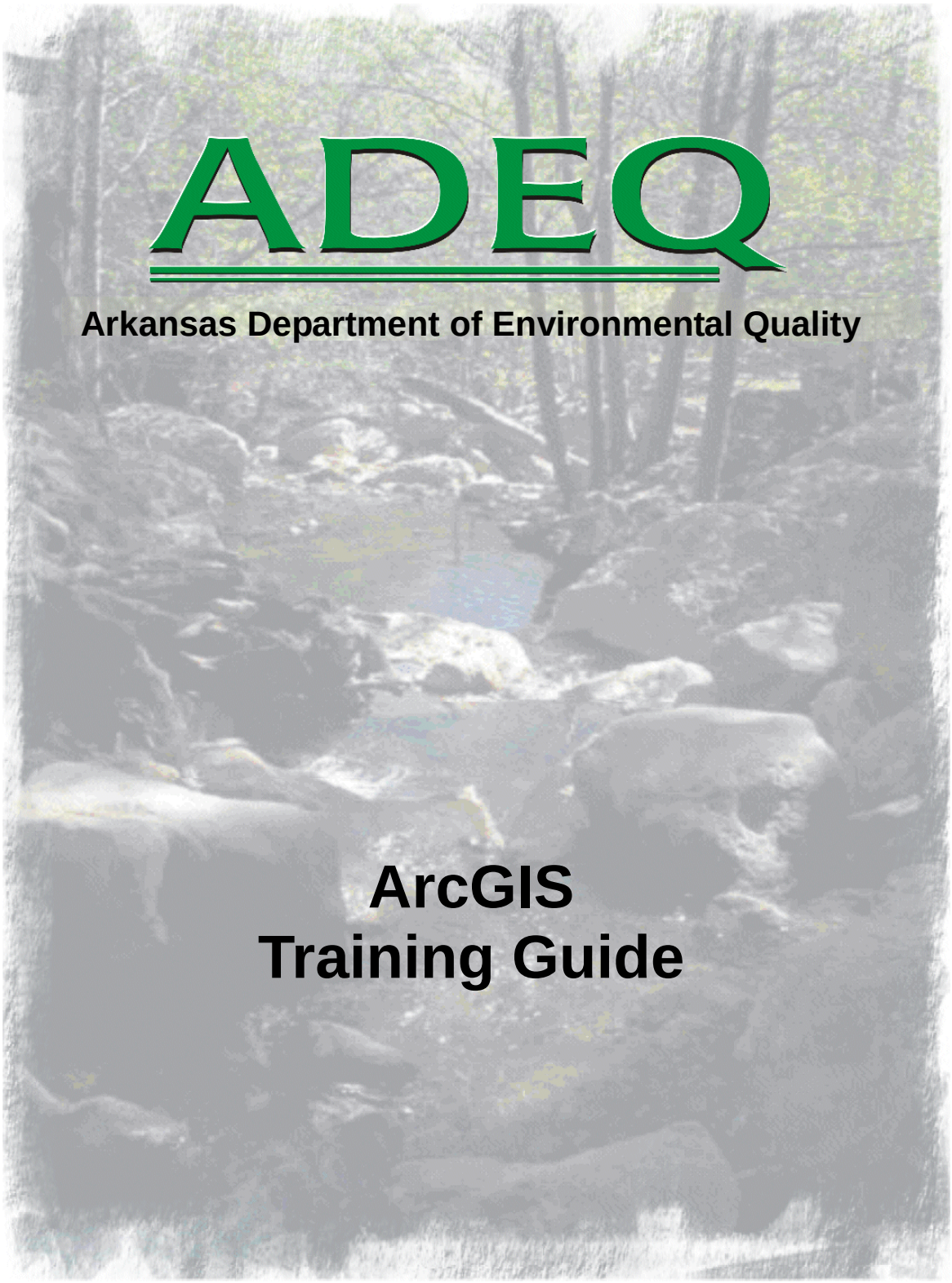

ADEQ

Arkansas Department of Environmental Quality

ArcGIS
Training Guide

Screenshots for this were created in ArcGIS version 9.1.

Revision Date: 3/31/2006

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Address comments or questions to Randy Puckett.

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Chapter 1: INTRODUCTION

Why Am I Here?

We can't tell you what your grand purpose in life might be, but you're learning about ArcGIS because of the potential to create maps, analyses, and reports using accurate locational data.

As part of the commitment by ADEQ to collect locational information for our permitted facilities, we have amassed an incredible amount of Global Information System (GIS) data. The first part of this effort was to collect the data; the second and more interesting part is putting it to use.

If you weren't among those who collected GIS data, here's what we've been doing. A collector (usually one of our inspectors) goes to a permitted facility with a device that interacts with satellites in the Global Positioning System (GPS—see below).

The collector stands at the point of the permitted item, such as a tank or for larger facilities a landmark such as the front gate. The GPS device "pings" nearby satellites and determines the exact latitude and longitude of the facility. The collector then downloads this information into our computers.

