SHORELAND MANAGEMENT GIS TRAINING EXERCISE
Blue Lake, Oneida County, Wisconsin

October 1999
Updated Spring 2003
Updated Spring 2005
Updated Spring 2007

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Overview of Exercise

The purpose of this exercise is to examine the capabilities of the ArcGIS 9.2 desktop GIS software and use these concepts to construct a functioning shoreland management GIS application "from scratch" using primarily local government-generated spatial data. The GIS application that will be developed as part of this exercise is focused on Blue Lake in northwest Oneida County near Minocqua, Wisconsin.   The three sections of the exercise include:

1. Import and integration of the local government spatial data used in the exercise;
2. Analysis of assessed value and property ownership patterns around the lake;
3. Review and analysis of shoreland zoning regulations impacting the lake;

The GIS software functionality that will be utilized includes data import and integration, image interpretation, linkage of attribute data with spatial data sets, thematic mapping, spatial query and analysis, customizing graphical user interfaces, incorporating external programs (scripts), and inter-application connectivity.   The Shoreland Management GIS training exercise reinforces concepts learned in the Introduction to ArcView training course developed by Environmental Systems Research Institute (ESRI) of Redlands, California.

Acknowledgments

Much of the background information on lake management and rural zoning in Oneida County was extracted from a DNR Lake Protection Grant proposal for shoreland zoning compliance assessment prepared by Oneida County staff.   Bryan Pierce, the Vilas County UW-Extension CNRED Agent and John Czarnezki, formerly the Oneida County UW-Extension CNRED Agent both provided information on shoreland zoning concerns in the northern lakes district.   The spatial data sets used in the application come from a variety of sources.   Planimetric and parcel data were obtained from Mike Romportl, the Oneida County Land Information Officer.   Another version of the parcel map was digitized by staff of the Land Information and Computer Graphics Facility (LICGF) from paper maps.   Digital wetland maps were obtained from the Wisconsin Department of Natural Resources.   Digital orthophoto quarter quads (DOQQs) were produced by the U.S. Geological Survey and obtained from the Ken Lubich in the Madison office of the Natural Resource Conservation Service.   Digital raster graphs (DRGs) were obtained from Lance Perry in the BIM/GEO section of the Wisconsin Department of Natural Resources and represent another U.S. Geological Survey product.   The tax roll, sanitary, and permit attribute files were provided by Lynn Grube of the Oneida County Data Processing Department.   The septic tank point data set was created specifically for the exercise to show an example of septic system maintenance notification and is completely fictitious.   Photo images of Blue Lake were taken in October 1996 by David Hart of UW-Madison LICGF.   Finally, a digital copy of the Oneida County Zoning and Shoreland Protection Ordinance was obtained from John Czarnezki and developed into a Windows help file using RoboHelp 3 from Blue Sky Software of LaJolla, California. The desktop GIS software utilized in this exercise, ArcView 3.1, is a product of

Environmental Systems Research Institute (ESRI) of Redlands, California.

Background

Oneida County is part of the northern temperate lakes district of Wisconsin and Michigan, a region characterized by one of the highest concentration of inland lakes in the world.   Oneida County contains 426 named and 701 unnamed lakes.   The total surface area of the county is 779,235 acres.   Of this, 74,415 acres (10.5 percent) is water. Important research in the early development of the field of limnology was conducted in the region and the area is known as the "cradle of limnology."

Development Pressures.   Development in Oneida County has increased over the past several decades.   There has been a boom in construction of both seasonal recreational homes and permanent residences.   The number of new building permits has increased from 1,112 in 1989 to 1,643 in 1993.   A total of 825 new sanitary permits were issued in 1993, up from 557 in 1989.   Much of the new construction activity has taken place on lakefront property.   Of the single family homes constructed in 1993, 52 percent were on lakefront properties.   The 1990 census indicates that 11,263 of 25,173 total housing units in the county (45 percent) are seasonal.   Developable lakefront property is becoming scarce and, as a result, shoreside property values have risen dramatically.

Commercial development is also active in Oneida County.   The county is a major tourism destination, with over 300 lodging facilities offering approximately 3200 rooms; 37 campgrounds with over 1500 total campsites; and seventeen recreation camps serving approximately 2,800 people.   Lodging occupancy information and visitors surveys indicate that Oneida County serves an average summer seasonal population of over 55,000 people, which is almost double the 1990 permanent population of 31,679.

The History of Rural Zoning in Oneida County.   In May 1933, Oneida County enacted the first comprehensive rural zoning ordinance in the United States.   In the early 1930's, most northern Wisconsin counties were facing financial difficulties stemming, in part, from difficulties in converting cut-over forest lands to agriculture.   The purpose of the rural zoning ordinance was to restrict settlement in remote areas.   The Oneida County Board of Supervisors was concerned about the high costs of transporting school children and the construction and maintenance of roads in remote areas.   The ordinance eventually became a model for other counties in Wisconsin and promoted the creation of county forest preserves across northern Wisconsin.

Since that time, the nature of zoning in rural Oneida County has changed.   The County adopted a Shorelands Protection Ordinance in November 1970 based on state enabling legislation.   The ordinance has since been revised several times.   It is now identified as the Oneida County Zoning and Shorelands Protection Ordinance. Amendments to the ordinance include provisions on mining, signage, non-conforming structures, and placement of mobile and manufactured homes.

Protecting Water Quality and Aesthetics.   Given the increasing development

pressure in the county and the fact that much of the new development is located on the county's fragile lake ecosystems, regulation of shoreland development is very important. Failing septic systems, construction site soil erosion, runoff of lawn fertilizers, and other sources represent non-point sources of pollution that impair water quality.   Water quality impairment threatens fish and wildlife habitat and aesthetics.   Various structural violations of the shoreland ordinance requirements may also threaten the water quality and natural beauty of the lake resources.

