

# SHORELAND MANAGEMENT GIS TRAINING EXERCISE

## Blue Lake, Oneida County, Wisconsin

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This GIS training exercise was developed as part of a cooperative venture between the University of Wisconsin Sea Grant Institute and the Land Information and Computer Graphics Facility (LICGF) at the University of Wisconsin-Madison with funding from the National Sea Grant College Program.

### **Overview of Exercise**

The purpose of this exercise is to examine the capabilities of the ArcView 3.2 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 five 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;
4. Notification of property owners concerning septic system maintenance, and;
5. Linkage of scanned photos with map information to aid in zoning enforcement and visual assessment.

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 ArcView project, 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.

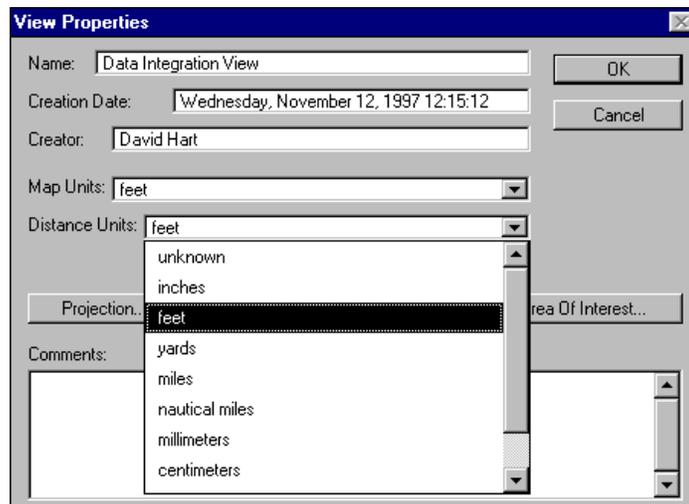
### Create a Project and a View.

Start the ArcView 3.2 program by double clicking the ArcView icon on the desktop or by selecting the ArcView program from the Start menu. At the “Welcome to ArcView GIS” dialog box, chose to create a new project **as a Blank Project**. When the program has loaded, select the **Project** pull-down menu and choose **Properties**. In the dialog box, type c:\coastgis\bluelake (or the directory specified by the instructor) as the Work Directory instead of \$HOME. Select **OK**.

Make sure the **View** icon is highlighted in the project window and click the **New** button. An empty view screen will appear entitled **View 1**.

Enlarge both the ArcView project window and the View1 window by using the maximize window button in the upper right corner of the window.

From the **View** pull-down menu, choose **Properties...** In the View Properties dialogue box, change the name from “View1” to “Data Integration View.” Type in your name as the creator. Set the map units to **feet** (the data are in Oneida County Coordinates which is a coordinate system based in feet). Set the distance units to **feet** (this will allow you to make distance measurements in feet). Click **OK**. Note the change in your View window.



From the **File** pull-down menu, choose **Save Project**. Navigate to the c:\coastgis\bluelake subdirectory and save the project file as “bluelake.apr”. Click **OK**.

An ArcView project file is assigned the extension “.apr”. An ArcView project file is an ASCII file that sets the various properties and configurations of your individual ArcView project. An ArcView project can contain multiple views, map layouts, and database tables. For this shoreland management training exercise, all of your work will be saved in a single project. 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 project, it will be very easy to return to where you left off simply by opening the project. 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 View.



Click the **Add Theme** button to add data files as themes into your view. In the Add Theme dialog box, for Data Source type, make sure **Feature Data Source** is selected. Locate and highlight the following data files. You can select multiple data files by holding the “Shift” key while making your selection. When all the files listed below are selected, click **OK**.

1. BL\_water (hydrography polygons)
2. BL\_parcl (parcels polygons)
3. BL\_bldgs (building outlines polygons)

The data files are ArcView shapefiles 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 ArcView, including ArcINFO coverages, AutoCAD DXF and DWG files, and Intergraph files.

Once the themes have been inserted into the View, make each of the themes visible by clicking on the box in front of each theme.

A theme is the name given to a spatial data file imported into ArcView. Themes are displayed in the View based on the order they appear in the Table of Contents (i.e. themes on the top of the Table of Contents are displayed over the other themes in the View). To change the display order of themes, click on the theme name to make it active and drag it to a new position on the Table of Contents. The **active theme** is the theme that is “raised” (surrounded by a shadow) in the Table of Contents. It is important to note which theme is active, as many ArcView functions are performed on the active theme.