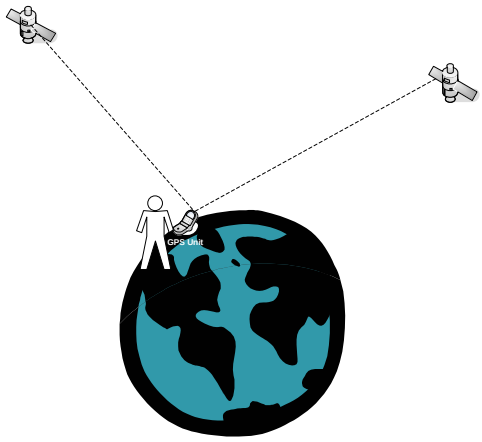

Figure 1-1: GPS Units Triangulate Satellite Readings

What's the Difference Between GPS and GIS?

The United States Department of Defense (USDOD) developed the Global Positioning System (GPS) for military purposes, to accurately determine a precise location anywhere in the world. The system that we refer to as **GPS** is made up of these satellites as well as GPS receivers—whether they are hand-held or the devices and chips inside cars, cell phones, and expensive pets.

The data from GPS receivers is downloaded into a database. This collection of locational data is referred to as **GIS** data, but the term "GIS" refers to more than the data—it also includes the systems used to handle the data. To put it another way, all locational data or software that manipulates this data is part of the Global Information System (GIS).

Overwhelmed with acronyms? Just remember that GPS is the system of satellites and receivers. GIS is the data we get from the receivers and the software used to manage the data.

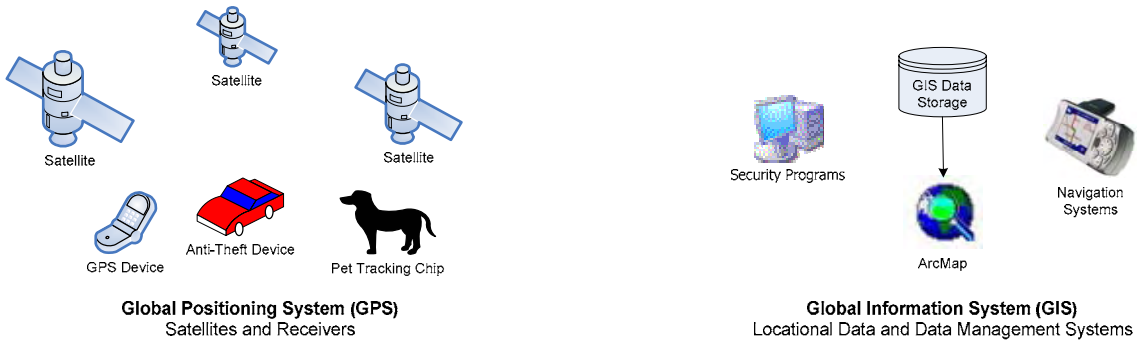

Figure 1-2: GPS versus GIS

What Happens to Our GIS Data?

We add value to our GIS data by entering detailed information in the Permit Data System (PDS). In this way, we have more than just dots on a map—each dot, or *node*, has several layers of meaning. For example, data from complaint sites can be used to create a map of those sites by state, city, or county. We can even assign different colors to complaints according to their status. The more information we have, the more we can do with it.

The GIS data we've collected is combined with other data that we obtain or purchase. For example, ADEQ is in the process of sharing our permit GIS data with the Department of Health and Human Services (DHHS). In exchange they'll give us access to their Wellhead Protection GIS data.

We also use commercial data purchased from the Environmental Systems Research Institute (ESRI). As it so happens, ESRI is also the maker of ArcMap, ArcCatalog, and a number of other GIS products. This data includes important features such as aerial views of Arkansas, topographical data, and various types of attributes such as roadways and waterways.