To address these concerns, Oneida County has initiated a comprehensive revision of the zoning and shoreland protection ordinance.   The overall goals of the project are to improve compliance rates of new and existing shoreland development, and to protect shoreland and lake ecosystem quality.   Funding for the multi-year effort comes from local sources and a state lakes protection grant.   The scope of the project includes: (1) an assessment of shoreland zoning compliance and resource problems; (2) revision of mining provisions in shorelands and floodplains; (3) comprehensive revision of the zoning and shoreland protection ordinance to improve its administration; (4) community education on the revised regulations; and (5) creation of a program to monitor and enforce the revised ordinance.

Spatial Information Technologies for Enforcement of Shoreland Zoning.   Oneida County has an active land records modernization program and is exploring methods to incorporate GIS/LIS technology to assist in administration and enforcement of the zoning and shoreland protection ordinance.   Specific activities include creation of digital parcel maps, development of parcel identification numbers (PINs) to link property attributes to the parcel map, development of digital orthophotos on a regular time frame, incorporation of aerial or boat-based videography to help detect property changes and zoning violations. Oneida County has contracted with the Land Information and Computer Graphics Facility (LICGF) at the University of Wisconsin-Madison to provide technical assistance, database development, and training to support develop a GIS-based monitoring system for long-term enforcement and evaluation of the ordinance.

Section 1. Data Input and Integration
*Estimated time: 45 minutes*

In this section, you will start a new ArcMap document, input a variety of spatial data sets, including buildings, hydrography, parcels, scale-corrected aerial photographs (orthophotos), and scanned USGS topographic maps (digital raster graphics), and manipulate the appearance and properties of these data sets. All your data sets should be on the C drive in a subdirectory named c:\coastgis\bluelake.

Create an ArcMap Document.

Start the ArcMap program by double clicking the ArcMap icon on the computer desktop or by selecting the ArcMap program from the ArcGIS programs folder in the Start menu. At the start-up dialog box, chose to start using ArcMap with **a new empty Map**.

From the **File** pull-down menu, choose **Document Properties…** type in your name as the Author and fill in other information of the map document.

From the **View** pull-down menu, choose **Data Frame Properties…** In the Data Frame Properties dialogue box, click **General** tab, and change the name from "Layers" to "Data Integration Frame." Then click **Coordinate System** tab. In the **Select a coordinate system** box, click **Predefined** item to expand the sub items. Click **Projected Coordinate Systems**, **County Systems**, and then **Wisconsin CRS** item. Choose "**NAD 1983 HARN Wisconsin CRS Oneida (US feet**)" coordinate system (the data are in Oneida County Coordinates which is a coordinate system based in feet). Click **OK**. Note the change in your ArcMap window.
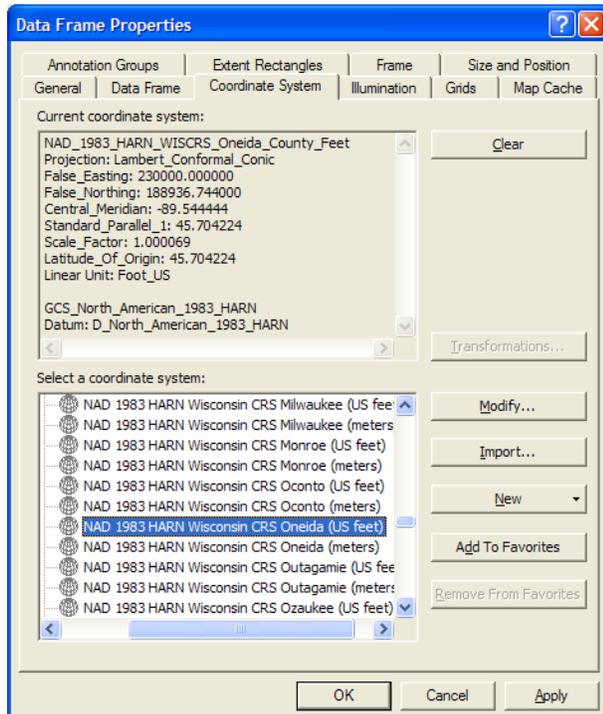
From the **File** pull-down menu, choose **Save**. Navigate to the c:\coastgis\bluelake subdirectory and save the map file as "bluelake.mxd". Click **OK**.

> An ArcMap document file is assigned the extension ".mxd". An ArcMap document can contain multiple data frames, database tables, and a map layout. For this shoreland management training exercise, all of your work will be saved in a single ArcMap document. Remember to save your work frequently. Use the disk button on the far left side of the interface. If your computer crashes, and you have recently saved your document, it will be very easy to return to where you left off simply by opening the document. If you do not frequently save your project and the computer crashes, you will lose any changes made since your last save.

Add Feature Data Files to the Data Frame.

Click the **Add Data** button to add data files as layers into your Data Frame. In the Add data dialog box, for Data Source type, make sure **Datasets and Layers** is selected. Navigate to the c:\coastgis\bluelake subdirectory. Locate and highlight the following data files. You can select multiple data files by holding the "Ctrl" or "Shift" key while making your selection. When all the files listed below are selected, click **OK**.

> 1. Bl_water.shp (hydrography polygons)
> 2. Bl_parcl.shp (parcels polygons)
> 3. Bl_bldgs.shp (building outlines polygons)
>
> The data files are ESRI shapefiles(*.shp) located in the c:/coastgis/bluelake subdirectory (or in the alternate subdirectory specified by the instructor). Many different formats of spatial data may be imported into ArcMap, including ArcINFO coverages, AutoCAD DXF and DWG files, and Intergraph files.

Once the data files have been inserted into the Data Frame. Make sure each of the layers is visible by clicking on the box in front of each layer.

> A layer is the name given to a spatial data file imported into ArcMap. Layers are displayed in the View based on the order they appear in the Table of Contents (i.e. layers on the top of the Table of Contents are displayed over the other layers in the View). To change the display order of layers, click on the layer name to make it active and drag it to a new position on the Table of Contents. The **active layer** is the layer that is "selected" (a blue background rectangle) in the Table of Contents. It is important to note which layer is active, as many ArcMap functions are performed on the active theme.

Reorder the layers in the Table of Contents to place Bl_bldgs at the top of the Table of Contents, followed by Bl_water, and Bl_parcl.

