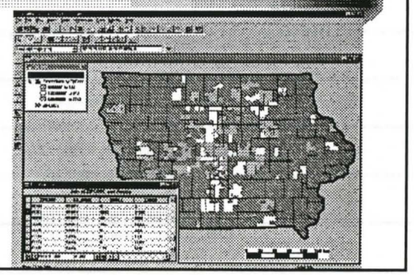


What does it look like?

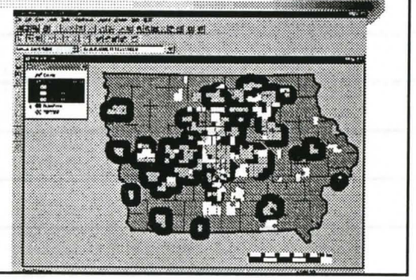


What else can it do?????

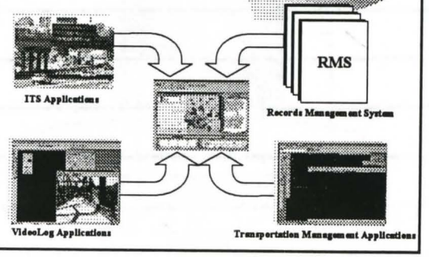
Thematic Mapping



Spatial Queries



GIS the INTEGRATOR!



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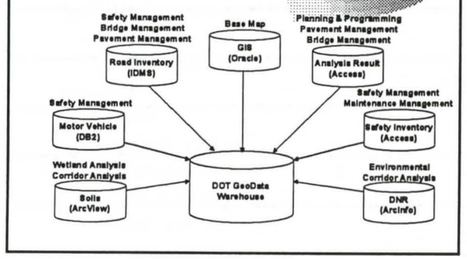
  - Data development

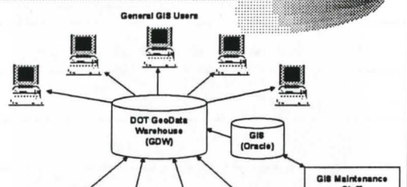
What's going on at Iowa DOT?

- Statewide Coordinated GIS - CTAMS
- Accident Location and Analysis System (GIS-ALAS)
- Non-NHS Pavement Management Program
- Access Mapping and Inventory Projects
- Departmental GIS Implementation Plan
- Many more efforts....

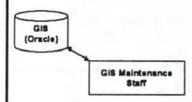
Integration of GIS Data



User Access to Warehouse

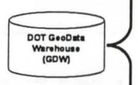


GIS Attribute & Map Maintenance



- GIS Database
  - Map attributes (Oracle)
  - Map files (.DGN Files)
  - Analysis Files
- GIS Maintenance Staff
  - Primarily Office of Transportation Data
  - Will use MicroStation, MGE, & custom applications

DOT GeoData Warehouse



- Iowa DOT GIS Data (MGE/Oracle)
  - Base Record Data
  - Accident Location Data
  - Management Systems
  - Digital Imagery
- Iowa DNR GIS Data (ArcView)
  - Environmental Data
  - Soils Data
- City and County Data
  - Cadastral
  - Utilities

General GIS Users

- GIS Query and Analysis
  - GeoMedia
  - Custom CTAMS applications
  - Other custom applications
- CTAMS
  - ISTEA Management Systems
- Other Integrated Applications
  - Video logging
  - Records Management System
  - Intelligent Transportation Systems

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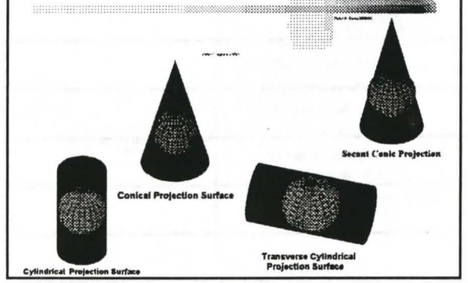
Technical Considerations

- Spatial Representation
  - Map Projection
  - Geodetic Datum
- Accuracy
  - Map Scale
  - Data collection & GPS
- Data Development
  - Enterprise data integration
  - Localized data integration

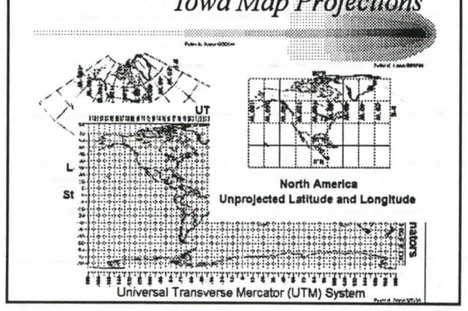
Map Projections & Geodetic Datums

- Map Projection
  - Defines how the spherical earth is represented in two dimensions
  - Conic, cylindrical, azimuthal, pseudocylindrical
- Geodetic Datum
  - Defines the size and shape of the earth and the origin and orientation of the coordinate systems used to map the earth.
  - Reference ellipsoid parameters, datum shifts, referenced geoid, etc.

Map Projections

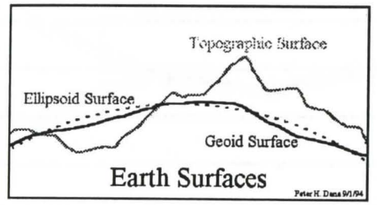


Iowa Map Projections



Geodetic Datums

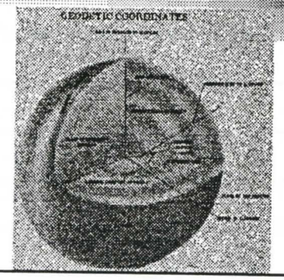
- Relationship of earth surfaces



Geodetic Datums

- Over 100 datums worldwide (local and global)
- North American Datum - 1927 (NAD27)
  - Clark 1866 Ellipsoid
  - Typically measured in feet
- North American Datum - 1983 (NAD83)
  - Geodetic Reference System 1980 (GRS80) Ellipsoid
  - Based on World Geodetic System 1984 (WGS84)
  - Typically measured in meters

Geodetic Datums



Why do I need to know this??

- Data comes in many different projections, datums and units
- Setting up projections and datums incorrectly will cause erroneous results in coordinate readouts or feature placement
- Use caution when integrating new data
- Contact the GIS staff if you have questions related to projections and datums

Data Accuracy

- GIS maps are not 100% accurate
  - Inaccuracies / limits to data collection methods
  - Incomplete or errors in data
- Scales of maps
  - 1:100,000 or 1:24,000 or 1:2,400 - etc…
- Precision (May have 3 decimals - not necessarily that accurate!!)

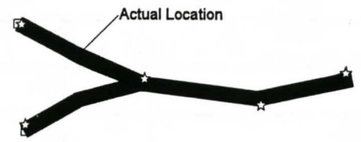
Accuracy Examples

Assume line width on map at .01 of an inch

- At 1:100,000 -- line represents 83.33ft!!!
- At 1:24,000 -- line represents 20ft!!
- At 1:2,400 -- line represents 2 ft!!

Most maps from DOT and DNR are 1:24,000 or 1:100,000 scale maps.

Data Accuracy



Accuracy Issues

- Base Map
  - U.S. Geological Survey Data
  - Updated yearly
  - State at 1:100,000
  - Some cities at 1:24,000
- Global Positioning Systems (GPS)
  - Centimeter to five meter accuracy
  - Real-time, differentially corrected, mobile

Iowa DOT Uses of GPS

- Roadside Development
  - Wetland locations
  - Environmental/historical sites
- Maintenance
  - Safety feature inventory
  - Access locations
- Transportation Data
  - Improve the accuracy of the base map (video log van)

What it can look like...

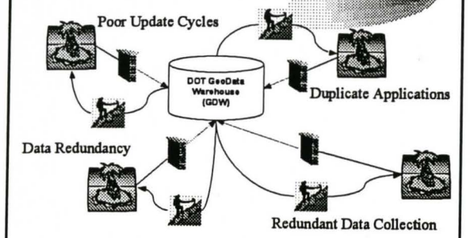
Why do I need to know this??

- Data comes in many different accuracies and scales
- Understand the limitations of some data and remember the least-common-denominator
- Use caution when integrating new data, especially if not well documented (metadata)
- Contact the GIS staff if you have questions related map scales and data accuracy

Data Development

- Ask some questions...
  - Do I need updated data from the GeoData Warehouse on a regular basis
  - Does it need to closely integrate with the other systems in the DOT?
  - Could this data ever be used by anyone outside my office?
- YES - GeoData Warehouse
- NO - Do your own thing

Why should I worry about this?



Questions??

LEARNING GEOMEDIA

◆ GeoMedia Overview

GeoMedia is a viewing and analysis tool for geographic information. You can use GeoMedia to integrate data from multiple sources and mulitple formats into one environment, perform sophisticated queries and spatial analyses, and quickly produce complex maps. GeoMedia's capabilities include:

- Display multiple geographic data types simultaneously without translation. GeoMedia uses automatic coordinate transformations so you can view data from numerous standard data sources as an integrated map.
- Perform spatial analysis through buffer zones, queries, and thematic displays.
- Control the contents and appearance of your map window through an interactive legend.
- Insert scanned maps, aerial photographs, and satellite imagery as backdrops.
- Insert labels on features.
- Create read/write warehouses to place and manipulate data.
- Attach multimedia to features by inserting hypertext links as attributes.
- Import data.
- Print customized maps.

◆ GeoMedia Concepts

GeoWorkspace

The *GeoWorkspace* is the area in which you work, through which you view geographic data stored in data warehouses. If you are connected to a read/write warehouse, you can also place and manipulate data from the GeoWorkspace. GeoWorkspace settings include: window

configuration, coordinate system, queries, legends, thematic displays, menu settings, and warehouse connections. The file extension for a GeoWorkspace is *.*gws*.

A *GeoWorkspace Template* is a starting point for a GeoWorkspace. A template can store the same settings (i.e. warehouse connections, views, queries, etc.) that a GeoWorkspace can store. The file extension for a GeoWorkspace Template is *.*gwt*.

Warehouse Connection

A *Warehouse Connection* is the source of geographic data accessed from a GeoWorkspace. Multiple warehouse connections may be made from within a GeoWorkspace. Available GeoMedia data servers include:

- Access (the only type of connection that can be opened as read/write)
- ARC/INFO
- ArcView
- CADD
- FRAMME
- MGDM
- MGE
- MGSM
- Oracle (SDO) (Data may be imported into an Oracle (SDO) warehouse.)

Features and Feature Classes

A *feature* is represented on a map by geometry (i.e. a line, point, area, etc.) and is defined by nongraphic attributes in the database.

Features are categorized by *feature classes* (i.e. roads, bridges). A data set generally consists of several feature classes. The word feature refers to each occurance of a feature within a feature class. For example, Counties is a feature class, where as Story County is a feature.

Legend

The *legend* is the display control center for the map window. It controls which map objects are displayed and how they look. Map objects are displayed (in the active window) by adding them to the legend. Map objects and legend entries are linked -- manipulating a legend entry will modify the display of a map object.

Query

A *query* is a request for specific information such as features meet specified criteria. Query results can be shown in a map window or data window or both.

Attribute Query

An *attribute query* is a request to the database for information about one feature class.

Spatial Query

A *spatial query* is a request to the database for information about two feature classes and their spatial relationship to each other. Spatial queries may be further defined by attribute queries.

◆ Start Learning GeoMedia!

This tutorial guides you through the basic features of GeoMedia®, using the sample dataset of the United States that is delivered with GeoMedia to select possible locations for a ski resort in the United States.

This tutorial is sequential, you must go through the sections in order because the later sections build on earlier ones. Keep in mind that this tutorial shows only one workflow, although there are many possible workflows with GeoMedia.

Create a GeoWorkspace

First, you create a new *GeoWorkspace*. The GeoWorkspace is the area in which you work, through which you view geographic data. If you are connected to a read/write warehouse, as explained in the next section, you can also place and manipulate data from the GeoWorkspace.

1. Open GeoMedia.

2. Under the *Create a New GeoWorkspace Using* section, select **Blank GeoWorkspace**.

   The GeoWorkspace is created, and it is given the default name, GeoWorkspace1.

   The GeoWorkspace contains the empty legend and the map window. The map window, which is titled *MapWindow1* by default, is the window in which you view feature geometries, images, and labels.