Reorder the themes 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 Theme Properties.

Make the BI\_bldgs (building outlines) theme active. When a theme is first created, it is displayed in a random color. This color can be changed. You can change individual theme symbols by using the legend editor and symbol palette. You will use the legend editor to make the buildings red. From the **Theme** pulldown menu choose **Edit Legend** to bring up the Legend Editor (a short-cut is to double click on the theme in the Table of Contents). The Legend Editor dialog box should indicate that the BI\_bldgs theme is currently active.



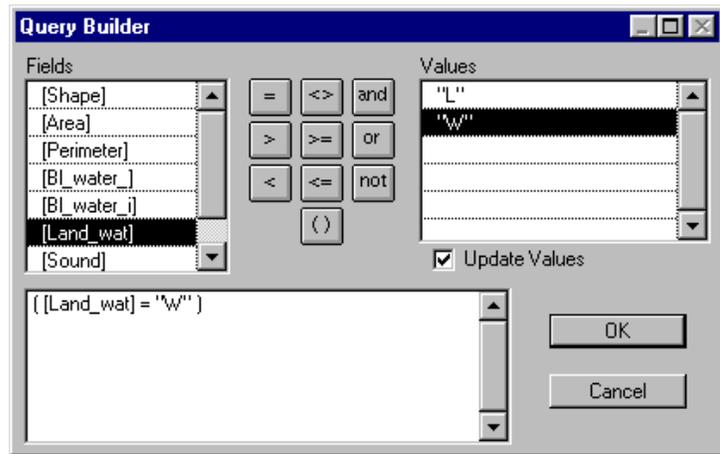
To change the color, double-click the color in the **symbol box**. This brings up the Fill Palette. Click the **Color Palette** button (displayed icon). Scroll through the colors in the Color Palette window and choose an appropriate bold shade of red. Click **Apply** in the Legend Editor to apply your changes to the Table of Contents and the map display. Close the Color Palette and Legend Editor by clicking the “X” (close window button) in the upper right corner of the window.

It is often important to change the name of a theme to have it describe more clearly the information you are displaying in the View. We will use theme properties to change the theme name to “Buildings.” First, make the BI\_bldgs theme active. To change the theme name, select the **Theme** pull-down menu and highlight **Properties**. You are now in the Theme Properties dialog box. To rename the theme, highlight the **Theme Name** input box and type in “Buildings”. Click **OK**. Notice that the new theme name is now displayed in the View’s Table of Contents.

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

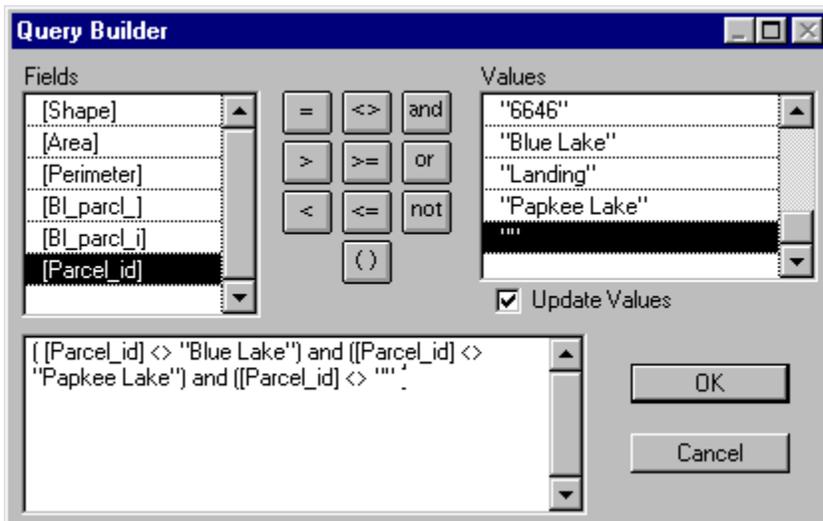
From the **Theme** pull-down menu, highlight **Properties...** You are now in the Theme Properties dialog box and you want to build a query that selects a subset of the ‘water’ theme.

