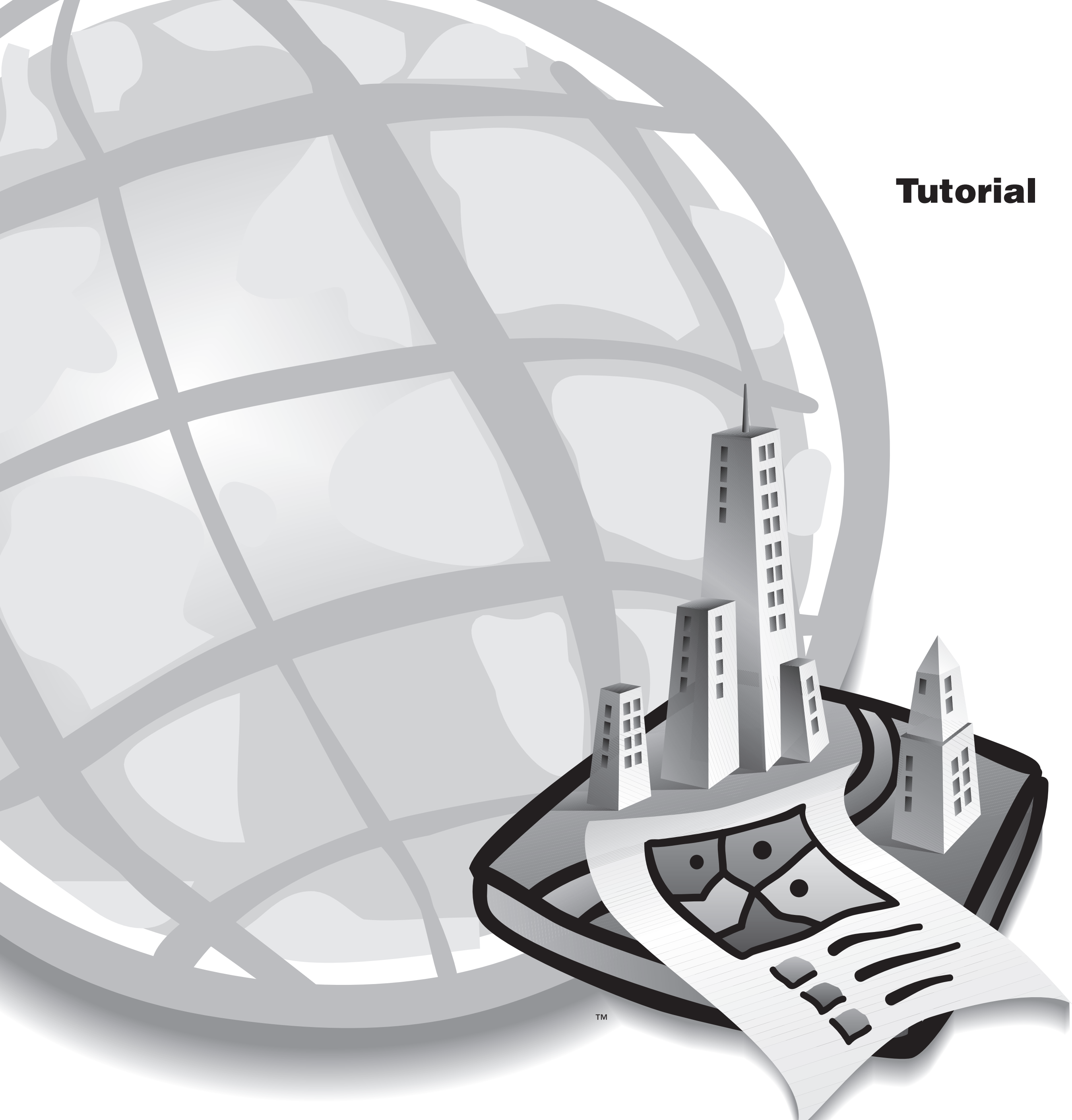
Tutorial



Atlas GIS™

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Part I:

Introduction and Atlas GIS Demo

1

Overview of Atlas GIS for Windows

Welcome to the Atlas GIS tutorial. This book is designed as an aid in learning how to use the many capabilities of the Atlas GIS program. This tutorial deals with important, frequently used functions; it doesn't attempt to introduce all of the operations possible with Atlas GIS.

The lessons in this book are designed for your convenience. Each lesson contains all of the instruction required to complete that lesson; you don't have to complete one lesson before you can do the next one. You can do one, a few, or all of the lessons, and in any order. If you're a new user, however, we recommend that you complete all of the lessons, in order from front to back.

We also recommend that you read Chapters 2 and 3 in the *Reference Manual* before beginning this tutorial. If you haven't already installed Atlas GIS on the hard drive of your computer, please refer to Chapter 2 in *Getting Started*.

Before you begin the lessons, read through the summary below for an overview of the lessons. And be sure to go through this lesson's "Atlas GIS Demo," which briefly demonstrates some of the features of Atlas GIS. Within just a few minutes, you'll be working with a file and using tools, and you'll even display a theme map.

Lesson Summary

- Part I: Introduction and Atlas GIS Demo

  This lesson provides an overview of the tutorial, as well as exercises you can follow for a self-guided demo of Atlas GIS for Windows.

- Part II: Learning the Program Tools

- These lessons introduce you to the most basic elements of Atlas GIS for Windows. They include a tour of the interface and lessons on moving around in the program, including using the various windows. They also instruct you on core concepts and how to manage files in Atlas GIS.

- Part III: Basic Skill

- Lessons in this part develop basic skills for working with maps and data. You'll learn several methods for selecting features and data, how to create a theme map, and how to label and annotate a map.

- Part IV: Building Your Skills

- Here you'll round out your skills, creating a subset of a map, merging files, and importing data. You'll also learn how to match locations to the map (this is called *geocoding*), and you'll perform geographic analyses.

- Part V: Common Applications

  These common applications help you put it all together. They contain examples of real-life uses for Atlas GIS, allowing you to see how you can combine your skills to produce results. The examples include creating sales territories, displaying your customers on a map, and performing a site selection ring study.

About the Tutorial Files

The tutorial files are located in the TUTORIAL subdirectory. On a single-user system, this subdirectory is created in the Atlas GIS program directory during installation. On a multi-user system, the tutorial files are located in each user directory. For the purpose of this tutorial, it is assumed you loaded Atlas GIS from your C:\AGISW directory; therefore, the tutorial files would be located in C:\AGISW\TUTORIAL.

Note: Network users should check with their system administrator for the path to the Atlas GIS program and system files.

Atlas GIS Demo

We thought you might like to see what you can do using Atlas GIS. So before you get started on the core lessons of the tutorial, we'll show you how to apply some basic skills to produce results quickly. As you follow along with the steps in this section, you'll perform the following tasks:

- Start up Atlas GIS
- Open a project file
- Zoom in on the map
- Opening another map frame
- Find a location by name
- Select map features
- Display a theme map
- Put on finishing touches

Don't worry if you don't understand everything you're doing—the idea here is *what*, not *how*. For the rest of this section, just perform the steps as directed and watch what happens.

Starting Up the Software

Atlas GIS for Windows starts up just like any other standard Windows application. Double-click on the Atlas GIS program icon to launch the application. If this is the first time you've run the software, you'll be asked to enter a user ID. This is used to form unique feature IDs for new map features you create in Atlas GIS. You can change this ID later if you want.

When the program is running, familiarize yourself with the user interface for a moment. For example, notice the Redraw button on the status bar at the bottom of the screen. You can click on this button to refresh displayed maps.

Opening a Project File

Throughout this lesson, you'll be working with a project file called DEMO.PRJ. When you first open this file, you'll see a map of California with counties displayed. This map also contains more detailed information about San Francisco, which you'll see and use as you go through this lesson.

To open the project file:

1. Choose FILE | OPEN to pop up the Open dialog box.

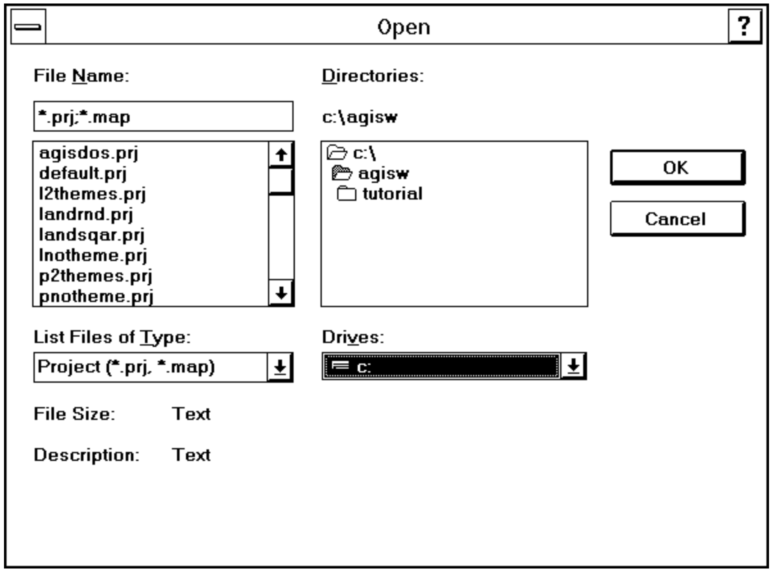


Figure 1.1 **Open dialog box**

2. In the Directories list box, double-click on the TUTORIAL directory.

   You're going to open the DEMO.PRJ project file, which is located in the C:\AGISW\TUTORIAL directory.

3. In the *File Name* list box, choose the 'DEMO.PRJ' project file.

   By default, the *List Files of Type* box displays the 'Project (*.prj, *.map)' option, so all project files in the current directory are displayed.

4. Click OK.

The screen should look similar to the following figure.

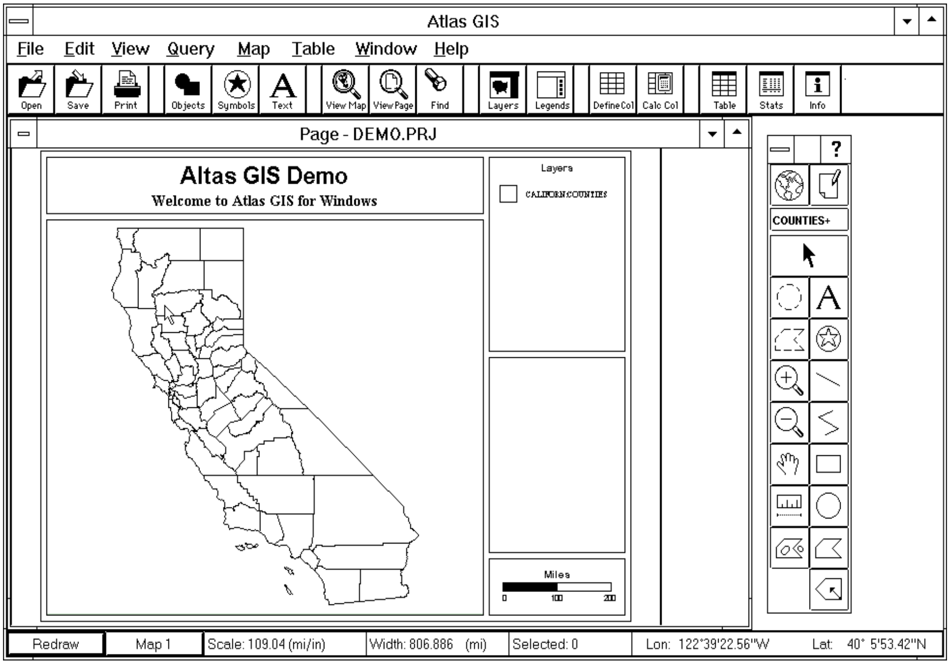


Figure 1.2 **Open DEMO.PRJ project file**

Notice that the status bar at the bottom of the application window is updated to display the current map information, and the Map tool is now active in the toolbox. The Map tool allows you to work with the map layers. (Refer to the following figure to see which tool this is.)

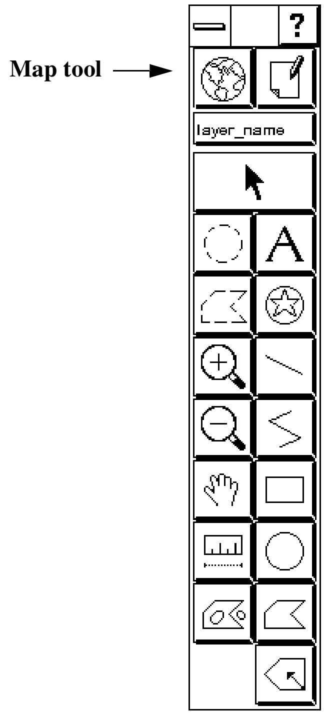


Figure 1.3 **Map tool in the toolbox**

Zooming In on the Map

The map on the screen shows the state of California with its counties displayed. Watch what happens when you zoom in for a closer look.

To zoom in on the map:

1. In the toolbox, click on the Zoom In tool. (Refer to the following figure.)

Zoom In tool

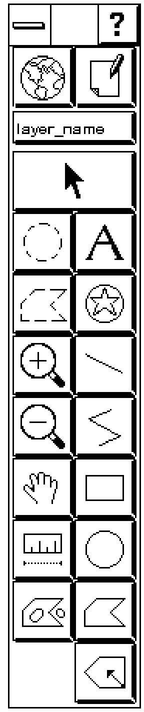


Figure 1.4 **Zoom In tool in the toolbox**

2. Click in the San Francisco Bay Area to zoom in, as illustrated in the following figure.

   Notice the cursor changes from a pointer to a magnifying glass with a plus (+) sign when you move it into the Page window.

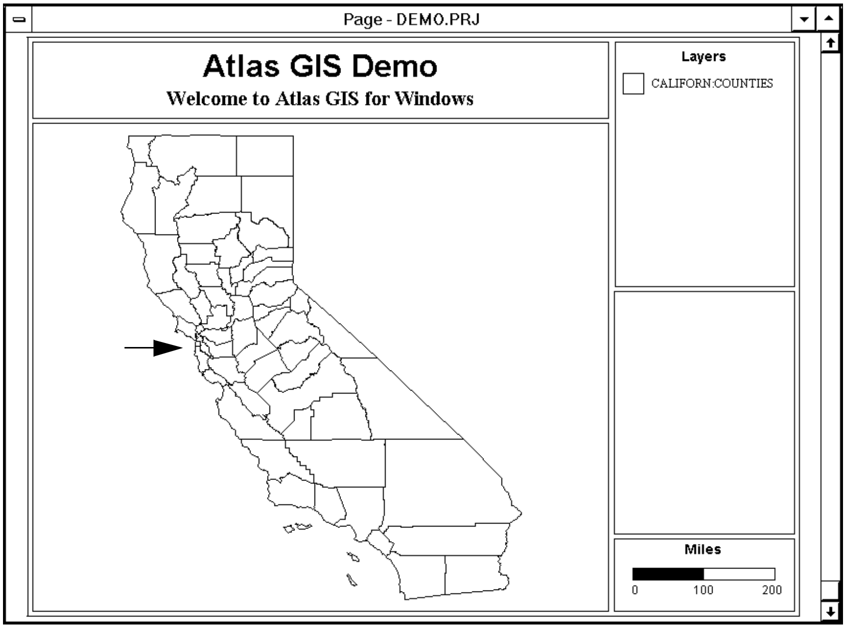


Figure 1.5 **Click to zoom in on the San Francisco Bay Area**

This automatically zooms in on the map by the zoom factor specified in FILE | PREFERENCES, with the place where you clicked as the new map center. Notice that the county labels are now visible.

You can also zoom in on a specified area by dragging, rather than clicking and using the default zoom factor, as you'll do in the next steps.

3. Click on the Zoom In tool again.

4. With the zoom cursor, drag a box to outline the zoom area shown in the following figure.

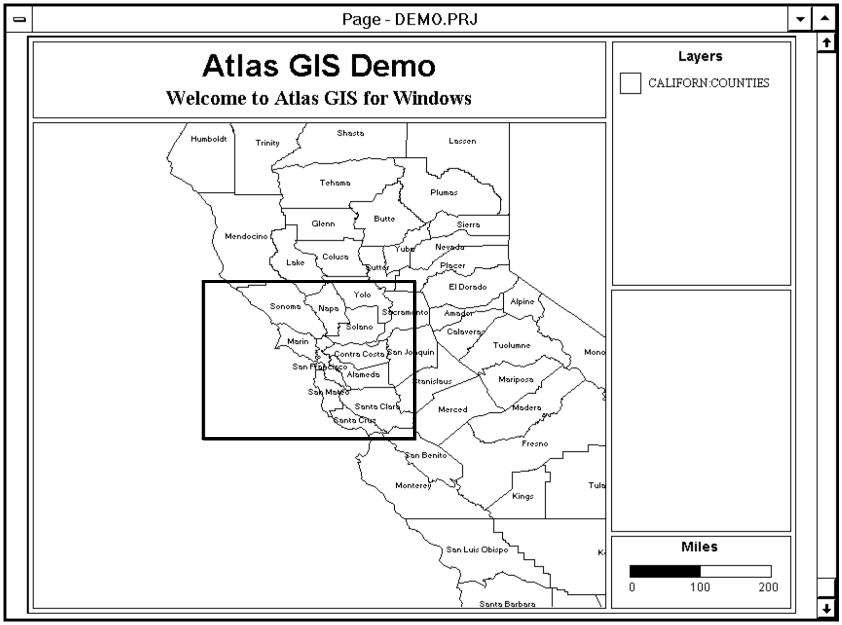


Figure 1.6 **Drag a box around the area to zoom in**

You'll be zooming in on the San Francisco Bay Area. The box you drag should also include Sonoma and Santa Clara counties.

When you release the mouse button, Atlas GIS enlarges the area inside the box to fill the map frame. Your map should look something like the following figure.

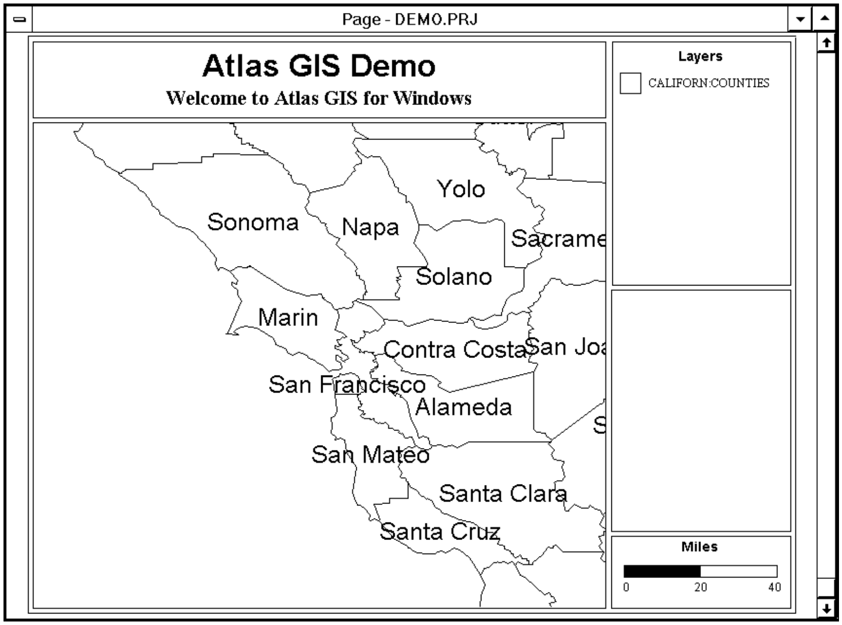


Figure 1.7 **Zoomed-in map area**

If you didn't get the desired results, you can choose VIEW | PREVIOUS MAP VIEW to undo the zoom, and then try again.

5. Click on the Zoom In tool again.

6. Drag a box around all of San Francisco County, as shown in the next figure.

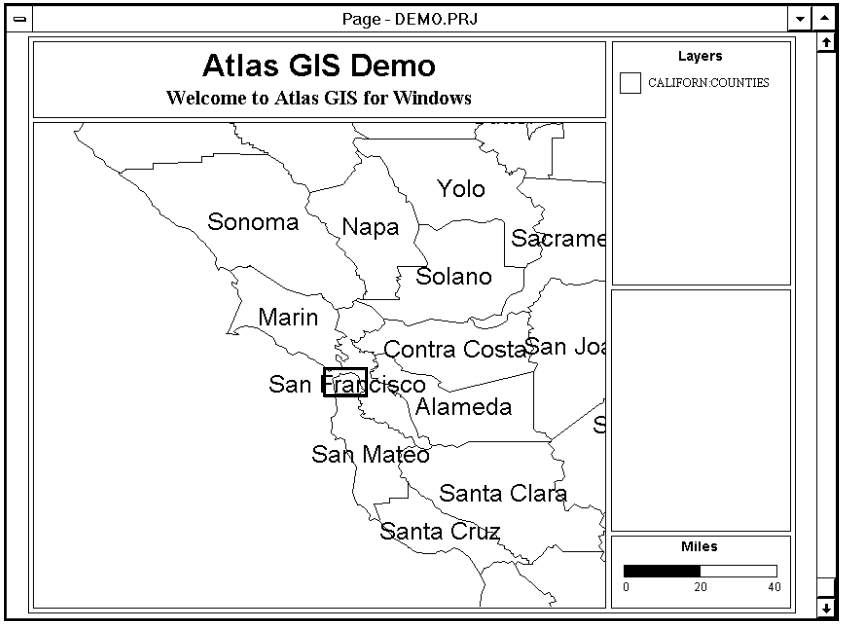


Figure 1.8 **Drag to zoom in on San Francisco**

San Francisco should now fill the map area. As you zoom in on the San Francisco area, the ZIP code boundaries and other features become visible, as shown in the following figure. Notice that the names of the now visible layers also appear in the layer legend.

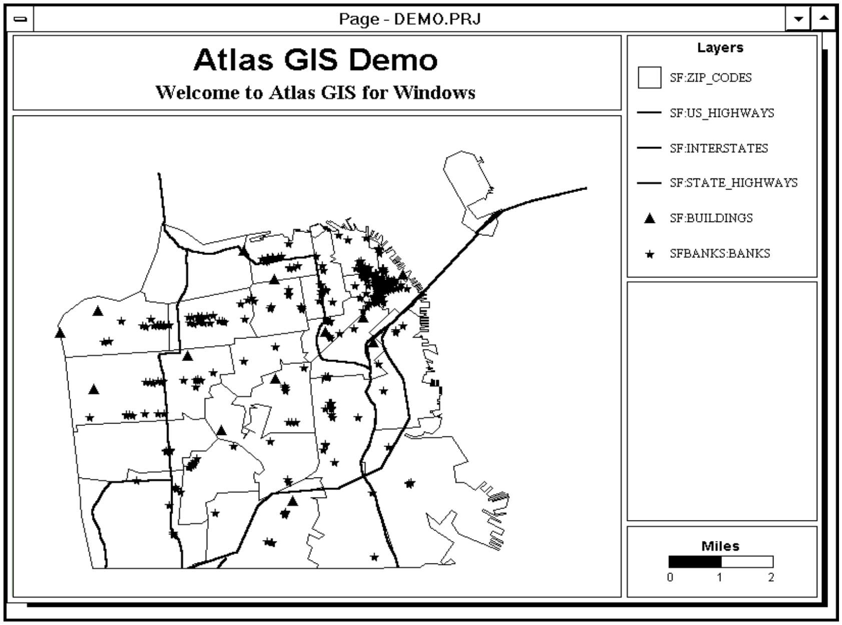


Figure 1.9 **Zoomed-in view of San Francisco County**

Opening Another Map Frame

In Atlas GIS, you can have more than one map frame open at a time. Each map frame can display different settings and views of the open geo files. In this exercise, you'll open another map frame as an inset to the main map.

To open another map frame:

1. Choose MAP | LEGENDS & FRAMES to pop up the Legends & Frames dialog box.

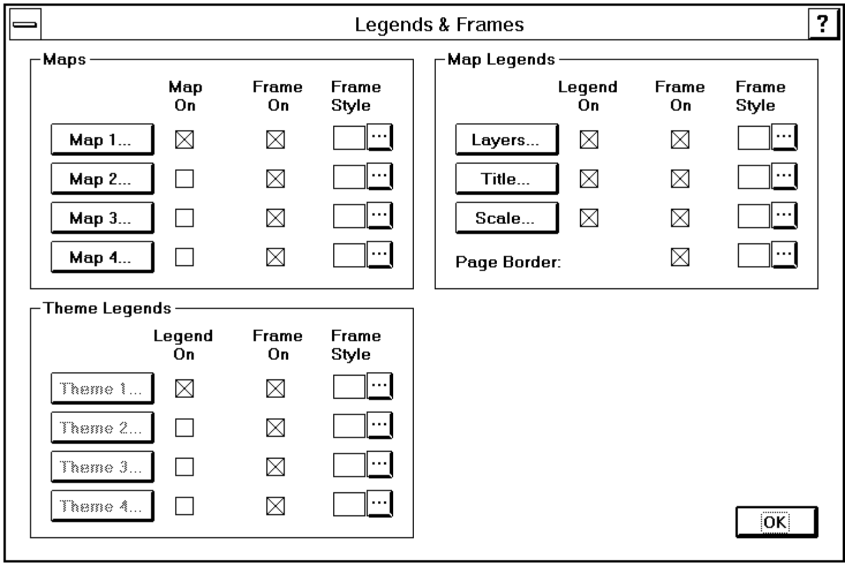


Figure 1.10 **Legends & Frames dialog box**

2. In the Maps group box, place a check in the *Map On* box next to the Map 2 button.

3. Click OK.

   A map frame appears in the upper-left corner of Map 1. Notice that the entire state of California is visible in Map 2.

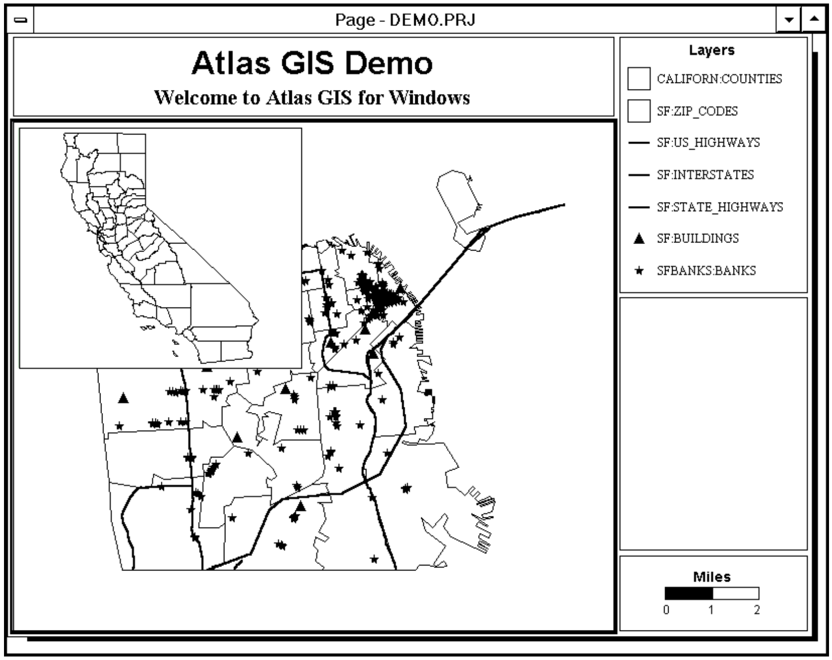


Figure 1.11 **Page with two map frames**

You can open additional map frames to create map insets like the one shown above, or you can resize the frames to create maps of equal size.

For the purpose of this lesson, you'll only work with Map 1 visible.

4. Choose MAP | LEGENDS & FRAMES to pop up the Legends & Frames dialog box.

5. In the Maps group box, uncheck the *Map On* box next to the Map 2 button.

6. Click OK.

Finding a Location On the Map

Atlas GIS includes a command called QUERY | FIND, which finds a location on the map by its name, address, or ZIP code. In this example, you'll find the location of the Transamerica Pyramid in San Francisco.

To find the location:

1. Choose QUERY | FIND to pop up the Find dialog box.

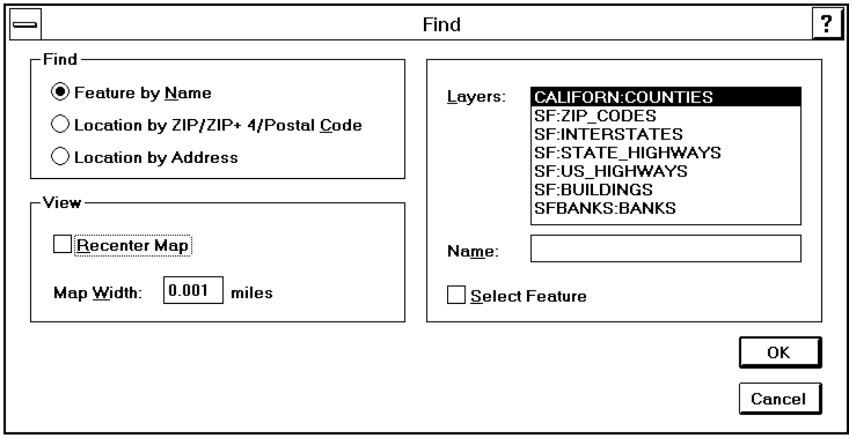


Figure 1.12 **Find dialog box**

2. In the Find group box, click on the Feature by Name option button.

   This tells Atlas GIS to search for a map feature using its name. The Find dialog box subpanel changes to allow you to choose the layers to search and to enter the name to search for.

3. In the subpanel (on the right side of the dialog box), click on 'SF:BUILDINGS' in the *Layers* list box to choose the layer.

4. In the *Name* text box, type 'Transamerica Pyramid' (without quotation marks).

   The search is case-sensitive, so capitalize the name exactly as it appears.

5. Place a check in the *Select Feature* box.

6. In the View group box, place a check in the *Recenter Map* box.

   This will redraw the map with the Transamerica Pyramid located at the center.

Note: This lesson assumes Atlas GIS is configured with the default preference settings. If you get unexpected results, choose FILE | PREFERENCES, and set the zoom factor to two (2), and units of measure to miles and inches.

7. In the *Map Width* text box, highlight the existing text, then type '2'.

   When the map redraws, the map area displayed will be two miles wide.

8. Click OK.

The Transamerica Pyramid location is now marked on the map and is in the center of the map area. The feature is also selected, so it's highlighted. Notice that the map now shows a 2-mile wide area.

Selecting Map Features

Now that you've located the Transamerica Pyramid, you can select all the major banks within a mile of its location.

To select the features:

1. In the toolbox, click on the Layers tool.

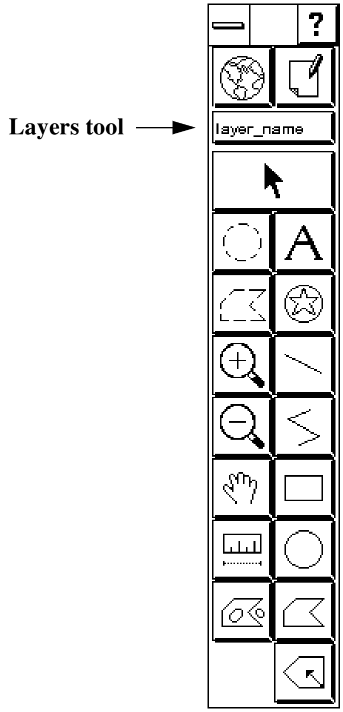


Figure 1.13 **Layers tool in the toolbox**

When the Map tool is active, clicking on the Layers tool pops up the Default Layer Set dialog box.

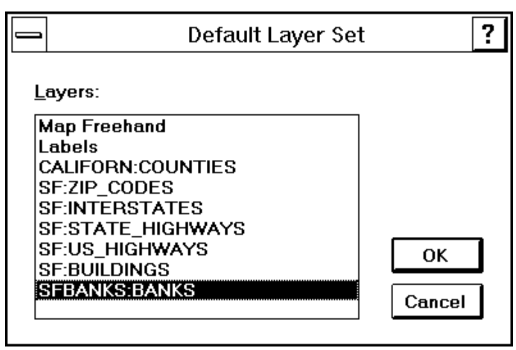


Figure 1.14 **Default Layer Set dialog box**

2. Choose the ‘SFBANKS:BANKS’ layer in the list.

3. Click OK.

   This specifies the SFBANKS:BANKS layer as the default layer set, so the tools you use will operate on this layer only.

4. Click on the Circle Select tool.

Circle Select tool

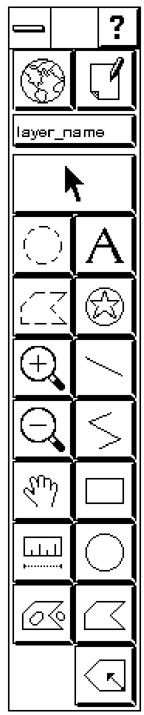


Figure 1.15 **Circle Select tool in the toolbox**

   This tool allows you to select features inside of or touching a circle. You can use the tool to drag a circle, or you can click on a location and specify an exact radius.

5. Locate the Transamerica Pyramid on the map.

   It should still be selected from the previous exercise. Refer to the following figure if you need assistance in locating it.

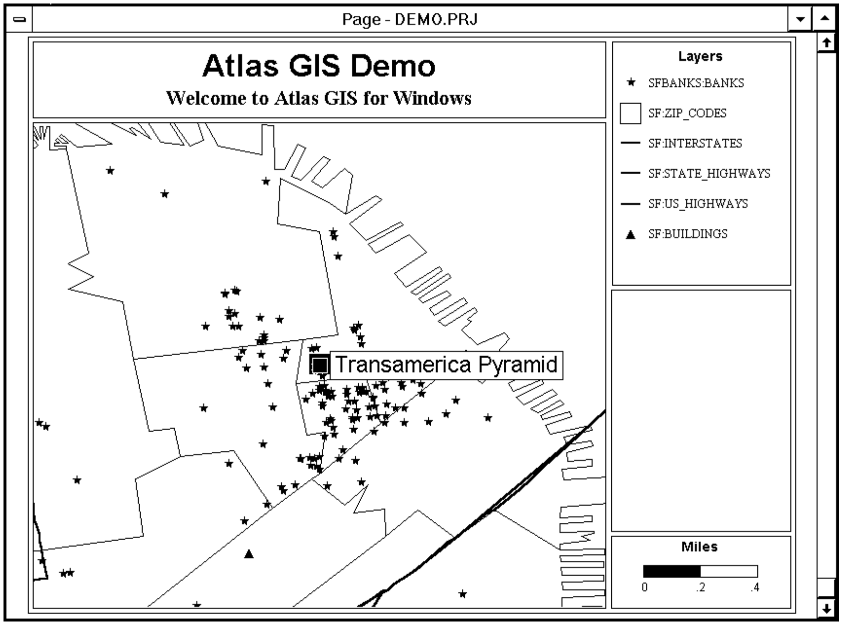


Figure 1.16 **Transamerica Pyramid location**

This will be the center point for the circle you'll create to select the bank features.

6. Click on the Transamerica Pyramid.

The Circle Radius dialog box pops up. (The Circle Select tool is very sensitive to mouse movement, so that you can drag very small circles. If the Circle Radius dialog box doesn't pop up, it may be that you actually dragged a small circle; click on the Circle Select tool and try again.)

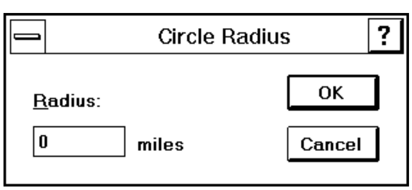


Figure 1.17 **Circle Radius dialog box**

7. In the *Radius* text box, highlight the existing text and type ‘1’.

   This tells Atlas GIS to select the features within a 1-mile radius around the building.

8. Click OK.

All of the major banks within one mile of the Transamerica Pyramid are now selected. Notice that there’s a very high concentration of banks near the building, with very few banks located near the perimeter of the circle. You might expect these results, since the Transamerica Pyramid is located in the business district of downtown San Francisco.

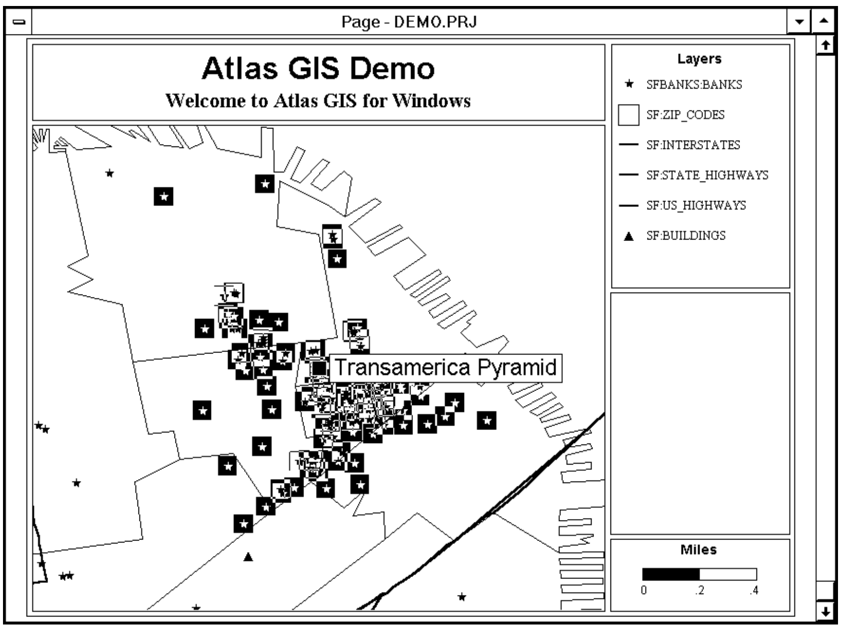


Figure 1.18 **Circle Select results**

You can deselect the features before proceeding.

To deselect the features:

- Click anywhere in the map frame where there isn’t a bank feature.

Changing the Map View

Before you go on, you'll change the map view to display a 10-mile wide area of the map, so that you can see all of the San Francisco ZIP code regions in the map frame. This will make it easier for you to see the theme of the map in the next exercise.

To set the map width:

1. Choose VIEW | MAP SCALE.

   The Map Scale dialog box pops up.

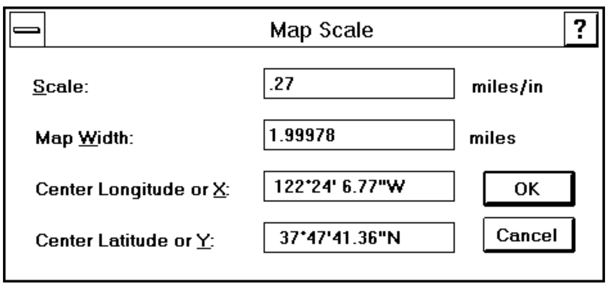


   Figure 1.19 **Map Scale dialog box**

2. In the *Map Width* text box, highlight the existing text, then type '10'.

   This sets the width of the displayed map area to ten miles.

3. Click OK.

The screen redraws, with the map frame displaying a 10-mile wide portion of the map. The screen should now look like the following figure.

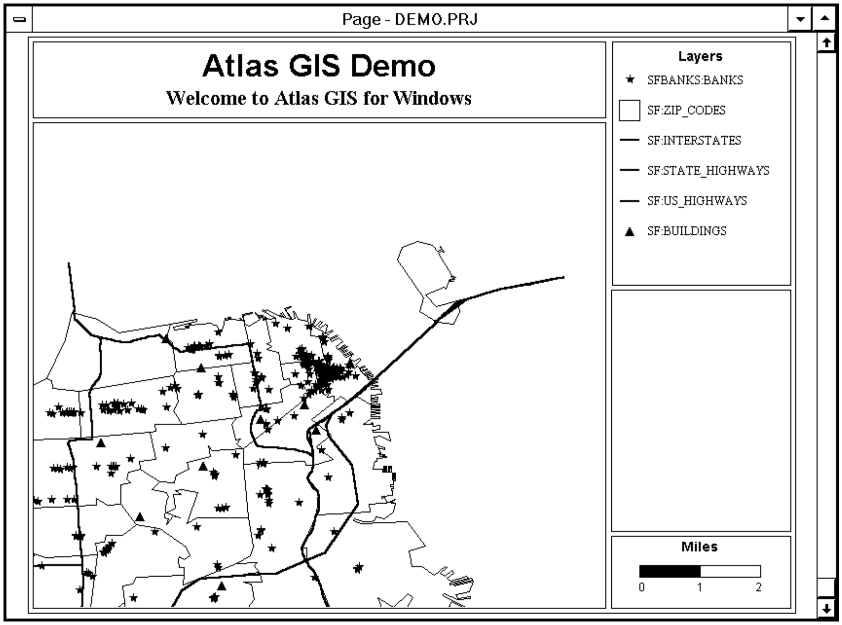


Figure 1.20 **Map width set to ten miles**

The map isn't centered so that you can view all of the ZIP codes at once, so you'll have to pan to recenter it in the frame.

To pan the map:

1. In the toolbox, click on the Pan tool.

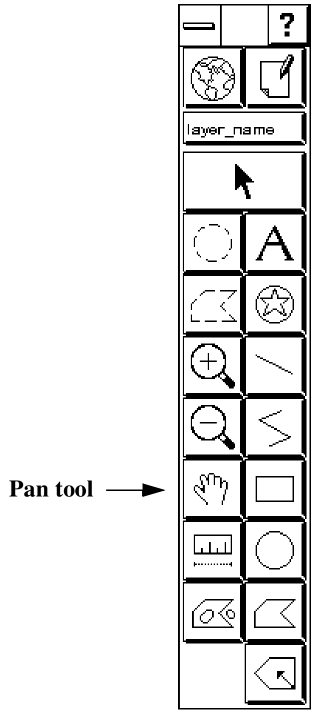


Figure 1.21 **Pan tool in the toolbox**

Notice that the cursor changes to a hand.

2. Place the cursor over the map area, then drag the map to recenter it in the frame.

   When you hold down the mouse button with the Pan tool active, a frame with an “X” inside appears over the map area. As you drag the frame, the center of the “X” indicates where the current center of the map will be displayed when you release the mouse button. (The map will redraw when you release the button.)

3. Repeat steps 1 and 2 until the map fits in the frame as shown.

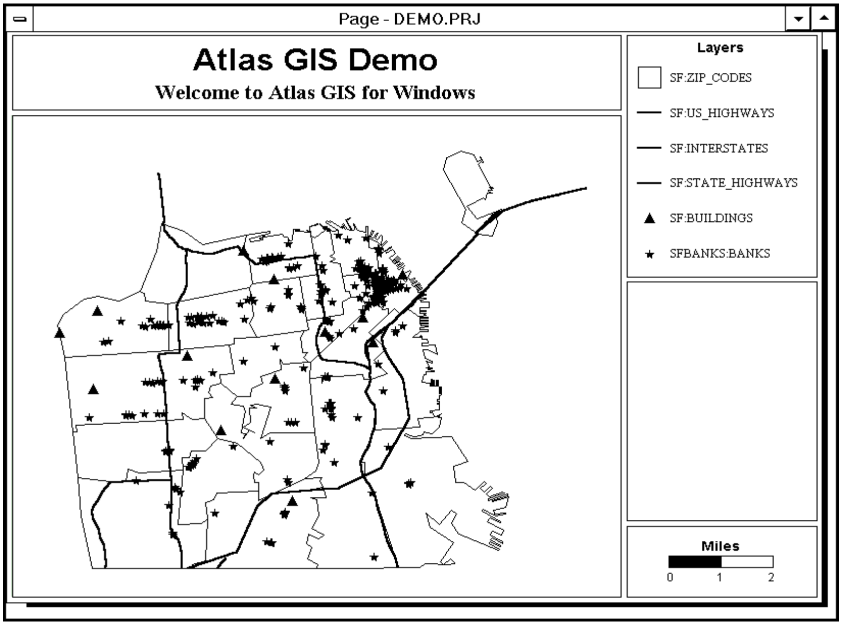


Figure 1.22 **Map recentered to view all ZIP codes**

Displaying a Theme

One of the most common uses of Atlas GIS is creating theme maps. In this exercise, you'll display a theme map of San Francisco showing the median household income for ZIP code regions. It will be interesting to see the results for the regions around the Transamerica Pyramid.

To create a theme map:

1. Choose MAP | LAYERS & THEMES to pop up the Layers & Themes dialog box.

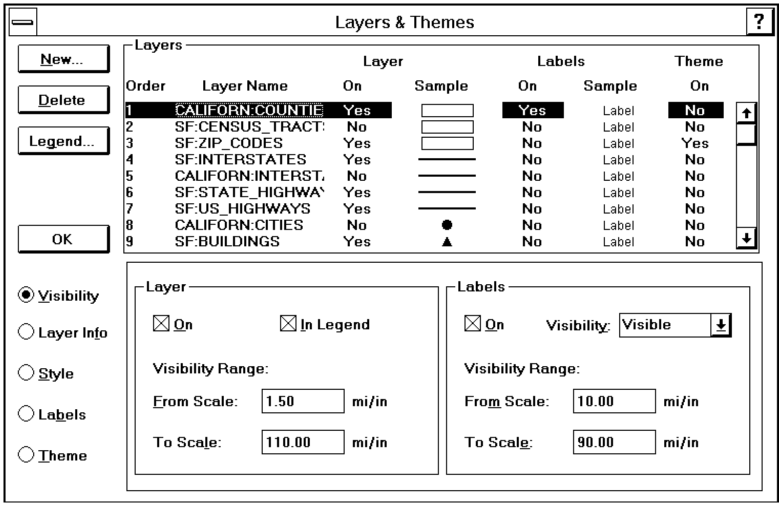


Figure 1.23 **Layers & Themes dialog box**

In the Layers group box, notice that most of the layers in this file are turned on, which means they're displayed as part of the map. Before you show the theme, you'll turn off some of the layers to make the map easier to view.

2. In the Layers group box, turn off the layers in the list below. To turn off a layer, click in the *Layer On* column (next to the *Layer Name* column), and toggle the setting to 'No'. (You may have to scroll to see some layers.)

   - SFBANKS : BANKS
   - SF : BUILDINGS

   The following layers should already be off:

   - CALIFORN: INTERSTATES
   - SF : CENSUS_TRACTS
   - CALIFORN: CITIES

3. In the Layers group box, choose the 'SF : ZIP_CODES' layer. (Click on the layer name to choose the layer.)

   Make sure this layer is turned on. You'll be using this layer to display the theme for the map.

4. Click on the Theme option button (in the lower-left corner of the dialog box).

   The lower subpanel changes to display the theme information for the selected layer. Notice that the *Theme On* box is unchecked, and the remaining settings are dimmed.

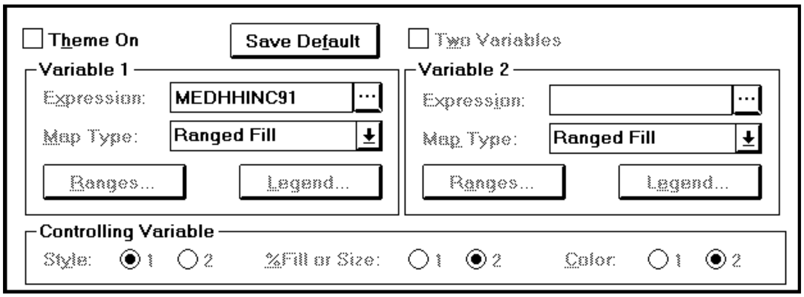


Figure 1.24 **Theme subpanel**

5. In the Theme subpanel, place a check in the *Theme On* box.

   Notice that the remaining options are no longer dimmed, and are already set up to display a ranged fill map. Many other types of theme maps are also supported, as you'll see in the next step.

6. In the *Map Type* list box, click on the drop-down arrow to view the list of options. Make sure you leave it set to 'Ranged Fill'.

7. Without changing any settings, click OK to exit the Layers & Themes dialog box.

The map now has a theme, illustrating the 1991 median household income for each ZIP code. A theme legend now displays, too, describing the significance of the fill colors. Notice that the ZIP code regions near the Transamerica Pyramid fit into the lowest range. Since business districts tend not to be prime housing areas, it's not surprising that these ZIP codes have some of the lowest median household incomes. (The theme map is illustrated in the following figure.)

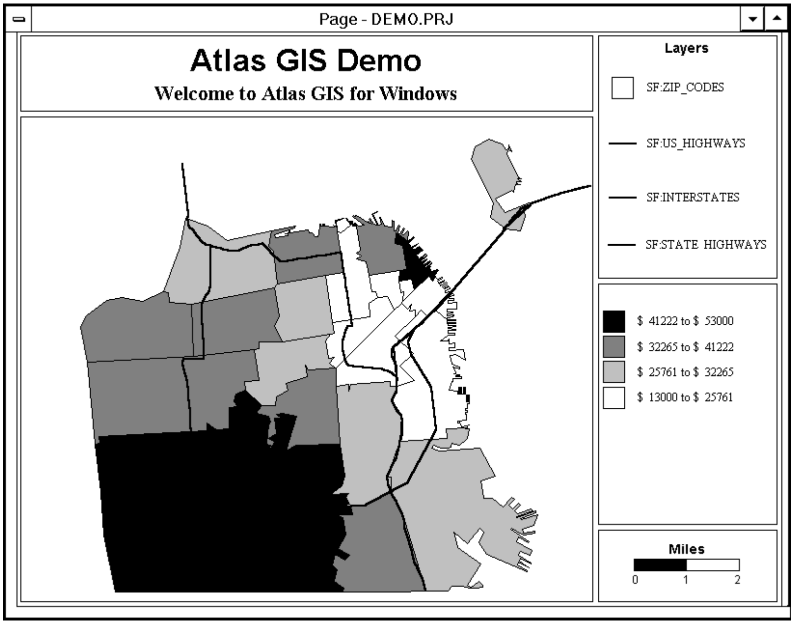


Figure 1.25 **Theme map**

Changing the Title

Now that you've changed the map to display a theme, the map title isn't quite appropriate. In the next exercise, you'll change the text of the title to reflect the map theme.

To change the map title:

1. Right-click anywhere in the title frame.

   This pops up the Title dialog box.

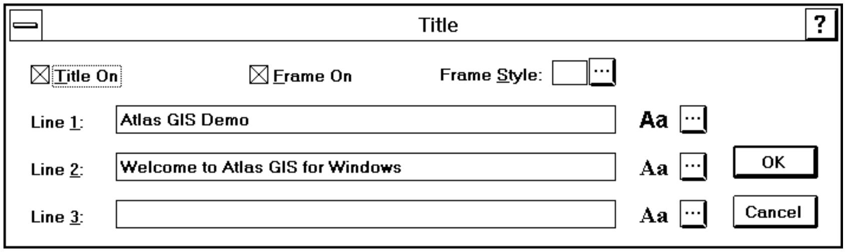


Figure 1.26 **Title dialog box**

2. Make sure the *Title On* and *Frame On* boxes are checked.

3. Click on the Frame Style […] button.

   This pops up the Frame dialog box.

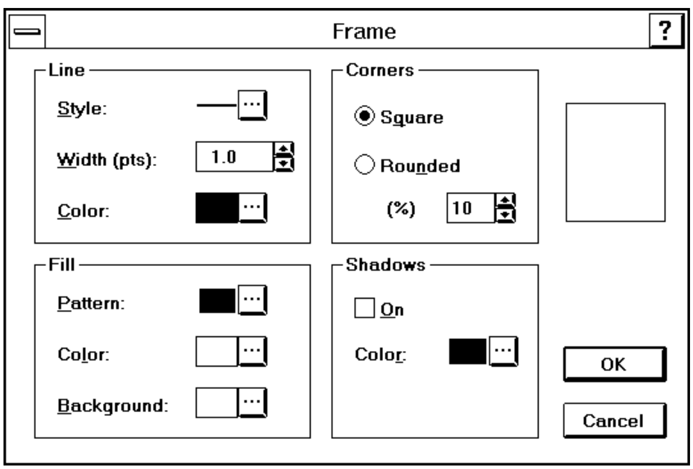


Figure 1.27 **Frame dialog box**

4. In the Shadows group box, place a check in the *On* box.

   This turns on a drop shadow behind the title frame.

5. Click OK to close the Frame dialog box and return to the Title dialog box.

6. In the *Line 1* text box, highlight the existing text and type 'Median Household Income: 1991'.

   This replaces the previous text for the first line of the map title.

7. In the *Line 2* text box, highlight the existing text and type 'San Francisco, CA'.

   This replaces the previous text for the second line of the map title. You'll leave the third line blank.

8. Click OK to close the Title dialog box.

The screen redraws, and the title is updated. Your Page window should now look similar to the following figure.

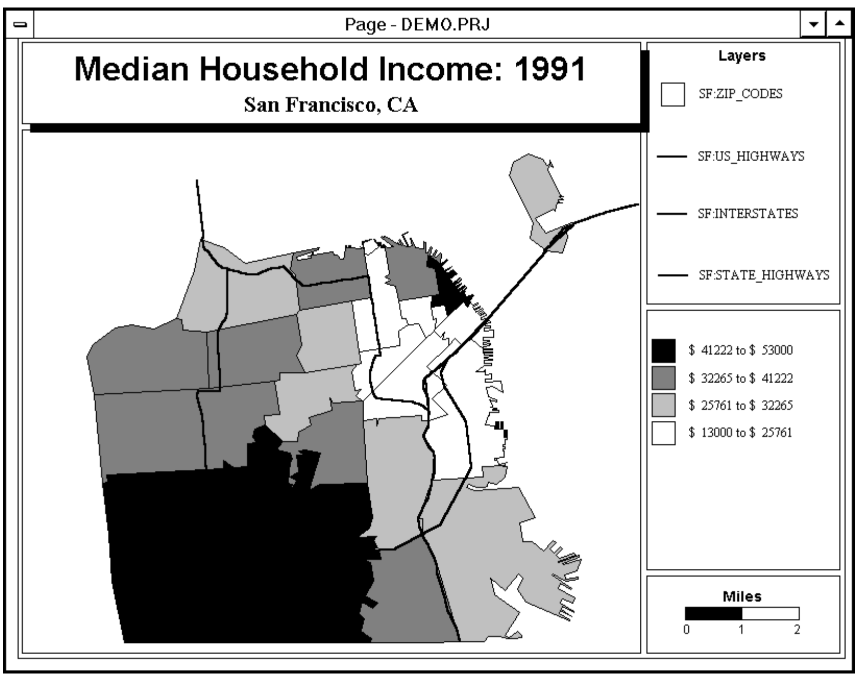


Figure 1.28 **Page window with updated title**

What To Do Next

Congratulations! You've finished the demo. Now that you've seen a little bit of what the program can do, you can really begin to learn about it. You should go through Lessons 2, 3, and 4 first. Lesson 2 familiarizes you with the user interface, helping you find your way around the program. Lessons 3 and 4 provide instruction on managing and working with your files, and some basic concepts you'll need to use Atlas GIS for Windows.

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' when prompted to save changes). This will close the open files and reset the Page window for the next lesson.

Part II:

Learning the Program Tools

2

Tour of the Interface

This lesson introduces you to the Atlas GIS for Windows user interface. It shows you what the application window looks like when you first start up the program, and describes each of the main screen elements.

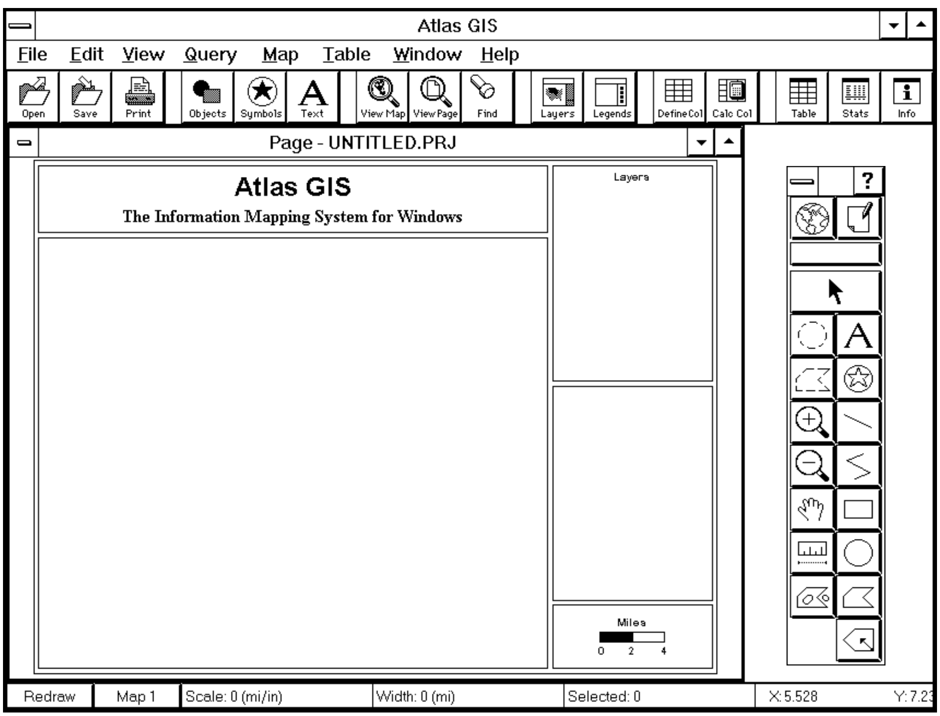


Figure 2.1 **Atlas GIS for Windows user interface**

- The *menu bar* at the top of the screen displays the menu topics. As you drag the mouse across the menu bar, each menu drops down a list of commands.

- The *button bar* (below the menu bar) provides shortcuts to commonly used menu commands.

- The *Page window* contains an image of the page (as it will appear in final printed form). This is the primary window, where all direct interaction with the map and page take place. The map displays in the map frame on the page.

- The *toolbox* contains tools that you use to select freehand objects, page elements, or map features, and to select layers to work with. You can also add or manipulate freehand objects or text, adjust your view, and more.

- The *status bar* at the bottom of the screen displays a variety of information, including the map scale, the map width, the number of selected map features, and the current cursor location on the map or page. It also includes a Redraw button, which you can click on to redraw the Page window, and the Current Map button, which you can click on to change the current map frame focus.

Menu Bar

The *menu bar* at the top of the screen displays the menu topics. As you drag the mouse across the menu bar (while holding down the left mouse button), each of these menus drops down a list of commands. Here's a summary of the menu commands, in the order in which they appear.

Table 2.1 **Summary of menu commands**

MENU	**COMMAND SUMMARY**
File	Performs basic file operations and program tasks, such as opening, merging, or saving files, and printing. Also, sets the program preferences and accesss SQL databases.
Edit	Performs basic editing of map and freehand objects, such as copy and paste. Also, changes the drawing order of objects, or align selected objects.
View	Changes the map and page view.
Query	Finds objects and performs queries to select features.

Table 2.1 **Summary of menu commands (Continued)**

MENU	COMMAND SUMMARY
Map	Controls the appearance of the map and page, and performs advanced map operations, such as creating buffers, combining features, and digitizing.
Table	Perform basic table editing, and perform advanced table operations, including geocoding and aggregating data.
Window	Open a window or make it active, and arrange windows on the screen.
Help	Access the on-line help for Atlas GIS. *Atlas GIS Help* includes extensive "how to" and reference information, and a glossary not included in the printed documentation. For information on dialog boxes, the toolbox, and the status bar, refer to the on-line help for Atlas GIS.

To try out the menu bar:

1. Drag the mouse across the menu bar now while holding down the mouse button, stopping to look at the commands available in each menu.

2. When you get to the HELP menu, choose the CONTENTS command to view the list of topics available. Feel free to explore *Atlas GIS Help* now.

   Note: *Atlas GIS Help* includes an on-line glossary of terms and other references and "how to" information not available in any of the printed documentation. For example, *Atlas GIS Help* contains detailed information on dialog boxes, the toolbox, and the status bar, which is not included elsewhere.

Button Bar

The *button bar* provides shortcuts to certain menu commands. Clicking on any one of these buttons is the same as choosing that command from its pull-down menu. You can use FILE | PREFERENCES to show or hide the button bar, and to change the button display.You can choose small buttons, large buttons, or large buttons with text. The text option shows the button name as well as the icon.

Figure 2.2 **Button bar**

Here's a list of the buttons (in the order that they appear) and their corresponding commands.

Table 2.2 **Button bar command shortcuts**

BUTTON	**MENU COMMAND**
Open	FILE ǀ OPEN
Save	FILE ǀ SAVE
Print	FILE ǀ PRINT
Objects	EDIT ǀ CHANGE PROPERTIES ǀ OBJECTS
Symbols	EDIT ǀ CHANGE PROPERTIES ǀ SYMBOLS
Text	EDIT ǀ CHANGE PROPERTIES ǀ TEXT
View Map	VIEW ǀ ENTIRE MAP
View Page	VIEW ǀ ENTIRE PAGE
Find	QUERY ǀ FIND
Layers	MAP ǀ LAYERS & THEMES
Legends	MAP ǀ LEGENDS & FRAMES
Define Col	TABLE ǀ DEFINE COLUMNS
Calc Col	TABLE ǀ CALCULATE COLUMN
Table	WINDOW ǀ NEW TABLE WINDOW
Stats	WINDOW ǀ NEW STATISTICS WINDOW
Info	WINDOW ǀ SHOW INFO WINDOW

You'll use some of these buttons in various lessons throughout this tutorial, after you've learned how to work with files and tables in Atlas GIS.

Page Window

The *Page window* displays an image of the page (as it will appear in final printed form). This is the primary window where all direct interaction with the map and page takes place. It contains the map frames and other page elements, which include the title, map scale, and layer legends. You can turn these elements on or off (except the page frame) and change their appearance with the MAP ǀ LEGENDS & FRAMES command. A sample Page window with all of the elements turned on is shown in the following figure.

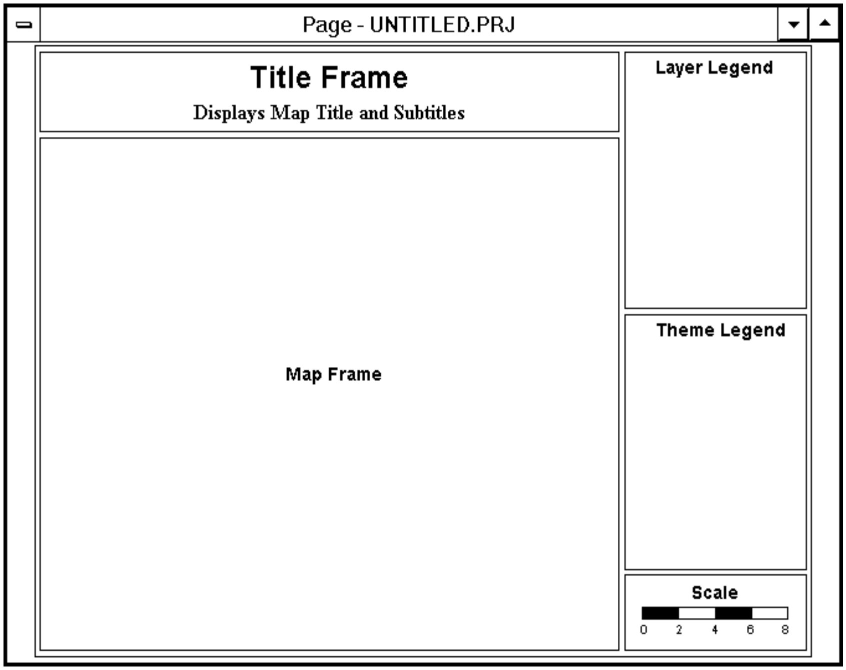


Figure 2.3 **Page window**

- The *map frames* contain images of the map. These are the areas of the page where the geo files are displayed and edited. You can display up to four map frames—only one is shown in the figure above.
- The *title* displays the map title and subtitles.
- The *layer legend* shows the graphic characteristics used for each layer.
- The *theme legends* are the keys for the theme variables. You can display up to four theme legends—only one is shown in the figure above.
- The *scale* depicts the scale of the map.