Modify Layer Properties.

Make the Bl_bldgs (building outlines) layer active. When a layer is first created, it is displayed in a random color. This color can be changed. You can change individual layer symbols by changing the **Symbology** of layer properties. You will change the symbology to make the buildings red. In the Table of Contents, right-click on bl_bldgs and click **Properties…** to bring up the Layer Properties dialog box (a short-cut is to double click on the layer in the Table of Contents).

To change the color, first click the **Symbology** tab. In **Show** box, make sure the **Single symbol** sub item of **Features** is selected. Click the big color button in the **Symbol** frame. This brings up the **Symbol Selector** (a short-cut is to double-click on the symbol for the bl_bldgs layer). Choose an appropriate bold shade of red from the scrolling box on the left, which contains predefined symbols. Or define your own symbol by changing the **Options** and **Properties…** Click **OK** in the Symbol Selector dialog box and Layer Properties dialog box.

It is often important to change the name of a layer to have it describe more clearly the information you are displaying in the View. We will use layer properties to change the layer name to "Buildings." In the table of contents, right-click on Bl_bldgs layer and click Properties… In the Layer Properties dialog, click the **General** tab. To rename the layer, highlight the **Layer Name** input box and type in "Buildings", then click OK. otice that the new layer name is now displayed in the Table of Contents.

Make the Bl_water (hydrography) layer active. In some cases, we will want to only display a subset of the spatial features in a particular layer. In this case, there is an island in Blue Lake that should not be displayed as water. You will use layer properties to build a query to select only where 'land_wat = W' and to change the layer name to "Water." You can define selection criteria using the Query Builder to display a subset of the theme features.

In the Table of Contents, right-click on Bl_water and click **Properties…** You are now in the Layer Properties dialog box and you want to build a query that selects a subset of the 'water' layer.

In the Layer Properties dialog box, click **Definition Query** tab, and then press the **Query Build…** button. In the Query builder, from the Fields list, double-click **"Land_Wat"** -- this now appears in the expression box. Next, you want to set this equal to a value (click once on the '=' sign). Click **Get Unique Values** button. From the **Unique Values** list, double click **'W'** to set the expression equal to 'water.' Click **OK** on the Query Builder. Before exiting Layer Properties dialog, click **General** tab, and change the **Layer Name** to 'Water'. Click **Symbology** tab to make the water blue. Click **OK**. Close out of Layer Properties dialog box. Note that when the map view is re-drawn, only those features which are water are displayed.
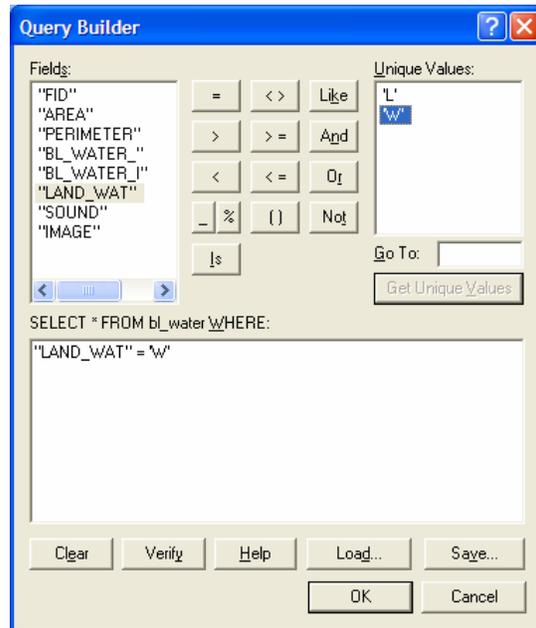
Make the Bl_parcl (parcels) layer active. The parcel data set includes lakes and other areas that have not been assigned a parcel identification number. We will want to exclude these from the layer.

Use the Query Builder in Definition Query page in Layer Properties to build a query to select only the parcels where the field Parcel_id is not equal to "Blue Lake", "Papkee Lake", or a blank value. The query should read **("Parcel_id" <> 'Blue Lake') and ("Parcel_id" <> 'Papkee Lake') and ("Parcel_id" <> '').** Note: '<>' denotes "not equal to." When the query is entered correctly (as in the figure below), click **OK**.
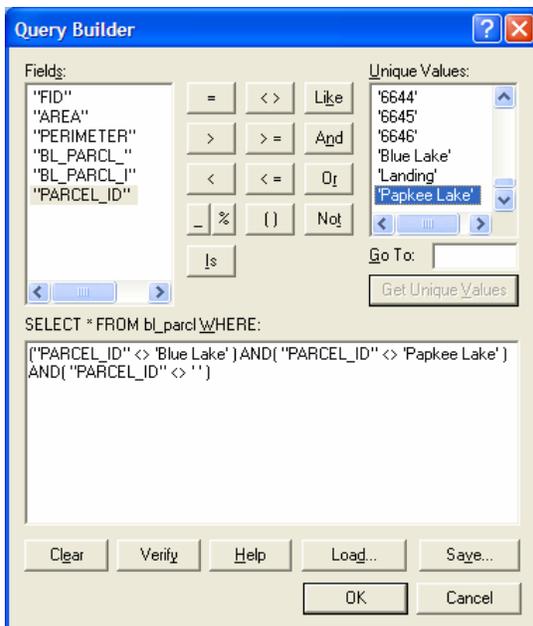
While in Layer Properties, change the layer name to "Parcels."

Use the Symbol Selector to make the parcels light gray.

While in the Data Integration Frame, use the measurement tool to examine the distance across the lake in different directions. The measurement tool utilizes the distance units set in Data Frame Properties. The distances are displayed at the bottom left of the ArcMap status bar. To stop measuring, double-click in the View or press **Esc** on your keyboard. For your information, Blue Lake is approximately 445 acres in size.

As mentioned previously, it is always a good idea to save your project on a regular basis. Now is a good time.

Add Image Data Files to the Data Frame.