 Select the **Query** 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). From the **Values** list double click **"W"** to set the expression equal to 'water.' Click **OK** on the Query Builder. Before exiting, change the **Theme Name** to 'Water'. Click **OK**. Close out of Theme Properties dialog box and make the view screen active. Use the legend editor to make the water blue. Note that when the View is re-drawn, only those features which are water are displayed.



Make the **Bl\_parcl** (parcels) theme 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 theme.

Use the Query Builder in Theme 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), select **OK**.



While in Theme Properties, change the theme name to "Parcels."

Use the legend editor to make the parcels light gray.



While in the Data Integration View, use the measurement tool to examine the distance across the lake in different directions. The measurement tool utilizes the distance units set in View Properties. The distances are displayed at the bottom left of the View window. To stop measuring, click in the blank gray area to the right of the buttons above the View. 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 View.

The buildings, water, and parcels datasets are termed feature data sources in ArcView. Feature data sources are made up of points, lines, and polygons, and are often referred to as vector data in the GIS lingo. ArcView 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 Theme** icon. Select **Image Data Source** under **Data Source Type**. Choose blueedoq.tif, bluewdoq.tif, bluedrg.tif and bluewdrg.tif (hold the shift key down to select both files at the same time). Drag the newly added themes to the bottom of the table of contents and make the Building, Water, and Parcels theme invisible (remove the check from the box in front of the theme). Make the blueedoq.tif theme 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 theme visible. Can you see any buildings that are not included in the Building theme? 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 Active Theme(s)** button can be used to zoom the View to the extent of the active theme. Make the bluewdoq.tif theme active and click on the **Zoom to Active Theme(s)** button.

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 `bluedrg.tif` and `bluedoq.tif` themes visible and all other themes invisible. Make sure the `bluedrg.tif` themes are on top of the `bluedoq.tif` themes in the Table of Contents. Double-click on the `bluedrg.tif` theme to make the theme active and to activate the **Image Legend Editor**. Select the **Colormap** button.

Make the following DRG layers transparent (0,1,2,3,5,6,7,8) and change the color of layer 4 to bright yellow. The transparent selection is in the upper left corner of the Color Palette (the white box with the x in it). When finished, click **Apply** in the **Image Colormap** 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.

Close the Color Palette, Image Colormap, and Image Legend Editor windows.

Make the Building, Water, and Parcels themes visible and all other themes invisible.



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

Time to save your project. As you go along, saving your project 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 View.

You will create a new View for this section. Start by making sure you are in the main project window. If you are in the Data Integration View, select the **Window** pull-down menu and choose the current project near the bottom (bluelake.apr). Make sure the **View** icon is highlighted in the project window and click the **New** button. An empty view screen will appear entitled **View 1**. Use **Properties...** from the **View** pull-down menu to change the name to “Tax Roll Data View” and set the map and distance units to **feet**.

You can copy and paste themes between Views, preserving the colors and properties of the original theme. Use the **Window** pull-down menu to move to the Data Integration View. Make the Buildings, Water, and Parcels themes active.

In order to make multiple themes active, simply hold down the “Shift” key and select each theme. All selected themes should be surrounded by a raised box.

Select **Copy Themes** from the **Edit** pull-down menu. Now move to the Tax Roll Data View, select **Paste** from the **Edit** pull-down menu.

### Join the Tax Roll database to the Parcels theme.



For each theme added to a view, there is an associated attribute table with descriptive information. You will begin by examining the existing attributes of the **Parcels** theme. Click the **Parcels** theme to make it active. From the **Theme** pull-down menu, select **Tables** (or click the **Open Theme Table** button). When the table opens, maximize the screen, scroll through the table, and review the fields.

Next, you will need to add the tax roll database file to the project. The first step is to return to the project window. This is accomplished by selecting the current project (bluelake.apr) under the **Window** pull-down menu. Next, check to make sure you have the **Table Icon** active in the Project window (or alternatively choose **Add Table...** from the **Project** pull-down menu). Click on the **Add** button. In the file browser, move to the **List Files of Type** drop-down list and select **dBASE(\*.dbf)**. Select the **taxroll96.dbf** file. 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.

Make sure both tables are open. The tables are open if you can see them under the Window pull-down menu. Click the title bar of the **taxroll96.dbf** table or select it from the Window pull-down menu to make it the active window. Click on the **Parcel\_id** field title in the **taxroll96.dbf** table; the title bar will be highlighted in a light gray. This will be the common field joining the two tables together. Now, select the **Attributes of Parcels** table from the Window pulldown menu to make it active. This will be the destination table. Click on the **Parcel\_id** field to highlight it.



