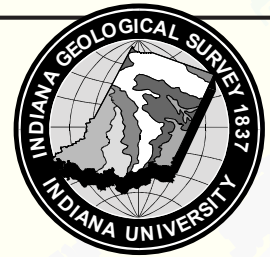


INTERACTIVE MAP OF THE DANVILLE COAL MEMBER IN INDIANA

Indiana Geological Survey Report of Progress 44



INDIANA
GEOLOGICAL SURVEY

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THE INTERACTIVE MAP OF THE DANVILLE COAL MEMBER IN INDIANA

by Agnieszka Drobniak and Maria Mastalerz

Indiana University
Indiana Geological Survey Report of Progress 44



AUTHORS

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ABSTRACT

The Danville Coal Member of the Dugger Formation is an important mining target in Indiana. The Indiana Geological Survey has been collecting physical and chemical data and mapping the Danville Coal for many years. This publication is the most comprehensive digital compilation of geologic information about the Danville Coal in Indiana that is currently available from the Indiana Geological Survey.

The database is accompanied by an interactive application that is a visual presentation of the Danville Coal Member. It allows users to interactively search, explore, and compare data on coal properties. These data are important for regional coal-quality evaluations and can be used by the public, industry, and state and federal governments.

Part 1

INTRODUCTION

The Danville Coal Member of the Dugger Formation is a part of the Pennsylvanian System of the Illinois Basin (fig. 1). The term “Danville” was used for the first time by Bradley in 1870 to describe a coal mined near the city of Danville in Illinois. Later, the name “Danville” was extended into Indiana (Wier, 1961, 1965; Wier and Gray, 1961) and used to describe Coal VII (Ashley, 1899), the Millersburg Coal (Fuller and Ashley, 1902), the Upper Millersburg Coal (Wier and Stanley, 1953; Wier, 1958), and the Little Newburg Coal (Owen, 1839; Ashley, 1909).

The Danville Coal is one of the main mining targets in Indiana. The overburden thickness of the coal bed changes from 0 ft in outcrop to more than 500 ft in Gibson and Posey Counties. The thickness of the coal ranges usually from 14 to 42 inches, although zones of thicker coal, more than 72 inches, occur in Vigo, Knox, and Gibson Counties (Mastalerz and others, 2009a). The original resources of the Danville Coal are estimated at 6.55 billion tons. Because of technical and land-use factors, the available (minable) resources are calculated to be 0.83 billion tons (Mastalerz and others, 2009a).

This publication is a digital compilation of geologic information about the Danville Coal Member in

Indiana (Table 1). More information about the Danville Coal Member (stratigraphy, resource, and coal quality) can be found in Indiana Geological Survey Special Report 66 (Mastalerz and others, 2009a), and several Indiana Geological Survey Open-File Studies (Conolly and Zlotin, 2000; Mastalerz and others, 2004; Mastalerz and Drobniak, 2007a; Mastalerz and others, 2009b) as well as in journal publications (Mastalerz and Drobniak, 2007b; Howler and others, 2005).

CONTENTS OF THE CD-ROM

This CD-ROM contains the following files:

Danville Coal Member – Introduction and Manual.pdf

A short introduction to the interactive map and a user’s manual (in Adobe Acrobat format.)

Danville Coal Member – Interactive map.pmf

Interactive map application, a visual presentation of the geologic information about the Danville Coal Member in Indiana (Esri ArcReader format).

Data

Folder containing data necessary for the interactive map application.