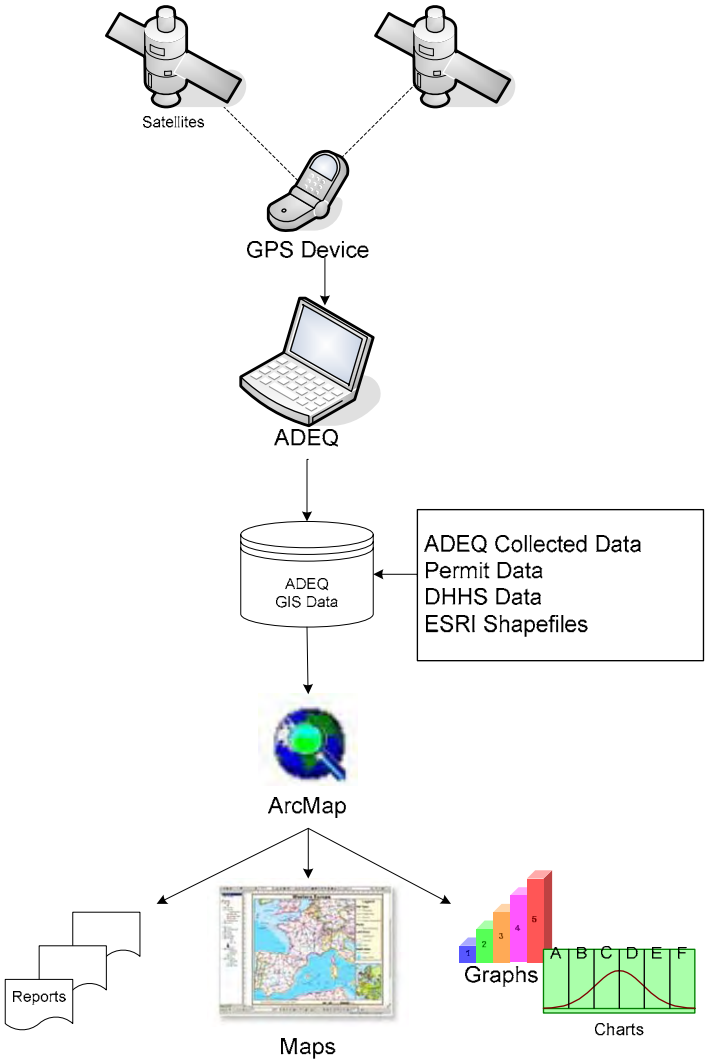

Figure 1-3: How GIS Data is Used at ADEQ

What is ArcCatalog and ArcMap?

ArcCatalog provides a way to access and manage all our GIS data. We use *shapefiles* in ArcMap, which are actually combinations of several linked files that ArcCatalog sees and manages as one object. For example, all roadways are combined into one shapefile, but that file contains layers of roads by type. You can create a map displaying only the major highways in the shapefile, or every little lane and byway in a four mile area. It's all there, and easy to find and manage.

We will begin our exercises by using ArcCatalog to locate an aerial view of Arkansas and its counties. We'll then open this layer within ArcMap and add attribute data, such as waterways and Interstate highways. We can then add other data layers containing attributes such as city populations and pollution control indexes.

ArcMap enables us to make maps that are not only functional, but informative. For example, we can view population as a single dot (or node) for each city, with different colors for various ranges of population. We can control the transparency of the waterway layer, move it underneath other layers, or delete it altogether. You'll find that manipulating data in ArcMap is easy once you learn the basic principles of each data type.

This class is divided into five sessions. Each session contains several exercises that we'll work through together. You can then take your manual with you to practice more at your desk or refresh your memory later on.