The buildings, water, and parcels datasets are termed feature data sources in ArcMap. Feature data sources are made up of points, lines, and polygons, and are often referred to as vector data in the GIS lingo. ArcMap can also import image data. Image data are made up of arrays of "pixels" (picture elements) or "grid cells". In this section, you will import digital orthophotos (scale-corrected aerial photographs) and Digital Raster Graphs (scanned USGS 7.5' topographic maps). The image files are in the TIFF file format (*.tif) with a TIFF world file (*.tfw) to give information about the placement of the image with reference to the Oneida County coordinate system.

Choose the **Add Data** icon. Choose blueedoq.tif, bluewdoq.tif, blueedrg.tif and

bluewdrg.tif (hold the shift key down to select both files at the same time). Click **Add**. If ArcMap pops up a dialog asking you to create pyramids for the image files, click **Yes** and let it create pyramids. Pyramids allow for rapid display at varying resolutions.
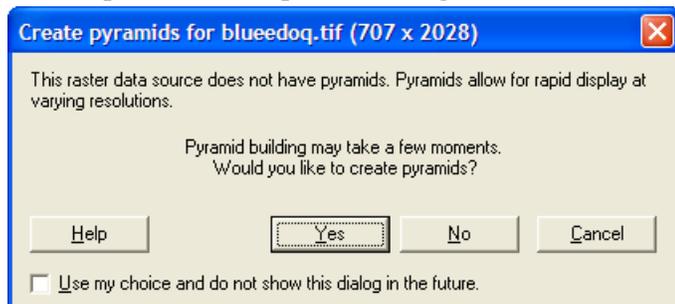
Drag the newly added themes to the bottom of the table of contents if they are not in the bottom and make the Building, Water, and Parcels layer invisible (uncheck the box in front of the layer). Make the bluewdoq.tif layer visible.

Zoom into the bay in the northwest corner of Blue Lake. Select the **Zoom In** icon. Make a box around the bay by pointing to the upper left corner of the bay and holding down the left mouse button to draw a box to the lower right corner of the bay.

Note the features in the bay. Note the black linear feature on the west side of the bay and the radial fan pattern in the center of the bay. Any ideas what might cause that? (It might help if we knew the date of the photography.) Make the Building layer visible. Can you see any buildings that are not included in the Building layer? Can you be sure they are buildings? Note what appears to be a dock on the north shore of the bay. Digital orthophotos make an interesting backdrop for the feature (vector) data.

The **Zoom To Layer** function in the right-click menu of a layer in the Table of Contents can be used to zoom the View to the extent of the selected layer. Right-click on the bluewdoq.tif layer and click on the **Zoom To Layer**.

The Digital Raster Graphs (DRGs) are a product of the US Geological Survey. They are scanned versions of the 7.5' topographic quads. They are often several years out-of-date, based on the most recent revision of the topo sheet.

Make the bluewdrg.tif and bluewdoq.tif layers visible and all other layers invisible. Make sure the bluewdrg.tif layer is on top of the bluewdoq.tif layer in the Table of Contents. Double-click on the bluewdrg.tif layer to activate the **Layer Properties** Dialog. Click **Symbology** tab. In **Show** box, select **Unique Value**s. Double-click on the following DRG symbols (0,1,2,3,5,6,7,8) to make them transparent (change the color to **No Color**) and change the color of value 4 to bright yellow. When finished, click **Apply** in the **Layer Properties** dialogue box. This allows contour lines to be displayed in bright yellow over the digital orthophoto. You have created a "quick and dirty" contour map and can better visualize the topography of the area. Explore how the contours look at different map scales. Manipulating digital orthophotos and DRGs can create many interesting maps that can be used for assessment of development around lakes at the regional scale.
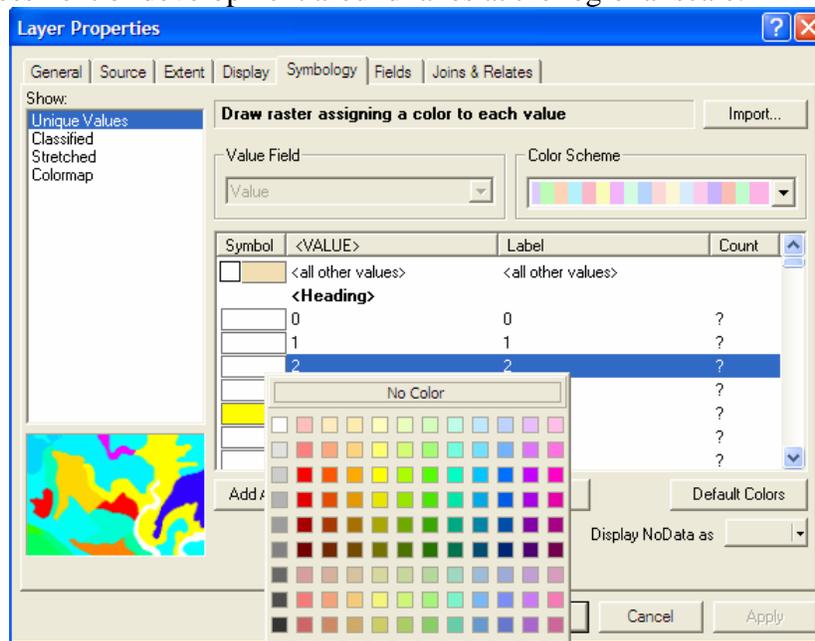
Click **OK** to close the Layer Properties dialogue box.
Make the Building, Water, and Parcels layers visible and all other layers invisible.

The **Full Extent** button can be used to zoom the View to the extent of all layers. Click on the **Full Extent** button.

Time to save your document. As you go along, saving your document should become second nature.

Section 2. Thematic Mapping of Parcel Attributes
Estimated time: 45 minutes

In this section, you will join tax roll data to the parcel map through the use of a unique parcel identification number (PIN). You will then be able to display and analyze patterns of assessed value and property ownership.

Create a new Data Frame.