Finally, click the **Join Button** in the menu bar to execute the function. The **taxroll96.dbf** source table is now “dynamically” joined with the **Attributes of Parcel** destination table. Note the fields in the joined table.

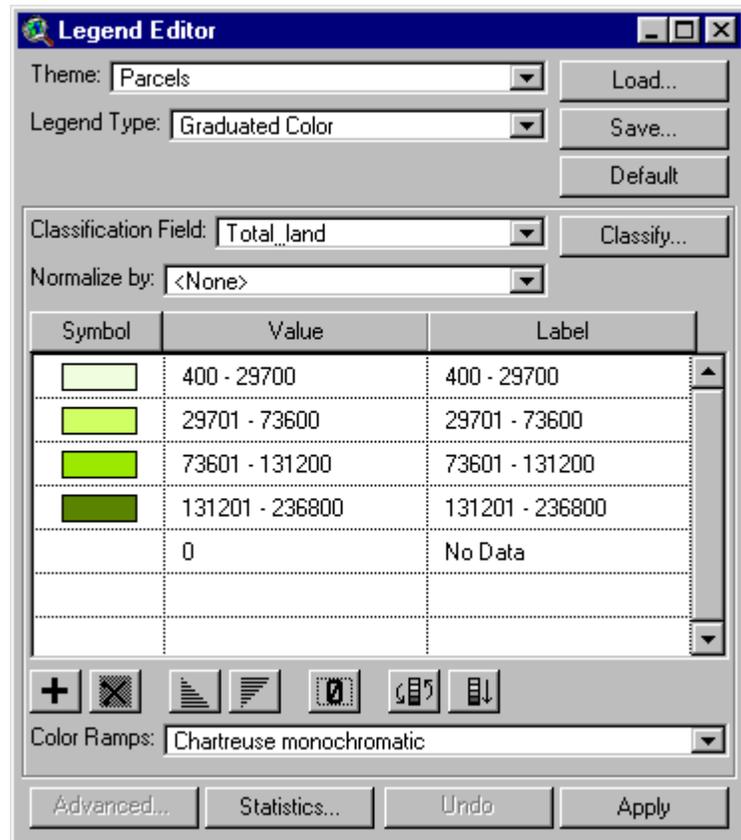
### **Display Assessed Value of the Land from the Tax Roll Database.**

Return to the Tax Roll Data View (using the **Window** pull-down menu). Make sure the Parcels theme is active. Double-click on the Parcels theme to make the Legend Editor active.

Choose **Graduated Color** from the **Legend Type:** drop-down list. Choose **Total\_Land** from the **Classification Field:** drop-down list. It is at the bottom of the list. Select the **Classify...** button. Choose **Natural Breaks** for **Type**. Select **4** for the **Number of Classes**. Click **OK**. Choose **Chartreuse monochromatic** from the **Color Ramps:** drop-down list.

Select the **Null Value button** (it looks like a zero with a slash through it). In the **Null Values dialogue box**, select **Total\_Land** from the **Field** drop-down list and enter the number **0** in the **Null Value box**. Check the box for **Display No Data Class**. Click **OK**.

Double-click on the symbol area next to the 0 value in the No Data class to bring up the Symbol Palette. Under the Color Palette, select a black color for this class. Click **Apply** in the Legend Editor. When finished, close the Legend Editor and the Symbol Palette.



Under the **Theme** pull-down menu, use **Properties** to change the name of the theme to **Assessed Value of Land**. Examine the View.

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-to-date, the number of matching errors is likely to increase.

Use the **Edit** pull-down menu to make a **Copy** of the Assessed Value of Land theme. **Paste** it into the Tax Roll Data View. Make one of the two copies active. Use Theme Properties to rename the theme to “Assessed Value of Land/Area”. Make this theme visible, while turning off the visibility of the “Assessed Value of Land” theme.

Double-click on the “Assessed Value of Land/Area” theme to invoke the Legend Editor. Modify the legend by selecting **Area** under the **Normalize by:** drop-down list. Choose **Apply** to display the data. Close the Legend Editor and compare the differences between the two parcel themes.

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.