Defining the Coordinate System

A GeoWorkspace coordinate system defines how geographic data are displayed. Data are transformed from the warehouse coordinate system to the GeoWorkspace coordinate system.

The default coordinate system for the GeoWorkspace is *Cylindrical Equirectangular*. However, you will need to change it to *US Standard*.

1. Select **View>GeoWorkspace Coordinate System** from the menu bar.

2. On the *GeoWorkspace Coordinate System* dialog box, make sure the **Storage Space** tab is selected, and select **Geographic** as the *Base storage type*.

3. Select the **Paper Space** tab. In the *Nominal map scale* field, type or select from the drop-down list **5,000,000** (5 million).

4. Select the **Geographic Space** tab. In the *Geodetic datum* field, select **United States Standard** from the drop-down list.

5. Click **OK** on the *GeoWorkspace Coordinate System* dialog box.

   The coordinate system is changed to US Standard.

NOTE: The GeoWorkspace coordinate system must match the warehouse coordinate system when displaying raster images, FRAMME data, and ARC/INFO data. However, a coordinate system file (**.csf*) can be defined to convert the warehouse data to the workspace coordinate system.

Saving the GeoWorkspace

Before continuing, save the GeoWorkspace.

1. Select **File>Save GeoWorkspace**.
2. In the *File name* field, type the name `learning`. Click **Save**.

   NOTE: Any time you exit this tutorial or GeoMedia, save the GeoWorkspace first.

◆ Using Warehouses to Connect to Data

Creating an Access Warehouse

Next, you create a warehouse to which you can write data. A warehouse is the source of geographic data for GeoMedia. Each warehouse contians only one type of geographic data, such as Access, MGE, FRAMME, MGE Segment Manager, ARC/INFO, Oracle, ArcView, or CADD.

For this project, you create an *Access* warehouse. An Access warehouse is the only type of warehouse you can *create* and write to through GeoMedia, although you can *connect to* any of the other types of warehouses.

1. Select **Warehouse > New Warehouse**.

The default template is *Normal.mdt*.

An Access Warehouse is the starting point for a new Access warehouse. A template must be used to create a new, empty warehouse.

2. Make sure the setting is **Document** and click **OK**.

3. In the *File name* field, type the name `learning` for the warehouse. Make sure **Save as type** is set to **Access**, and click **Save**.

   The file is saved in the Warehouses directory as learning.mdb.

Connecting to an Existing Access Warehouse

GeoMedia lets you connect to and display multiple geographic data types simultaneously without translation. For example, you could connect to an MGE warehouse, a FRAMME warehouse, and an ARC/INFO warehouse and view data from these different sources as an integrated map.

For this project, you will connect to another Access warehouse, *USSampleData.mdb*, and import some of its data into the Access warehouse you just created, *learning.mdb*. Since you do not need all of the data contained in *USSampleData.mdb*, you import just the *feature classes* that you want to use.

In GeoMedia, a *feature* is a geographic entity represented on a map by geometry and defined by nongraphic attributes in the database. A *feature class* is the classification to which each instance of a feature is assigned.

The sample US data set for this project contains feature classes such as States, Cities, and Interstates. For example, Minnesota is a feature in the *States* feature class, and Boston is a feature in the *Cities* feature class.

First, you connect to the warehouse from which you want to import data, *USSampleData.mdb*. This is the *source* warehouse.

1. Select **Warehouse > New Connection**.

   The **Warehouse Connection Wizard** displays the different types of warehouses to which you can connect, such as MGE, FRAMME, and ARC/INFO.

2. Select **Access**, and click **Next**.

3. In the ***Define a connection name to access your Access warehouse*** field, delete the current text, and type `Connection to US Data`.

4. To select a GeoMedia database file, click **Browse**.

5. Select **c:\Warehouses\USSampleData.mdb**, and click **Open**.

6. Type this description: `US Data`, and click **Next**.

7. Make sure that the option **Access all features in the warehouse** is selected, and click **Next**.

8. Keep the option **Let the wizard open the connection as read only** and click **Finish**.

9. To verify that the connections to both warehouses are present, both the one you created and the source, select **Warehouse > Edit Connection.**

10. Click **Close** after verifying that both connections are listed.

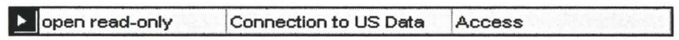
Importing Data from an Access Warehouse

To *import* data means to copy data from a source warehouse to a target warehouse. You can import data from any GeoMedia-supported warehouse to an Access warehouse. Importing data to an Access warehouse allows you to place, move, edit, and delete features.

1. Select **Warehouse > Import from Warehouse**.

2. Read the instructions on the **Import Warehouse Wizard** dialog box, and click **Next**. The *source* warehouse is *Connection to US Data (USSampleData.mdb)*, and the *target* warehouse is *learning.mdb*.

3. When asked, **Which connection do you want to use to access your source warehouse?**, select **Connection to US Data**. To select it, click the row button--the first item on that row. Click **Next**.



4. When asked, **Which connection do you want to use to access your target warehouse?**, make sure your connection called **learning** is selected, and click **Next**.

5. At the prompt **Select the feature class you want to import from the source warehouse then click the ">" button**, press and hold the CTRL key and select the following feature classes from the *Import from source warehouse* list: **Cities, Counties, Interstates, StateNameLabels, and States.**

6. Click the single **right arrow (>)** to copy the features to the right side of the dialog box. These are the features to be imported.

If you need to make a correction, you can select the (<) button to remove a feature from the right side, or you can use the (<<) button to remove all features.

7. When the five feature classes are correctly displayed in the **Import to target warehouse** field, click **Next**.

8. Change the name of the **StateNameLabels** feature class to **StateNames** by clicking the field and typing in the new name (do not use spaces within the name). Do not change the name of the **States** feature class. Click **Next**.

9. When asked **What do you want to do?**, make sure **Create new legend entries** option is selected.

10. Select **Active Map Window (MapWindow1)** to display the feature classes in this map window, and click the **(>)** button.

11. Click **Finish**.

    The **Import Statistics** *dialog box appears, and the message* **Importing...** *appears as the features are imported for each feature class. This may take a few minutes. As each feature class is imported, the status bar indicates the progress, and then the number of features that have been imported is shown for that feature class. When both feature classes have been imported, the message* **Import complete** *appears.*

12. Click **Close**.

    The features appear in the map window. You should see a map of the United States with Cities, Counties, Interstates, StateNames, and States.

13. If you do not see the entire map in your window, make the window larger and then select **View>Fit All**.

Deleting a Connection

Since you have imported data to your own Access warehouse, you no longer need the connection to USSampleData.mdb, and can delete this connection.

1. Select the **Warehouse>Edit Connection**.

2. In the *Warehouse Connections* dialog box, on the row for the *Connection to US Data*, click inside the **Status** column.

   The entry highlights, indicating that it is currently selected, and then a down arrow appears. This indicates a drop-down list.

   To close the connection, select **closed** from the *Status* pull-down menu.

3. On the *Warehouse Connections* dialog box, select the row button for the connection named **Connection to US Data**.

   The row highlights.

4. Click **Delete** to delete this connection. Answer **OK** to *Do you really want to remove this connection*?

5. Click **Close**.

◆ Working with the Legend

The *legend* is the interactive control center that determines what is displayed in the map window. Through the legend, you control which map elements--such as feature classes, images, query results, and thematic displays--are displayed in the map window and how they look. A separate entry exists for each map object. Each entry contains, at minimum, a title and graphical representation of the map object.

1. The legend should be displayed in the map window. If it is not, select **View>Legend** to turn it on.

The map is somewhat crowded with so much displayed in it. You just want to look at states for now, so you do not want some of the other information to display.

2. Select **Legend > Properties**. On the row for the *Cities* entry, click inside the **Display** column.

   The entry highlights, indicating that it is currently selected, and then a down arrow appears. This indicates a drop-down list.

3. Click the down arrow, and select **Off**. Click **OK** to dismiss the dialog box.

   The entry for ***Cities*** *is still on the legend, but the entry is dimmed and the cities are no longer displayed on the map.*

Now you will remove another entry from the legend, Counties. Rather than repeating the process above, you will use a shortcut.

4. Place your cursor over the **Counties** entry on the legend, and click on the **right mouse button**. Click **Display Off** to turn off the counties.

5. Repeat the previous step to remove the interstates from the map.

Only the states and state names should be displayed. However, the state names are too small to read, so you will need to make them bigger.

6. Select **Legend>Properties**, from the menu bar or from the toolbar.

7. Select the entry (row) for **StateNames** by clicking the row selector button.

8. Click the **Style** button at the lower right corner of the **Entries** tab. On the ***Style Definition*** dialog box, select a font size of 48-points by clicking the drop-down arrow in the *Size* field, and selecting **48**. Select **Bold**, and click **OK**.

9. With the *StateNames* row still selected, click in the **Display** cell for that row. Click the drop-down list to open it, and **scroll down** and select the **By Scale** option.

10. Click the **Scale** button.

    The *Scale Range* dialog box lets you set a scale at which graphics are displayed. When the map window scale falls within the scale range of a legend entry and *Display* is set to **By Scale**, the graphics are displayed; otherwise, the graphics are not displayed.

11. Change the *Minimum* field to **10,000,000** (10 million). Do not change the *Maximum* field. Click **OK**.

12. Click **OK** to dismiss the *Legend Properties* dialog box.

    The state names are now large enough to read.

13. Save the GeoWorkspace.

◆ Creating a Thematic Map

A *thematic map* uses colors and patterns to display *attribute* data in the map window. An attribute is nongraphic information stored in a table and linked to a feature. An attribute is displayed as a column in a database table. An attribute *value* is a field in the attribute column.

You will create a thematic map to display the attribute *annual snowfall*, by range of values, of the feature class *States*. The thematic map will help you decide on a state for the ski resort.

1. Select **Legend > Add Thematic**.

2. On the **Add Thematic Entry** dialog box, from the **Feature class** drop-down list, click the + next to the connection named **learning** to open the list of feature classes it contains. From this list, select **States**.

3. From the list of *Available Attributes* that displays, select **ANNULSNOW**. Click **Range** and then click **Define**.

The **Map By Ranges** *dialog box appears.*

4. In the *Color selection* box, click the **Rotate Color Schemes** button.

A range of colors appears.

5. Continue to click the **Rotate Color Schemes** until a range that you like displays. Any color range will do.

6. Click **OK** on the *Map By Ranges* dialog box and then click **OK** on the *Add Thematic Entry* dialog box.

The thematic map is displayed with the colors you selected, showing the annual snowfall of each state, by range of values. Most of the state names are now obscured by the thematic map.

7. Right-click anywhere on the legend, and click **Properties**.

8. On the **Legend Properties** dialog box, select the entry for **StateNames** (click the row selector for that row), and select the topmost **Priority** arrow to move **StateNames** to the

top of the list. Click **OK** to dismiss the dialog box.

The state names again appear in the map window because they are now displayed above all of the other legend entries.

9. Save the GeoWorkspace.

◆ Creating Queries and Buffer Zones

A *query* is a request for information. When you display a query, you are requesting to see features that meet specific criteria. With GeoMedia, you can build a query by making selections on a dialog box, without needing to know SQL. Queries present current information in the warehouse. This means that each time you display a query, you get the current information in the warehouse.

A *buffer zone* is a user-defined region around or within one or more features. You can buffer zone geometry for a feature class or the results of a query.

Build a Query

Next you create an *attribute filter query*, which lets you search the database for a specific value or a range of values for one attribute or a combination of attributes that apply to one feature class. The feature you query will be *States*.

First you will change a couple of options.

1. Select **Tools>Options**.
2. Select the **Measurement** tab.
3. In the *Distance* field, select **mi** from the drop-down list to set the ground units to miles.
4. Select the **Query** tab.

5. Uncheck the option, **Confirm show value operations.**
6. Click **OK**

Now, you want to see which states have a relatively high annual snowfall and a low temperature. These would be good candidates for a ski resort.

1. Select **Tools > New Query** to display the **New Query** dialog box.
2. From the **Select Features in** drop-down list, open the connection named **learning**. From this list, select **States**.
3. Click the **Filter** button to display the dialog box that lets you define a *filter* for States.

You specify which features you want to find by defining a filter. Think of an attribute filter query as a sentence. A filter would be the same as a "where" clause (find all schools where enrollment is less than 400).