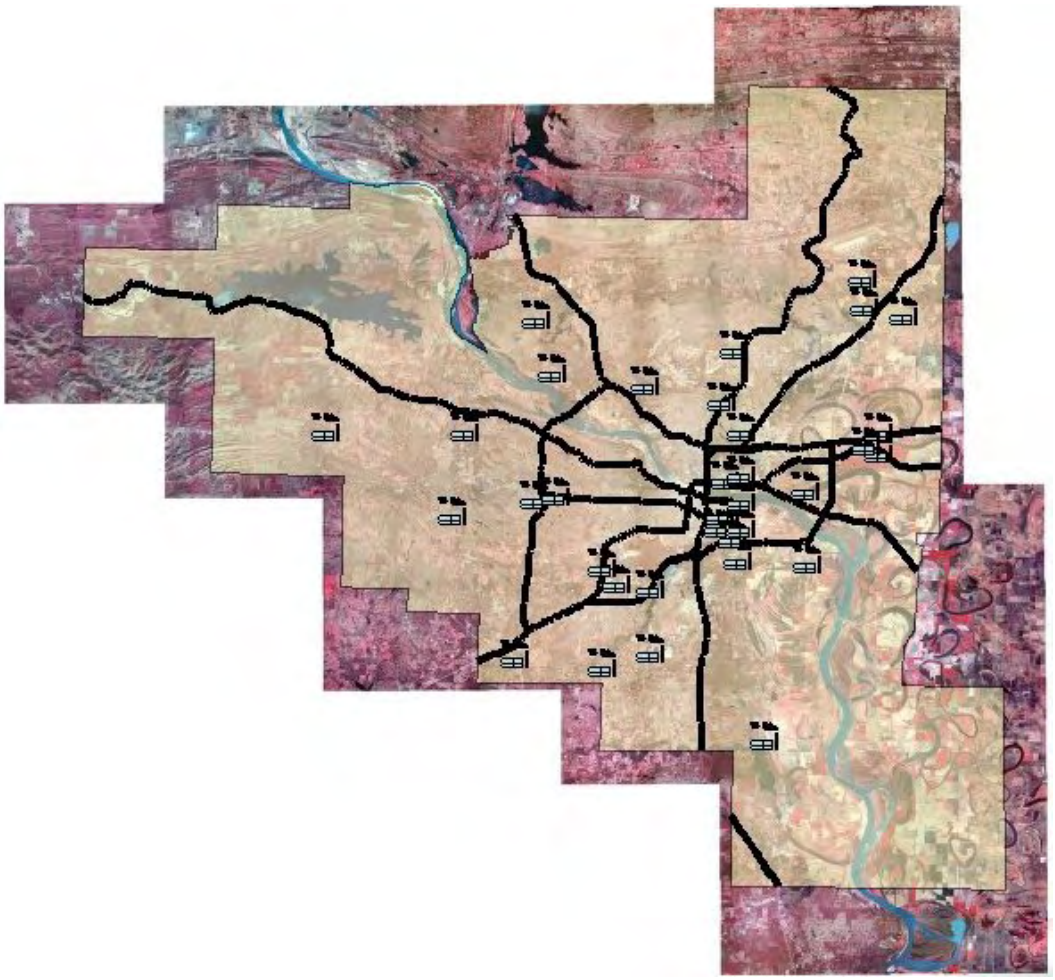

Figure 1-4: Air Permits in Pulaski County

Chapter 2: MANAGING YOUR DATA

ArcCatalog is similar to Windows Explorer, in that it enables you to view and manage the data you'll use in ArcMap. Since the process of creating maps requires a great deal of data management, ArcCatalog was specially designed for this task. Why? Well, you may remember from the Introduction that an ESRI shapefile is actually a group of files bundled together. When you view these files in Windows Explorer, you can see all of them listed separately—what a hassle! In ArcCatalog, they all appear as one shapefile, and can be moved or copied using a simple drag-and-drop method.

In this session, we'll connect ArcCatalog to the folders we need and then copy some GIS data to our own personal folders. Then we'll create a simple map and add a few layers of data. Finally, we'll learn how to import permit data from the Permit Data System (PDS) and create a query to view only the information we want. Sound tricky? You'll be a map expert before you know it!

This exercise covers the following topics:

Introducing ArcCatalog

Open ArcCatalog and let's take a look around. If you don't have a desktop shortcut for ArcCatalog, open the START MENU and select **Program**>**ArcGIS**>**ArcCatalog**.

The left pane in ArcCatalog shows all the folders to which you are *connected*. This is another way ArcCatalog differs from Windows Explorer—you only see the files you need. The **Connect** and **Disconnect** icons (circled) give you complete control over this view.

> Since you haven't yet connected to the training folders for this class, your view is a little different from *Figure 2-1* below. We'll get to that in a minute.