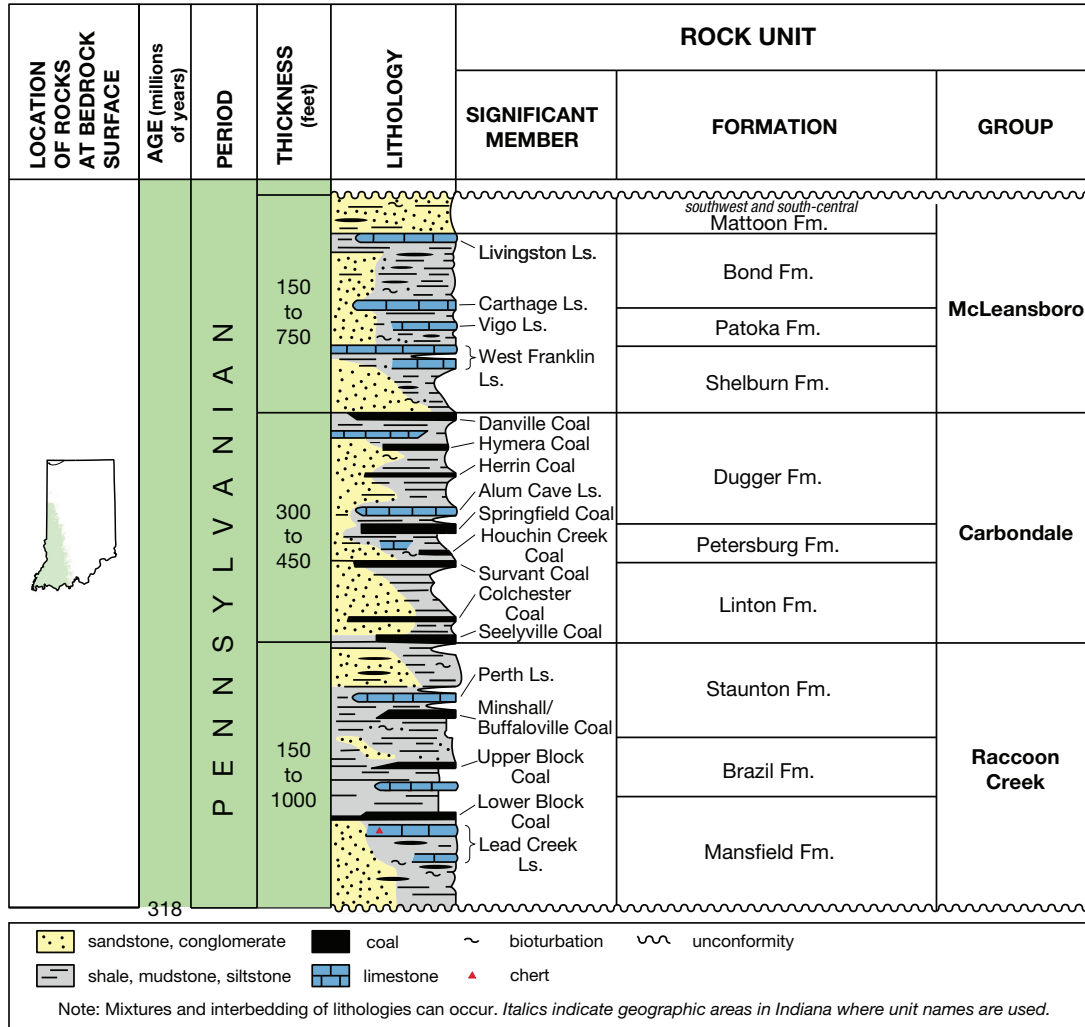


Figure 1. Generalized stratigraphic column of the Pennsylvanian System in Indiana (from Thompson and Sowder, 2010).

Table 1. The Danville Coal interactive map application layers

1. Danville Coal Member mercury data points	13. Railroads
2. Danville Coal Member chlorine data points	14. Cities
3. Danville Coal Member quality data points	15. Danville Coal Member active mines
4. Danville Coal Member petrography data points	16. Danville Coal Member mined out
5. Danville Coal Member NCRDS data points	17. Danville Coal Member projected extent
6. Coal-burning electric power plants	18. Danville Coal Member thickness
7. Indiana counties	19. Danville Coal Member depth
8. Indiana quadrangles	20. Danville Coal Member elevation
9. Indiana townships	21. Danville Coal Member moisture content
10. Indiana sections	22. Danville Coal Member ash content
11. Interstates	23. Danville Coal Member heating value
12. Highways	24. Danville Coal Member sulfur content

Metadata

Folder containing information about the layers displayed in the interactive application.

Depth, thickness, and elevation information come from the Indiana Geological Survey Coal Stratigraphic Database (Drobniak and Mastalerz, 2012a). Coal quality data originate from the Indiana Coal Quality Database (Drobniak and Mastalerz, 2012b). Reference (cities, counties, land survey township and sections) and infrastructure layers (roads, railroads, mines) were obtained from IndianaMap (www.indianamap.org).

CONTACT

Questions regarding the database should be directed to:

Coal and Industrial Minerals Section
Indiana Geological Survey
611 North Walnut Grove Ave.
Bloomington, IN 47405-2208
phone: 812-855-5805
fax: 812-855-2862
e-mail: IGSinfo@indiana.edu

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Part 2

QUICK-START TUTORIAL

To open the file **Danville Coal Member – Interactive map.pmf** file you will need Esri ArcReader software installed on your computer. After registering, it can be downloaded for free from the Esri Web site: <http://www.esri.com/software/arcgis/arcreader/index.html>.

To download ArcReader, choose “Download Now” from the menu on the left. Follow the Esri instructions to install the software.

ArcReader | Overview - Mozilla Firefox

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http://www.esri.com/software/arcgis/arcreader/index.html

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ArcGIS

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- Demos
- Brochures/White Papers
- Common Questions
- System Requirements
- User Stories/Reviews
- Download Now**

What's New

GEOInformatics Praises ArcGIS Desktop
See why [ArcGIS Desktop](#) [PDF] is key to working with spatial data content and designing workflows in the age of the GeoWeb.

What's Coming in ArcGIS 10
See how [ArcGIS Desktop 10](#) will help you perform your GIS work faster.

Overview

ArcReader is a free, easy-to-use desktop mapping application that allows users to view, explore, and print maps and globes. Anyone with ArcReader can view high-quality interactive maps authored by a higher-level ArcGIS Desktop product and published with the ArcGIS Publisher extension.