4. Select **ANNULSNOW** (annual snow) from the list of attributes.
5. Click the **down arrow** (pictured below) beneath the *Attributes* field.

6. Select the greater than **(>)** operator.

   The attribute and operator appear in the **Filter** *field at the bottom of the dialog box. You can also type SQL statements directly into this field.*

7. Click the **Show Values** button.
8. From the list of values that appears, select **40** (or, you could type this value directly into the expression box) and click the down arrow below the **Values** field.

The expression **ANNULSNOW > 40** *is displayed in the* **Filter** *field.*

9. Select the **AND** operator.
10. Select the **AVETEMP** (average temperature) attribute, and click the **down arrow** beneath the list.
11. Select the less than **(<)** operator.

12. Type the value `50` at the end of the query expression in the **Filter** field.

    The expression **ANNULSNOW > 40 AND AVETEMP < 50** *should be displayed in the* **Filter** *field.*

13. Click **OK** on the **States Filter** dialog box.

14. In the **Name** field in the **New Query** dialog box, delete the text **Query1** and type `States by Snow/avetemp`. It is always a good idea to give your queries a descriptive name, as it is easier for you to select the query by a meaningful name.

Named queries are very useful, as you can rerun them at any time, display them in other map or data windows, or use them as input to other queries.

15. For a description, type `States where annual snow > 40 and average temperature < 50.`

16. Click **OK** to run the query and dismiss the *New Query* dialog box.

    The query is added to the legend. The legend entry for the query contains the style key that shows the color of the query results on the map which are shown as states outlined in a different color.

Changing the Style of Map Objects

The **Style Definition** dialog box lets you change the appearance of a map object--such as feature classes, images, query results, and thematic displays.

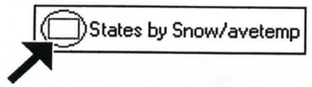
1. Turn off the display of the thematic map by right-clicking its legend entry, **States by ANNULSNOW**, and selecting **Display Off**.

2. Take the entry for the thematic map off of the legend, by right-clicking its legend entry, **States by ANNULSNOW**, and selecting **Hide Legend Entry**.

NOTE: Although the thematic map is currently not displayed on the legend or on the map, it can be redisplayed by selecting **Legend > Properties** and clicking in the **Entry** column in its row to display it on the legend, and by setting the value in the **Display** field to **On** to display it on the map. For now, leave it turned off in both places.

The thematic map is no longer displayed, but it still may be difficult to see the results of the query you just ran, although those states are outlined in a different color. To better see the query results, you can change the style.

3. To change the style, use a shortcut: double-click the style key(see arrow below) on the legend for the query entry **States by Snow/avetemp**.



    The **Style Definition** *dialog box appears. The* **Area Boundary** *tab shows the color, weight, and line style for the boundary of the item.*

4. Select the **Area Fill** tab. From the *Type* drop-down list in the primary fill box, select **Solid**.

5. Select a primary fill color you want by selecting the **Color** button and picking a color, such as light blue.

6. Click **OK** to dismiss the **Color** dialog box.

7. From the **Pattern** drop-down list, select a pattern, such as **Trellis**.

An example of the pattern appears in the **Sample** *area.*

8. Choose another **Cross-hatch color** if you want.

9. Click **OK** when you have a pattern and colors you want.

    The results of the query **States by Snow/avetemp** *appear on the map in the colors and pattern you selected.*

10. The state names are covered by the query results. You can use a shortcut to change the priority of the state names so they appear over the query results. Select the entry for **StateNames** on the legend, continuing to hold the mouse button down, and use the mouse cursor to drag this entry to the top of the legend.

The state names appear over the patterned area.

11. Save the GeoWorkspace.

Define a Connection Filter

A *connection filter* defines an area in your map window. When you apply a connection filter to a warehouse, only features in the defined area are displayed and accessible when you add them to the map window. Connection filters only impact feature classes added after the filter was applied. Connection filters are optional, but you define one in this project to see the features in only two states.

For example, suppose you decide to focus on only the states of Minnesota and Wisconsin for possible ski resorts.

1. From the menu bar, select **View > Zoom > In**.

You will zoom in on a mid-west region of the United States.

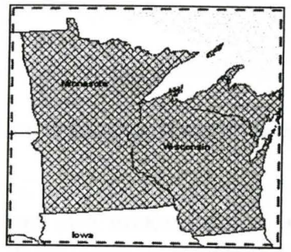
2. Place the zoom-in pointer above the middle of the state of North Dakota. Press and hold the left mouse button, and drag the cursor to the bottom of the right edge of the state of Ohio, and then release the left button.

The view is zoomed in on.

3. Press **ESC** to exit the *Zoom* command.
4. Select **Warehouse > Define Connection Filter**.
5. In the *Filter name* field, type `Minnesota and Wisconsin`.
6. Keep the *Spatial* operator, **Overlap**, and the placement option, **Create a new filter by placing a two point area**.
7. Click **Define**.

The cursor changes to a crosshair.

8. Place the first point for the top, left corner of the rectangle above the top, left corner of the state of Minnesota. Click and drag to place the second point for the bottom, right corner of the rectangle below the bottom, right corner of the state of Wisconsin, so that the rectangle contains the boundaries of these two states, as shown below.



9. **Double-click** the left mouse button to accept the filter. The filter will disappear.
10. Click **Show** to see the filter again. (You may have to drag the **Define Filter** dialog box out of the way to see the filter.)
11. Click **Close** on the *Define Connection Filter* dialog box.

The display of the filter is removed, but the filter itself has been created.

12. To apply the connection filter you have just defined to your existing warehouse connection, select **Warehouse > Edit Connection**.
13. Click the **Connection filter** field in the row for the **Learning** warehouse connection to display a drop-down list; then select from this list the connection filter you just created, **Minnesota and Wisconsin**, and then click **Close**.

    The next time you add a feature class or query, only the results that fall within the connection filter will be displayed.

Add a Feature Class

Since you want the new feature classes to appear only within the filter you created, the previous legend entries: Cities, Counties, and Interstates, need to be deleted from the legend. If you were to turn these entries back on, since they were added before the filter, they would appear throughout the entire US.

1. To delete the legend entries, highlight **Cities** and hit the **Delete** key.

2. Answer **yes** to the question, *Delete Legend Entires?*

3. Repeat the previous two steps for the **Counties** and **Interstates** entries.

You will now add three feature classes from your warehouse to display and query.

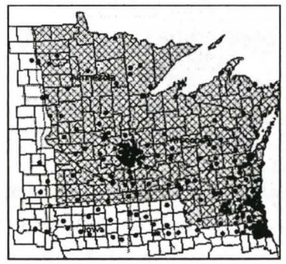
1. Select **Legend > Add Feature Class**.

2. On the *Add Feature Class Entry* dialog box, make sure the **Learning** connection is selected.

3. Hold down the CTRL key and select **Cities, Counties,** and **Interstates** from the list of feature classes.

4. Click **OK**.

Legend entries are added for cities, counties, and interstates, and only those features that fall within the area defined by the connection filter are displayed in the map window.



5. Turn off the display of the new entries for **Cities** and **Counties** by selecting the **Cities** legend entry, holding down the CTRL key, and selecting the **Counties** legend entry, and then by right-clicking these entries and selecting **Display Off**.

6. Hide the legend entries for **Cities** and **Counties** by right-clicking on these legend entries and selecting **Hide Legend Entry**.

Building Another Query

You will now create another attribute filter query to find the large cities within your connection filter.

1. Select **Tools > New Query** to display the *New Query* dialog box.

2. From the *Select Features in* drop-down list, select **Cities** from the **Learning** connection.

3. Click the **Filter** button to display the *Cities Filter* dialog box.

4. Select **POP** (population) from the list of attributes, and **click** the down arrow.

5. Select the greater than **(>)** operator.

The attribute and operator appear in the **Filter** *field.*

6. Type the value `100000` directly into the *Filter* field (for 100,000).

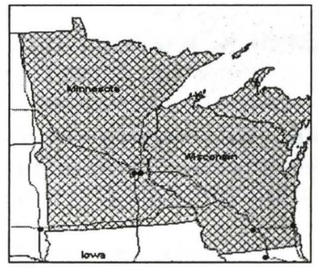
7. Click **OK** on the *Cities Filter* dialog box.

8. In the *Name* field on the *New Query* dialog box, type `Major Cities`.

9. For a description, type `Cities where population > 100,000`.

10. Click **OK** to display the query.

The query results appear in the map window. Notice that only cities that meet the query criteria and fall within the area defined by the connection filter appear.



Editing a Query

Now you will edit the Major Cities query to include only the cities within the states of Minnesota or Wisconsin.

1. Select **Tools > Queries** to display the *Queries* dialog box.

2. From the list of queries, select **Major Cities**, and then click **Edit**.

3. On the *Edit Query* dialog box, click **Filter.**

4. On the *Cities Filter* dialog box, click inside the **Filter** field, just after the string to be edited, **POP > 100000**.

5. Click the **AND** operator. Then, click the parentheses () operator.

6. Move the insertion point inside the parentheses. Then select from the attributes list in the following order:

   - The **STATE_NAME** attribute
   - The down arrow
   - The equal (=) operator
   - **Show Values**.
   - **MINNESOTA** from the list of values
   - The down arrow
   - The **OR** operator
   - The **STATE_NAME** attribute
   - The down arrow
   - The equal (=) operator
   - **WISCONSIN** from the list of values
   - The down arrow

   The text should read **POP > 100000 AND (STATE_NAME = 'MINNESOTA' OR STATE_NAME = 'WISCONSIN')**.

IMPORTANT: Take a minute to verify that the text in the **Filter** field matches the text shown above. If it does not match, you may not obtain the correct results in the remainder of this tutorial.

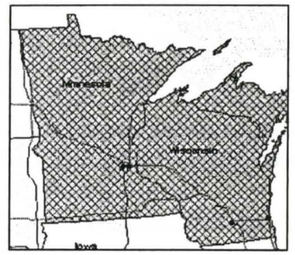
7. Click **OK** to dismiss this dialog box.

The query is updated in the **Filter** *field in the* **Edit Query** *dialog box.*

8. Edit the *Description* field to add the text **in Minnesota and Wisconsin**.

9. Click **OK** to run the query.

The query results are updated to include just those cities in Minnesota and Wisconsin.



10. Click **Close** on the *Queries* dialog box.

11. Save the GeoWorkspace.

Insert a Buffer Zone

You place a *buffer zone* 100 miles around the major cities. A buffer zone is a designated area around or within a feature or features on which you can perform spatial analysis.

1. Select **Insert > Buffer Zone**.

2. From the *Buffer zone around* drop-down list, open **Queries**, and then select **Major Cities**.

3. In the *Output buffer zone to* box, make sure **Warehouse** is set to **learning**. GeoMedia saves buffer zones as features, so you must have an open read/write warehouse to which the buffer zone will be saved.

4. In the **Feature class** field, delete the current text, and type `ZoneAroundMajorCities` (no spaces). This is the name of the buffer zone.

5. Click the **Style** button.

6. With the **Area Boundary** tab selected, in the **Primary line** box, change the **Color** to another color of your choice, such as **orange** and click **OK** on the *Color* dialog box. Also, change the weight to **2.0** from the pull-down menu.

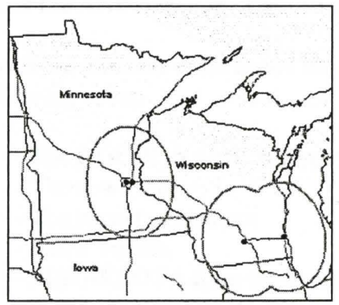
7. Click **OK** on the **Style Definition** dialog box.

8. In the **Constant distance** field, type the value `100`.

9. Make sure the **Point** buffer type is set to **Single**, and select the **Merged** option to create a merged buffer zone. Click **OK**.

The buffer zones appear in the map window.

10. To make it easier to see the buffer zones, turn off the display of the query, **States by Snow/avetemp**, by right-clicking this legend entry and selecting **Display Off**.



11. Hide the legend entry by right-clicking **States by Snow/avetemp** on the legend and selecting **Hide Legend Entry**.

12. Save the GeoWorkspace.

Building a Query Using a Buffer Zone

You will create two more queries. These queries will be *spatial* queries, which request information from the database about two feature classes or queries based on their spatial relationships to each other.