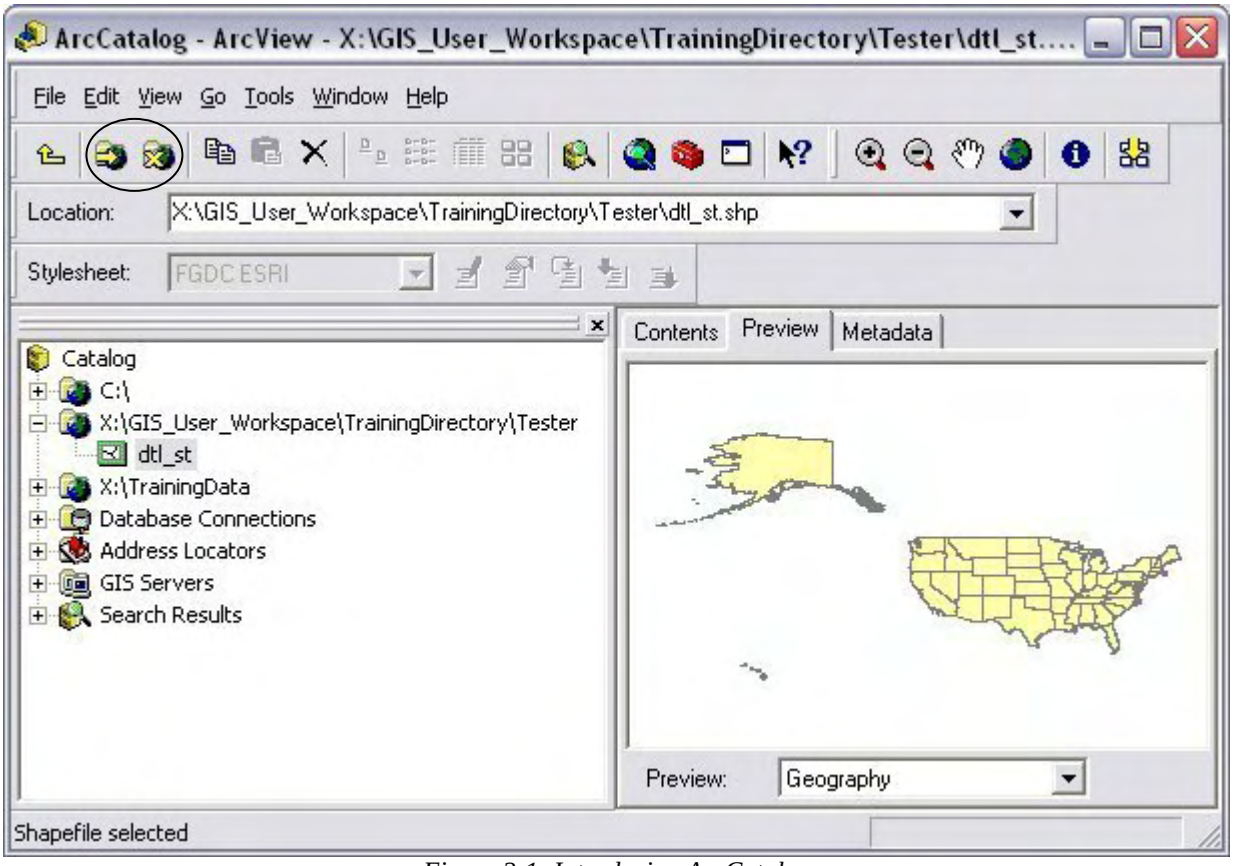

Figure 2-1: Introducing ArcCatalog

The right pane in ArcCatalog provides three tabs: Contents, Preview, and Metadata. These tabs enable you to find out more about a specific file before opening it in ArcMap.

Viewing Your Files

Now let's look at the training data you'll use in this exercise. All of it is located in your personal folder.

> If this is a self-guided course, contact Randy Puckett to set up your personal folder.

Your folder is where you'll save your map and store your own copies of each shapefile. Note that the drive mapped from your computer to the GIS Workspace might be the U or W drive. In this book it will be the **X** drive, where "X" is the letter mapped on your computer to the GIS Workspace drive.

Complete the following steps to view your folder in ArcCatalog:

1. Open ArcCatalog. If you don't have a desktop shortcut for ArcCatalog, open the START MENU and select **Program**>**ArcGIS**>**ArcCatalog**.

2. In ArcCatalog, select the **Connect** icon to open the CONNECT TO FOLDER dialog box.

3. Navigate to X:\GIS_User_Workspace\TrainingDirectory and locate your training folder. It will have your name where "Tester" appears in the figure below.