To modify the page elements:

1. Right-click on the title, the scale, or the layer legend to pop up a dialog box.

   You can right-click on any page element to change its properties (for example, to turn a frame on or off, or to change the colors). This is a shortcut to choosing the MAP | LEGENDS & FRAMES command and then clicking on the button with the name of page element.

2. Click on the [?] button in the top right corner of the dialog box.

   On-line help for the dialog box appears. All dialog boxes in Atlas GIS have one of these help buttons. You can click on the button at any time for help with that dialog box.

   Now you'll close the Help window.

3. Double-click on the Control-menu box to close the Help window.

4. Click on the Cancel button to close the page element's dialog box.

5. Now go to the menu bar and choose MAP | LEGENDS & FRAMES.

   This pops up the Legends & Frames dialog box.

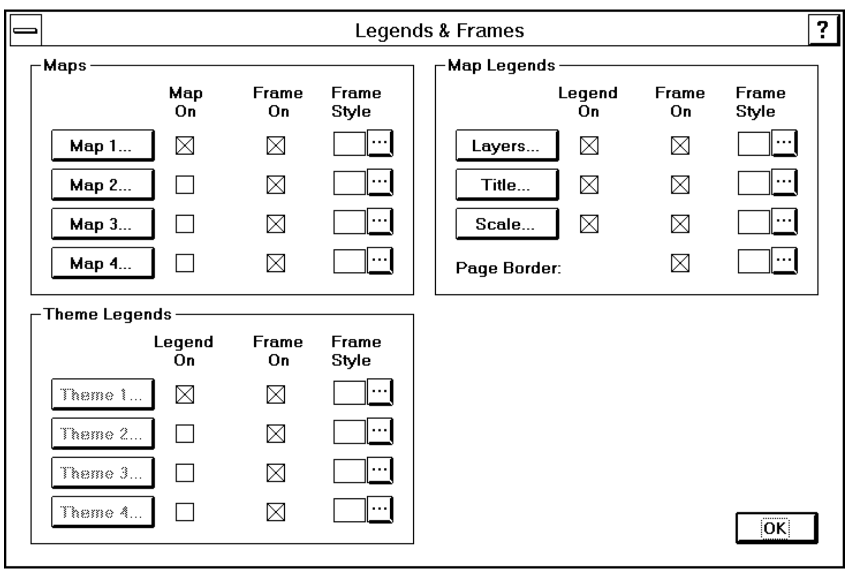


Figure 2.4 **Legends & Frames dialog box**

6. In the Map Legends group box, uncheck the *Legend On* box next to the Scale button, then click OK.

This turns off the scale, so it no longer displays in the Page window. From the Legends & Frames dialog box, you can turn off any of the page elements (except the page frame) by unchecking the *Map On* or *Legend On* box next to that element's button. You can change the contents of an element by clicking on the button with the element's name on it. You can also change the frame properties for an element by clicking on its Frame Style [...] button.

7. Choose the MAP | LEGENDS & FRAMES command again to pop up the Legends & Frames dialog box.

8. In the Map Legends group box, place a check in the *Legend On* box next to the Scale button, then click OK to close the dialog box and turn the scale back on.

Toolbox

The toolbox is contained in a floating window that you can relocate anywhere on your screen. You can even close it and retrieve it later through the WINDOW menu. And with the FILE | PREFERENCES command, you can specify the size of the tool icons.

The tools in the toolbox allow you to perform a wide variety of tasks. The tools at the top of the toolbox allow you to choose the layers to work with. You can use the Pointer tool to select map features, and to select, move, resize, and rotate freehand objects. You can also use the Circle Select and Polygon Select tools to select and deselect multiple map features. The drawing tools allow you to add map features or freehand objects to your map, such as lines, polygons, text, and symbols. The remaining tools allow you to zoom in or out, pan the map or page, and measure distances.

The following figure illustrates the toolbox. The tools are called out for your reference.

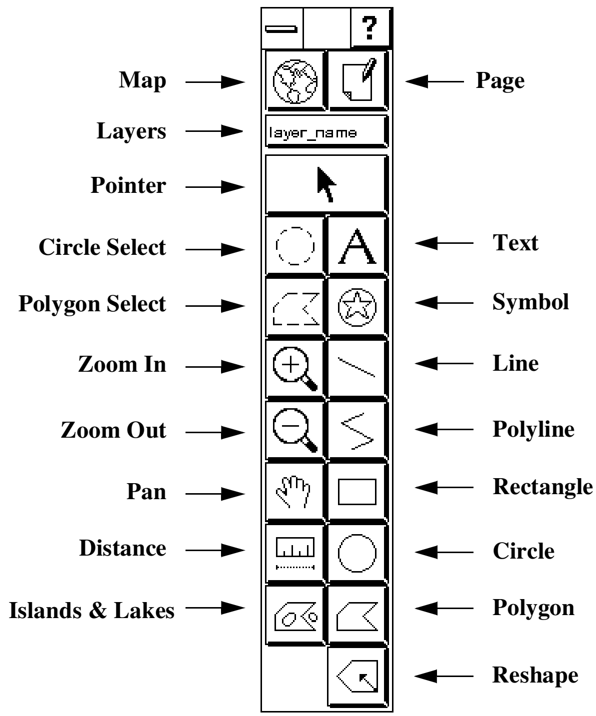


Figure 2.5 **Toolbox**

Here's a summary of the tools, in alphabetical order.

Table 2.3 **Summary of tools**

TOOL	**DESCRIPTION**
Circle	Adds a circle.
Circle Select	Selects all features inside of or touching a circle.
Distance	Measures the distance between two or more points.
Islands & Lakes	Allows you to combine regions into islands or lakes.
Layers	Allows you to define the default layer set (i.e., selects the map freehand layer, the labels layer, or one or more map layers as the layer or layers to work with). Tool face indicates the first layer in the set. A plus sign (+) indicates the set includes multiple map layers.
Line	Adds a line.

Table 2.3 **Summary of tools (Continued)**

TOOL	DESCRIPTION
Map	Specifies the default layer set as the layer or layers to work with.
Page	Specifies and selects the page freehand layer as the layer to work with.
Pan	Pans the map or page to view an area currently outside the working area.
Pointer	Selects freehand objects or map features. Also allows you to manipulate freehand objects, page elements, or labels.
Polygon	Adds a polygon.
Polygon Select	Selects all features inside of or touching a polygon.
Polyline	Adds a line with multiple segments.
Rectangle	Adds a rectangle.
Reshape	Adds, deletes, or moves vertices of map features.
Symbol	Adds a symbol or point.
Text	Adds a freehand text object.
Zoom In	Zooms in on the map or page.
Zoom Out	Zooms out from the map or page.

You'll use many of these tools throughout the lessons in this book, so you'll learn about them in context as you need them. If you'd like detailed information about the tools, all of the reference information on the tools is provided on-line in *Atlas GIS Help*, which you can access by choosing HELP | CONTENTS or clicking on the [?] button located in the upper-right corner of the toolbox.

Status Bar

The *status bar* is located at the bottom of the application window and displays a variety of information. It also includes a Redraw button, so you can redraw the page with a single click, or cancel a redraw in progress.

Here's a summary of the items in the status bar, in the order in which they appear from left to right.

Table 2.4 **Status bar**

ITEM	DESCRIPTION
Redraw Button	Indicates (by its color) whether the current page image is accurate. Clicking on the Redraw button causes the page to redraw, or cancels a redraw in progress.
Current Map Button	Indicates which map frame has the current focus (when more than one map frame is open). Clicking on the button allows you to change the current map focus.
Map Scale	Shows the current map scale.
Map Width	Shows the width of the map displayed in the map area.
Selected Features	Shows the number of selected map features.
Current Cursor Location	Displays the current location of the cursor on the map or page.

Like the toolbox, you'll learn more about the status bar in context as you go through the lessons in this book. If you'd like detailed information about the status bar, all of the reference information is provided on-line in *Atlas GIS Help*, which you can access by choosing HELP | CONTENTS.

Other Windows

In addition to the Page window, Atlas GIS features several other windows you can open (from the WINDOWS menu) to perform specific tasks or to view information.

- The *Info* window displays data for the last selected feature.

- The *Table* windows display geographic and attribute data for a specified layer. You can edit the data in the table, query and select features, and perform advanced table operations, including geocoding and aggregating data. You can have multiple Table windows open simultaneously.

- The *Statistics* windows display "live" summary statistics about the selected features for every *numeric* column in a layer. The statistics include the record count, sum, average, and weighted average. You can have multiple Statistics windows open simultaneously.

These windows are described in more detail in Lesson 7, “Using the Different Windows.”

End of Lesson

Don’t save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose ‘No’ when prompted to save changes). This will close the open files and reset the Page window for the next lesson.

3

Using Files and Tables

There are three basic file types you'll work with in Atlas GIS: project files, geo files, and tables. These files store the basic, fundamental information about your map. When you're working with maps, you'll want to manage these files efficiently to make your job easier. In this lesson, you'll learn guidelines for storing your projects, and how to open and save files. For detailed information about these different file types, see Chapter 3, "Storing and Managing Data," in the *Reference Manual*.

Note: When you open a geo file or table, the file is not loaded into memory (because these files can be quite large). Instead, Atlas GIS automatically updates these files while you edit. If you do not want to edit the original file, use the FILE | SAVE AS command to create a copy of the file before you begin working with the file, or use the Read Only option in the FILE | OPEN command. For more information on these commands and options, see the *Reference Manual* and *Atlas GIS Help*.

Setting up a Project Directory

Before you begin working on a new project, it's a good idea to set up a separate directory for it. When you save your work, you'll save the files to this project directory. Having all the files for a map in a separate directory helps keep the project organized and easier to work with. (See your *Microsoft® Windows™ User's Guide* for information on creating directories and copying files.)

As a safeguard, you should copy any files you'll need to the project directory before you edit them. Atlas GIS automatically updates geo files and tables as you make changes. Therefore, copying the files to the project directory ensures that the directory contains all the necessary files, and that the original files are preserved.

For the tutorial lessons, it is assumed that you installed the tutorial files to a directory called C:\AGISW\TUTORIAL. You'll find a number of project files, geo files, and tables in this directory, all specifically designed for the lessons in this tutorial.

Important Note: Some of the lessons in this tutorial share the same files. In lessons where we know a file will be modified and the change would affect other lessons, we tell you to save the file under another name before beginning the lesson. In some cases, however, such as importing files, Atlas GIS automatically creates special files. If these files already exist when you start a lesson, you might get unexpected results. Therefore, if someone has already completed the tutorial using the files on your system, you may want to delete the entire contents of the C:\AGISW\TUTORIAL directory and reinstall the files. (You can do a partial installation to install only the tutorial files. For directions on installing the files, refer to Chapter 2 of *Getting Started*.)

Using a Project File as a Template

A project file contains all the file names and settings necessary to recreate your map completely. It includes a list of names for all the geo files and tables used to create the map, the settings that determine how the map looks, and any freehand annotations.

Each time you start Atlas GIS, a default project file (called DEFAULT.PRJ) is automatically opened. This project file contains the default page settings. You can use this or any other project file as a template. Simply open the project file you wish to use as a template, and use the FILE | SAVE AS command to create another project file. In this exercise, you'll open a project file we've created for you, and save it to a new project file.

To use a project file as a template:

1. Choose FILE | OPEN to pop up the Open dialog box.

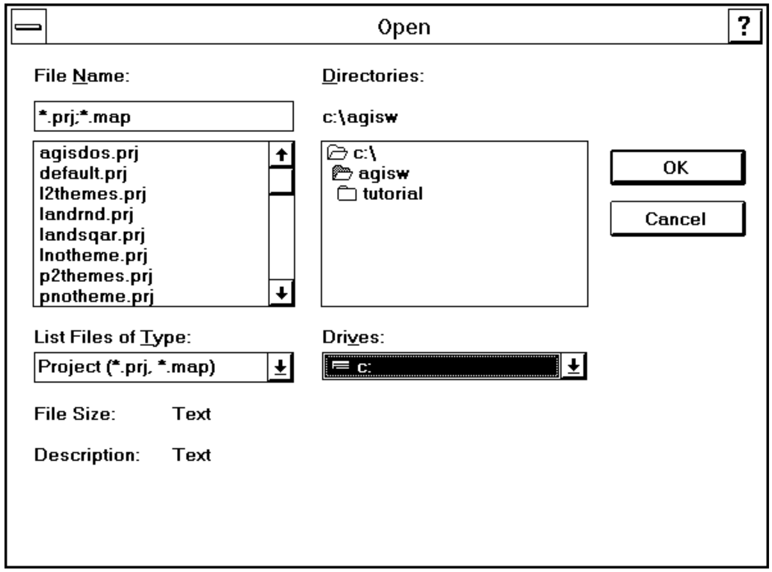


Figure 3.1 **Open dialog box**

2. In the *List Files of Type* list box, choose 'Project (*.prj, *.map)'.

3. In the *File Name* list box, choose the 'TEMPLATE.PRJ' project file in the C:\AGISW\TUTORIAL directory.

4. Click OK.

   Atlas GIS closes any open files, then opens the TEMPLATE.PRJ file.

5. Choose FILE | SAVE AS to pop up the Save As dialog box.

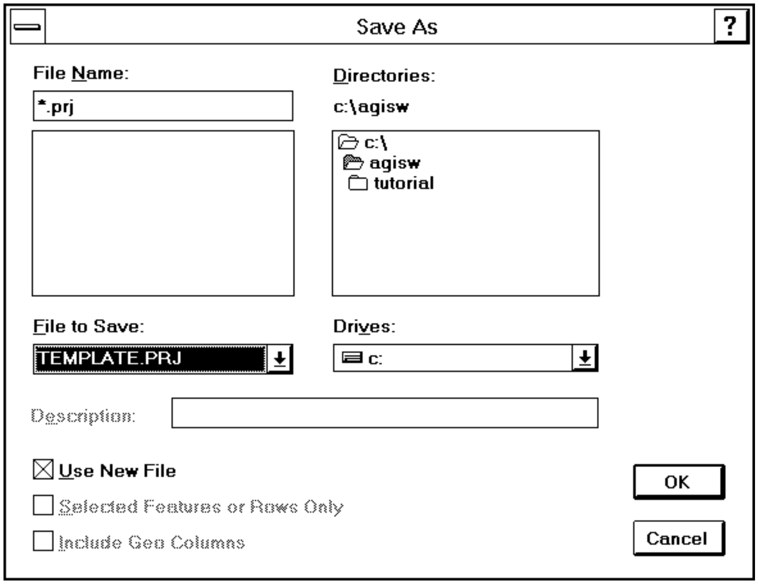


Figure 3.2 **Save As dialog box**

6. In the *File To Save* list box, choose 'TEMPLATE.PRJ'.

7. In the *File Name* text box, type 'PRACTICE.PRJ'.

8. In the *Drives* list box and *Directories* list box, choose the drive and directory that you set up for the tutorial lessons. (It's probably C:\AGISW\TUTORIAL.)

9. Make sure the *Use New File* box is checked.

   This closes the original TEMPLATE.PRJ and opens PRACTICE.PRJ for use.

10. Click OK.

Opening a Geo File

Geo files use the name extension .AGF and contain locational information for the geographical objects—called *map features*—that make up your maps. These features are stored as x-y coordinates in one or more map layers in the geo file. With Atlas GIS for Windows, you can have more than one geo file open simultaneously.

In this exercise, you'll open two geo files: US_STATE and US_HWYS. These files each contain unique layers. US_STATE contains state boundaries and 100 major cities, and US_HWYS contains interstate highways.

To open a geo file:

1. Choose FILE | OPEN to pop up the Open dialog box.

2. In the *List Files of Type* list box, choose 'Geo (*.agf)'.

3. In the *File Name* list box, choose the file 'US_STATE.AGF' in the C:\AGISW\TUTORIAL directory

4. Click OK.

   The open geo file should look something like this.

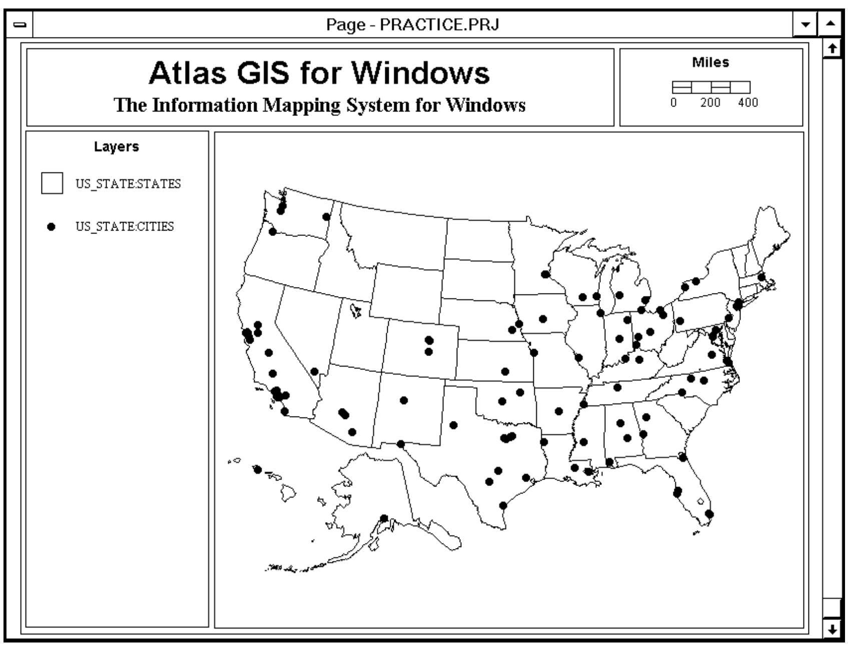


Figure 3.3 **View of the US_STATE geo file**

5. Choose FILE | OPEN again to pop up the Open dialog box.

   Notice the *List Files of Type* list box should still be set to ‘Geo (*.agf)’.

6. In the *File Name* list box, choose the file ‘US_HWYS.AGF’ in the directory C:\AGISW\TUTORIAL.

7. Click OK.

The open geo files should now look like the following figure.

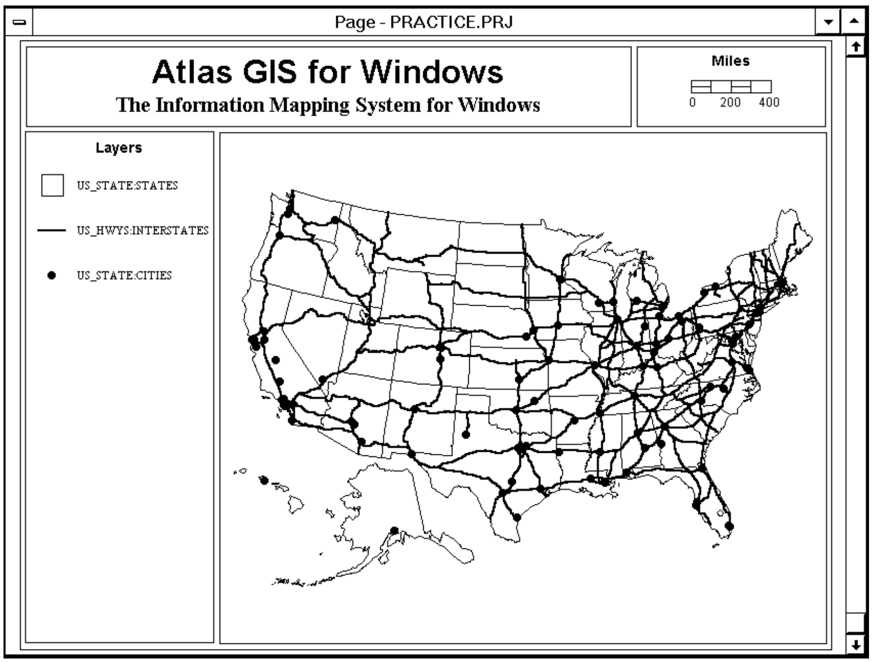


Figure 3.4 **View of the US_STATE and US_HWYS geo files**

Opening a Table

There are two types of tables in Atlas GIS: attribute and point. Both types contain data associated with map features in the geo file. However, point tables also include coordinates to show points on the map; therefore, they can be displayed independently from geo files.

In this exercise, you'll open an attribute table called US_DEMOG.DBF and link it to a layer in a geo file you just opened. This table contains demographic information by state.

To open a table:

1. Choose the FILE | OPEN command to pop up the Open dialog box.

2. In the *List Files of Type* list box, choose 'Table (*.dbf)'.

3. In the *File Name* list box, choose the file 'US_DEMOG.DBF' in the directory C:\AGISW\TUTORIAL.

4. Click OK.

   The Table Link dialog box pops up.

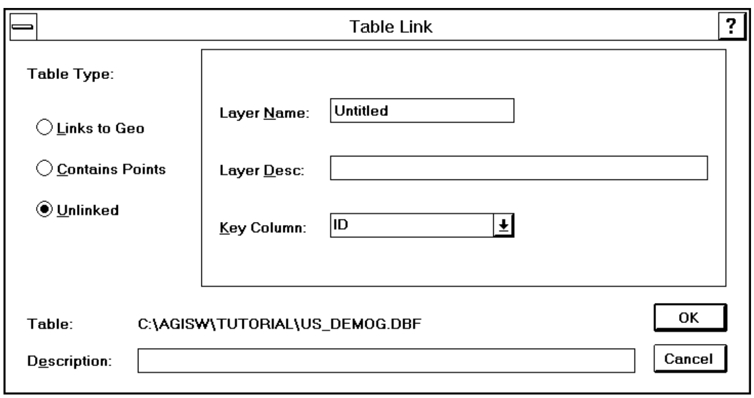


Figure 3.5 **Table Link dialog box**

5. Click on the Links to Geo option button.

6. In the *Layer Name* list box, choose 'US_STATE:STATES'.

   The table will link to this layer in the geo file.

7. In the *Key Column* list box, choose 'ID'.

The values in this key column in the table will be matched with values in the _ID column in the geo file; matching rows will be linked.

8. In the *Description* text box, type ‘U.S. Demographic Data’.

9. Click OK.

The table is now linked to the US_STATE:STATES layer of the geo file. To view the table, you must open a new Table window and view the layer to which the table is linked.

To open a new Table window:

1. Choose WINDOW | NEW TABLE WINDOW.

   The Window Layer dialog box pops up.

2. In the Layer list box, choose the ‘US_STATE:STATES’ layer.

3. Click OK.

   The Table window displays the geographic data for the US_STATE:STATES layer, as well as the demographic data contained in the linked attribute table.

4. Scroll across the table to see the different columns.

5. Double-click on the Control-menu box to close the window.

Detailed instructions on using the Table window are provided later in Lesson 7, “Using the Different Windows,” and Lesson 10, “Working With Tables.”

Saving a Project File

Although Atlas GIS automatically updates your geo files and tables as you edit them, it does not update your project files until you save them. The FILE | SAVE command saves your project file (including page settings and the list of open geo files and tables), so the next time you open the project file it can restore the map.

In the exercises in this lesson so far, you've created a new project file, and you've opened geo files and a table. In this next exercise, you'll save the project file, so that it will store the names of the geo files and table. If you open the project file later, the program will open the geo files and table automatically.

To save a project file:

- Choose FILE | SAVE or click on the Save button on the button bar.

End of Lesson

Before proceeding, choose FILE | NEW | PROJECT. This will close the open files and reset the Page window for the next lesson.

4

Working with Layers

Maps created in Atlas GIS consist of *map features* (regions, lines, and points) that are organized into *map layers*. You can think of layers as a stack of transparencies, each containing features that combined make up the total map. A map layer contains only one kind of feature (regions, lines, or points), but you can have more than one layer for each type of feature. For example, streets and highways would both be line features, but they may be represented in two separate (line) layers.

Each Atlas GIS project file also contains a *page freehand layer*, a *map freehand layer*, and a *labels layer*. The freehand layers contain objects or text that you add using the tools provided in Atlas GIS. This is useful when you want to annotate a map with, for example, a North arrow (or compass rose), a decorative symbol, or special explanatory information. The labels layer contains the map feature annotations (i.e., labels), which are based on a column name or expression.

Map layers allow you to group, manage, and graphically depict different classes of features, and to analyze their relationships. You can turn map layers on or off and set them to be visible only at certain scales. You can also set the graphic characteristics for each map layer.

In this lesson, you'll select a map layer and change some of the layer settings. You'll also move labels in the labels layer, add a circle to the map freehand layer, and move page elements in the page freehand layer.

Selecting a Layer to Work with

When working with the map, you need to select the layer or layers you want to work with (i.e., the *default layer set)*. The default layer set is the layer or layers in which the tools and EDIT commands operate. The default layer set may contain the map freehand layer or the labels layer, or one or more map layers. If a command doesn't use the default layer set, it prompts you to specify a map layer.

In this exercise, you'll open a map of San Francisco, and select a single (region) layer as the default layer set.

To select map layers:

1. Choose FILE | OPEN and open the SFZIPS.PRJ file located in the directory C:\AGISW\TUTORIAL.

   Note: Make sure you choose 'Project (*.prj, *.map) in the *List Files of Type* list box so that you can open the project file.

   This project file automatically opens the SF.AGF and SFSTORES.AGF geo files; opening geo files also automatically activates the Map tool.

2. Click on the Layers tool to pop up the Default Layer Set dialog box.

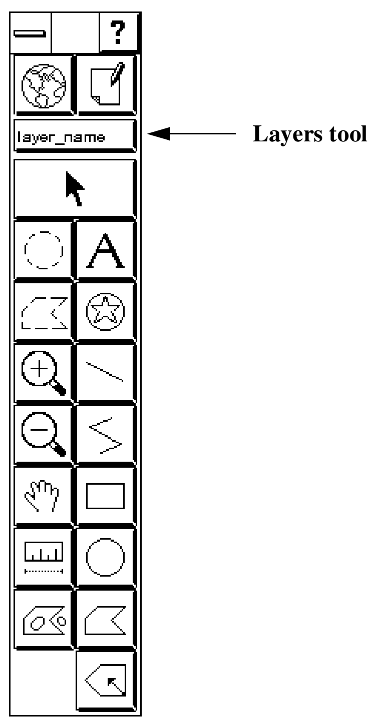


Figure 4.1 **Layers tool in the toolbox**

When the Map tool is active, clicking on the Layers tool pops up the Default Layer Set dialog box. When the Page tool is active, the Layers tool is inactive.

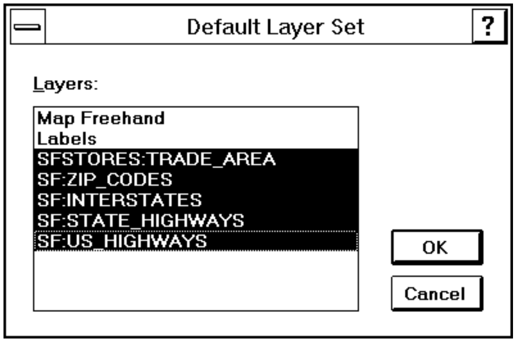


Figure 4.2 **Default Layer Set dialog box**

3. In the *Layer*s list box, choose 'SF:ZIP_CODES'.

   Layer or layers chosen (highlighted) in this list box become the *default layer set.* Click on a single layer to select it, or drag to select multiple map layers in succession. You can also use the modifier keys (CTRL+CLICK to toggle selections, or SHIFT+CLICK to make an extended selection).

4. Click OK.

   The name of the first layer in the default layer list appears in the area directly below the Layers tool. When the default layer set has more than one map layer, a plus sign (+) is also displayed. The Pointer tool should still be active. You'll use it to select a feature next.

5. Click on a ZIP code region to select it.

   The region you clicked on is selected.

6. Now click on a highway on the map.

   Notice that the ZIP code region below the feature you clicked on is selected. This is because the ZIP code layer is the only layer in the default layer set; features in layers that are not part of the default layer set are not selectable.

Changing Map Layer Settings

In Atlas GIS, you change map layer settings using the MAP | LAYERS & THEMES command. For example, you can turn layers on or off, change the colors and fill pattern for the features in a layer, or turn on labels. In this exercise, you'll turn on the SFSTORES:STORES layer, and change the color of the ZIP code boundaries.

To change map layer settings:

1. Choose MAP | LAYERS & THEMES to pop up the Layers & Themes dialog box.

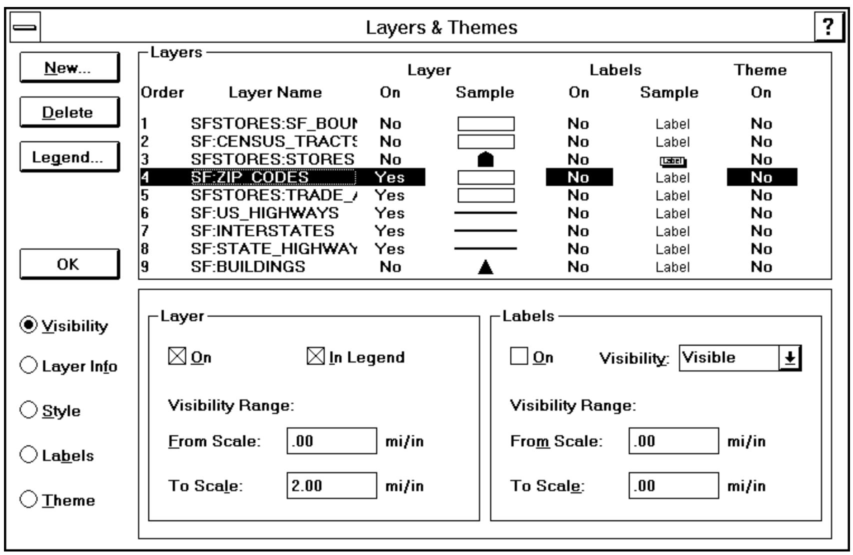


Figure 4.3 **Layers & Themes dialog box**

2. In the Layers group box, click in the *Layer On* column for the SFSTORES: STORES layer to toggle the setting to 'Yes'.

   This turns on the SFSTORES:STORES layer so that it will appear on the map.

3. Choose 'Yes' in the Labels On column for the SFSTORES:STORES layer.

   The labels for the layer will also be displayed on the map.

4. Now click on the 'SF:ZIP_CODES' layer name to choose that layer.

5. Click on the Style option button on the lower left side of the dialog box.

   The subpanel in the dialog box changes to show the line and fill style settings for the layer, similar to the subpanel in the following figure.

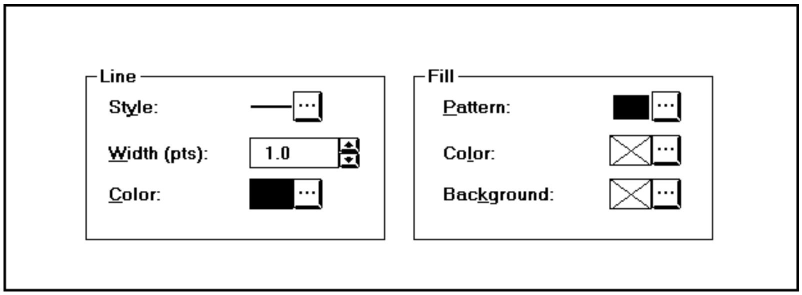


Figure 4.4 **Style subpanel**

   You'll change the line color settings for this layer, to change the outlines of the ZIP code regions. You won't change any of the fill settings.

6. In the Line group box, leave the *Style* and *Width* settings as they are.

7. Click on the Color [...] button to pop up the Color dialog box.

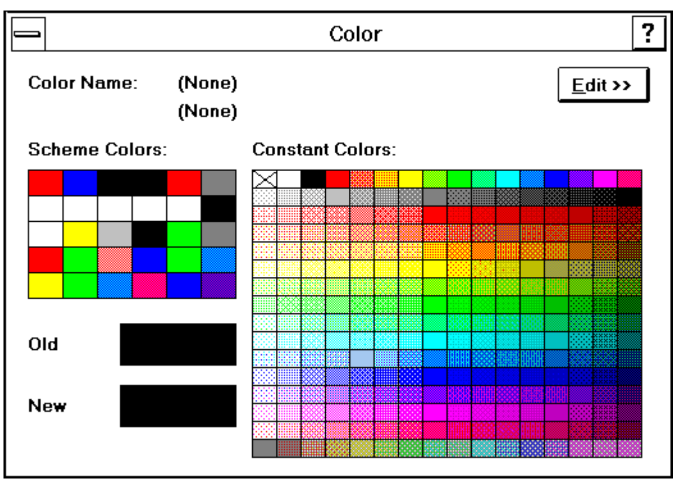


Figure 4.5 **Color dialog box**

8. In the *Constant Colors* palette, choose a brown color.

   The Color dialog box closes automatically, and returns you to the Layers & Themes dialog box.

9. Click OK.

The map should now look similar to the following figure, with three store locations now added to the map along with their labels. The ZIP code boundaries should now be brown.

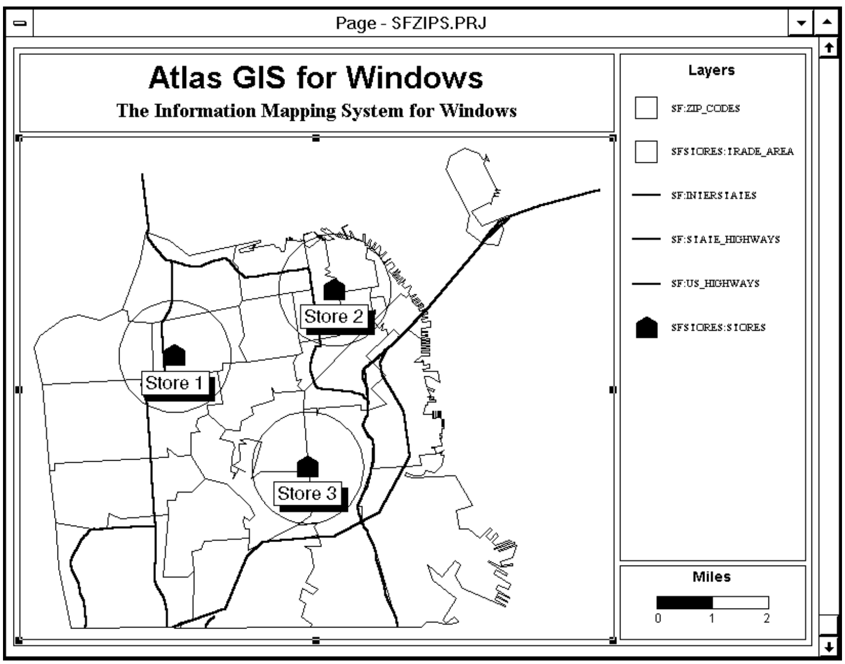


Figure 4.6 **SFSTORES:STORES layer and its labels turned on**

For more information on the MAP | LAYERS & THEMES command, refer to the *Reference Manual*. For descriptions of all the options in the Layers & Themes dialog box, refer to *Atlas GIS Help*.

Moving Labels in the Labels Layer

You can fine-tune your map by using the labels. When labels for a map layer are visible, you can move and rotate individual labels to any position.

To move labels in the labels layer:

1. Click on the Layers tool to pop up the Default Layer Set dialog box.

2. In the Layers list box, choose ‘Labels’.

3. Click OK.

   After you select a layer to work with, the Pointer tool is automatically active.

4. Click on the ‘Store 1’ label.

   The label is selected, and edit handles appear in or on the label. Whenever a label is selected, you can move or rotate it.

5. Place the cursor anywhere in the label (except on the handle located in the center of the label), and drag the label to position it above the store.

   Notice as you drag, the cursor changes to a four-way directional cursor.

6. Click on the ‘Store 2’ label.

7. Place the cursor on the center edit handle and drag.

   Depending on the direction you drag, the label is rotated clockwise or counterclockwise. Notice as you drag, the cursor changes to a semi-circle with an arrowhead.

   Now you’ll restore the labels to their original position.

8. Choose MAP | RESET LABELS to pop up the Reset Labels dialog box.

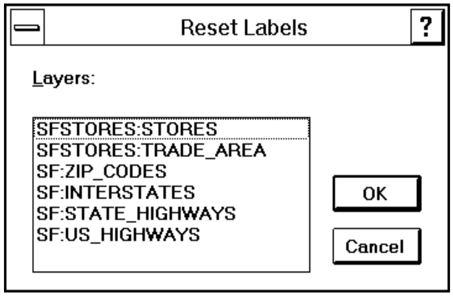


Figure 4.7 **Reset Labels dialog box**

9. In the Layers list box, choose ‘SFSTORES:STORES’.

10. Click OK.

The map should look like it did when you began this exercise.

Adding a Circle to the Map Freehand Layer

When you draw an object in the map freehand layer, the object becomes tied to the map. Therefore, as you zoom in or out on the map, the map-based freehand object becomes larger or smaller, maintaining its size in proportion to the map. Map-based objects also stay in the same place on the map.

Adding a circle to the map freehand layer is a quick and simple way to illustrate a particular area. For example, you can draw a 5-mile delivery zone for a warehouse. In this exercise, you’ll draw a circle to show a trade zone with a 1-mile radius around a store.

To add a circle to the map freehand layer:

1. Click on the Layers tool to pop up the Default Layer Set dialog box.

2. In the Layers list box, choose ‘Map Freehand’ and click OK.

   This specifies that the map freehand layer is the default layer set (i.e., the layer to work with).

3. Click on the Circle tool.

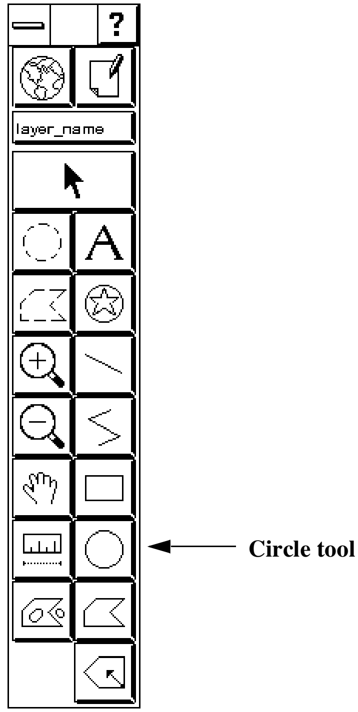


Figure 4.8 **Circle tool in the toolbox**

Notice the cursor changes from a pointer to a cross hair.

4. Place the cursor over the Store 2 symbol and click to place the center point for the circle.

   When you release the mouse button, the Circle Radius dialog box pops up.

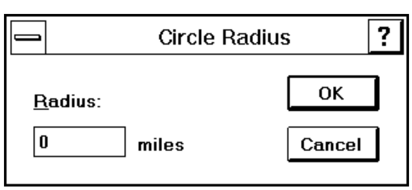


Figure 4.9 **Circle Radius dialog box**

5. Type ‘1’ in the Radius text box.

6. Click OK.

The map redraws to show a circle with a 1-mile radius. It should look similar to the following figure.

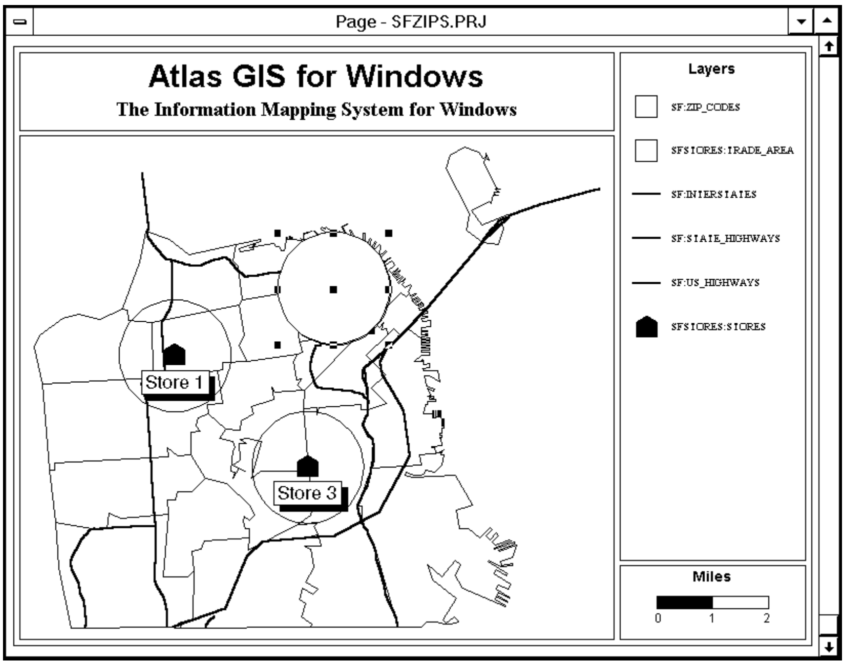


Figure 4.10 **Map with 1-mile radius map freehand circle**

Note: If you inadvertently make the circle the wrong size, you can remove it by choosing EDIT | DELETE OBJECT, then draw the circle again.

You can also add objects or text to the page freehand layer by clicking on the Page Freehand tool and repeating the steps described above. Unlike objects in the map freehand layer, objects added to the page freehand layer become part of the page just like the layer legend and scale. Therefore, when you adjust the view of the map, the page-based objects remain the same.

Moving Page Elements in the Page Freehand Layer

The page elements are part of the page freehand layer. When you select the page freehand layer as the layer to work with, you can edit or move the page elements. In this exercise, you'll move the scale and resize the map legend.

To move a page element in the page freehand layer:

1. Click on the Page tool to select the page freehand layer.

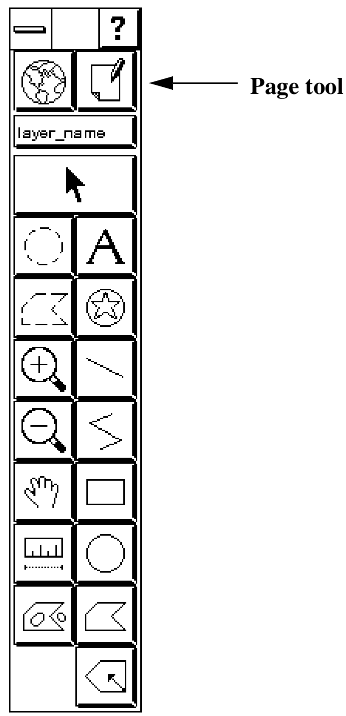


Figure 4.11 **Page Freehand tool in the toolbox**

This allows you to select freehand objects in the page freehand layer, including page elements.

2. Click anywhere in the scale frame to select the map scale.

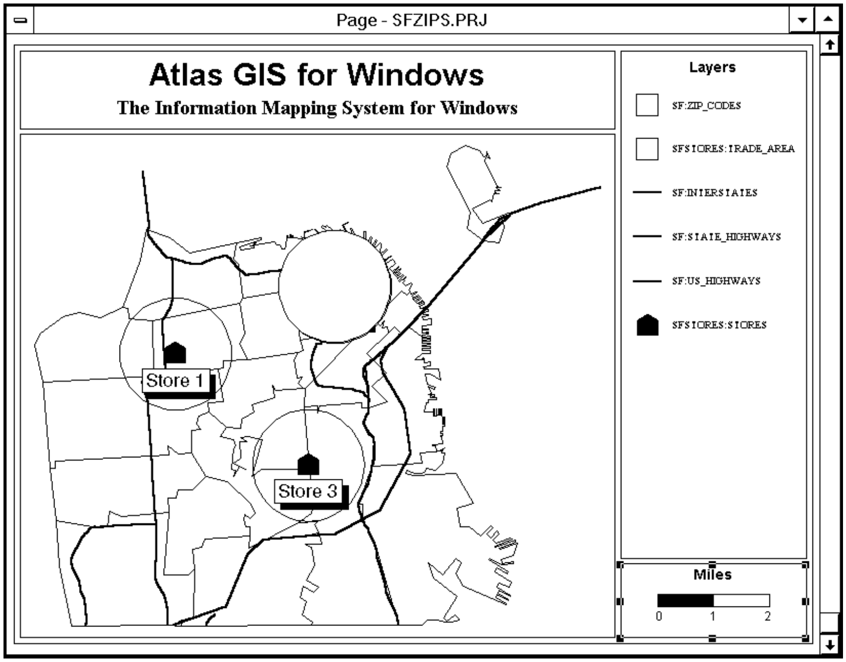


Figure 4.12 **Page window with scale frame selected**

Notice the edit handles on the selected frame.

3. Place the cursor inside the scale frame and drag the frame to the lower right corner of the map frame, as shown in the following figure.

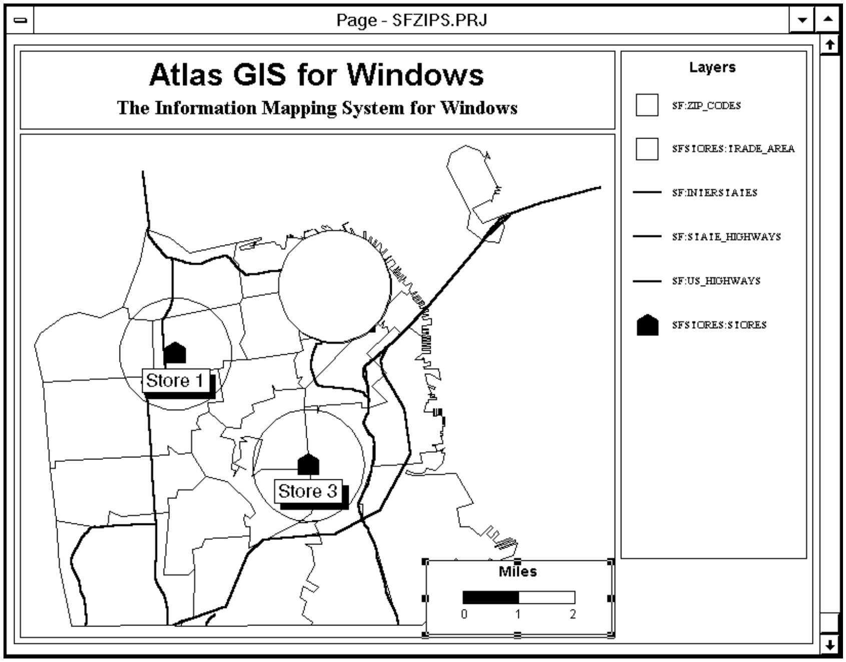


Figure 4.13 **New location of the scale**

After moving the scale, you can resize the layer legend to fill in the place where the scale used to be.

4. Select the layer legend frame. (Click on the frame to select it.)

5. Drag the edit handle at the bottom center of the legend frame, until the frame aligns with the bottom of the map frame.

For this lesson, you won't save these new page settings. (If you want to save the page layout, you could save the project file using FILE | SAVE.)

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' when asked to save changes). This will close the open files and reset the Page window for the next lesson.

5

Viewing the Map and Page

While you're working in Atlas GIS, you can adjust your view of the map and page to suit the task you're performing. For example, you might zoom in on an area of the map to add a freehand object, or you might want to pan the map to see a part not shown on the screen. You might also want to view the entire page before printing, to get the full effect of the layout.

In this lesson, you'll use many of the VIEW menu commands and the zoom and pan tools from the toolbox to change the view of the map and the page. The project file you'll be working with (called SFCALIF.PRJ) contains county boundaries for California, as well as some detailed information for the San Francisco area.

Zooming In

The Zoom In tool allows you to zoom in on either the map or page, depending upon which layer is selected. When you zoom in on the map, you select an area with the Zoom In tool and Atlas GIS enlarges that area of the map to fill the map frame (if you have more than one map frame open, only the map in the current map frame is affected). You can also select a spot as the center of the zoom area and change the view by the amount of magnification specified in FILE | PREFERENCES. Refer to the on-line help for more information on this method.

To zoom in on the map:

1. Choose FILE | OPEN (or click on the Open button in the button bar) and open the SFCALIF.PRJ project file in the directory C:\AGISW\TUTORIAL.

   This opens the CALIFORN.AGF and SF.AGF geo files and activates the Map tool.

2. Click on the Zoom In tool.

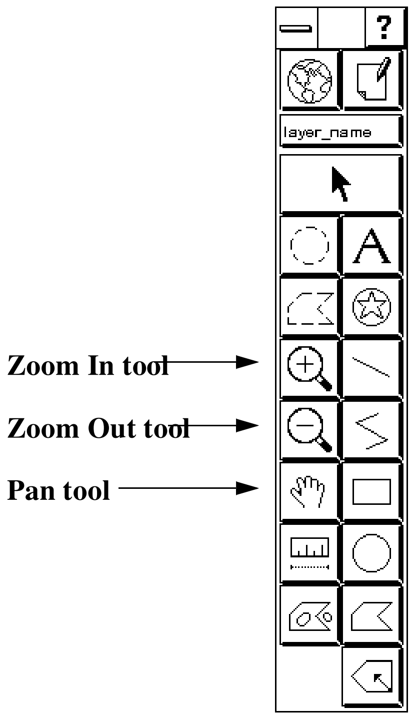


Figure 5.1 **Zoom In, Zoom Out, and Pan tools in the toolbox**

   Clicking once on the tool activates it for one-time use. Double-clicking on a zoom tool activates it for multiple use, until you click on a different tool.

3. Place the zoom cursor (magnifying glass with a plus sign inside) on the northwest corner of the San Francisco Bay Area and drag down to the southeast corner of the Bay Area to define the zoom area, as shown in the following figure.

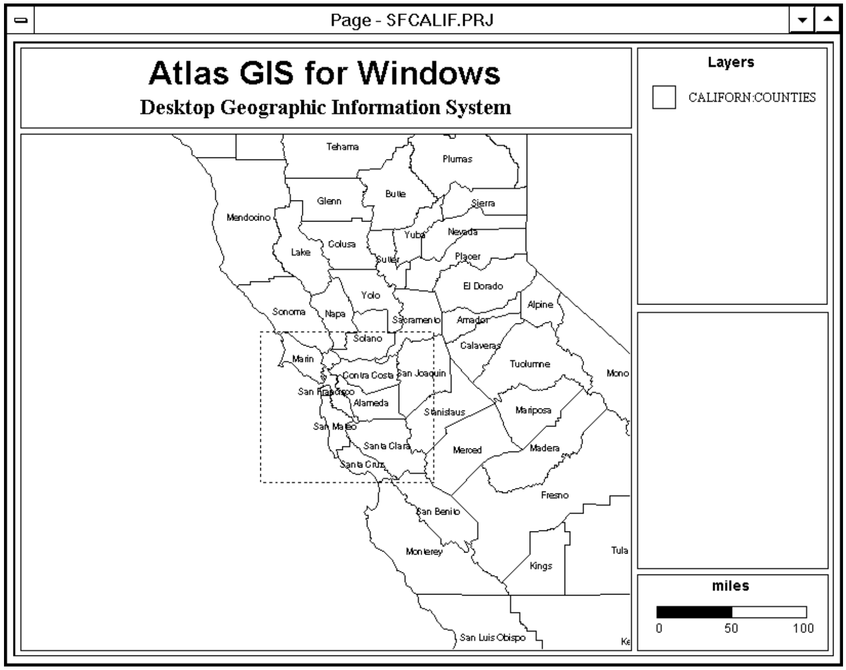


Figure 5.2 **Define the area to zoom**

When you release the mouse button, the designated zoom area is redrawn to fill the map frame. The map should look similar to the following figure.

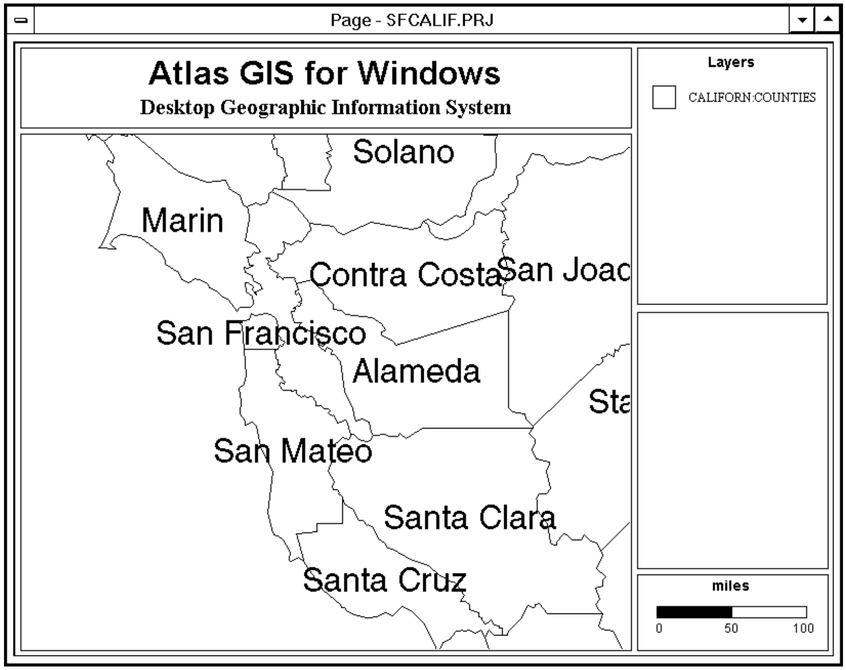


Figure 5.3 **View after zooming in on the map**

If you didn't get the intended results, choose VIEW | PREVIOUS MAP VIEW to undo the zoom, then try the zoom again.

In addition to zooming in on the map area, you can also zoom in on the page. Notice the difference when you zoom in on the *page* instead of the *map.*

To zoom in on the page:

1. Click on the Page tool to select the page freehand layer.

2. Click on the Zoom In tool.

3. Place the zoom cursor on the top left corner of the layer legend and drag to the lower right corner of the legend frame.

   Your screen should look similar to the following figure, with the zoomed area filling as much of the Page window as possible.

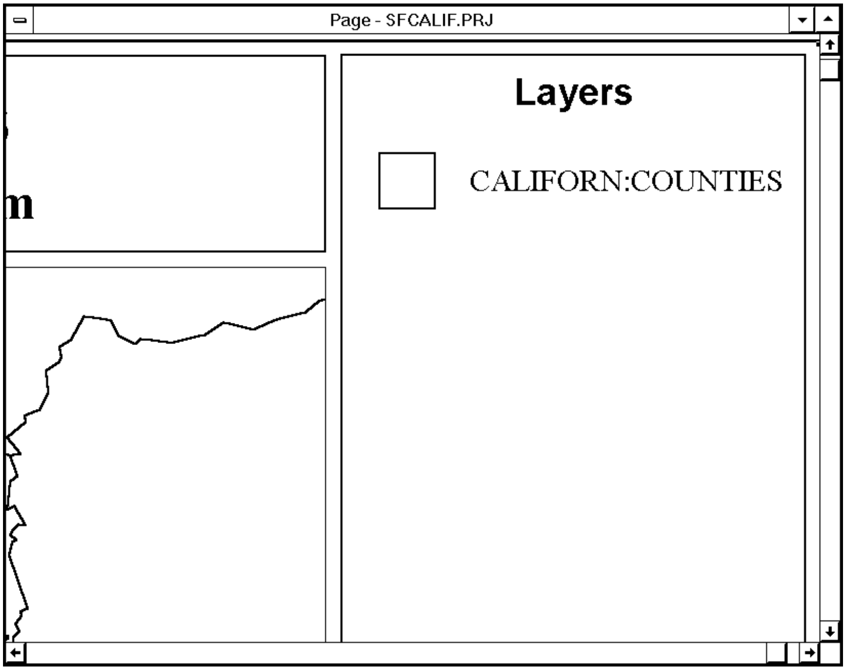


Figure 5.4   **View after zooming in on the page**

4. Choose VIEW | ENTIRE PAGE to reset the Page window.

You might zoom in on the page when you want to get a close look at a page freehand object or a page element. Or you might zoom in on the page when you want to get a close look at part of the map, without changing the portion of the map displayed in the map frame.

Panning

Another way to change your view of the map or page is to *pan*, specifying a new location as the center of the display. Panning doesn't change the magnification or zoom factor of the view; it just recenters the map in the map frame or the page in the Page window. For example, you might pan the map to view an area that's currently outside of the map frame.

You might pan the page when you're zoomed in and want to see another portion, or when the Page window is smaller than the page size. You have to be zoomed in on the page to pan it, then you can use the Pan tool or the scroll bars. You can then choose VIEW | ENTIRE PAGE to reset the page view.

In the following steps, you'll pan the map.

To pan the map:

1. Click on the Map tool to work with the map.

2. Click on the Pan tool.

   Like the Zoom In and Zoom Out tools, single-clicking sets the tool for single use, and double-clicking activates it for multiple use.

3. Place the cursor (a hand) on San Francisco, then click to set the new map center.

   When you release the mouse button, the screen redraws, so the place you clicked is displayed at the center of the map. You can also hold the mouse button down and drag to pan, which is useful if you just want to reposition the map by a small amount.

4. Choose VIEW | PREVIOUS MAP VIEW to undo the pan.

Viewing Selected Map Features

The VIEW | SELECTED MAP FEATURES command allows you to set the map view so that the selected map features fill the map frame. You might use this command to zoom in on a selected map feature to add freehand annotation, or to view a selected feature from a set of small, densely-packed features.

To view selected map features:

1. Click on the Map tool.

2. Click on the Layers tool to pop up the Default Layer Set dialog box.

3. In *Layers* list box, double-click on 'CALIFORN:COUNTIES'.

   This selects the CALIFORN:COUNTIES map layer as the layer to work with, closes the dialog box, and activates the Pointer tool. (Anytime you specify the default layer set, the Pointer tool becomes active automatically.) You'll use it to select a feature next.

4. Select San Francisco. (Click on the feature to select it.)

   Notice the status bar updates to display the current number of selected map features, which should be one.

5. Choose VIEW | SELECTED MAP FEATURES.

   The screen redraws automatically, fitting the selected features in the map frame.

Viewing the Entire Map

The VIEW | ENTIRE MAP command fits the entire map into the map frame. This is useful when you've zoomed in multiple times and want to view the entire map again. You can choose this command to zoom back out all the way, rather than choosing VIEW | PREVIOUS MAP VIEW several times. Go ahead and choose VIEW| ENTIRE MAP now to see how it works (or click on the View Map button on the button bar).

Viewing the Entire Page

The VIEW | ENTIRE PAGE command scales the page contents to fit the entire page to the Page window. This is useful anytime you've zoomed in on the page and want to get back to the full page—for example, after using VIEW | MAP FRAME to concentrate on the map. Choose the VIEW | ENTIRE PAGE command now to see how it works.

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' when asked to save changes). This will close the open files and reset the Page window for the next lesson.

6

Changing the Page

In Atlas GIS you define the size and shape of your *page*, and lay out the *map* and other elements on the page. (You can think of the page as your final printed output.) An image of the page is displayed in the *Page window*, where you can view and work with any or all of the page elements.

In this lesson, you'll learn how to set up your page, and how to work with the various page elements as you design the page.

Setting Up the Page

The FILE | PAGE SETUP command allows you to specify the page size and orientation, and define the margins. When selecting a page size, keep in mind that Atlas GIS for Windows allows you to print your page onto as many separate pieces of paper as it requires, so your page size is not limited to your printer's paper size. You can choose a standard paper size as your page size, or you can specify a custom height and width.

When setting up your page, you might also consider how you'll be printing the final map. If your page size matches (or is smaller than) your printer's paper size, you can print the page at actual size, without any additional consideration. If your page size is larger than your printer's paper size, you can print the page reduced to fit on one sheet of paper, or you can print the page at actual size onto multiple sheets of paper.

To set up the page:

1. Choose FILE | SAVE AS and save the UNTITLED.PRJ project file as 'MYPAGE.PRJ'.

   Make sure the *Use New File* box is checked, and that you save the project file in the directory that you set up for the tutorial lessons. (It's probably C:\AGISW\TUTORIAL.)

2. Choose FILE | PAGE SETUP to pop up the Page Setup dialog box.

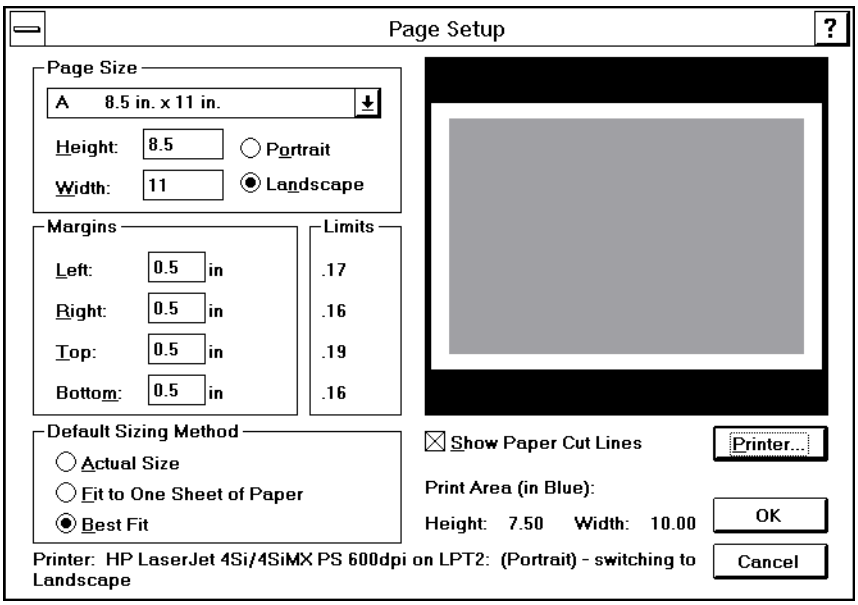


Figure 6.1 **Page Setup dialog box**

The current printer is listed at the bottom of the dialog box. If you have more than one printer attached, you can click on the Printer button to select a different printer.

3. In the Page Size group box, choose 'B (11 in. x 17 in.)' from the list box.

   Notice that the page dimensions display in the *Height* and *Width* text boxes. If your current printer can't print on paper the same size as your page (in this case, on an 11 x 17 sheet), Atlas GIS will print the page on the paper size available. If necessary, it will print the page over several separate pieces of paper, and you can paste them together to create your full-sized map. (Or you can reduce it and force it to fit on one sheet of paper.)

Note: When you send the page to your output device, it is printed on the *paper* at the actual, physical size of the page.

4. Click on the Landscape option button to specify the page orientation.

5. In the Margins group box, type '1' in the *Left*, *Right*, *Top*, and *Bottom* text boxes.

   Note that the *hard* margins (i.e., the margins of the page where the printer is unable to print) are shown in the Limits group box. These settings vary according to the specified printer.

6. In the Default Sizing Method group box, click on the Best Fit option button.

   This allows you to preview how the page will print with the current setup. Depending upon which printer you have selected, you can probably see how the page will actually print in two pieces, with a cut line for your reference.

7. Click OK.

Changing the Layout and Appearance

After setting up the page, you can decide which elements (map, legends, scale, title) you want to include on the page, and determine their size, placement, and graphic characteristics. This process is called *page layout*. The page can contain the elements in the following table.