The first query will let you find all sparsely populated counties that fall within the buffer zone you just created. These counties may be good candidates for a ski resort.

1. Select **Tools > New Query**.

2. From the *Select Features in* drop-down list, select **Counties** from the **Learning** connection.

3. Click **Filter** to display the *Counties Filter* dialog box.

4. Select **POP** (Population) from the list of attributes, and click the down arrow.

5. Select the less than (<) operator.

6. Type the value `30000` directly into the **Filter** field (for 30,000).

7. Click **OK** on the *Counties Filter* dialog box.

8. Click the **Spatial** button on the **New Query** dialog box.

9. In the *That* field, select **are contained by** from the drop-down list.

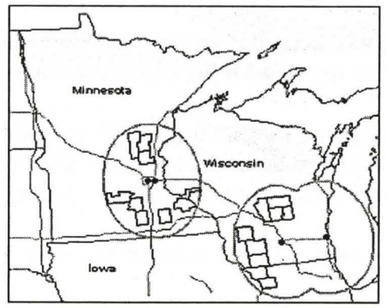
10. In the **Features in** field, select the buffer zone you just created, **ZoneAroundMajorCities**, from the **learning** connection in the drop-down list.

11. In the **Name** field, type `Small Counties Around Major Cities`.

12. For a description, type `Counties around major cities where population < 30,000`.

13. Click **OK** to run the query.

The counties that fall within the buffer zone are displayed in the map window.



14. Save the GeoWorkspace.

Build a Query on a Query

You now build another query to find all counties from your previous query that are within 10 miles of an interstate.

1. Select **Tools > New Query** to create your final query.

2. From the *Select Features in* drop-down list, open **Queries,** and select the query you just created, **Small Counties Around Major Cities**.

3. Click **Spatial**.

4. In the *That* field, select **are within distance of** from the drop-down list.

5. Enter the value `10` for 10 miles in the **Distance** field.

6. In the *Features in* field, select the **Interstates** feature class from the **Learning** entry in the drop-down list.

7. Name this query **Final Counties**.

8. For a description, type `Small counties around major cities within 10 miles of an interstate.`

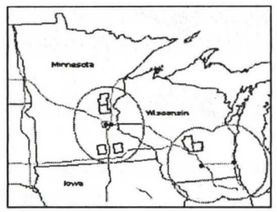
9. Click **OK** to display the query.

The query results are displayed in the map window, but it is difficult to see the results since the results of the query **Small Counties Around Major Cities** *are also displayed.*

10. Turn off the display of this other query so that you can better see the results of the **Final Counties** query. (Right click on **Small Counties Around Major Cities** and select **Display Off.**)

11. Hide the legend entry by right-clicking on **Small Counties Around Major Cities** and selecting **Hide Legend Entry**.

You can now see the results of **Final Counties**.



12. Save the GeoWorkspace.

Create a Join

Joins allow you to create a relationship between two feature classes or queries so that attributes of each can be shared between them in a single resulting query.

You will create a join for the six counties in the *Final Counties* query in order to see the attribute information of the counties together with the attribute information of the corresponding state in which the county is located.

1. Select **Tools > Join**.

2. On the *Join* dialog box, from the *Left side of join* drop-down list select the **Final Counties** query from the Queries list.

3. Select the feature class **States** from the **Learning** connection in the *Right side of join* dialog box.

4. From both the left and right **Available attributes** fields, select the attribute **STATE_NAME**, on which you will create a join.

6. Click the down arrow to add the attribute pair to the **Selected attribute pairs** field.

In the **Selected attribute pairs** *field, the entry* **STATE_NAME/STATE_NAME** *appears (processing may take a minute).*

7. Make sure that for the *Type of join*, **Inner** is selected.

8. Keep the name the query, **Join of Final Counties and States,** in the *Query name* field.

9. Type the description `Join by state_name.`

10. Make sure **Display join in data window** is selected.

11. Keep the name of the data window **DataWindow1**.

12. Click **OK**.

The join is displayed with the title **Join of Final Counties and States** *in the data window. Six records are displayed, one for each county.*

13. Scroll to the right in the data window to see the fields that are displayed.

Data is displayed first for each of the six counties, and then for each county's state. Some of the attributes for the state have a **1** appended to the column name, to indicate a difference from the county attribute of the same name.

Suppose you wanted to compare the weather conditions (annual snowfall, annual rainfall, and average temperature) of each county to those of the county's state. To do this, you can specify the columns you do not want to be displayed.

14. Select **Data > Show Columns**.

15. Uncheck all of the columns except the following:

    - **AVETEMP**
    - **ANNULRAIN**
    - **ANNULSNOW**
    - **COUNTY ID**
    - **STATE_NAME1**
    - **AVETEMP1**
    - **ANNULRAIN1**
    - **ANNULSNOW1**

16, Click **OK**

17. Scroll the data window to see that only the columns that you selected now appear, allowing you to see only the information you want (in this case, the weather conditions).

18. Close the data window by clicking on the X button on the menu bar with the gray background (the X on the blue background will close the GeoWorkspace). Keep the map window maximized.

19. Save the GeoWorkspace.

◆ Using the Data Window

You will display a *data window* to look at the attributes for each county that you found with your last query, *Final Counties*. A data window is a view, in table format, of the nongraphic attributes of features.

Open a Data Window

1. Select **Window > New Data Window**.

2. In the **New Data Window** dialog box, keep **DataWindow1** for the name of the window, and select **Final Counties** from the **Queries** connection.

3. Click **OK**.

The data window appears, with six entries corresponding to the six counties that meet the requirements of the query.

4. To better see the map and data windows, select **Window>Tile Horizontally**.

5. Make the Map Window active by clicking on it once.

6. Select **View>>Fit All**, then select **View>>Zoom>>In**. Click in the upper left hand corner of Minnesota and drag the box to the lower right hand corner of Wisconsin. Then select **ESC**.

7. To display the entries in the data window by state, select the **STATE_NAME** column heading and it will highlight.

8. Select **Data > Sort Ascending**.

The entries are sorted by state name.

9. Select any entry in the data window by clicking on the row selector for a row.

Notice that the corresponding County highlights in the map window. Conversely, if you select a state in the map window, the entry is highlighted in the data window.

This also demonstrates that you can use either a map window or a data window to select a feature from the database.

10. **Close** DataWindow1.

◆ Placing Labels and Images

Labels in GeoMedia may be composed of text that you type and one or more attribute values derived from values stored in the warehouse.

Before placing labels, several steps will be performed to get the map window the way you want it.

Remove the Connection Filter

The connection filter you defined is no longer needed, so you can remove it.

1. Select **Warehouse > Edit Connection**.
2. Click the **Connection filter** column in the row for the **Learning** connection to display a drop-down list, and then scroll down to select the blank area in the list.
3. When the filter name no longer appears in the **Connection filter** column, the filter is removed from the warehouse connection.
4. Click **Close**.
5. On the legend, turn off the display of the state names by right-clicking the legend entry and selecting **Display Off**.

When you create your final output, you do not need the state names to appear on the United States map.

6. Select **View > Fit All**.
7. Save the GeoWorkspace.

Name the Legend

You now name the legend for the US map. Naming a legend lets you apply it to another map in the same GeoWorkspace. Assuming you have the same feature classes, the feature classes will be displayed with the symbology from the named legend.

1. Select **Legend > Name Legend**.

2. In the *Name* field, type `LearningLegend1`.
3. Click **OK**.

Manipulate the View

You create another new map window in which you display a closer view of your results. In the new map window, you zoom in on the states of Minnesota and Wisconsin, which is the area that contains the results of the *Final Counties* query. Then you place labels for these counties.

Before opening the new map window, you can give your current map window a more descriptive name.

1. Select **Window > Map Window Properties**.
2. In the *Map window name* field, type `US Map`.
3. Click **OK**.
4. Select **Window > New Map Window** to open another map window.
5. In the *New Map Window* dialog box, name the new map window **Final Counties**.
6. Select **LearningLegend1**.
7. Click **OK**.

The new map window, **Final Counties**, *is displayed.*

8. Select **Window > Cascade** to see the two windows.
9. With the ***US Map*** window active, select **View > Fit All**.

In the next section, when you create the final output in Imagineer™ Technical, you will place a map view in a frame using the **Fit to Frame** option to size the map view to the frame. You first need to make sure that the map view is displayed appropriately in GeoMedia. Since you will display the entire view in the frame, you fit the view in the map window now.

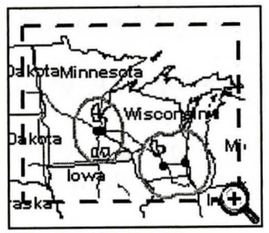
10. Maximize the **Final Counties** window.

11. Turn on the display of the state names in the **Final Counties** map window by right-clicking the legend entry and selecting **Display On**.

12. Select **View > Zoom > In**.

13. Place the zoom-in pointer at the top-left corner of the state of Minnesota.

14. Press and hold the left mouse button, and drag the cursor to the bottom-right corner of Wisconsin.



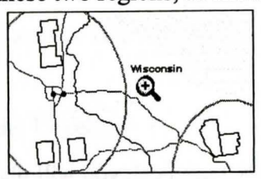
15. Release the left button.

The view is zoomed in on.

You should see four counties in Minnesota to the left, and two counties in Wisconsin to the right.

16. Hide the legend by double-clicking the legend icon on the legend title bar in order to better see all six counties.

17. With the cursor still displayed as a zoom-in pointer, click in the approximate center of these two regions, as shown below.



The view is zoomed in on again.

You should clearly see the six counties of the query results. It is not important that you see the entire buffer zones, just the counties within the buffer zones.

18. Select the **View > Pan** command if you need to move the query results around in the window to better see them.

19. You do not need to zoom in further, so press **ESC** (with the GeoMedia window active) to return the cursor to the select tool.

20. Save the GeoWorkspace.

Insert a Label as a Query

A label can be output either as a query or as a feature class. In this section, you will place a label that is output as a query.

As you will see, outputting a label as a query allows the labels to be automatically associated with the feature being labeled. Thus, labels automatically update if attribute values on which they are based change and are moved, deleted, and so forth, when their corresponding features are edited. However, labels cannot be edited until they are output to a read/write feature class.

1. Select **Tools > Label**.

2. On the *Label* dialog box, from the *Label Features in* drop-down list, select the **Final Counties** query from the Queries list.

3. From the list of attributes, select **ANNULSNOW**.

The attribute appears in the **Layout** *field.*

4. Type " (for inches) after the attribute in the *Layout* field.

5. Make sure the **Alignment** is set to **Center center**.

6. Make sure **Query (active link, read-only)** is selected in the *Output labels as* group.

7. In the **Query name** field, type the name `Annual Snowfall`.

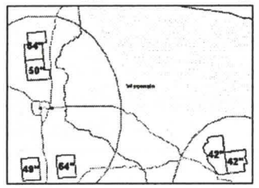
8. In the **Description** field, type `Label output as a query`.

9. Keep the name of the map window **Final Counties**, and click the **Style** button.

10. Check **Bold** to make the labels bold.

11. Click **OK** twice to dismiss both dialog boxes.

The labels appear in the map window.



Insert a Label as a Feature Class

You will now place a label that is output as a feature class. Outputting labels as a feature class does not provide an active link for attribute values, but it instead allows the labels to be edited independently of their corresponding features.

1. Select **Tools > Label**.

2. On the *Label* dialog box, make sure the **Final Counties** query is selected in the **Label** *Features in* drop-down list.

3. Click in the **Layout** field and type `County`.

4. From the **Attributes** field, select **COUNTY_ID**.

The attribute appears in the **Layout** *field.*

5. Press CTRL and Enter to go to the next line.

6. In the **Layout** field, type `Pop`.

7. From the **Attributes** field, select **POP**.

8. Set the **Alignment** to **Center center**.

9. Select **Feature Class (static, editable)** in the *Output labels as* section.

10. In the *Connection* field, select **learning**.

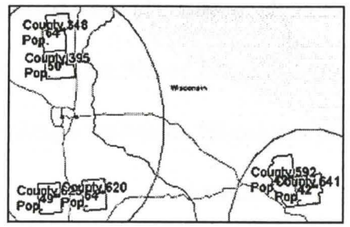
This adds the feature class to the **learning** warehouse.