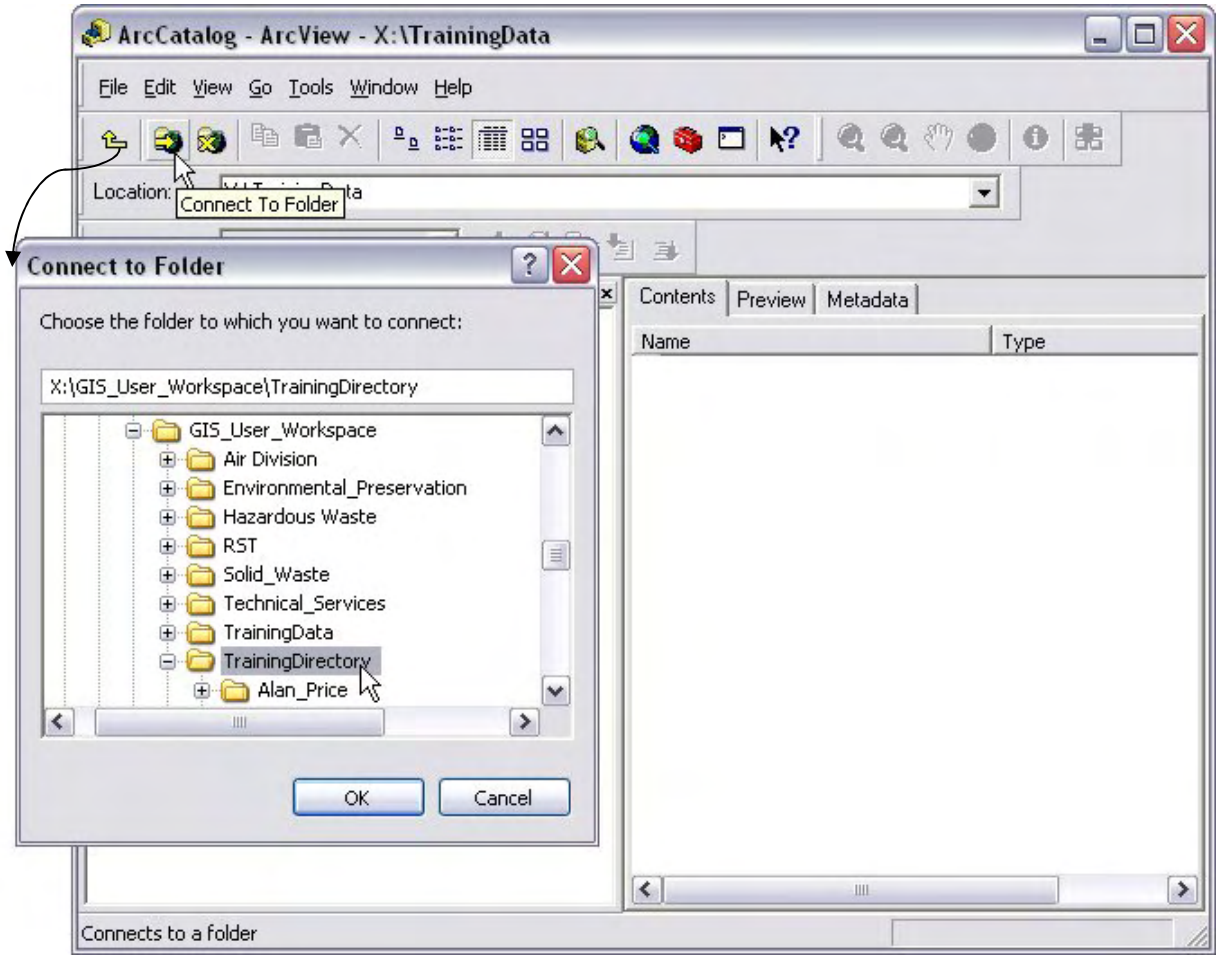

Figure 2-2: Viewing Your Training Folder

4. Select OK. Your folder should be listed in the left pane of the ArcCatalog window.

Copying Shapefiles to your Folder

At this point you have all the shapefiles required to complete these exercises. Let's review the steps for copying shapefiles to your folder for future reference. This is important to know because the shapefiles you use must be **copied** from their original folder to your folder. Even if you don't plan to change the shapefile data, moving an original shapefile into your own folder prevents others from using it.

Complete the following steps to copy shapefiles to your personal folder:

1. Locate and select the desired shapefile. In this case, let's say you want a copy of the *dtl_st* shapefile that resides in the Training Data folder. Locate the file and highlight it.

2. Select the PREVIEW tab in the right pane—it should show that this is a map of the United States including Alaska and Hawaii.

3. It is also advisable to select the METADATA tab to see more information about this dataset. This will show who created the file, what it is (not always obvious from the preview), and when it was last updated.

4. We can stop here in the training, but when the time comes to copy a shapefile in the future, be sure to press the **Ctrl** key on your keyboard.

5. Hold it down while you select the file and drag it to your folder. A plus sign should appear next to your mouse cursor (*Figure 2-3*). It should take some time for the shapefile to copy to your folder.

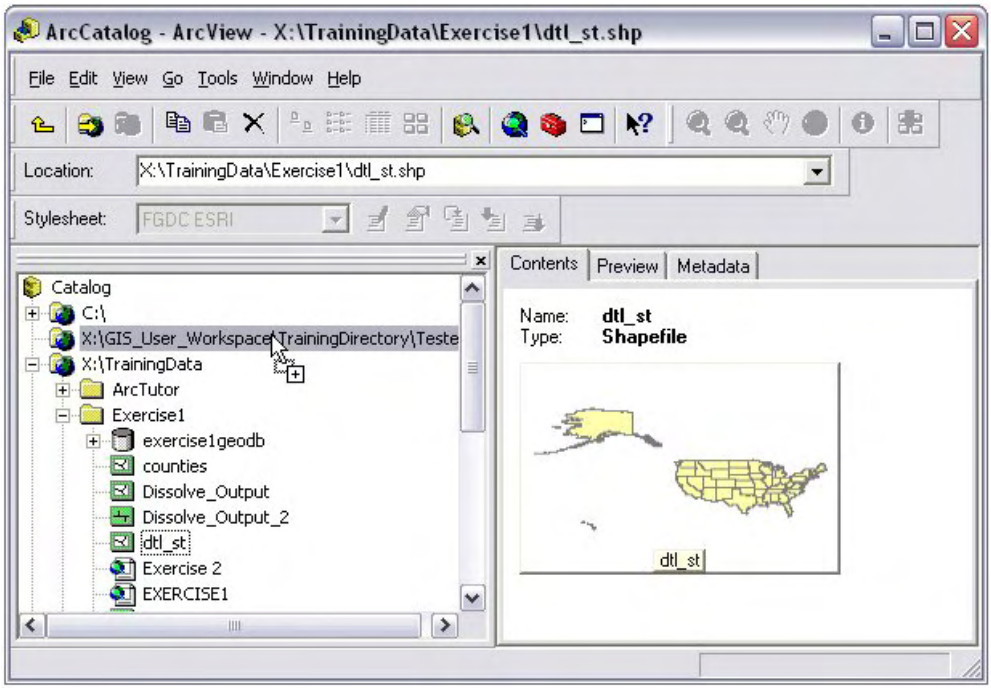

Figure 2-3: Copying a Shapefile to Your Personal Folder

6. When the process is complete, verify that the original file is still in the folder where you found it and a *copy* of it is in your personal folder.