With ArcReader, you can

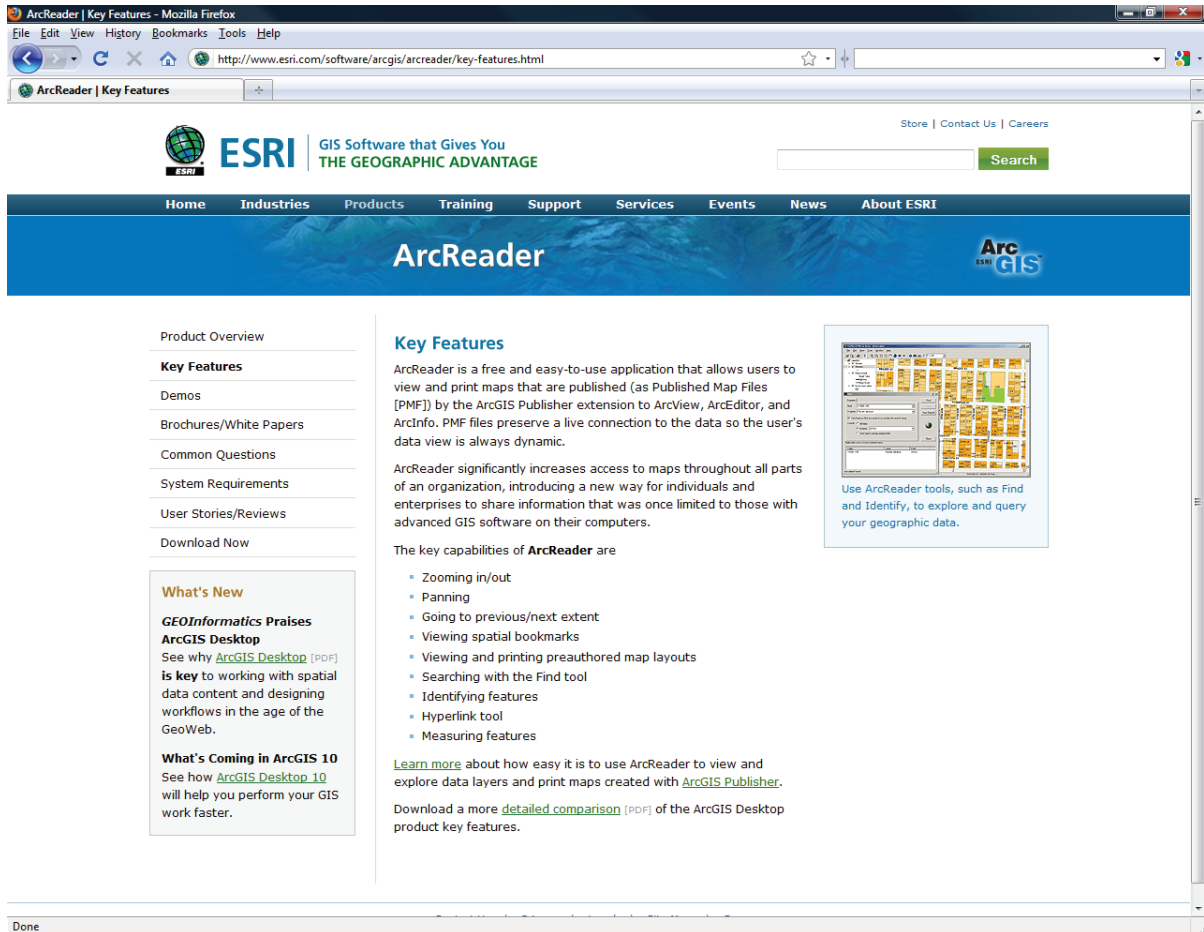
- **View, navigate, and print** published ArcGIS maps using ArcReader (.pmf files).
- Deploy your GIS data to **novices and professionals alike**.
- **Zoom, pan, and switch** between map and page layout view.
- **Communicate more efficiently** with the ability to graphically mark up maps.
- **Print published map and globe documents** including all layer symbology and cartographic map elements on any supported printer.
- **Create custom** ArcReader applications and **embed ArcReader capabilities** into existing applications.

Done

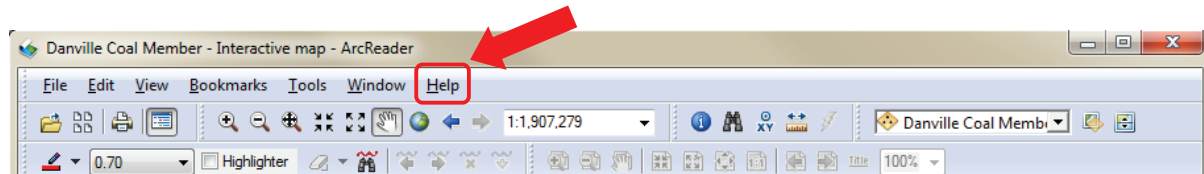
To read more about ArcReader and its capabilities, go to: <http://www.esri.com/software/arcgis/arcreader/key-features.html>. The Web site provides a software overview and demo, demonstrates key features, and answers common questions, as well as allowing free download of the application.