11. In the **Feature class** field, type `CountyandPop` (no spaces).

12. In the *Description* field, type `Label output as a feature class.`

13. Keep the name of the map window ***Final Counties*** for the labels to display in. Click **OK**.

The labels appear in the map window.



Move Map Objects

In the map window, notice that several of the county labels overlap each other. Because these labels have been output as a feature class, they can be moved or edited. You will now move the labels, using two different methods, so that they can be seen more clearly.

1. Make sure the **Select** tool is active.

2. Select one of the County/Population text labels you have placed by clicking on it.

3. Select **Edit > Move**.

The cursor changes to a cross-hair.

There are two ways to move an object--by dragging it to a new location or by selecting the points from which and to which to move the object. You use the first method first.

4. Press and hold the left mouse button, and drag the text to a new location. When you have selected a location for the label that is somewhere around the county (such as above it or to the right of it), release the mouse button.

5. Select another label to be moved.

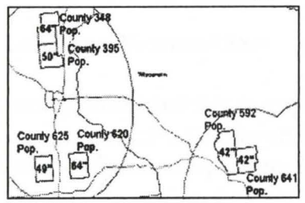
You use the second method to move this object.

6. Select **Edit > Move**.

7. When the cursor changes to a cross-hair, click the point *from which* you want to move the object.

8. Click the point *to which* you want to move the object.

9. Move each of the other corresponding labels to position them where they can be clearly viewed around each county, using either of the two methods.



10. Save the GeoWorkspace.

Place a North Arrow and a Scale Bar

GeoMedia lets you place a *north arrow* and a *scale bar* on your map. A north arrow is an image that indicates the direction on a map to the geographic North Pole. A scale bar is a moveable bar that is marked at intervals to indicate the relationship between the distance on a map and the corresponding actual distances.

1. Select **View > North Arrow** to place a north arrow.

2. Right-click on the north arrow, and select **Properties** to display the *North Arrow Properties* dialog box.

3. To choose an alternate north arrow, click **Browse**.

4. Select **arrow1.wmf**, and click **Open**.

5. Click **OK** to dismiss the dialog box.

6. Drag the north arrow to a new location in the map window, such as the top, right corner.

7. Select **View > Scale Bar** to place a scale bar.

8. Right-click on the scale bar, and select **Properties** to display the *Scale Bar Properties* dialog box.

9. Change the **Units** to **mi** for miles.

10. Change the **Text/Lines** color to dark blue, and click **OK** on the **Color** dialog box.

11. Change the **Minor fill** color to light blue, and click **OK** on the **Color** dialog box.

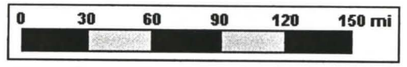
12. Change the **Major fill** color to purple, and click **OK**.

13. Check **Set interval values**.

14. Specify **5** for **Number of intervals**.

15. Set the **Length of interval** field to **30**.

16. Click **Apply** to preview your changes.



17. Click **OK**.

18. Drag the scale bar to a new location in the map window, such as the bottom, right corner.

Delete Legend Entries

To prepare for the final output, you can remove the legend entries you do not want to appear on the map.

1. Select **View > Legend** to make the legend visible.

2. Select **Legend > Properties**.

3. Select the following legend entries, by clicking the row selector for the following entries, and holding down the CTRL key:

   -Small Counties Around Major Cities
   -Cities
   -Counties
   -Interstates
   -States by snow/avetemp
   -States by ANNULSNOW

4. Click **Delete** to delete the selected entries.

NOTE: If you delete an entry by mistake, click **Cancel** on the dialog box and re-select **Legend>Properties** and follow the previous steps again.

5. Verify that the only entries that now appear on the *Legend Properties* dialog box are the following:

   - CountyandPop
   - Annual Snowfall
   - Final Counties
   - ZoneAroundMajorCities
   - Major Cities
   - StateNames
   - States

6. Click **OK** to dismiss the *Legend-Properties* dialog box.

Rename the Legend

Now you rename the legend that is used by the **Final Counties** map window.

1. Select **Legend > Name Legend**.
2. In the **Name** field, type `LearningLegend2`
3. Click **OK**.
4. Save the GeoWorkspace.

◆ Preparing the Results

You can plot your results using Imagineer™ Technical 2.0, which is delivered with GeoMedia. Using GeoMedia's custom map layout commands, Imagineer Technical 2.0 becomes a map presentation environment. In addition to the capabilities provided by GeoMedia's custom commands, all of Imagineer's capabilities are provided.

Before proceeding, make sure Imagineer is installed on your system. For maximum efficiency and speed, it is best to minimize but not dismiss GeoMedia.

Set Up for Plotting

To set up for plotting, you set the default printer on your system to be the one you want to use to plot the map and set up your sheet in Imagineer.

IMPORTANT: Set up the plotter before you start Imagineer. If Imagineer is already open, close it.

The current system printer determines the resolution of the file that is created with the **Frame Properties** command. If you move the frame from one machine to another, you must update the links to the GeoMedia data so that the metafiles are re-created with the new resolution of the new default system printer.

Create an Imagineer Drawing File

You use the Imagineer template that is delivered with GeoMedia as a starting point for creating your final output.

1. Make sure that GeoMedia is running, but its window is minimized.
2. Start Imagineer.
3. Select **Tools > Options**.
4. Select the **File Locations** tab on the **Options** dialog box.
5. Select the **User Templates** file type.
6. Click **Modify**.

7. Specify the location of the provided templates. By default, they are located in *c:\Program Files\GeoMedia\Templates\Imagine.*

8. Click **OK** on the dialog boxes.

9. Select **File > New**.

10. From the list of templates, select **MapLayout-English.igt**, make sure **Document** is selected, and click **OK**.

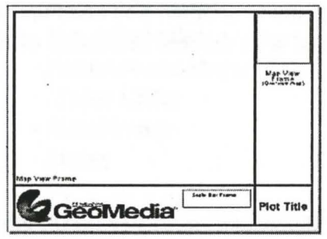
11. Select **File > Sheet Setup**.

12. On the **Size and Scale** tab, make sure **Scale (1:1)** is selected for the **Drawing Scale**.

13. Click **OK** to dismiss the **Sheet Setup** dialog box.

14. Select **View > Fit**.

The drawing sheet fits in the window.



Design the Layout of the Map

GeoMedia delivers three **Map Layout** tools that you can use in Imagineer: **Design GeoMedia Layout** (DesignLayout.exe), **Frame Properties** (EditFrameProp.exe), and **Create Legend Graphics** (LegendGraphics.exe). These can be found as a toolbar at the top of the Imagineer screen and look like this:

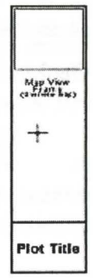
The **Design GeoMedia Layout** command lets you design a map layout, by placing frames on an Imagineer sheet. After placing the frames, you can use the **Frame Properties** command to populate them with a map view, scale bar, or north arrow from a GeoWorkspace.

This MapLayout template has three frames already placed on it. Two of the frames are to be used for map views, and one of the frames is to be used for a scale bar. You place a fourth frame, to be used for a north arrow.

1. From the Imagineer toolbar, select **Design GeoMedia Layout**.

The cursor becomes a cross-hair, ready to place the first point of the frame.

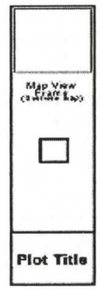
2. Place the cursor anywhere in the area below the text, **Map View Frame (Overview map)**.



3. Click the left mouse button to place the first point.

If you need to make a correction, you can discard a previously placed first point by right clicking, and then you can place another first point.

4. Diagonally from the first point, move the cursor to place a rectangle, similar to that shown below.



5. When the rectangle is the size you want, click to place the second point of the frame.

6. With the Imagineer window active, press ESC to exit the **Design GeoMedia Layout** command.

It is always a good idea to save a document in case you have to come back to it later.

7. Select **File > Save As...**

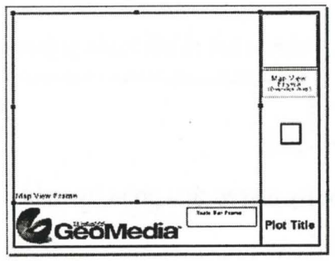
8. In the **File name** field, type `learning` to save the file as *learning.igr*.

9. Click **Save**.

Place GeoMedia Map Views in the Layout Frames

After designing the layout of your map, you edit each frame to link it to a GeoMedia GeoWorkspace object (a map view, scale bar, or north arrow).

1. Select the largest frame, as indicated by the text, **Map View Frame**.



Selection handles appear around the frame.

2. From the Imagineer toolbar, select **Frame Properties**.

3. On the **Edit Frame Properties** dialog box, for the **GeoWorkspace** field, browse to select **learning.gws**.

4. From the **Select view** list, select **Final Counties**.

5. In the **Frame type** box, select **Map view**.

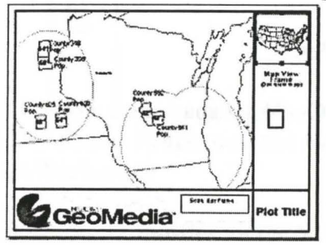
6. Click **Fit to Frame**.

The map view is automatically scaled to the frame size.

7. Click **OK** to dismiss this dialog box.

The map view appears in the frame.

8. Select the second frame for a map view, in the top, right corner of the sheet.



9. Select **Frame Properties**.

10. Make sure **learning.gws** is selected in the *GeoWorkspace* field on the *Edit Frame Properties* dialog box.

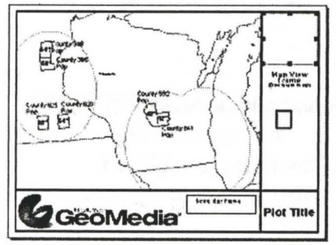
11. From the **Select view** list, select **US Map**.

12. In the *Frame type* box, select **Map view**.

13. Click **Fit to Frame**.

14. Click **OK**.

The map displays in the frame.



Place a Scale Bar and North Arrow in the Layout Frames

1. To place a scale bar, select the **scale bar** frame.

2. From the Imagineer toolbar, select **Frame Properties**.
3. On the **Edit Frame Properties** dialog box, for the **GeoWorkspace** field, select **learning.gws**.
4. From the **Select View** list, select **Final Counties**.
5. In the **Frame type** box, select **Scale bar**.
6. Click **OK**.

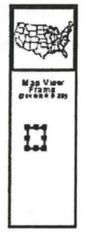
The scale bar is placed in the frame.

7. To remove the border around the scale bar, right click inside the scale bar frame.
8. Select **Properties**.
9. On the **Format** tab on the **Properties** dialog box, turn off **Show Border**.
10. Click **OK** to dismiss this dialog box.
11. Move the scale bar down below the text, **Scale Bar Frame**, by dragging it with the cursor.

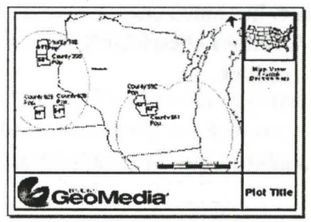
12. Delete the text, **Scale Bar Frame**, by selecting this text and pressing **DELETE**.

Now you repeat the instructions to place a north arrow into the frame you placed.

13. Select the frame you placed for the north arrow.



14. Select **Frame Properties**, and make sure **learning.gws** is selected for the **GeoWorkspace**.
15. Select **Final Counties** for the **Select view,** and **North arrow** as the **Frame type**.
16. Click **OK**.
17. Turn off the border for the north arrow.
18. Move the north arrow to the upper right corner of the Final Counties map view, by dragging it.
19. Move the scale bar to the lower right corner the Final Counties map view, by dragging it.



Edit Text

It is simple to edit text in Imagineer.

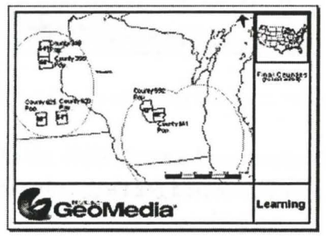
1. Double-click the text, **Plot title**.

The insertion point is placed in the text string.

2. Delete the text string and type `Learning`.

3. Replace the text string below the US map, **Map View Frame**, with `Final Counties`.

4. Replace the text string inside the parentheses, **Overview map**, with `For ski resort`.



5. You can change the font or size of a text string by right-clicking the text, selecting **Properties**, and selecting the **Paragraph** tab.