Introducing ArcMap

Now that you've got some data to use, it's time to make a map with it. Begin by opening ArcMap. If you don't have a desktop shortcut for ArcMap, open the START MENU and select **Program**>**ArcGIS**>**ArcMap**. Since we're starting with a new map file, select the radio button for A new empty map (*Figure 2-4*).

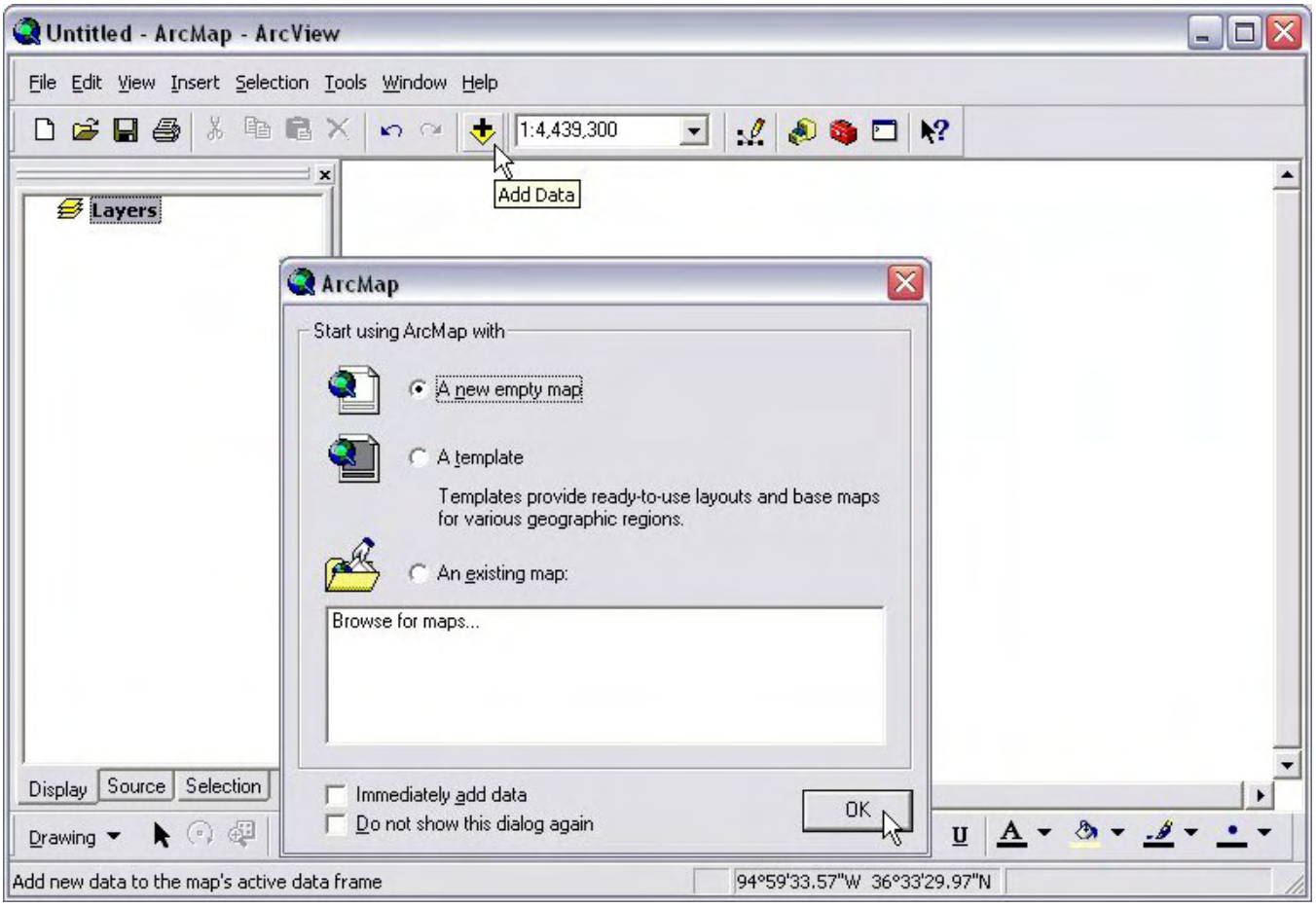

Figure 2-4: Introducing ArcMap

You should now have an empty window in ArcMap. The pane on the right is the **Table of Contents** where your map data will display. Notice that the pane on the left contains a Layers folder. Your shapefiles, each of which constitutes a "layer" will be listed here.

Adding Map Layers

Let's talk about layers for a moment. On your map, shapefiles display just as they appear in your Layers folder, from top to bottom. When you begin your map, you'll "connect" to the Counties shapefile in your training folder, then we'll add roads and waterways. Since each added layer displays according to its order in the Layers folder, you'll always want Counties at the bottom of the list, then waterways, then roads. Once we've added these layers, we'll discuss how to change their order in the Layers folder with a simple drag-and-drop procedure.