You will create a new Data Frame for this section. From the **Insert** pull-down menu, choose Data Frame. A **New Data Frame** will be created in the bottom of the Table of Contents and the view will become empty. Make sure the **New Data Frame** is active by choosing activate in the right-click menu of the frame. Use **Data Frame Properties…** from the view pull-down menu (or the right-click context menu of the frame) to change the name to "Tax Roll Data Frame" and set the map coordinate system to "**NAD 1983 HARN Wisconsin CRS Oneida (US feet)**".

You can copy and paste layers between Data Frames, preserving the colors and properties of the original layer. In the ArcMap Table of Contents, select the Buildings, Water, and Parcels layers in the Data Integration Frame.

> In order to make multiple layers selected, simply hold down the "Ctrl" or "Shift" key and select each layer. All selected layers should be highlighted.

Right-click on one of the selected layers. On the context menu, click **Copy**. In the Table of Contents, right click on the **Tax Roll Data Frame**. On the context menu, click **Past Layer(s)**. Click the minus sign in front of the Data Integration Frame to collapse the layers. You will only use the Tax Roll Data Frame in this section. Make sure the Tax Roll Data Frame is active.

Join the Tax Roll database to the Parcels layer.

For each layer added to a data frame, there is an associated attribute table with descriptive information. You will begin by examining the existing attributes of the **Parcels** layer. In the Table of Contents, right-click the **Parcels** layer and click **Open Attribute Table**. When the table opens, scroll through the table, and review the fields.

Close the Parcels table.

Next, you will need to add the tax roll database file to the ArcMap document. On the standard toolbar, click the **Add Data** button. In the Add Data dialog, navigate to c:\coastgis\bluelake and select the **taxroll96.dbf**, then click **Add**. The taxroll96 table is added to the table of contents.

> When a table is added to a map, the tab at the bottom of the table of contents switches from Display to Source, showing tables and paths to layers.

In the table of contents, right-click the **taxroll96** table and click **Open**. When the table opens, take a moment to scroll through the table and review the fields.

> One of the more useful capabilities of desktop GIS is the ability to view and analyze the spatial patterns of information stored in relational databases. A "join" is a way to match and append records between two tables through a common identifier. In performing the join operation, the taxroll96.dbf file will be your source table, and the Attributes of Parcel table will be your destination table.

Close the taxroll96 table. In the table of contents, right click on the **Parcels** layer. On the context menu, point to **Joins and Relates**, and then click **Join…** A **Join Data** dialog will pop up. In the drop-down list at the top of the Join Data dialog, make sure "Join attributes from a table" is selected. In drop-down list number 1, click the drop-down arrow and click **PARCEL_ID**. This specifies PARCEL_ID as the common attribute in the Parcels Table. In drop-down list number 2, click the drop-down arrow and click **taxroll96**. In number 3, click the drop-down arrow and click PARCEL_ID. This specifies PARCEL_ID as the common attribute in the taxroll96 table. Click **OK**.

Finally, the **taxroll96.dbf** source table is now "dynamically" joined with the Attributes of Parcels destination table.
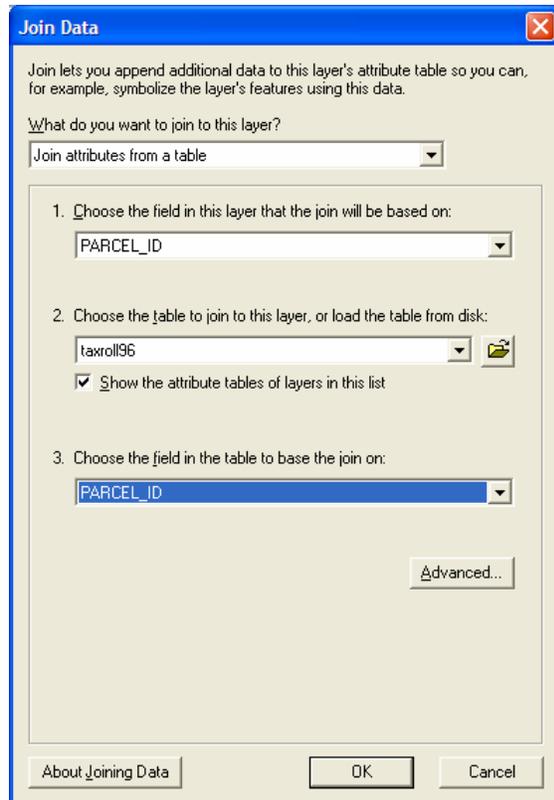
Before opening the Parcels table, you should remove the **Definition Query** of the Parcels layer (from Layer Properties), because there is a bug in ArcMap.

After empty the Definition Query, in the table of contents, right-click the Parcels layer and click **Open Attribute Table**. Note the fields in the joined table.

Display Assessed Value of the Land from the Tax Roll Database.

Close the Attributes of Parcels table. Make sure the Tax Roll Data Frame is active. Double-click the Parcels layer to open the Layer Properties dialog. Click the **Symbology** tab.

In the **Show** box, click **Quantities**, and then choose **Graduated Color**. In the **Fields** frame, click the **Value** drop-down arrow and click **taxroll96.TOTAL_LAND**. In the **Classification** frame, click **Classify**… button to open the classification dialog. Make sure