Add a Legend

Create Legend Graphics converts the GeoMedia legend into graphic style keys and text that Imagineer can understand and edit.

Unlike map views, the legend you place in Imagineer is not linked to the original GeoMedia GeoWorkspace. To make changes to the new legend, you can either make change using Imagineer, or make changes using GeoMedia and then rerun **Create Legend Graphics**.

1. From the Imagineer toolbar, select **Create Legend Graphics**.

2. On the **Create Legend Graphics** dialog box, select **learning.gws** in the **GeoWorkspace** field.

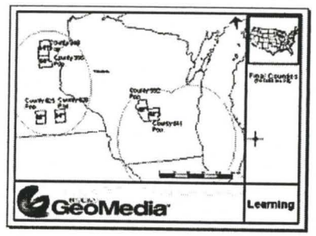
3. Select the legend, **LearningLegend2**, in the **Legends** field.

4. Select the option to **Sort legend alphabetically**.

5. Change the **Font** to **Arial**.

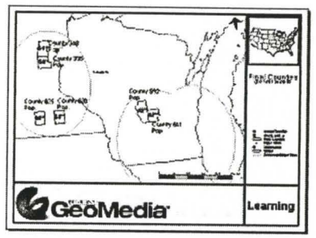
6. Click **OK** to close the dialog box.

7. Click a point in a location similar to that shown below. This point defines the location for the upper left corner of the legend.



The legend is added, one entry at a time.

8. After the legend is completed, the results can be printed! (You will not be able to print from the Training Lab.)



Note that the full capabilities of Imagineer are available to you to add any additional embellishments, marginalia, or design features you want.

Congratulations! You have completed this tutorial. You should now be familiar with the basics of GeoMedia, and ready to use it on your own. If you want more information on any GeoMedia command, or for information on advanced topics, select **Help > GeoMedia Help Topics**.

Iowa DOT GIS Workflow

Using data produced by the Iowa DOT and the Iowa DNR, you will learn how to use data from different data warehouses to create a map display of features of interest. Rather than displaying all features from the warehouses on the map, you will learn how to limit the data displayed to only that data of interest to you. Specifically, you will learn how to:

- Define and apply a filter to a warehouse connection.
- Formulate and perform a query to retrieve and display particular feature data.
- Create a buffer zone to display feature data that shares a defined physical proximity with another feature.
- Create a thematic map to illustrate the occurrence of data of interest.
- View data related to specific features in a data window.

Like the GeoMedia tutorial, these exercises build upon each other to demonstrate how to combine, search, and display data from multiple, large data sources to arrive at very specific geographic information. In this exercise, we will be identifying primary roads with a certain surface type and AADT, population density of a county, and wetlands or rivers that cross into a new road design. The combination of this data will lead to answers about where certain features exist in the State of Iowa.

Getting Started

Create a new GeoWorkspace.

File>>New GeoWorkspace
>Document
>OK

Be sure to save the workspace and give it a name such as **ACCRoads**.

You will also need to set the coordinate system for the GeoWorkspace.

View>>GeoWorkspace Coordinate System
>Projection Space tab>>select **Universal Transverse Mercator**
>Geographic Space tab>>select **North American 1927**
>OK
File>>Save GeoWorkspace

◆ Lab I - *Iowa DOT Data*

In the first part of this workflow, you will be trying to identify primary roads in the state that may be in need of repair or replacement. To do this, several things will be looked at such as surface type, AADT, and ACC Ratings. This data is found on the Iowa DOT base record which has been converted to Access for this exercise.

Connecting to the Data

The Iowa DOT road data is in an **Access** database on the CD.

Warehouse>>New Connection
>Browse the CD for **d:\TrainingCD\Idot\Road2.mdb**
>Click the ***Read Only*** box on the ***Browse*** screen

Don't forget to name the connection (***Idot data***) and open it as **Read Only**.

Displaying Features

You will want to display the feature: county borders.

Legend>>Add Feature Class
>From **Connections** select (***Idot Data***)
>From **Feature Classes** select ***border***

Performing a Query on a Warehouse

To refine your data display for the specific information that you are interested in, you can perform a query to search the data for particular feature attributes such as a certain pavement type or a particular level of traffic. For this exercise, instead of adding all the primary roads, you will query the road data to identify portions of the primary highway with a certain surface type(asphalt, 60-69) and a certain traffic level (2000).

Tools>>New Query
>Select Features In: choose (***Idot data***)**>>primary_road**
>Select the **Filter** button. Enter this filter: **SURF_TYPE >= 60 AND SURF_TYPE <= 69 AND AADT > 2000**
>OK
Name: Don't forget to enter a name for the query (***ACCRoads***)

Description: Optional
>OK

The query will be performed, added to the legend, and displayed in the MapWindow. This may take a couple minutes.

Creating a Thematic Map

You can create a thematic map to better display the results of your work. In this case, we will create a thematic map of the ACC Roads based on their ACC rating.

Legend>>Add Thematic
Feature Class: >Queries> select (***ACCRoads***)
Available Attributes: select **acc_rating**
>Unique>>
>Define (this may take a few minutes)
Change **Label**: to **Descriptions**
Style: fair change to **yellow**, weight=**3.0**
good change to **green**, weight=**3.0**
poor change to **red**, weight=**3.0**
>OK to dismiss Define window
>OK to dismiss Thematic Map window

This will display the acc_rating by color on the roads from the previous query. Red segments could be considered areas for further investigation into road improvement.

Since the thematic map will cover up the query display, you can turn it off.

Right click on the legend entry (***ACCRoads***).
>select **Display Off**
Right click on the legend entry (***ACCRoads***).
>select **Hide Legend Entry**

ACCRoads was removed from the legend display.

Save the Workspace

File>>Save GeoWorkspace

◆ Lab II - *Iowa DNR Data*

In this lab, we are going to concentrate on one county (Clay) that showed red segments from the thematic map in the first lab of this workflow. We will try to find out if any of the red segments fall within areas of moderately-high population.

Opening a New Map Window

We want to save the thematic map that was created in Lab I and focus in on a smaller area, so we want to open a new map window.

Window>>New Map Window
>Window Name: (Clay)
>OK

New Query

We need to find Clay County by doing a query on the ***border*** feature class.

Tools>>New Query
>Select Features In: select **(*Idot Data*)>>border**
>Filter: CO_NAME = 'Clay'
>OK
>Name: (***Clay County***)
>OK

Connecting to DNR Data

The Iowa DNR data is in an **ArcView** database on the CD.

Warehouse>>New Connection
>Browse the CD for **d:\TrainingCD\DNR\Clay**

Don't forget to name the connection(***ClayDNR***).

Defining a Connection Filter

To limit the data you see to a particular area, such as Clay County, you can apply a connection filter to one or more warehouse connections.

To define a connection filter:

Warehouse>>Define Connection Filter
Filter Name: type **Clay**
Spatial Operator: >Inside
Placement Options: >Create a new filter by selecting an area geometry
>Define
>Click once inside the Clay County border to highlight it
>Double click inside border to confirm.
>Select **Close** when *Define Connection Filter* dialog box reappears.

To apply the connection filter:

Warehouse>>Edit Connection
>select the **Connection Filter** column in the (***ClayDNR***) row
>Select **Clay County**
>Connection Filter column (***Idot Data***)
>Select **Clay County**

The results of the connection filter will only be displayed on actions taken from this point forward (the filter is not visibly displayed).

Save the Workspace

File>>Save GeoWorkspace

Creating a Thematic Map

Now, we will create a thematic map of population based on the census block data provided by the Iowa DNR.

Legend>>Add Thematic
Feature Class: > (***ClayDNR***) **>** select **cen90_clay**
Available Attributes: select **TOTALPOP**
>Range>>
>Define (this may take a few seconds)
Range technique: select **Equal Count**
Number of Ranges: select **5**
>Hit the **Color Selection** button to choose a color scheme. (Green looks good)

Label: select **Description**
Optional: Change all the decimals to the next highest whole number.
>OK to dismiss Define window
>OK to dismiss Thematic Map window

This will display the total population by color in Clay County.

Performing a Spatial Query

A spatial query is used to find features of interest that fall geographically close to another feature. You will use this to see if any of the roads with poor acc ratings are within a certain distance of the moderately high populated areas.

Tools>>New Query
Select features in: select **Queries>(*ACCRoads*)**
Filter: type **acc_rating = 'poor'**
>Hit the **Spatial** button
That: select **are within a distance of**
Distance: type **10**
Units: select **mi**
Select Features in: select **(*ClayDNR*)>cen90_clay**
Filter: type **TOTALPOP > 150**
Name: name the query (***In_Need***)
>OK

The results of the spatial query will appear in your map window. If you cannot see it, you may want change the style of the feature. To do this, **double-click** on the Legend entry, and **change the color and weight** of the line.

Save the Workspace

File>>Save GeoWorkspace

◆ Lab III - *Accident Data*

Now that we have located potential roads in need around moderately high populated areas, we can take a look at accident data to see if the road may be the cause of serious injury or fatal accidents.

Connecting to Accident Data

The accident data is in two different **Access** databases on the CD. One contains the point feature of the accident and the other contains the information about the accident.

Warehouse>>New Connection
>Browse the CD for **d:\TrainingCD\Idot\ClayCrashLoc.mdb**
>Click the ***Read Only*** box on the ***Browse*** screen

Don't forget to name the connection(***CrashLocations***).

Warehouse>>New Connection
>Browse the CD for **d:\TrainingCD\Idot\ClayCrashData.mdb**
>Click the ***Read Only*** box on the ***Browse*** screen

Don't forget to name the connection(***CrashData***).

Joining Features to Attributes without Geometry

Data in crashdata does not contain a map location, which means it can not be shown in the map window by using *Add Feature Class*. Since the accident location file and the accident data file both contain the case number of the accident, we are able the join the table that contains a map location (crashlocations) and the table that does not contain a location (crashdata).

Tools>>Join
Left side of Join: select **CrashLocations>>CrashLocations**
Right side of Join: select **CrashData>>CrashData**
Available Attributes: select **CASE_NUM** from both sides
>Click the **down arrow**
Type of Join: select **Inner**
Query Name: type **Accidents**
>Click the **Display join in MapWindow** box
Map Window Name: select ***Clay***
Style: you can change if you like

>**Click** the **Display join in Data Window** box
Data Window Name: type **Accidents**
>OK

Move the Data and Map Windows around so that you can them both.

>**Double click** on an accident point and watch that it highlights in the data window. The information box also appears with all of the data in it.
>Close

You can now close the Data Window (***Accidents***).

>Select the Data Window (***Accidents***) by **clicking on it once**.
>Click on the **X** in the upper, right hand corner of the Data Window

Performing a Spatial Query

Before performing the query, in order to see the results of it better, the existing accident display needs to be turned off.

>Click on the ***Accident*** entry in the Legend.
>Right-click on the mouse
>select **Display Off**

Now we can do a spatial query to bring in all fatal accidents that have occured along the sections of road found in the In_Need query.

Tools>>New Query
Select Features In: select **Queries>>*Accidents***
>Spatial button
That: select **touch**
Features In: select **Queries>>*In_Need***
Name: type ***Accidents Touching Road***
>OK

Only one accident appears and you know from looking at the join data that there appeared to be more along the road. This is because of accuracy differences in the two data sets and the actual location of the accident might not be on the road. Also, if you would want to include accidents on intersections along the route, they might be located on the other leg of the intersection that was not queried on.

We will do another query that more accurately reflects that accidents along the route by looking for accidents that occur within 50 feet of the road.

Tools>>New Query
Select Features In: select **Queries>>*Accidents***
>Spatial button
That: select **are within a distance of**
Distance: type **50**
Units: select **ft**
Features In: select **Queries>>*In_Need***
Name: type ***Accidents by Road***
>OK

You may have to change the color to see the new query better. Double-click on the Legend entry to change the style.

The results of this query find more accidents than the previous one.

New Query

Now, we can do another query to find all of the fatal accidents of the ones that were within 50 feet of the road.

Tools>>New Query
Select Features In: select **Queries>>*Accidents By Road***
>Filter button
Type in **G_SEV = '1'** (stands for fatal accident)
>OK
Name: type ***Fatal Accidents***
>OK

Three fatal accidents were found along the In_Need section of road.