Now that you've opened ArcMap and have a new empty map, let's add some data. Keep in mind that the shapefiles you'll add should already be in your training folder.

Complete the following steps to connect to a shapefile:

1. Select the **Add Data** icon in ArcMap.

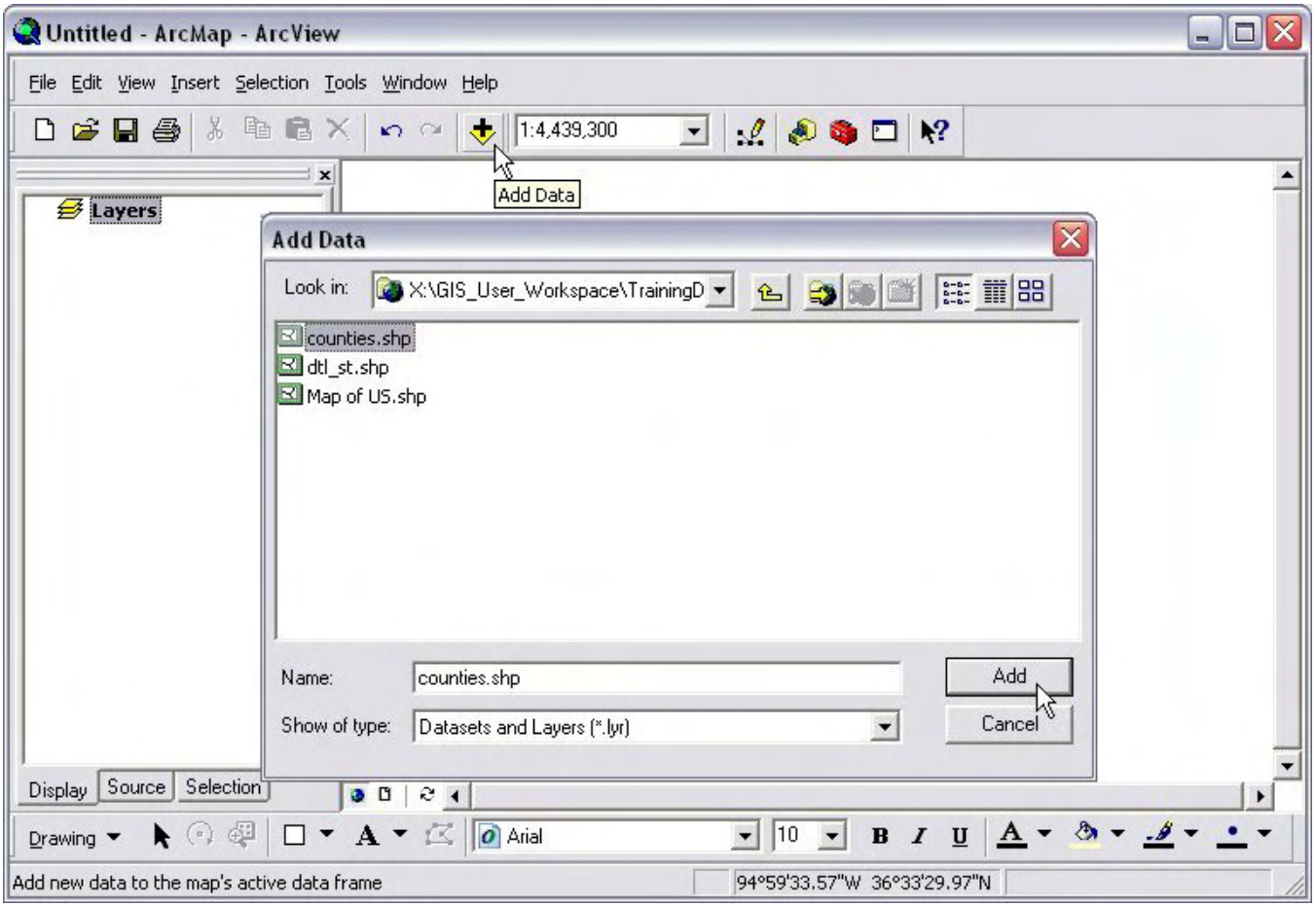

Figure 2-5: Adding a Map Layer

2. Select the file counties.shp from your folder in the X:\GIS_User_Workspace\TrainingData directory.

3. Select the Add button.

Let's Review:

You should now have a map with outlines of the counties in Arkansas, although it looks kind of short and squatty. We'll fix that in a minute, but for now take a look at your Layers folder. Underneath the Counties layer is a box with the same coloring as your map. This is the Symbol box, and its purpose is to control the appearance of your map. In fact, you can control everything you see in your Layers folder. If you right-click on the Symbol box, you'll open a color palette (more on that later). If you right-click on Counties, you'll open the contextual menu for that layer. If you right-click on your Layers folder, you'll open the contextual menu for all layers. This is where we'll fix the appearance of our short and squatty map.