Natural Breaks (Jenks) is selected in **Method** drop-down list and change the **Classes** to 4. In **Data Exclusion** frame, click **Exclusion…** button to open the **Data Exclusion Properties** dialog. The **Query** page is displayed in default. In the text box, enter the query statement as **("taxroll96.TOTAL_LAND" = 0) OR ("taxroll96.TOTAL_IMP" IS NULL)** to exclude those data. Click **Legend** tab, check the box in front of **Show symbol for excluded data**. Click the symbol button to change the color to black. Fill in "No Data" to **Label** text box and click **OK** button to close the **Data Exclusion Properties** dialog and **Classification** dialog.
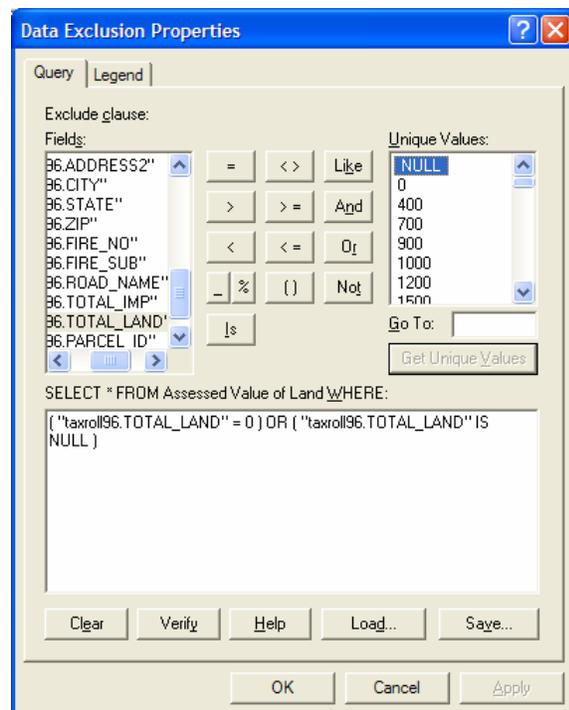
In **Layer Properties** dialog, click **General** tab and change the layer name to **Assessed Value of Land**. Click **OK** to close it.

The no data values in black represent either a zero value in the tax roll database or where a match could not be made between the tax roll database and the Attributes of Parcels table. What could cause matching problems between the two files? Some possibilities could be typographic errors in the unique parcel identification number or subdivision activity that splits or combines parcels and assigns them new PINs. If the digital parcel map and/or the tax roll database are not kept up-todate, the number of matching errors is likely to increase.

Note: There is another bug in ArMap of ArcGIS Desktop 9. The map view doesn't display the parcels whose **taxroll96.TOTAL_LAND** value is Null. Only parcels with value 0 are displayed. To solve this problem, you can build a query in **Definition Query** to show all parcels. But avoid using the PARCEL_ID field, which was utilized as the join key. For example, "**bl_parcel.FID > -1**". Then the parcels will be displayed correctly.

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Right click on the Assessed Value of Land layer and click **Copy**. **Paste** it into the Tax Roll Data Frame to make a copy of the layer. Make one of the two copies active. Use Layer Properties to rename the Layer to "Assessed Value of Land/Area". Make this layer visible, while turning off the visibility of the "Assessed Value of Land" layer.

Double-click on the "Assessed Value of Land/Area" layer to invoke the Layer Properties dialog. Click **Symbology** tab. In **Field** frame, modify the **Normalization** drop-down list to "**bl_parcel.Area**". Click **OK** to close the Layer Properties dialog and compare the differences between the two parcel layers.

> Note that many of the large parcels that have a high total assessed value of land are in the lowest category when you examine assessed value per square foot. Also note that the assessed value of the land seems to be highly dependent on the amount of lake frontage. Finally, note that what appear to be fairly similar lakefront parcels on the island actually span a range of assessed values of land per square foot.

Display Out-of-State Ownership from the Tax Roll Database.

From the right-click context menu on the layer, use **Copy** and **Past Layer(s)** to make a copy of the **Assessed Value of Land layer**. Change the layer name of the copy to "Property Ownership". Make the two Land Value layers invisible. Make the new "Property Ownership" layer active and invoke the Symbology page in Layer Properties dialog. In the **Show** frame, select **Categories** and click **Unique Values**. Select "**taxroll96.State**" from the **Value Field** drop-down list.

Click **Add Values** button, select "**WI**" from the list box in Add Values dialog and click **OK**. Click Add Values button again, choose "**IL**" and click **OK**.

In Symbology page in Layer Properties dialog, double-click the symbol in front of the **<all other values>** item and change the color to light green. Make sure the box in front of the symbol is checked. Change the symbol color of "**IL**" to pink and the symbol color of "**WI**" to gray.

Click **Apply** and **OK** button to close the dialog.
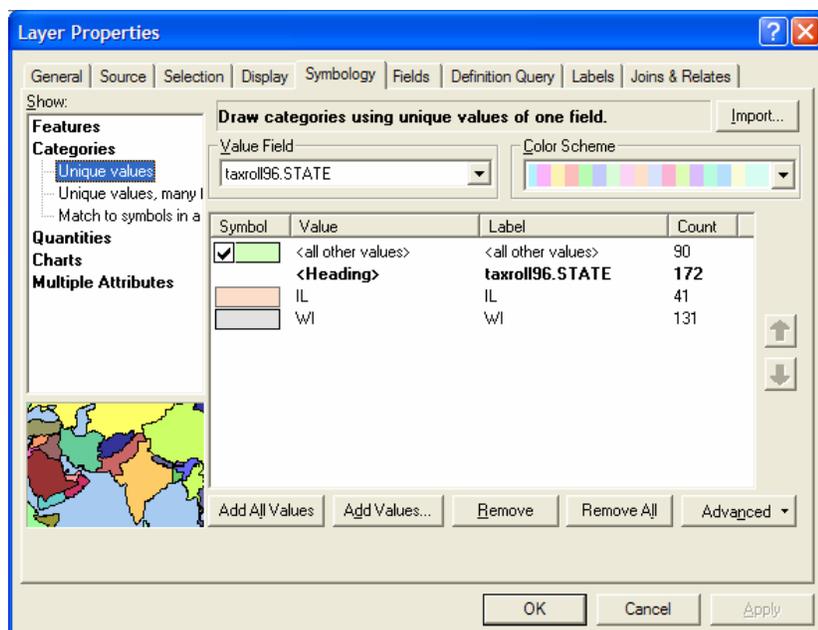
From **Selection** pull-down menu, click **Select By Attributes…** Select **Property Ownership** in the **Layer** drop-down list. Change **Method** to **Create a new selection**. The zip code for the Blue Lake area (Minocqua, Wisconsin) is '54548'. Develop a query **("taxroll96.ZIP" = '54548')** to select all those parcels where the tax bill is sent to the local zip code. Click on **Apply** then close the window. You could assume that most of these are permanent residents on Blue Lake. The selected parcels are outlined in cyan.
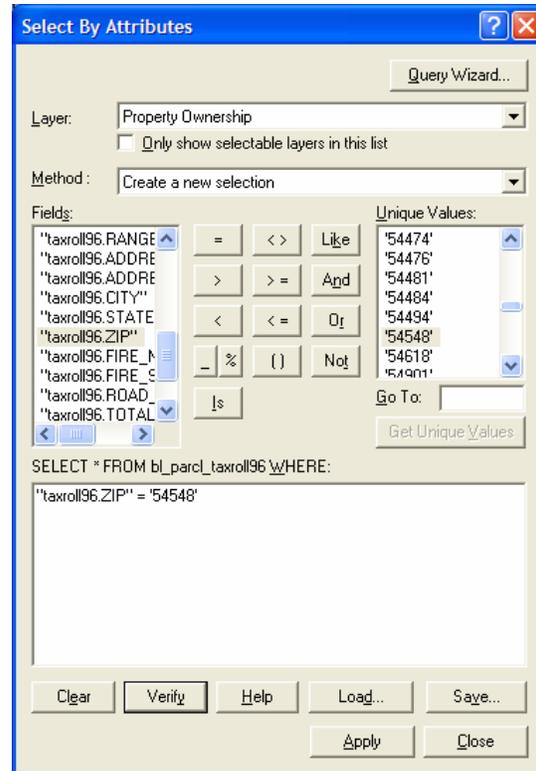
Do you notice any patterns about ownership on the lake? The eastern side of the lake tends to have more out-of-state ownership, while there is more in-state ownership on the western side of the lake. There also seem to be clusters of Illinois residents in certain locations on the lake.