Save the Workspace

File>>Save GeoWorkspace

◆ Lab IV - *Data Window Features*

The data window is helpful when you want to actually see the values returned by a query, or all of the information associated with a feature class. From the Data Window, you can also hide columns, promote rows to the top, and copy information to another spreadsheet such as Excel or Lotus. First, to open a Data Window:

Window>>New Data Window...
Name: type **In_Need**
>Choose **Queries>>(*In_Need*)**
>OK

To hide some of the columns:

>Click on the **column name** (Key_Id)
>Right-click on the mouse
>select **Hide Column**

Another way to hide columns:

Data>>Show Columns
>Leave only the following **checked**:

CO	**AADT**
ST_RTE	**SURF_TYPE**
NHS	**MPH_LIMIT**
STREET	**acc_rating**
YR_CNT	

>OK

Let's say that we are only interested in the sections around the city of Spencer. To find these without a query:

Window>>Cascade
>Move the windows so that you can see the data window and the Clay County window.

>In Clay County window, **right-click** on **census thematic map**
>select **Locatable** (This is so you will not be able to select this feature when you drag the arrow across the map window.)
>With the **pointer** in the Clay County window, **click and drag a fence** around the city and include possible roads in need. (The sections will highlight in the data window.)

To copy the data to a spreadsheet:

>Switch to the **Data window** (click on it)
>Data>>Promote Rows (This moves the rows to the top of the screen).
>Go to the bottom highlighted row and **click in the first cell in the first column** and **drag up and across** to re-highlight all of the rows selected by the fence.
>Right-click on the highlighted part
>select **Copy**
>Open Excel (without closing GeoMedia)
>Right click on Excel or Lotus spreadsheet
>select **Paste**

Now the selected sections have been put into an Excel spreadsheet and can be further manipulated into different formats.

Save the Workspace

File>>Save GeoWorkspace

◆ Lab V - *Design Files*

An area for improvement has been located and a design of a by-pass around the city of Spencer has been started. Before work can be performed, environmental issues need to be investigated. By bringing in a design file and adding other data to the window, you can see what the new alignment of the road will affect in the field.

Opening a New Map Window

We want to save the what is in the previous window and focus on yet a smaller area, so we want to open a new map window.

Window>>New Map Window
>Window Name: (EIS)
>OK

Adding a Query to the Map Window

To make sure that are design file is brought into the correct area, we will need to query for Clay County.

Legend>>Add Query
>Select **Clay County**
>OK

Connecting to a Design (CAD) File

The design file is read through a **CAD** schema definition (*****.csd) file on the CD. It has already been created for this exercise, but normally you will have to create one for each design file you wish to bring into GeoMedia.

Warehouse>>New Connection
>Browse the CD for **d:\TrainingCD\cad\us71prop1.csd**

Don't forget to name the connection(***Design***).

* Need to Copy this ^file to your local drive and connect to the copied us71prop1.csd file on the local drive.

Displaying Features

The *.csd file created features out of the entities found on specific levels, so these features need to be added to the map window before they can be viewed.

Legend>>Add Feature Class
>From **Connections** select (***Design***)
>From **Feature Classes** select ***NewRoad***

Save the Workspace

File>>Save GeoWorkspace

Removing Legend Entries

Since it appears that the design appears in the right location, you can take the Clay County border off of your map window and zoom in closer on the design on the new road.

>Click on the legend entry ***Clay County***
>Hit the **Delete** key
Message box: **Delete legend Entries?**
>OK

The Clay County border is removed from the legend and the map window.

To see the new road design better:

View>>Fit All

Creating a Buffer around Features

To identify features of interest that occur near primary features, you can create a buffer zone around a feature class to limit the display to those features only within a defined proximity to the primary feature. For this exercise, you will create a buffer zone around a the new design of the highway.

To create a buffer zone, we must first create a new warehouse with a read/write connection.

Warehouse>>New Warehouse
>select **Document**
>OK
File Name: type **(*Spencer*)**
Save As Type: select **Access**
>Save

Now we can create a buffer zone.

Insert>>Buffer Zone
Buffer Zone Around: select **(*Design*)>NewRoad**
Warehouse: select **(*Spencer*)**
Feature Class: type **Limits**
Constant Distance: type **150** >select **ft**
Buffer Type: select **Line>round**
>Merged
>OK

Connecting to Statewide DNR Data

The Iowa DNR data is in an **ArcView** database on the CD.

Warehouse>>New Connection
>Browse the CD for **d:\TrainingCD\DNR\Statewide**

Don't forget to name the connection(***StatewideDNR***).

Querying a Buffer Zone

After creating the buffer zone, we can query the data for particular features to see if they occur within the buffer zone. We will use the Statewide DNR data to query for underground storage tanks within the buffer zone of 150 feet from the new design.

Tools>>New Query
>Select Features In: >(*StatewideDNR*)>storage_tanks_regulated_underground
>Spatial
That: select **are entirely contained by**

Features In: select **(*Spencer*)>** select **Limits**
Name: Don't forget to enter a name such as **(*UST near Design*)**
>OK

The query will be performed, added to the legend, and displayed.

To see the data connected to the features within the buffered query, we can open a new data window with those data in it:

Window>>New Data Window
>Select **Queries>** select **(*USTnearDesign*)**
>OK

Or to see just the information associated with one site:

>Double-click on the point associated with the site that you want information about

Changing the Point Symbol

It is possible to change the point symbol to another kind of symbol. We will change the UST sites in the project area to a different symbol such as a star.

>Double-click on the symbol for UST near Design in the Legend.
Type: select **Symbol**
Symbol: scroll through the list until you find a symbol you like, **Star** for example.
If you highlight it in the list, the symbol will display in the sample box.
>OK

Save the Workspace

File>>Save GeoWorkspace

Defining a Buffer as a Connection Filter

Instead of doing a spatial query to find all the features within a buffer zone, you can define a buffer zone as a filter, turn the filter on, and add the features through the legend to your map window.

Warehouse>>Define Connection Filter
Filter name: type (***DesignBuffer***)
Spatial Operator: select **Overlap**
Placement Options: select **Create a new filter by selecting an area geometry**
>Define
>Click inside the buffer
>Double-click to accept the buffer as your filter
>Close

To turn the filter on:

Warehouse>>Edit Connection
>select the **Connection Filter** column in the (***ClayDNR***) row
>select (***DesignBuffer***)
>Close

Displaying Features

Now, any features that you add to the map window from the (***ClayDNR***) will appear within the filter that we created from the design buffer zone. We will add rivers and wetlands to see if there are areas of concern along our new road design.

Legend>>Add Feature Class
Connection: select (***ClayDNR***)
>select **rivers_clay**
>OK

To use the wetlands data, you will need to query the feature class for all the areas that are wetlands:

Tools>>New Query
Select Features In: select (***ClayDNR***) **>>wetld_clay**
Filter: type **DESC1 <> 'U'** (<> means not equal to)
Name: type (***Wetlands***)
>OK (This may take a minute.)

To make the wetlands easier to distinguish, we will do a thematic map:

Legend>>Add Thematic
Feature Class: select **Queries>>(*Wetlands*)**

Available Attributes: select **DESC1**
>Unique>>
>Define
Label: select **Descriptions**
>Hit the **Color** button until you find colors you like
>OK
>OK

Save the Workspace

File>>Save GeoWorkspace

◆ Lab VI - *Imagery*

Imagery can be brought into GeoMedia. In this lab, we will bring in a scaned aerial photograph that has been registered through IRAS C and a USGS Digital Raster Graghic (DRG). The DRG is a digital raster image of a USGS paper map and is useful for data collection or as a base overlay in GIS.

To insert an image, there has to be an Access warehouse open with a read/write connection. We already have a read/write warehouse open (***Spencer***) that we used to create the buffer zone.

Inserting an Image - Aerial Photograph

Insert>>Image
Image Name: select **Browse**
Browse to **d:\TrainingCD\Images\21071006161.cot**
Pop-up message box **File Marked as Read Only:** select **OK**
Warehouse: select **Spencer**
Placement Mode: select **By Header**
Coordinate System Information File: select **Browse**
Browse to **d:\TrainingCD\CAD\IowaNorthStatePlane.dgn**
>OK

To see the features that are now under the picture:

Click and drag the legend entry to the bottom of the legend list.

To see the photograph better:

View>>Zoom>>In
>Click and drag a box around the picture
-OR-
>Click once on the picture and repeat until you are close enough to see the photo.
>ESC to return to the arrow cursor.

To see the whole design area again:

View>>Fit All

Inserting an Image - DRG

Insert>>Image
Image Name: select **Browse**
Files of Type: select **TIFF (*.tif)**
Browse to **d:\TrainingCD\Images\043095b2.tif**
Pop-up message box **File Marked as Read Only:** select **OK**
Warehouse: select **Spencer**
Placement Mode: select **Georeferenced**
>OK

To see the features that are now under the picture:

>Click and drag the legend entry to the bottom of the legend list.

To see the DRG better:

View>>Zoom>>In
>Click and drag a box around the area you wish to zoom in on
-OR-
>Click once on the picture and repeat until you are close enough to see the photo.
>ESC to return to the arrow cursor.

With all the windows you created, you can use Imagineer to create a layout of the information that you have found.

Warehouse Connection Wizard

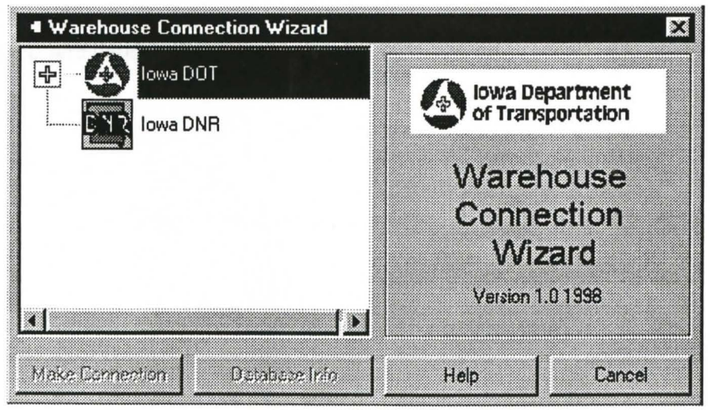
The Warehouse Connection Wizard (WCW) provides users with access to Geomedia warehouses without requiring knowledge of warehouse location and type. Without the WCW users must know the exact location of a warehouse, in addition to the type of storage format the warehouse is maintained. Certain warehouse types (i.e. MGE, MGSM) require special procedures to be followed in order to connect as a data warehouse. The WCW was created to alleviate these problems by automating much of the connection procedure. Table 1 contains a comparison of each workflow required to connect to a warehouse using the traditional Geomedia method versus the WCW.

Table 1. Workflow Comparison of Connection Methodologies.

Geomedia Methodology	Warehouse Connection Wizard
Warehouse>New Connection	IowaDOT>Connect to Warehouse
Specify Type of Connection	Specify Warehouse
Define Connection Name	Make Connection
Define Path to Warehouse File	
Define any Connection Filter	
Specify Whether Connection is Writable	
Make Connection	

In addition to automating the procedure, information regarding the contents of the warehouse can also be accessed using the WCW. The basic interface is shown in Figure 1.

Figure 1. WCW Basic Interface



Using the Warehouse Connection Wizard

The basic workflow for using the WCW consists of:

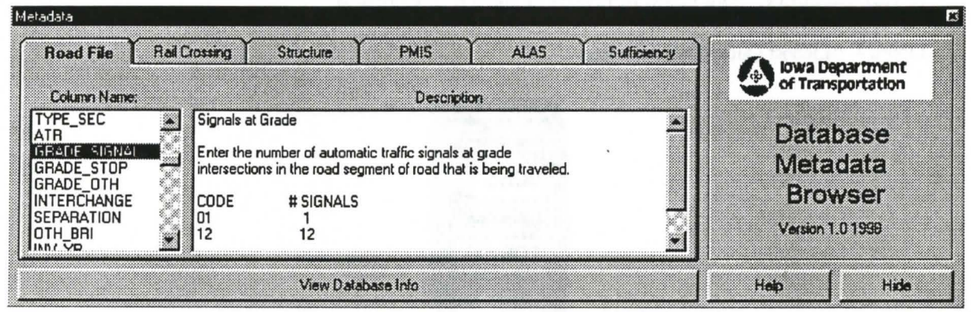
- Activate WCW from IowaDOT menu.
- Select warehouse to connect to.
- Click on the make connection button to connect to warehouse.
- Use the Legend menu in Geomedia to add features from warehouse.