Under the **Edit** pull-down menu, use the **Copy Theme** and **Paste** commands to make a copy of the **Assessed Value of the Land** theme. Change the theme name of the copy to “Property Ownership”. Make the two Land Value themes invisible.

Make the new “Property Ownership” theme active and invoke the Legend Editor. In the Legend Editor dialogue box, select **Unique Value** under the **Legend Type** drop-down list. Select “State” from the **Values Field** drop-down list.

Select the **Null Value** button. In the **Null Values** dialogue box, select **State** from the **Field** drop-down list. Check the box for **Display No Data Class**. Click **OK**.



Click on the **Count** header at the top of the table. Then select the **Sort Descending** button (it looks like an upside down staircase). While in the Legend Editor, change the colors for some of the states. Make ‘WI’ gray, ‘IL’ pink, and the remaining states a light green. Select **Apply** and close the Symbol Palette and Legend Editor.

With the “Property Ownership” theme active, Select **Query** from **Theme** pull-down menu. The zip code for the Blue Lake area (Minocqua, Wisconsin) is ‘54548’. Develop a query ([Zip] = “54548”) to select all those parcels where the tax bill is sent to the local zip code. Click on **New Set** then close the window. You could assume that most of these are permanent residents on Blue Lake. The selected parcels display in yellow.

The screenshot shows the 'Property Ownership' dialog box. On the left, a list of fields includes [City], [State], [Zip], [Fire\_no], [Fire\_sub], [Road\_name], and [Total\_imp]. The [Zip] field is selected. In the center, there are logical operators: =, <>, and, >, >=, or, <, <=, not, and (). On the right, a list of values includes '54494', '54548', '54618', '54901', '54982', and '55305'. The '54548' value is selected. Below the values list is a checked 'Update Values' checkbox. At the bottom, there are three buttons: 'New Set', 'Add To Set', and 'Select From Set'. A query field at the bottom contains the text '[ Zip] = '54548''.

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.

Clear the selection from the Property Ownership theme by making this theme active and select **Clear Selecting Features** from the Theme pulldown menu. Save the project again.

## Section 3. Spatial Analysis of Shoreland Zoning Regulations

*Estimated Time: 30 minutes*

### **Part 1. Explore a Hypertext Linked Help File of the Shoreland Zoning Ordinance**

Administering a zoning ordinance often requires reference to multiple maps and text documents. Managing these documents in a paper form can become complicated. ArcView, in concert with other software packages, can support creation of an “electronic zoning ordinance” integrating both text and map. A Windows help file was created for the Oneida County Zoning and Shoreland Protection Ordinance using a software package called RoboHelp from Blue Sky Software.

Under the **Windows Menu** in ArcView, Select **bluelake.apr**.

If you are using a computer operating system other than Windows (3.1, 95, NT, 98, 2000, XP), skip this section. If you are using one of these three systems, search for the Windows Help executable program for your operating system. The name of this program varies; try “**winhelp.exe**” or “**winhlp32.exe**”. Typically, you will find these files under the following directories which vary by operating system:

Windows 3.1	winhelp.exe	\windows\system\
Windows 95	winhlp32.exe	\windows\
Windows XP	winhelp.exe	c:\windows\
-or-	winhlp32.exe	c:\windows\system32

When you find this program, note its full pathway name.

From the Project window, highlight the **Scripts** icon and select **New**. Type **System.Execute(“c:\windows\winhelp.exe c:\coastgis\bluelake\oneida.hlp”)**.

If necessary, substitute the appropriate pathway in your system for the “c:\winnt\winhelp.exe” portion of the script and substitute the appropriate pathway for the **oneida.hlp** file to where the downloaded exercise data was stored.

1. Select **Properties...** under the Script pull-down menu.
2. Type **Open.ZoningText** in place of Script1 in the Name field. Click **OK**.
3. **Compile** the script by selecting the **Check Mark icon**.
4. Select the **Runner icon** to run the program
5. Select the “**Table of Contents**” text in underlined, green text to jump to the table of contents for the Oneida County Zoning and Shoreland Protection Ordinance.
6. Scroll down to the Waterline Setback section.

7. Select the **Definitions button** at the top of the page to access definitions to all the terms in the zoning ordinance.
8. Select “O”
9. Select the “**ordinary high water mark**” hypertext to pop-up a definition for that term.
10. Explore the “Waterline Setback” section of the zoning ordinance.
11. Close the Electronic Zoning Ordinance.