The tutorial can be accessed by clicking on:

http://webhelp.esri.com/arcgisdesktop/9.3/tutorials/arcreader/arcreader_tutorial_index.htm.



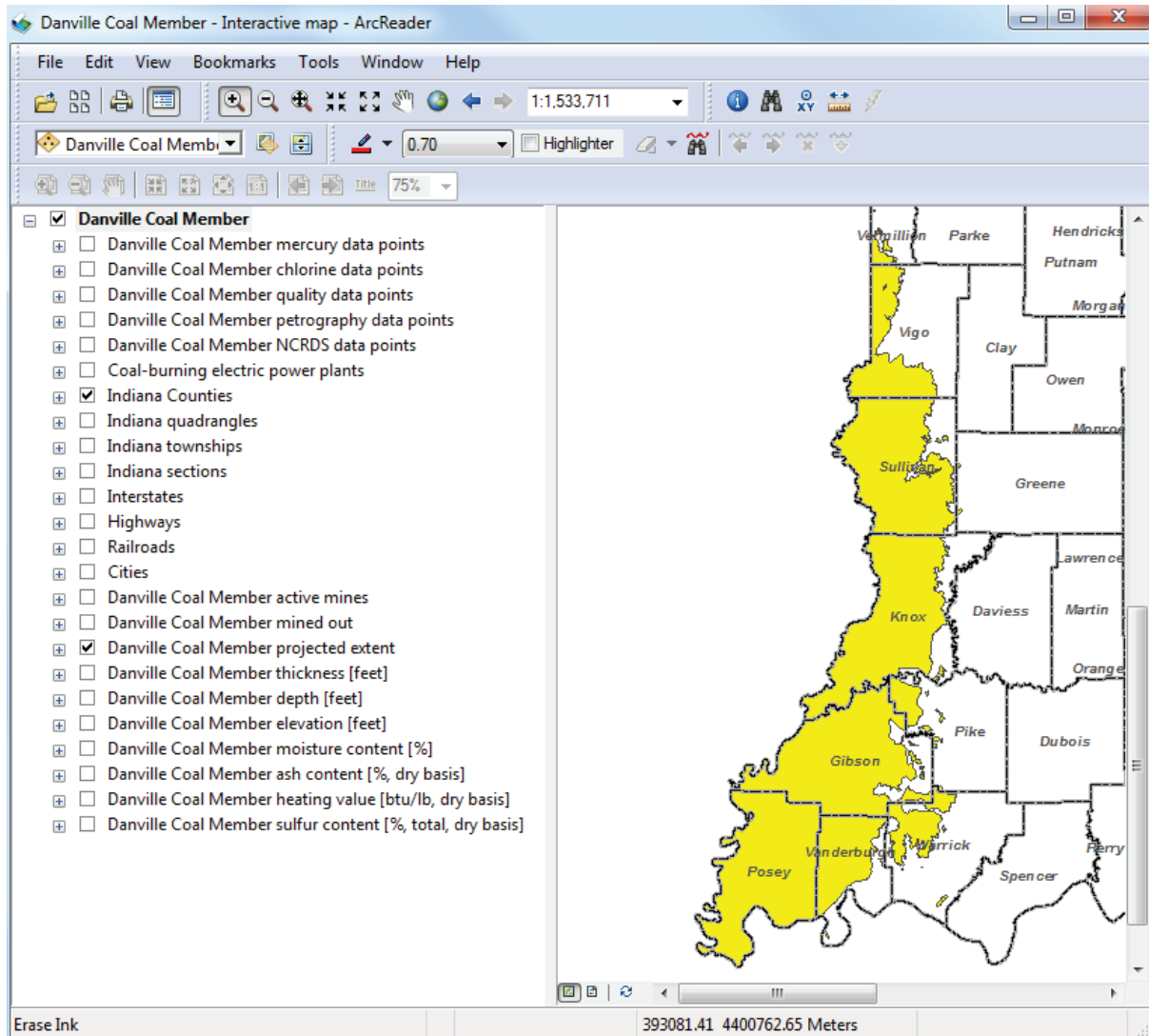
After opening the software, you may also access Help by choosing it from the menu bar.



VIEWING THE MAP AND BASIC FEATURES

After installing ArcReader, open the contents of the CD and click on **Danville Coal – interactive map.pmf** to open it.

The application will show several expandable layers on the left panel (Table of Contents) and a map of south-western Indiana. County boundaries and the extent of the Danville Coal Member in Indiana are displayed.