Database Metadata Browser

The Database Metadata Browser (DMB) allows users online access to database column information. The DMB tool was created to help users to determine what the name of a column in the database signifies or what a particular code in a column represents. The basic interface is shown in Figure 3.

> For example, the Road File column RTE_IND stands for 'ROUTE INDICATOR' and the number 3 represents 'MUNICIPAL'.

Figure 3. Database Metadata Browser Interface



Using the Database Metadata Browser

The basic workflow for using the DMB consists of:

- Activate DMB from IowaDOT menu.
- Select appropriate database tab.

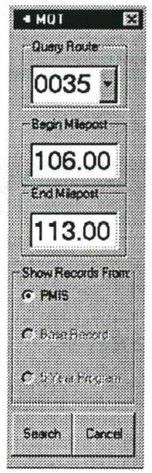
Milepost Query Tool

The Standard Query Language (SQL) query that must be written to select a series of segments referenced by milepost is rather involved. An example of such a query to select all the Pavement Sections between mileposts 106 and 113 on interstate routes 35 follows:

```
Select * from PMIS where ST_RTE = "0035" and BEG_MILE <= 113 and END_MILE >= 106
```

The Milepost Query Tool (MQT) provides users the ability to easily select roadway sections referenced by milepost, without having to understand or learn the SQL commands necessary to run the query. The basic interface is shown in Figure 4.

Figure 4. Milepost Query Tool Interface



Using the Milepost Query Tool

The basic workflow for using the MQT consists of the following:

- Activate MQT from IowaDOT menu.
- Select the query route.
- Select the beginning and ending mileposts.
- Select the database to query.
- Execute the search query.

Hypertext Links

Hypertext is a link to an external file. When the link is executed (double-clicked), the application associated with the file is invoked, and the file is opened or played by clicking the hypertext cell in the data window. To create a hypertext link, a new feature class must be created in a read/write warehouse connection, and must be added to the MapWindow in the GeoWorkspace. Then a hypertext link must be added to the feature table so that it will show in the data window when the feature is selected.

Open a read/write warehouse connection

(Only do this if a read/write connection for your project is not already open.)

Select **Warehouse>>New Warehouse**

In the *New* window, select **normal.mdb** and make sure that **document** is selected. Click **OK**.

In the *New Warehouse* window, type a **name** to save the warehouse as, and click **OK**.

Create a New Feature Class

Select **Warehouse>>Feature Class Definition**

Highlight the warehouse that was just created (or highlight your existing read/write connection), and then select **New**.

The *New-FeatureClass1* window opens on the **General** tab.

In the **Name:** category, type in your feature name.

In the **Description:** category, type in a description (optional).

In the **Geometry Type:** category, chose the type of geometry that you want to represent the new feature.

Now, select the **Attribute** tab at the top of the *New-FeatureClass1* window.

First Row

Select on the cell in the first row under the **Key** column. (A gold key should appear).

Select the cell in the first row under the **Name** column and enter **ID**.

Select the cell in the first row under the **Datatype** column, and from the pull-down window select **Autonumber**.

Select the cell in the first row under the **Description** column, and enter a **description** of the *ID* field if desired. (This field gives each feature in the new feature class a unique ID to locate the feature in the DataWindow.)

Second Row

Select the cell in the second row under the **Name** column and enter **Type**.

Select the cell in the second row under the **Datatype** column, and from the pull-down window select **Character**. Then change the *Length:* category to **20**.

Select the cell in the second row under the **Description** column, and enter a **description** of the *Type* field if desired. (This field can be used to explain what the point (feature) in the GeoWorkspace is representing such as a photograph or a certain type of sign-variable message.)

Third Row and so on (You can continue to add rows until all the data that you want to enter about that certain feature is complete.)

Select the cell in the row under the **Name** column and enter **a name category for the data field.**

Select the cell in the row under the **Datatype** column, and from the pull-down window select **one of the following:**

Character - if you want to enter an alphabetic type description. Make sure that you change the *Length* field to reflect the length of the description that you want to enter.

Number - if you want to enter a numerical type description. Make sure that you change the *Format*, *Size*, and *Decimal Places* fields to reflect the data that you want to enter.

Currency - if you want to enter a dollar amount type description. Make sure you change the *Format* and *Decimal Places* fields to reflect the data that you want to enter.

Date - if you want to enter a date as a description. Make sure you change the *Format* field.

Boolean - if you want to enter a boolean type description (yes/no, on/off, etc.). Make sure to change the *Wording*: field.

Select the cell in the row under the **Description** column, and enter a **description** of the field if desired.

Last Row (Hypertext row)

Select the cell in the last row under the **Name** column and enter **a name for the hypertext link** (i.e. *image* for photograph files).

Select the cell in the last row under the **Datatype** column, and from the pull-down window select **Character**. Then change the *Length:* category to **50 or longer** depending on the length of the path to the file. Make sure that the box beside *Hypertext* at the bottom of the window is **checked**.

Select the cell in the last row under the **Description** column, and enter a **description** of the field if desired.

Select **OK**, and then click **Close** on the *Feature Class Definition* window.

Insert a Feature in the MapWindow

To be able to view the added feature once you have added it, you will need to add the new feature class to the legend: **Legend>>Add Feature Class**, then chose the **read/write connection name** and the **name of the new feature class** that you just created.

Zoom to the area that you wish to place the new feature by using the *Zoom Tools*.

Select **Insert>>Feature**.

On the toolbar that is added at the top of the screen, click the **drop-down menu arrow** and select the **read/write connection** and **name of the feature class** that was just created. (The cursor will turn to cross-hairs.)

Click once on the spot that you wish to place the new feature, and select **OK** on the *Properties* window that pops-up. Repeat as many times as needed.

Insert Feature Attributes (Including Hypertext)

Open a DataWindow for the new feature class.

Select **Window>>New DataWindow**.

In the *New DataWindow* window, select the **read/write connection name** and the **new feature class name**. Click **OK**.

Enter the attributes and hypertext links in the DataWindow.

Select the **type cell** of the feature and enter the **corresponding type**.

Select any other field cell and enter the corresponding data.

Right click in the hypertext cell. In the list, choose **Hypertext>>Insert**.

In the *Insert Hypertext* window, find the **name** of the file that you want linked to that specific feature (ID number) in the new feature class, and select **OK**.

(A path name should appear underlined and blue in the hypertext column cell.)
To have the DataWindow accept the path name, make sure that you **click in a different cell** before closing the window.

Once all the features in the new feature class have all the data and hypertext links added to the data window, **close** the *DataWindow1*.

Hit **ESC** or click the **arrow** button to get out of the *Insert feature mode.*

Opening the Hypertext Link

Double-click on the new feature in the *MapWindow*.

Then, **click** on the hypertext link (underlined and in blue) and the application with the appropriate file is launched.

Another way is to **click once** on the feature, and then **right click**. Choose **Select Set Properties** and **click once** on the hypertext link to launch the file.

Displaying CAD Files in GeoMedia

The *.csd file is used to bring Microstation or AutoCAD design files into GeoMedia for viewing. The *.csd file defines the features of the CAD design file by level, color, style, type, weight, etc.

In order to define the features that are in the design file, a leveling chart or knowledge of which features reside on which levels is needed.

When displaying CAD drawings in GeoMedia, a warehouse connection is established similar to the way a warehouse is necessary for MGE, ArcView or Access. One of the necessary parameters when connecting to a CAD warehouse is a CSD file. These instructions step through the process of creating that file.

*Creating a *.csd File*

In the Start Menu>>Programs>>GeoMedia, chose the **CAD Server Setup Utility**.

In the CAD Server Schema box under *Create a new CAD Server Schema using*, choose **Microstation** and click **OK**.

It will open the *CAD Server Definition - Microstation Template* with the **Files** tab selected.

In the *Directories* section, chose **New**.

Select the directory where the design file(s) is(are) located.
You should see the design files in that directory appear under the *Map files in directory: Available Maps*: section.

Highlight the design files in the *Available Maps*: section that you want to bring up in GeoMedia and then click the **">" arrow button**.

Now, in the *Directories* section, chose **New** to find the directory with the Coordinate System File (This will either be *IowaNorthStatePlane.dgn*, or *IowaSouthStatePlane.dgn*).

Select the directory where the coordinate system file(s) is(are) located.
Highlight the directory that contained the coordinate system file(s) under the *Directories* section (the coordinate system files should appear in the *Coordinate System files in selected directory, Available Coordinate System files:* section).

Highlight the Coordinate System file in the *Available Coordinate System files*: section and click the **">" arrow button**.

At the top of the *CAD Server Definition* window, click on the **Feature Definition** tab.

In the *Feature Class* section, chose **New**. This is where a leveling chart is needed.

Enter a **unique name** for the feature that you are defining in the *first blank*. This must not contain any characters other than letters, numbers, and underbars.

Specify the file defining the coordinate system by clicking on the **down arrow** and selecting the same file as you did in the *Available Coordinate Systems files*(IowaNorthStatePlane.dgn or IowaSouthStatePlane.dgn).

Click **Next**.

In the *Feature Attributes* section, under *Available attributes,* **highlight** at least one of the following: (Use the graphic type if a backdrop of the design file is wanted and use the spatial type if you want to query or buffer the design file.)

GraphicAny	if there is more than one type of element (point, line, polygon) on the level of the feature class you are defining or you do not know what type of element is on the level
GraphicArea	if the elements on the level are polygons
GraphicLine	if the elements on the level are linework
GraphicPoint	if the elements on the level are point coverages
GraphicText	if the elements on the level are text (this is the only option that will bring in text)
SpatialAny	if there is more than one type of element on the level of the feature class you are defining and you want to be able to query or buffer based on the feature you are defining
SpatialArea	if the elements on the level are polygons and you want to query or buffer by the defined feature
SpatialLine	if the elements on the level are linework and you want to query or buffer by them
SpatialPoint	if the elements on the level are point coverages and you want to query or buffer by them

and then click the **">" arrow button**.

In the *Primary geometry* section, make sure that there is a **checkmark** beside the graphic/spatial option that you want to be considered the default geometry (especially if you chose more than one option).

Click **Next**.

Under *Feature Definition Attributes, Available attributes*: **highlight** at least one of the following (this defines what elements are considered part of the feature that you are defining):

Level	Puts all elements that meet the level criteria into this feature class
Color	Puts all elements with a certain color into this feature class (should be used with the level attribute).
Style	Puts all elements with a certain style into this feature class (should be used with the level attribute).
Type	Puts all elements with a certain type into this feature class (should be used with the level attribute).
Weight	Puts all elements with a certain weight into this feature class (should be used with the level attribute).

and then click the **">" arrow button**.

Click **Next**.

In the *Enter feature definition attribute values* dialog box, each feature that was picked in the previous step shows up in the Graphic attributes column. Position your cursor in the **Value** column and click on the left mouse button. When the cursor appears, enter the values associated with the element located in the Graphic Attribute column of the same row. For example, in the level row, enter the level number in the value column that the feature in question is located on.

Click **Next**.

In the *Maps, Available maps*: section, highlight all the maps that either contain this feature or that you want associated with this *.csd file, and then click the **">" arrow button**.

Click **Finish**.

Repeat these steps for any other feature that you would like displayed in GeoMedia. It is possible to put elements from more than one level in the feature class that is being

defined. To do this, instead of entering one number in the value field, enter as many as you want by listing like this: 1-5 or 1, 2, 3, 4, 5 or 1-4, 7, 8, etc.

When you are finished defining all the features, click the **X** in the top right corner or go to **File>>Exit**.

When asked to save file, select **yes**, and save the file to a directory (preferably were the project is located).

Connecting to a CAD warehouse

Select **Warehouse>>New Connection**

In the **Connection Type** box, select **CAD** and then **click** on **Next**

Type in a name for your CAD connection
Browse for the .csd you just created
Type in a description for the connection (optional)
Click on **Next**

Select *Access all features in the warehouse*
Click on **Next**

Select *Let the wizard open the connection as read-only*
Click on **Finish**

The CAD features can then be added using the **Legend>>Add Feature Class**. Take note that no attributes exist on CAD features, so no query capability is available, but otherwise the features can be used just as any other GeoMedia feature.