### **Add a Button to Run the Ordinance from the View GUI**

12. Select “**bluelake.apr**” from the Windows pull-down menu.
13. Select **Customize...** from the Project pull-down menu.
14. In the Customize dialog box, select **View** in the Type drop-down box and **Buttons** in the Category drop-down box.
15. Scroll over to the far right side of the box containing the button icons and select the Help button that appears as a question mark with an arrow.
16. Select the **New** button. This places a new button on the screen.
17. Double-Click on the work **Click**.
18. Scroll down and select **Open.ZoningText** in the Script dialog box. Select **OK**.
19. Double-Click on the worn **Icon**.
20. Select the **Load** button in the Icon Manager dialog box.
21. Select **Windows Bitmap (.bmp)** from the List Files of Type drop-down menu and select **book.bmp** as the icon to display for the button.
22. Select **OK** in the Load Icon dialog box. Select **OK** in the Icon manager dialog box. Close the Customize dialog box.

A new button with a zoning book icon has been added to the View GUI which launches the Oneida County Shoreland Zoning Ordinance when pressed.

Is a zoning ordinance in this form easier to use? Would it be easier and cheaper for the county to distribute the ordinance to the public? What drawbacks might an ordinance in this form have?

### **Part 2. Waterline Setbacks**

You will create a new View for this section. Start by making sure you are in the main project window. If you are in the Tax Roll Data View, select the **Window** pull-down menu and choose the current project near the bottom (bluelake.apr). Make sure the **View** icon is highlighted in the project window and click the **New** button.

An empty view screen will appear entitled **View 1**. Use **Properties...** from the **View** pull-down menu to change the name to “Shoreland Regulations View” and set the map

and distance units to **feet**. Use the **Window** pull-down menu to move to the Tax Roll Data View. Make the Buildings, Water, and Property Ownership themes active. Select **Copy Themes** from the **Edit** pull-down menu. Now move to the Shoreland Regulations View, select **Paste** from the **Edit** pull-down menu. Double-click on the Property Ownership theme to invoke the Legend Editor and under the drop-down list, select **Single Symbol**. Change the color to light gray. Under the Theme Properties, change the 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 Theme** command. The Select by Theme command creates a new set of features from a theme (the target theme) based on their relationship to another theme (the selector theme). The target theme must be active in the table of contents to begin. First, make the **Building** theme active in the table of contents (*this is the target theme*). In the **Theme Menu**, choose **Select By Theme**. You are now in the Select by Theme dialog box. Choose to select features of the active theme that **Are Within Distance Of**. In the ‘selected features’ drop-down list select **Water** (*this is the selector theme*). Enter **75 (feet)** for the selection distance. Click **New Set**.

Notice that all of the buildings that are within 75 feet of the water are now highlighted in yellow. 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 theme is going to be **Parcels**, so make sure the Parcels theme is active in the table of contents. As before, in the **Theme Menu**, choose **Select By Theme**. In the second drop-down list you want to select **Buildings** (*the selector theme*). Next, in the first drop-down list (Select features of active themes that) select **Intersect**. Click **New Set**.

Notice that now the parcels are highlighted yellow. 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 set of parcels as a new theme. With the Parcels theme active, select **Convert to Shapefile** from the Theme pull-down menu. Save as new file as **nonconf1.shp** in the Convert Parcels dialog box. Select **OK**. Select **Yes** when prompted to add the new shapefile to the view. Make the Parcels theme active and

choose **Clear Selected Features** from the Theme pull-down menu. Change the name of the new theme to **Nonconforming for Waterline Setback** and make the theme active.

### **Part 3. 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 **Query** command. Make the **Parcels** theme active and select **Query** from the Theme pull-down menu.

In the Query Builder, from the **Fields** list, double-click [**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). From the **Values** list, double click on any number and change it, while highlighted in black, to **20000** in the expression builder. Select the **New Set** button and close the Query Builder window.

Again, we will save the selected set of parcels as a new theme. Select **Convert to Shapefile** from the Theme pull-down menu. Save as new file as **nonconf2.shp** in the Convert Parcels dialog box. Select **OK**. Select **Yes** when prompted to add the new shapefile to the view. Make the **Parcels** theme active and choose **Clear selected features** from the Theme pull-down menu. Change the name of the new theme to **Nonconforming for Lot Size** and make the theme active.