From **Selection** pull-down menu, click **Clear Selected Features** to clear the selection. Save the document again.

Section 3. Spatial Analysis of Shoreland Zoning Regulations
*Estimated Time: 30 minutes*


Part 1. Waterline Setbacks

You will create a new data frame for this section. If you are in the Tax Roll Data Frame, select the **Insert** pull-down menu and choose **Data Frame**. An empty map screen will appear. If not, activate the frame by right-clicking the frame and choosing **Activate**. Use data frame **Properties…** to change the name of the new created data frame to "Shoreland Regulations Frame" and set the map **Coordinate System** to "**NAD 1983 HARN Adj WI Oneida Feet**" (look at section 1 if you forget). Under **Tax Roll Data Frame**, select **Buildings**, **Water**, and **Property Ownership** layers. Right-click on one of these three layers, and click **Copy**. Click the minus sign in front of the **Tax Roll Data Frame** to collapse it. Now right click on the **Shoreland Regulations Frame**, and click **Paste Layer(s)**.

Double-click on the **Property Ownership** layer to invoke the **Layer Properties** dialog and click **Symbology** tab. In the **Show** box, select **Features** and click **Single symbol**. Change the symbol color to light gray. Click **General** tab, and change the layer name to **Parcels**.

Find all the Buildings within 75 feet of the Shore.

The Oneida County Zoning and Shoreland Protection Ordinance specifies a waterline setback of 75 feet for most structures, in most cases. To determine which structures are within 75 feet of the shore, we will use the **Select By Location** command. The Select By Location command creates a new set of features from a layer (the target layer) based on their relationship to another layer (the selector layer). In the **Selection** menu, choose **Select By Location…** You are now in the Select By Location dialog box. In the first drop-down list, choose **select features from** and check the box in front of the Buildings layer (*this is the target layer*). Select **are within distance of** in **that** drop-down list (the second drop-down list). Choose **Water** layer (*this is the selector layer*) in **the features in this layer** drop-down list (the third drop-down list). Enter **75(feet)** for the selection distance. Click Apply. Close the dialog.

Notice that all of the buildings that are within 75 feet of the water are now outlined in cyan. You may need to zoom in to see this.
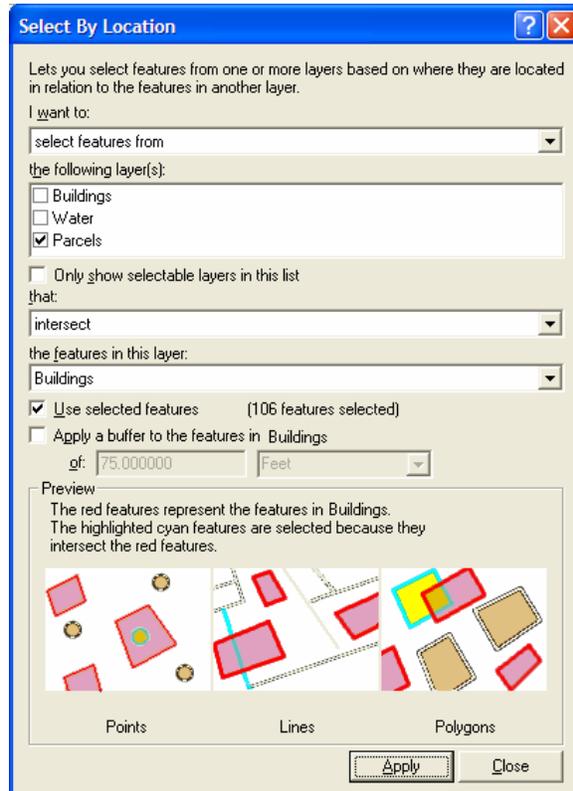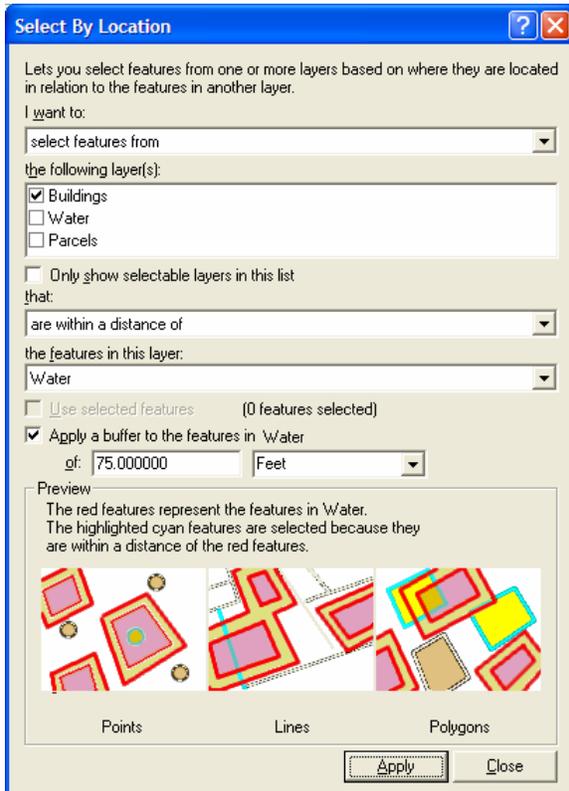
Find Parcels that Contain the Selected Buildings.