Table 5.1 **Page elements**

ELEMENT	**DESCRIPTION**
Map Frame 1 – 4	The areas of the page where the open geo files and point tables are displayed and edited. Up to four map frames can be opened at one time.
Layer Legend	The legend or key showing the graphic characteristics used for each map layer.
Scale	A scale bar showing the map scale.
Theme Legend 1 – 4	The legend or key for a theme variable. Up to four theme legends can be opened at one time.
Title	The map title and subtitles.

You can lay out any or all of these page elements in your page, in any way you choose. The elements can even overlap.

Displaying Page Elements

When you design your page, you'll choose which page elements to display in it. In this exercise, you'll include the Map, Title, Scale, and Layer Legend in your page.

To display page elements:

1. Choose MAP | LEGENDS & FRAMES (or click on the Legends button on the button bar) to pop up the Legends & Frames dialog box.

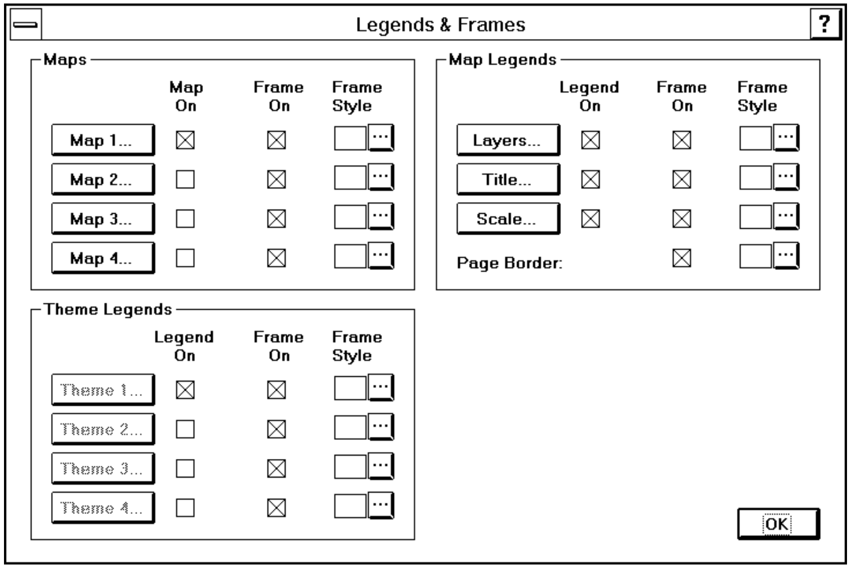


Figure 6.2 **Legends & Frames dialog box**

2. In the Maps group box, place a check in the *Map On* box next to the Map2 button.

3. In the Theme Legends group box, uncheck the *Legend On* box next to the Theme 1 button.

4. In the Map Legends group box, uncheck the *Frame On* boxes next to the Layers and Scale buttons.

Next, you'll round the frame corners for Map 1, Map 2, and the title. You'll also add a drop-shadow to Map 2.

To change the frame styles:

1. In the Map Legends group box, click on the Frame Style [...] button next to the Title button.

   The Frame dialog box pops up, displaying the current settings for the title frame.

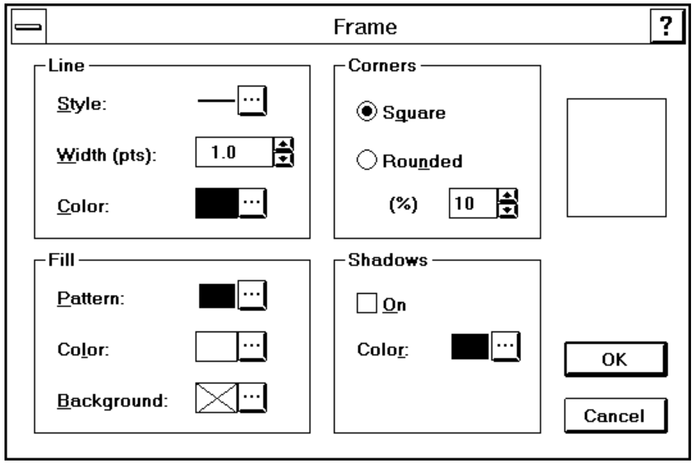


Figure 6.3 **Frame dialog box**

2. In the Corners group box, click on the Rounded option button.

3. Click OK to return to the Legends & Frames dialog box.

4. In the Maps group box, click on the Frame Style [...] button next to the Map 1 button, and repeat steps 2 and 3.

5. Click on the Frame Style [...] button next to the Map 2 button to pop up the Frame dialog box.

6. In the Line group box, set the options according to the following table. (For assistance, refer to the instructions following the table.)

OPTION	SETTING
Style	Use default style
Width (in points)	3
Color	Red

- In the *Style* box, use the default line style.
- In the *Width* text box, type ‘3’.

- Click on the Color […] button to pop up the Color dialog box. In the Constant Colors palette, click on the 'Red' slot. (Notice that you can move the mouse across the colors without holding down the mouse button to display the color names.)

7. In the Corners group box, click on the Rounded option button.

8. In the Shadows group box, place a check in the *On* box.

9. Click OK to return to the Legends & Frames dialog box.

10. Click OK.

    The map redraws to display the new page element settings. Now you'll open two geo files.

11. Choose FILE | OPEN and open the CALIFORN.AGF geo file located in the C:\AGISW\TUTORIAL directory.

    A map of California appears in each map frame.

12. Choose FILE | OPEN and open the SF.AGF geo file located in the C:\AGISW\TUTORIAL directory.

    The map should look similar to the following figure.

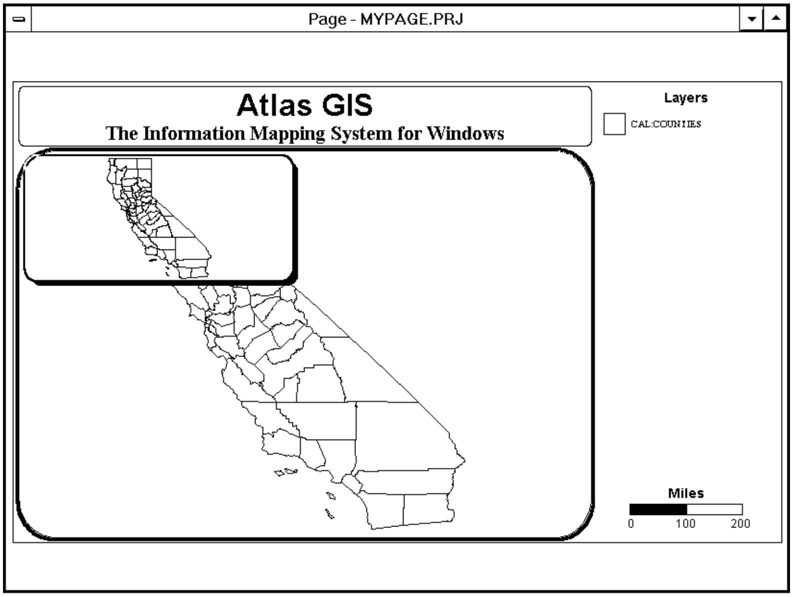


Figure 6.4 **Page with new settings**

Next you'll zoom in on the map in the small map frame (Map 2).

To adjust the map view:

1. Click on the Current Map button (located on the status bar) and choose 'Map 2' from the pop-up list.

   This places the focus on the map frame for Map 2. If you have more than one map frame open, you need to specify the frame in which certain commands (i.e., the QUERY and VIEW commands) operate.

   You can also click on a map frame to place the focus on it.

2. Choose QUERY | FIND to pop up the Find dialog box.

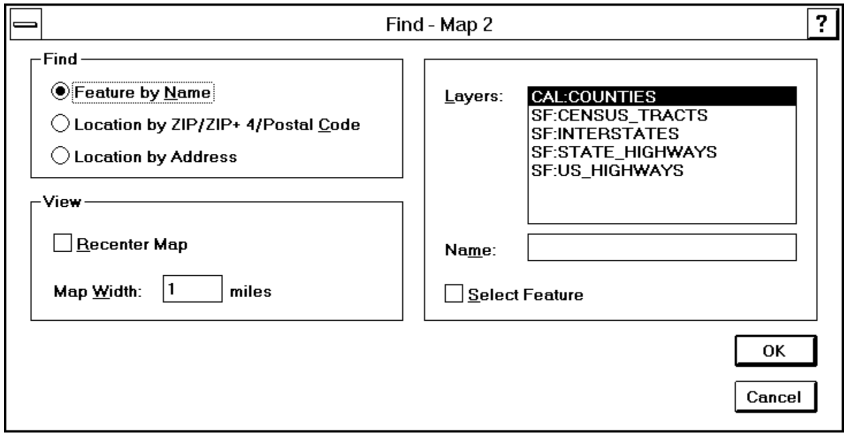


Figure 6.5 **Find dialog box**

Notice when more than one map frame is opened, the title of the dialog box includes the map that will be affected.

3. In the Find group box, click on the Feature By Name option button.

4. In the *Layers* list box, choose 'CALIFORN:COUNTIES'.

5. In the *Name* text box, type 'San Francisco'.

   The search is case-sensitive, so capitalize the name exactly as it appears.

6. Place a check in the *Select Feature* box.

7. Click OK.

   San Francisco county is located, selected, and marked in Map 2; the map in Map 1 is unaffected. Now you'll zoom in on the map in Map 2.

8. Choose VIEW| SELECTED MAP FEATURES.

   Atlas GIS zooms in on the selected feature, which is San Francisco county.

9. Click in anywhere in Map 2 to deselect the feature.

Resizing and Moving Page Elements

In this exercise, you'll resize and rearrange the page elements.

To resize the page elements:

1. Click on the Page tool to select the page freehand layer.
2. Click on the title frame to select it.

   Notice that edit handles appear on the title frame.
3. Grab the edit handle on the right side of the frame and drag it to the right until the space between the title frame and page frame is the same as it is on the left.

   As you resize the frame, a dashed line indicates where the new frame border will be. Don't worry that the title frame overlaps the layer legend and scale.
4. Click on the map frame for Map 1 (the largest map frame) to select it.
5. Grab the edit handle on the right side of the map frame, and drag it to the right until its frame is aligned with the title frame.

   When you resize the map frame, the map resizes proportionally. Next, you'll reset the map view.
6. Make sure 'Map 1' is displayed on the Current Map button in the lower left section of the window. If not, click on it and choose 'Map 1'.
7. Choose VIEW | ENTIRE MAP.

   The entire map is visible again in Map 1. In the next exercise, you'll move the map frame for Map 2, the layer legend, and the scale.
8. Click on the Pointer tool to deselect the Pan tool.

To move page elements:

1. Select the scale (click on the frame to select it).
2. Drag the scale to the lower-left corner of Map 1.
3. Select the layer legend and drag it to the lower-right corner of Map 1.

4. Select the map frame for Map 2 and drag it to the upper-right corner of Map 1.

   Next, you'll reposition the map in Map 1.

5. Click on the Map tool to work with the map.

6. Double-click on the Pan tool (to set it to multiple use).

7. Place the pan cursor (a hand) on California in Map 1, then drag until the map looks similar to the following figure.

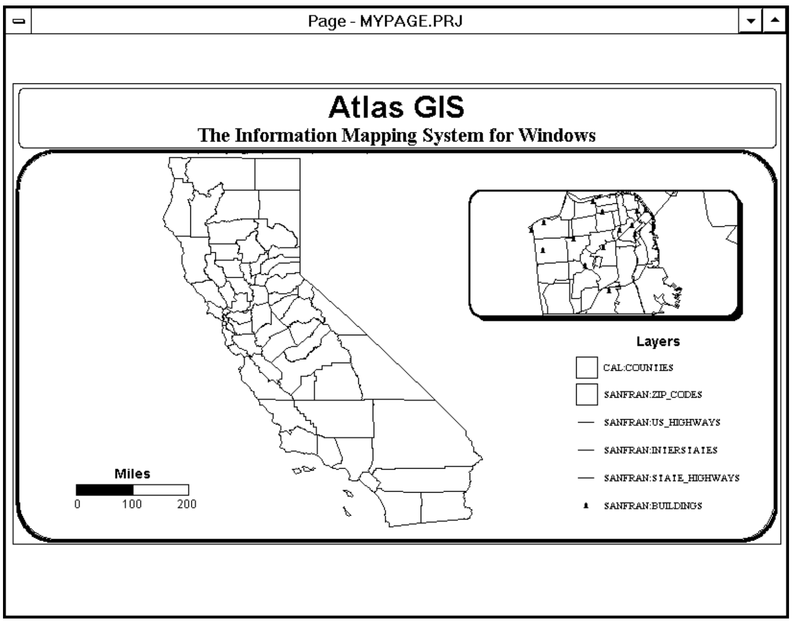


Figure 6.6 **Map with page elements resized and moved**

Once the page elements are in position, you're ready to set up the title, layer legend, and scale.

Setting Up the Title

The title frame includes the map title and subtitles. You can modify the title using the Title dialog box. In this exercise, you'll change the title text, as well as the font style, size, and color.

To set up the title:

1. Click on the pointer tool.

2. Right-click anywhere inside the title frame to pop up the Title dialog box.

   You could also click on the Title button in the Legends & Frames dialog box; right-clicking inside the frame is a shortcut. (You can right-click inside any of the page elements to edit them. This is a quick, easy way to change a page element that doesn't look exactly the way you want it to look.)

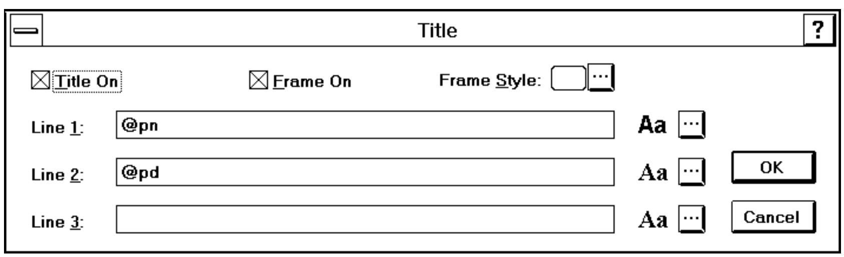


Figure 6.7 **Title dialog box**

   Notice that the *Title On* box is checked, since the title is on. The *Frame On* box is also checked, displaying a frame around the title.

3. In the *Line 1* text box, highlight the existing text and type 'California Counties'.

4. Click on the Line 1 […] button (following the *Line 1* text box).

   The Text dialog box pops up.

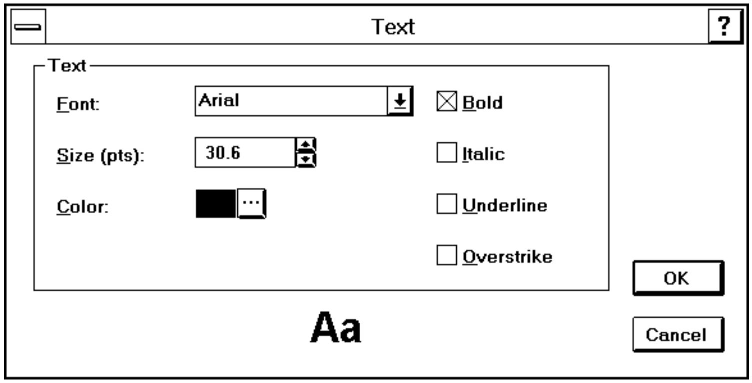


Figure 6.8 **Text dialog box**

5. In the Text group box, set the options according to the following table. (For assistance, refer to the instructions following the table.)

OPTION	SETTING
Font	Times New Roman
Size (in points)	46
Color	Red
Bold	Checked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

- In the *Font* list, choose 'Times New Roman' or a similar font; in the *Size* list, type '46'.
- Click on the Color […] button to pop up the Color dialog box. Click on the 'Red' patch in the *Constant Colors* palette to select the color and return to the Text dialog box.
- Make sure the *Bold* box is checked. Leave the remaining option boxes unchecked.

6. Click OK to return to the Title dialog box.

7. In the *Line 2* text box highlight the existing text and type 'Practice Map for Lesson 6'.

8. Click OK.

Setting Up a Layer Legend

A layer legend displays the symbols and feature styles used for layers, along with corresponding descriptions. You can modify the layer legend through the Layer Legend dialog box.

To set up a layer legend:

1. Right-click on the layer legend to pop up the Layer Legend dialog box.

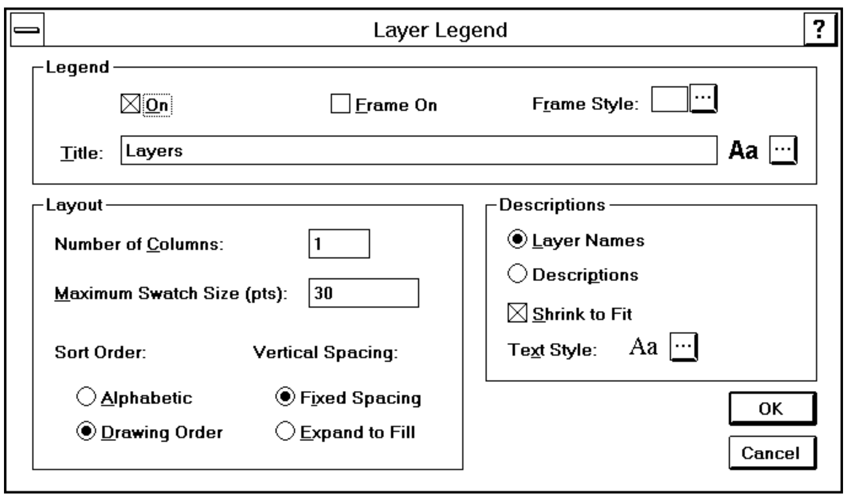


Figure 6.9 **Layer Legend dialog box**

2. In the Legend group box, make sure the *On* box is checked to display the layer legend; leave the *Frame On* box unchecked.

3. In the *Title* text box, highlight the existing text and type 'Layer Legend'.

4. Click on the Title […] button to edit the text attributes for the legend title.

   The Text dialog box pops up.

5. In the Text group box, set the options according to the following table.

OPTION	**SETTING**
Font	Times New Roman
Size (in points)	24
Color	Blue
Bold	Checked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

6. Click OK to return to the Layer Legend dialog box.

7. In the Layout group box, set the options according to the following table.

OPTION	**SETTING**
Number of Columns	1
Maximum Swatch Size	20
Sort Order	Alphabetic
Vertical Spacing	Fixed Spacing

8. In the Descriptions group box, click on the Layer Names option button.

   The layer names will display next to their corresponding sample swatches in the layer legend.

9. Make sure the *Shrink to Fit* box is checked.

   If any of the layer names are too long to fit in the legend, Atlas GIS will shrink the legend text until the names fit.

10. Click OK.

Setting Up the Scale

The scale frame indicates the map scale. You can modify the scale frame appearance through the Scale dialog box. In this exercise, you'll turn off the frame border and change the scale increments.

To change the scale appearance:

1. Right-click in the scale frame to pop up the Scale dialog box.

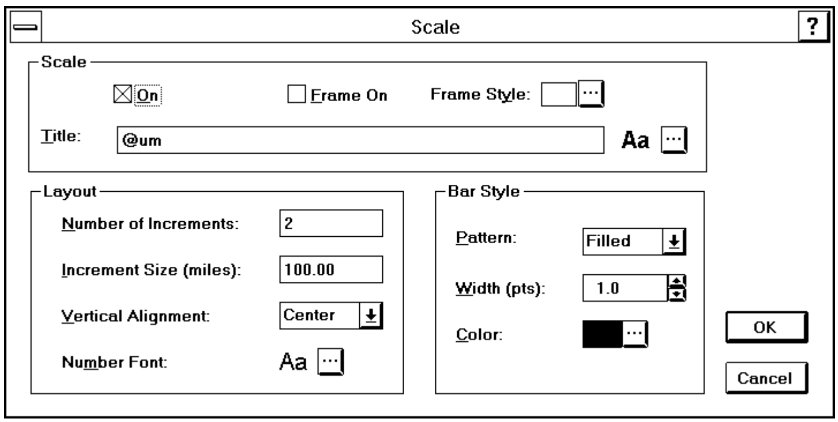


Figure 6.10 **Scale dialog box**

2. In the Scale group box, make sure the *Scale On* box is checked to display the map scale; leave the *Frame On* box unchecked.
3. In the Layout group box, set the *Number of Increments* to '4'.
4. In the *Increment Size* text box, type '50'.
5. Click OK.

The completed map should look similar to the following figure. (Note that the map in the following figure has also been annotated with the freehand rectangle in Map 1 and 'San Francisco County' text above Map 2. To make these annotations, use the Rectangle tool and Text tool in the map freehand layer.)

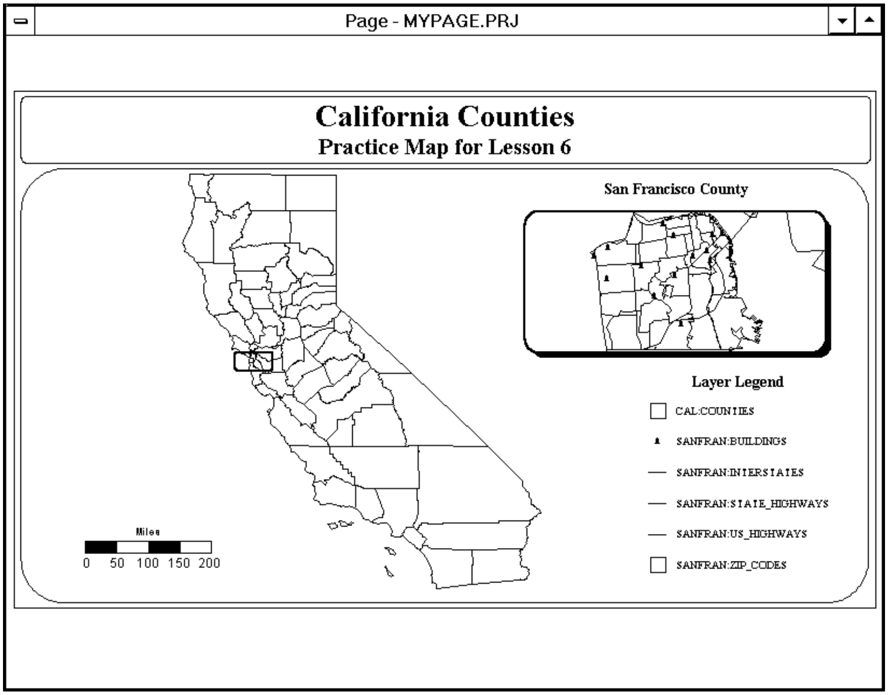


Figure 6.11 **Completed practice map**

Saving the Page Settings

The page settings are saved with the project file..

To save the page settings:

- Choose FILE | SAVE to save the MYPAGE.PRJ project file, including the page settings.

End of Lesson

Before proceeding, choose FILE | NEW | PROJECT. This will close the open files and reset the Page window for the next lesson.

7

Using the Different Windows

The Page window is the primary window for Atlas GIS, where most of your interaction with the map and page takes place, such as selecting map features. In addition to the Page window, however, you can open several other windows to perform specific tasks or to view information. These are the Info, Table, and Statistics windows.

You can open any of these windows (or bring it to the front if already open) using the WINDOW menu commands. As you use the windows, notice that the Info window and Statistics windows are floating windows—they always stay on top of other windows. The Table window, however, can move to the back while you work with other windows. You can easily retrieve it through the list of open windows (at the bottom of the TABLE command menu). When you're finished working in a window, you can close it (by double-clicking on the Control-menu box).

When you have a Table window or the Info window open, you can launch another application from within Atlas GIS. This feature, called *Application Linking*, is easy to use—just right-click on a cell in a table, where the cell contains a file name and path for the data you want to access. You'll use this feature later in this lesson, after becoming familiar with the different Atlas GIS windows.

Table Window

The *Table window* displays data (geographic and attribute) for the layer you choose, in a spreadsheet format. You can edit the data in the table, query and select features, and perform advanced table operations, such as aggregating data. The exercises in this lesson are designed to familiarize you with basic table operations. For more detailed information, refer to Lesson 10, "Working With Tables."

To use the Table window:

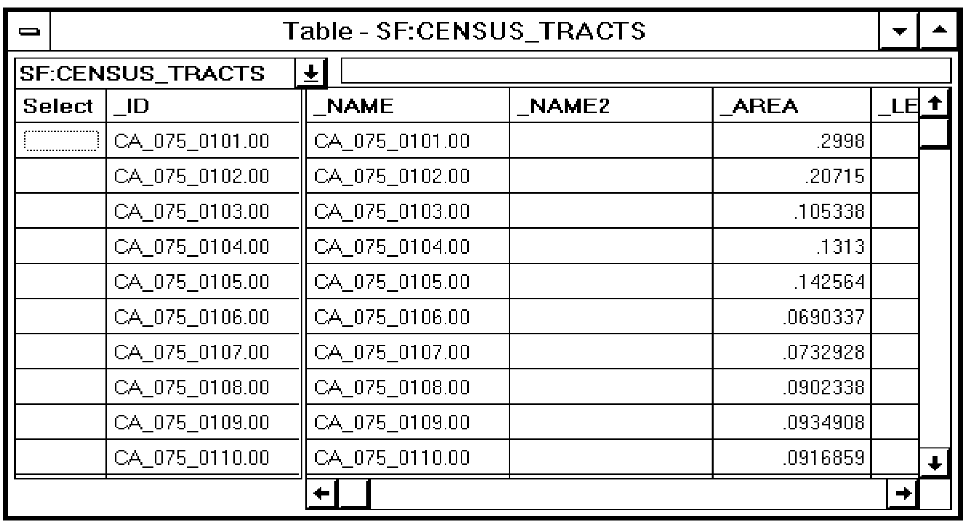
1. Choose FILE | OPEN (or click on the Open button on the button bar) and open the SFADDRES.PRJ file located in the directory C:\AGISW\TUTORIAL.

2. Choose WINDOW | NEW TABLE WINDOW (or click on the Table button on the button bar).

   The Window Layer dialog box pops up.

3. In the *Layer* list box, double-click on 'SF:CENSUS_TRACTS'.

   This selects the layer and closes the dialog box. The Table window displays the data for the layer. It should look similar to the following figure.



Select	_ID	_NAME	_NAME2	_AREA	_LE
	CA_075_0101.00	CA_075_0101.00		.2998	
	CA_075_0102.00	CA_075_0102.00		.20715	
	CA_075_0103.00	CA_075_0103.00		.105338	
	CA_075_0104.00	CA_075_0104.00		.1313	
	CA_075_0105.00	CA_075_0105.00		.142564	
	CA_075_0106.00	CA_075_0106.00		.0690337	
	CA_075_0107.00	CA_075_0107.00		.0732928	
	CA_075_0108.00	CA_075_0108.00		.0902338	
	CA_075_0109.00	CA_075_0109.00		.0934908	
	CA_075_0110.00	CA_075_0110.00		.0916859	

Figure 7.1 **Table window**

- The *table title* in the title bar indicates the name of the layer displayed in the window. (Note that the layer name includes the file name.)
- The *layer list* allows you to choose a layer to display in the window. You can choose a different layer from this list at any time.
- *Column names* display at the top of each column.

- The first column in a Table window is the SELECT column—it is always anchored. When the SELECT column is checked for a given row, that row and the corresponding map feature (if there is one) are selected.
- The display bar above the column names shows the *column description* for the current column. (Click in a column to see the description.)
- The *vertical scroll bar* to the right of the table allows you to view the rows in the table that are out of the viewing area.
- The *horizontal scroll bar* below the table allows you to view the columns in the table that are out of the viewing area.

If you scroll through the columns, you can see all of the columns in the geo file. You can link attribute data to the layer and display that, too. To link attribute data to the SF:CENSUS_TRACTS layer, you'll open the SFTRACT.DBF attribute table.

4. Choose FILE | OPEN and open the SFTRACT.DBF table in C:\AGISW\TUTORIAL.

   The Table Link dialog box pops up so that you can confirm the settings.

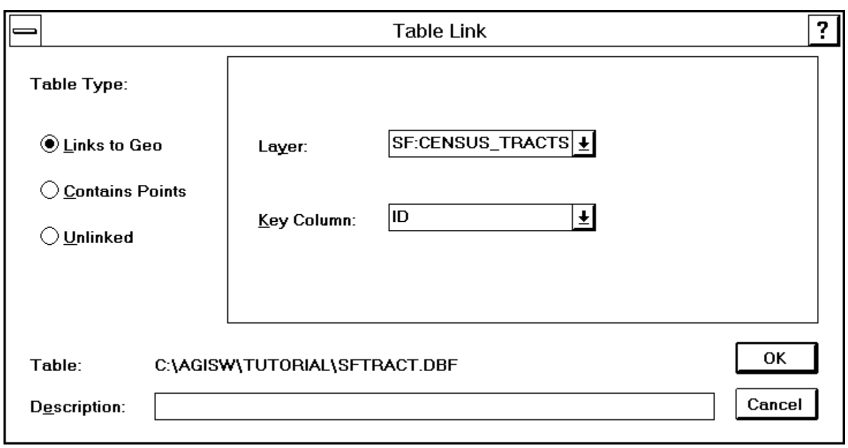


Figure 7.2 **Table Link dialog box**

5. Verify that the settings match those in the following table.

OPTION	SETTING
Table Type	Links to Geo option button
Layer Name	SF:CENSUS_TRACTS
Key Column	ID

6. Click OK.

   You can now view the linked attribute data in the Table window. (You may need to scroll to view the columns.)

   Notice that the Table window is split into two panes.

   - The *left pane* contains the *anchored* columns—they're anchored in place, so that you don't have to scroll to view them. (You can anchor columns using the TABLE | DEFINE COLUMNS command, or by dragging the column from the right pane into the left pane.) Normally, the left pane displays all of the anchored columns at once, unless you resize the pane so there isn't enough room. In that case, a horizontal scroll bar appears below the pane.
   - The *right pane* contains all of the unanchored columns. If there are too many columns to display at once in the pane, a horizontal scroll bar below the pane allows you to scroll the columns.

7. In the SELECT column, click in one of the cells.

   This places a check mark in the cell and highlights the row to indicate it's selected. Notice that selecting a row selects the corresponding feature on the map.

8. CTRL+CLICK in the cell again to deselect the row.

9. Double-click on the Control-menu box to close the window.

   This closes the Table window, but the geo file and table remain open.

For detailed information on using the Table window, see Lesson 10, "Working with Tables."

Info Window

The Info window displays the geographic and attribute data for the last selected feature. The information is taken directly from the geo file and linked attribute table (or the point table); the rows in the Info window correspond to the columns in the geo file or table. If you reorder the columns in the Table window, the rows in the Info window will be rearranged as well. (Reordering the columns only changes the viewing order; it doesn't change the actual file or table structure.) You can edit the data in either the Info window or the Table window, and it is automatically updated in the other.

The Info window is a floating window—when it's open, it stays on top so that it can't be obscured by a Table window or the Page window.

To use the Info window:

1. Click on the Layers tool.

   Since the Map tool is already active, clicking on the Layers tool pops up the Default Layer Set dialog box.

2. In the *Layers* list box, double-click on 'ADDRESS:SITES'.

   This selects the ADDRESS:SITES map layer as the layer to work with, closes the Default Layer Set dialog box, and automatically activates the Pointer tool. You'll use the Pointer tool to select a feature next.

3. Select the feature '500 Market St' on the map. (Click on the feature to select it.)

   Notice the status bar is updated to display the current number of selected features, which is now one.

4. Choose WINDOW | SHOW INFO WINDOW (or click on the Info button on the button bar).

   This opens the Info window, which displays the data for the selected feature. It should look similar to the following figure.

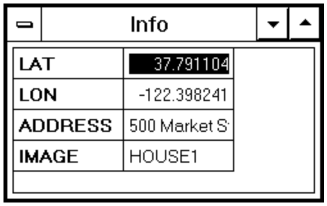


Figure 7.3 **Info window**

5. Select the unlabeled point feature on the map.

   Notice the Info window updates to display the data for the new feature. Selecting a map feature—either in the Table window or on the map—also updates the Info window. This is particularly useful when working with the map; you can view the data without opening a Table window.

6. Click on the ADDRESS cell in the Info window to place the cursor in the cell, then type '630 Quartz Way'.

   When you edit the feature in the Info window, the changes are also made and stored in the table.

7. CTRL+CLICK on the selected feature (on the map) to deselect it.

   Note that the data still displays in the Info window, since the window displays the data for the last feature selected.

8. Double-click on the Control-menu box to close the window.

   This closes the Info window without affecting any open files.

Statistics Window

The Statistics window displays summary statistics about the selected features for every *numeric* column in the layer you choose. The names of the numeric columns appear as rows in the Statistics window, in the same order the columns occur in the table. (If you change the viewing order of the columns in the Table window, the rows in the Statistics window will be rearranged as well.) For each numeric column in the table, the Statistics window displays the following summary statistics.

Table 7.1 **Explanation of summary statistics**

STATISTIC	DESCRIPTION
Count	The total number of selected features that have a value for this column.
Sum	The arithmetic sum of the data values from all the features that have a value in this column.
Average	The arithmetic average of the data values from all the features that have a value in this column.
Weighted Average*	The weighted average of the data values from all the features that have a value in this column. The weighted average is the sum of the column value times the weight column value, divided by the sum of the weights. (The weight column is specified in the Define Columns dialog box.)

*Note that the weighted average is only calculated when the aggregation method is "Weighted Average" (specified in the Define Columns dialog box). Otherwise, it's the same as the average.

The Statistics window is a floating window—when it's open, it stays on top so that it can't be obscured by a Table window or the Page window.

To work with the Statistics window:

1. Choose WINDOW | NEW STATISTICS WINDOW (or click on the Stats button on the button bar).

   The Window Layer dialog box pops up with a layer list to choose from.

2. In the *Layer* list box, double-click on 'SF:CENSUS_TRACTS'.

   This selects the layer and closes the dialog box. The Statistics window pops up. It should look like the following figure.

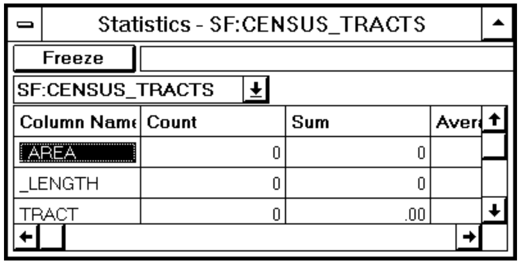


Figure 7.4 **Statistics window**

3. Click on the Layers tool to pop up the Default Layer Set dialog box.

4. In the *Layers* list box, double-click on ‘SF:CENSUS_TRACTS’.

   You’ll select the census tracts within 1 mile of a particular feature next, and then view the statistics for the selected census tracts.

5. Click on the Circle Select tool.

   Notice that the cursor changes from a pointer to a cross hair when it’s in the Page window.

6. Place the cursor over the feature ‘500 Market St’ and drag a circle with a radius of about 1 mile.

   As you drag to define the circular selection area, the radius of the circle is displayed in the title bar of the Page window. After you’ve drawn the circle and released the mouse button, the census tracts inside of and touching the circle are selected.

   Notice the information that appears in the Statistics window. (You may need to resize the Statistics window to view all the summary statistics.) The statistics are updated as you change the selections. It is possible to freeze the Statistics window, so that the information becomes static and can’t be updated.

7. Click on the Freeze button in the Statistics window.

   Notice that the layer name and Freeze button are now dimmed.

The Freeze button is useful for comparing two sets of selections in the same layer (since you can have multiple Statistics windows open simultaneously, even for the same layer). For example, you can select a set of features and freeze the Statistics window, and then continue working with your features and data, without losing the statistics displayed in the window. You can even open another Statistics window for the same layer, select another set of features, and freeze that window.

When you're finished viewing the data, you can close this Statistics window.

8. Double-click on the Control-menu box to close the Statistics window.

Launching Other Applications from Atlas GIS

One very powerful feature of Atlas GIS for Windows is *Application Linking*, its ability to associate many different types of files with the tables you use in your project files. You can then launch the appropriate applications from within Atlas GIS to view the files as you work, without exiting Atlas GIS. You can launch applications to view pictures, graphics, text documents, and even spreadsheets. For example, if you were a real estate broker, you could access pictures of listed properties, or run a spreadsheet application to view the information stored in a spreadsheet file.

Launching another application from within Atlas GIS is as simple as right-clicking on a cell in an Atlas GIS table (through a Table window or the Info window). The cell should contain the file name and path for the data you want to access. If the file extension is associated with the appropriate application (in the Windows File Manager), then that application will launch when you right-click on the cell containing the file name. When the application comes up, the file opens automatically.

Follow the steps below to pop up a picture of the leading sales manager for a gourmet ice cream company.

Note: For best results, your video display should be configured for high resolution graphics with at least 256 colors.

To open the table containing the picture reference:

1. Choose FILE | OPEN and open the APPLINK.DBF table in C:\AGISW\TUTORIAL.

The Table Link dialog box pops up.

2. Click on the Unlinked option button.

3. In the *Layer Name* text box, type 'Application Linking.

4. In the *Key Column* list box, choose 'ID'.

5. Click OK.

The table is now open, unlinked. To view the table, you must open a new Table window.

To open a new Table window:

1. Choose WINDOW | NEW TABLE WINDOW.

   The Window Layer dialog box pops up.

2. In the *Layers* list box, choose 'APPLINK:APPLICATION LINKING'.

3. Click OK.

A Table window pops up, displaying the data for the specified layer.

To use the Application Linking feature:

1. In the Table window, scroll across until you reach the MANAGER column.

2. Right-click in the cell that contains the following path and file name: 'C:\AGISW\TUTORIAL\NICK.BMP'.

   Atlas GIS for Windows automatically launches a software package called PaintBrush (bundled with Windows), and the picture is displayed. If you have files whose file name extensions are associated with other applications, you could also launch those programs, such as word processing or spreadsheet software. This enables you to review any supporting materials as you work with Atlas GIS.

   Note: If you installed Atlas GIS in a location other than C:\AGISW, the application will not launch (because it won't be able to find the referenced file). In this case, change the pathname in the table and try to launch the application again.

Figure 7.5 **Leading sales manager's picture**

3. Close PaintBrush to return to Atlas GIS for Windows.

   Since you're finished with the Table window, you can close this window.

4. Double-click on the Control-menu box to close the window.

End of Lesson

Don't save your project file before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

8

Printing

Atlas GIS allows you to print your *page* (which contains the map and other page elements) on any standard Windows-supported printer. You can print the entire page on a single sheet of paper, or print it on multiple sheets of paper to cover a large map without losing detail. You can even specify a portion of the page to print (for example, if you need to restart your printing after a printer problem, such as a paper jam).

In this lesson, you'll print a page, which contains a map of San Francisco, on multiple sheets of pager.

Setting Up Your Printer

Before you print from Atlas GIS, make sure the print driver for your printer has been properly installed for Windows. Use the Atlas GIS FILE | PRINT SETUP command to verify which printer is connected, and to access the Windows Printer Setup dialog box. If you need help setting up your printer, refer to your printer owner's manual.

Printing a Map

At any time during an Atlas GIS session, you can use the FILE | PRINT command to send an image of the *current page* to a printer. When you print, keep the following things in mind.

- Atlas GIS prints the *page* on the paper (within the margins specified in the Page Setup dialog box).
- Atlas GIS always prints the entire page, regardless of the current page zoom.

You might find it helpful to know your page setup and printer capabilities before you print the page, so you know which settings to choose. For example, in this lesson, the page size is 11 x 17 inches, with 1-inch margins on all sides. If your printer is set up to print on 11 x 17-inch paper, you can print the page at actual size on one sheet of paper. If your printer only supports 8.5 x 11-inch paper, you can print the page onto multiple sheets of paper, or reduce the page to fit on one sheet of paper. For this lesson, you'll print the page in tiles.

To print the page:

1. Choose FILE | OPEN (or click on the Open button on the button bar) and open the SFADDRES.PRJ project file located in the directory C:\AGISW\TUTORIAL.

2. Choose FILE | PRINT to pop up the Print Page dialog box.

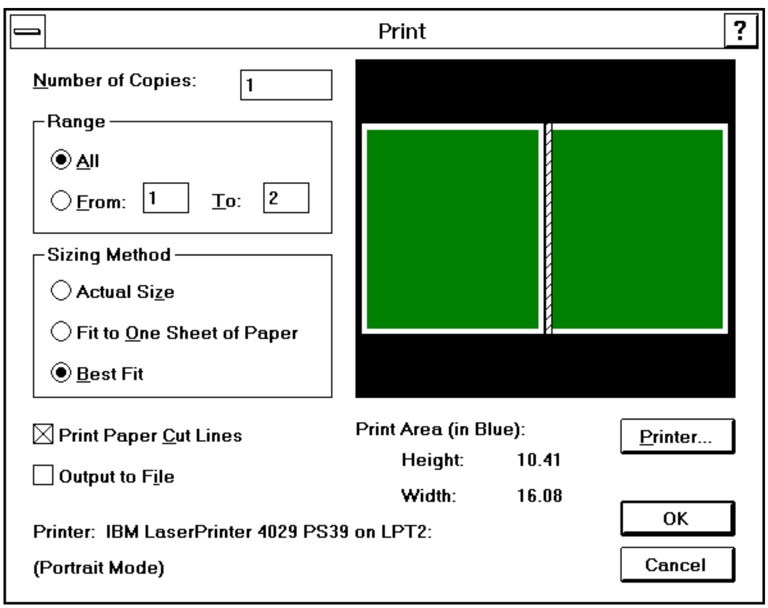


Figure 8.1 **Print Page dialog box**

Notice the name of your current printer appears at the bottom of the dialog box.

3. In the *Copies* text box, type '1'.

4. In the Range group box, click on the All option button.

   Since the page is printing on several sheets, this option specifies that all the sheets will be printed.

5. In the Sizing Method group box, click on the Best Fit option button.

   This option prints the page on the minimum number of sheets possible. If necessary, Atlas GIS changes the paper orientation setting for the printer to match the orientation of the page, as specified in the Page Setup dialog box. With this setting, you don't have to change the page orientation in the Printer Setup dialog box; Atlas GIS does it for you, without affecting the printer setup for your other Windows applications.

6. Make sure the *Print Paper Cut Lines* box is checked.

   If the actual page size is larger than the paper you're printing on, the page will print on multiple pieces of paper. Checking the *Print Paper Cut Lines* box will make it easier to trim the page so you can fit the different pieces together precisely.

7. Make sure the *Output To File* box is unchecked.

   This will print your map to the printer, rather than to a file.

8. Click OK.

   The page information is sent to the printer.

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

Part III:
Basic Skills

9

Selecting Features and Data

In Atlas GIS, you can use the select tools and the QUERY commands to select map features. When features are selected, they are highlighted on the map for later operations. For example, you can create buffers around selected features, or edit feature properties.

Using the Select Tools

Atlas GIS for Windows provides three select tools—the Pointer, Circle Select, and Polygon Select tools. You can use the Pointer tool to select map features (and table points) in several different ways. You can select one single feature; several features, one at a time; or all the features in a rectangular area (by dragging). You can also use the Pointer tool to select freehand objects in the same way. The Circle Select and Polygon Select tools, which are only available for map layers, select map features inside a circle or polygon that you define.

You can have map features and freehand objects selected in different layers simultaneously; however, the tools and EDIT commands will affect only the selected map features or objects *in the current layer*—either the default layer set or the page freehand layer. So when you're working with map layers, only map features in the default layer set will be affected by the tools and EDIT commands. And you can edit page freehand objects when you're working in the page freehand layer, without affecting the map feature selection.

For example, if you select a region in a map layer, the region is highlighted. Then, if you change to the map freehand layer and select some freehand text, the text will also be highlighted (and it will have edit handles). The region remains selected, but won't be affected as you work because you're no longer working in the map layer containing that feature.

Note: Map features can only be selected when the map layers that contain them are part of the default layer set; this makes it easier to select the features you want when features in different layers overlap. For information on working with the default layer set, see Lesson 4, "Working With Layers."

Pointer

The Pointer tool is active by default when you start Atlas GIS. It also becomes active automatically after the single use of another tool. If you've chosen another tool for multiple use (by double-clicking on it), you can click on the Pointer tool to activate it.

The Pointer tool selects freehand objects and map features. For example, you use this tool to select features when you want to create buffers around them or combine them. You can also use the Pointer tool when you want to edit freehand objects, but this lesson focuses on selecting features and data. See Lesson 12, "Labeling and Annotating the Map and Page," for exercises on selecting and editing freehand objects.

The modifier keys in the following table are used with the Pointer tool, either while clicking on features or while dragging the selection rectangle with the mouse.

Table 9.1 **Selection with the Pointer tool and modifier keys**

KEY	EFFECT ON SELECTED FEATURES	EFFECT ON UNSELECTED FEATURES
CLICK	All selected features are deselected; however, the feature clicked on is selected.	Unselected feature is selected.
SHIFT+CLICK	All selected features remain selected.	Unselected feature is selected.
CTRL+CLICK	Selected features are deselected if clicked on; otherwise, they remain selected.	Unselected feature is selected.
SHIFT+DRAG	All selected features remain selected.	Unselected features inside rectangle perimeter are selected.
CTRL+DRAG	Selected features inside rectangle perimeter are deselected; selected features outside of rectangle remain selected.	Unselected features inside rectangle perimeter are selected.

To select features using the Pointer tool:

1. Open the STORES.PRJ project file located in C:\AGISW\TUTORIAL.

   This map contains some store and customer locations in the San Francisco area. It should look like the following figure.

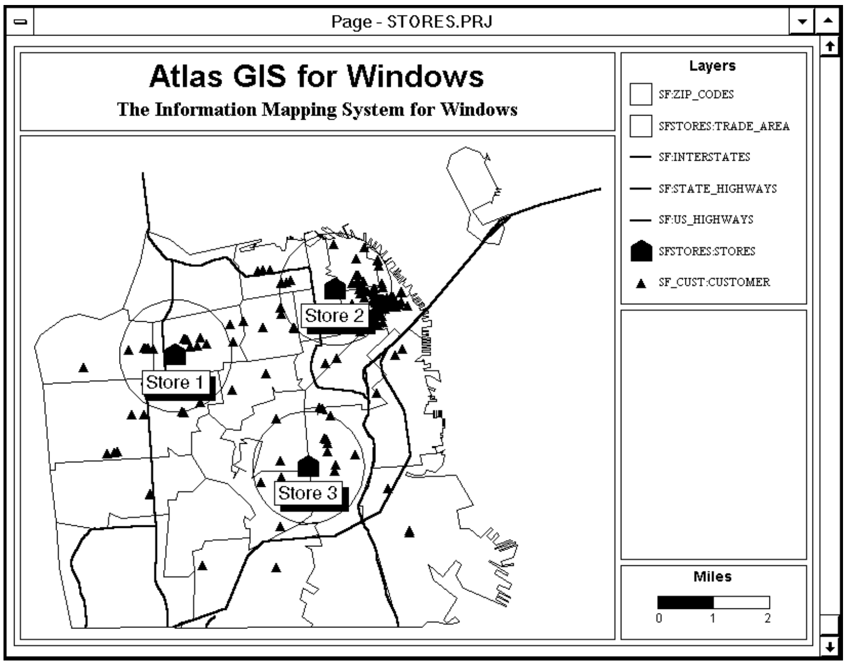


Figure 9.1 **Store and customer locations in San Francisco**

2. Click on the Layers tool.

   Since the Map tool is activated automatically when geo files are opened, clicking on the Layers tool pops up the Default Layer Set dialog box.

3. In the *Layers* list box, double-click on the 'SFSTORES: STORES' layer.

   This selects the SFSTORES: STORES layer as the layer to work with, closes the dialog box, and activates the Pointer tool.

4. Click on the map feature labeled 'Store 1' to select it.

Notice that the feature is highlighted to indicate that it's selected.

5. Now SHIFT+CLICK on the feature labeled 'Store 2'.

   Both Store 1 and Store 2 are now selected.

   When you SHIFT+CLICK, all selected features remain selected and any unselected features you click on are selected. This adds items to the selection set.

6. Click on Store 3.

   Notice that Store 3 is now the only selected feature. Clicking on a feature selects that feature, and deselects all previously selected features.

7. Drag to select Stores 1 and 2.

   This also deselects Store 3. If you wanted to drag to add features to the selected set of features, you could use the SHIFT key while dragging. The modifier keys work the same for dragging as they do for clicking.

8. Now CTRL+CLICK on Store 2.

   This deselects Store 2. CTRL+CLICK toggles the selection. It selects or deselects the feature you clicked on without changing the rest of the selection set.

Circle Select

This tool allows you to select all the map features (including table points) that lie within a circle you specify. You can define the area by drawing a circle or specifying the desired radius. In the following exercise, you'll select all customers within approximately 1.5 miles of Store 1. (First you'll specify the conditions under which map features are selected with the select tools.)

To use the Circle Select tool:

1. Choose FILE | PREFERENCES to pop up the Preferences dialog box.

2. Click on the Workspace option button.

   The Preferences dialog box should now look like the following figure.

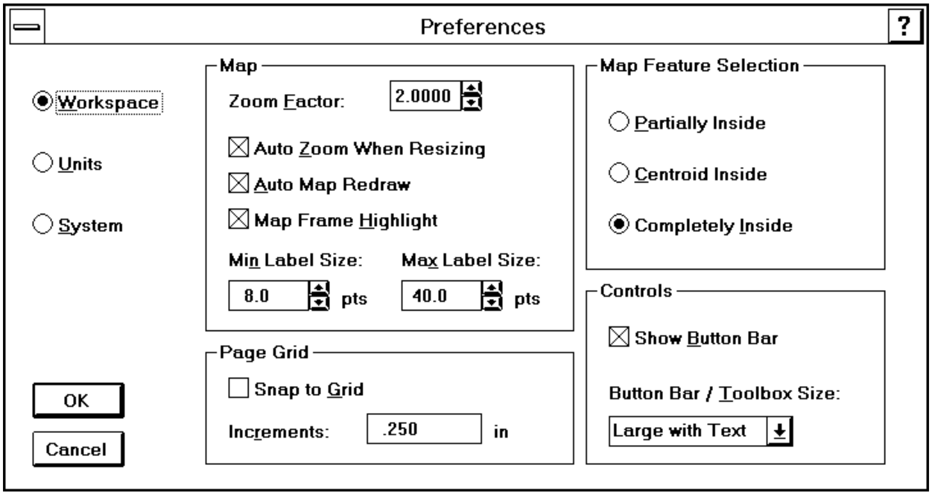


Figure 9.2 **Preferences dialog box, with Workspace options displayed**

3. In the Map Feature Selection group box, select Touching in the Select Features list.

   When you select features within an area, features that are partially inside will also be selected; they don't have to be completely inside. (The options in this group box allow you to specify whether map features completely or partially inside a selection boundary are selected. See the on-line help for a complete description of the options in the Preferences dialog box.)

4. Click OK.

5. Click on the Layers tool to pop up the Default Layer Set dialog box.

6. In the *Layers* list box, CTRL+CLICK on the 'SF_CUST: CUSTOMER' layer.

   This adds the layer to the default layer set.

7. Click OK.

8. Click on the Circle Select tool.

Notice the cursor changes from a pointer to a cross hair when it's in the Page window.

9. Place the cursor on Store 1 and drag until the circle's radius is about 1.5 miles.

   As you drag to define the circular selection area, the radius of the circle is displayed in the title bar of the Page window. After you've drawn the circle and released the mouse button, the features completely and partially inside of the circle are selected (for those layers in the default layer set).

Polygon Select

The Polygon Select tool works like the Circle Select tool. You use the tool to select all features within a polygon you draw. For example, this tool is useful for selecting everything in a non-circular area, such as a trade area defined by a group of census tracts or ZIP codes.

In the previous exercise, you selected customer locations within 1.5 miles of Store 1. Looking at the map you can see several unselected customers just west and south of the customers you selected. In this exercise, you'll use the SHIFT key with the Polygon Select tool to add those customers to the selection set.

To use the Polygon Select tool:

1. Click on the Polygon Select tool.

   Notice the cursor changes from a pointer to a cross hair when it's in the Page window.

   Holding down the SHIFT key enables you to add the new selections to the existing selection set. Without the modifier key, the new features would be selected, and the previously selected features would be deselected.

2. Place the cursor on the location indicated in the following figure, and SHIFT+CLICK to place the starting point for the polygon.

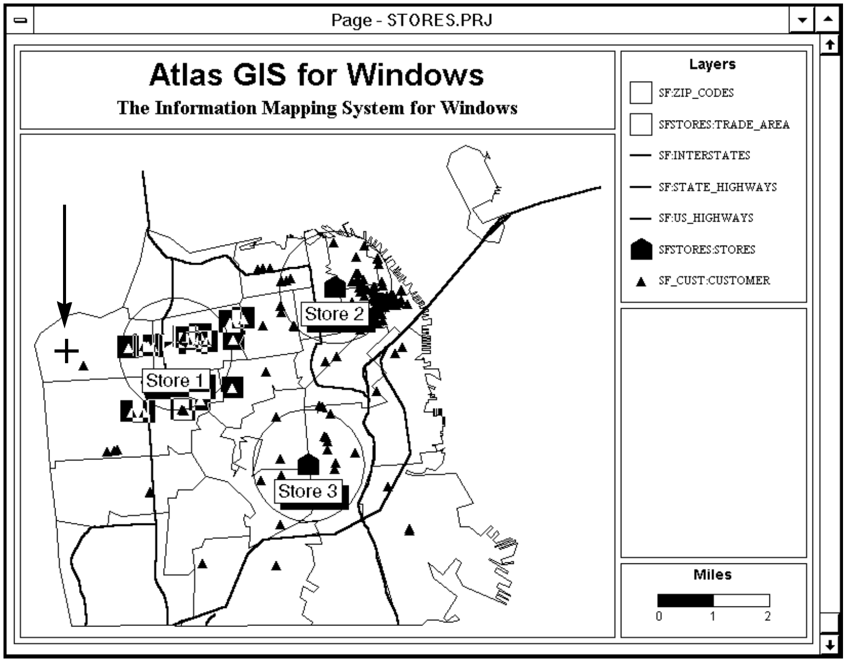


Figure 9.3 **Place the starting point**

3. Move the cursor to the next point (refer to the following figure), and SHIFT+CLICK again to place another point (vertex of the polygon).

   Atlas GIS draws a temporary line between the points automatically.

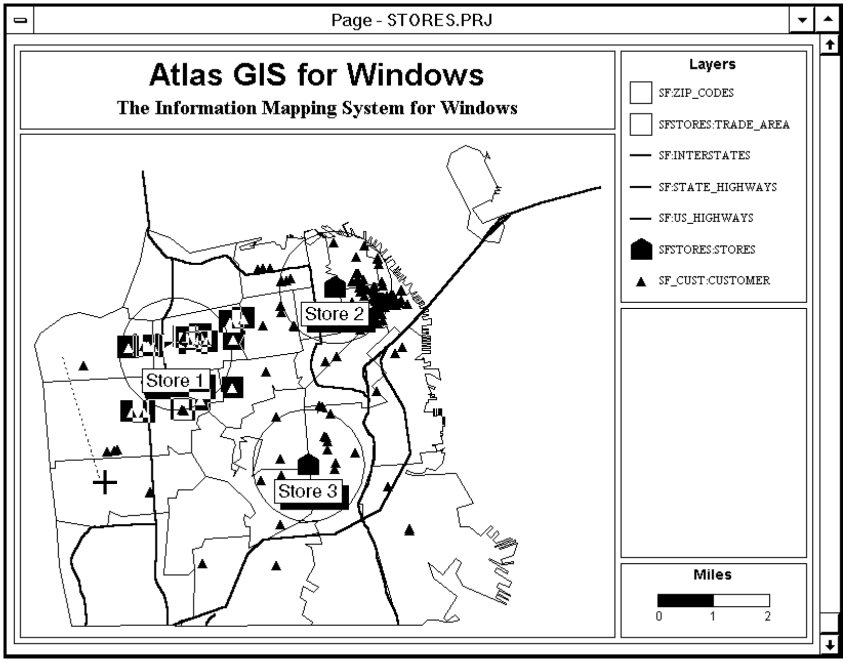


Figure 9.4 **Place the next vertex of the polygon**

4. Continue to place the polygon vertices (using SHIFT+CLICK) until you've outlined the area shown in the next figure.

   Use the BACKSPACE key if you need to delete the previous vertex.

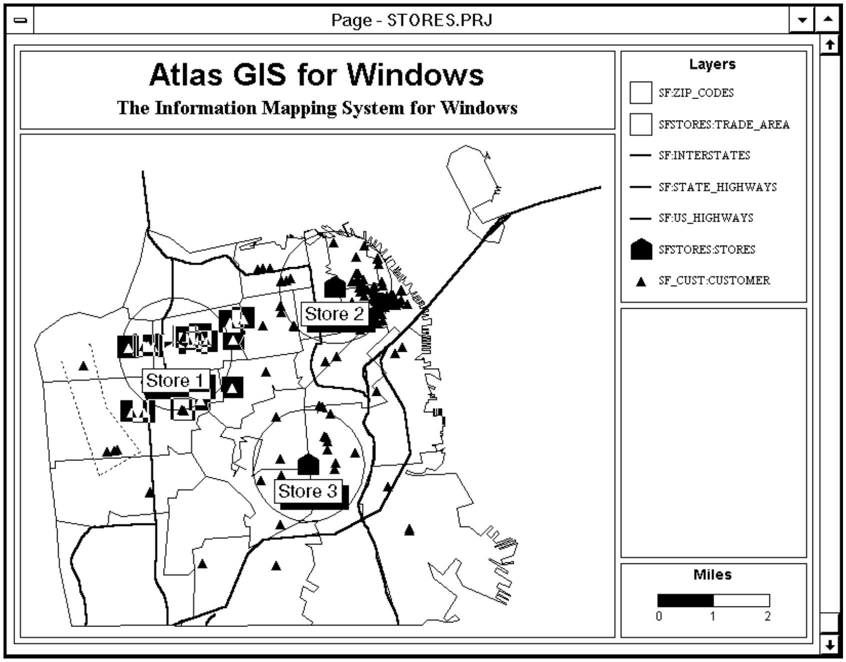


Figure 9.5 **Draw the polygon**

5. After you place the last vertex, hold down the SHIFT key and double-click.

   When you double-click, Atlas GIS draws a line between the last point and the original starting point to finish the polygon. The polygon disappears and the features inside are selected. Notice that the status bar is updated to display the new number of features selected.

Using the Query Commands

The QUERY commands allow you to find and select map features for editing and other operations in Atlas GIS, or just to find areas that meet certain conditions. You can select features by layer, by value, or by location. For example, you might want to select all of your customers (select by layer); or only those customers whose purchases exceeded a certain amount (select by value); or only those customers located within a certain region (select by location). In the following exercises, you'll select features by layer, by value, and by location.

Select By Layer

This command selects, resets, or toggles the selection status of all map features in the selected layers. You can choose to affect one layer or multiple layers. In this exercise, you'll select all of the customers (table points) in the SF_CUST point table. First, you'll deselect all the selected features.

To deselect all selected features:

- Click anywhere in the map frame (but not on a feature).

To select features by layer:

1. Choose QUERY | SELECT BY LAYER to pop up the Select By Layer dialog box.

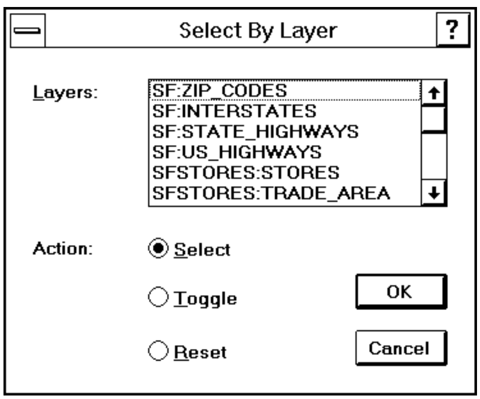


Figure 9.6 **Select By Layer dialog box**

2. From the *Layers* list box, choose 'SF_CUST:CUSTOMER'.

   This designates SF_CUST:CUSTOMER as the layer to be affected by the query.

3. In the *Action* options, click on the Select option button to select all map features in the specified layer.

4. Click OK.

   All of the customers in the SF_CUST:CUSTOMER layer should now be selected.

Select By Value

The QUERY | SELECT BY VALUE command selects map features by an exact value, within a certain range, or by expression. It uses the data values in a geo file or table to select features that pass a conditional test or match a value. In this exercise, you'll use an expression to select all customers with sales that were above average.

Before you can build the expression, you'll need to know what the average sales were for all your customers. Since all of your customers are selected (from the previous exercise), you can open the Statistics window to look up the average sales.

To determine the average sales:

1. Choose WINDOW | NEW STATISTICS WINDOW (or click on the Stats button in the button bar).

   The Window Layer dialog box pops up for you to choose a layer for the new window.

2. In the *Layer* list box, choose 'SF_CUST: CUSTOMER'.

3. Click OK.

   The Statistics window pops up, displaying data for the 'SF_CUST: CUSTOMER' layer. You may need to resize it to see all of the data.

4. In the Statistics window, find the entry 'SALES' in the *Column Name* column. Then move across that row until you find the *Average* column. The average sales should be 112186.

5. Double-click on the Control-menu box in the Statistics window to close it.

Now that you have the average sales, you can select all customers with sales that were above the average. You'll use an expression to select them.

To select features by expression:

1. Choose QUERY | SELECT BY VALUE to pop up the Select By Value dialog box.

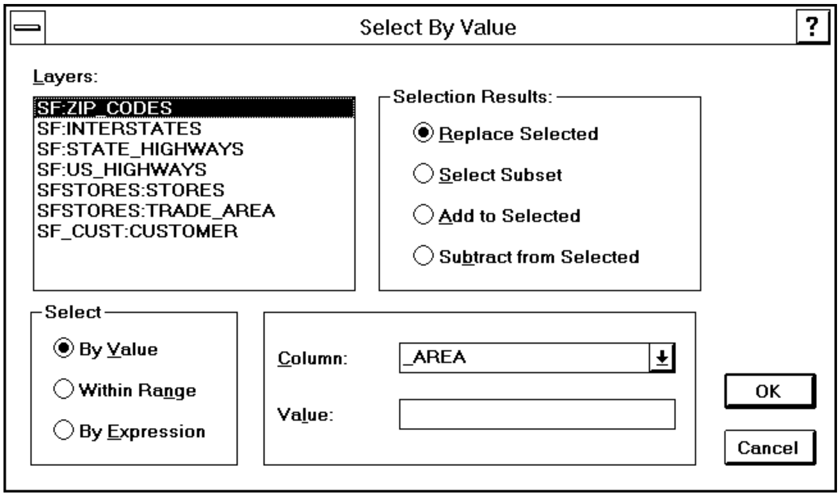


Figure 9.7 **Select By Value dialog box**

2. In the Layers list box, choose 'SF_CUST:CUSTOMER'.

3. In the Selection Results group box, click on the Replace Selected option button.

   This specifies that only the features from this query are selected. All previously selected features will be deselected.

4. In the Select group box, click on the By Expression option button.

   The subpanel changes so that you can specify the expression.