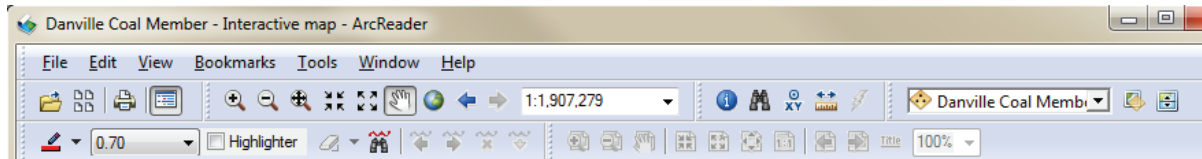
All the layers can be turned on and off by checking or unchecking the box next to the layer. The layers that are checked are drawn in the map display area. It is important to remember that the layers on the map are shown in the order they are listed in the table of contents. For example, the “Danville Coal projected extent” will be drawn on top of all other layers listed below it, covering the lower layers. To view the thickness, depth, elevation, or coal quality layer, make sure to turn off the layers above.

All the layers can be expanded by clicking on the plus sign next to them. By expanding the layer, you can see the symbol used for the feature.

- Danville Coal Member**
 - Danville Coal Member mercury data points
 - Danville Coal Member chlorine data points
 - Danville Coal Member quality data points
 - Danville Coal Member petrography data points
 - Danville Coal Member NCRDS data points
 - Coal-burning electric power plants
- Indiana Counties**
- Indiana quadrangles
- Indiana townships
- Indiana sections
- Interstates
- Highways
- Railroads
- Cities
- Danville Coal Member active mines**
 - Mine type
 - Active surface mines (2010 data)
 - Active underground mines (2010 data)
- Danville Coal Member mined out
- Danville Coal Member projected extent**
- Danville Coal Member thickness [feet]
 - Legend
 - Less than 1 foot
 - 1 to 2 feet
 - 2 to 3 feet
 - 3 to 4 feet
 - 4 to 5 feet
 - 5 to 6 feet
 - 6 to 7 feet
 - 7 to 8 feet
- Danville Coal Member depth [feet]
- Danville Coal Member elevation [feet]
- Danville Coal Member moisture content [%]
- Danville Coal Member ash content [%, dry basis]
- Danville Coal Member heating value [btu/lb, dry basis]
- Danville Coal Member sulfur content [%, total, dry basis]












Use the Data Toolbar to move around the map and query features on the map. Hover over the icon to see the name of the tool. If you need more information about the tool, press Shift + F1 while pointing on the tool icon.



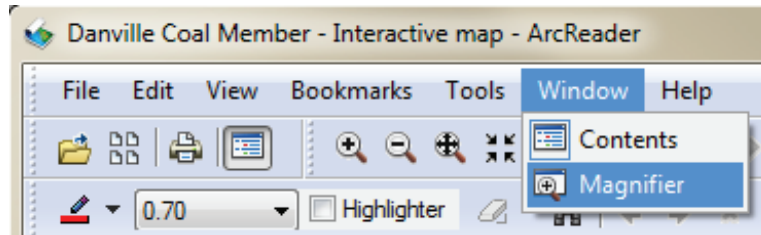
The basic toolbar buttons and their functions are explained below.