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

## Section 4. Septic System Maintenance Notification

*Estimated Time: 30 minutes*

### **Part 1. Add an Event Theme of Septic Tank Locations**

Event data sets have a few things in common: they contain a reference to a location, a unique identifier, and may contain attributes about that location. The reference to a location could be an XY coordinate, a street address, or a measure along a street or other type of route. In this portion of the exercise, we are going to add an XY event to the project that will show the (fictitious) location of septic fields.

You will create a new View for this section. Start by making sure you are in the main project window. Select the **Window** pull-down menu and choose the current project (bluelake.apr). Make sure the **View** icon is highlighted in the project window and click the **New** button. Use **Properties...** from the **View** pull-down menu to change the name to “Septic System Maintenance View” and set the map and distance units to **feet**. Use the **Window** pull-down menu to move to the “Shoreland Regulations View”. Make the Buildings, Water, and Parcels themes active. Select **Copy Themes** from the **Edit** pull-down menu. Now move to the Septic System Maintenance View, select **Paste** from the **Edit** pull-down menu.

First, you need to import or add the septic field data into the project. . Select the **Window** pull-down menu and choose the current project. Click on the **Tables icon**, then select the **Add...** button. The **Add Table** file browser should appear. Move to the **c:\coastgis\bluelake** directory. From the **List of File Types** drop down list, select **dBASE(\*.dbf)**. Then select **septic.dbf** from the list of files. Click **OK** to add the file. Enlarge the table window and examine the septic data listed. Note the ‘**Construct**’ and ‘**Lastpump**’ fields. These represent the year the septic tank was constructed and the year the septic tank was last pumped.

Next, you want to make the **Septic System Maintenance View** screen active. From the **View menu**, select **Add Event Theme**. The **Add Event** file browser should appear. From the **Table** drop down list select **septic.dbf**. Note that the X and Y fields have already been selected. Click **OK**.

The events are now added to the **View screen** table of contents. Click the check box to make the Septic events theme visible. To change the theme name in the table of contents, select **Properties** from the **Theme menu**. Highlight the **Theme Name** box and change the name to ‘**Fictitious Septic Fields**’. Return to the View.

## **Part 2. Identify the Septic Tanks Last Pumped in 1996 or Before**

Participation by counties and other governmental units in the Wisconsin Private Sewage System Replacement or Rehabilitation Grant Program administered by the Department of Commerce under Wisconsin Administrative Code Comm 87 requires a “maintenance program which requires inspection or pumping of all new or replacement private sewage systems at least every three years” (Comm 87.60 (5)(b)(4)). The owner of a private sewage system subject to the maintenance program must submit a certification form to the appropriate local government unit that states that the system is in proper operating condition and that, after inspection and pumping, the tank is less than one-third full of sludge and scum.

First, make the **‘Fictitious Septic Fields’** theme active. Then select **Query...** from the **Theme** pull-down menu. Create the expression “Lastpump <= 1996” and select **New Set** then close the **Query** window. Select the **Open Theme Table** button to view the database. A total of 110 of 155 septic tanks should have been selected.

Return to the **Septic System Maintenance View**. Make the **Parcels** theme active in the table of contents since this is the theme which lists the owner’s address of the affected parcel and septic tank. Next, from the **Theme Menu**, select **Select by Theme**. Select features of the active theme that **‘Intersect’** the selected features of **‘Fictitious Septic Fields.’** A total of 97 of the 262 **Parcels** should have been selected. To export the table with the selected records to an ASCII text file, select **Export...** from the **Attribute Table’s File Menu**. You should now be in the **Export Table** dialog box. Select **Delimited Text** as the type and click **OK**. You now want to rename the file as **‘sbnotify.txt’** and save it the **c:\coastgis\bluelake** directory.

After you have identified the properties which contain the septic tanks that need to be pumped, you can export this database file and merge it with a form letter using Microsoft Word.

## **Part 3. Mail Merge a Form Letter in Microsoft Word**

Note: Some computers in the lab may not have Microsoft Word installed. If this is the case, follow along on a different computer for this section.