There is not much information tagged to buildings, but there are many attributes tied to parcels (e.g. property owner mailing address, site address, and assessed value). In this case, the target layer is set **Parcels**. As previous example, in the **Selection** menu, choose **Select By Location**. Make sure **select features from** is selected in the first drop-down list. Check **Parcels** layer (*the target layer*), and uncheck the other layers. In the second drop-down list you want to select **Intersect**. Next, select **Buildings** (*the selector layer*) in the third drop-down list and check **Use selected features** under the drop-down list. Click **Apply** and close the dialog.

Now, both the parcels and buildings are selected. You can right-click on the **Buildings** layer in the table of contents, point to **Selection** and click **Clear Selected Features**.

> Notice that now the parcels are outlined in cyan. What happens when a structure encroaches on a neighboring parcel? Contemplate what impact errors in spatial data can cause in administration of the shoreland zoning ordinance.
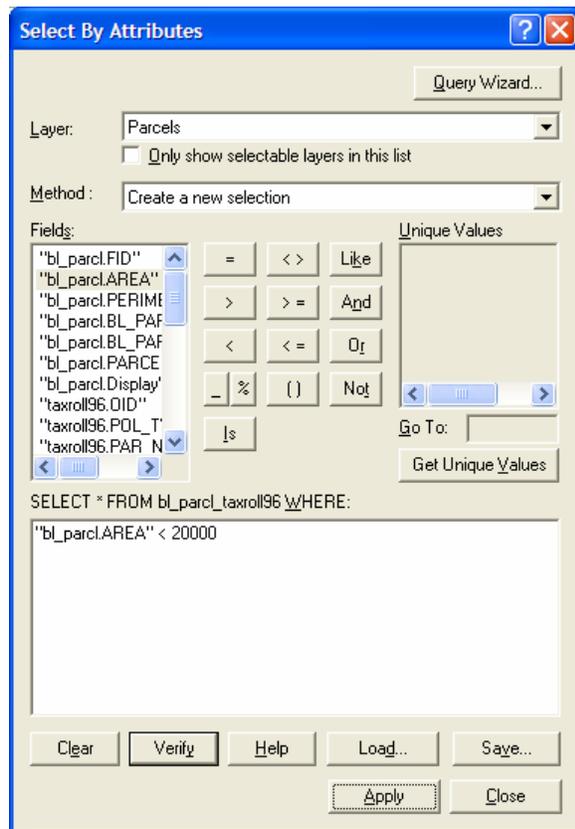
Next, we will save the selected features of parcels as a new layer. Right-click on the **Parcels** layer in the table of contents. In the context menu, point to **Data** and click
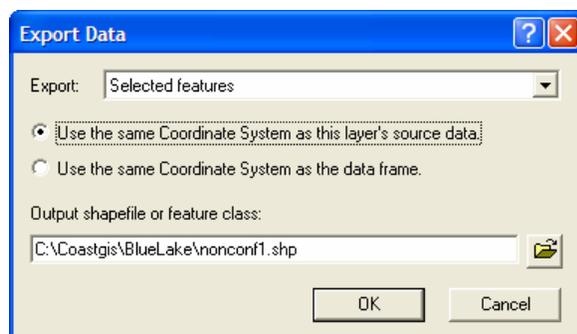
Export Data… In Export Data dialog, choose **Selected features** in **Export** drop-down list and choose **Use the same Coordinate System as this layer's source data**. Fill in the file name with full path as "C:\Coastgis\BlueLake\nonconf1.shp" in the text box. Click **OK**. Select **Yes** when prompted to add the exported data to the map as a layer. Choose **Clear Selected Features** from the **Selection** pull-down menu. Change the name of the new layer to **Nonconforming for Waterline Setback**.

Part 2. Lot Size

The Oneida County Zoning and Shoreland Protection Ordinance specifies a minimum lot size of 20,000 square feet for unsewered lots, in most cases. To determine which parcels fall short of this standard, we will use the **Select By Attributes** command. Choose **Select By Attributes** from the Selection pull-down menu. In the dialog, select **Parcels** in Layer drop-down list and choose **Create a new selection** in Method drop-down list. From the **Fields** list, double-click **"bl_parcl.AREA"** -- this now appears in the expression box. Next, you want to set to a value "less than" 20,000 square feet (click once on the '<' sign). Then, type in **20000** right after the '<' sign. Click **Apply** and close the dialog.

Again, we will save the selected features of parcels as a new layer. Right-click on the **Parcels** layer in the table of contents. In the context menu, point to **Data** and click **Export Data…** In Export Data dialog, choose **Selected features** in **Export** drop-down list and choose **Use the same Coordinate System as this layer's source data**. Fill in the file name with full path as "C:\Coastgis\BlueLake\nonconf2.shp" in the text box. Click **OK**. Select **Yes** when prompted to add the exported data to the map as a layer. Choose **Clear Selected Features** from the **Selection** pull-down menu. Change the name of the new layer to **Nonconforming for Lot Size**.

> Compare the two new layers. Are there any lots that are both nonconforming for waterline setback and lot size?

Evaluation Form

What were the strengths of the Blue Lake Shoreland Management GIS Exercise?

What were the weaknesses of the Blue Lake Shoreland Management GIS Exercise?

How could this GIS training exercise be improved?