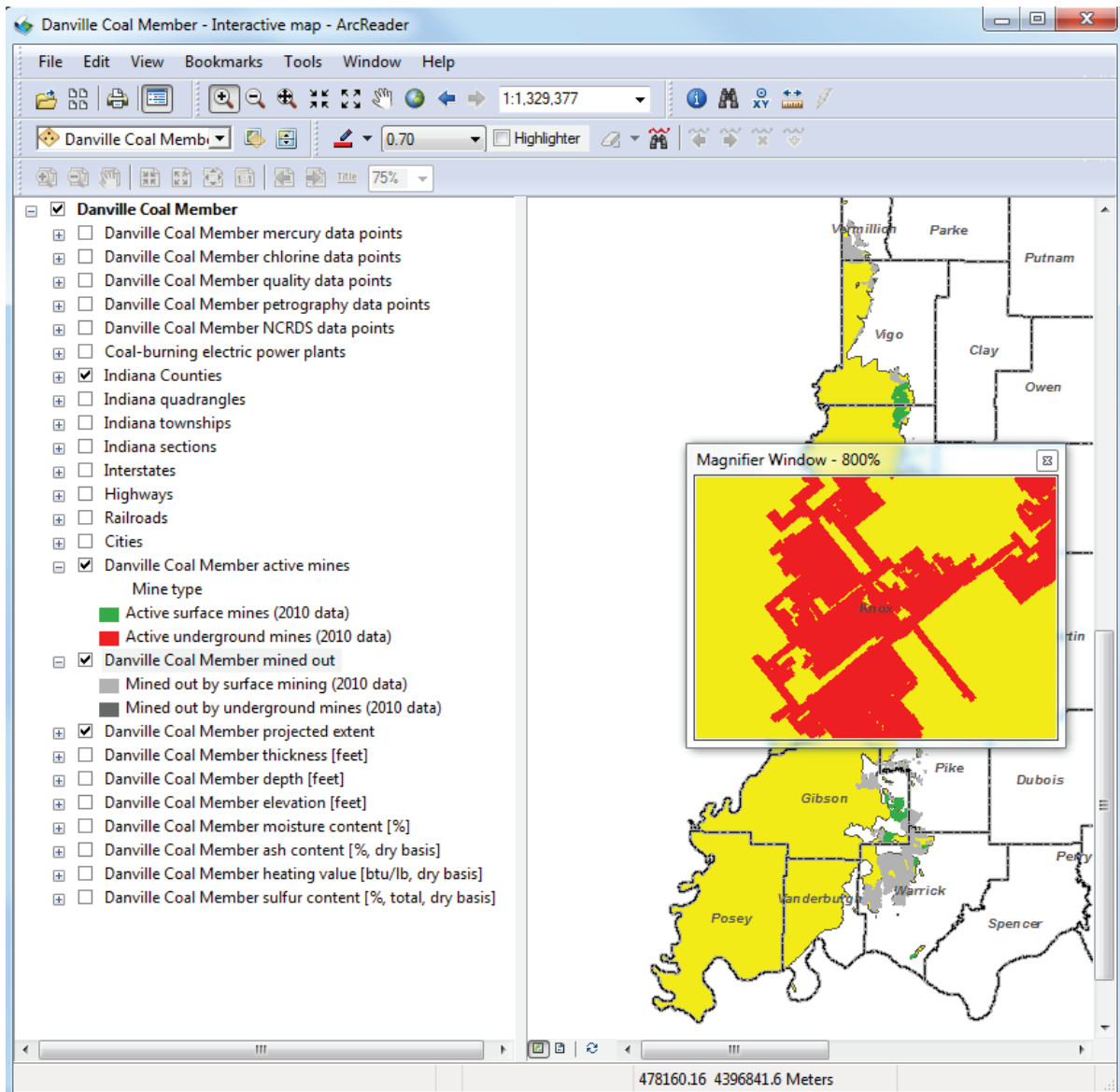
Button	Name	Function
	Zoom in	Zoom in by clicking a point or dragging a box
	Zoom out	Zoom out by clicking a point or dragging a box
	Continuous zoom/pan	Continuously zoom and pan the map
	Fixed zoom in	Zoom in on the center of the map
	Fixed zoom out	Zoom out from the center of the map
	Pan	Pan the map
	Full extent	Zoom to the full extent of the map
	Go back	Go back to the previous extent
	Go next	Go forward to the next extent

USING THE MAGNIFIER WINDOW

Use the Magnifier window if you do not want to change the displayed location on the map but still want to see more detail. The Magnifier window tool opens by clicking on the “Window” menu in the menu bar and then by clicking on “Magnifier.”

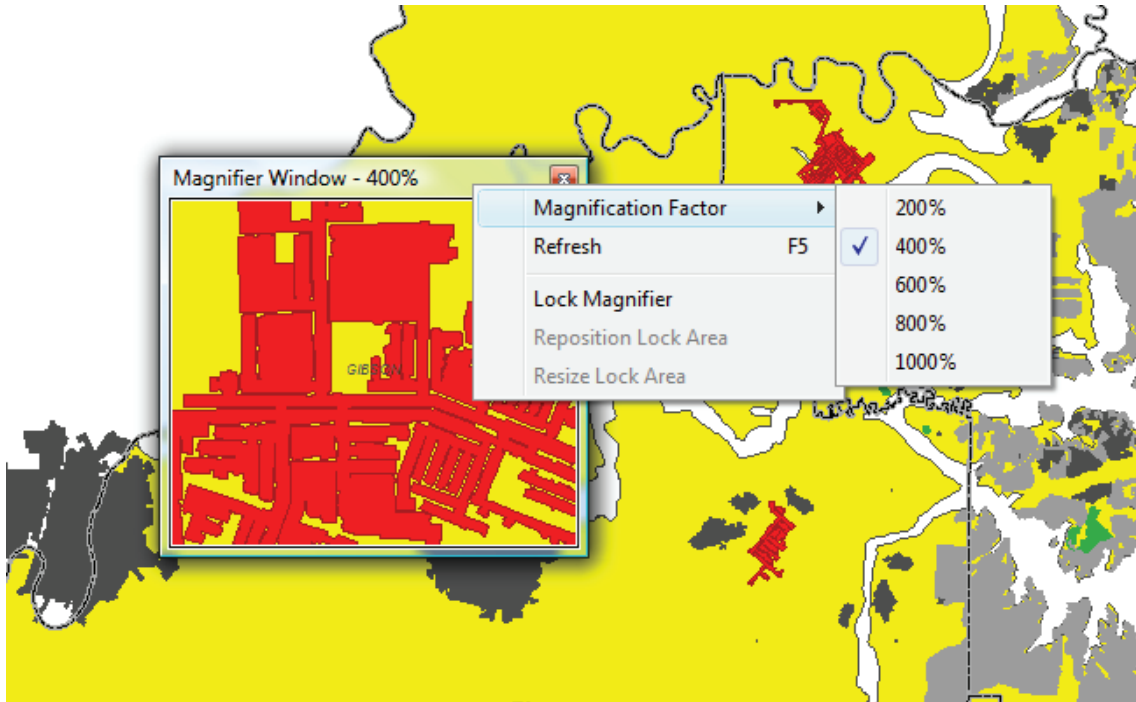


When the Magnifier tool pops up, drag it over the map, point the Magnifier over the area you want to magnify, and release the mouse button.