5. In the subpanel, click on the Expression […] button to pop up the Expression Builder.

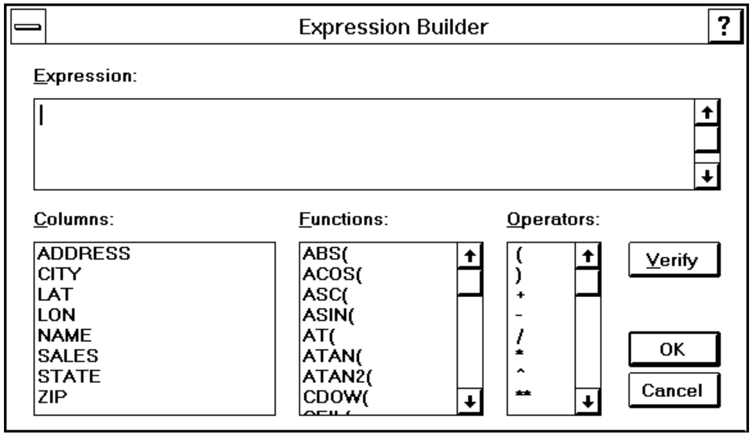


Figure 9.8 **Expression Builder**

6. In the *Columns* list box, choose 'SALES'.

   This chooses the SALES column as the first element in the expression. Notice that SALES appears in the *Expression* text box.

7. In the *Operators* list box, choose '>'.

   This adds the greater-than (>) symbol to the expression.

8. In the *Expression* text box, type '112186' after the greater-than symbol.

   The *Expression* text box should now have the following expression in it:

   ```
   SALES>112186
   ```

9. Click on the Verify button.

   This verifies that you've entered a valid expression. A message should pop up telling you the whether expression is correct.

10. Click OK to close the message.

    If the expression is incorrect, make sure you entered the text correctly.

11. Click OK to exit the Expression Builder.

This returns you to the Select By Value dialog box. Notice that the expression you created in the Expression Builder is displayed in the *Expression* text box.

12. Click OK.

    The screen redraws, and you can see that customers with above average sales (over $112,186) are selected. Notice that any other customers that were previously selected are no longer selected.

Select By Location

The Select By Location commands select map features inside of, outside of, touching, or near other features. For example, you might use QUERY | SELECT BY LOCATION | INSIDE to select all customer locations within designated sales regions or trade areas.

In this next exercise, you'll select the trade areas around Store 2 and Store 3, then select customers from within those regions.

To select features by location:

1. Make sure the Map tool is active.

2. Click on the Layers tool to pop up the Default Layer Set dialog box.

3. In the *Layers* list box, double-click on the 'SFSTORES:TRADE_AREA' layer.

   This selects the SFSTORES:TRADE_AREA layer as the only map layer to work with. The SFSTORES:STORES and SF_CUST:CUSTOMER layers are no longer in the default layer set; however, any selected features in these layers will remain selected.

   Removing the store and customer layers from the default layer set will make it easier to select trade areas. Since the trade areas overlap many features in the store and customer layers, clicking on a trade area would have popped up a list of all selectable features at that location to choose from.

   The Pointer tool is active automatically.

4. SHIFT+CLICK on the trade areas around Store 2 and Store 3 to select them.

This adds the Store 2 and Store 3 trade areas to the current selection, without deselecting the customer features that are already selected.

5. Choose QUERY | SELECT BY LOCATION | INSIDE to pop up the Select By Location - Inside dialog box.

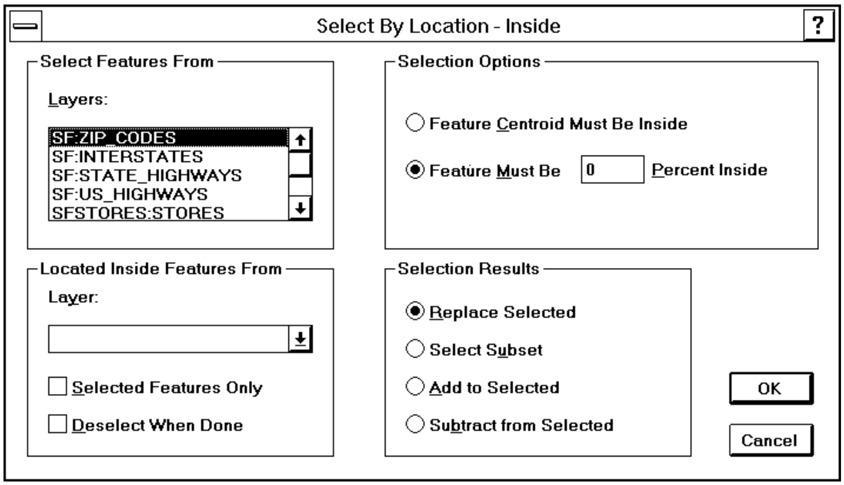


Figure 9.9 **Select By Location - Inside dialog box**

6. In the Select Features From group box, choose 'SF_CUST: CUSTOMER' from the *Layers* list box.

   Features (i.e., customers) in this table will be selected.

7. In the Located Inside Features From group box, choose the layer name 'SF STORES: TRADE_AREA' from the *Layer* list box.

   The SF STORES: TRADE_AREA layer contains the trade areas around Store 2 and Store 3. You'll be selecting features that are located inside those regions.

8. Place a check in the *Selected Features Only* box.

   You'll only be selecting features that are located within two of the regions (i.e., trade areas) in this layer. If you leave this box unchecked, you'll select features located within every region in this layer.

9. Place a check in the *Deselect When Done* box.

This specifies that the trade areas will be deselected at the end of the query.

10. In the Selection Options group box, click on the Feature Centroid Must Be Inside option button.

    Since the features you're selecting are points, their centroids are their actual locations, so you'll want them to be inside the region.

11. In the Selection Results group box, click on the Select Subset option button.

    This selects the map features for the query from the current selection set. Only selected features will be searched, and only those located inside the specified regions will remain selected.

12. Click OK.

    The screen redraws, displaying the new selections.

At the beginning of this exercise, all of the customers with purchases above average were selected in the SF_CUST:CUSTOMER layer. Now, out of those selected customers, only those that are located in the trade areas around Store 2 and Store 3 remain selected.

Using the Select Tools and Query Commands Together

With Atlas GIS, you can use the Pointer tool (with the modifier keys) to complement selection from queries. After selecting features with a QUERY command, you can then use the Pointer tool with the CTRL or SHIFT key to select or deselect individual features.

In the previous exercise, you selected customers located in the trade areas for Store 2 and Store 3 whose purchases were above average. In this exercise, you'll add a few customers outside of the Store 2 trade area to the selection.

To add features to the selection:

1. Make sure the Map tool is active.

2. Click on the Layers tool to pop up the Default Layer Set dialog box.

3. In the *Layers* list box, double-click on 'SF_CUST:CUSTOMER'.

This enables you to modify the selection set in this map layer only.

There are some customers located just south of the trade area for Store 2 with above-average sales, so you're going to add them to your selection. You'll use the Info window to determine which features you'll select.

4. Choose WINDOW | SHOW INFO WINDOW (or click on the Info button on the button bar) to pop up the Info window.

   The Info window displays information for the last feature selected.

5. CTRL+CLICK on one of the features just south of the Store 2 trade area.

   By using CTRL+CLICK, you can toggle the selection of the feature without losing any of the current selections. This enables you to deselect an individual feature if you don't want to include it in the feature set. For example, if the feature you click on doesn't have sales above the average, you'll want to deselect it.

   Notice that the data for the selected feature displays in the Info window. (You may need to resize the Info window so that you can view all of the data, especially the sales figures.)

6. Look at the SALES value for this customer. If the value exceeds $112,186, then you'll want to keep this feature selected. If it's lower, then CTRL+CLICK on it again to deselect it.

7. Check the SALES value for each of the features located just south of the Store 2 trade area, and CTRL+CLICK to select those features whose sales exceed $112,186.

   You should be adding two customers to the current selection. Liz Dodge had sales of $315,782, and Randall Harrison's sales were $112,785.

Your map should now look like the following figure.

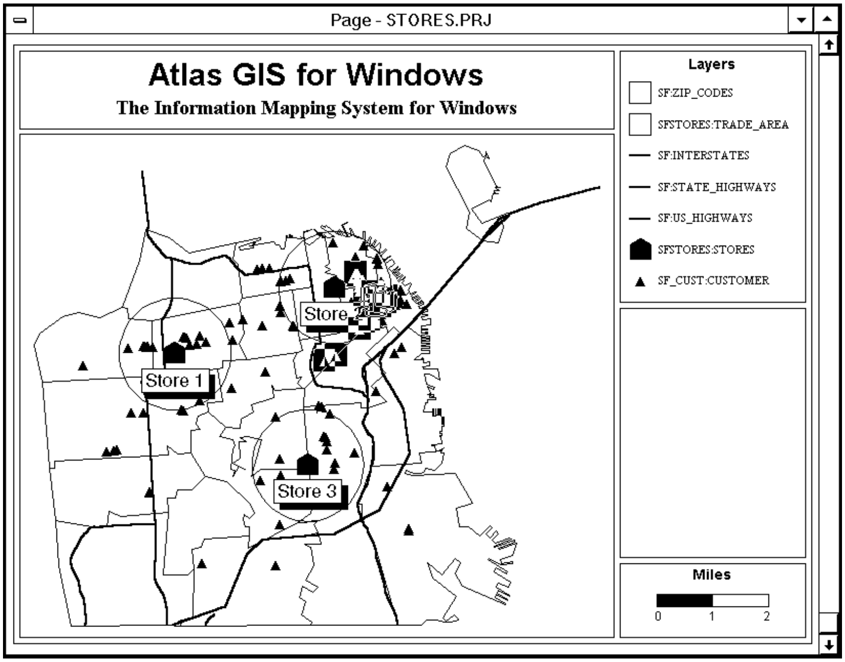


Figure 9.10 **Selected customer locations**

End of Lesson

Don’t save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose ‘No’ when prompted to save changes). This will close the open files and reset the Page window for the next lesson.

10

Working with Tables

A *Table window* in Atlas GIS displays data (geographic and attribute) for the layer you choose. You can view and edit the table data and select features. You can also perform advanced table operations in Atlas GIS, including querying features, aggregating data, calculating data to fill a column, and geocoding by address or ZIP/postal centroids. These advanced commands operate on tables without requiring a Table window to be open.

In this lesson, you'll learn how to work with tables. You'll create a sort expression and sort a table, manipulate columns, and calculate data for a new column. The table you'll use in this lesson is a point table that contains information about banks in the San Francisco area.

Viewing and Editing a Table

You can view and edit tables in Atlas GIS using a Table window. These windows work like any other standard window in an application. You can drag to resize the window, and use scroll bars to see portions of the table that are out of view. Editing table data is very much like editing a spreadsheet in a spreadsheet application; for example, clicking in a cell places the focus on the cell for editing.

The following exercises are very basic, and are designed to acquaint you with tables and Table windows.

To view a table:

1. Open the BANKTABL.PRJ project file located in C:\AGISW\TUTORIAL.

2. Choose WINDOW | NEW TABLE WINDOW (or click on the Table button in the button bar).

The Window Layer dialog box pops up.

3. In the *Layer* list box, choose 'BANKTABL:BANKS'.

   A Table window pops up with the BANKTABL:BANKS point table displayed. Notice that the window is divided into two panes. The left pane contains anchored columns, and the right pane contains unanchored columns. (The SELECT column is always located at the far left of the window.)

4. Click on the Table window's Maximize button in the top right corner to increase the size of the window.

   Notice that the left pane automatically resizes itself to display as much of each anchored column as possible. It will always do this, whenever you resize the Table window.

5. In the toolbox, double-click on the Control-menu box to close the toolbox.

   You won't need the toolbox for this lesson, and it would only be in the way while the Table window is maximized. When you want to open the toolbox again later, choose WINDOW | SHOW TOOLBOX.

6. Click on the horizontal and vertical scroll bars to view the columns and rows that are outside of the current viewing area.

If you scroll over to the ZIP column, you'll find that some of the cells in the column are blank. In the next exercise, you'll fill in some of the missing ZIP codes.

To edit table cells:

1. Use the scroll bars to locate the ZIP cell for Hibernia Bank, Mission Branch.

   The ZIP cell should be empty.

2. Click on the cell and type '94110', and then press ENTER.

   Notice when you click on the cell, the entire cell is highlighted. When the cell is highlighted, typing any text overwrites any previous entry. If you double-click on the cell, or press the SPACE or ENTER key after clicking once, the cursor is inserted to the left of the text.

3. Locate the ZIP cell for Hibernia Bank, Civic Center Branch.

This should be the next cell down in the ZIP columns.

4. Click on the cell and type ‘94102’, and then press ENTER.

Sorting a Table

In Atlas GIS you can use a *sort expression* to sort your table on a specific column or on an expression. You can use one of the defined sort expressions provided with each table, or you can create your own. (The defined expressions sort on the _ID, _NAME, or _NAME2 column in a geo file, or on the key column in a table.) Once a table is sorted, you can view it in sort order and quickly search for specific values.

Although it takes time to create a sort expression, searching using a sort expression is almost instantaneous. In contrast, performing a non-sorted, sequential search can take a long time—especially with a large table. If you have a large table and will be performing multiple searches on the same value, creating a sort expression can save you time.

Creating a sort expression also allows you to view the table in a specific order. For example, you can sort a table by ascending sales values to view the rows in order from lowest to highest sales.

Creating a Sort Expression

When using Atlas GIS, you may want to view an attribute table in descending order of a field that has not yet been sorted. In this exercise, you’ll create a simple expression that sorts the table in descending order of total deposits.

To create a sort expression:

1. Choose TABLE | SORT to pop up the Sort dialog box.

2. In the *New Sort Expression* text box, type ‘– TOTAL’.

   By default, entering the column name TOTAL sorts on that column, in ascending order. By placing a minus sign in front of the column name, you specify that the values should be sorted in descending order.

Rather than typing the expression in the New Sort Expression text box, you could have created this expression using the Expression Builder, which you'll look at next.

3. Click on the New Sort Expression […] button to pop up the Expression Builder.

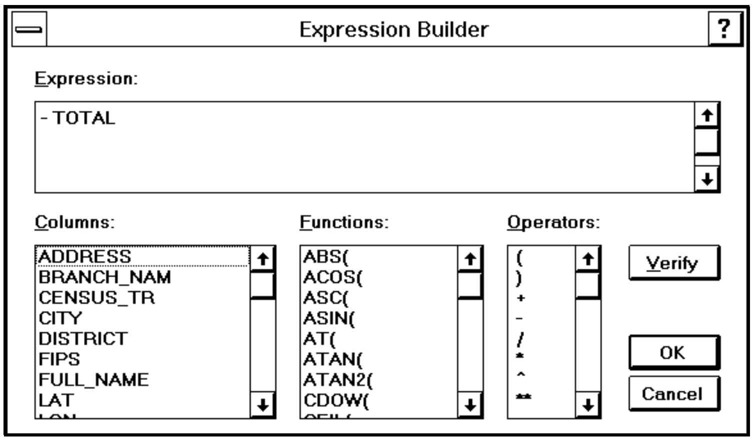


Figure 10.1 **Expression Builder**

The Expression Builder allows you to create more complicated expressions using the functions and operators it provides. For more information about expressions, refer to Appendix A in the *Command Reference*.

Notice that the expression you typed in the *New Sort Expression* text box in the Sort dialog box appears in the *Expression* text box in the Expression Builder. You could have created the expression in the Expression Builder by clicking on the operators and column name in the appropriate list boxes.

4. Click OK to exit the Expression Builder and return to the Sort dialog box.

5. Click on the Add New button.

This adds the new expression to the *Defined Sort Expressions* list box.

Using a Sort Expression

To sort a table, you must specify a default sort expression or any user-defined sort expression to organize the information. (Atlas GIS does not automatically change the order when you create a new sort expression, in case you're adding multiple expressions at once.) To change the viewing order of the table using the new expression you created, you'll need to specify that expression for the sort.

To sort a table using a sort expression:

1. In the Sort dialog box, choose the new expression in the *Defined Sort Expressions* list box.

2. Click OK.

   An index is created based on the new sort expression, and the table is sorted on the new index. It's sorted in descending order of total deposits, with the bank that has the most deposits appearing in the first row.

3. Scroll over to the TOTAL column now to verify that it's sorted in descending order.

Adjusting and Manipulating Columns

When you're working with the table, you can adjust and manipulate the columns according to your preference. For example, if you can't see the full entry in a column, you can resize the column. You can also move two columns so that they are side by side while you work with them. Or you can anchor a column so that it always displays, no matter where you scroll in the table.

For this exercise, you'll resize the FULL_NAME column, move the TOTAL column next to the BRANCH_NAME column, and anchor the TOTAL column in the table.

To adjust and manipulate columns:

1. Scroll to the FULL_NAME column in the Table window.

   Since the NAME and BRANCH_NAME columns are anchored, you already have a pretty good idea which banks you're looking at, so you'll resize the FULL_NAME column to make it smaller.

2. Place the cursor on the right edge of the FULL_NAME column.

   Notice when you move the cursor over the column edge, the pointer changes to a double-arrow.

3. Drag the right edge of the column to the left, until the column is about 10 to 12 characters wide. (The column name will just fit in the column.)

   Now let's say you want to view the total deposits for the banks, but you want to know which banks the figures are for as you work with them. You'll move the TOTAL column over to the left pane and anchor it next to the BRANCH_NAME column.

4. Place the cursor on the TOTAL column name and drag the name to the left pane of the Table window, then drop it next to the BRANCH_NAME column.

   Notice that the cursor changes to a box containing left and right arrows when you click on the column name.

   If you look in the Define Columns dialog box, you'll see that a check has been placed in the *Anchor* cell for TOTAL.

5. Right-click on a column name in the Table window (or choose TABLE | DEFINE COLUMNS) to pop up the Define Columns dialog box.

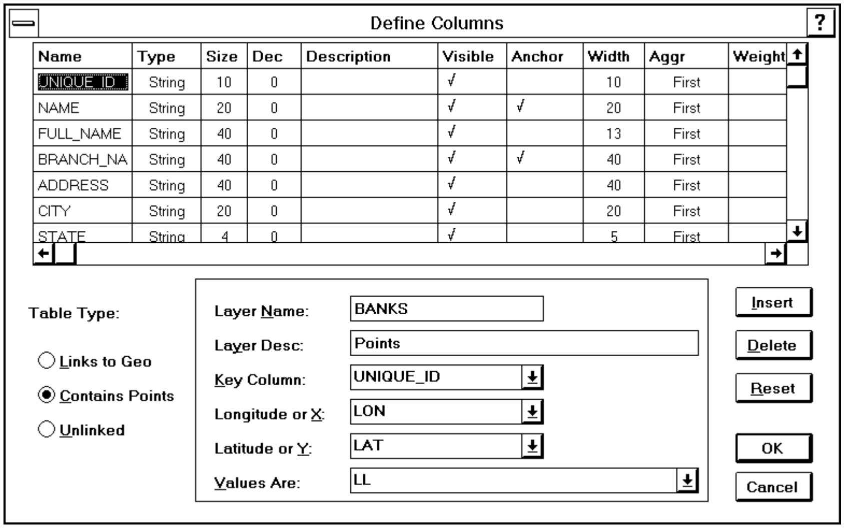


Figure 10.2 **Define Columns dialog box**

6. In the Define Columns dialog box, scroll down until you can see the TOTAL column name in the *Name* column, then scroll right to see the check in the *Anchor* column.

7. Click OK.

Adding and Defining Columns

As you're working with a table, you might decide that you want to calculate some new data, then add it to a new column in the table. In the example you've been working with in this lesson, you have data for the banks showing the total deposits, as well as the breakdown of public and non-public deposits. To continue with this example, you'll determine what percentage of the total deposits are public.

In this exercise, you'll add a new column, PCT_PUBLIC, to the BANKS table. Then you'll calculate data for that column, filling it with the percentage of the total deposits that are public.

To add a column to a table:

1. Choose TABLE | DEFINE COLUMNS (or click on the Define Col button on the button bar) to pop up the Define Columns dialog box.

2. Scroll down to the PUBLIC entry in the *Name* column, and click on that cell.

3. Click on the Insert button (at the far right of the dialog box).

   An empty row appears above the PUBLIC row. You'll enter the settings for the new table column here.

4. Click in the *Name* cell and type 'PCT_PUBLIC'.

   This text box specifies the name of the new column.

5. Double-click on the *Type* cell, and choose 'Float'.

   This specifies that the column will contain floating-point numeric data. (For more information on column data types, see "Type" in the *Atlas GIS Reference Manual*, chapter 9, pg. 17.)

6. In the *Size* cell, type '6'.

   The column you are defining will contain percentages. A column size of six characters allows for five digits and a decimal. Next you'll specify that the numbers in the column will have two decimal places, allowing for a percentage number up to 100.00.

7. In the *Dec* cell, type '2'.

8. In the *Description* cell, type 'Percent of Total Deposits--Public'.

9. Make sure the *Visible* cell is checked.

   This specifies that the column is visible in the Table window.

10. Make sure the *Anchor* cell is unchecked.

    This column doesn't need to be anchored, since you won't use it frequently.

11. In the *Width* cell, type '10'.

    This specifies that the width of the column display in the Table window will be 10 characters wide.

12. Leave the remaining settings set to the defaults, and click OK.

    A message appears warning you that the changes you requested require that the table be restructured.

13. Click OK.

The PCT_PUBLIC column is inserted to the left of the PUBLIC column in the table. In the next exercise, you'll calculate the data for the column.

Calculating Data for a Column

To fill a new column with data, you can have Atlas GIS perform the calculation and fill in the column for you. In this exercise, you'll fill the PCT_PUBLIC column with the percentage of the total deposits that are public.

To calculate data for a column:

1. Choose TABLE | CALCULATE COLUMN (or click on the Calc Col button in the button bar) to pop up the Calculate Column dialog box.

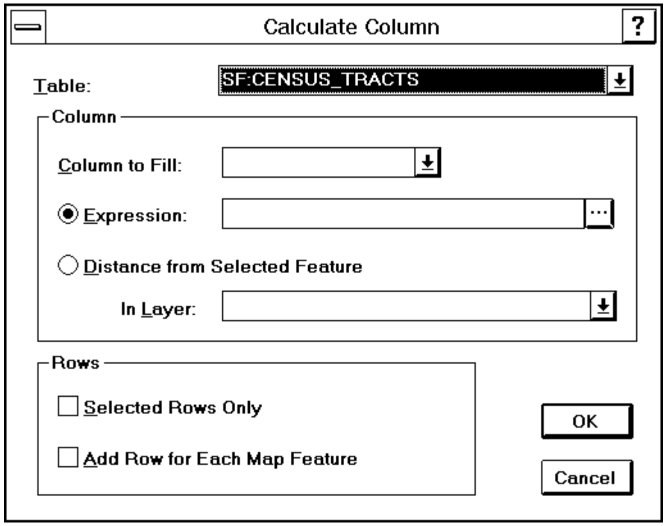


Figure 10.3 **Calculate Column dialog box**

2. In the *Table* list box, choose 'BANKTABL:BANKS'.

   This chooses the table containing the column to be filled with the calculated data.

3. In the Column group box, choose 'PCT_PUBLIC' in the *Column to Fill* list box.

4. Click on the Expression option button and type '(PUBLIC / TOTAL) * 100' in the text box.

   This expression calculates the percentage of total deposits that are public.

   Rather than typing in the expression, you could click on the Expression [...] button to pop up the Expression Builder and create the expression there.

5. In the Rows group box, make sure the *Selected Rows Only* and *Add Row for Each Map Feature* boxes are unchecked.

6. Click OK.

Atlas GIS calculates the percentage of total deposits that are public, then enters these values in the PCT_PUBLIC column.

7. In the Table window, scroll to the PCT_PUBLIC column to view the calculated values.

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

11

Creating Theme Maps

Theme maps display data graphically. They illustrate the spatial relationship between geographic features and their attribute data; they're called theme maps because they convey a theme. Generally, these maps represent the data by applying shading, color-coding, or dots to the map. For example, you could show total sales by coloring sales territories red for high sales, orange for medium sales, and yellow for low sales. You could also represent potential customers by placing proportionally sized symbols on the map to represent low to high potential.

Atlas GIS provides the tools necessary to create three types of theme maps:

- *Ranged Maps*—Enable you to use a variety of methods to divide the data into distinct ranges. Each data range is represented by a color, fill pattern, line style, symbol type, and so on.
- *Proportional Maps*—Allow you to depict data by varying the percentage of fill, line width, or symbol size for each feature in direct proportion to its data value.
- *Dot-density Maps*—Enable you to fill regions with dots that are randomly placed and uniformly sized. The number of dots in a region is proportional to the data value, and their density in various regions can reveal distinct patterns, such as clustering.

The exercises in this lesson show you how to create a ranged fill map, a proportional symbol map, and a bivariate map. (*Bivariate* maps contain two variables from the same layer.) For more information on theme maps, refer to MAP | LAYERS & THEMES in the *Reference Manual*, and to *Atlas GIS Help*.

Throughout this lesson, you'll be working with maps of convenience stores in San Francisco. You'll create theme maps showing convenience store potential by census tract, sales potential by location, and sales potential versus actual sales.

Creating a Ranged Fill Map

A ranged fill divides the data into ranges and uses colors and fill patterns to indicate each data range. Atlas GIS offers a variety of ranging methods to choose from.

In this exercise, you'll create a ranged fill map to show convenience store potential by census tract.

To specify the data variables:

1. Open the SFCONVST.PRJ project file in the C:\AGISW\TUTORIAL directory.

2. Right-click anywhere in the map frame (or choose MAP | LAYERS & THEMES) to pop up the Layers & Themes dialog box.

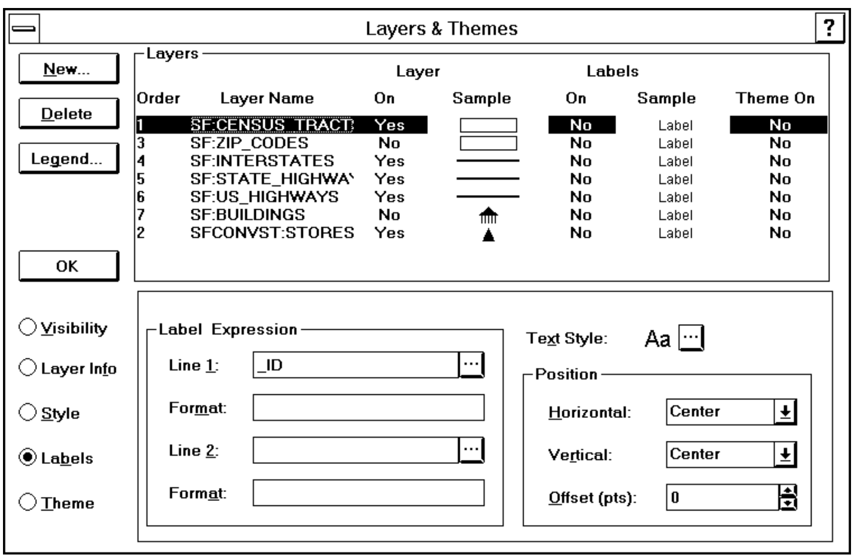


Figure 11.1 **Layers & Themes dialog box**

3. In the Layers group box, choose the 'SF:CENSUS_TRACTS' layer.

4. Click on the Theme option button.

   The lower subpanel changes to display the theme information for the selected layer.

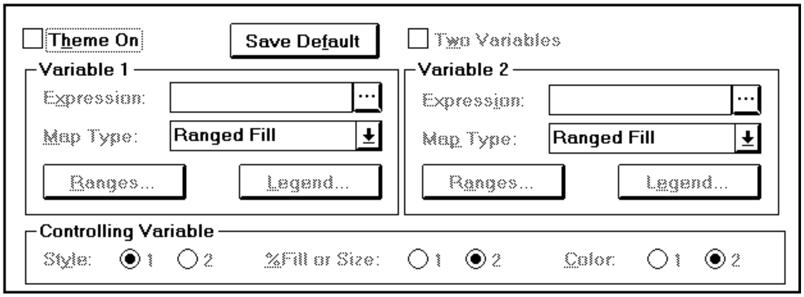


Figure 11.2 **Theme subpanel**

5. In the Theme subpanel, place a check in the *Theme On* box.

6. In the Variable 1 group box, click on the Expression […] button.

   This pops up the Expression Builder.

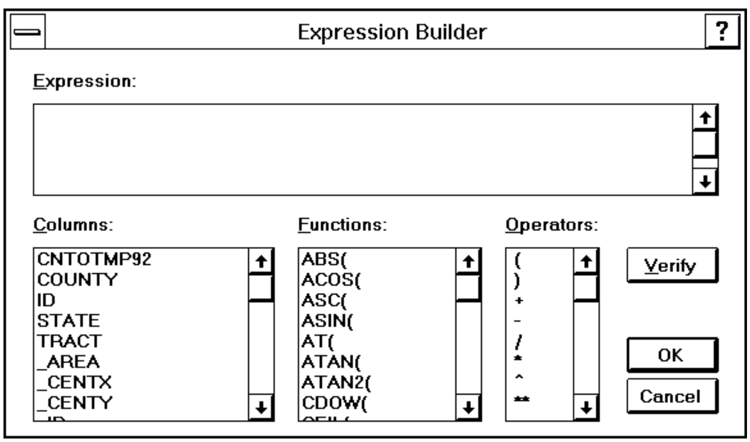


Figure 11.3 **Expression Builder**

7. Choose 'CNTOTMP92' from the *Columns* list.

   The CNTOTMP92 column contains the total market potential for convenience stores in the listed census tracts in 1992. Throughout this lesson, the expressions defining your variables will consist of column names, without any additional calculations.

8. Click OK to exit the Expression Builder and return to the Layers & Themes dialog box.

   Now you'll specify that you're creating a ranged fill map.

9. In the Variable 1 group box, choose 'Ranged Fill' in the *Map Type* list box.

10. Click OK.

    The theme map displays, using the default ranges and colors.

The map illustrates convenience store potential by census tract, with four different ranges of potential. Next you'll return to Layers & Themes to customize the ranges and colors. For example, you'll specify five ranges of potential. And to make the census tracts with highest potential stand out, you'll change the color of that range to red.

To specify the theme settings:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

2. In the Layer group box, make sure the 'SF:CENSUS_TRACTS' layer is chosen.

3. Click on the Theme option button.

4. In the Variable 1 group box, click on the Ranges button.

   The Ranged Fill dialog box pops up, allowing you to specify the range settings for the theme.

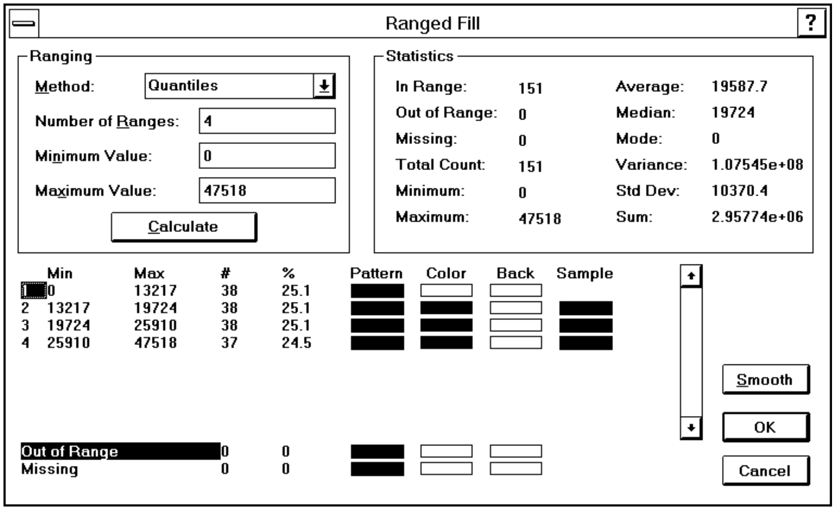


Figure 11.4 **Ranged Fill dialog box**

5. In the Ranging group box, choose 'Quantiles' from the *Method* list.

   The quantiles method creates ranges that contain the same percentage of the data values. It divides the data values equally among the ranges, so that each range contains roughly the same number of data values.

6. In the *Number of Ranges* text box, type '5', and then press the TAB key to move to the next field.

   Notice that the Calculate button turns yellow to indicate the changes require calculation to update the ranges.

   In the *Minimum Value* and *Maximum Value* text boxes, notice that Atlas GIS has automatically entered the minimum and maximum data values. You'll use these default values.

7. Click on the Calculate button.

   Atlas GIS calculates the ranges that will be depicted on the map.

8. In the bottom half of the dialog box, click on the *Color* swatch for the first range (with the lowest values).

This pops up Color dialog box, so you can choose the foreground color for the features in that range.

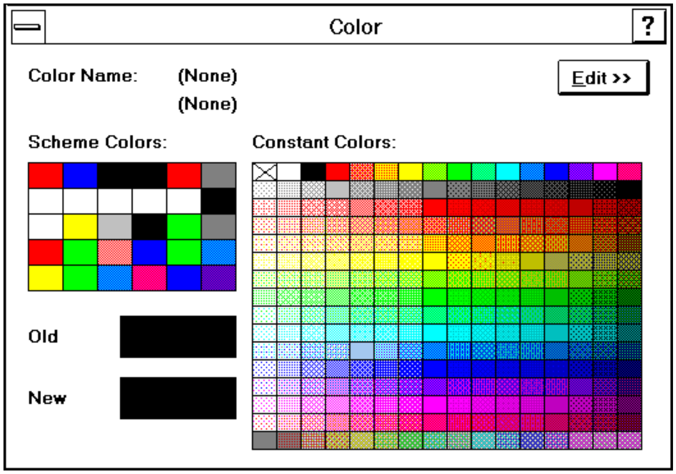


Figure 11.5 **Color dialog box**

9. In the *Constant Colors* palette, choose ‘Yellow’.

   This selects the color and exits the Color dialog box.

   Choose the colors from the *Constant Colors* palette, so that the theme colors will be unaffected if you ever change the color scheme of the map. If you were to choose colors from the *Scheme Colors* palette, the colors would change every time you changed the scheme colors for the map. For more information on the Color dialog box, refer to the on-line help.

10. Click on the *Color* swatch for the last range (with the highest values).

    The Color dialog box pops up.

11. From the *Constant Colors* palette, choose ‘Red’.

    This selects the color and exits the Color dialog box.

12. Click on the Smooth button.

The colors in the middle ranges are replaced; all the colors now range from yellow to red.

13. Click OK to return to the Layers & Themes dialog box.

14. Click OK.

The map redraws, displaying the new ranges and colors. Now that the map conveys exactly the theme you want, you can customize the theme legend.

To customize the theme legend:

1. Right-click on the theme legend to pop up the Theme Legend - Ranged dialog box.

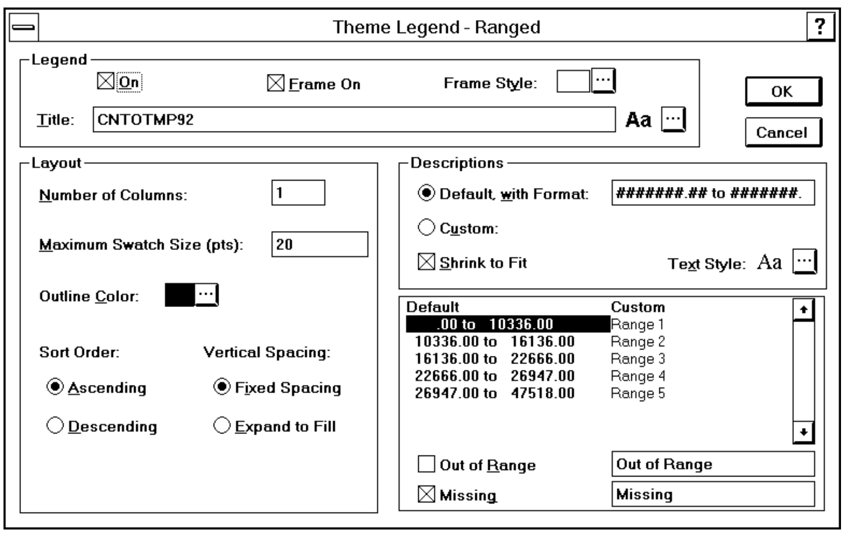


Figure 11.6 **Theme Legend - Ranged dialog box**

2. In the Legend group box, type ‘Store Potential by Tract’ in the *Title* text box.

3. To set the properties for the title text, click on the Title […] button.

   This pops up the Text dialog box.

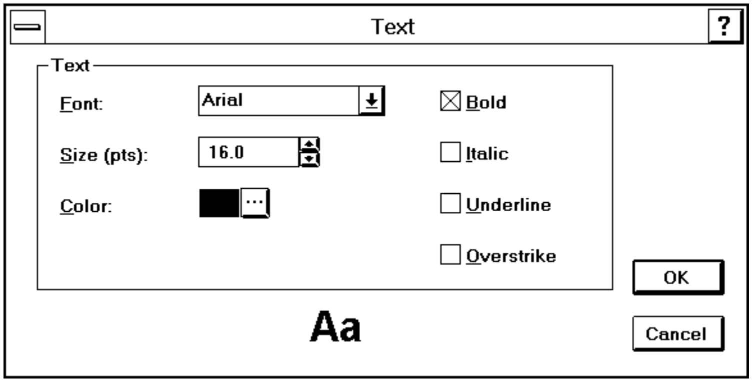


Figure 11.7 **Text dialog box**

4. In the Text group box, set the options according to the following table. (For assistance, refer to the instructions following the table.)

OPTION	**SETTING**
Font	Times New Roman
Size (in points)	16
Color	Red Brown
Bold	Checked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

- In the *Font* list, choose 'Times New Roman'; in the *Size* list, type '16'.
- Click on the Color […] button to pop up the Color dialog box. Click on the 'Red Brown' patch in the *Constant Colors* palette to select the color and return to the Text dialog box.
- Place a check in the *Bold* box. Leave the remaining option boxes unchecked.

5. Click OK to return to the Theme Legend - Ranged dialog box.

   In the Layout group box, use the default settings for the *Number of Columns*, *Maximum Swatch Size*, and *Outline Color*.

6. For *Sort Order*, click on the Ascending option button.

   This lists the legend entries from lowest to highest value.

7. For *Vertical Spacing*, click on the Expand to Fill option button.

   This spaces the legend entries so they fill the legend frame.

8. In the Descriptions group box, click on the Default, with Format option button and type '$99,999 to $99,999' in the text box.

   Atlas GIS will use the minimum and maximum range values as the range descriptions in the theme legend, using the specified format. If you don't specify a format, the entries appear exactly as they appear in the *Default* list.

9. Place a check in the *Shrink to Fit* box.

   This shrinks the descriptions to fit in the legend frame, if necessary.

10. Click on the Text Style [...] button to pop up the Text dialog box.

11. In the Text group box, set the options according to the following table.

OPTION	SETTING
Font	Times New Roman
Size (in points)	14
Color	Black
Bold	Unchecked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

12. Click OK to return to the Theme Legend - Ranged dialog box.

13. Below the *Default* list of ranges, make sure the *Out of Range* and *Missing* boxes are unchecked.

    The legend won't include entries for values that are missing or don't fall within the minimum and maximum range values.

14. Click OK to save the settings and close the dialog box.

The finished map should look something like the figure below.

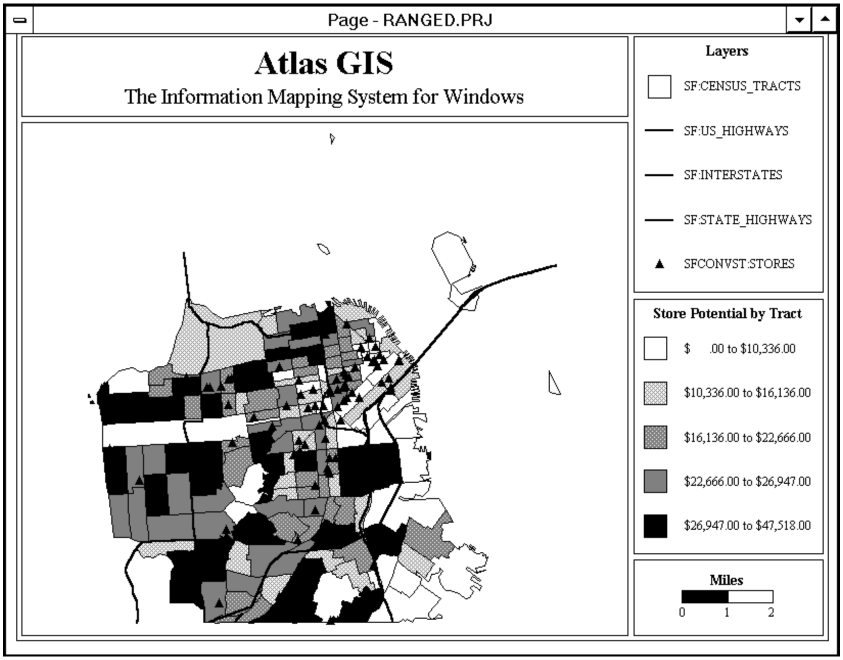


Figure 11.8 **Completed ranged fill map**

You'll be changing the theme settings to create another theme map in the next exercise. If you'd like to save this map before proceeding, choose FILE | SAVE AS and save the project file as RANGED.PRJ.

Creating a Proportional Symbol Map

Proportional maps allow you to depict data by varying the percentage of fill, line width, or symbol size for each feature in direct proportion to its data value. To create a proportional theme map, you set the low value and high value benchmarks and the corresponding symbol size or percentage of fill for that value. Atlas GIS then calculates the proportional symbol size or fill for each remaining data value accordingly.

In this exercise, you'll create a theme map using proportional symbols to show sales potential by location.

To specify the data variables:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

2. In the Layers group box, turn off the themes for all the layers. (Toggle the setting to 'No' in the *Theme On* column.)

   You can have multiple themes enabled simultaneously, but you won't need them for this lesson.

3. For the 'SFCONVST:STORES' layer, toggle the *Theme On* column setting to 'Yes'.

   This selects the layer and turns on the theme. The lower subpanel displays the theme options for the selected layer, so you can define the theme.

4. In the Variable 1 group box, click on the Expression […] button to pop up the Expression Builder.

5. Choose SALES from the *Columns* list, then click OK. (You might need to scroll to the SALES entry.)

   This returns you to the Layers & Themes dialog box, where you can continue defining your theme for the map.

To specify the theme settings:

1. In the Variable 1 group box, choose 'Proportional Symbol' in the *Map Type* list box.

   This indicates that you're creating a proportional theme map.

2. Click on the Ranges button.

   The Proportional Symbol dialog box pops up, allowing you to specify the settings for the theme.

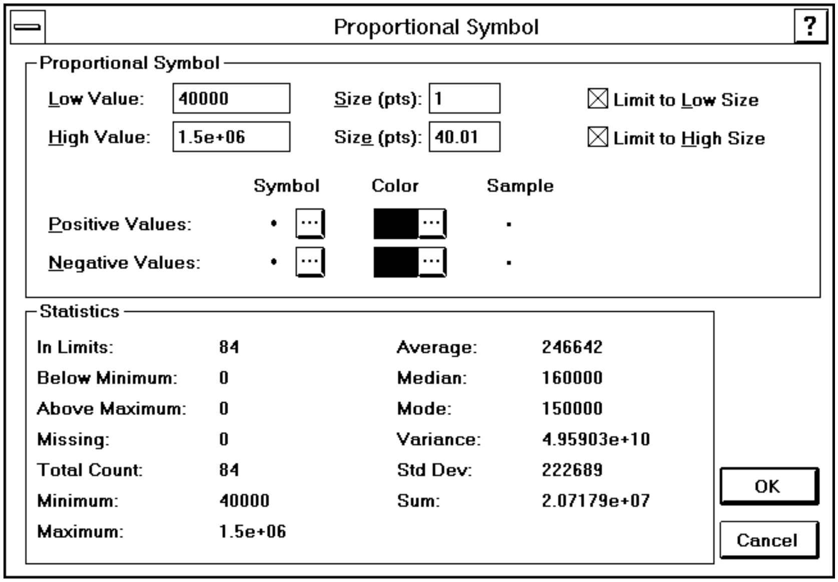


Figure 11.9 **Proportional Symbol dialog box**

Notice that the Statistics group box displays the calculated statistics that will be depicted on the map. Atlas GIS automatically enters the *Minimum* and *Maximum* data values as the low and high values for the symbols.

3. In the Proportional Symbol group box, use the default entries for the *Low Value* and *High Value* text boxes.

4. In the *(Low Value) Size* text box, type '10'.

   This sets the symbol size assigned to the low value. If you place a check in the *Limit to Low Size* box, no symbol is smaller than this size for cases where you have values lower than the *Low Value* you specified.

5. In the *(High Value) Size* text box, type '30'.

   This sets the symbol size assigned to the high value. If you place a check in the *Limit to High Size* box, no symbol is larger than this size.

6. In the *Positive Values* options, click on the Symbol […] button to pop up a symbol table.

7. Scroll to the end, and choose the filled building symbol in the last row. Here's what that symbol looks like:

8. Click on the Color […] button to pop up the Color dialog box, and choose 'Blue' from the *Constant Colors* palette.

   Since we don't have negative sales values for any of the stores, you won't choose a symbol and color for the *Negative Values*.

9. Click OK to return to the Layers & Themes dialog box.

You'll customize the theme legend before returning to the map.

To customize the theme legend:

1. In the Variable 1 group box, click on the Legend button.

   The Theme Legend - Proportional dialog box pops up.

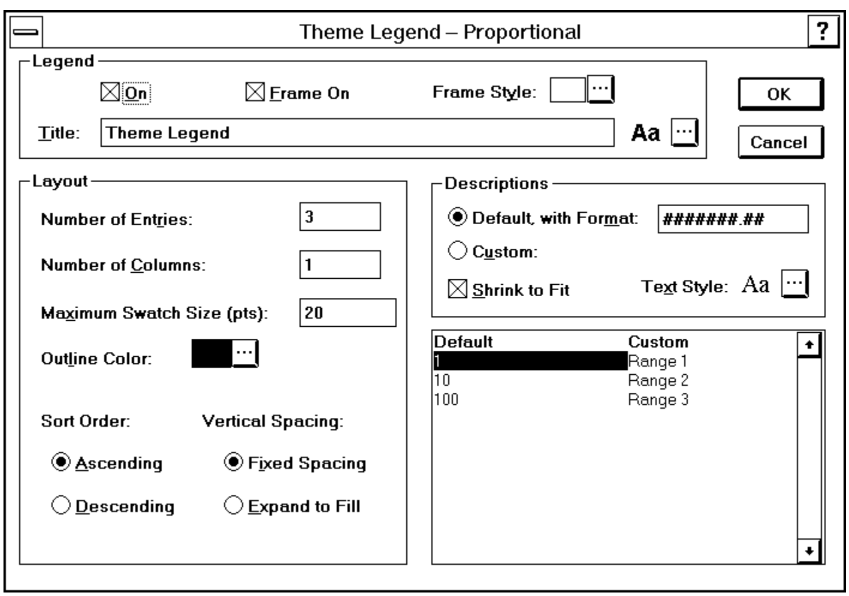


Figure 11.10 **Theme Legend - Proportional dialog box**

2. In the Legend group box, type ‘Sales Potential by Store’ in the *Title* text box.

3. Click on the Title […] button to pop up the Text dialog box.

4. In the Text group box, set the options according to the following table.

OPTION	SETTING
Font	Times New Roman
Size (in points)	16
Color	Red Brown
Bold	Checked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

5. Click OK to return to the Theme Legend - Proportional dialog box.

6. In the Layout group box, type ‘2’ in the *Number of Entries* text box.

   This sets the number of legend entries that will be displayed in the legend.

7. In the *Maximum Swatch Size* text box, type ‘30’.

   This sets the maximum size (in points) for the sample swatch in the legend.

8. For *Sort Order*, click on the Ascending option button.

9. For *Vertical Spacing*, click on the Fixed Spacing option button.

   This spaces the legend entries by a fixed amount; it doesn’t add extra space in between entries so they fill the entire theme legend frame.

10. In the Descriptions group box, click on the Custom option button.

    You’ll type a custom description in the *Custom* column, which will appear in the theme legend rather than the *Default* entry.

11. In the first row of the *Custom* column, choose (i.e., highlight) the existing text and type ‘Low Sales Volume’.

12. In the second row of the *Custom* column, highlight the existing text and type ‘High Sales Volume’.

13. In the Descriptions group box, place a check in the *Shrink to Fit* box.

    This shrinks the descriptions to fit in the legend frame, if necessary.

14. Click on the Text Style […] button to pop up the Text dialog box.

15. In the Text group box, set the options according to the following table.

OPTION	SETTING
Font	Times New Roman
Size (in points)	14
Color	Black
Bold	Unchecked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

16. Click OK to return to the Theme Legend - Proportional dialog box.

17. Click OK to return to the Layers & Themes dialog box.

18. Click OK.

The finished map should look something like the following figure.

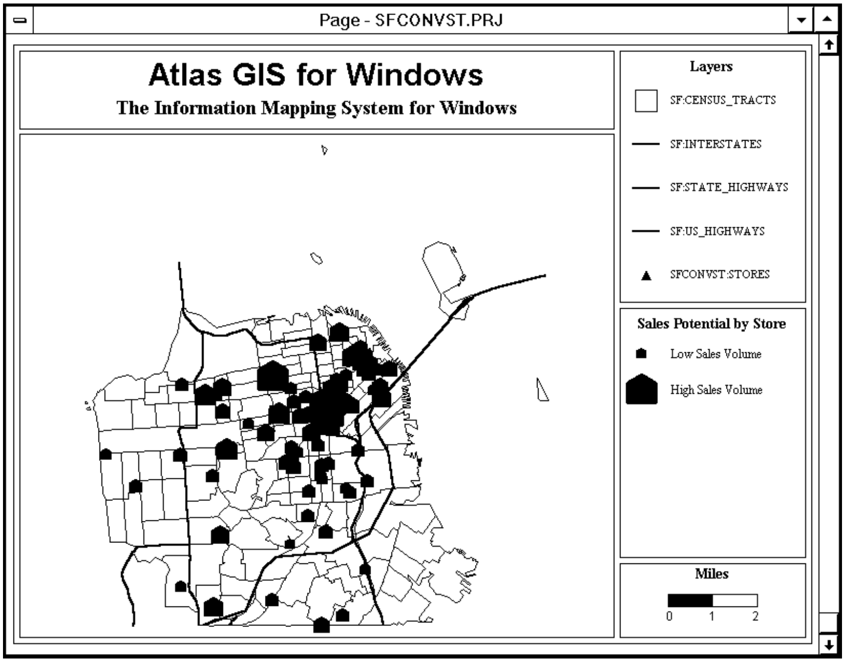


Figure 11.11 **Completed proportional symbol map**

You'll be changing the theme settings to create another theme map in the next exercise. If you'd like to save this map before proceeding, choose FILE | SAVE AS and save the project file as SYMBOLS.PRJ.

Creating a Bivariate Map

Atlas GIS allows you to display as many variables as you want on the same map. These variables can be for the same layer or for different layers; you can display as many as two variables per layer. When displaying two variables for the same layer, the map is called a *bivariate map*. For example, you can create a bivariate map in which one variable controls the fill pattern and the other controls the color.

For a bivariate map, at least one of the variables must be ranged; you can't specify two proportional variables in the same layer. You can, however, specify two ranged variables if you like. If one of the variables is proportional, it must control either the percentage of fill, the line thickness, or the symbol size.

In this exercise, you'll create a bivariate map that shows the estimated sales potential for convenience stores versus the actual sales. You'll have one ranged variable, and one proportional variable. The ranged variable will be the estimated store potential, which will control the color. The proportional variable will be the actual sales, which will control the symbol size. So in the final map, you'll have proportionally sized symbols, where size indicates the actual sales for the store, and color indicates the potential range.

To specify the data variables:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

   The SFCONVST:STORES layer should still be chosen in the Layers group box, and the subpanel should display the theme options for that layer. The theme should still be turned on from the previous exercise.

2. Place a check in the *Two Variables* box.

   Variable 1 will use the same settings you defined in the last exercise. Make sure the *Expression* text box says 'SALES' and the *Map Type* list box says 'Proportional Symbol'.

   In this map, the sales for each store is a proportional variable, which controls the symbol style and size. The higher volume stores will have larger symbols.

3. In the Variable 2 group box, click on the Expression […] button to pop up the Expression Builder.

4. In the *Columns* list, choose 'POTENTIAL', then click OK. (You might need to scroll to see this entry.)

   This identifies the POTENTIAL column as Variable 2 and returns you to the Layers & Themes dialog box, where you can continue defining Variable 2.

5. In the *Map Type* list box, choose 'Ranged Symbol'.

   For a bivariate map, at least one of the variables must be ranged. In this map, the estimated sales potential is the ranged variable, which controls the symbol color.

In this next exercise, you'll specify the controlling variables for the theme before you customize the theme settings and the legend for each variable.

When you create your own theme maps, however, you can wait to specify the controlling variables at the very end before you print; it doesn't matter when you do it.

To specify the controlling variables:

1. In the Controlling Variable group box, for *Style*, click option button 1.

   The *Style* specifies which data variable controls the fill pattern, line style, or symbol type. In this exercise, Variable 1 (SALES) is the controlling variable for the symbol type.

2. For *%Fill or Size*, click option button 1.

   The *%Fill or Size* specifies which data variable controls the percentage of fill, the line thickness, or the symbol size. If one of the two variables is proportional, it must control the *%Fill or Size*. In this exercise, Variable 1 (SALES) is proportional and is the controlling variable for the symbol size.

3. For *Color*, click option button 2.

   The *Color* specifies which data variable controls the fill, line, or symbol color. In this exercise, Variable 2 (POTENTIAL) is the controlling variable for the symbol color.

4. Click OK.

The theme map displays, using the default ranges and colors. (Notice there's now a second theme legend, for the second variable.) You'll need to customize the theme settings and legends to make the theme clear. For example, let's say you want to identify any underperforming stores, with high potential and low sales. You'll make those stores easy to spot, choosing a large symbol size for stores with high potential, and the color red for low sales values.

For this exercise, you can use the same range settings for Variable 1 that you used in the previous exercise. You will, however, turn off the theme legend for this variable. Instead, you could add a line to the map title later to say the store size indicates sales volume. For example, your map title could be "Sales Potential Versus Sales Analysis, Size of Store Indicates Sales Levels."

To turn off the theme legend:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

2. In the Variable 1 group box, click on the Legend button to pop up the Theme Legend - Proportional dialog box.

3. In the Legend group box, make sure the *On* box is unchecked.

4. Click OK to return to the Layers & Themes dialog box.

Now you'll customize the Variable 2 theme settings.

To specify the theme settings for Variable 2:

1. In the Variable 2 group box, click on the Ranges button.

   The Ranged Symbol dialog box pops up.

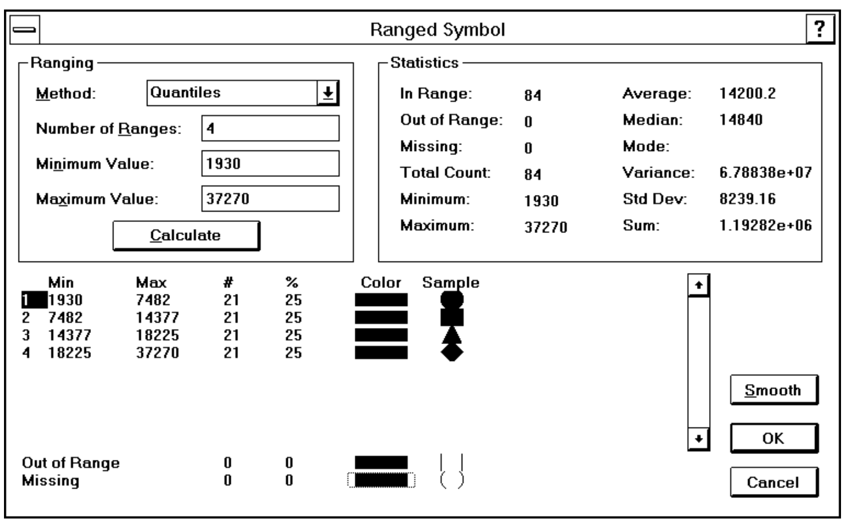


Figure 11.12 **Ranged Symbol dialog box**

2. In the Ranging group box, choose 'Equal Size' from the *Method* list.

This creates ranges of equal size based on the number of ranges. You'll accept the default settings for the *Number of Ranges*, *Minimum Value*, and *Maximum Value*.

3. Click on the Calculate button.

   Atlas GIS calculates the statistics that will be depicted on the map. Notice that the Statistics group box updates to display the calculated statistics.

4. In the bottom half of the dialog box, click on the *Color* swatch for the first range.

   This pops up the Color dialog box, so you can choose the color for the symbols in this range. Since this range includes the lowest sales values, you'll choose red, so that these stores stand out on the map.

5. Choose 'Red' from the *Constant Colors* palette.

6. Click on the *Color* sample for the second range and choose 'Blue'.

7. Click on the *Color* sample for the third range and choose 'Green'.

8. Click on the *Color* sample for the fourth range and choose 'Yellow'.

9. Click OK to return to the Layers & Themes dialog box.

Now that you've customized the theme settings, you can customize the theme legend for the variable before returning to the map.

To customize the theme legend for Variable 2:

1. In the Variable 2 group box, click on the Legend button to pop up the Theme Legend - Ranged dialog box.

2. In the Legend group box, type 'Potential' in the *Title* text box.

3. Click on the Title […] button to pop up the Text dialog box.

4. In the Text group box, set the options according to the following table.

OPTION	SETTING
Font	Times New Roman
Size (in points)	16
Color	Red Brown
Bold	Checked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

5. Click OK to return to the Theme Legend - Ranged dialog box.

6. In the Layout group box, you'll use the default settings for all of the options.

7. In the Descriptions group box, click on the Default, with Format option button and type '$99,999 to $99,999' in the text box.

   Atlas GIS will use the default range entries as the range descriptions in the theme legend, using the specified format. If you don't specify a format, the entries will appear exactly as they appear in the *Default* list.

8. Make sure the *Shrink to Fit* box is unchecked.

   If the descriptions don't fit in the legend frame, you might want to resize the frame, rather than shrinking the text to fit. For long descriptions, the shrink to fit option might shrink the text to an illegible size.

9. Click on the Text Style [...] button.

   This pops up the Text dialog box, where you can change the style of the description text in the theme legend.

10. In the Text group box, set the options according to the following table.

OPTION	SETTING
Font	Times New Roman
Size (in points)	14
Color	Black
Bold	Unchecked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

11. Click OK to return to the Theme Legend - Ranged dialog box.

12. Below the *Default* list, make sure the *Out of Range* and *Missing* boxes are unchecked.

    Descriptions for values that are out of range or missing will not appear in the theme legend.

13. Click OK to return to the Layers & Themes dialog box.

14. Click OK.

You probably want to move the theme legend frame for Variable 2 into the spot where the Variable 1 theme legend was located. To move the frame, choose the Page Freehand tool, select the theme legend frame, and drag it to the desired location.

The completed map should look something like the following figure.

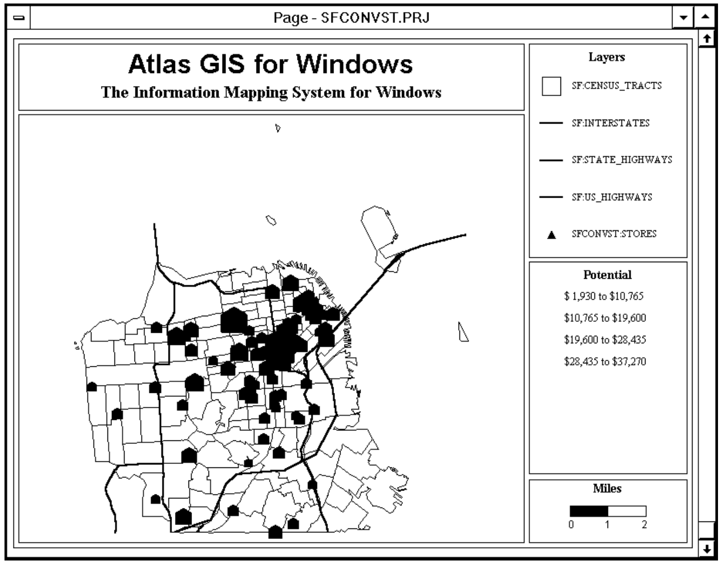


Figure 11.13 **Completed bivariate map**

If you'd like to save this map before proceeding, choose FILE | SAVE AS and save the project file as BIVARIAT.PRJ.

End of Lesson

Before you proceed, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

12

Labeling and Annotating the Map and Page

Preparing maps for presentation includes changing the graphic characteristics of the map features and adding feature labels to enhance the meaning and clarity of a map. In Atlas GIS, using layers provides a powerful method of organization, allowing you to efficiently manipulate features in both simple and complex maps. You can change the display characteristics for all features in a layer, turn labels on and off, and control how they look.

In addition to setting the graphic characteristics for your map features, you can also rearrange the legends and frames and change their attributes. You can modify the text properties, change the shape of the frames, or even add a drop shadow. You can also add a variety of freehand graphics and text to the map and page.

In this lesson, you'll work with a map like one you created in a previous lesson. You'll change the layer settings, turn on labels, change the label visibility by scale, and arrange the page elements. You'll also add freehand text and freehand graphics for the finishing touches.

Changing Layer Settings

Layers allow you to graphically depict different kinds of features. For example, you might draw ZIP codes with thin lines and sales territories with thick lines, highways as double red lines and roads as single black lines, and display major accounts with a particular symbol. You can also turn labels on and off for each layer.

To turn layers on or off:

1. Open the STOR_TRD.PRJ project file in C:\AGISW\TUTORIAL.

2. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

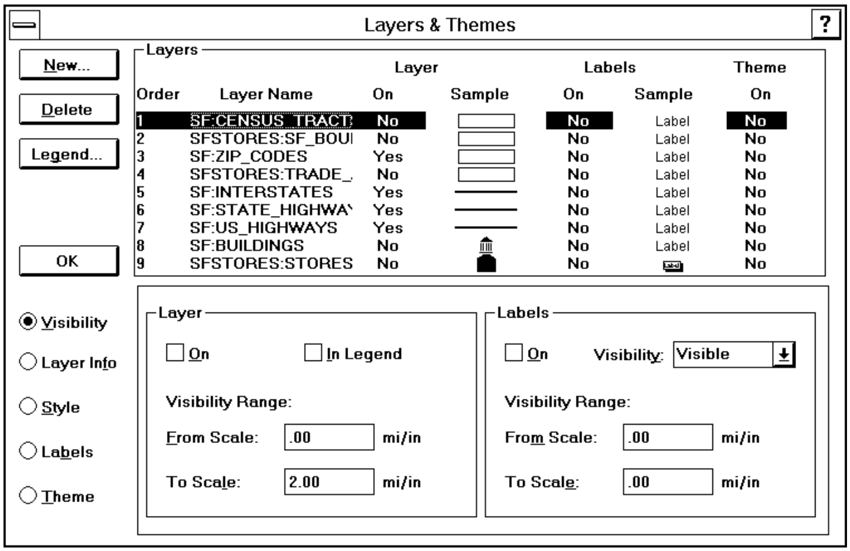


Figure 12.1 **Layers & Themes dialog box**

3. In the *Layer On* column, toggle the setting for the SFSTORES:STORES layer to 'Yes'.

   This selects the layer and turns it on. Notice that the subpanel displays the visibility options for the layer.