1. Minimize the ArcView screen and then open Microsoft Word. From the **File Menu** select **Open...** Move to **c:/coastgis/bluelake** and open the file **formsept.doc**. This is a form letter created to merge with the database that lists the properties affected by the waterline setback.
2. In the **Tools Menu** you want to scroll down and select **Mail Merge**. A **Mail Merge Helper** box will appear and you want to proceed with **Step 1 - Main**

**Document** and click **Create**, and then select **form letters**. A question box will appear asking if you wish to select the active window or another document - click the **Active Window** button.

3. Next, proceed to **Step 2** in the Main Merge Helper box and click **Get Data**, and then select **Open Data Source**. Note that you are in the c:\coastgis\bluelake directory. Then, from the **List of File Types** drop down list select **Text Files (\*.txt)**, and then go and select **snotify.txt**. Select **OK**. A question box will appear stating that no merge fields have been identified; click the **Edit Main Document** button.
4. In the main document, place the cursor immediately below the line “Oneida County Property Owner”, establishing the beginning of the return address location. Then, from the lower left corner of the menu bars select from the **Insert Merge Field** scroll list and select **Address1**. Move the cursor to the beginning of the next line and then again select from the Insert Merge Field **Address2**. Repeat this step at the beginning of the next line and then select **City**. Place a comma and then a space and then, on the same line, insert the merge field **State**. Follow this with another space and then the merge field **Zip**.
5. In the final step, go to the **Tools Menu** again and highlight **Mail Merge**. From the **Mail Merge Helper** box, proceed to **step 3** and click **Merge...** The **Merge Box** should appear, simply click the **Merge** button and the program should produce 97 separate form letters for all of the affected properties.

## Section 5. Using Hot Links to Aid Zoning Enforcement

*Estimated Time: 15 minutes*

Hot links can be utilized to obtain additional information about a feature. The additional information can take the form of an image file, a text file, another ArcView document, or a separate ArcView project. A hot link can also call an Avenue script, which might make a system call to run an outside program or perform a complicated series of ArcView commands.

You will again create a new View for this section. Start by making sure you are in the main project window. Select the **Window** pull-down menu and choose the current project. Make sure the **View** icon is highlighted in the project window and click the **New** button. Use **Properties...** from the **View** pull-down menu to change the name to “**Hot Link View**” and set the map and distance units to **feet**. Use the **Window** pull-down menu to move to the “Shoreland Regulations View”. Make the Buildings, Water, and Parcels themes active. Select **Copy Themes** from the **Edit** pull-down menu. Now move back to the Hot Link View, select **Paste** from the **Edit** pull-down menu.

Using the **Add Theme** button, import the Photos.shp shapefile. From the **Theme Menu**, select **Theme Properties**. In the Theme Properties Dialogue Box, select the **Hot Link icon**. You may need to scroll down in the left window to find it. Select **Image** for the **Field:** and **Link to Image File** for the **Predefined Action:**. Select **OK**.

While back in the View window, make sure the **Photos.shp** theme is active. Select the **Hot Link button** (it looks like a lightning bolt). Click on any of the point features in the **Photos.shp** theme to bring up a photo image of that area.

Other type of files or programs can be hot-linked to features in a theme. Examples include scanned documents, video clips, results of a model run. What are some other useful files that could be hot-linked to the theme we have been using for the Blue Lake shoreland management GIS application?

## Evaluation

### **Shoreland Management GIS Training Exercise - Blue Lake, Oneida County, WI**

Please complete the following evaluation to help us better understand your experience with this tutorial and to increase the effectiveness in future updates to the exercise.

How useful did you find this exercise?

- Very Useful
- Somewhat Useful
- Not very Useful

How would you rank the difficulty of the exercise?

- Too easy
- Just the right level of difficulty
- Very difficult

Were the instructions easy to follow?

- I strongly agree
- I agree
- I disagree
- I strongly disagree
- Not sure

Did you feel the content was appropriate in understanding the GIS applications?

- I strongly agree
- I agree
- I disagree
- I strongly disagree
- Not sure

Would you recommend this exercise to co-works, fellow students, etc?

- Yes
- No
- Maybe

Please add any suggestions that you may have in assisting with the future development and updates to this exercise.

*Please mail this evaluation form to: University of Wisconsin Sea Grant Institute - Attn: David Hart  
Room 201, Goodnight Hall - 1975 Willow Drive - Madison, WI 53706-1177*