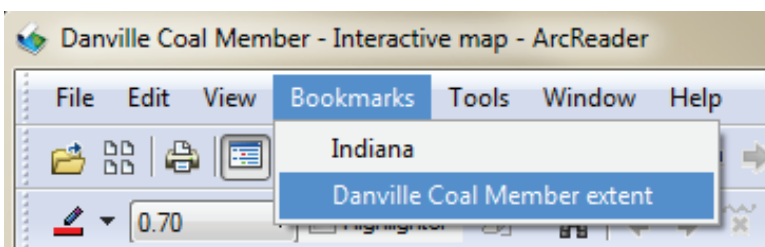
The size of the Magnifier window can be adjusted as well as the window scale. Right-click on the Magnifier window and on “Magnification Factor” to change the scale.

By locking the Magnifier, you can move the window to another place; the original snapshot will not change. Right-click on the Magnifier window and choose “Lock Magnifier.”



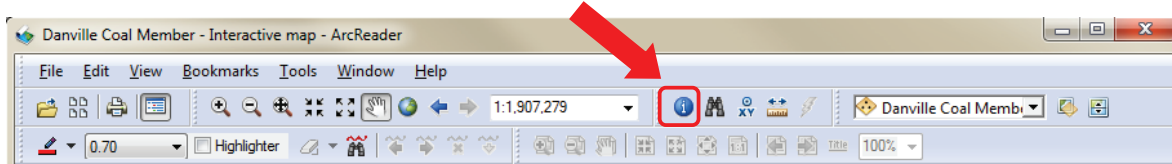
BOOKMARKS

Bookmarks make it easy to quickly navigate to a predefined geographic area. In the file **Danville Coal Member – interactive application.pmf**, two bookmarks were saved—the extent of Indiana and the projected extent of the Danville Coal Member. To access the bookmarks, click on “Bookmarks” in the menu bar.



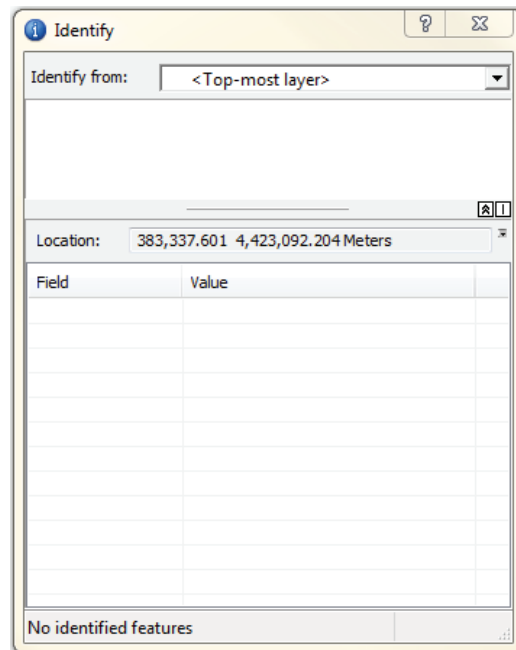
QUERYING A MAP

Some layers contain additional information not visible on the map. Use the Identify tool to obtain spatial and tabular information. Click the Identify tool.



The Identify dialog box opens.

To access information about a layer, choose the layer name from the Identify drop-down list and click on a feature on the map that belongs to this layer.



Example 1: Finding a name of an underground mine

Turn on the “Danville Coal Member active mines” layer. Click on the Identify tool and from the drop-down list box choose “Danville Coal Member active mines.” Click on the mine on the map you want to identify. The mine name and type, its owner, and county names are displayed in the Identify window.

The screenshot shows the ArcReader interface with the following elements:

- Map Legend:**
 - Danville Coal Member
 - Danville Coal Member mercury data points
 - Danville Coal Member chlorine data points
 - Danville Coal Member quality data points
 - Danville Coal Member petrography data points
 - Danville Coal Member NCRDS data points
 - Coal-burning electric power plants
 - Indiana Counties
 - Indiana quadrangles
 - Indiana townships
 - Indiana sections
 - Interstates
 - Highways
 - Railroads
 - Cities
 - Danville Coal Member active mines
 - Mine type
 - Active surface mines (2010 data)
 - Active underground mines (2010 data)
- Identify Window:**
 - Identify from: **Danville Coal Member active mines**
 - Selected feature: Air Quality Mine
 - Location: Knox