4. Click OK.

This exits the Layers & Themes dialog box, and the map redraws, displaying the store symbols. Next you'll change the symbol style and turn on the labels.

To change feature style:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

The SFSTORES:STORES layer should still be selected in the Layers group box.

2. Click on the Style option button, at the lower left of the dialog box.

   The subpanel changes to display the style options for the layer.

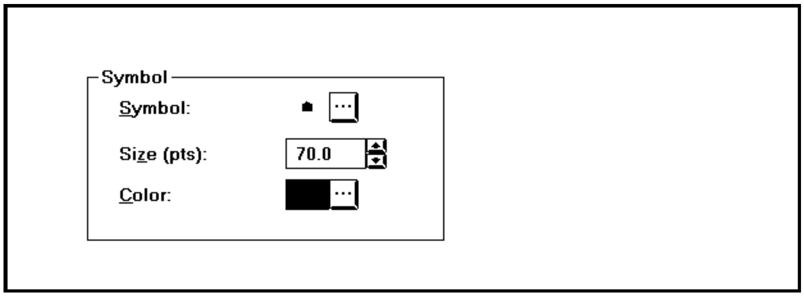


Figure 12.2 **Style subpanel for a point layer**

3. In the Symbol group box, click on the Symbol […] button.

   A symbol table pops up.

4. In the fifth row of the table, choose the second star in from the right. The symbol looks like this:

5. In the *Size* text box, type ‘20’.

6. Click on the Color […] button to pop up the Color dialog box.

7. In the *Constant Colors* palette, choose ‘Magenta’.

   The Color dialog box closes automatically, and returns you to the Layers & Themes dialog box. The symbols will remain this color until you specify a change, even if you change the color scheme. For more information on the Color dialog box, refer to the on-line help.

You’ve finished changing the symbol style for the layer. Next you’ll turn on the labels.

To label features:

1. In the Layers group box, toggle the *Labels On* column setting for the SFSTORE:STORE layer to 'Yes'.

2. Click on the Labels option button on the lower left side of the dialog box.

   Notice that the subpanel changes to display the label options for the layer.

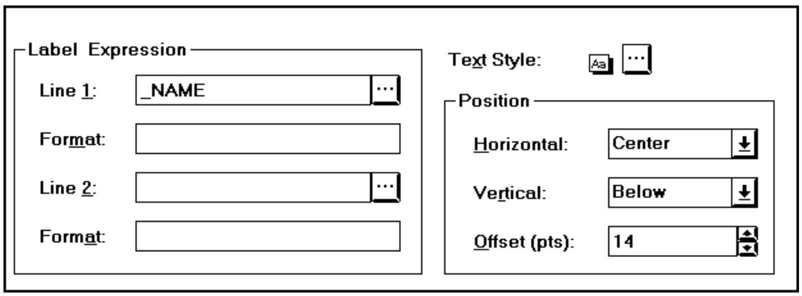


Figure 12.3 **Labels subpanel**

3. In the Label Expression group box, make sure the Line 1 […] text box says '_NAME'.

   This labels each feature with the name stored in the _NAME column. You can have two-line labels, but you'll only use one for this lesson. You'll leave the rest of the settings in this group box blank.

4. In the Position group box, choose 'Center' in the *Horizontal* list box.

5. In the *Vertical* list box, choose 'Below'.

   This places the labels below each point location.

6. In the *Offset* text box, type '14'.

   The labels will be offset below the symbols on the map, so they don't overlap the symbols. Next you'll set the style for the label text.

To set the label text style:

1. Click on the Text Style […] button to pop up the Label Text dialog box.

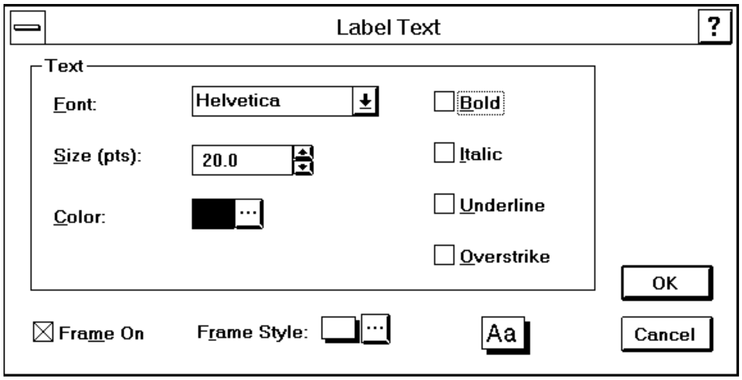


Figure 12.4 **Label Text dialog box**

2. In the Text group box, choose 'Helvetica' (or a similar font) in the *Font* list box.

3. In the *Size* text box, choose '18'.

   The label size is tied to the map, so you want to choose a size that looks right with the current map view. As the map zooms in and out, the labels will be scaled accordingly so they'll continue to fit.

4. Click on the *Color* […] button to pop up the Color dialog box.

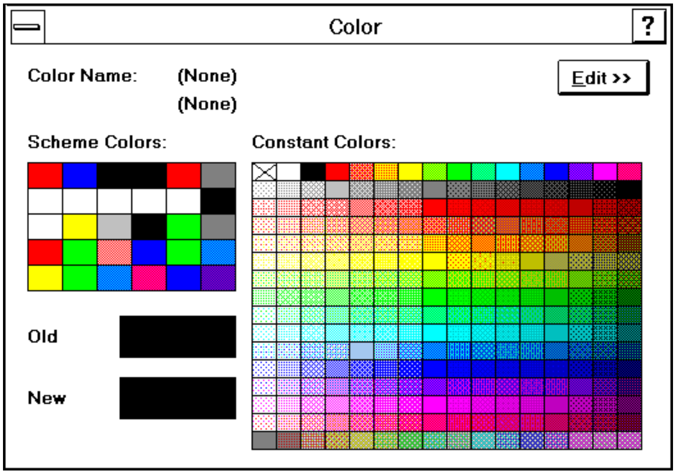


Figure 12.5 **Color dialog box**

5. In the *Constant Colors* palette, choose ‘Blue’.

   The Color dialog box closes automatically, and returns you to the Label Text dialog box.

6. In the Text group box, make sure the *Bold*, *Italic*, *Underline*, and *Overstrike* boxes are unchecked.

   These labels will have a frame around them. In the following steps, you’ll turn on the frames and define their style.

To set the label frame style:

1. In the Label Text dialog box, place a check in the *Frame On* box, located at the bottom left of the dialog box.

   This turns on the frame around the labels.

2. Click on the Frame Style […] button to pop up the Frame dialog box.

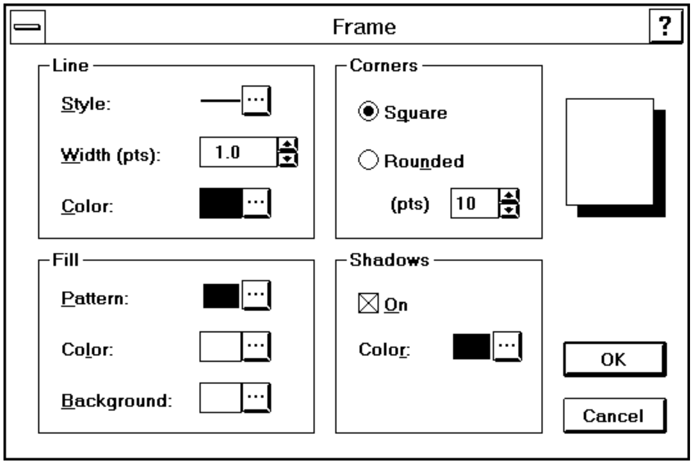


Figure 12.6 **Frame dialog box**

For most of the settings, you'll use the default settings. You'll just change the background color of the labels.

3. In the Fill group box, click on the Background […] button to pop up the Color dialog box.

4. In the *Constant Colors* palette, choose 'Cyan'.

   The Color dialog box automatically closes and returns you to the Frame dialog box.

5. Click OK to return to the Label Text dialog box.

6. Click OK to return to the Layers & Themes dialog box.

7. Click OK.

   The screen redraws, and you can see the new store symbols and labels on the map.

In the remainder of this lesson, you'll be working with the page freehand and map freehand layers. You'll learn how to select and edit page elements as well as freehand objects.

Using the Freehand Layers

Each Atlas GIS project file contains a *page freehand layer* and a *map freehand layer*. These freehand layers contain objects or text that you add using the tools provided in Atlas GIS. This is useful when you want to annotate a map with, for example, a north arrow (or compass rose), a decorative symbol, or special explanatory information. When the page freehand layer is selected, you can also select the page elements, for example, to resize or move them.

When you add an object to the map freehand layer, the object becomes tied to the map. Therefore, as you zoom in or out on the map, the map-based freehand object becomes larger or smaller, maintaining proportion to the map, and maintaining its location on the map as well. When you add an object to the page freehand layer, the object becomes linked to the page, and maintains proportion to (and location on) the page.

You can use the Pointer tool for selecting and editing page elements and objects in the freehand layers. When the page freehand layer is selected, the Pointer tool selects objects tied to the page. When the map freehand layer is selected, the Pointer tool selects objects tied to the map. You can select one single object; all the objects in a rectangular area (by dragging); or several objects, one at a time (using the modifier keys). When selecting freehand objects with the Pointer tool, the modifier keys work the same as they do when selecting map features. The modifier keys are described in Lesson 9, "Selecting Features and Data."

In the page freehand layer or the map freehand layer, selected objects are highlighted and have edit handles, which allow you to move, resize, or rotate objects. (Note that freehand text and freehand symbols only have one edit handle each.) The edit handles define the bounding rectangle (which surrounds the selected objects when being moved, resized, or rotated), as illustrated in the following figure. When you select multiple freehand objects, each object displays a set of handles (and each selected object is surrounded by a separate bounding rectangle when you're editing them). If you edit any one of the selected objects, all the selected objects will be similarly modified. (For information on how to use the edit handles, refer to "Moving, Resizing, and Rotating Freehand Objects" in the on-line help.)

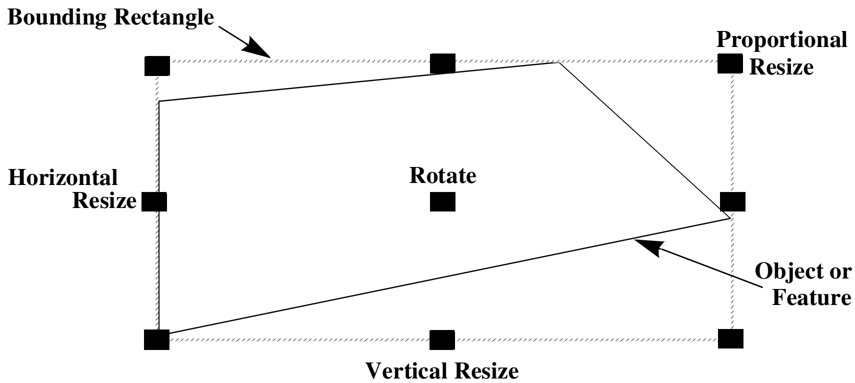


Figure 12.7 **Edit handles on freehand objects**

In the remaining exercises, you'll be working with the page freehand and map freehand layers. You'll modify the page layout, change the display settings for frames in the Page window, and resize page frames as well. You'll also add and edit freehand objects and text.

Arranging the Page Elements

Now that you've set the feature style and turned on labels, you'll change the page layout. In the following exercise, you'll turn off the legends and scale, and resize the title and map frames. The Atlas GIS application window should be maximized for this exercise, if it isn't already.

To turn off frames:

1. Choose MAP | LEGENDS & FRAMES (or click on the Legends button) to pop up the Legends & Frames dialog box.

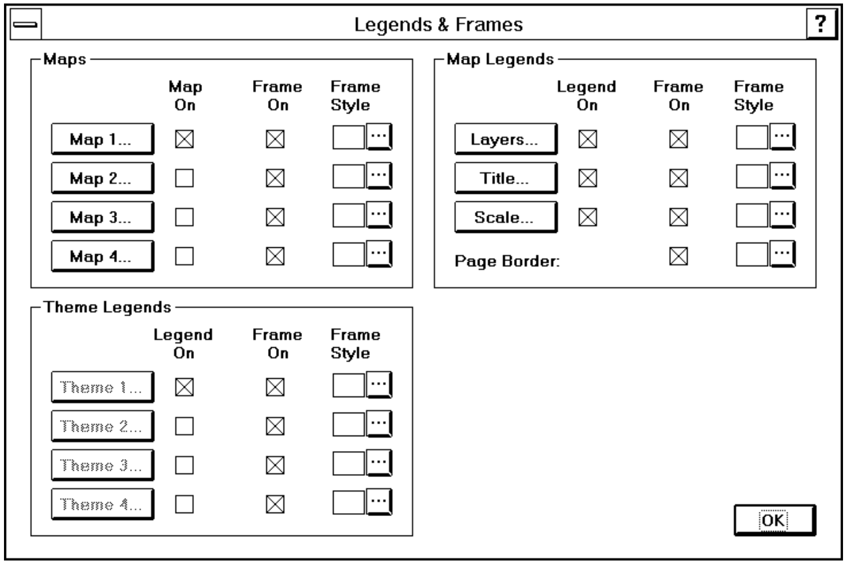


Figure 12.8 **Legends & Frames dialog box**

2. In the Maps group box, make sure the *Map On* box and *Frame On* box is checked for Map 1; the *Map On* boxes for Map 2, Map 3, and Map 4 should be unchecked.

3. Click on the Frame Style […] button for Map 1.

   This pops up the Frame dialog box, where you can modify the frame settings. For this exercise, you won't change the settings for the page, title, and map frames; we just wanted you to see the available settings.

4. Click OK to return to the Legends & Frames dialog box.

5. In the Theme Legends group box, make sure the *Legend On* box is unchecked for Theme 1, Theme 2, Theme 3, and Theme 4.

6. In the Map Legends group box, make sure the *Legend On* box and *Frame On* box is checked for Title; the *Legend On* boxes for Layers and Scale should be unchecked.

7. Make sure the *Frame On* box is checked for Page Border.

8. Click OK.

The page redraws to display only the page border, map, and title.

Now you'll resize the title and map frames to fill the page frame.

To resize frames:

1. Click on the Page tool to work with the page freehand layer.

2. Click on the title frame to select it.

   Notice that edit handles appear on the frame only. Page elements don't have a rotate edit handle; therefore, you can only move and resize them.

3. Drag the edit handle on the right side of the frame until the space between the title frame and page frame is the same as it is on the left.

   As you resize the frame, a dashed line indicates where the new frame border will be.

   For this exercise, when you release the mouse button, the resize handle should almost touch the page frame. When you have the title frame properly sized, you'll resize the map frame.

4. Click on the map frame to select it.

5. Drag the edit handle on the right side of the frame until the frame side is aligned with the title frame.

   When you resize the map frame, the map resizes proportionally. You'll reset the map scale next.

6. Choose VIEW | MAP SCALE to pop up the Map Scale dialog box.

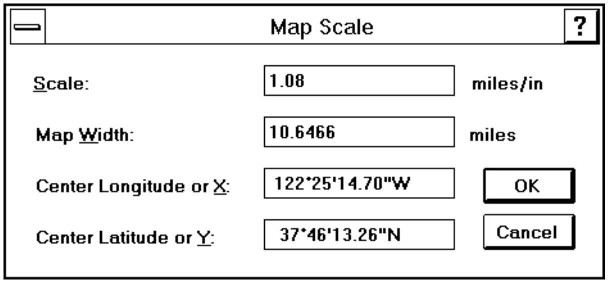


Figure 12.9 **Map Scale dialog box**

7. In the *Scale* text box, type ‘1.43’; leave the rest of the settings as they are.

8. Click OK.

The map and title frames should now fill the page frame, as shown in the following figure.

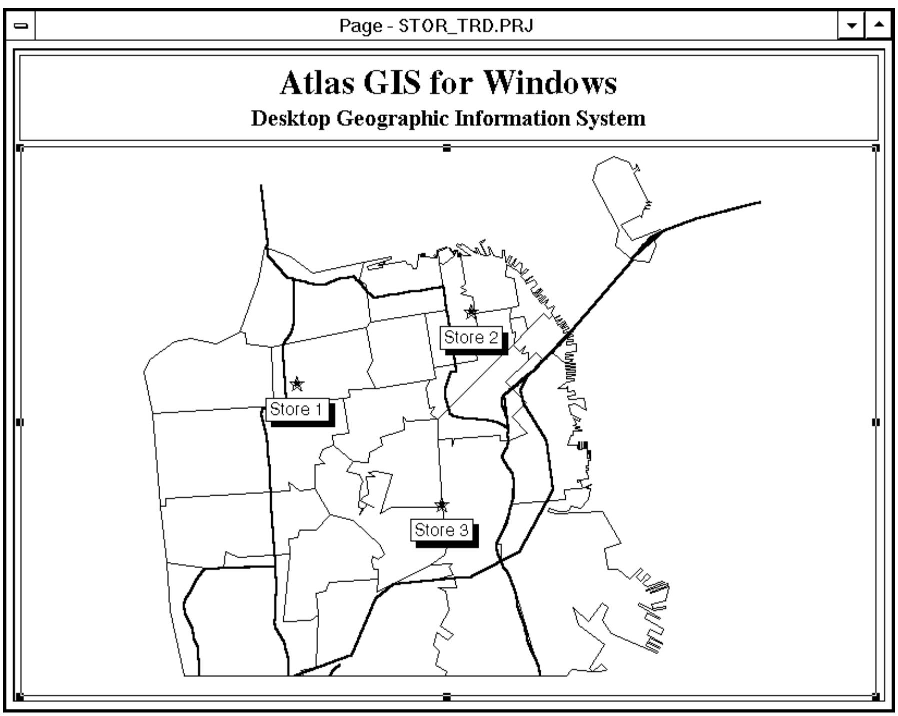


Figure 12.10 **Resized map and title frames**

For more information on changing page settings, such as modifying the title, legend, or scale, refer to Lesson 5, “Changing the Page.”

Adding and Editing Freehand Text

As one of the finishing touches, you’ll annotate the map with freehand text to identify the store districts. You’ll add this text to the map freehand layer.

To add freehand text:

1. Click on the Map tool to work with the map.

2. Click on the Layers tool to pop up the Default Layer Set dialog box.

3. In the *Layers* list box, double-click on ‘Map Freehand’.

   This selects the map freehand layer to work with. The text that you add will be tied to the map, so it will maintain its proportion to the map (rather than the page) as you zoom in and out.

4. Click on the Text tool.

   Notice the cursor changes to a cross hair when it’s in the Page window.

5. Click on the right side of the map, as indicated in the following figure.

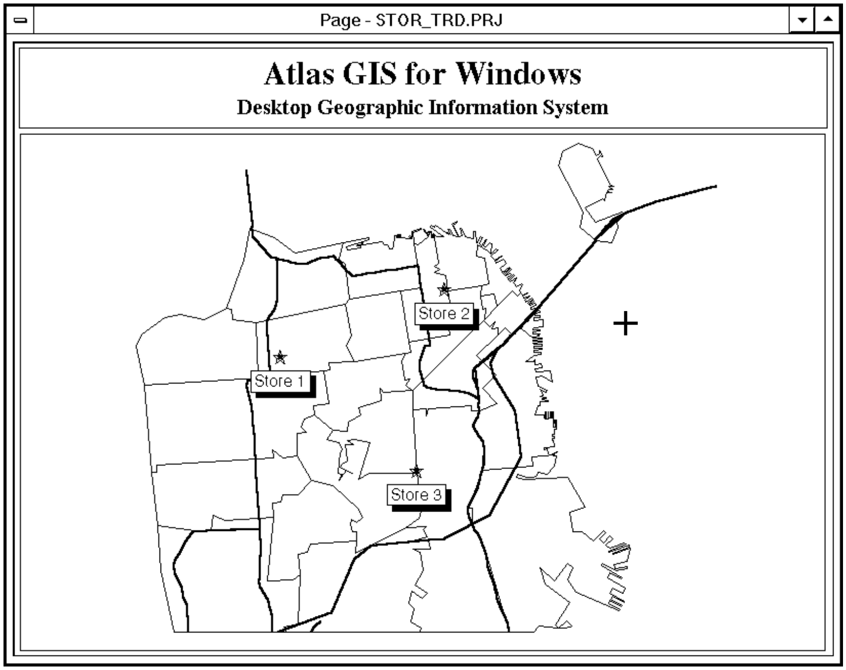


Figure 12.11 **Adding freehand text**

This adds a text frame to the map freehand layer, with a text cursor inserted so that you can type in the text.

6. Type 'Store Districts' and press ENTER.

   The text appears in the text frame and is automatically selected. Next you'll edit the text properties.

7. Click on the Text button on the button bar (or you can choose EDIT | CHANGE PROPERTIES | TEXT).

   The Text dialog box pops up, displaying the current properties of the selected text.

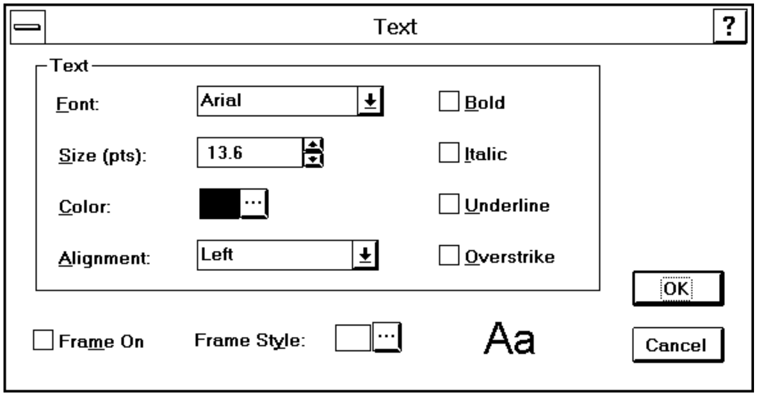


Figure 12.12 **Text dialog box**

8. In the Text group box, set the options according to the following table. (For assistance, refer to the instructions following the table.)

OPTION	**SETTING**
Font	Helvetica
Size (in points)	20
Color	Black
Alignment	Left
Bold	Checked
Italic	unchecked
Underline	Checked
Overstrike	Unchecked

- In the *Font* list, choose ‘Helvetica’; in the *Size* list, type ‘20’.
- Click on the Color […] button to pop up the Color dialog box. Click on the ‘Black’ patch in the *Constant Colors* palette to select the color and return to the Text dialog box.
- In the *Alignment* list box, choose ‘Left’.
- Place checks in the *Bold* and *Underline* boxes; leave *Italic* and *Overstrike* unchecked.

9. Make sure the *Frame On* box at the bottom of the dialog box is unchecked.

10. Click OK.

    Since the list of store districts will be a different text style, you'll add another text object for that list. First you'll need to deselect the text object you just added.

11. Click anywhere in the Page window (except on a map freehand object) or CTRL+CLICK on the text object to deselect it.

    Now you can add another text object.

12. Click on the Text tool again.

13. Place the cursor below the previous text object, as indicated in the following figure, and click.

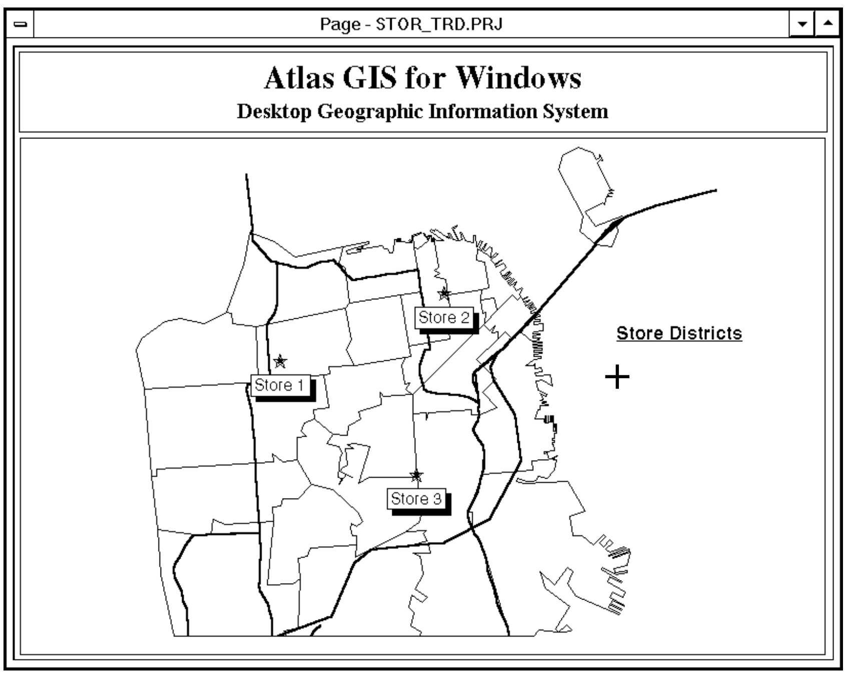


Figure 12.13 **Adding the second text object**

This text object will contain three lines of text, one entry for each store. To have multiple lines of text in the same freehand text object, each line (except the very last one) needs to end with a soft return (SHIFT+ENTER). The last line needs to end with a hard return (ENTER).

14. Type 'Store 1: Western' and press SHIFT+ENTER.

15. Type 'Store 2: Downtown' and press SHIFT+ENTER.

16. Type 'Store 3: Southern' and press ENTER.

    The three lines of text appear in the text frame. Next you'll edit the text properties.

17. Choose EDIT | CHANGE PROPERTIES | TEXT (or click on the Text button) to pop up the Text dialog box.

18. In the Text group box, set the options according to the following table.

OPTION	**SETTING**
Font	Helvetica
Size (in points)	18
Color	Blue
Alignment	Left
Bold	Unchecked
Italic	Unchecked
Underline	Unchecked
Overstrike	Unchecked

19. Make sure the *Frame On* box at the bottom of the dialog box is unchecked.

20. Click OK.

The text objects now display the new settings. In this next exercise, you'll make sure the two objects are evenly aligned.

To align freehand objects:

1. Select the two text objects you just created. (SHIFT+CLICK on each of the two objects to select them both.)

2. Choose EDIT | ALIGN | LEFT.

   The left sides of the text objects are now aligned.

3. Click anywhere in the Page window to deselect the items.

   This will prevent them from being modified inadvertently.

You're almost finished annotating the map. You'll add one last thing to finish the map.

Adding and Editing Freehand Graphics

In this final exercise, you'll add a compass rose as a finishing touch. You'll add this symbol to the page freehand layer.

To add a freehand symbol:

1. Click on the Page tool to work with the page freehand layer.

   The object you add will be linked to the page, so it will maintain its proportion to the page as well as its location on the page (rather than the map) as you zoom in and out.

2. Click on the Symbol tool.

3. Click near the bottom right corner of the map frame, as shown in the following figure.

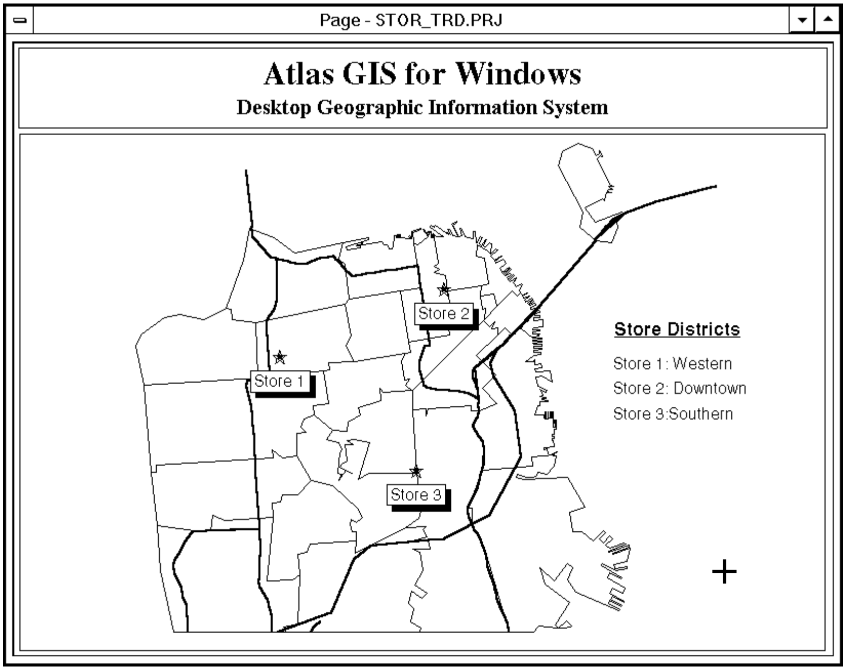


Figure 12.14 **Adding a freehand symbol**

A symbol is added where you clicked, and is automatically selected. Now you can edit the symbol, choosing the symbol, size, and color.

4. Choose EDIT | CHANGE PROPERTIES | SYMBOLS (or click on the Symbols button).

   The Symbols dialog box pops ups, displaying the current properties for the selected symbols.

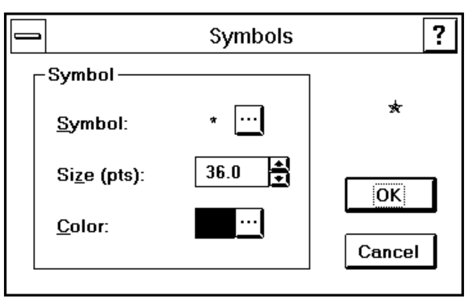
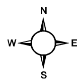


Figure 12.15 **Symbols dialog box**

5. In the Symbol group box, click on the Symbol […] button.

   This pops up a symbol table.

6. Scroll down until you come to a compass rose in the first column of the table. The symbol looks like this:

7. Choose the compass rose symbol.

   The symbol table closes automatically and returns you to the Symbols dialog box.

8. In the *Size* text box, type ‘40’.

9. Click on the Color […] button and choose ‘Black’ from the *Constant Colors* palette.

10. Click OK.

The compass rose is now displayed on the map, and you’re finished with the map. If you’d like to save this project, be sure to use the FILE | SAVE AS command and save it under another name.

End of Lesson

Before you proceed, choose FILE | NEW | PROJECT (and choose ‘No’ if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

Part IV:
Building Your Skills

13

Creating a Subset of a Map

In this lesson, you'll learn to create a subset of an existing map. This technique is useful when you're interested in working with only a specific portion of a complicated or large-area map. Of course you can always zoom in on a specific area of a map, but if you're doing a lot of work on a small area of a very large, complex geo file, you'll probably want to create a subset of the map. When you create a subset, you retain the information you want, and eliminate extraneous features and data you don't need. This saves you time and allows you to work more efficiently.

To create a map subset, the geo file from which the subset features are selected must be opened. In this lesson, you'll open a map of California and create a subset of the Northern California counties. You'll select the subset and save it to a separate geo file.

Selecting a Subset

To create a subset of an existing map, you must first select the features you want in the new map. In this exercise, you'll select ten California counties in the San Francisco Bay area and all features contained within their borders.

To select the features for a subset:

1. Open the CA_CNTY.PRJ file located in C:\AGISW\TUTORIAL.

   The project file opens the CALIFORN.AGF geo file, which contains features for California counties.

2. Choose WINDOW | NEW TABLE WINDOW (or click on the Table button).

   The Window Layer dialog box pops up.

3. In the *Layer* list box, choose 'CALIFORN:COUNTIES'.

4. Click OK.

   The Table window opens, displaying the geographic attributes for the layer CALIFORN:COUNTIES.

5. In the Table window, use CTRL+CLICK to select the following ten counties. (CTRL+CLICK to place a check in the *Select* column for the ten rows that have these names in the _NAME2 column of the table.)

   - Alameda
   - Contra Costa
   - Marin
   - Napa
   - San Francisco
   - San Mateo
   - Santa Clara
   - Santa Cruz
   - Solano
   - Sonoma

   Notice as you select a row in the Table window, the corresponding map feature in the Page window is highlighted (selected).

   Now you'll select the interstates and cities within these counties.

6. Choose QUERY | SELECT BY LOCATION | INSIDE to pop up the Select By Location - Inside dialog box.

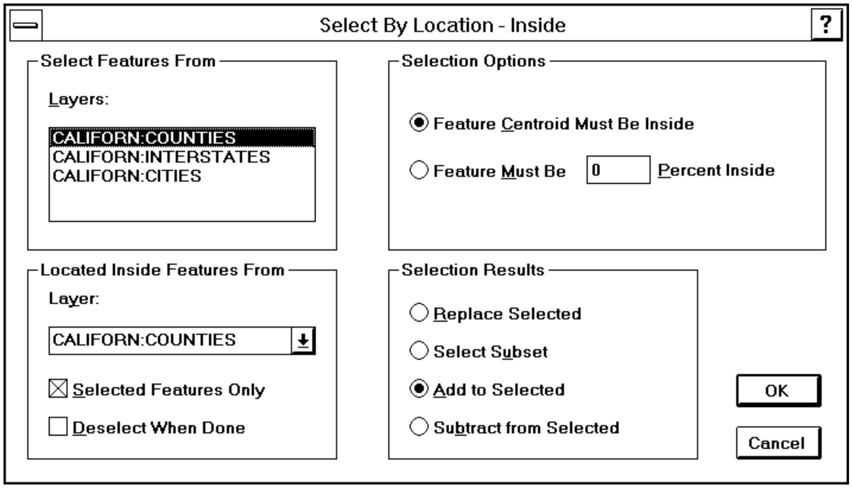


Figure 13.1 **Select by Location - Inside dialog box**

7. In the Select Features From group box, select 'CALIFORN:INTERSTATES' and 'CALIFORN:CITIES' in the *Layers* list box (by dragging or using SHIFT+CLICK).

   The features will be selected from these map layers in the geo file.

8. In the Located Inside Features From group box, choose the layer 'CALIFORN:COUNTIES' in the *Layer* list box.

   The selected regions in this layer (i.e., the counties) are the features that control the selection of the subset. You can think of these as the overlay or outline features, and other features that are located inside these outlines (but in other layers) will be selected. For example, cities located inside the selected counties will be selected.

9. Place a check in the *Selected Features Only* box, and make sure the *Deselect When Done* box is unchecked.

   You want to select the interstates and cities located inside only the selected counties, and then leave the counties selected when done, so that you can save them in the subset.

10. In the Selection Options group box, click on the Feature Centroid Must Be Inside option button.

Features whose centroids are within the county boundary will be selected for the subset. If part of a feature is within the boundary, but the centroid is outside, the feature won't be selected.

11. In the Selection Results group box, click on the Replace Selected option button.

    With this option, any previously selected features except the counties will be deselected. Since you left the *Deselect When Done* box unchecked, the counties will remain selected at the end of the query, and features located within those counties will also be selected as a result of the query.

12. Click OK.

    The map redraws to show the features selected. You can close the Table window to see the map.

13. In the Table window, double-click on the Control-menu box to close the window.

    The Page window should now look something like the following figure.

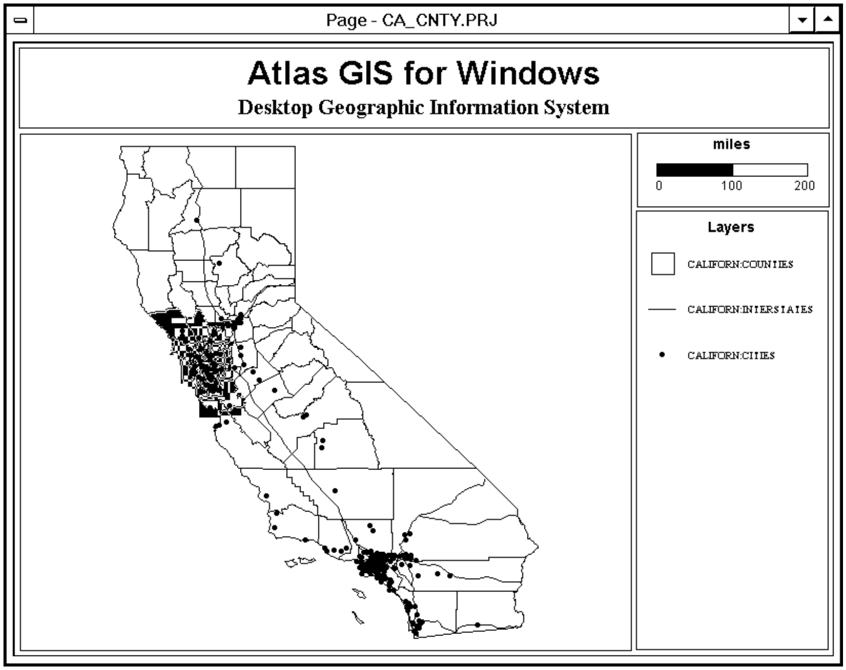


Figure 13.2 **Selected features**

14. Choose VIEW | SELECTED MAP FEATURES to zoom in on the subset, just to double-check the results.

Saving the Subset

After selecting features for the subset, you can now save them to a new geo file, and open that file for use.

To create a geo file from a subset:

1. Choose FILE | SAVE AS to pop up the Save As dialog box.

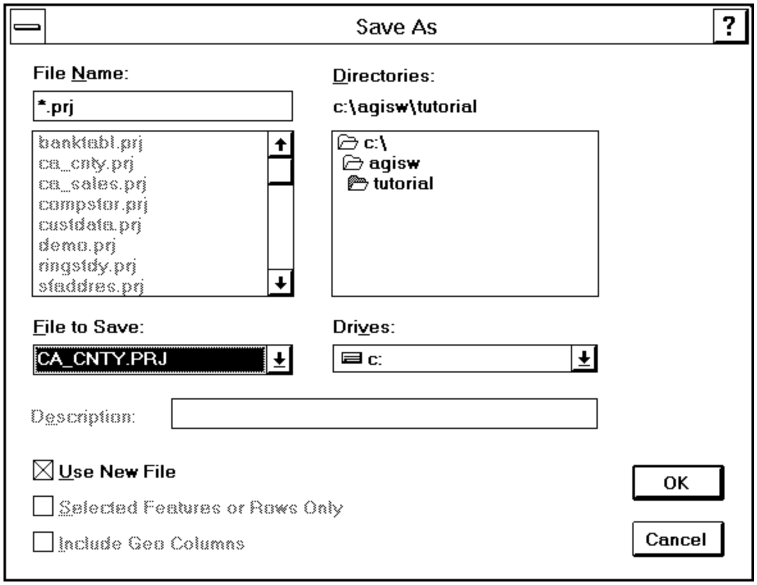


Figure 13.3 **Save As dialog box**

2. Make sure the current directory is C:\AGISW\TUTORIAL.

3. In the *File to Save* list box, choose ‘CALIFORN.AGF’.

4. In the *File Name* text box, type ‘SFBAY.AGF’.

5. In the *Description* text box, type ‘San Francisco Bay Area Counties’.

6. Place a check in the *Selected Features or Rows Only* box.

   This will save only the selected features—the subset—to the new geo file.

7. Place a check in the *Use New File* box.

   When you exit the dialog box, the original geo file will be closed, and the new file will be open for use.

8. Click OK.

Atlas GIS creates a new geo file with features for the San Francisco Bay Area counties, and closes the CALIFORN.AGF geo file. The screen redraws, displaying only the new SFBAY.AGF geo file.

9. Choose VIEW | ENTIRE MAP to fill the map frame with the new geo file. The new map should look similar to the following figure.

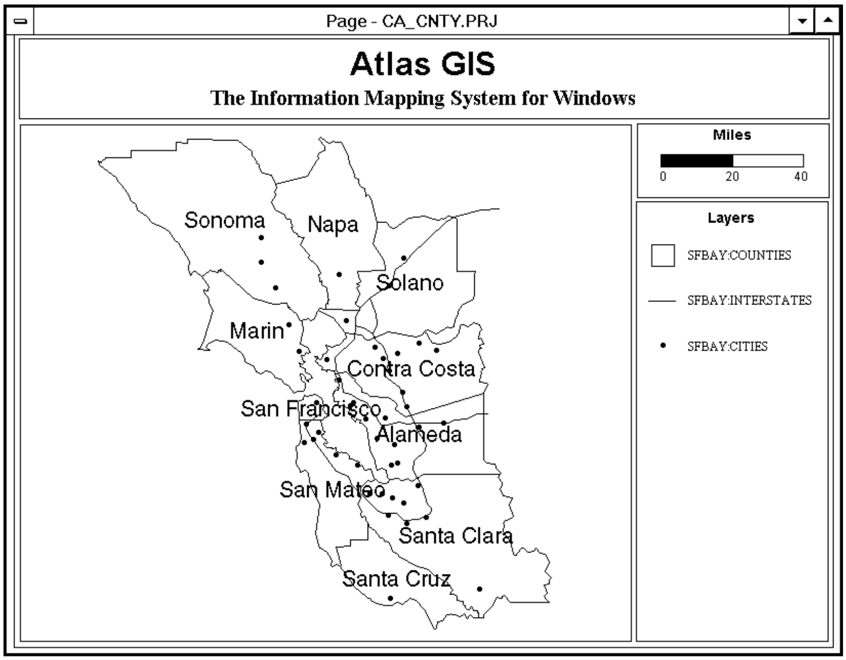


Figure 13.4 **New geo file for San Francisco Bay Area counties**

End of Lesson

Before proceeding, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

14

Merging Files orTables

Atlas GIS for Windows allows you to work with several geo files and tables simultaneously; however, you may want to merge information from two or more files into a single file. For example, you might have the same layer in two separate geo files, perhaps ZIP codes in adjoining areas. Merging these geo files together makes them one layer, which enables you to use one attribute table with all of the ZIP codes at once. Opening the geo files as separate files would leave them as separate layers, so the table could only be linked to one layer at a time. Merging the geo files saves you from linking and relinking the table to each separate geo file while you work. If you had a ZIP code table for each of these areas, then you could merge the tables as well. And you can also merge two tables that have the same rows but different columns.

You'll use FILE | MERGE to combine information from two or more files into a single file. You can merge either geo files or tables. In this lesson, you'll use this command first with geo files, and then with tables.

Merging Geo Files

When merging geo files, FILE | MERGE combines features from two or more geo files into one, consolidating layers with the same name. If a layer in a file you're merging *from* (merging file) doesn't exist in the file you're merging into (target file), Atlas GIS automatically creates a new layer in that file.

Since a feature ID cannot be duplicated in the same layer, Atlas GIS compares the merging feature IDs against the feature IDs in the file they're merging into. If the feature ID is unique (i.e., the ID is not duplicated in the target file), the feature is added to the target file. Atlas GIS provides several options for specifying how duplicate IDs are handled during the merge.

In this lesson, you'll use FILE | MERGE to merge three geo files: EASTBAY.AGF, NORTHBAY.AGF, and SOUTHBAY.AGF. These three files each contain counties in the San Francisco Bay Area. You'll combine them into one new file, called BAYAREA.AGF.

To merge geo files:

1. Open the EASTBAY.AGF geo file located in C:\AGISW\TUTORIAL.

   In Atlas GIS, you merge files into an open file. In order to preserve the EASTBAY.AGF file when you merge the other files into it, you'll save it as another file now, using the name you'd like for the final, merged file.

2. Choose FILE | SAVE AS to pop up the Save As dialog box.

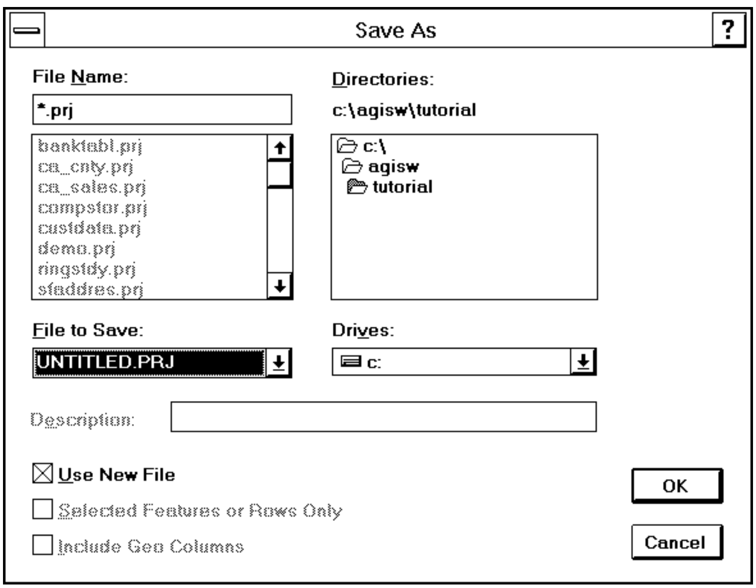


Figure 14.1 **Save As dialog box**

3. Make sure the current directory is C:\AGISW\TUTORIAL.

4. In the *File to Save* list box, make sure 'EASTBAY.AGF' is chosen.

5. In the *File Name* text box, type 'BAYAREA.AGF'.

6. In the *Description* text box, type 'San Francisco Bay Area Counties'.

7. Make sure the *Selected Features or Rows Only* box is unchecked.

   This ensures that the entire file will be copied and saved to the new file.

8. Place a check in the *Use New File* box.

   When you exit the dialog box, the new file will be open and ready for use.

9. Click OK.

   Atlas GIS creates a new geo file (called BAYAREA.AGF) with features for the counties in the eastern part of the San Francisco Bay Area, and closes the EASTBAY.AGF file. The screen redraws, displaying only the new BAYAREA.AGF geo file.

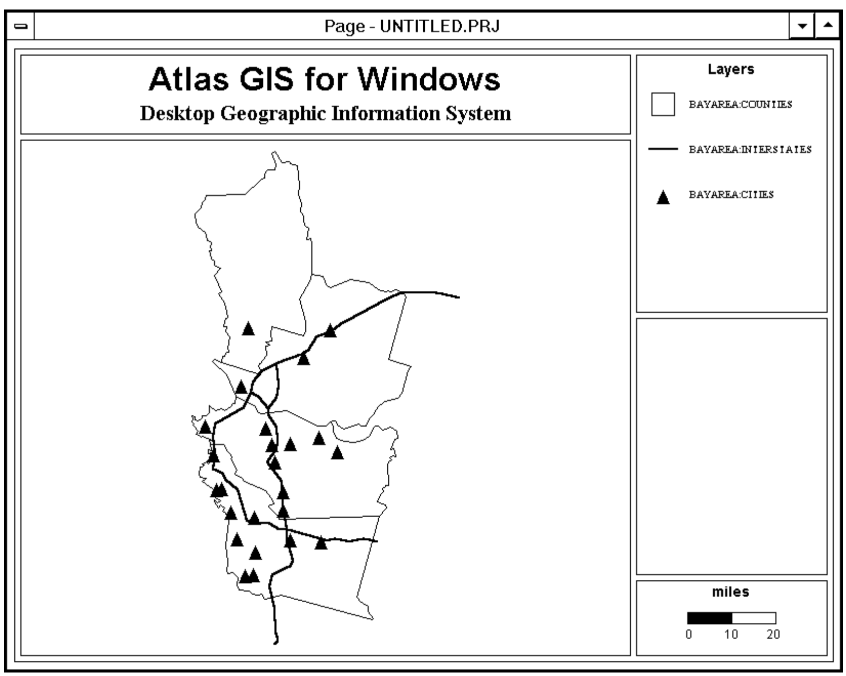


Figure 14.2 **BAYAREA.AGF geo file**

10. Choose FILE | MERGE to pop up the Merge dialog box.

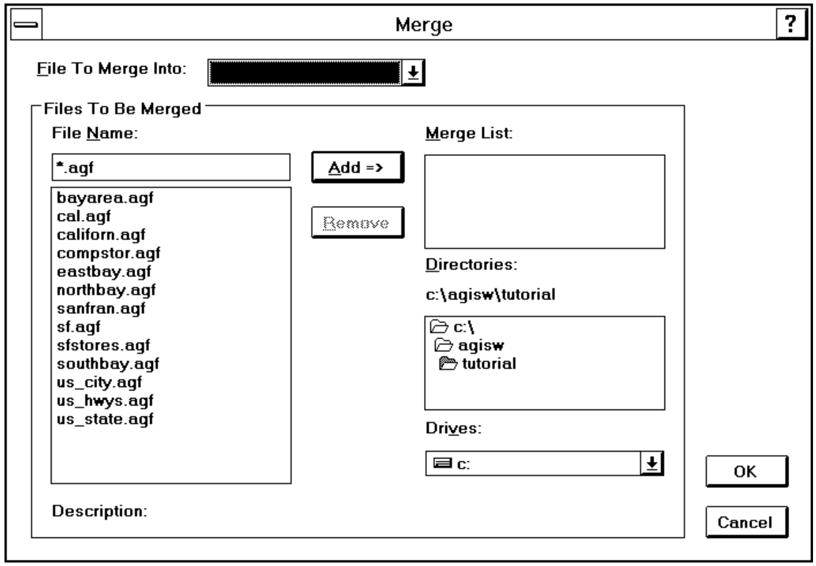


Figure 14.3 **Merge dialog box**

11. From the *File to Merge Into* list box, choose 'BAYAREA.AGF'.

    The information from the other files will be merged with and become part of this open file.

12. In the Files To Be Merged group box, make sure the current directory is C:\AGISW\TUTORIAL.

13. In the *File Name* list box, choose 'NORTHBAY.AGF'.

14. Click on the Add button to add the NORTHBAY.AGF file to the *Merge List* box.

    Note: Files must have the same projection to be merged. When you add a file to the merge list that has a different projection than the file it's merging into, a message asks if you want to change the projection.

15. In the *File Name* list box, choose 'SOUTHBAY.AGF', then click on the Add button to add the SOUTHBAY.AGF file to the *Merge List* box.

    All of the features from both of these files will be added to the BAYAREA.AGF file.

16. Click OK.

The Merge Geo Files dialog box pops up.

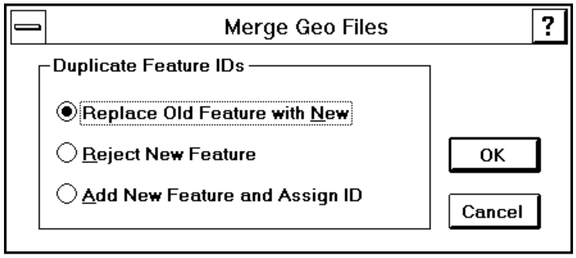


Figure 14.4 **Merge Geo Files dialog box**

17. In the Duplicate Feature IDs group box, click on the Add New Feature and Assign ID option button.

    In the case of a duplicate feature ID, this option adds the new feature to the file being merged *into*, and assigns it a unique ID. There shouldn't be any duplicates, but this option prevents you from deleting any features that unexpectedly have the same ID.

18. Click OK to merge the NORTHBAY.AGF and SOUTHBAY.AGF files into the BAYAREA.AGF file.

    A progress message displays while Atlas GIS merges the files. The map then redraws to display the changes, and the layer legend is updated.

19. Choose VIEW | ENTIRE (or click on the View Map button) to see the entire map.

    The new map should look similar to the following figure.

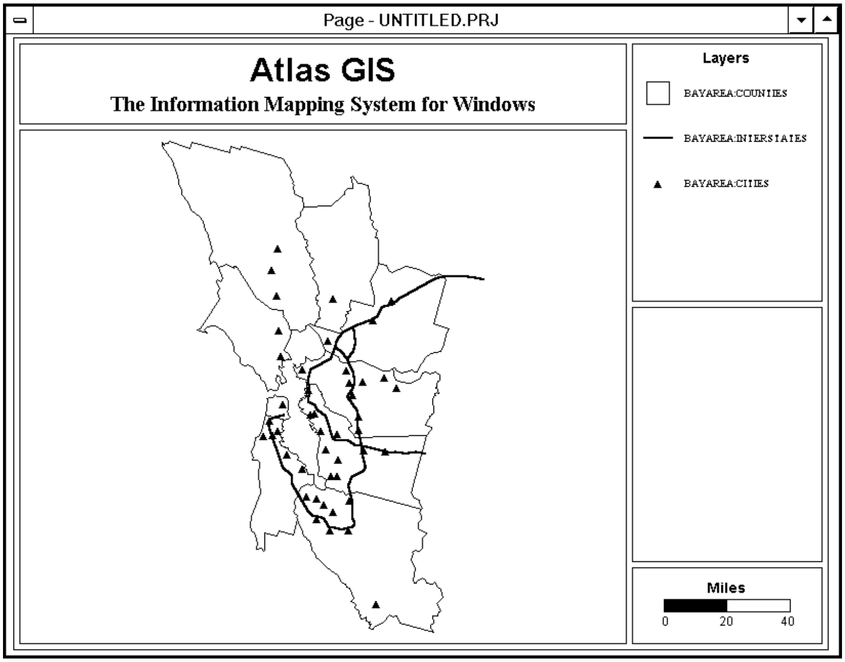


Figure 14.5 **BAYAREA.AGF after merging geo files**

Merging Tables

You can also use the FILE | MERGE command to combine information from two or more tables into one. For example, you can merge attribute data from two tables into a single table, which you can then link to a layer in a geo file.

When merging tables, Atlas GIS compares the key column values of the data being merged against the key column in the table it's being merged into. If the key value for a row is unique (i.e., the value is not duplicated in the target table), the row is appended to the bottom of the target table. Atlas GIS provides several options for specifying how duplicate key values are handled during the merge, in case a row matches an existing row.

In this lesson, you'll use FILE | MERGE to merge three tables containing county demographic data: EASTBAY.DBF, NORTHBAY.DBF, and SOUTHBAY.DBF. This will allow you to link all of the data to the merged geo file you just created.

To merge tables:

1. Open the EASTBAY.DBF table located in C:\AGISW\TUTORIAL.

   The Table Link dialog box pops up. Since the table contains county demographic data, you'll link it to the BAYAREA:COUNTIES layer in the BAYAREA.AGF geo file you just created.

2. In the *Table Type* options, click on the Links to Geo option button.

   The subpanel displays the link options for the table.

3. In the *Layer* list box, choose 'BAYAREA:COUNTIES'.

4. In the *Key Column* list box, choose 'ID'.

5. Click OK.

   To merge tables, the table you're merging data *into* must be open. In order to preserve the EASTBAY.DBF file when you merge the other files into it, you'll save it as another file now, using the name you'd like for the final, merged table.

6. Choose FILE | SAVE AS to pop up the Save As dialog box.

7. Make sure the current directory is C:\AGISW\TUTORIAL.

8. In the *File to Save* list box, choose 'EASTBAY.DBF'.

9. In the *File Name* text box, type 'BAYAREA.DBF'.

10. In the *Description* text box, type 'San Francisco Bay Area Counties'.

11. Make sure the *Selected Features Only* box is unchecked.

    This ensures that the entire file will be copied and saved to the new file.

12. Place a check in the *Use New File* box.

    When you exit the dialog box, the new file will be open and ready for use.

13. Click OK.

Atlas GIS creates a table (BAYAREA.DBF) with attribute data for the counties in the eastern part of the San Francisco Bay Area, and closes the table EASTBAY.DBF. (The new table is linked to the BAYAREA: COUNTIES layer.) Now you'll merge the other tables into this new table.

14. Choose FILE | MERGE to pop up the Merge dialog box.

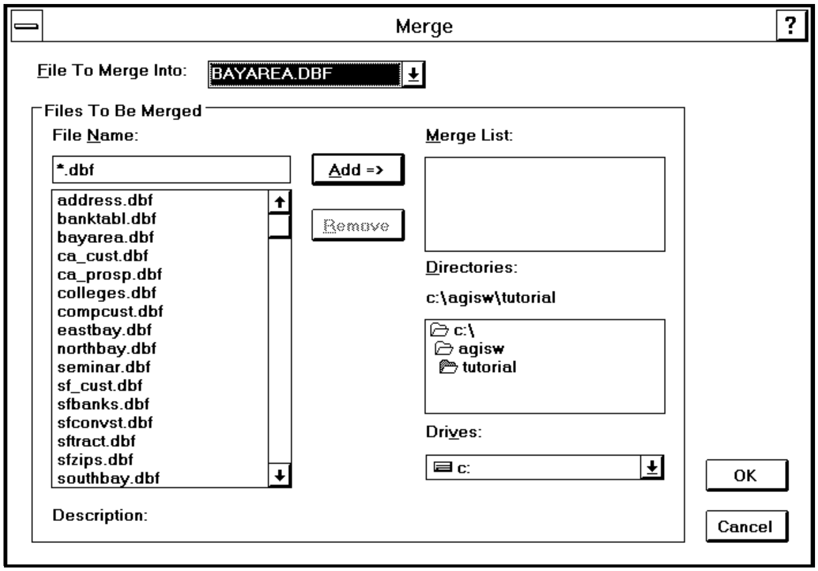


Figure 14.6 **Merge dialog box**

15. In the *File To Merge Into* list box, choose the 'BAYAREA.DBF' table.

16. In the Files To Be Merged group box, make sure the current directory is C:\AGISW\TUTORIAL.

17. In the *File Name* list box, choose 'NORTHBAY.DBF'.

18. Click on the Add button to add the NORTHBAY.DBF table to the *Merge List* box.

19. In the *File Name* list box, choose 'SOUTHBAY.DBF', then click on the Add button to add the SOUTHBAY.DBF table to the Merge List box.

All of the rows from both of these tables will be added to the BAYAREA.DBF table.

20. Click OK.

    The Merge Tables dialog box pops up.

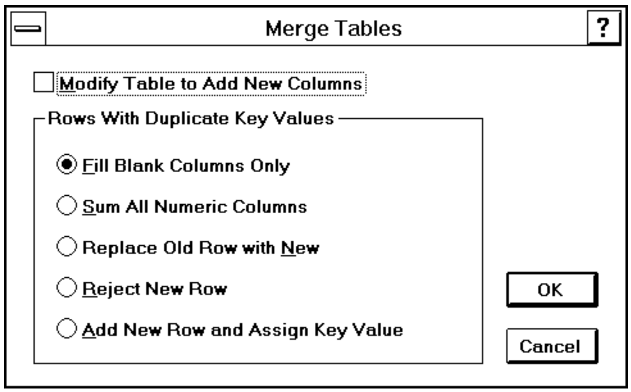


Figure 14.7 **Merge Tables dialog box**

21. From the Rows With Duplicate Key Values group box, click on the Add New Row and Assign Key Value option button.

    In the case of a duplicate key value, this option adds the new row to the table you're merging the row *into*, and assigns it a unique key value. There shouldn't be any duplicates, but this option prevents you from deleting any rows that unexpectedly have the same key value.

22. Click OK to merge the NORTHBAY.DBF and SOUTHBAY.DBF tables into the BAYAREA.DBF table.

The data from the merging tables is copied into the BAYAREA.DBF table, and the NORTHBAY.DBF and SOUTHBAY.DBF tables remain intact. To view the data, you can open a new Table window and view the BAYAREA:COUNTIES layer.

To view the merged data:

1. Choose WINDOW | NEW TABLE WINDOW (or click on the Table button on the button bar).

   The Window Layer dialog box pops up.

2. In the *Layer* list, choose 'BAYAREA:COUNTIES'.

3. Click OK.

   A Table window opens, displaying the geographic and attribute data for the layer.

For more information on how to view and edit a table, refer to Lesson 10, "Working With Tables."

Note: When merging only one table into another, Atlas GIS adds columns not found into the target table. So if the table that the information is being imported *from* contains a column that's not in the table it's merging into, Atlas GIS adds that column to the target table. This allows you to merge two tables with the same row but different columns. When you're merging multiple tables, however, Atlas GIS doesn't provide this option; any extra columns are ignored.

End of Lesson

Before proceeding, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

15

Importing Data

You can purchase data already formatted for Atlas GIS or you can import your own data, using FILE | OPEN. Atlas GIS for Windows allows you to import a variety of spreadsheet, database, and text file formats for use as tables. (Atlas GIS imports Microsoft® Excel™ or Lotus 1-2-3™ spreadsheet files, and comma- or tab-delimited ASCII text files. Atlas GIS also opens dBASE-compatible database files directly as tables, without importing.) You can link the new table to a geo file layer, import it unlinked, or use it as a point table if it contains coordinates. For example, you might import spreadsheet data and link it to a geo file layer for use as an attribute table. Or you might open a database file, geocode it, and then use it as a point table.

In this lesson, you'll open a database file and import a spreadsheet file. For additional information on importing files, refer to FILE | OPEN in the *Reference Manual* or to the on-line help.

Opening a Database File

Atlas GIS allows you to open dBASE-compatible files (with the extension .DBF) directly for use as tables, without importing. (If you have a database that uses non-dBASE compatible files, it can probably create dBASE files as well, which you can open in Atlas GIS.) When you open a dBASE file, Atlas GIS uses the actual file, rather than creating a copy to import.

For this exercise, you'll open a database file in dBASE format. The file doesn't yet contain point coordinates (since it hasn't been geocoded), so you'll open the table unlinked.

To open a database file:

1. Open the CA_SALES.PRJ file in the C:\AGISW\TUTORIAL directory.

   This project file opens the CALIFORN.AGF geo file.

2. Choose FILE | OPEN (or click on the Open button) to pop up the Open dialog box.

3. In the *List Files of Type* box, choose 'Table (*.dbf)'.

   The file list should now display all files with the extension .DBF in the current directory.

4. Make sure the current directory is C:\AGISW\TUTORIAL.

5. In the *File Name* list box, choose 'CA_CUST.DBF'.

6. Click OK.

   The Table Link dialog box pops up.

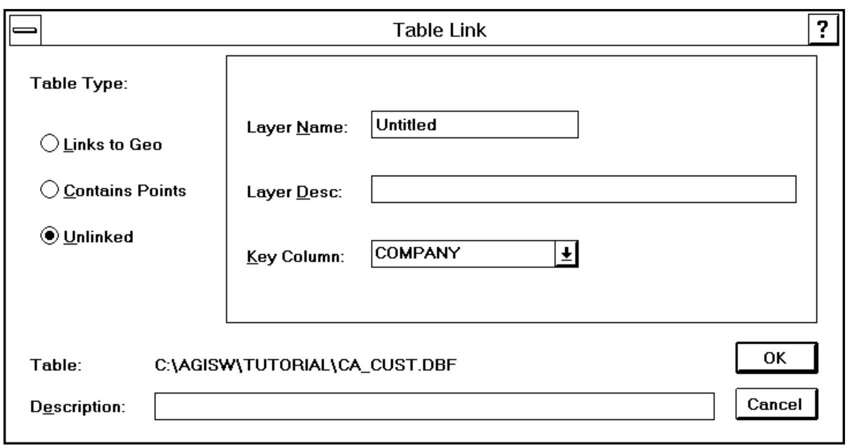


Figure 15.1 **Table Link dialog box**

Atlas GIS uses .COL files to store table settings. Since this is the first time this database file has been used in Atlas GIS as a table, there is no .COL file for the table. The information you enter in the Table Link dialog box will be used to create a .COL file, allowing Atlas GIS to use the database file as a table.

7. In the Table Link dialog box, click on the Unlinked option button.

   This option button should already be chosen by default.

   Typically when you're opening a database file—particularly a customer list—for use in Atlas GIS, you'll geocode it so you can display the locations on the map. To do this, you'll open the table as containing points. If the table does not contain longitude and latitude columns, Atlas GIS asks whether you want to add them to the table. Once the columns are created, you can fill in the longitude and latitude coordinates for the locations using the TABLE | GEOCODE BY ADDRESS or TABLE GEOCODE BY ZIP\POSTAL CODE command. The table then becomes a point table, and displays as its own layer.

8. In the *Layer Name* text box, highlight the existing text and type 'PROSPECTS'.

   Unlinked tables (like point tables) are treated as separate layers. This assigns a name to the layer.

9. In the *Layer Desc* text box, type 'California Customer Prospects'.

   The text you type here describes the table, which is now considered a layer.

10. In the *Key Column* list box, choose 'COMPANY'.

    This specifies the key column for the table so that each row can be uniquely identified.

11. In the *Description* text box, type 'Customer Database Table'.

    The text you type here is the file name description.

12. Click OK.

    Atlas GIS opens the table (using the original database file). Your edits will be made in the original .DBF file, and the table settings will be stored in the new .COL file.

If you want to view the new table, open a new Table window. For more information on viewing and editing tables, refer to Lesson 10, "Working With Tables," and to *Atlas GIS Help*.

If you wanted to display the customer locations on the map, you could add LAT and LON columns to the table and then geocode the table. This process is described in Lesson 18, "Displaying Your Customer Database on a Map."

Importing a Spreadsheet

Atlas GIS allows you to import data from spreadsheet applications for use as tables. You can import an entire spreadsheet or specify a range of cells. When you import data from a spreadsheet, Atlas GIS copies the data and creates a new table with the extension .DBF, leaving your original file intact.

For this exercise, you'll import a spreadsheet in Microsoft Excel format and link it to a geo layer in the CALIFORN.AGF geo file.

To import a spreadsheet:

1. Choose FILE | OPEN (or click on the Open button) to pop up the Open dialog box.

2. In the *List Files of Type* list, choose 'Excel (*.xls)'.

   The file list displays all files with the extension .XLS in the current directory. Spreadsheet files can be imported if they're in Microsoft Excel or Lotus 1-2-3 format. When you save the file in your spreadsheet application, save the file in one of these formats with the proper extension. (If you're using an application other than Excel or Lotus, it's best to save the file in .DBF format to open it as a table in Atlas GIS.)

3. Make sure the current directory is C:\AGISW\TUTORIAL.

4. In the *File Name* list box, choose 'CA_SALES.XLS'.

5. Click OK.

   Since this is the first time this table has been used in Atlas GIS, the Table Import dialog box pops up.

Figure 15.2 **Table Import dialog box**

In the *Table to Create* text box, Atlas GIS automatically inserts your spreadsheet file name with the extension .DBF. When you import data from a spreadsheet, Atlas GIS copies the data and creates a new table with the extension .DBF, leaving your original file intact.

6. In the *Description* text box, type 'Sales Territory Info'.

   This describes the new table file.

7. Click OK.

   A message displays while Atlas GIS starts the import process, making a first pass through the file; this can take a while. When the first pass is finished, the Spreadsheet Options dialog box pops up.

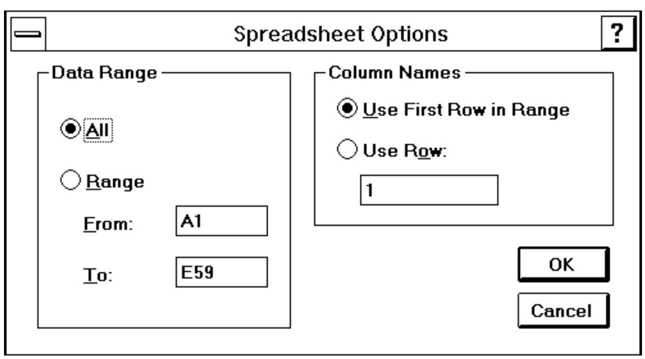


Figure 15.3 **Spreadsheet Options dialog box**

8. In the Data Range group box, click on the All option button to import the entire spreadsheet.

9. In the Column Names group box, click on the Use First Row in Range option button.

   The first row in the range of rows being imported (in this case, the first row in the spreadsheet) will be used for the column names in the table.

10. Click OK.

    A message displays while Atlas GIS imports the file; this pass is slower than the first. When Atlas GIS finishes this process, the new .DBF file is ready to be opened for use. You just need to specify the table's link options before Atlas GIS can open the file. The Table Link dialog box pops up so you can specify the table link options.

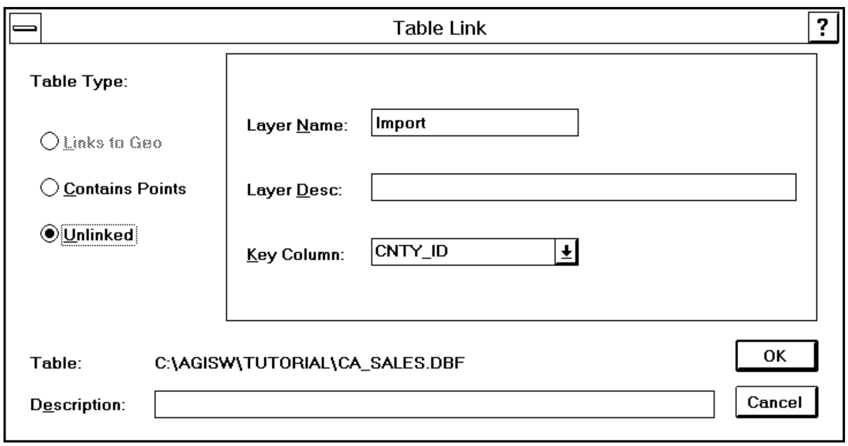


Figure 15.4 **Table Link dialog box**

Atlas GIS uses .COL files to store table settings. Since this is the first time this table has been used in Atlas GIS for Windows, there is no .COL file for the table. The information you enter in the Table Link dialog box will be used to create the file.

11. In the *Table Type* options, click on the Links to Geo option button.

    This lets you link the table to a layer in the open geo file. Notice that the subpanel at the right changes to display the link options.

12. In the *Layer* list box, choose 'CALIFORN:COUNTIES'.

The table will be linked to the CALIFORN:COUNTIES layer in the geo file.

13. In the *Key Column* list box, choose ‘CNTY_ID’.

    Atlas GIS matches the *key column* you choose in the table to the _ID column in the geo file. When an entry in the key column of the table matches the _ID entry for a row in the geo file, the two rows are linked.

14. Click OK.

    The table settings for IMPORT.DBF are stored in the new .COL file, and an index file on the key column is also created for the table. If you want to view the table, you can open a new Table window and select the layer it’s linked to in the geo file.

For additional information on importing files, refer to the on-line help and the *Reference Manual*.

End of Lesson

Don’t save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose ‘No’ if prompted to save changes) to close the open files and reset the Page window for the next lesson.

16

Matching Locations to the Map

When you have data in a table that you want to display as points on a map, Atlas GIS can assign them longitude-latitude coordinates. This process is called *geocoding*. Atlas GIS provides three methods of geocoding:

- *Geocoding by ZIP* assigns a longitude-latitude coordinate that corresponds to the centroid (center) of a ZIP code region. (These centroids are assigned from a centroid database provided with the Atlas GIS software.) This can be very useful for maps covering a large area, such as an entire state or country.
- *Geocoding by address* assigns a longitude-latitude coordinate that matches the location of a street address. Additionally, this method includes a standardization function that verifies and updates the addresses in your table. Geocoding by address is best suited for maps covering smaller areas, such as cities or ZIP code boundaries.
- *Geocoding by map layer* assigns longitude-latitude coordinates that correspond to the centroids of features in a map layer or rows in another point table. The features may be either points, lines, or regions, allowing you greater flexibility in geocoding.

In this lesson, you'll practice using the first two methods.

In the first exercise, you'll use the TABLE | GEOCODE BY ZIP command to geocode a customer prospect list that's been opened as a table, in order to display the prospect locations on a map. The coordinates that will be added to the table will correspond to the centroids of ZIP codes.

In the second exercise, you'll use the TABLE | GEOCODE BY ADDRESS command to geocode a table containing addresses for several restaurants in Mountain View, California. The coordinates that will be added to the table will correspond to the actual street addresses of the restaurants, allowing you to display their exact locations on a map. (For more information on how Atlas GIS performs geocoding, see the on-line help, or refer to TABLE | GEOCODE BY ADDRESS, TABLE | GEOCODE BY ZIP , and TABLE | GEOCODE BY MAP LAYER in the *Reference Manual*.

Note: Make sure that the drive and directory where the geocoding files are located are specified in FILE | PREFERENCES in the Geocode Data Path. For more information about the geocode data path, see FILE | PREFERENCES in the *Reference Manual*.

Geocoding by ZIP

In this exercise, you'll use the TABLE | GEOCODE BY ZIP command to geocode a customer prospect list that's been opened as a table, in order to match the prospect locations to the map. You'll need to open the table and add columns for the longitude and latitude coordinates before you can geocode the table.

To open the file as a table:

1. Open the CA_SALES.PRJ project file in the C:\AGISW\TUTORIAL directory.

2. Open the CA_PROSP.DBF table in the C:\AGISW\TUTORIAL directory.

   The Table Link dialog box pops up. Since the table doesn't have longitude and latitude columns, you could open the table as unlinked and create the columns using TABLE | DEFINE COLUMNS; however, in this exercise you'll specify that the table contains points and let Atlas GIS create the longitude and latitude columns automatically.

3. Click on the Contains Points option button.

   The subpanel displays the options for opening a point table.

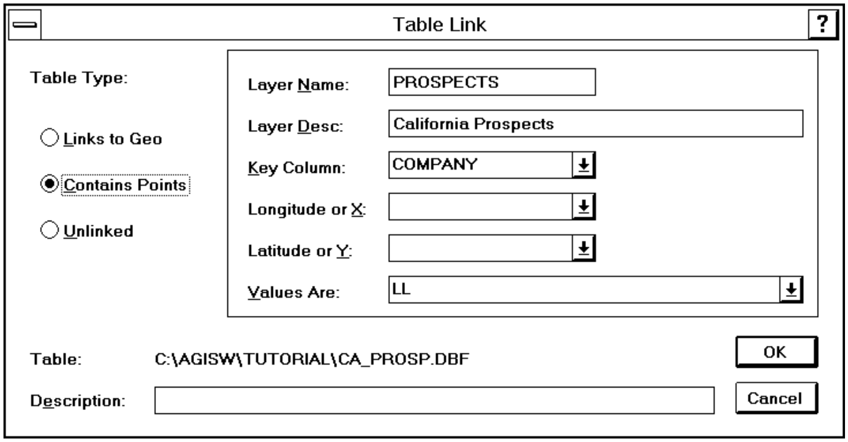


Figure 16.1 **Table Link dialog box**

4. In the *Layer Name* text box, type 'PROSPECTS'.

   This assigns a name to the layer. (Point tables are treated as separate layers.)

5. In the *Layer Desc* text box, type 'California Prospects'.

6. In the *Key Column* list box, choose 'COMPANY'.

   This specifies the key column for the table so that each row can be uniquely identified.

7. Leave the *Longitude or X* and *Latitude or Y* columns unspecified.

   There are no longitude and latitude columns in the table yet; by not specifying any columns in these list boxes, Atlas GIS will create them automatically.

8. Click OK.

   A message pops up informing you that the table does not contain longitude and latitude columns, and asks whether you want to add them.

9. Click on the Yes button to add the columns.

The coordinate columns LON and LAT are inserted as the far right columns of the table. You may view the columns in a Table window.

10. Choose WINDOW | NEW TABLE WINDOW and display the CA_PROSP:PROSPECTS layer in the window.

    Notice that the new LON and LAT columns are empty; they don't yet contain the longitude and latitude coordinates. Next, you'll geocode the rows in the table so that you may display the prospect locations as points on the map.

To geocode the table:

1. Choose TABLE | GEOCODE BY ZIP to pop up the Geocode By ZIP dialog box.

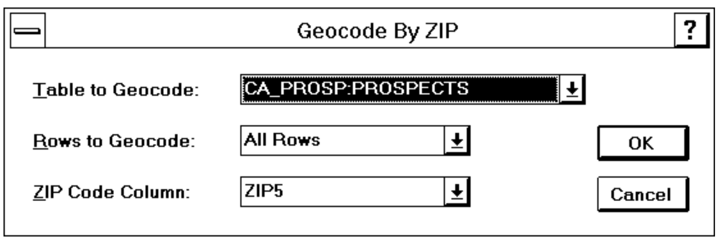


Figure 16.2 **Geocode By ZIP dialog box**

2. In the *Table to Geocode* list box, choose 'CA_PROSP:PROSPECTS'.

3. In the *Rows to Geocode* options, choose 'All Rows'.

   You want to match all rows, since this table has never been geocoded.

4. In the *ZIP Code Column* list box, choose 'ZIP5'.

   Atlas GIS will use the entries in the ZIP5 column to match the rows in the point table to the rows in the centroid database. The centroid database, provided with the Atlas GIS software, contains the longitude and latitude coordinates of all U.S. 5-digit ZIP code centroids (geographic centers). Atlas GIS automatically matches the specified column in the point table (i.e., ZIP5) to the ZIP column in the centroid database, then assigns the coordinates from the centroid database to the matching rows in the point table. The longitude coordinates will be assigned to the LON column, and the latitude coordinates will be assigned to the LAT column.

5. Click OK to begin the geocoding process.

   Atlas GIS assigns the ZIP code centroids to the specified table rows. (This can take a while.)

   When the process is complete, you can scroll through the table to see the new coordinates.

6. Click on the Redraw button or choose VIEW | REDRAW to display all the matched points on the map.

If the Table window obscures the map, you can close the Table window or just move it out of the way. If you want to change the symbol style and size, right-click on the map (to pop up the Layers & Themes dialog box) and choose the style options for the layer.

Before going on to the next exercise, you should close the project file.

To close the project file:

1. Choose FILE | CLOSE to pop up the Close dialog box.

2. In the *Files to Close* list box, choose CA_SALES.PRJ and click OK.

3. When prompted, click on No to lose changes to the file.

Now that you know how to geocode by ZIP, you are ready to learn how to geocode by address.

Geocoding by Address

Like geocoding by ZIP, geocoding by address assigns longitude and latitude coordinates to the rows in a table. Because this process uses street addresses (rather than ZIP code centroids) to determine the coordinates, it is very useful when you need to display the exact location of a feature on a map. For example, a police department can geocode a database of addresses where recent crimes have occurred, then display the exact crime locations on a map. Similarly, a company can create points from an existing list of customers to monitor customer distribution in a given area.

In this lesson, you'll use the TABLE | GEOCODE BY ADDRESS command to perform a short but typical address-matching session. You'll geocode a table containing addresses for several restaurants in Mountain View, California. You'll first process the entire table all at once, then you'll process any unmatched rows one at a time.

Setup

Before you can geocode a table, you need to make sure that the table contains at least two columns for the information that will be added during geocoding. Specifically, there must be a longitude column and a latitude column, and additional columns for any other results you may want added during geocoding, such as match codes, census codes, or standardize codes. You can create these columns using the TABLE | DEFINE COLUMNS command prior to geocoding; however, for this exercise, we have created the following columns for you: LON, LAT, MATCHCODE, TRACT, and STNDR.

To open the table for geocoding:

1. Open the MTNVIEW.PRJ project file located in C:\AGISW\TUTORIAL.

   Since you'll be making permanent changes to the MVDINER.DBF file when you geocode it, you need to save the file under another name to preserve the original data.

2. Choose FILE | SAVE AS to pop up the Save As dialog box.

3. Make sure the current directory is C:\AGISW\TUTORIAL.

4. In the *File to Save* list box, choose 'MVDINER.DBF'.

5. In the *File Name* text box, type 'DINERS.DBF'.

6. In the *Description* text box, type 'Mountain View Diners'.

7. Make sure the *Use New File* box is checked.

8. Click OK.

   Atlas GIS creates a new table (called DINERS.DBF) with data for the restaurants in the Mountain View area, and closes the MVDINERS.DBF file.

9. Choose TABLE | GEOCODE BY ADDRESS.

   The Geocode By Address dialog box pops up.

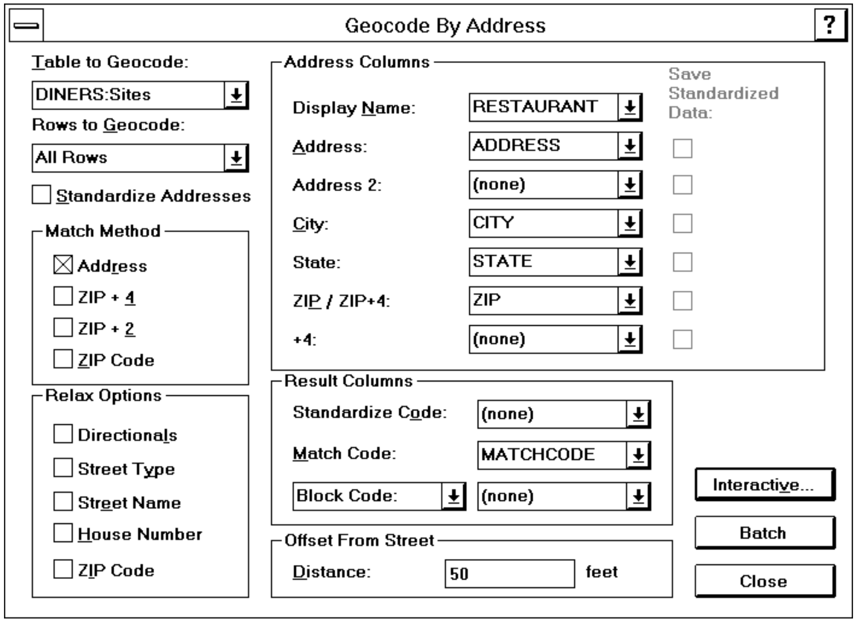


Figure 16.3 **Geocode By Address dialog box**

10. In the *Table to Geocode* list box, choose DINERS:SITES.

11. In the *Rows to Geocode* list box, choose ‘All Rows’.

    You want to match all rows, since this table has never been geocoded.

12. Leave *Standardize Addresses* unchecked.

    When you place a check in the *Standardize Addresses* box to turn on this feature, Atlas GIS compares the addresses in your table with a postal database. If there were a partially incorrect address in your table, Atlas GIS would correct the address. For the tutorial, however, leave the box unchecked.

13. In the Address Columns group box, set the list box options according to the following table.

OPTION	**SETTING**
Display Name	RESTAURANT
Address	ADDRESS
Address 2	<None>
City	CITY
State	STATE
ZIP/ZIP+4	ZIP
+4	<None>

Note: You don't have to specify the names of the longitude and latitude columns; Atlas GIS automatically places the coordinates in the LON and LAT columns, respectively.

14. Notice that the *Save Standardized Data* check boxes are dimmed. If Standardize Addresses were turned on, these boxes would let you indicate which columns you want overwritten with the correct data.

15. In the Match Method group box, place a check in the *Address* box and make sure the other options in the group box are unchecked.

    This tells Atlas GIS to assign coordinates based on the address only. If you were to check any of the other options, such as ZIP+4, in addition to Address, coordinates would be assigned for the next option you checked (ZIP+4) if the address could not be found.

16. In the Relax Options group box, make sure all of the options are unchecked.

    With all of the Relax Options off, Atlas GIS will match exact addresses only. During the first attempt, you want to find an exact match for as many addresses as possible. In the second attempt, you will relax some of the options in order to help match the rows that weren't matched during the first pass.

17. In the Result Columns group box, choose 'MATCHCODE' in the *Match Code* list box.

A match code is a code that is automatically entered into a specified column every time Atlas GIS tries to match an address. This code indicates how a row was matched (exact match, street type incorrect but all else correct, etc.) or why it was not matched. You'll use these match codes later in the lesson to help troubleshoot matching problems.

For the tutorial, we will not choose columns for the standardize code or census code. (Standardize codes are generated only when you turn on Standardize Addresses.) For information on these codes, see the on-line help.

18. In the Offset From Street group box, type '50' in the *Distance* text box.

    This number determines how far from the street each address location will be displayed. In this case, the points will display 50 feet back from the street.

Now you need to decide whether Atlas GIS should geocode the entire table in one pass, or process it interactively (i.e., stop at each unmatched address for you to match manually). Typically, a combination of these methods is useful for geocoding a table. For example, on your first pass, geocode the entire table to find as many exact matches as possible. Then on subsequent passes, use the relax options and the match codes that are returned for each row to match the addresses that weren't matched in the first pass.

To geocode the entire table:

1. Click on the Batch button to process the table all at once.

   The Geocode By Address Progress dialog box appears and displays a progress bar to indicate what percentage of the rows have been processed. This dialog box also displays the match type, count, match rate, and the number of matched and unmatched records.

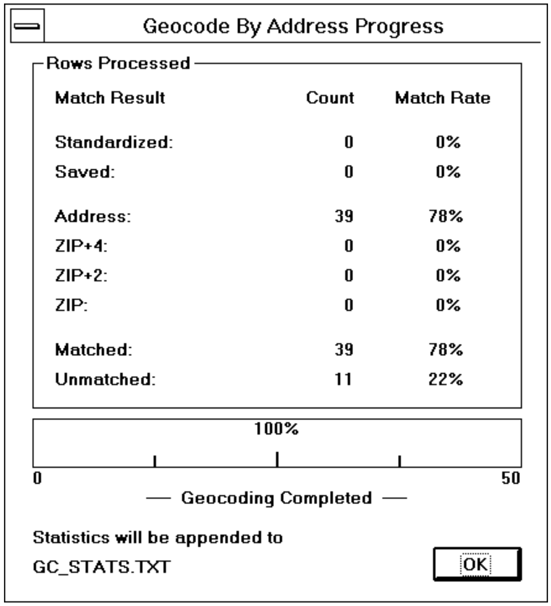


Figure 16.4 **Geocode By Address Progress dialog box**

2. When ‘Geocoding Completed’ displays at the bottom of the box, notice that 11 records were unmatched.

3. Click OK to close the Geocode By Address Progress dialog box.

Viewing the Results

After you’ve completed the first attempt at matching addresses, you can display the matched locations on the map. You can also look at the changes to the point table. In rows that were matched, the longitude and latitude coordinates of the address location are inserted in the LON and LAT columns, respectively. The TRACT and STNDR columns remain blank, because we did not assign the census or standardize codes to them in this exercise. A match code is assigned to the MATCHCODE column in every row; when a row was unmatched, the first character in the MATCHCODE column is ‘0’.

To view the results:

1. Click on the Close button in the Geocode By Address dialog box.

The map view is redrawn to display the successfully matched addresses.

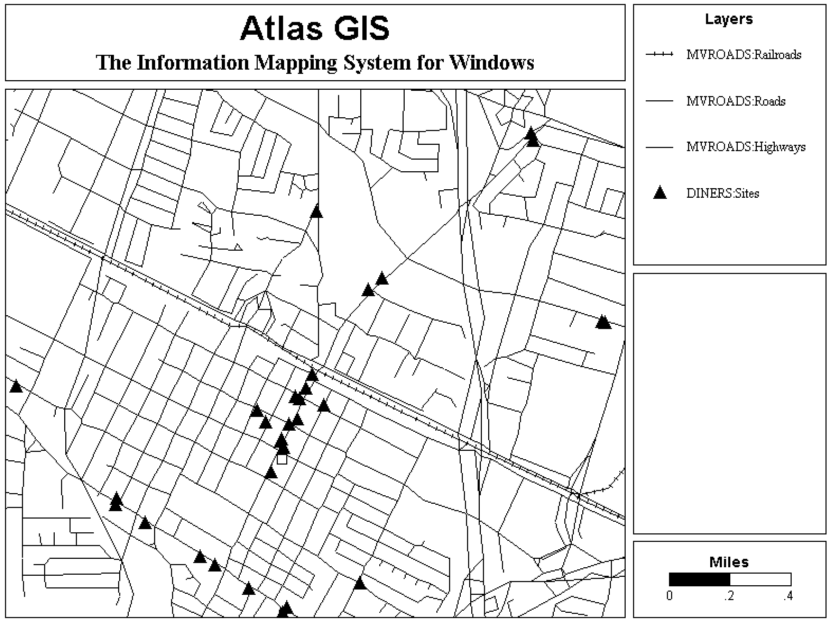


Figure 16.5 **DINERS map after initial pass**

2. Click on the Table button to pop up the Window Layer dialog box, or choose WINDOW | NEW TABLE WINDOW.

3. In the *Layer* list box, choose DINERS:SITES and click OK.

   A Table window pops up with the DINERS:SITES point table displayed. Use the horizontal and vertical scroll bars to view the information entered during geocoding.

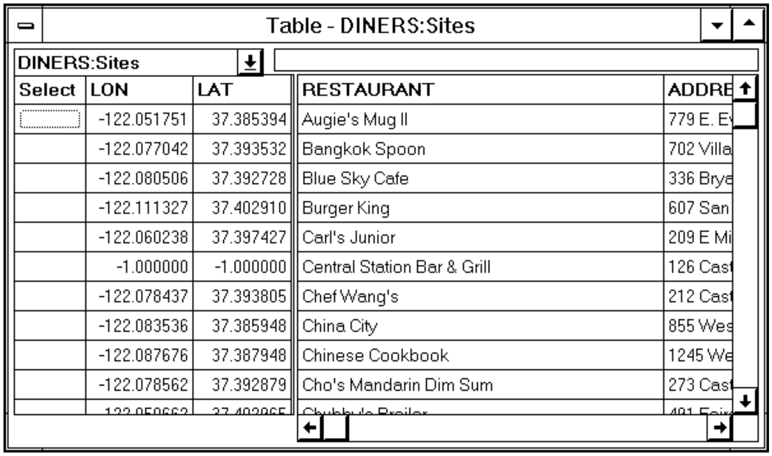


Figure 16.6 **DINERS table after initial pass**

As you scroll down through the table, notice that all matched rows have a match code ‘6’ in the MATCHCODE column, and all unmatched rows have a ‘0’. The match codes that appear in this lesson have the following meanings:

MATCH CODE	**DESCRIPTION**
0	No match or unresolved multiple match
4	Relaxed street match or user-resolved multiple match
6	Exact match

For the match codes numbers above (0 only if it’s an unresolved multiple match), the number is followed by the string ‘NHTDS’, where the letters have the following meanings:

MATCH CODE	**DESCRIPTION**
N	Street name
H	House number
T	Street type (avenue, street, drive, etc.)
D	Directional prefix or suffix
S	Street side

If one of letters is upper-case, that part of the address was found. If one of the letters is lower-case, that part of the address was not found. For example, 'NHtDS' would indicate that all parts of the address but the street type were found. The '1' that appears after these characters indicates that the address came from a custom geocoding database.

Finally, if the match code ends in an 'M', the address has more than one possible match (multiple matches). For a complete list of match codes, see "Match Codes" in the on-line help.

Relaxing Address Components

After running the first pass of geocoding with an exact match required for all address components, you may find it necessary to *relax* one or more of the components and try geocoding again. When you relax a component, Atlas GIS looks for alternatives when (and only when) an exact match cannot be found. For example, if Atlas GIS cannot find an exact match for the street name, and the street name component is relaxed, it looks for a close name with a correct number. A close name is a name that sounds similar, such as *Main* and *Maine*. For more information on how address components are affected when relaxed, see "Relax Options" in the on-line help.

To relax an address component:

1. Choose TABLE | GEOCODE BY ADDRESS to pop up the Geocode By Address dialog box.

2. In the *Rows to Geocode* list box, choose 'Unmatched Rows Only'.

3. In the Relax Options group box, place a check in the *Directionals*, *Street Type*, and *Street Name* boxes.

   Normally, it's a good strategy to work with only one option at a time. For example, you could relax the directionals and do a batch run, then relax the street type and do a batch run, and so forth. To make the exercise shorter, however, you'll relax all three at once.

4. Click on the Batch button.

   The Geocode By Address Progress dialog box pops up and displays the geocoding progress.

During this second pass, Atlas GIS tries again to match any row that is currently unmatched (that is, any row with LON and LAT columns that are blank or have 0 or -1). With the directional, street type, and street name components relaxed, Atlas GIS looks for a street segment where the street number is an exact match, and the rest are close matches. When there is more than one possible match for a row, you will view the possible matches and select the correct address when you use the Interactive feature in the next exercise.

5. When the Geocode By Address Progress dialog box displays 'Geocoding Completed', click OK.

Retrying Individual Matches

Although relaxing address components helps match some of the addresses, it may also lead to either multiple matches or incorrect matches. Therefore, you may find it necessary in some cases to edit the unmatched rows manually.

In the previous steps, you performed a batch matching with several address components relaxed. While many addresses were matched, you still have three that are unmatched. You will now use the Interactive feature to geocode these addresses.

To geocode one address at a time:

1. In the Geocode By Address dialog box, click on the Interactive button.

   Atlas GIS processes for a few seconds, then pops up the Geocode Multiple Match dialog box.

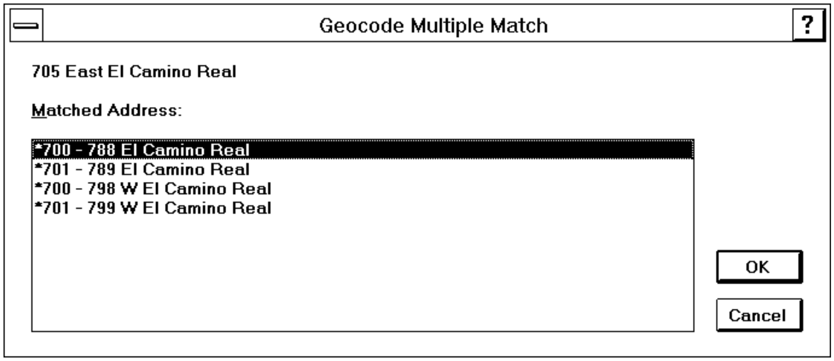


Figure 16.7 **Geocode Multiple Match dialog box**

This dialog box appears when there is more than one possible match. The unmatched address, ‘705 East El Camino Real’, appears in the upper-left corner of the dialog box. The *Matched Address* list box below displays the possible matches.

Let’s assume that the correct address is ‘705 El Camino Real’. Notice that there are two possible matches for El Camino Real: one beginning with 700, and one beginning with 701. The reason there are two within the same range is that one contains the even-numbered addresses, whereas the other contains the odd numbers. This is an important distinction, because the choice you make here will determine the side of the street on which the point appears.

2. In the *Matched Address* list box, choose ‘701-789 El Camino Real’ and click OK.

   The Geocode Multiple Match dialog box closes, and the Geocode By Address Interactive dialog box pops up, displaying the row you just matched.

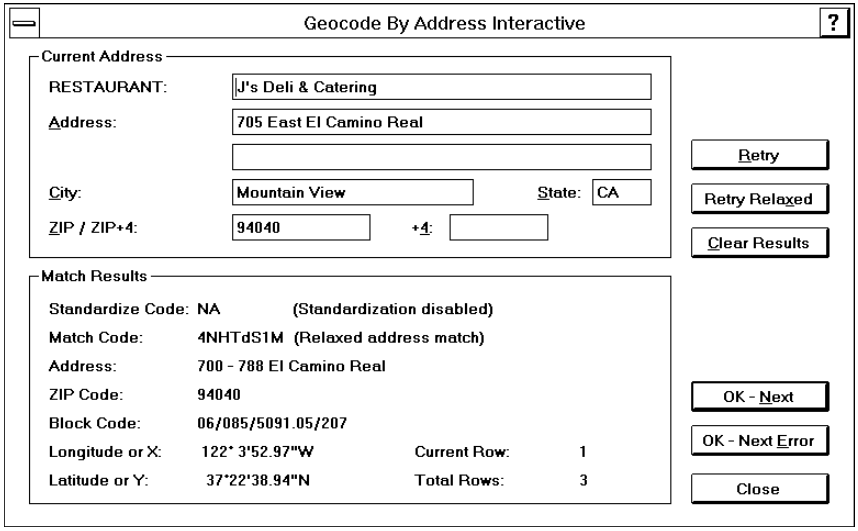


Figure 16.8 **Geocode By Address Interactive dialog box**

3. Click OK—Next Error.

   Atlas GIS processes briefly, then takes you back to the Geocode By Address Interactive dialog box and displays the next unmatched address. The Geocode Multiple Match dialog box appears only if there is more than one possible match; in this case, it found no matches at all, so you went directly to the Geocode By Address Interactive dialog box.

   Notice that the address is ‘100 City Hall’. City Hall is not a street but the name of a common building. The geocoding database does not recognize common buildings; it requires a street address. In this case, City Hall is on Castro Street. (To teach Atlas GIS to recognize certain addresses like City Hall, see “Translation Files” under TABLE | GEOCODE BY ADDRESS in the *Reference Manual*.)

4. In the Current Address group box, highlight ‘City Hall’ in the *Address* text box and type ‘Castro Street’.

   Notice that when you highlight text on the screen, the text you type overwrites it.

5. Click on the Retry button.

In the Match Results group box, notice that ‘Exact address match’ now displays in the parentheses next to the match code.

Note: Retry uses the same relax options you specified in the Geocode By Address dialog box, whereas Retry Relaxed would relax all of the address components.

6. Click OK—Next Error.

   The Geocode By Address Progress dialog box displays, then the Geocode Multiple Match dialog box pops up, displaying the possible matches for the address ‘103 Dana’.

   Let’s assume the correct street directional is *East* Dana. As before, you are given two options for a similar range of addresses; in this case, you want the one containing odd-numbered addresses.

7. Highlight ‘101-131 E Dana’ and click OK.

   That was the last unmatched row. You are now back at the Geocode By Address Progress dialog box, where it displays ‘Geocoding Completed’.

8. Click OK.

   Atlas GIS closes both the Geocode By Address Progress dialog box and the Geocode By Address Interactive dialog box, then takes you back to the Geocode By Address dialog box.

9. Click on the Close button.

Congratulations! You’ve finished your first geocoding session. The Table window is still open, and the map in the background redraws to display the points. Since the table is now a point table, you may use it to display, query, perform analytical operations, and create theme maps of the addresses just as you would with other map features. You can also manipulate the way in which the points are displayed, just as you can with any other layer in a map.

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes) to close the open files and reset the Page window for the next lesson.

17

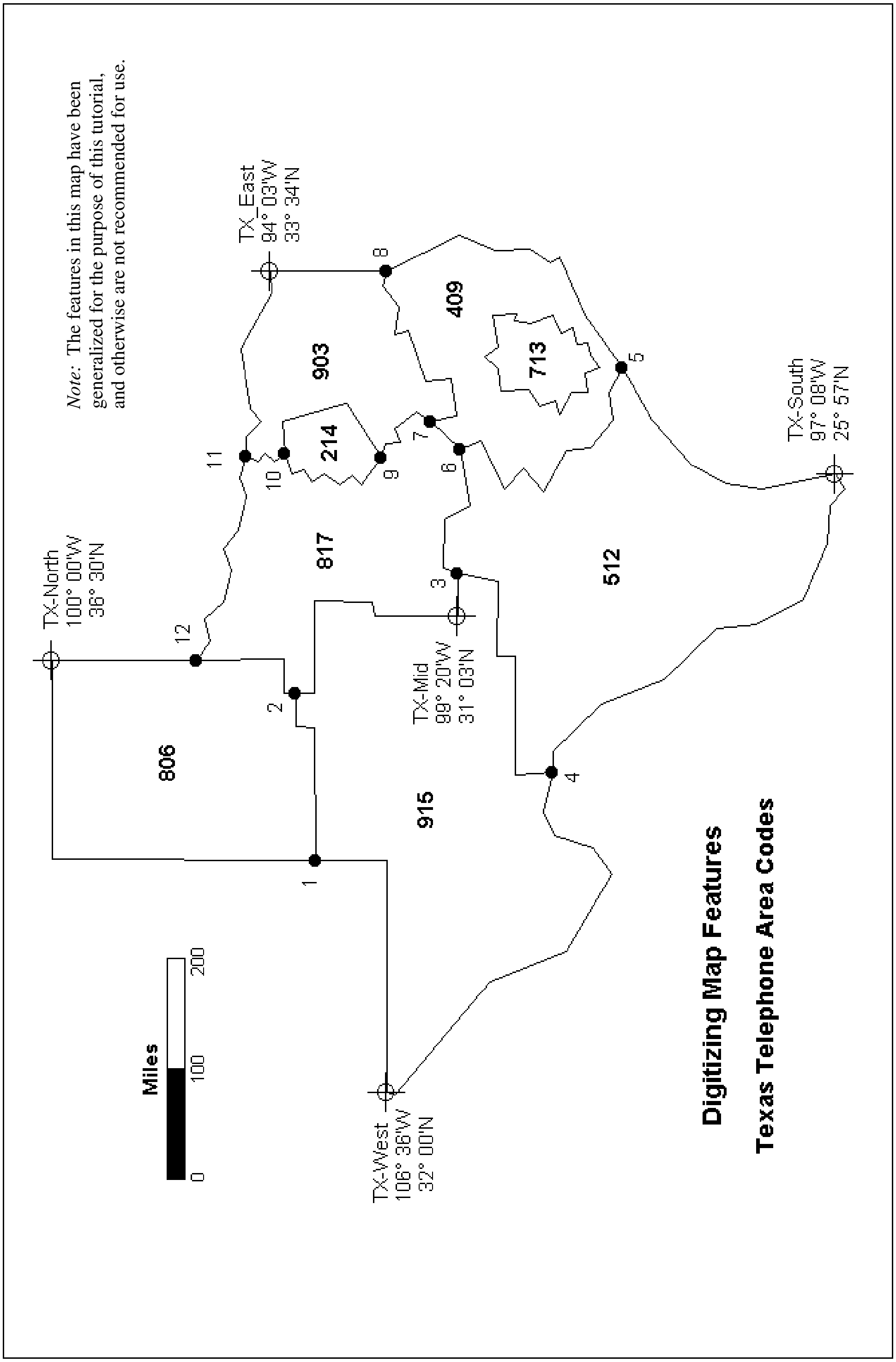
Digitizing a Map

With Atlas GIS and a digitizing tablet, you can digitize any paper map. Using this capability, you can create your own geo files for any area you need to map. In this lesson, you'll use a sample paper map to create a geo file of Texas area codes. This map—located on the following page—includes five control points and eight area code regions, and should fit easily on any digitizing tablet you may have available.

This lesson takes you through specific steps for digitizing the Texas area codes; however, even if you don't follow the step-by-step exercises, you may want to read the lesson through to familiarize yourself with digitizing in Atlas GIS. For example, this lesson covers the following topics:

- Setup procedures such as preparing the map, working with a template, and creating a new geo file to establish the coordinate system.
- Defining and saving control points.
- Digitizing map features, which includes adding new features, creating features that share common borders, and creating features that are embedded in other features.

Note: It is assumed that your digitizing tablet has been configured correctly for Windows using one of the following device drivers: Windows tablet driver (Wintab) version 1.x or Virtual Tablet Interface™ (VTI) version 2.10. It is also assumed that you are using at least a four-button digitizing cursor, and the cursor is set to the default Atlas GIS digitizing cursor settings. For more information on configuring a tablet, see the instruction manual provided with your digitizing tablet. For information on obtaining Wintab or VTI device drivers, or the default Atlas GIS digitizing cursor configuration, see the "Digitizing Overview" in the *Atlas GIS Help*.



Note: The features in this map have been generalized for the purpose of this tutorial, and otherwise are not recommended for use.
TX_East
94° 03'W
33° 34'N
TX-North
100° 00'W
36° 30'N
TX-Mid
99° 20'W
31° 03'N
TX-South
97° 08'W
25° 57'N
TX-West
106° 36'W
32° 00'N
806
915
817
214
903
409
713
512
1
2
3
4
5
6
7
8
9
10
11
12
Miles
0
100
200
Digitizing Map Features
Texas Telephone Area Codes

Note: It's important that you use the correct buttons on your digitizer. Some buttons may be labeled differently, depending on the manufacturer and model. Typically, for most four-button digitizers, the buttons are labeled 1 through 4. For most 16-button digitizers, however, buttons are typically labeled 0–9 and A–F. To avoid confusion in this lesson, digitizer buttons are referenced according to their numerical order on the digitizer. Thus, the first numerical button on the digitizer (which may be labeled either 0 or 1) is referred to as Button 1 in the lesson. The second numerical button is Button 2, the third numerical button is Button 3, and so on.

Setup

Before you can define control points and begin digitizing, you need to complete the following procedures. You can complete these procedures in any order; however, for a new map, they are generally performed successively in the following order.

- Specify the units you'll use for the map and page.
- Prepare the paper map.
- Define a template area, which is a portion of your digitizing tablet that has been configured as a screen pointing area. This allows you to use the digitizing cursor in Atlas GIS similarly to the way you would use a mouse.
- Establish the coordinate system for the map by either creating a new geo file or opening an existing one.

Specifying Map and Page Units

In this lesson, you'll set the map and page units to U.S. standard measurements, and the coordinate format to degrees, minutes, and seconds.

To choose the map and page units:

1. Choose FILE | PREFERENCES to pop up the Preferences dialog box.

2. Click on the Units option button.

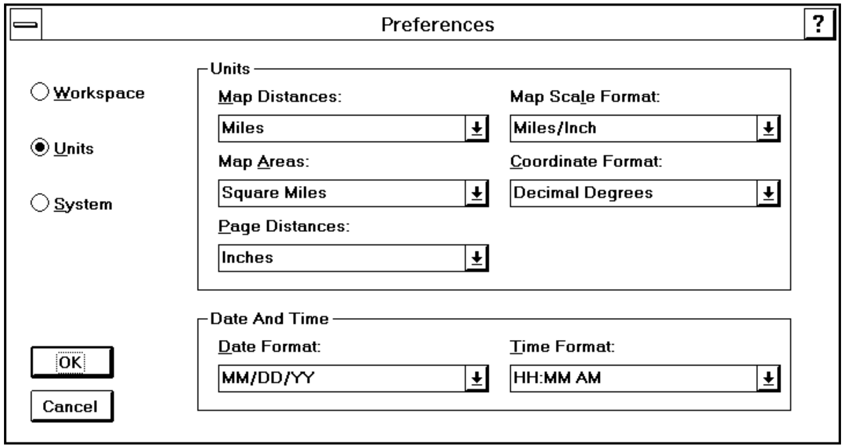


Figure 17.1 **Units options in the Preferences dialog box**

3. In the Units group box, choose 'Miles' in the *Map Distances* list box.
4. In the *Page Distances* list box, choose 'Inches'.
5. In the *Coordinate Format* list box, choose 'Deg Min Sec'.
6. Click OK.

Preparing the Paper Map

When you digitize, it is important that the paper map is secured flat on the digitizing tablet. Securing the map helps to prevent inaccuracy in digitizing. It is necessary then to make sure the map or a portion of the map fits on your digitizing tablet. If a map is too large, you can use a photocopy machine to reduce the map to a size you can work with, or you can divide it into multiple sheets and work with them individually.

Note: For the purpose of this lesson, use a photocopier to reduce the map size if needed. Be aware that photocopiers may distort the map, producing possibly larger transformation errors. For more information on digitizing multiple map sheets, see the *Atlas GIS Help*.

To prepare the paper map:

1. Make a photocopy of the Texas Telephone Area Codes map, which was provided earlier in this lesson.

2. Place the map on the digitizing tablet, making sure that the map is absolutely flat on the tablet and within the tablet's digitizing area.

3. Secure the map on the tablet.

   If the tablet does not have a device to hold the map in place, use drafting tape or some other removable tape to secure it.

Working with a Template

Atlas GIS allows you to configure a portion of your digitizing tablet as a screen pointing area (i.e., template), which allows you to use a digitizing cursor in Atlas GIS as you would use a mouse.

In some situations, you may find a template very useful; however, it is not required for digitizing. For example, in certain configurations, such as a large tablet away from your computer, the template can save you from continually reaching for the keyboard or mouse.

If the template and map happen to overlap, you can still use the template by clicking Button 3 (the third numerical button) of your digitizing cursor to turn the template area on or off as needed.

The template is set up by securing a piece of paper on your tablet and using the FILE | PREFERENCES command to digitize two points to register the template area and position. The template is typically placed on the digitizing tablet near the map and within easy reach of where you're working.

To define a template:

1. Secure a piece of paper on the digitizing tablet, making sure that it is completely flat on the tablet.

   Note: The size and position of the paper will determine the size and location of the template area. Securing the paper helps you remember the template location.

2. Choose FILE | PREFERENCES to pop up the Preferences dialog box.

3. Click on the Workspace option button.

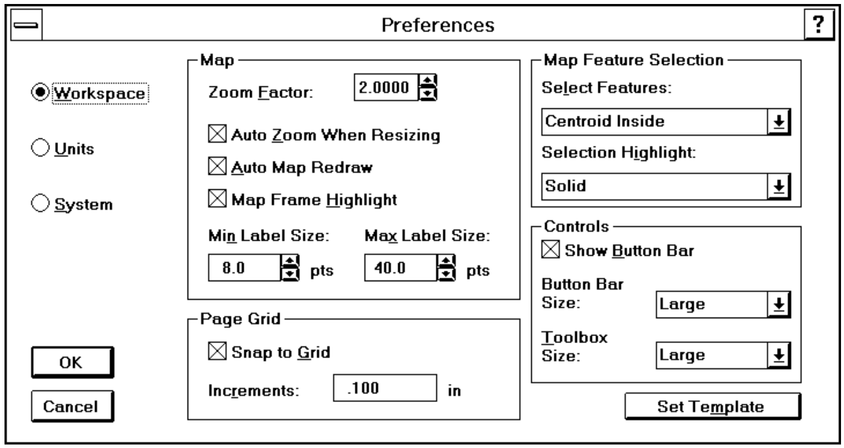


Figure 17.2 **Workspace options in the Preferences dialog box**

4. Click on the Set Template button.

   The message "Click on a corner of your template" appears.

5. Place the digitizing cursor on the upper-right corner of the template area, and click any button on your digitizing cursor to set the position.

   The message "Click on the opposite corner of your template" appears.

6. Move the digitizing cursor to the lower-left corner of the template area, and click any cursor button.

7. In the Preferences dialog box, click OK.

   The location of the template is recorded, the template is turned on automatically, and the Preferences dialog box is closed.

8. Move the digitizing cursor over the paper map and template area, noticing the change in the pointer movement on the screen.

When you move the digitizing cursor in the active template area, the pointer moves across the screen; in the area outside the template, the pointer does not move.

If the template and paper map overlap, or you do not want to use the template, you can turn the template on or off as needed.

To turn the template on or off:

1. Click Button 3 (the third numerical button) of your digitizing cursor.
2. Move the digitizing cursor over the area you had specified as the template.

   Notice that the pointer remains fixed in place as you move the digitizing cursor.
3. If desired, click Button 3 again to turn the template on.

Establishing a Coordinate System

You can establish the coordinate system for your map by opening an existing geo file, or creating a new one. In either case, the *projection* of the geo file should match the paper map; otherwise, you may be unable to digitize the map accurately. (When a paper map is created, the spherical surface of the Earth must be translated onto the flat piece of paper. This translation is called a *map projection*. Since the spherical surface of the Earth cannot be translated onto a flat surface without distorting either area, shape, distance, or direction, it's important to choose a coordinate system that uses the same projection used to create the paper map.)

Note: If you are working with a map that does not have a coordinate system or projection, you may need to pick or define a user-defined system. With a user-defined system, however, you cannot combine or overlay the geo file with any files in a different coordinate system. For more information on map projections, see Chapter 3, "Basic Mapping Concepts," in the *Reference Manual*.

The paper map of Texas was created using straight, equally spaced lines for both longitude and latitude. If you use the control points on the map with a longitude-latitude coordinate system, the control point transformation errors (and subsequent errors when digitizing other points) will be small.

In this section, you'll use the FILE | NEW | GEO command to create a new geo file with a longitude-latitude projection.

To establish the coordinate system and create a new geo file:

1. Choose FILE | NEW | GEO to pop up the New Geo File dialog box.

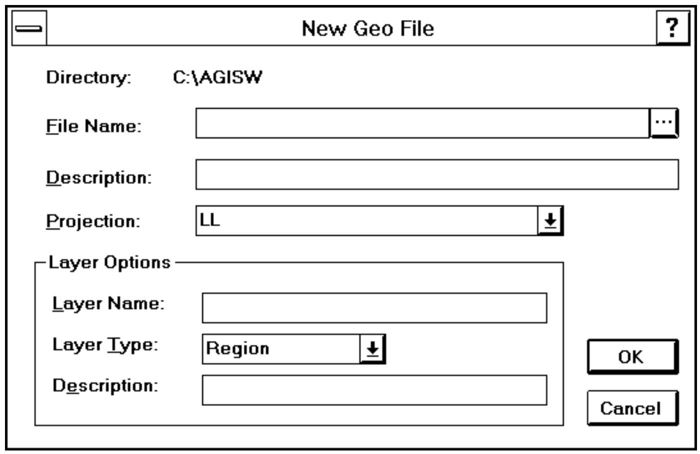


Figure 17.3 **New Geo File dialog box**

2. In the *File Name* text box, type 'TEXAS_AC'.

   Notice the directory path where the geo file will be stored is shown in the *Directory* text field. To store the new geo file in a different location, click on the File Name [...] button to pop up the New Geo File Name dialog box, and choose another drive and/or directory.

3. In the *File Description* text box, type 'Digitized Texas Map'.

4. In the *Projection* list box, choose 'LL'.

   'LL' is the setting for a Longitude-Latitude projection. If later you open another geo file or a point table, Atlas GIS will reproject its coordinates to match this projection (if they do not already match).

5. In the Layer Options group box, type 'area_codes' in the *Layer Name* text box.

6. In the *Layer Type* list box, choose ‘Region’.

7. In the *Description* text box, type ‘Texas telephone area codes’.

8. Click OK.

   The file is created and the layer name ‘area_codes’ appears on the Layer tool. Now you’re ready to set up your control points.

Working with Control Points

Control points are points on a paper map that have known coordinates. Atlas GIS uses control points to calculate a *tablet-to-map transformation*, a process that makes it possible for Atlas GIS to translate positions on the tablet to coordinates in the geo file.

Control points also allow you to restore the relationship between the geo file and the paper map on the tablet. This is useful for finishing maps that were not completely digitized in one session, or for updating existing maps.

Setting Control Points

The MAP | CONTROL POINTS command allows you to enter and edit control points. When you choose this command, you can make entries for three or more control points for a map—a minimum of four control points is recommended.

The map of Texas contains five control points, each marked on the map by a cross and circle. The corresponding name and longitude-latitude coordinates are printed near each control point. Notice that the control points are spread evenly across the map in order to achieve the most accurate representation.

To specify a control point, you enter a name and longitude-latitude (or x-y) coordinates for the point, and then digitize the point by pointing at it on the paper map and clicking Button 1 of the cursor.

To set control points:

1. Choose MAP | CONTROL POINTS to pop up the Control Points dialog box.

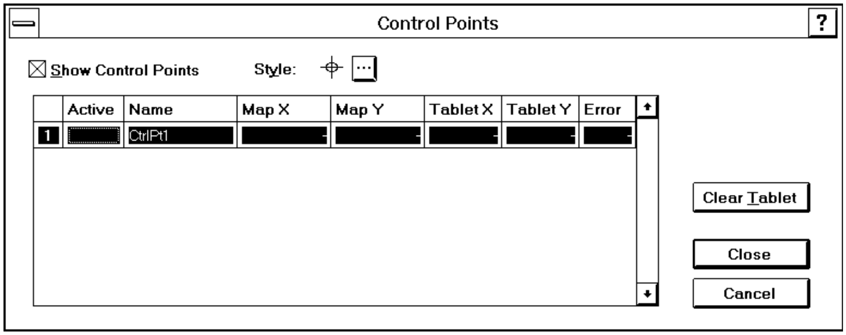


Figure 17.4 **Control Points dialog box**

2. Enter the following information for the control points:

Row	**Name**	**Map X**	**Map Y**
1	TX-West	106 36W	32N
2	TX-North	100W	36 30N
3	TX-East	94 03W	33 34N
4	TX-South	97 8W	25 57N
5	TX-Mid	99 20W	31 03N

For example, in the *Name* cell for the first control point, type 'TX-West'. In the *Map X* cell, type '106 36W'. (The 'W' indicates the longitude is west of the prime meridian.) In the *Map Y* cell, type '32N'.

You can enter longitude and latitude as either degrees, minutes, and seconds (with a space between each number, but without the degree, minute, or second symbols) or as decimal degrees. In this lesson, you'll use the degrees, minutes, and seconds format, although most of the entries use only degrees and minutes.

Now you're ready to digitize the control points. But first, we'll save the information you've entered so far.

Control points are saved in the project file when you close the Control Points dialog box and choose FILE | SAVE. Saving the settings allows you to use this information to restore the relationship between the geo file and the paper map on the tablet. This is useful for finishing maps that were not completely digitized in one session, or for updating existing maps.

To save the control points:

1. Click on the Close button.

2. Choose FILE | SAVE and save the project as TEXAS_AC.PRJ.

Now that you've entered and saved the information for the control points, you'll digitize them to correlate the tablet to the map.

To digitize the control points:

1. Choose MAP | CONTROL POINTS to pop up the Control Points dialog box.

2. Click anywhere on the first row to return focus to the first control point.

3. On the paper map, place the digitizing cursor on the control point labeled 'TX-West' and click Button 1 (the first numerical button) on your digitizing cursor.

   After you click Button 1, coordinates appear in the first control point's *Tablet X* and *Tablet Y* cells. The focus also automatically moves to the next row.

4. Continue digitizing the remaining controls points in the order you entered them in the Control Points dialog box.

When you're finished, the Control Points dialog box should look something like the following figure, although the *Tablet X* and *Tablet Y* cells will most likely contain slightly different coordinates.

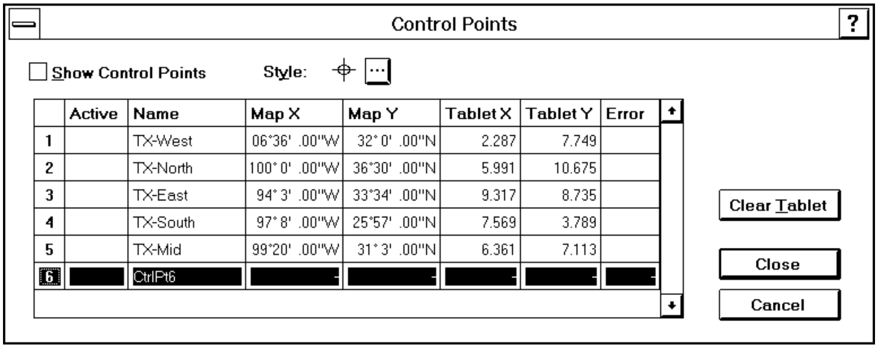


Figure 17.5 **Digitized control points**

After you've digitized the control points, you need to specify the points to use in the tablet-to-map transformation equation. In this lesson, you'll use all five control points.

To calculate the transformation error:

1. Place a check in the *Active* cell for each of the five control points.

   Once the *Active* cell is checked for at least three control points, a calculated value appears for the *Error* cells. These *transformation errors* are the difference between the map coordinates you entered and those calculated by Atlas GIS. These values, shown in the current page distance units, help you determine how accurate your map will be.

   Note: Only the *active* control points are used to calculate the transformation errors, though an error is shown for all digitized control points in the dialog box.

2. Look at the transformation error and make sure that it is on the same scale as the resolution of the digitizing tablet being used.

   As long as the error value is relatively small, the control point is acceptable. For example, for a digitizing tablet with a resolution of thousands of lines per inch (lpi), an acceptable transformation error would be in the hundredths or thousandths of an inch. In general, control points with transformation errors between zero and 0.1 inch are probably acceptable; those equal to or greater than 0.1 are probably unacceptable.

Larger values indicate that you may have entered a map coordinate incorrectly, digitized a control point incorrectly, or selected the wrong projection for your paper map.

To display control points:

1. Place a check in the *Show Control Points* box.

2. Click on the Style [...] button to pop up the Symbol dialog box.

3. In the Symbol group box, set the options according to the following table:

OPTION	SETTING
Symbol	1
Size (pts)	20
Color	Red

4. Click OK to return to the Control Points dialog box.

5. Click on the Close button.

   Depending on your digitizing tablet setup, the control points may or may not be visible.

6. Choose VIEW | ENTIRE TABLET.

   Atlas GIS adjusts the map view to match the active area of your digitizing tablet. The VIEW | ENTIRE TABLET command allows you to view the control points in relation to the entire active area of the digitizing tablet. This is helpful when you need to see the area digitized in relation to the whole map, or to that part of the map that is "seen" currently by the tablet.

   Now zoom in on the control points.

7. Click on the Zoom In tool.

8. Drag to define a rectangular zoom area around the control points only.

As you drag, a temporary rectangular boundary appears. When you release the mouse button, the area within the boundary is enlarged to fill the entire map frame. The screen should look something like the following figure.

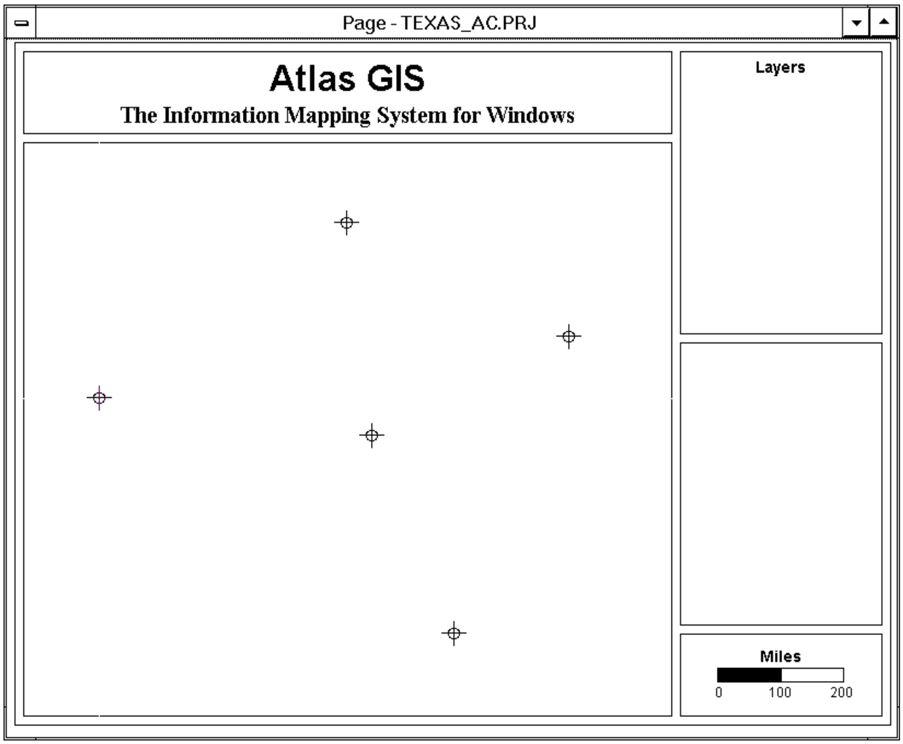


Figure 17.6 **Control points visible on screen**

To save the digitized control points:

Choose FILE | SAVE and save the project.

Now that the control points have been set and saved, you can begin digitizing your map features.

Digitizing Map Features

Digitizing a map feature in Atlas GIS involves three basic steps: choosing the map layer for the new feature, creating the feature, and editing the feature's attribute data. Repeat the second and third steps for each additional feature that you add to the layer.

You can use any of the drawing tools in Atlas GIS to create map features. In this section, you'll use the Polygon tool and the Islands & Lakes tool to create the features. You'll also use the Info window to view and edit the attribute data for each new feature.

Creating a Region

The first feature you'll digitize is the 915 area code region.

To create a region:

1. Click on the Layers tool, make sure the 'area_codes' layer is the only layer highlighted (i.e., the default layer set), and click OK.

2. Click on the Polygon tool.

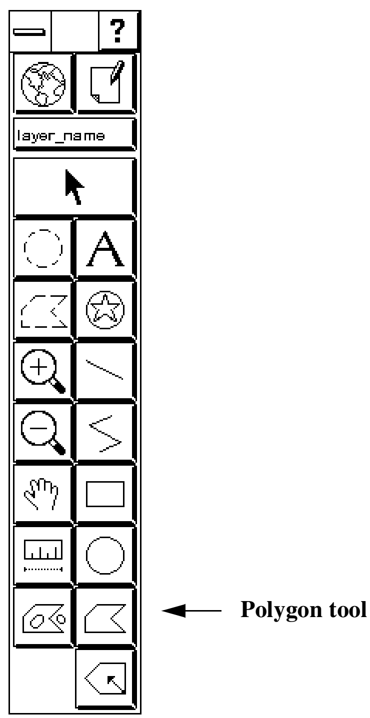


Figure 17.7 **Polygon tool in the toolbox**

3. On the paper map, place the digitizing cursor on the control point labeled ‘TX-West’.

   Notice that the cross hair appears on screen.

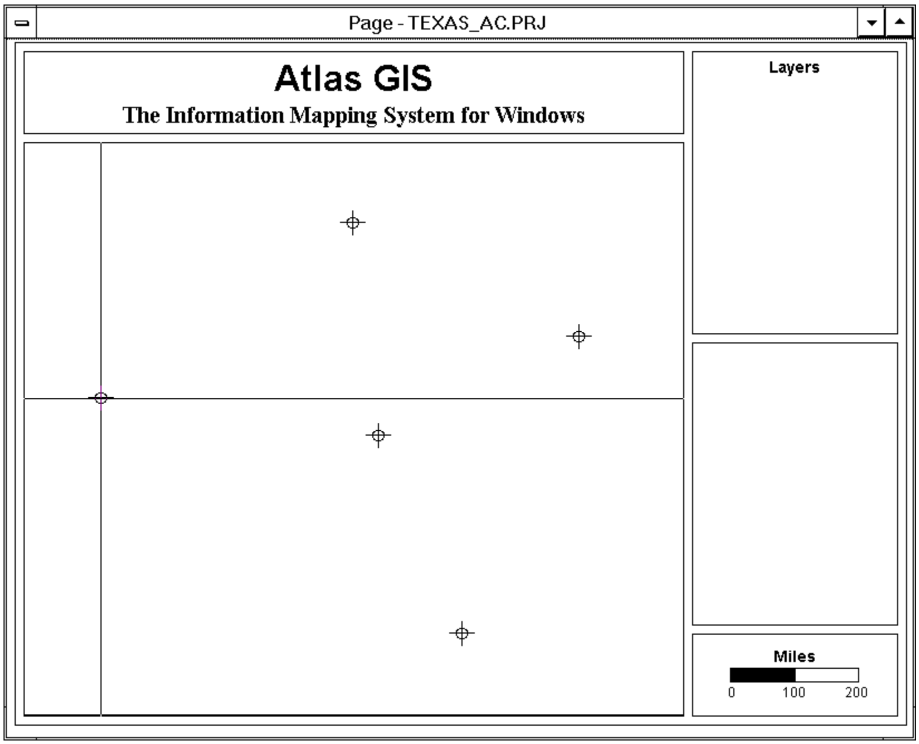


Figure 17.8 **Placing the first vertex**

4. On the ‘TX-West’ control point, click Button 1 of the digitizing cursor.

   The first vertex of the region is created.

5. Place the digitizing cursor on the next vertex of the region and click Button 1. (The following figure is an example of where you might place the region’s vertices.)

   A line segment is drawn between the two vertices.

Note: If you place a vertex incorrectly, press the BACKSPACE key to remove it. You can continue pressing the BACKSPACE key to remove vertices all the way back to and including the first vertex in the region.

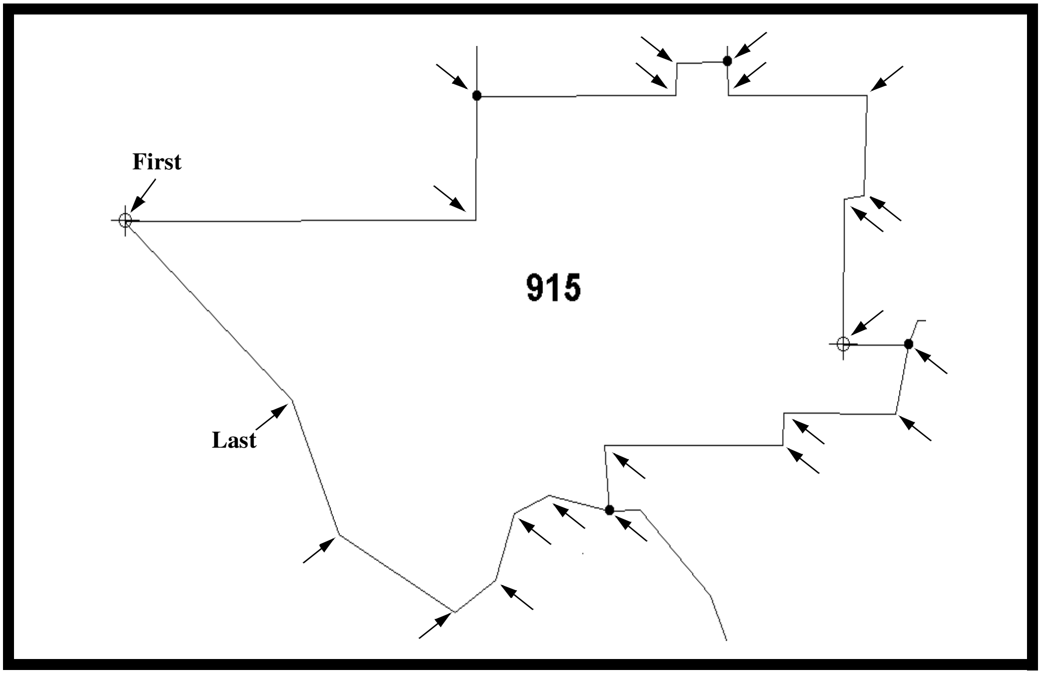


Figure 17.9 **Possible vertices for the 915 area code**

6. Continue digitizing all but the last vertex of the region.

7. Place the digitizing cursor on the last vertex and click Button 4.

   A line segment is drawn between the first and last vertices, closing the region and adding it to the map layer.

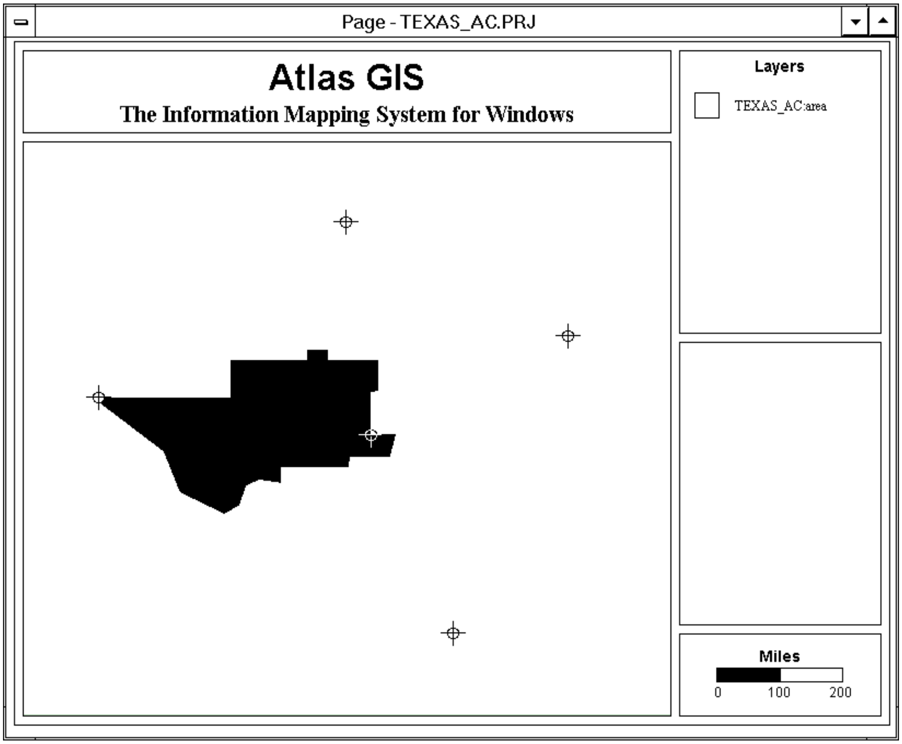


Figure 17.10 **Completed first region**

To edit the feature attributes:

1. Choose WINDOW | SHOW INFO WINDOW to pop up the Info Window.

   The Info window pops up and displays the geographic data and any linked attribute data for the selected feature. The attribute information in the Info window is fully editable.

   To begin editing a cell, double-click in the cell. (You can single-click on the cell if it already has the focus.)

2. In the Info window, enter the values shown in the following table:

COLUMN NAME	VALUE
_ID	AC915
_NAME	915
_NAME2	Area Code 915

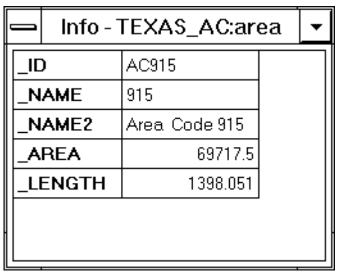


Figure 17.11 **Edited Info window**

3. Since you'll be digitizing and editing other features, you can leave the Info window open. If you want to close it, choose WINDOW | HIDE INFO WINDOW.

Creating a Region with a Common Border

The second region you'll digitize shares a border with the first. In this section, you'll see how to create a common border between two regions. This allows you to avoid slivers (small holes or overlapping areas) and avoid having to draw the border twice.

To create a region with a common border:

1. Click on the Polygon tool.

2. On the paper map, place the digitizing cursor on the control point labeled 'TX-South' and click Button 1 of the digitizing cursor.

3. Working clockwise around the region, digitize the vertices from the control point up to, but not including, Node 4.

On this map, a node is a vertex that begins the line (i.e., the border) shared by two regions.

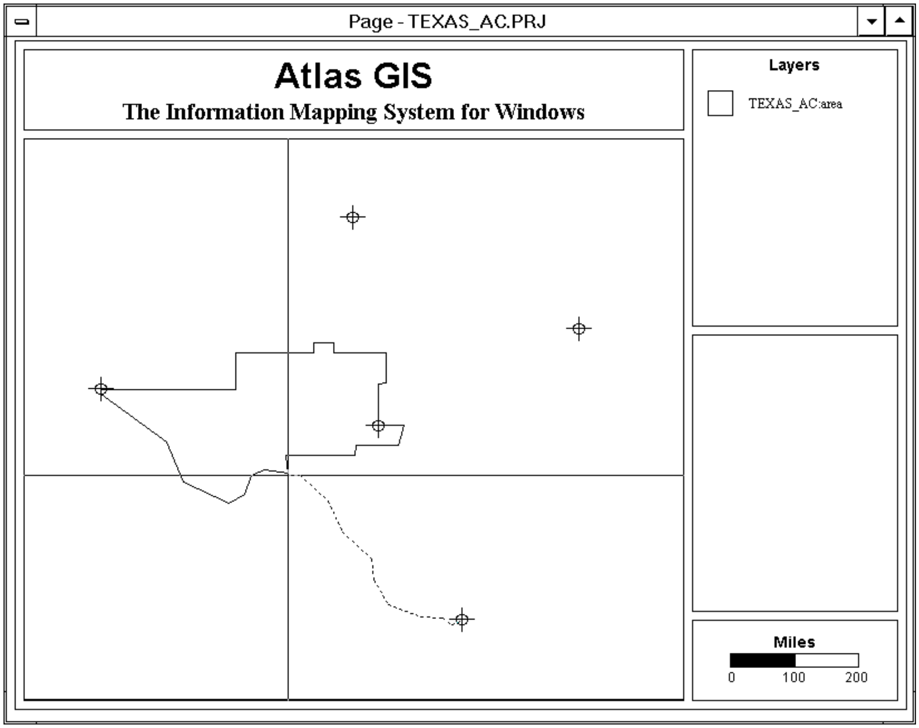


Figure 17.12 **Placing the vertex for the common border**

4. On Node 4, press Button 2. While holding down Button 2, trace the line segment between Node 4 and Node 3. On Node 3, release the button.

   Pressing and holding down Button 2 “grabs” the vertex for Node 4 and traces the “common” border that Area Code 512 will share with its neighboring region.

5. Using Button 1, continue digitizing all but the last vertex of the region.

6. Place the digitizing cursor on the last vertex and click Button 4.

   The feature is closed and added to the map layer.

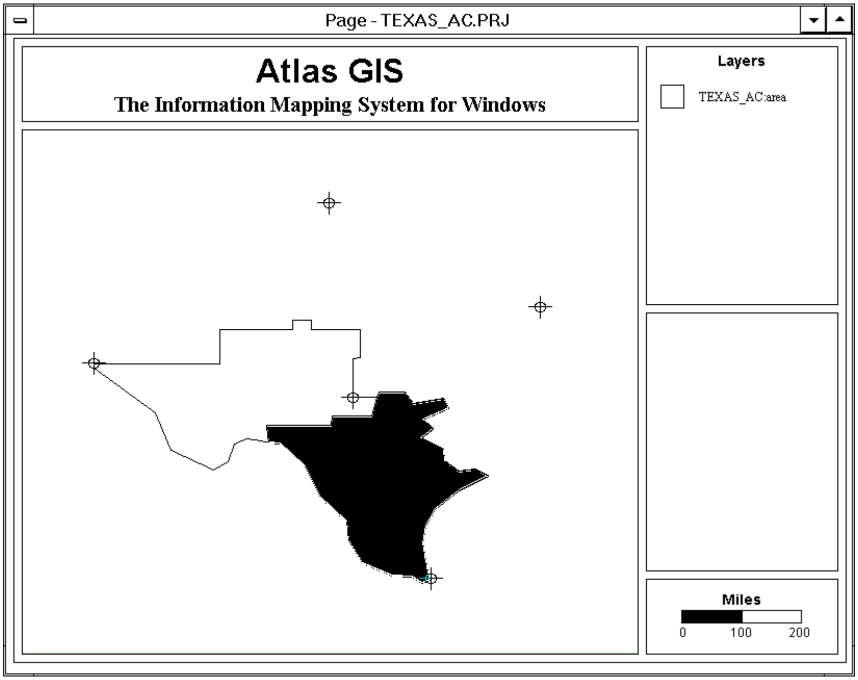


Figure 17.13 **Completed 512 area code**

7. If necessary, choose WINDOW | SHOW INFO WINDOW.
8. In the Info window, enter the values according to the following table:

COLUMN NAME	**VALUE**
_ID	AC512
_NAME	512
_NAME2	Area Code 512

9. If desired, close the Info window.

Creating an Embedded Region

The next region, 409, contains the 713 area code within its boundaries. Creating this embedded region requires a few extra steps. The 409 area code is considered to be a map feature with a lake or *hole*. First, you'll create two polygons: one each for the outer and inner borders. Next, you'll create a feature with a lake using the Islands & Lakes tool, which essentially cuts out the inner area from the outer. Finally, you'll create the embedded area code (713).

To create an embedded region:

1. Click on the Polygon tool.

2. On the paper map, place the digitizing cursor on Node 8 and click Button 1 of the digitizing cursor.

3. Working clockwise, digitize the vertices from the control point up to, but not including, Node 5.

   Node 5 is the vertex that begins the border shared by Area Code 512 and the region you are creating.

4. On Node 5, press Button 2 to grab this vertex and trace the line between Node 5 and Node 6. On Node 6, release the button.

5. Using Button 1, continue digitizing all but the last vertex of the region.

6. Place the digitizing cursor on the last vertex and click Button 4.

   The outer region is closed and added to the map layer. Now create the inner region.

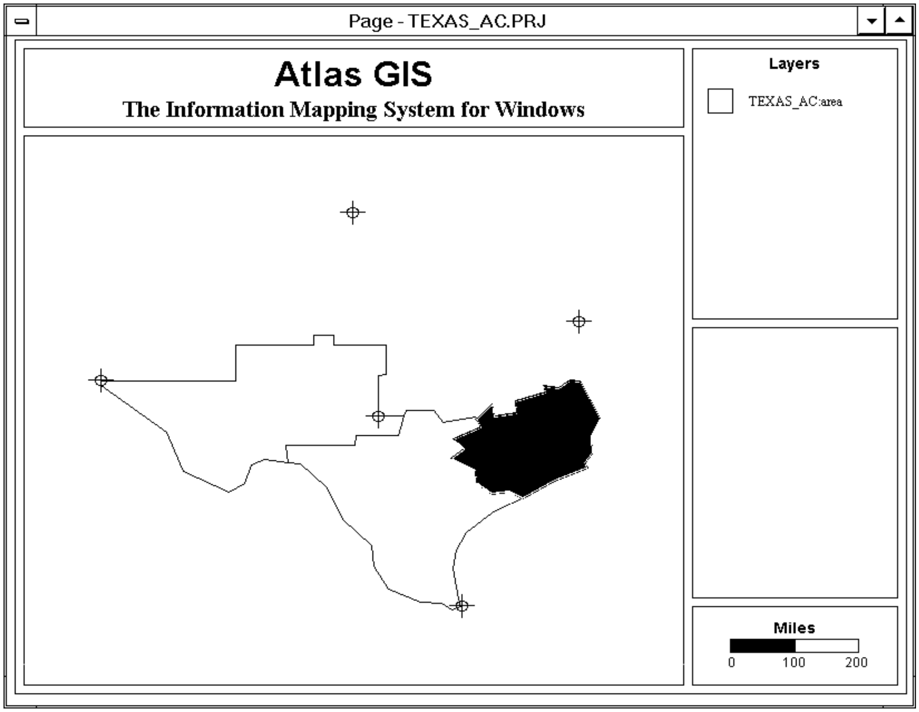


Figure 17.14 **Completed outer region**

7. Click on the Polygon tool again.

8. Starting on any vertex in the inner region, use Button 1 to add all but the last vertex.

9. Place the digitizing cursor on the last vertex and click Button 4.

10. On the screen and in the map frame, deselect the regions by clicking on an area away from any other map feature.

    You can use the mouse on screen or Button 1 of your digitizing cursor in the active template area.

11. Now try to select the inner region.

    Notice that the Select Map Feature dialog box pops up and prompts you to choose the map feature to select.

12. Select the inner region (the one whose feature ID has the higher number).

13. Now add the outer region to the selection.

    Use SHIFT+click with the mouse, or hold down the SHIFT key and click Button 1.

14. With both regions selected, click on the Islands & Lakes tool.

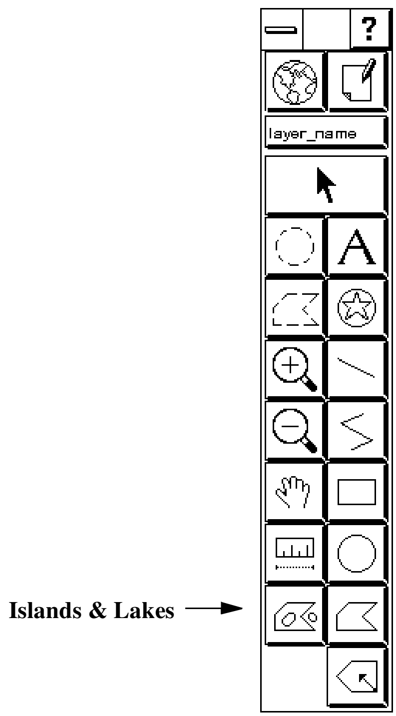


Figure 17.15 **Islands & Lakes tool in the toolbox**

The inner region is removed from the outer region, creating a single map feature with a lake.

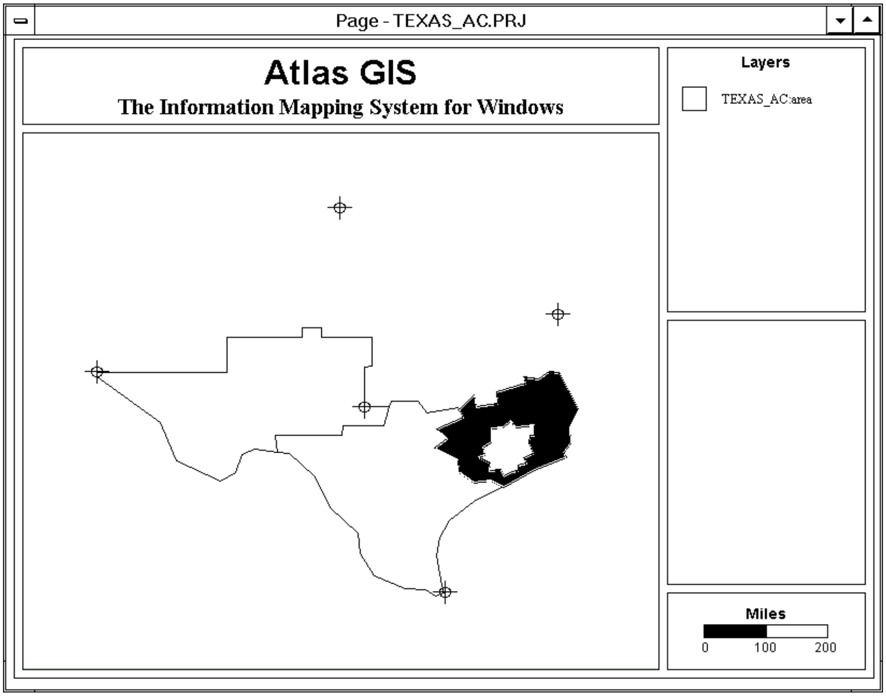


Figure 17.16 **Region with a lake**

15. If necessary, choose WINDOW | SHOW INFO WINDOW and enter values according to the following table:

COLUMN NAME	VALUE
_ID	AC409
_NAME	409
_NAME2	Area Code 409

The 409 area code is completed. Now create the 713 area code.

16. On the screen and in the map frame, deselect the region by clicking on an area away from any other map feature.

17. Click on the Polygon tool again.

18. On the border of the lake, click Button 2 and trace the lake.

19. On the last vertex, release Button 2, and then click Button 4 to create the embedded feature.

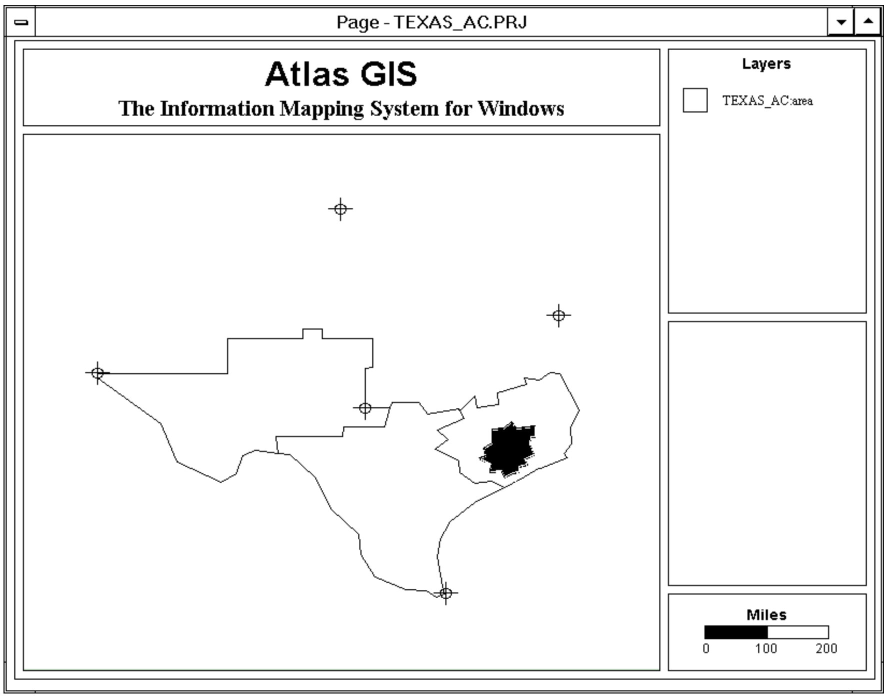


Figure 17.17 **Completed 713 area code**

20. In the Info window, enter values according to the following table:

COLUMN NAME	VALUE
_ID	AC713
_NAME	713
_NAME2	Area Code 713

The embedded region is completed. Notice that you can now select either the outer or inner region independently from the other.

On Your Own

You may want to continue digitizing the rest of the regions of the paper map into your geo file. It will give you even more practice at the techniques you've learned so far.

For more information on digitizing, refer to the on-line help and the *Reference Manual*.

End of Lesson

Before you proceed, you may want to save your project; otherwise, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

18

Performing Geographic Analysis

One of the unique aspects of a geographic information system (GIS) is that it allows you to analyze existing data based on geographic relationships. With the powerful geographic analysis functions of Atlas GIS, you can create new features and new attribute data by performing overlay and buffer operations. The new information you create might be an end result in itself, or you might incorporate it into the next stage of the analysis.

You can extend the power of geographic analysis by altering the input variables and creating alternative scenarios that test different ways of solving a problem. Using the analysis tools of Atlas GIS, you can compare these different scenarios in a variety of ways, from visual inspection to performing mathematical calculations. You'll find this can dramatically enhance your decision making.

In this lesson, you'll create one scenario using store and customer data. After you've completed the lesson, you may want to change some of the input variables on your own to create different territories with alternate versions of the bottom line. Then you can compare each version to see which one might be the most effective in meeting the demands of the marketplace.

In the example used throughout this lesson, a computer wholesaler has three stores, as well as an outside sales force. You'll create trade areas for the stores, then use those areas as a foundation for creating sales territories made up of ZIP codes. You'll then calculate the market potential and market share for those territories, so that you can evaluate the territory design.

Creating Buffer Zones

The MAP | CREATE BUFFERS command allows you to perform an importan geographic analysis function—the creation of *buffer zones* around points, lines, or regions. A buffer zone is a region of specified distance around a map feature or features. Buffer zones are used to designate an area of influence or determine the proximity of one feature to another.

By designating an attribute field for the buffer distance, you can perform variable distance buffering to show, for example, varying sizes of noise corridors around different types of roads. You can create a buffer zone, and then summarize data for the features contained within the buffer. For example, the area affected by a proposed transportation corridor could be analyzed.

In this exercise, you'll define a one-mile trade area around each of the three stores. The trade areas are created in a new layer, adding a new set of data to your map.

To create a buffer:

1. Open the COMPSTOR.PRJ project file in the C:\AGISW\TUTORIAL directory.

   The exercises in this lesson modify the COMPSTOR.AGF geo file, so you need to save the geo file under another name.

2. Choose FILE | SAVE AS to pop up the Save As dialog box.

3. In the *File to Save* list box, choose 'COMPSTOR.AGF'.

4. In the *File Name* text box, type 'COMPS.AGF'.

5. Make sure the *Selected Features or Rows Only* box is unchecked.

6. Make sure the *Use New File* box is checked.

7. Click OK.

   This copies the COMPSTOR.AGF file to COMPS.AGF, and closes the original geo file.

8. Choose MAP | CREATE BUFFERS to pop up the Create Buffers dialog box.

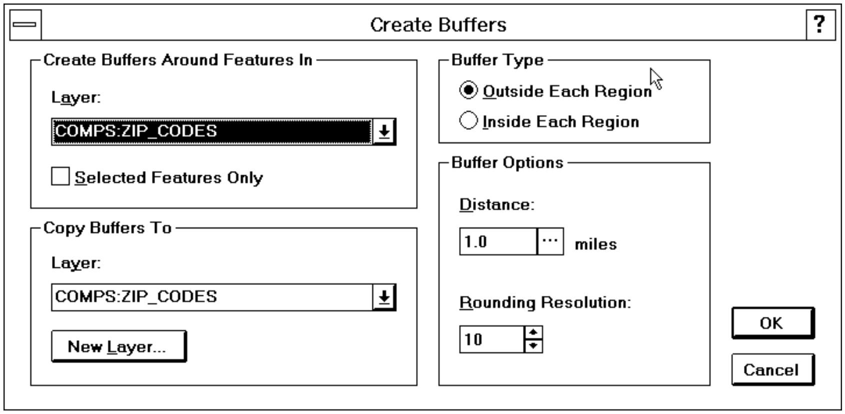


Figure 18.1 **Create Buffers dialog box**

9. In the Create Buffers Around Features In group box, choose the layer 'COMPS:STORES' in the *Layer* list box.

   Notice that the Buffer Type group box changes to display 'Circle' and 'Band' as the new options, and the *Rounding Resolution* in the Buffer Options group box changes to '30'.

10. Make sure the *Selected Features Only* box is unchecked.

    This creates buffers around all features in the layer. You'll need to create a layer for the buffers.

11. In the Copy Buffers To group box, click on the New Layer button.

    This pops up the New Layer dialog box.

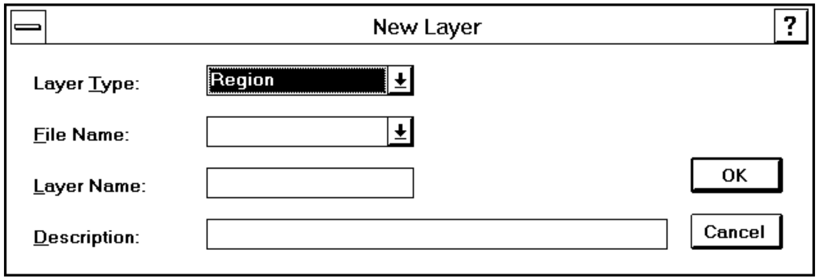


Figure 18.2 **New Layer dialog box**

12. In the *Layer Type* list box, choose ‘Region’.

13. In the *File Name* list box, choose ‘COMPS.AGF’.

14. In the *Layer Name* text box, type ‘TRADE_AREA’.

15. In the *Description* text box, type ‘Store Trade Areas’.

16. Click OK to return to the Create Buffers dialog box.

17. In the Copy Buffers To group box, choose the new ‘COMPS:TRADE_AREA’ layer in the *Layer* list box.

18. In the Buffer Type group box, click on the Circle option button.

    This specifies that circle buffers will be created.

19. In the Buffer Options group box, type ‘1’ in the *Radius* text box.

    This specifies a radius of one mile for each circle.

20. In the *Rounding Resolution* text box, use the default setting (30).

    This determines the number of points in the circle that will be drawn around each location.

21. Click OK.

    The screen redraws to display the buffers around the store locations; the buffers are selected.

Often when you're analyzing trade areas, you'll compare multiple trade areas of varying distance for each site. This is especially useful for site selection, in order to determine and maximize market potential. For this lesson, let's say that you've already done the comparative analysis, and you've determined these are acceptable trade areas for the stores. Now that you've located the trade areas, you're going to determine the market potential for these trade areas.

Aggregating Data

In Atlas GIS, you use the TABLE | AGGREGATE DATA command to aggregate data from one layer to another existing layer. You can create data for larger features by aggregating the data of the smaller features inside them. For example, you might aggregate block group demographic data to create demographic data for planning districts. You can also aggregate data from features with a common attribute value. For example, you could aggregate data for customers located inside or near ZIP codes to create data on a ZIP code level. (When aggregating based on location inside, you can perform area-weighted data aggregation.)

When aggregating data, Atlas GIS uses the aggregation method specified for each column in the Define Columns dialog box. For example, the specified method for a numeric column might be sum, average, weighted average, minimum, maximum, or first (for definitions of these methods, see *Aggregation methods* in the on-line help). And if you ever need to aggregate a string column, you can use an aggregation method of first. If you're not sure how the data will be aggregated for a particular column, you can check the setting in the *Aggr* field in the Define Columns dialog box before performing the data aggregation.

In this exercise, you want to determine the market potential for the new trade areas. You already have the market potential for each ZIP code in San Francisco. You'll aggregate this data for the trade areas.

To determine the market potential for the trade areas, you'll perform an area-weighted data aggregation. This means the market potential of each ZIP code in a trade area will be aggregated to the trade area; for partially contained ZIP codes, Atlas GIS determines what percentage of the ZIP code is contained inside the trade area, then calculates the corresponding percentage of the data for the trade area.

Atlas GIS aggregates attribute data for the numeric columns that it finds in both the layer you're aggregating the data from and the layer you're calculating the data for. Therefore, you must have attribute tables linked to both layers, and they must have at least one numeric column in common (with the same name). The new layer you created in the last exercise, COMPS:TRADE_AREA, doesn't yet have a linked attribute table to store attribute data; you'll need to create a table before Atlas GIS can aggregate the data. (You can do this from inside the Aggregate Data dialog box as you're specifying the aggregation.) This table will need a MKT_POTL column for the data you'll aggregate from the ZIP codes.

To aggregate data from the ZIP codes to the trade areas:

1. Choose TABLE | AGGREGATE DATA to pop up the Aggregate Data dialog box.

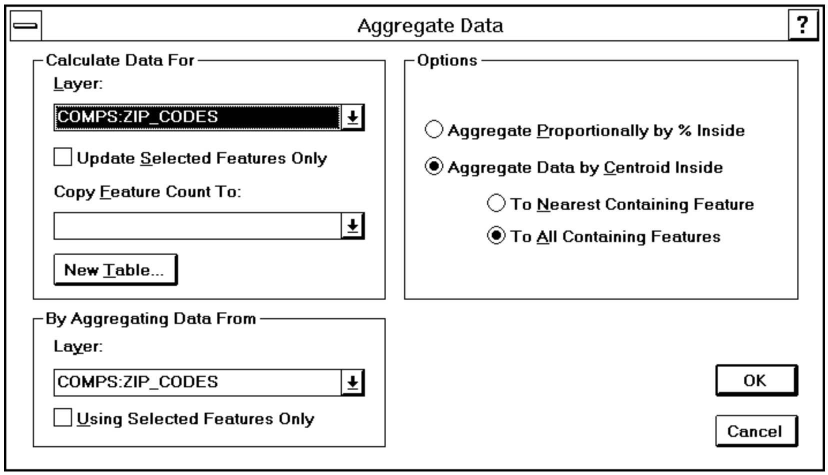


Figure 18.3 **Aggregate Data dialog box**

The subpanel on the right side displays the aggregation options. The available options will vary according to layer types being used.

2. In the Calculate Data For group box, choose 'COMPS:TRADE_AREA' in the *Layer* list box.

   This chooses the trade areas as the features for which you're aggregating the data.

3. Make sure the *Update Selected Features Only* box is unchecked.

   When this box is unchecked, data will be calculated for all features in the layer.

4. Leave the *Copy Feature Count To* list box blank.

   This option chooses a column to fill with the number of features you're aggregating data from, for each of the features for which you're aggregating the data. For this exercise you'll leave it blank, since you don't really need to know how many ZIP codes are in each trade area.

You'll need to create a new table to store the aggregated data.

5. Click on the New Table button to pop up the New Table dialog box.

   For this exercise, you're creating the new table from within the Aggregate Data dialog box, as you specify the aggregation to perform. You could have instead created the table using the FILE | NEW | TABLE command, before choosing TABLE | AGGREGATE DATA, but it's easier to not have to think about it ahead of time.

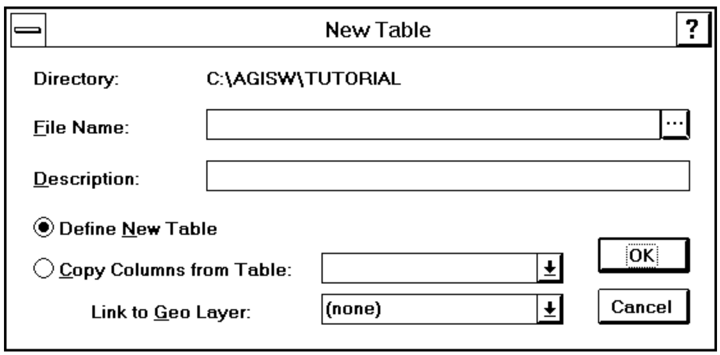


Figure 18.4 **New Table dialog box**

6. In the *File Name* text box, type 'TRADE.DBF'.

   The directory for the file is shown above the *File Name* text box. If you wanted to create the new table in a different directory, you could click on the File Name […] button to pop up the New Table Name dialog box, which allows you to change directories.

7. In the *Description* text box, type 'Store Trade Area Market Potential'.

8. Click on the Define New Table option button.

   When you exit the New Table dialog box, you'll be prompted to define the new table.

9. Click OK.

   The Define Columns dialog box pops up.

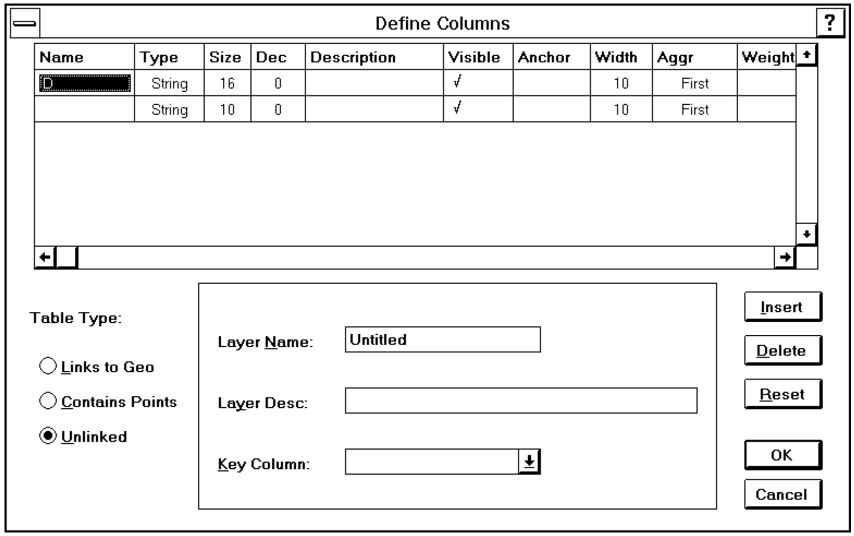


Figure 18.5 **Define Columns dialog box**

10. Click in the first empty cell in the *Name* column.

    This first cell should be the ID entry. You should click in the cell below that. You'll enter the settings for the new table column here. Enter the settings for the column as shown below.

DEFINITION	**ENTRY**
Name	MKT_POTL
Type	Float
Size	10
Dec	0
Description	Market Potential
Visible	Checked
Anchor	Unchecked
Width	10
Aggr	Sum
Weight	Empty

11. In the *Table Type* options, click on the Links to Geo option button.

12. In the *Layer* list box, choose ‘COMPS:TRADE_AREA’.

13. In the *Key Column* list box, choose ‘ID’.

14. Click OK.

    The new table is created with the column you specified, as well as an ID column. (This was the first entry in the Define Columns dialog box. You accepted all of the defaults for the ID column; you didn’t change any of the settings.)

    You’re now returned to the Aggregate Data dialog box, where you can continue specifying the aggregation. So far, you’ve finished with the settings in the Calculate Data For group box.

15. In the By Aggregating Data From group box, choose ‘COMPS:ZIP_CODES’ in the *Layer* list box.

    This aggregates the data from the ZIP code regions.

16. Make sure the *Using Selected Features Only* box is unchecked.

    Atlas GIS will aggregate the data for all ZIP codes located within the territories, rather than only from selected ZIP codes (in the territories).

    When you specify the layers you’re aggregating data from and calculating data for, the options subpanel displays the following options.

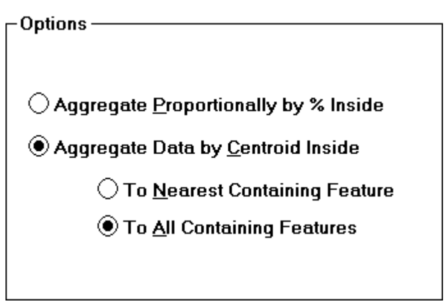


Figure 18.6 **Options subpanel for region-in-region aggregation**

17. In the Options group box, click on the Aggregate Proportionally by % Inside option button.

    This specifies that Atlas GIS aggregates the data proportionally by the percent that the ZIP codes are contained within the trade areas. For example, for a ZIP code that's 60% inside the trade area, 60% of the market potential for that ZIP code will be attributed to the trade area. Performing this area-weighted data aggregation allows you a high degree of precision and accuracy for your calculations.

    Atlas GIS uses the aggregation method specified in the Define Columns dialog box for the source table. (For the MKT_POTL column, the aggregation method is 'Sum' in the *Aggr* column in the source table.) Atlas GIS will sum the data from the ZIP codes to determine the values for the trade areas.

18. Click OK.

Note: Performing all of this work requires extensive calculation, so this can take a while.

The MKT_POTL column in the TRADE.DBF table you created (and linked to the COMPS:TRADE_AREA layer) should now be filled with the new data. You can open a Table window for that layer to view the data if you want.

Now that you've calculated the market potential for each trade area, you'll create territories for the outside sales force.

Combining Features to Create New Features

When you're performing geographic analysis, there will probably be times when you want to combine features and aggregate their attribute data. For example, suppose you wanted to create a sales territory map of the United States. You could select all of the states in the northwest and combine them into a single sales region. Then you could also do the same thing with the southwest, northeast, and southeast states.

Atlas GIS includes two commands that combine regions or points to create new features. The MAP | COMBINE | SELECTED command combines selected features into one map feature and aggregates the data to that feature. The MAP | COMBINE | BY VALUE command groups features with the same attribute value together, then combines each group and aggregates the data.

In this exercise, you'll combine the ZIP codes around the stores to create territories for the outside sales force. You'll first need to select all ZIP codes touching the trade areas.

To select regions by location:

1. Make sure the Map tool is active, then click on the Layers tool to pop up the Default Layer Set dialog box.

2. In the *Layers* list box, choose 'COMPS:TRADE_AREA'.

   This map layer is selected as the layer to work with.

3. Click OK.

4. Select the Store 1 trade area. (Click on the feature to select it.)

   You'll select all of the ZIP codes inside of or touching this trade area first, and then combine them to create a sales territory.

5. Choose QUERY | SELECT BY LOCATION | TOUCHING to pop up the Select By Location - Touching dialog box.

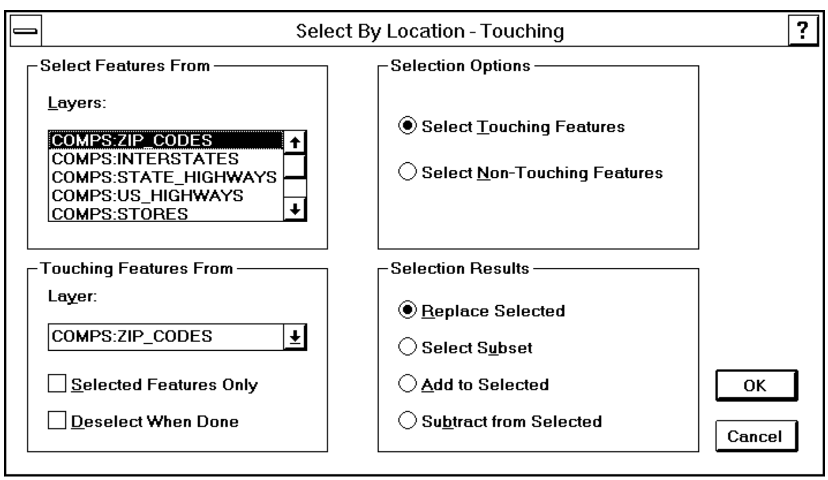


Figure 18.7 **Select By Location - Touching dialog box**

6. In the Select Features From group box, choose 'COMPS:ZIP_CODES' in the *Layers* list box.

7. In the Touching Features From group box, choose 'COMPS:TRADE_AREA' in the *Layer* list box.

8. Place a check in the *Selected Features Only* box.

   For this exercise, only the selected Store 1 trade area will be used. ZIP codes inside of or touching this trade area will be selected.

9. Place a check in the *Deselect When Done* box.

   Only the results (ZIP codes) will remain selected; the trade area the ZIP codes are inside of or touching will be deselected.

10. In the Selection Options group box, click on the Select Touching Features option button.

11. In the Selection Results group box, click on the Replace Selected option button.

    This specifies that the selected ZIP codes will be the only selected features; any other selected features will be deselected.

12. Click OK.

All of the ZIP codes inside of or touching the Store 1 trade area are selected. Now you'll combine them to create a single region in a new layer.

To combine selected features:

1. Choose MAP | COMBINE | SELECTED to pop up the Combine Selected dialog box.

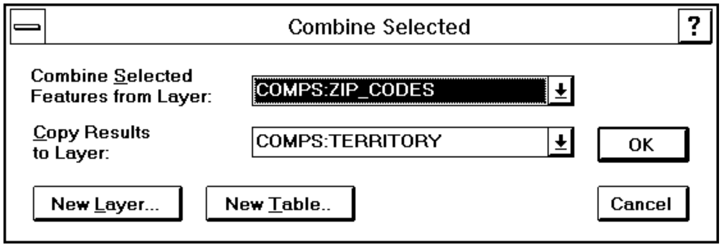


Figure 18.8 **Combine Selected dialog box**

2. In the *Combine Selected Features from Layer* list box, choose the layer 'COMPS:ZIP_CODES'.

   You'll be copying the features to a new layer, which you'll need to add.

3. Click on the New Layer button to pop up the New Layer dialog box.

4. In the *Layer Type* list box, choose 'Region'.

5. In the *File Name* list box, choose 'COMPS.AGF'.

6. In the *Layer Name* text box, type 'TERRITORY'.

7. In the *Description* text box, type 'Sales Territory Data'.

8. Click OK to return to the Combine Selected dialog box.

   Now that you've added the new layer, you need to select it as the layer for the new combined feature.

9. In the *Copy Results to Layer* list box, choose 'COMPS:TERRITORY'.

   The new sales territory created from the combined ZIP codes will be copied to this layer.

   Now you'll need to create a new table, so that you can store the aggregated attribute data and link it to the new layer. You'll need columns in the table for market potential, sales, number of customers, and market share.

10. Click on the New Table button to pop up the New Table dialog box.

11. In the *File Name* text box, type 'TERRITOR.DBF'.

    The directory for the file is shown above the *File Name* text box. If you wanted to create the new table in a different directory, you could click on the File Name […] button to pop up the New Table Name dialog box, which allows you to change directories.

12. In the *Description* text box, type 'Sales Territories'.

13. Click on the Define New Table option button.

14. Click OK.

    The Define Columns dialog box pops up.

15. Click in the first empty cell in the *Name* column.

    This first cell in the first row should be the ID entry. You should click in the cell below that. You'll enter the settings for the new table column here.

    You'll actually have to repeat this process to add each of the four columns you need for the layer. Enter the settings for each column as shown in the following table. Notice that this table only lists some of the possible column settings. Leave the rest of the settings at their defaults, as noted below the table.

NAME	TYPE	SIZE	DEC	DESCRIPTION	WIDTH	AGGR
MKT_POTL	Float	10	0	Market Potential	10	Sum
SALES	Float	10	0	Sales	10	Sum
MKT_SHARE	Float	5	2	Market Share	5	None
COUNT	Float	3	0	Customer Count	3	Sum

    - Make sure the *Visible* cell is checked for each of the new columns.
    - Make sure the *Anchor* cell is unchecked for each of the new columns.
    - Make sure the *Weight* cell is empty for each of the new columns.

16. In the *Table Type* options, click on the Links to Geo option button.

17. In the *Layer* list box, choose ‘COMPS:TERRITORY’.

18. In the *Key Column* list box, choose ‘ID’.

19. Click OK.

    The new table is created with the four columns you specified, as well as an ID column. (This was the first entry in the Define Columns dialog box. You accepted all of the defaults for the ID column; you didn’t change any of the settings.) The table will be linked to the new sales territory layer.

    You’re now returned to the Combine Selected dialog box.

20. Click OK.

    Note: Performing all of this work requires extensive calculation, so this can take a while.

    When Atlas GIS is finished combining the features, the new sales territory displays on the map, and the attribute data for the new territory is in the new attribute table.

    The map should now look like the following figure.

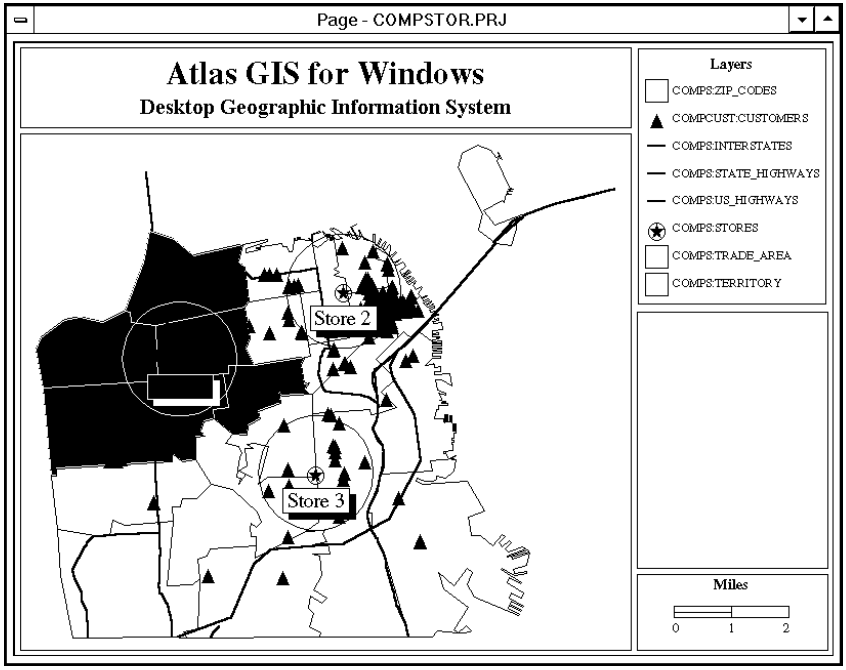


Figure 18.9 **New sales territory, created from combined Zip codes**

If you want to view the attribute data for the new feature, you can open the Info window, since the new territory is selected. Or you can open a new Table window and choose the territory layer.

21. Repeat the process for the Store 2 and Store 3 trade areas.

You'll have to repeat this process for each of the other two store trade areas to create their sales territories; however, you won't need to create a new layer or new table. Select the ZIP codes in a trade area, then combine them, copying the new features and data to the COMPS:TERRITORY layer and its linked table.

If you were creating a larger number of territories, you would probably want to use the MAP | COMBINE | BY VALUE command. Lesson 19, "Creating and Mapping Sales Territories," includes an example of how you might do this.

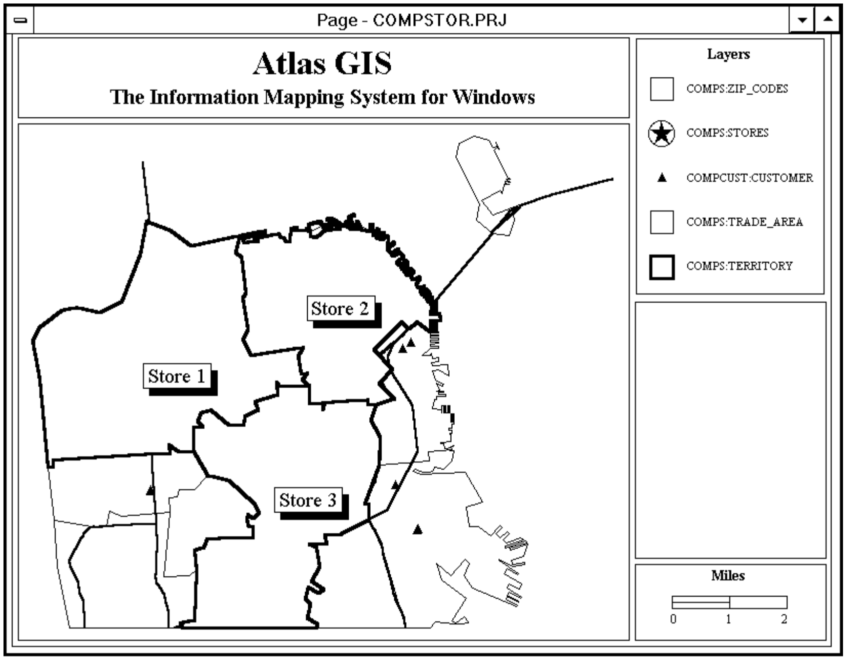


Figure 18.10 **New sales territories**

When you're finished, all three territories will be displayed on the map, and their attribute data will be stored in the linked table. If you'd like to be able to distinguish the territories from each other more easily, you can choose a thick line for the regions, and choose a new fill color. (You can right-click on the map to pop up the Layers & Themes dialog box to change the style for the layer.)

When you look at the map, you can see that some of the customers are located outside of the new sales territories. Sometimes this may happen. In cases like this, you'll want to evaluate your needs and decide how to proceed. For example, you might want to expand your trade areas. Or, you might manually select the ZIP codes for a territory, using the Statistics window to view the total number of customers and total sales as you select and deselect various ZIP codes to define the territory.

In the next exercise, you'll calculate your market share by territory. You can then use this new data to evaluate your territories and decide whether to redefine them.

Calculating Column Data

Now that you've created the new territories, you'll determine the market share for the new territories. When you combined the ZIP codes to create the territories, you automatically aggregated the market potential from the ZIP codes. To determine the sales for the territories, you'll aggregate the sales data from customers located in each territory. You'll then calculate the market share for the territories.

To aggregate data from the customers to the territories:

1. Choose TABLE | AGGREGATE DATA to pop up the Aggregate Data dialog box.

2. In the Calculate Data For group box, choose 'COMPS:TERRITORY' in the *Layer* list box.

3. Make sure the *Update Selected Features Only* box is unchecked.

   Atlas GIS will update all features in the layer.

4. In the *Copy Feature Count To* list box, choose 'COUNT'.

   This will fill the COUNT column with the number of customers in each trade area.

5. In the By Aggregating Data From group box, choose the layer 'COMPCUST:CUSTOMERS' in the *Layer* list box.

   Atlas GIS will aggregate the data from the customer points for each of the trade areas.

6. Make sure the *Using Selected Features Only* box is unchecked.

   Atlas GIS will aggregate the data from all of the customers in the territory.

7. In the Options group box, click on the Aggregate to Nearest Containing Feature option button.

   This ensures that data will not be aggregated to more than one territory, in case territories overlap. In such cases, the point data will be aggregated to the region whose centroid is nearest to the point.

8. Click OK.

When the aggregation is complete, the SALES and COUNT columns are filled in the table.

Now that you have the market potential and sales for each territory, you'll calculate the market share already captured for each territory. (You might use this, for example, to set goals for the outside sales force.) To do this, you'll use the TABLE | CALCULATE COLUMN command.

To calculate the market share:

1. Choose TABLE | CALCULATE COLUMN (or click on the Calc Col button) to pop up the Calculate Column dialog box.

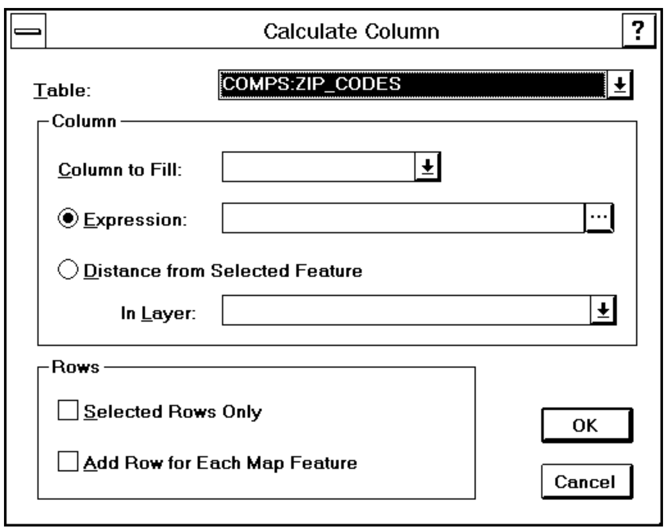


Figure 18.11 **Calculate Column dialog box**

2. In the Table list box, choose 'COMPS:TERRITORY'.

3. In the Column group box, choose 'MKT_SHARE' in the *Column to Fill* list box.

4. Click on the Expression option button.

5. In the Expression text box, type ‘ (SALES / MKT_POTL) * 100’.

   This calculates the market share for each territory, by dividing the sales by the market potential, then multiplying by 100 to determine a percentage. This is the percentage of the total potential for each territory that has been captured by the store and sales force in that territory.

   Rather than typing in the expression, you could click on the Expression [...] button to pop up the Expression Builder, and create the expression there.

6. In the Rows group box, make sure the *Selected Rows Only* and *Add Row for Each Map Feature* boxes are unchecked.

7. Click OK.

   Atlas GIS calculates the market share and fills the MKT_SHARE column in the COMPS:TERRITORY layer (table) with the new values. You can view these values in the Table window.

You can use all of these results to define your territories and set goals for the stores and sales force. For example, you might determine the total potential for each territory’s outside sales force by subtracting the store’s potential (or even a portion of it) from the territory’s potential. Or you might think that the market share for the territories is unbalanced, and decide to redesign the territories. (In this case, you’ll want to use the MAP | COMBINE | BY VALUE command, as discussed in Lesson 19, “Creating and Mapping Sales Territories.”) Or you might use the store and territory potential to determine how to allocate advertising dollars. These are just a few examples of how the calculations you perform can dramatically enhance your decision making.

End of Lesson

Before you proceed, choose FILE | NEW | PROJECT (and choose ‘No’ if prompted to save changes). This will close the open files and reset the Page window for the next lesson.

Part V: Common Applications

19

Displaying a Customer Database on a Map

The ability to display data on a map is essential in analyzing the spatial relationships of information. For example, a police department can match a list of crime locations to a city map, and then display the points to observe the distribution of crime activity. Similarly, a company can create points from a list of customers to monitor customer distribution.

Atlas GIS allows you to import a spreadsheet file or an ASCII text file, or open a dBASE-compatible file (with the extension .DBF) for use as a table. If the file does not already contain geographic coordinates, you can open the table unlinked, add columns for the coordinates, and then geocode it to ZIP code centroids to create coordinate points for the locations. You can then display these points on the map.

In this lesson, you'll import and geocode a list of potential customers for a company that sells class rings and yearbooks to colleges and universities across the United States. After you geocode the table, you'll display these points on the map so that you can see the geographic distribution of the potential customers. This lesson incorporates skills you learned in Lesson 15, "Importing Data," and Lesson 16, "Matching Locations to the Map."

Importing Your Data

The first step in displaying your data on the map is to open the table in Atlas GIS. In this exercise, you'll open a database of potential customers (colleges and universities). The file is a dBASE-compatible called COLLEGES.DBF.

Note: When you open a database in Atlas GIS, it's important to realize that you're working with the original file. Any edits to the table are made directly to the database file.

To open the file as a table:

1. Open the CUSTDATA.PRJ project file in the C:\AGISW\TUTORIAL directory.

   This project file opens the US_STATE.AGF geo file to display the United States state boundaries. You'll be able to use these as a locational reference after importing the database and geocoding the potential customer sites so they display on the map.

2. Open the COLLEGES.DBF in the C:\AGISW\TUTORIAL directory.

   When you choose 'Table (*.dbf)' in the *List Files of Type* list box, the *File Name* list box displays all files with the extension .DBF in the current directory, including Atlas GIS tables and any dBASE files not yet opened as tables. If you had a list of customers in a spreadsheet or text file, you'd choose the appropriate file type to import the file.

   After you click OK, the Table Link dialog box pops up.

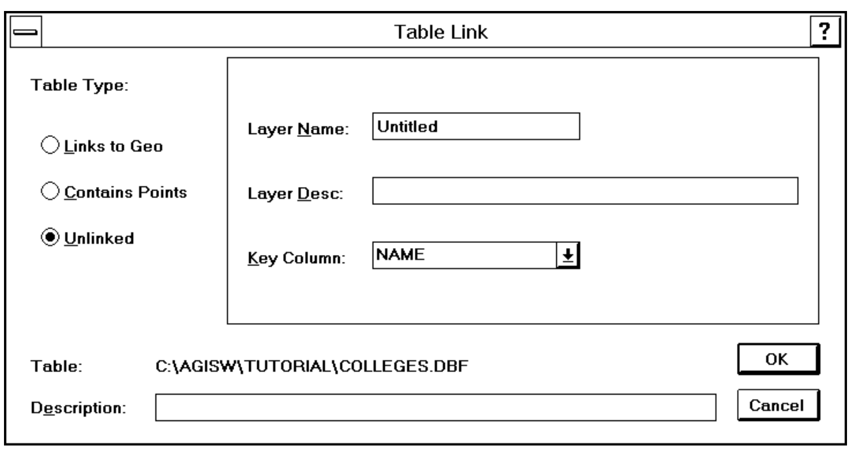


Figure 19.1 **Table Link dialog box**

The information you enter in this dialog box is used to create a .COL file. This .COL file stores the table settings and enables Atlas GIS to use the database file as a table.

For your convenience, the COLLEGES.DBF file already has columns (LON and LAT) for the geographic coordinates. When you're opening your own files, you'll probably need to open the table and allow Atlas GIS to add the longitude and latitude columns before you can geocode. Refer to Lesson 16, "Matching Locations to the Map," for an example.

3. In the Table Link dialog box, click on the Contains Points option button.

   The subpanel displays the options for opening a point table.

4. In the *Layer Name* text box, type 'PROSPECTS'.

   This assigns a name to the layer. Point tables are treated as separate layers. Naming the table allows you to identify it easily when it's displayed in a Table window, or in a list of layers (for example, in the Layers & Themes dialog box).

5. In the *Layer Desc* text box, type 'New Prospects'.

   The text you type here describes the type of points the layer contains.

6. In the *Key Column* list box, choose 'NAME'.

   This specifies the key column for the table (so each point in the table can be uniquely identified).

7. In the *Longitude or X* list box, choose 'LON'.

   During geocoding, Atlas GIS will insert the longitude values in this column.

8. In the *Latitude or Y* list box, choose 'LAT'.

   During geocoding, Atlas GIS will insert the latitude values in this column.

9. In the *Values Are* list box, accept the default setting.

This specifies the projection to be used for the point coordinates. (Since these columns are empty, you can accept the default.) During geocoding, Atlas GIS will insert the coordinates in the current map projection if you have a geo file or point table already open. When no geo files or point tables are open, you can specify the projection for the coordinates.

Note: When you're opening a table that already contains point coordinates, it's important to indicate the projection of the coordinates.

At the bottom of the Table Link dialog box, notice that the *Table* field shows the name of the new table, COLLEGES.DBF. There's a text box below it for a description of the table (file).

10. In the *Description* text box, type 'U.S. Prospects'.

11. Click OK.

    A message pops up warning that the table is in a different projection than the open file.

12. Click OK to have Atlas GIS change the table's projection.

    Atlas GIS changes the table's projection, then opens the table (using the original database file). Your edits will be made in the original .DBF file, and the table settings will be stored in the .COL file.

    Now you can view the table in a Table window.

13. Choose WINDOW | NEW TABLE WINDOW, and choose the COLLEGES: PROSPECTS layer in the Window Layer dialog box.

Matching Your Customer Locations to a Map

Once you've opened the file as a point table, you're ready to geocode the prospects. This uses U.S. ZIP code centroids to create a geographic coordinate point for each customer prospect, so that you can display the points on the map. (For more detailed information on geocoding, refer to the *Reference Manual*, under TABLE | GEOCODE BY ZIP CODE.)

To match your customer locations to a map:

1. Choose TABLE | GEOCODE BY ZIP to pop up the Geocode To ZIP dialog box.

2. In the *Table to Geocode* list box, choose 'COLLEGES:PROSPECTS'.

3. In the *ZIP Code Column* list box, choose 'ZIP_CODE'.

   This tells Atlas GIS to look in the ZIP_CODE column to find the ZIP code for each table row. Atlas GIS will then assign the ZIP code's centroid coordinate to the row, so that it can display as a point on the map.

4. In the *Rows to Geocode* group box, click on the All Rows option button.

5. Click OK.

Atlas GIS assigns the ZIP code centroids to the locations.

Viewing the Results

To view the points on the map, close the Table window, then click on the Redraw button on the status bar (or choose VIEW | REDRAW). All the matched points are displayed on the map. It should look something like the following figure.

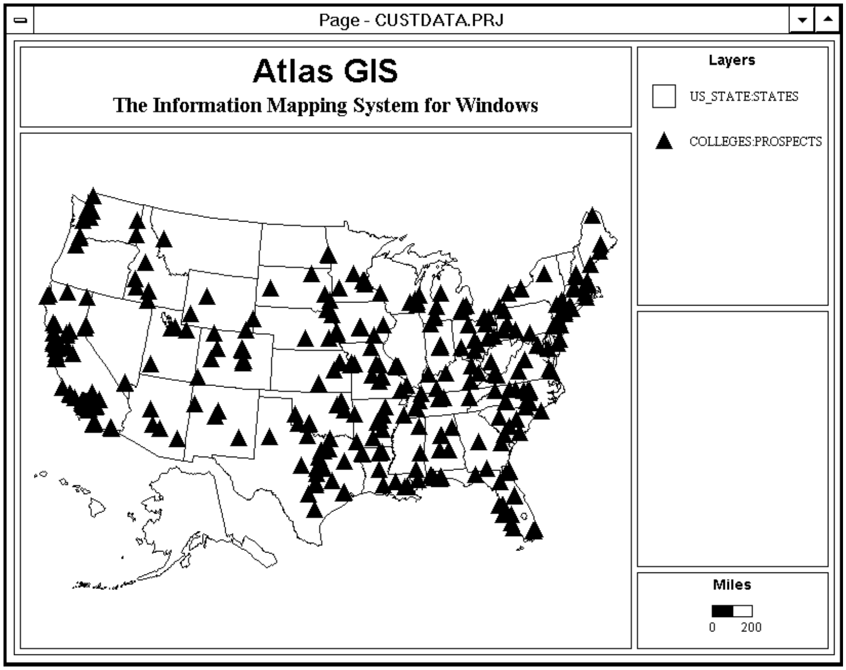


Figure 19.2 **Distribution of prospective customers**

If you open the Info window and select one of the points, you can see that the LON and LAT columns contain the longitude and latitude coordinates assigned to each location.

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' when prompted to save changes) to close the open files and reset the Page window for the next lesson.

20

Creating and Mapping Sales Territories

One common application of Atlas GIS is creating sales territories. The method you use to define the territories depends upon your needs. You can use a very basic method, basing the territories solely on geographic boundaries (such as combining states or ZIP codes), or you can use a more sophisticated method, using sales data or market potential, to create balanced territories of equal potential. When you create the new regions, the data is aggregated from the original features, so you can immediately perform geographic analyses on the new regions.

As you create your own territories, first determine your needs, then select an appropriate method for defining the new regions. Here are some examples of how you might create territories:

- Color code regions to show which territory they're in.
- Combine the base regions into territories manually, creating one territory at a time.
- Assign a territory value or name to each base region, using a column in the table, and then combine the regions by value. This makes it easy to reassign regions, and to perform analysis on a variety of scenarios.

In this lesson, you'll learn different methods for creating and color coding territories, which you can apply in different ways. This lesson is divided into two exercises. In the first exercise, you'll define territories based on state boundaries. In the second exercise, you'll define another set of territories based on sales data. For the second set, as you identify the states to include in each territory, you'll assign the territory name to those states. You'll also create a theme map for the states so that as you assign them to a territory they are color-coded, making them easily distinguishable for presentation purposes. Finally, you'll combine the states into regions, so that you can aggregate the data and perform geographic analyses for the new regions.

Note: This lesson demonstrates more than one method for creating territories, so that you can choose the best method for your needs when you create territories. Because the exercises are so comprehensive, this lesson will probably take longer to complete than most of the other lessons.

Creating Territories Using State Boundaries

One method of defining territories is to use any geographic boundaries, such as ZIP codes, counties, states, or census tracts. In this exercise, you'll create a sales territory map of the United States, selecting the states for each territory and combining them to create the territory region.

To create the first territory using state boundaries:

1. Open the TERRITOR.PRJ project file in the C:\AGISW\TUTORIAL directory.

   This opens the US_STATE.AGF geo file to display the state boundaries. The exercises in this lesson modify the geo file, so you need to save the geo file under another name.

2. Choose FILE | SAVE AS to pop up the Save As dialog box.

3. In the *File to Save* list box choose 'US_STATE.AGF'.

4. In the *File Name* text box, type 'NATIONAL.AGF'.

5. Make sure the *Selected Features or Rows Only* box is unchecked.

6. Make sure the *Use New File* box is checked.

7. Click OK.

   This copies the US_STATE.AGF file to NATIONAL.AGF, and closes the original geo file.

   Before you select the states for the territories, you'll want to make sure the select tools will also select features that are partially inside the selection area (rather than just features that are completely inside).

8. Choose FILE | PREFERENCES to pop up the Preferences dialog box.

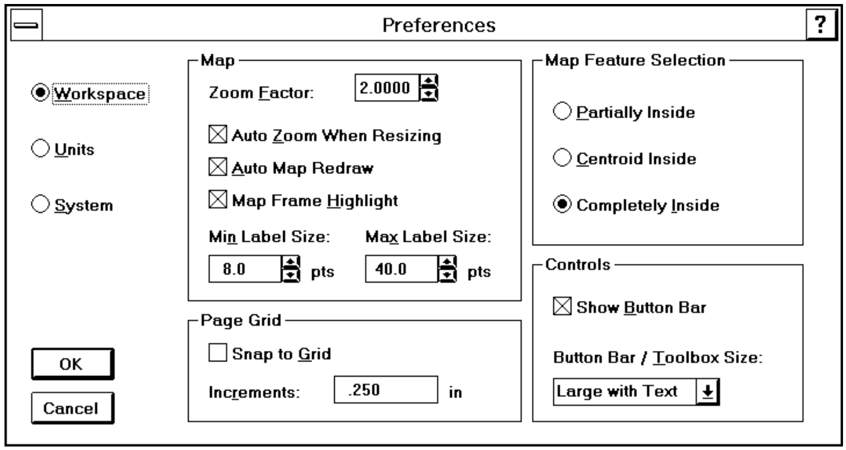


Figure 20.1 **Preferences dialog box**

9. Click on the Workspace option button.

10. In the Map Feature Selection group box, click on the Partially Inside option button.

    As you use the Polygon Select tool, Circle Select tool, or the Pointer tool, any features partially contained within the area you draw will be selected.

11. Click OK.

12. Click on the Layers tool to pop up the Default Layer Set dialog box, and double-click on 'NATIONAL:STATES'.

13. Click on the Polygon Select tool.

    You'll draw a polygon containing the states to include in the territory.

14. Select the western states shown in the following figure.

    Note: If you miss a state, SHIFT+CLICK on that state to add it to the selection. If you select one unintentionally, you can CTRL+CLICK on it to deselect it, without deselecting other features.

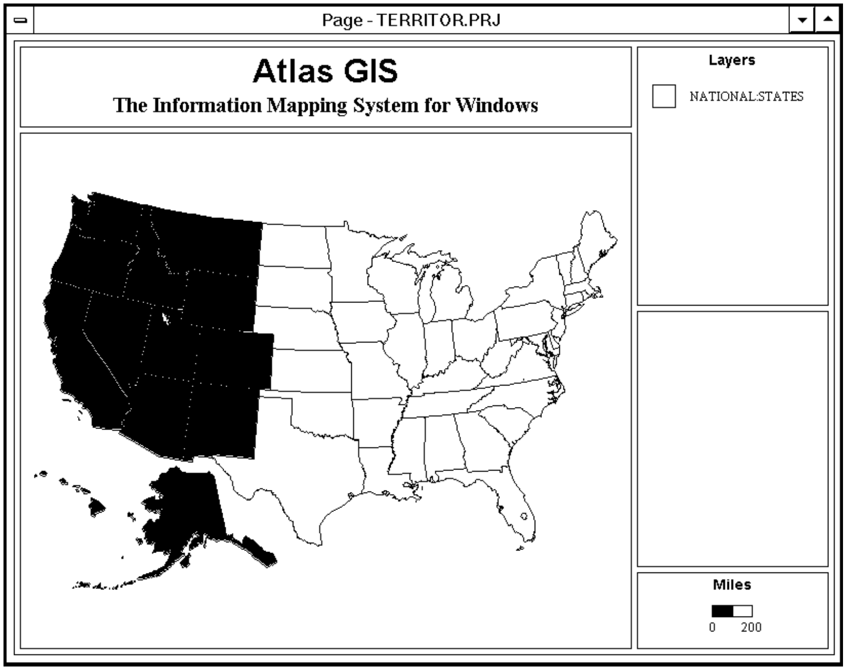


Figure 20.2 **Western territory states**

15. Choose MAP | COMBINE | SELECTED to pop up the Combine Selected dialog box.

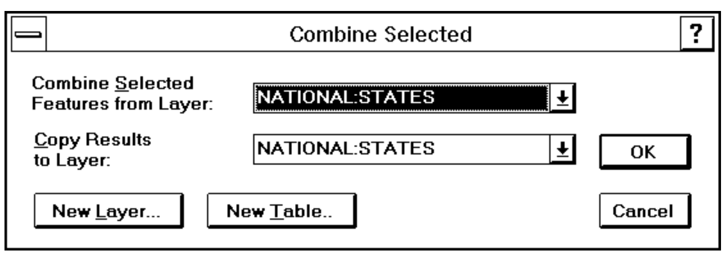


Figure 20.3 **Combine Selected dialog box**

The options in this dialog box allow you to create the first territory.

16. In the *Combine Selected Features from Layer* list box, choose the 'NATIONAL:STATES' layer.

This will combine all of the selected features (states) to create a new region, which will be the western territory. Since the territory boundaries will follow state boundaries, you'll create a new layer for the territories, to make it easier to distinguish the features.

17. Click on the New Layer button to pop up the New Layer dialog box.

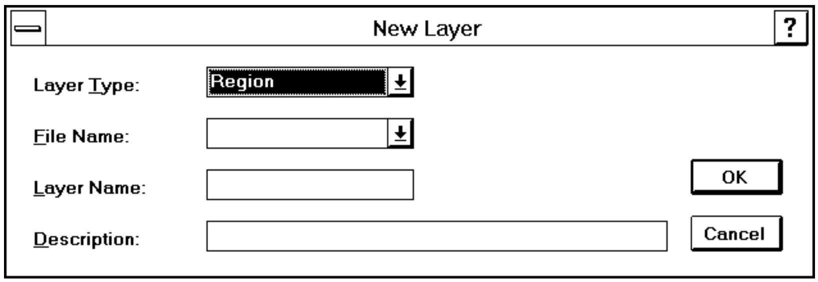


Figure 20.4 **New Layer dialog box**

18. In the *Layer Type* list box, choose 'Region'.

19. In the *File Name* list box, choose 'NATIONAL.AGF'.

    The new layer will be created in the NATIONAL.AGF geo file.

20. In the *Layer Name* text box, type 'TERRITORIES'.

    The new layer name will be NATIONAL:TERRITORIES.

21. In the *Description* text box, type 'National Sales Territories'.

22. Click OK to return to the Combine Selected dialog box.

23. In the *Copy Results to Layer* list box, choose 'NATIONAL:TERRITORIES'.

24. Click OK.

    Atlas GIS combines the states to create a new region, which it places in the NATIONAL:TERRITORIES layer.

Note: Performing all of this work requires extensive calculation, so this may take a while.

25. Click anywhere in the map frame to deselect the new territory.

In order to see the territory more clearly, you'll specify a thicker line style for the layer.

To set the line style for the new territories:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

2. In the Layers group box, choose the NATIONAL:TERRITORIES layer.

3. Click on the Style option button.

   The subpanel displays the style settings for the layer.

4. In the Line group box, type '3' in the *Width* text box.

   This sets the line width for the territory borders to 3 points. You'll leave the rest of the settings as they are.

5. Click OK.

The new territory you created is now outlined with a heavy line.

In the following exercise, you'll select the states for each of the remaining territories, and combine the features to create a new region for each territory.

To create the remaining territories:

1. Click on the Polygon Select tool.

2. Select the central states shown in the following figure.

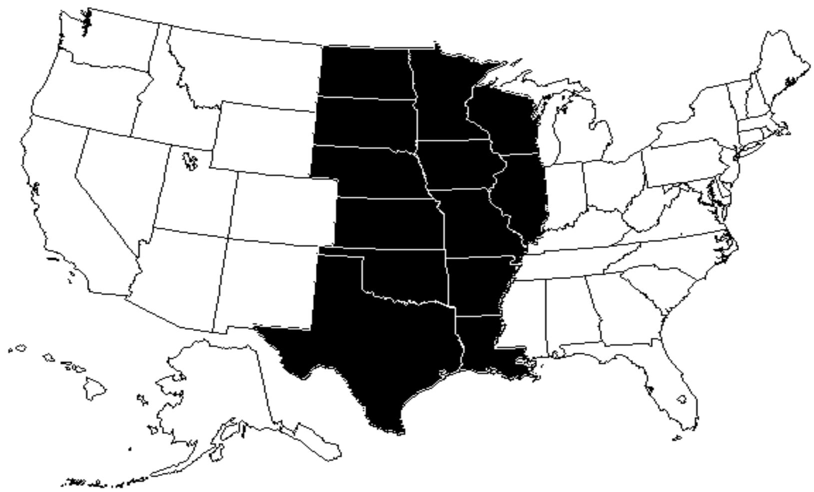


Figure 20.5 **Central territory states**

3. Choose MAP | COMBINE | SELECTED to pop up the Combine Selected dialog box.

4. In the *Combine Selected Features from Layer* list box, choose the 'NATIONAL:STATES' layer.

5. In the *Copy Results to Layer* list box, choose 'NATIONAL:TERRITORIES'.

6. Click OK.

   Atlas GIS combines the states to create a new region, which it places in the NATIONAL:TERRITORIES layer.

7. Click on the Polygon Select tool.

8. Select the northeastern states shown in the following figure.

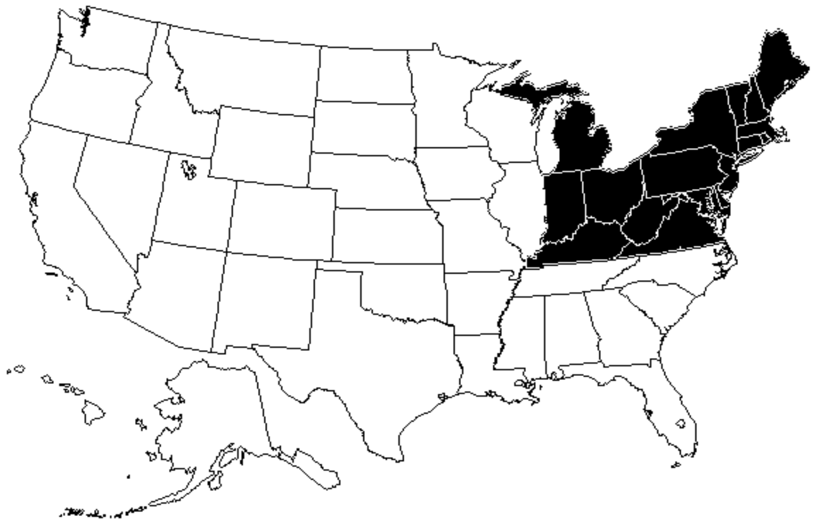


Figure 20.6 **Northeastern territory states**

9. Repeat steps 3 through 6 to combine the selected features.

10. Click on the Polygon Select tool.

11. Select the southeastern states shown in the following figure.

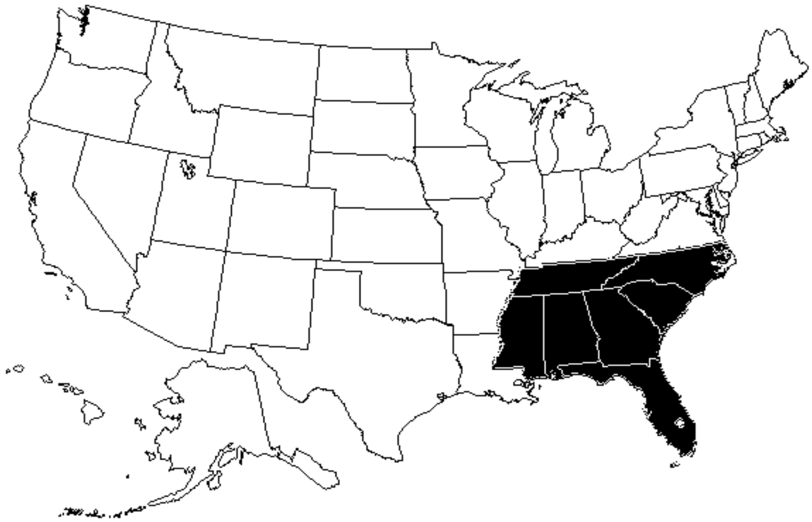


Figure 20.7 **Southeastern territory states**

12. Repeat steps 3 through 6 to combine the selected features.

    Atlas GIS combines the states to create the last region, which it places in the NATIONAL:TERRITORIES layer.

You've created four separate territories in the U.S., using the state boundaries. In the next exercise, you'll use a different method to create sales territories.

To prepare for the next exercise:

1. Right-click in the map frame to pop up the Layers & Themes dialog box.
2. In the Layers group box, turn off the NATIONAL:TERRITORIES layer.
3. Click OK.

Creating Territories Using Sales Data

If you have sales data for regions, you can use that data to create sales territories of approximately equal potential. In this exercise, you'll create a sales territory map of the United States, selecting the states for each territory based on sales figures. (You'll also color code the states.) To determine approximately what the sales amount should be for each territory, you'll determine the total sales for all of the states, then divide that figure by the number of territories you want to create.

As you define the territories, you might want to change the territory assignments for some states. To make this easier, you'll assign a value (territory name) to each of the states, then combine them based on this value. To assign a state to a different territory, you can just change the territory name for that state, and then combine the states by value once again. This saves you the trouble of reselecting all of the states for each territory.

Since you'll be combining the states based on an assigned value, you'll first select the states and assign them values (using TABLE | CALCULATE COLUMN). You won't actually combine the states to create the new regions until later, after you've assigned each state to a territory. This allows you to create the territories all at once, rather than one at a time, and to modify them easily later if desired.

Preparing the Map and Color Coding

Because you'll be defining the new regions based on sales data, you'll need to open the table containing the data before proceeding.

To prepare the states and data:

1. Open the US_SALES.DBF attribute table in the C:\AGISW\TUTORIAL directory.

   The Table Link dialog box pops up.

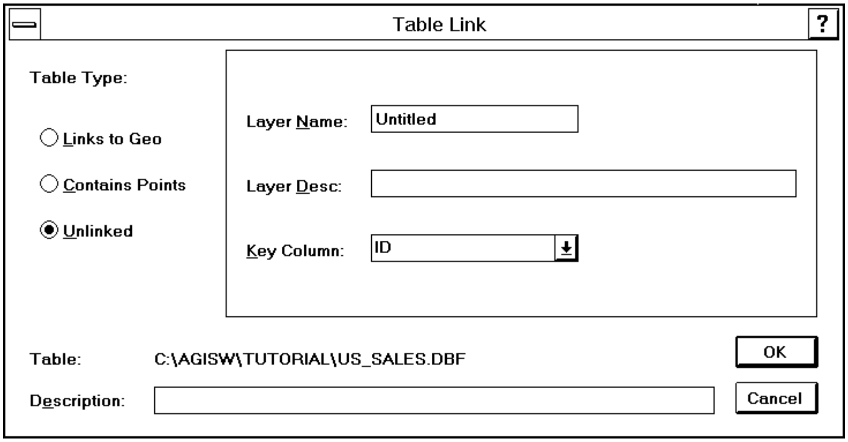


Figure 20.8 **Table Link dialog box**

2. From the *Table Type* options, click on the Links to Geo option button.

   The subpanel at the right changes to display the link options.

   This table contains sales figures for each state, so you'll link it to the layer containing the state regions.

3. In the *Layer* list box, choose 'NATIONAL:STATES'.

4. In the *Key Column* list box, choose 'STATE_ID'.

   Atlas GIS will use the entries in the STATE_ID column to link to the geo file.

5. Click OK.

   You'll create a column for the territory names now.

6. Choose TABLE | DEFINE COLUMNS (or click on the Define Col button).

   Since a table is not displayed in a Table window, the Table dialog box pops up. This dialog box allows you to specify the table to create the column in.

7. In the *Layer* list box, choose 'NATIONAL:STATES' and click OK.

   The Define Columns dialog box pops up.

8. In the *Name* column, click in the empty cell at the bottom.

   You'll enter the settings for the new table column here. Enter the settings for the column as shown in the following table.

DEFINITION	ENTRY
Name	TERRITORY
Type	String
Size	16
Dec	0
Description	Territory Name
Visible	Checked
Anchor	Unchecked
Width	16
Aggr	First
Weight	Empty

9. Click OK.

   A message pops up warning that the table will be restructured.

10. Click OK to proceed.

    The new column is added to the table. You'll open a Table window for the layer to see the new column.

11. Choose WINDOW | NEW TABLE WINDOW (or click on the Table button).

    The Window Layer dialog box pops up.

12. In the *Layer* list box, choose 'NATIONAL:STATES' and click OK.

13. In the Table window, scroll to see the new TERRITORY column you created.

Leave the Table window open, so that you can add and edit the territory names as you define the territories.

Now that you've created the column for the territory names, you can define a theme based on the entries that will be in the column. With the theme defined, the states will be color coded by territory name; you'll be able to see the territories without actually creating new regions, as you assign territory names to the states.

To define the theme:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

2. In the Layers group box, toggle the *Theme On* setting to 'Yes' for the NATIONAL:STATES layer.

   The subpanel below changes to display the theme options for the layer.

3. In the Variable 1 group box, type 'TERRITORY' in the *Expression* text box.

   The variable for the theme will be the territory name assigned to each state.

4. In the *Map Type* list box, choose 'Ranged Fill'.

   The states will be filled with colors, indicating the territories.

5. Click on the Ranges button to pop up the Ranged Fill dialog box.

6. In the Ranging group box, choose 'List of Values' in the *Method* list box.

   This method is especially useful when you have character data. It creates a ranged fill map in which you supply distinct data values (numeric or character) for each range. This method lets you specify ranges to match exact data values from the geo file or attribute table.

   You'll type the data values (territory names) in the subpanel at the bottom of the dialog box, after you specify the number of ranges. (You'll be defining four territories: Western, Central, Northeastern, and Southeastern.)

7. In the *Number of Ranges* text box, type '4'.

8. In the *Values* column (in the lower half of the dialog box), type the following values for each range:

   - For Range 1, type ‘Western’.
   - For Range 2, type ‘Central’.
   - For Range 3, type ‘Northeastern’.
   - For Range 4, type ‘Southeastern’.

   When a feature’s TERRITORY column value matches a specified range value, the feature is assigned to that matching range. So the Western region states will be in Range 1, Central in Range 2, and so on.

9. Click on the Calculate button.

   This updates the ranges and their statistics. Currently all values are out of range, since you haven’t assigned the territory names yet.

   Next you’ll set the range colors.

10. Click on the *Color* swatch for the first range.

    This pops up the Color dialog box, so you can choose the foreground color for the features in that range.

11. Choose ‘Yellow’ from the *Constant Colors* palette.

12. For Ranges 2, 3, and 4, click on the *Color* swatch and choose ‘Blue’, ‘Magenta’, and ‘Dark Green’, respectively (from the *Constant Colors* palette in the Color dialog box).

13. Click OK to return to the Layers & Themes dialog box.

14. Click OK.

You won’t be able to see the theme yet, since the TERRITORY column is still blank. After you place territory names in the column for various states and redraw the screen, those states will be color coded according to the theme you just defined.

Selecting the States for Each Territory

To determine approximately what the sales amount should be for each territory, you'll determine the total sales for all of the states, then divide that figure by the number of territories you'll be creating. First you'll select all of the states in the layer, then use the Statistics window to view the total.

To find the total sales for all states:

1. Choose QUERY | SELECT BY LAYER to pop up the Select By Layer dialog box.

2. In the *Layer*s list box, choose 'NATIONAL:STATES'.

3. From the *Action* options, click on the Select option button.

4. Click OK.

   This selects all the states (to get the total sales), and closes the dialog box.

5. Choose WINDOW | NEW STATISTICS WINDOW.

   The Window Layer dialog box pops up.

6. In the *Layer* list box, choose 'NATIONAL:STATES'.

7. Click OK.

   The Statistics window pops up, displaying summary statistics for the specified layer. Notice that the *Sum* value of the SALES is 248,709,873. If you divide this by four (the number of regions you'll create), the quotient is 62,177,468.25. You'll create four territories of approximately this size.

   Leave the Statistics window open. You'll use it throughout this lesson.

To begin defining the first territory, you'll select some states that you think ought to form a territory with approximately the desired sales.

To define the first territory based on sales data:

1. Click on the Polygon Select tool.

2. Select the states shown in the following figure.

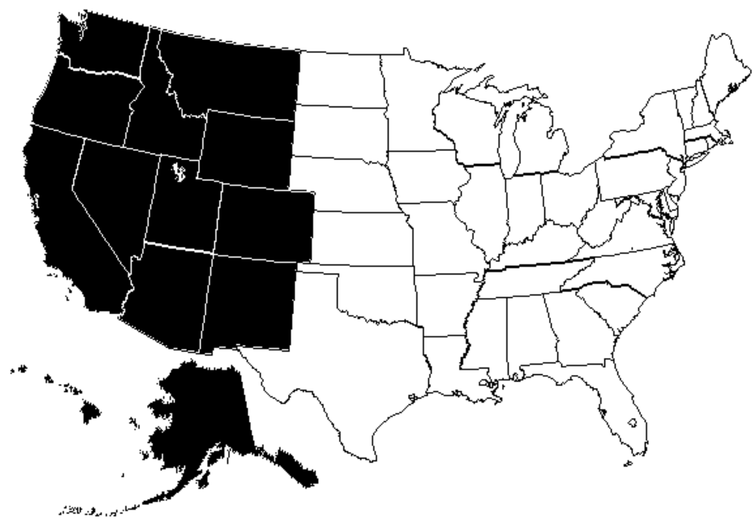


Figure 20.9 **Preliminary state selection for first territory**

In the Statistics window, notice that the *Sum* value for the SALES is now 52,786,082. This is a bit lower than the target, so you'll add another state to the selection to see how that affects the sum.

3. Make sure the Pointer tool is active, then SHIFT+CLICK on the state of Texas to add it to the selection.

   In the Statistics window, the *Sum* value for the SALES is now 69,772,592, which is much higher than the target. So you'll deselect Texas and try adding other states until you get a *Sum* value closer to the desired value.

4. CTRL+CLICK on Texas to deselect it, then SHIFT+CLICK to select the states shown in the following figure.

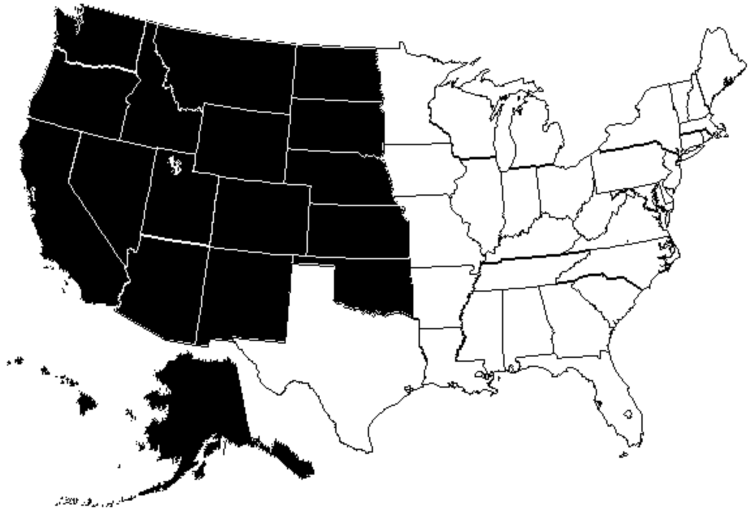


Figure 20.10 **Final state selection for first territory**

In the Statistics window, notice that the *Sum* value for SALES is now 61,322,430. This is very close to the desired value, so you'll create a new territory based on these selected states.

Since you'll be combining the states based on the territory names, you'll assign a territory name to the selected states.

5. Choose TABLE | CALCULATE COLUMN (or click on the Calc Col button) to pop up the Calculate Column dialog box.

   You'll choose the layer containing the table to calculate data for.

6. In the *Table* list box, choose 'NATIONAL:STATES'.

   The US_SALES.DBF attribute table is linked to this layer. The territory name for each state will be stored in the TERRITORY column of the US_SALES.DBF table.

7. In the Column group box, choose 'TERRITORY' in the *Column to Fill* list box.

8. Click on the Expression option button, and in the text box type ' "Western" '.

   Be sure to include quotation marks around the word Western. This specifies that the text inside the quotation marks will be entered in the column.

9. In the Rows group box, place a check in the *Selected Rows Only* box.

   This enters the specified value into the TERRITORY column for each selected feature.

10. Click OK.

    Atlas GIS enters the specified value in the TERRITORY column for the selected states and redraws the screen.

11. Click anywhere on the map to deselect the states.

The screen redraws, displaying each of the states in yellow, the specified color for states in the Western theme range.

In the next exercise, you'll select the states for the next territory, and assign the territory name to those states.

To define the second territory:

1. Click on the Polygon Select tool.

2. Select the central states shown in the following figure.

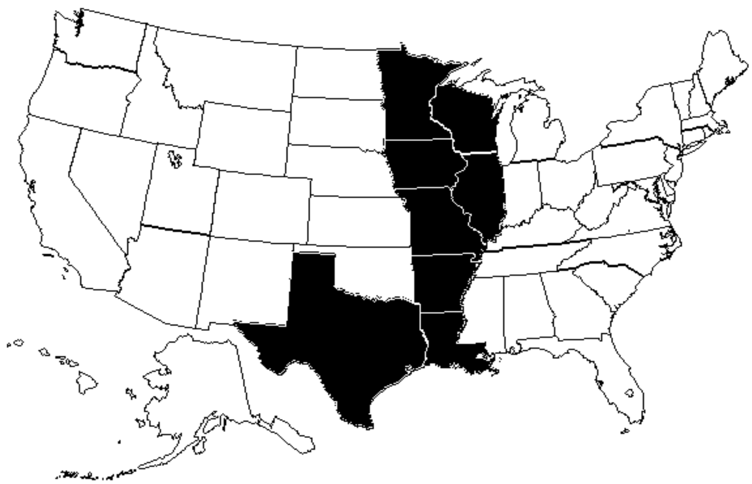


Figure 20.11 **Preliminary selection of states for central sales region**

In the Statistics window, notice that the *Sum* value for SALES is 52,148,506. This is below the target value, so you'll need to select one or more additional states to get the total closer to the target, if possible.

3. Use the Pointer tool and SHIFT+CLICK on Michigan to select it (or SHIFT+CLICK to place a check in the *Select* column for Michigan in the Table window).

   Notice that the *Sum* value for SALES is now 61,443,803. This is very close to the target figure, so you can go ahead and assign a territory name to each of the selected states, and then combine the states.

4. Choose TABLE | CALCULATE COLUMN (or click on the Calc Col button) to pop up the Calculate Column dialog box.
5. In the *Table* list box, choose 'NATIONAL:STATES'.
6. In the Column group box, choose 'TERRITORY' in the *Column to Fill* list box.
7. Click on the Expression option button, and type ' "Central" ' in the text box.

Be sure to type the quotation marks around the word Central.

8. In the Rows group box, place a check in the *Selected Rows Only* box.

9. Click OK.

   The word Central is inserted in the TERRITORY column for each of the selected states, and the screen redraws, coloring the states blue, the specified color for the Central theme range.

In the next exercise, you'll select the states for the northeastern territory and assign the territory name to those states.

To define the third territory:

1. Select the northeastern states shown in the following figure.

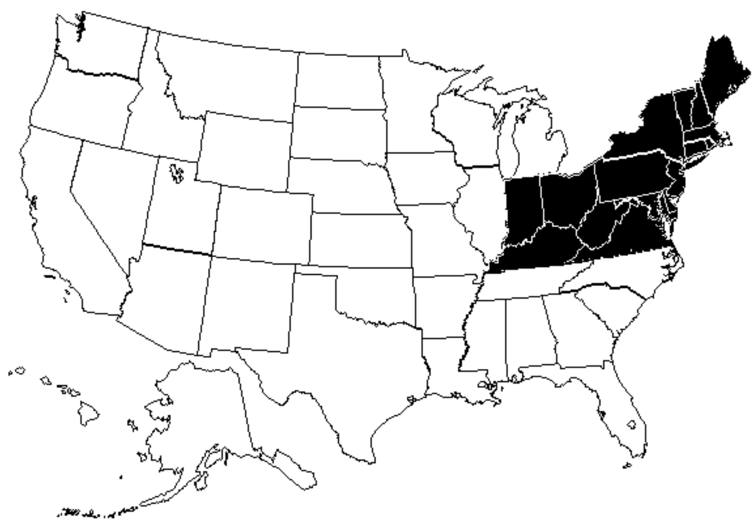


Figure 20.12 **Preliminary selection of states for northeastern sales region**

In the Statistics window, notice that the *Sum* value for SALES is 84,921,170. This is far above the target value, so you'll need to deselect one or more additional states to get the total closer to the target.

Feel free to deselect and reselect features to check the new total, making adjustments. For a list of features to deselect, refer to the next step.

2. Deselect the states in the following list. (Either CTRL+CLICK on each feature, or make sure there is no check in the *Select* column in the Table window for each of these states.)

    - Indiana
    - Kentucky
    - West Virginia
    - Virginia
    - Maryland
    - Washington, D.C.
    - Delaware

    The remaining selected states are shown in the following figure.

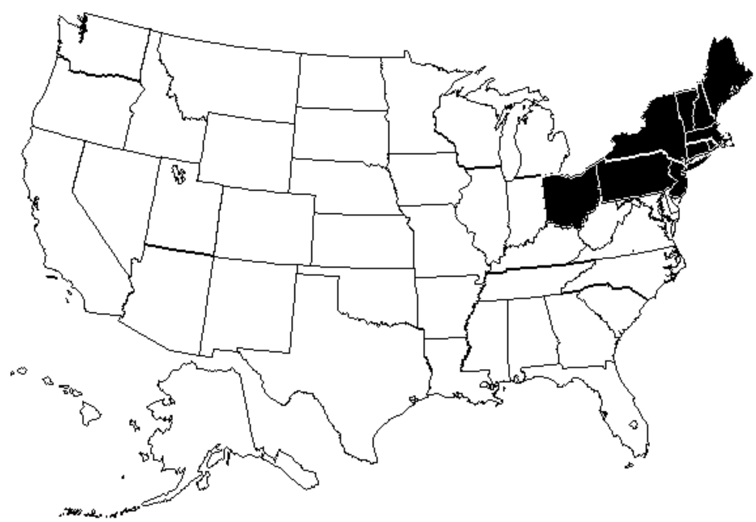


Figure 20.13 **Final selection of northeastern states**

Notice that the *Sum* value for SALES is now 61,656,344. This is very close to the target figure, so you can go ahead and assign the territory name "Northeastern" to each of the selected states.

3. Choose TABLE | CALCULATE COLUMN and assign the territory name "Northeastern" to the selected features.

   The word Northeastern is inserted in the TERRITORY column for each of the selected states, and the screen redraws, coloring the states magenta, the specified color for the Northeastern theme range.

You'll now define the fourth territory, and make minor adjustments (reassigning states) to balance out the territories.

To define the fourth territory:

1. Select the remaining states, as shown in the following figure.

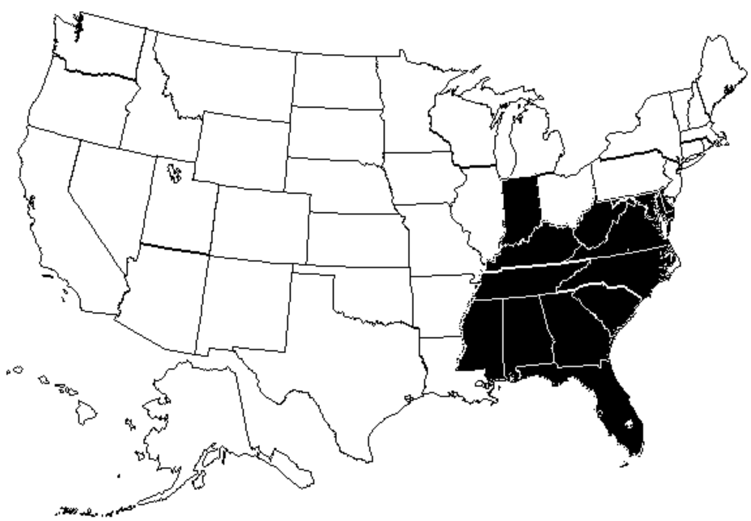


Figure 20.14 **Selection of southeastern states**

2. Choose TABLE | CALCULATE COLUMN and assign the territory name "Southeastern" to the selected features.

   The word Southeastern is inserted in the TERRITORY column for each of the selected states, and the screen redraws, coloring the states dark green, the specified color for the Southeastern theme range.

   Notice that the sum is 64,287,296. This is a little higher than the desired target. To achieve a better balance between the territories, you'll compare the overall values for the territories so far, and check the sales for some of the states to see which ones might be reassigned to different territories.

   The total for the Northeastern region is 61,656,344, which was a little lower than the target. So you might assign a state from the Southeastern region to the Northeastern, to balance out the totals. Since the difference isn't very much, you'll want to find a state with fairly low sales, relative to the other states. You may have noticed while making selections that Delaware has relatively low sales (666,168); you'll reassign it to the Northeastern region.

3. In the Table window, type 'Northeastern' in the TERRITORY column for the state of Delaware.

You're finished with the Table window and the Statistics window, so you can close them before proceeding.

Creating the New Territories

Now that the territories are fairly balanced, you'll combine the states by value to create the new territory regions.

To combine the states to create the new regions:

1. Choose MAP | COMBINE BY VALUE to pop up the Combine By Value dialog box.

2. In the Combine Features From group box, choose 'NATIONAL:STATES' in the *Layer* list box.

3. In the *Grouping Expression* text box, type 'TERRITORY'.

This will combine all features that have the same value in the TERRITORY column. Therefore, all of the features with “Western” will be combined to create a new region, as will all those with “Central,” “Northeastern,” and “Southeastern.” In total, four different regions will be created.

4. Make sure the *Selected Features Only* box is unchecked.

5. Place a check in the *Combine Non-Touching* box.

   This will combine all of the features (states) that have the same value in the TERRITORY column into one region, whether or not they touch. The features don’t have to be touching to be combined, so non-touching states (like Alaska and Hawaii) can be included.

   Since the territory boundaries follow the state boundaries, you’ll create a new layer for the territory, to make it easier to distinguish the features. You’ll also create a new table (linked to the layer) so that the attribute data linked to the states will be aggregated to the new regions.

6. In the Copy Results To group box, click on the New Layer button to pop up the New Layer dialog box.

7. In the *Layer Type* list box, choose ‘Region’.

8. In the *File Name* list box, choose ‘NATIONAL.AGF’.

   The new layer will be created in the NATIONAL.AGF geo file.

9. In the *Layer Name* text box, type ‘SALES_REGIONS’.

   The new layer name will be NATIONAL:SALES_REGIONS.

10. In the *Description* text box, type ‘Sales Regions’.

11. Click OK.

    This creates the new layer and closes the New Layer dialog box, returning you to the Combine By Value dialog box. Next you’ll create a new table for the data that will be aggregated from the states for the new regions.

12. In the Copy Results To group box, click on the New Table button to pop up the New Table dialog box.

13. In the *File Name* text box, type 'SALESREG.DBF'.

    The directory for the file is shown above the *File Name* text box. If you wanted to create the new table in a different directory, you could click on the File Name […] button to pop up the New Table Name dialog box, which allows you to change directories.

14. In the *Description* text box, type 'Sales Region Data'.

15. Click on the Copy Columns from Table option button, and choose 'US_SALES.DBF' in the list box.

    This creates a new table with the same columns as US_SALES.DBF.

16. In the *Link to Geo Layer* list box, choose 'NATIONAL:SALES_REGIONS'.

17. Click OK.

    The new table is created, and you're returned to the Combine By Value dialog box.

18. In the Copy Results To group box, choose 'NATIONAL:SALES_REGIONS' in the Layer list box.

19. Click OK.

    A progress message displays while Atlas GIS combines the features. This can take a while.

Atlas GIS combines the states to create four new regions, which it places in the NATIONAL:SALES_REGIONS layer. The attribute data for the states is automatically aggregated to the new regions as well. You can view this data in the Table window. (It's linked to the new layer.)

To see the new regions more clearly, right-click in the map frame to pop up the Layers & Themes dialog box, and specify a thicker line style for the layer.

End of Lesson

Don't save your files before proceeding. Instead, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes) to close the open files and reset the Page window for the next lesson.

21

Performing Site Selection

You can use Atlas GIS when selecting sites, whether for new store locations, manufacturing sites, distribution outlets, seminars, or whatever your application may be. With Atlas GIS, you can analyze data based on geographic relationships, and you can create new features and new data (for example, you can create buffers around existing locations and aggregate data to the buffers). Using the Atlas GIS tools, you can take the guesswork out of your site selection process and make informed decisions.

In this lesson, you'll be selecting ten cities for seminars based on the number of customers in and around those cities. You'll import your customer data and geocode the locations, so they display on the map. Then you'll create buffers around the cities, and aggregate the customer count to each buffer. To find the ten cities with the highest concentration of customers, you'll create a theme map of the buffers.

Importing Your Data

In this exercise, you'll open your customer database and geocode to ZIP code centroids, so that the locations display on the map.

To prepare for the lesson:

1. Open the RINGSTDY.PRJ project file (located in C:\AGISW\TUTORIAL).

   This opens the US_STATE.AGF geo file, which contains U.S. states and major cities. It also opens the US_CITY.AGF geo file, which contains a subset of the major cities in the US_STATE.AGF geo file. The exercises in this lesson modify the geo files, so you need to save the geo files under another name.

2. Choose FILE | SAVE AS to pop up the Save As dialog box.

3. In the *File to Save* list box choose 'US_STATE.AGF'.

4. In the *File Name* text box, type 'SITESTAT.AGF'.

5. Make sure the *Selected Features or Rows Only* box is unchecked.

6. Make sure the *Use New File* box is checked.

7. Click OK.

   This copies the US_STATE.AGF file to SITESTAT.AGF, and closes the original geo file.

8. Choose FILE | SAVE AS again.

9. In the *File to Save* list box choose 'US_CITY.AGF'.

10. In the *File Name* text box, type 'SITECITY.AGF'.

11. Make sure the *Selected Features or Rows Only* box is unchecked.

12. Make sure the *Use New File* box is checked.

13. Click OK.

    This copies the US_CITY.AGF file to SITECITY.AGF, and closes the original geo file.

In this lesson, you'll be selecting ten cities for seminars, based on the number of customers in and around those cities. You'll need to open the customer database next.

To open the customer database and geocode it:

1. Open the SEMINAR.DBF file in the C:\AGISW\TUTORIAL directory.

   When you choose 'Table (*.dbf)' in the *List Files of Type* list box, the *File Name* list box displays all files with the extension .DBF in the current directory, including tables and dBASE files not yet opened as tables in Atlas GIS.

Note: The SEMINAR.DBF file is a dBASE file. Many applications can create dBASE-compatible files, which you can open directly in Atlas GIS. You can also import Excel, Lotus, or ASCII text files.

When you click OK, the Table Link dialog box pops up.

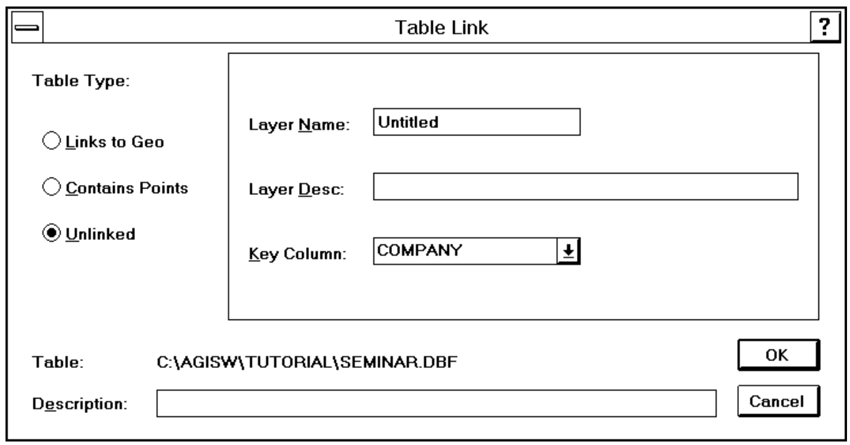


Figure 21.1 **Table Link dialog box**

The information you enter in this dialog box is used to create a .COL file. This .COL file stores the table settings and enables Atlas GIS to use the database file as a table.

For your convenience, the SEMINAR.DBF file already has columns (X_COORD and Y_COORD) for the geographic coordinates. When you're opening your own files, you'll probably need to open the table and allow Atlas GIS to add the longitude and latitude columns before you can geocode it as a point table. Refer to Lesson 16, "Matching Locations to the Map," for an example.

2. In the Table Link dialog box, click on the Contains Points option button.

   The subpanel displays the options for opening a point table.

3. In the *Layer Name* text box, type 'CUSTOMERS'.

   This assigns a name to the layer. Point tables are treated as separate layers. Naming the table allows you to identify it easily when it's displayed in a Table window, or in a list of layers (for example, in the Layers & Themes dialog box).

4. In the *Layer Desc* text box, type 'Customers for Seminar'.

   The text you type here describes the type of points that the layer contains.

5. In the *Key Column* list box, choose 'COMPANY'.

   This specifies the key column for the table (so that each point in the table can be uniquely identified).

6. In the *Longitude or X* list box, choose 'X_COORD'.

   During geocoding, Atlas GIS will insert the x-coordinate values in this column.

7. In the *Latitude or Y* list box, choose 'Y_COORD'.

   During geocoding, Atlas GIS will insert the y-coordinate values in this column.

8. In the *Values Are* list box, accept the default setting.

   This specifies the projection to be used for the point coordinates. (Since the columns are empty, you can accept the default.) During geocoding, Atlas GIS will insert the coordinates using in the same map projection as any open geo file or point table. When no geo files or point tables are open, you can specify the projection for the coordinates.

   Note: When you're opening a table that already contains point coordinates, it's important to indicate the projection of the coordinates.

   At the bottom of the Table Link dialog box, notice that the *Table* field shows the name of the new table, SEMINAR.DBF. There's a text box below it for a description of the table (file).

9. In the *Description* text box, type 'U.S. Customers'.

10. Click OK.

A message pops up warning that the table is in a different projection than the open file.

11. Click OK to have Atlas GIS change the table's projection.

    Atlas GIS changes the table's projection, then opens the table (using the original database file). Your edits will be made in the original .DBF file, and the table settings will be stored in the .COL file.

    You can view the new table in a Table window.

12. Choose WINDOW | NEW TABLE WINDOW (or click on the Table button).

    The Window Layer dialog box pops up.

13. In the *Layer* list box, choose 'SEMINAR:CUSTOMERS'.

14. Click OK.

Matching Your Customer Locations to a Map

Once you've imported your database, you're ready to geocode the customers, creating points that can be displayed on the map. (For more detailed information on geocoding, refer to the *Reference Manual*, under TABLE | GEOCODE TO ZIP .)

To match your customer locations to a map:

1. Choose TABLE | GEOCODE BY ZIP to pop up the Geocode By ZIP dialog box.

2. In the *Table to Geocode* list box, choose 'SEMINAR:CUSTOMERS'.

3. In the *ZIP Code Column* list box, choose 'ZIP5'.

   This tells Atlas GIS to look in the ZIP5 column to find the ZIP code for each table row. Atlas GIS will then assign the ZIP code's centroid coordinate to the row, so that it can display as a point on the map.

4. In the *Rows to Geocode* group box, click on the All Rows option button.

Since the table doesn't yet contain any coordinates, you'll geocode all rows in the table.

5. Click OK.

   Atlas GIS assigns the ZIP code centroids to the locations. A message appears indicating the status and final results of the process.

6. Click OK to close the message box.

To view the results:

- To view the points on the map, click on the Redraw button on the status bar (or choose VIEW | REDRAW).

All the matched points are displayed on the map, which should look like the following figure.

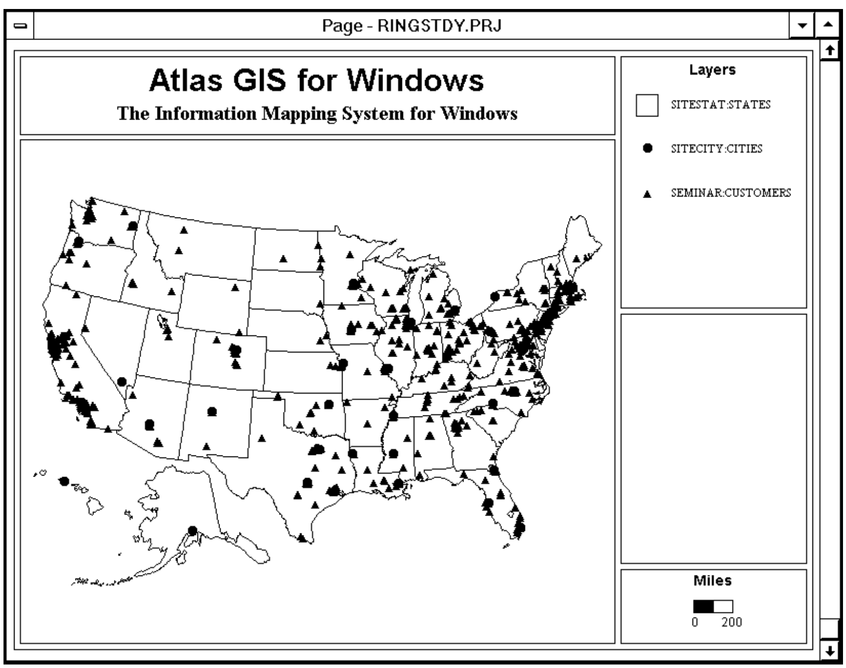


Figure 21.2 **Distribution of prospective customers**

If you view the table again in the Table window, you'll notice that the coordinate values for each location have been added to the table.

Creating Buffers Around Cities

To determine how many customers are located within a certain distance of each city, you'll create buffers around the cities and aggregate the customer count. For this exercise, we've narrowed down the number of cities for you and created a special geo file with a limited number of cities. We've done this to provide you with a shortcut for this lesson, rather than having you select a large number of features and create buffers around them. When you narrow down the cities, it's easier to distinguish the top cities, and the map is easier to view as well.

When you perform your own site selection, you'll probably want to narrow down the number of cities (or other locations) before creating buffers. You can do this by selecting the cities you want to evaluate, and then creating buffers only around those selected features. This is especially useful when major cities are located very near each other, and you only want to consider one of them. For example, you might select the one with the larger airport, if you think customers will be more willing to travel there. You'll need to make those decisions based on your own needs and criteria.

For this exercise, we've created a new geo file called SITECITY.AGF, which contains a limited number of cities. These cities are in the SITECITY:CITIES layer of the project file. For this lesson, you'll turn on this layer, and turn off the other cities layer.

To toggle the city layers:

1. Right-click in the map frame to pop up the Layers & Themes dialog box.
2. In the Layers group box, turn off the SITESTAT:CITIES layer.
3. Turn on the SITECITY:CITIES layer.
4. Click OK.

Now that the limited number of cities is displayed on the map, you can create buffers around those cities.

To create buffers around cities:

1. Choose MAP | CREATE BUFFERS to pop up the Create Buffers dialog box.

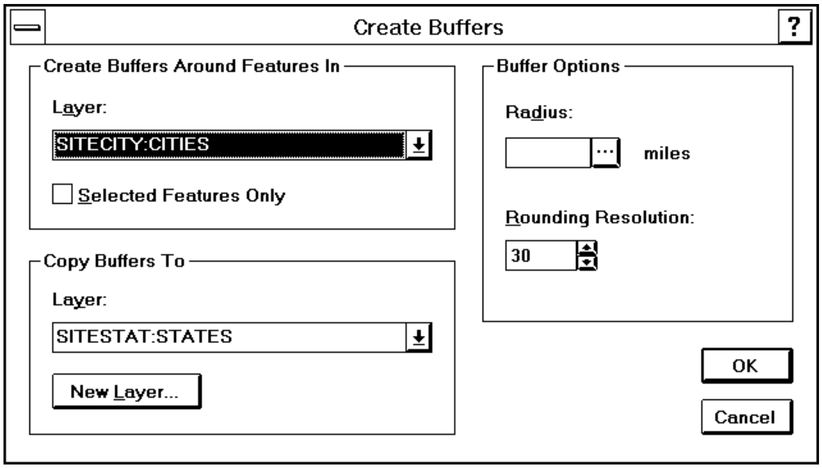


Figure 21.3 **Create Buffers dialog box**

2. In the Create Buffers Around Features In group box, choose 'SITECITY:CITIES' in the *Layer* list box.

3. Make sure the *Selected Features Only* box is unchecked.

   This specifies that you want buffers around all of the cities.

4. In the Copy Buffers To group box, click on the New Layer button.

   This pops up the New Layer dialog box.

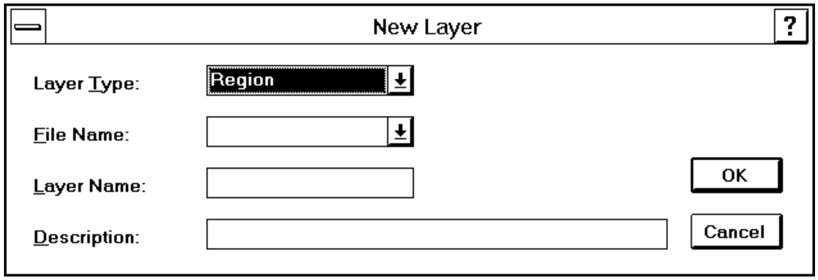


Figure 21.4 **New Layer dialog box**

5. In the *Layer Type* list box, choose ‘Region’.

   The buffers will be regions, so the new layer has to be a region layer.

6. In the *File Name* list box, choose ‘SITECITY.AGF’.

   This adds the new layer to the SITECITY.AGF geo file.

7. In the *Layer Name* text box, type ‘BUFFERS’.

   The new layer name will be SITECITY:BUFFERS.

8. In the *Description* text box, type ‘100-mile Buffers’.

9. Click OK.

   The new layer is created, and the New Layer dialog box closes, returning you to the Create Buffers dialog box.

10. In the Copy Buffers To group box, choose ‘SITECITY:BUFFERS’ in the *Layer* list box.

11. In the Buffer Options group box, type ‘100’ in the *Radius* text box.

    This will create a 100-mile radius buffer around each of the cities.

12. In the *Rounding Resolution* text box, type ‘60’.

    Each buffer is actually a circular region made up of 60 points.

13. Click OK.

    Atlas GIS creates the buffers around the cities and redraws the map.

14. Click anywhere on the map to deselect the buffers.

Counting the Customers Within Each Buffer

Since you're planning seminars, you'll want to offer them in the areas where you'll have the highest potential attendance. To do this, you need to identify the areas that have the highest number of customers. In this exercise, you'll count the number of customers in each buffer.

To aggregate the customer data to the buffers:

1. Choose TABLE | AGGREGATE DATA to pop up the Aggregate Data dialog box.

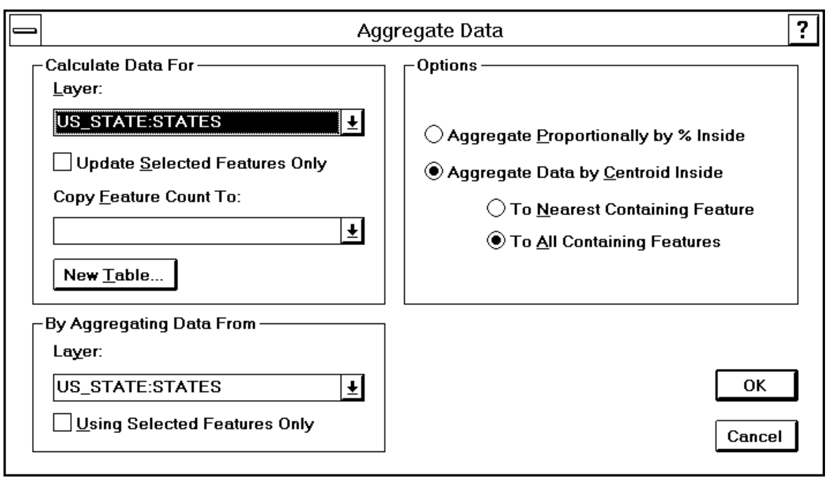


Figure 21.5 **Aggregate Data dialog box**

2. In the Calculate Data For group box, choose 'SITECITY:BUFFERS' in the *Layer* list box.

3. Make sure the *Update Selected Features Only* box is unchecked.

Next you'll create a table for attribute data for the buffers. For example, the number of customers located in each of the buffer regions will be stored in the COUNT column you create in this new table.

4. Click on the New Table button to pop up the New Table dialog box.

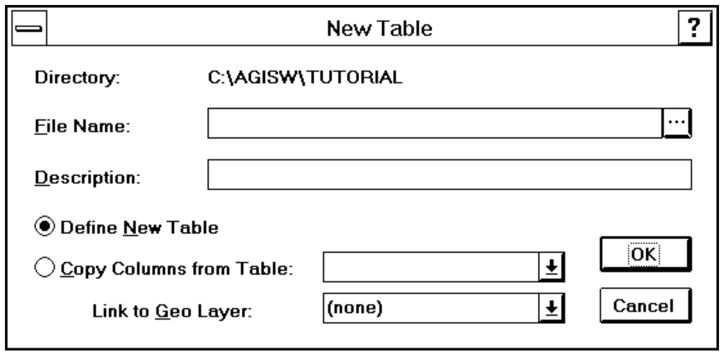


Figure 21.6 **New Table dialog box**

5. In the *File Name* text box, type 'BUFFERS.DBF'.

   The directory for the file is shown above the *File Name* text box. If you wanted to create the new table in a different directory, you could click on the File Name […] button to pop up the New Table Name dialog box, which allows you to change directories.

6. In the *Description* text box, type 'Seminar Data—100-Mile Buffers'.

7. Click on the Define New Table option button.

8. Click OK.

   The New Table dialog box closes, and the Define Columns dialog box pops up.

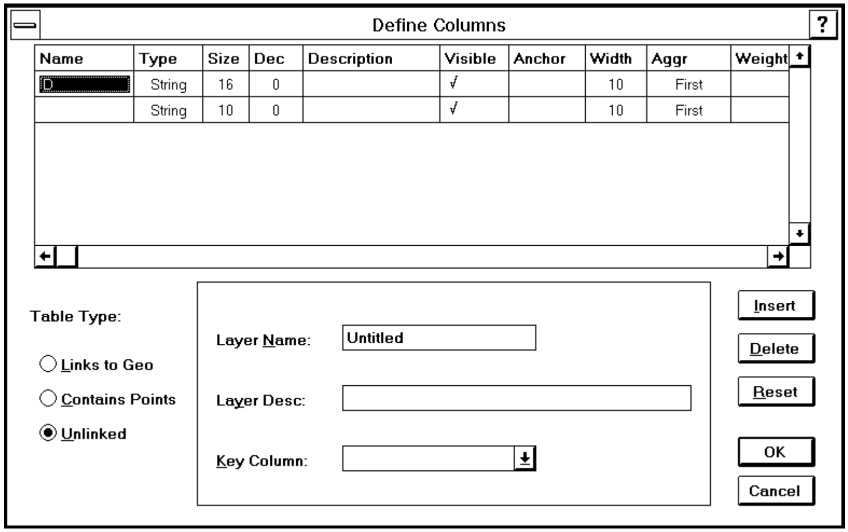


Figure 21.7 **Define Columns dialog box**

9. Click in the first empty cell in the *Name* column.

   This first cell (in the first row) should be the ID entry; click in the cell below that. You'll enter the settings for the new table column here. Enter the settings for the column as shown in the table below.

DEFINITION	ENTRY
Name	COUNT
Type	Float
Size	5
Dec	0
Description	Customers Within 100 Miles
Visible	Checked
Anchor	Unchecked
Width	5
Aggr	Sum
Weight	Empty

10. In the *Table Type* options, click on the Links to Geo option button.

11. In the *Layer* list box, choose 'SITECITY:BUFFERS'.

12. In the *Key Column* list box, choose 'ID'.

13. Click OK.

    The new table is created with the column you specified, as well as an ID column. (This was the first entry in the Define Columns dialog box. You accepted all of the defaults for the ID column; you didn't change any of the settings.)

    You're now returned to the Aggregate Data dialog box, where you can finish specifying the settings. You left off in the Calculate Data For group box.

14. In the *Copy Feature Count To* list box, choose 'COUNT'.

    The number of customers in each buffer will be counted and placed in the COUNT column.

15. In the By Aggregating Data From group box, choose 'SEMINAR:CUSTOMERS' in the *Layer* list box.

    Atlas GIS will aggregate the data from the customer features to the buffer regions.

16. Make sure the *Using Selected Features Only* box is unchecked.

17. In the Options group box, click on the Aggregate to All Containing Features option button.

    This specifies that any customers in areas where buffers overlap will be counted in all of the buffers that contain them. It doesn't matter that they'll actually be counted twice (once for each city), since they would probably go to either city for the seminar if they're in that city's buffer.

    In your own applications, if you don't want customers counted more than once, you can aggregate the data to the nearest containing feature instead. (This means the data will be aggregated to the buffer whose center is closer.)

18. Click OK.

The number of customers in each buffer is calculated. You can use this data to determine which cities will be best for seminars.

Creating a Theme Map for the Buffers

To determine the cities with the highest potential attendance, you'll create a theme map of the buffers, indicating the ten cities with the highest number of customers, the next ten cities, and all remaining cities.

To create a theme map for the buffers:

1. Right-click anywhere in the map frame to pop up the Layers & Themes dialog box.

2. In the Layers group box, choose the 'SITECITY:BUFFERS' layer.

3. Click on the Theme option button to display the Theme subpanel.

4. Place a check in the *Theme On* box.

5. In the Variable 1 group box, type 'COUNT' in the *Expression* text box.

6. In the *Map Type* list box, choose 'Ranged Fill'.

7. Click on the Ranges button.

   The Ranged Fill dialog box pops up.

8. In the Ranging group box, choose 'Counts' in the *Method* list box.

   The Counts method creates a ranged map in which you supply the number of data values that each range will contain. If the numbers that you enter don't equal the total count of values, the remaining values are listed as out of range. This method is essentially the same as the Quantiles method, except that you can fine-tune the range size.

   You'll want to identify the top ten cities, the next ten cities, and the remaining ones. You'll specify three ranges to categorize the cities accordingly.

9. In the *Number of Ranges* text box, type '3'.

Atlas GIS automatically enters the minimum and maximum data values in the *Minimum Value* and *Maximum Value* text boxes.

10. Make sure the *Minimum Value* text box is set to ‘0’.

11. Make sure the *Maximum Value* text box is set to ‘125’.

12. Click on the Calculate button.

    In the lower part of the dialog box, Atlas GIS has calculated the ranges based on the new settings.

13. In the *User #* column, type the values indicated below for each range:

    - For Range 1, type ‘17’.
    - For Range 2, type ‘10’.
    - For Range 3, type ‘10’.

    Since you want to find the ten cities with the highest number of customers, you need to specify a count of ‘10’ in the range with the highest values, which is Range 3. To find the ten next highest cities, you need to specify ‘10’ for the range with the next highest values, which is Range 2. All remaining cities (17) are in Range 1.

14. Click on the Calculate button again, to update the ranges.

    After specifying the number of counts for each range, you’ll specify the theme colors.

15. Click on the *Color* sample for Range 1, and choose ‘Yellow’ from the *Constant Colors* palette.

16. For Range 3, choose ‘Red’.

17. Click on the Smooth button at the right of the dialog box.

    This smooths the colors, so the highest range will be red, the lowest range will be yellow, and the middle range will be orange.

18. Click OK.

The Ranged Fill dialog box closes, returning you to the Layers & Themes dialog box.

For this exercise, you won't bother defining the theme legend, since you won't be using the map for presentation purposes. In your own applications, however, you might want to specify the theme legend settings. For example, you might change the legend title, and specify a descending sort order, so that the "Top 10" range appears at the top of the list. You might also customize the range descriptions. For more information on specifying the theme legend settings, refer to Lesson 11, "Creating Theme Maps," and to the on-line help.

19. Click OK.

The theme map shows the ten city buffers with the highest concentration of customers in red. You'll definitely want to hold seminars in those cities. The cities in orange are also possibilities, with the next highest concentration. You can eliminate the yellow cities, which have the lowest numbers.

Note: The method used in this lesson is not the only way you can perform site selection. There are a variety of ways you can do this, and you should use whatever method meets your needs best. For example, you could select the ten cities for the seminars by using TABLE | AGGREGATE DATA to do point-near-point aggregation using a distance of 100 miles. You could then make a ranged symbol map using different sizes, colors, or symbols for the top 10 and next 10 cities, and setting the style for the lowest count range so that those cities don't appear at all. When you perform site selection, choose whatever method you find easiest to use.

End of Lesson

Before proceeding, choose FILE | NEW | PROJECT (and choose 'No' if prompted to save changes). This will close the open files and reset the Page window.

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