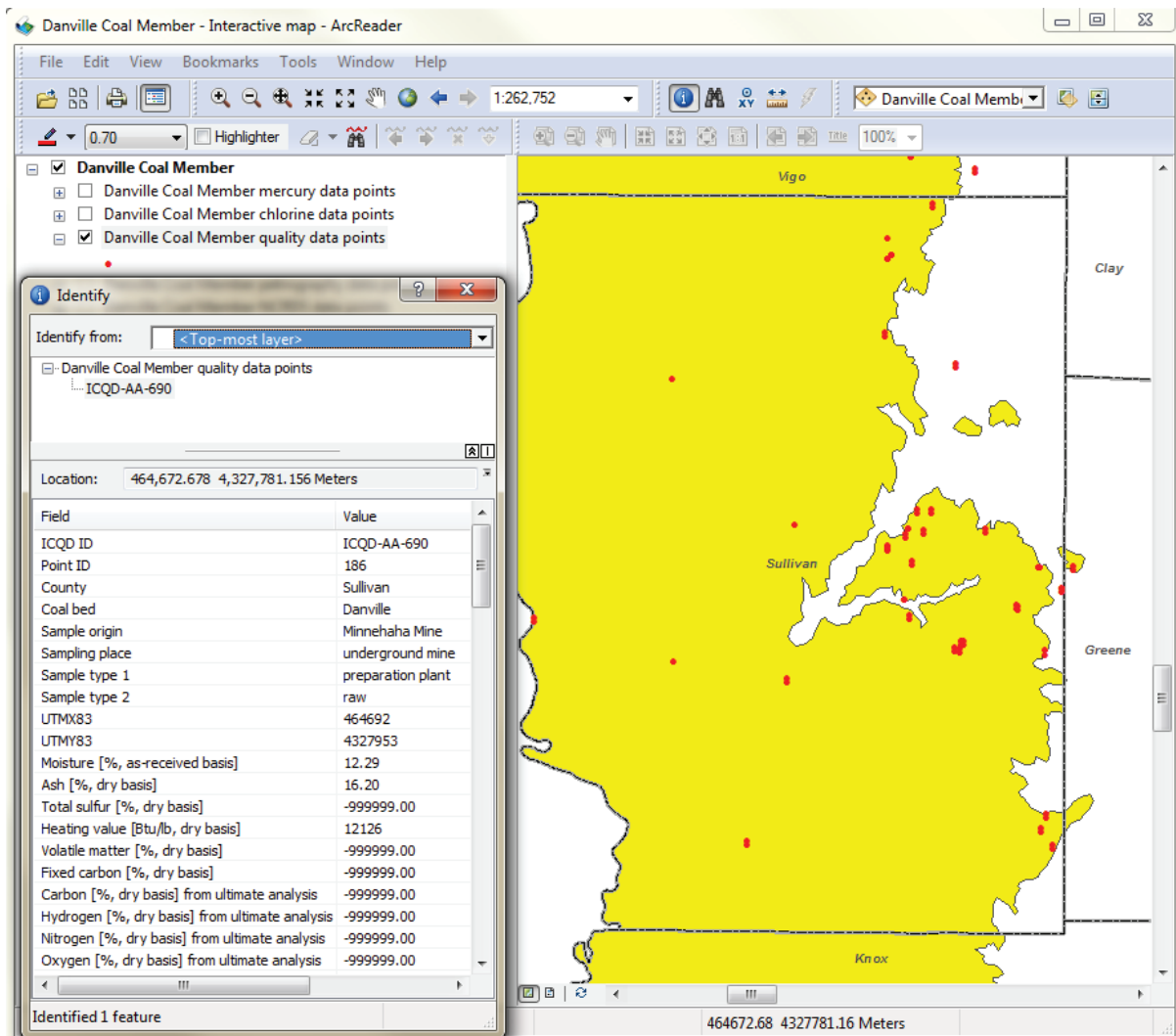
Field	Value
Mine name	Air Quality Mine
Mine type	underground
Company name	Peabody Midwest Mining, LLC
County name	KNOX

 - Identified 1 feature

Example 2: Finding coal property information

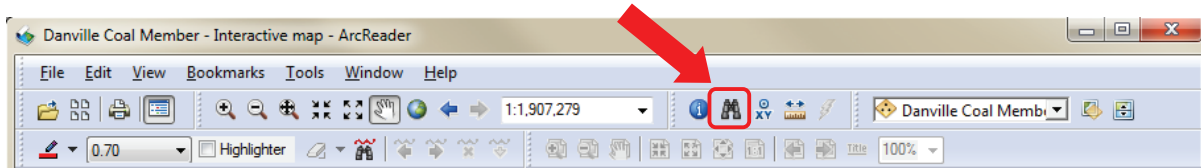
Turn on the “Danville Coal Member quality data points” layer. Click on the Identify tool and from the drop-down list box choose “Danville Coal Member quality data points.” Click on the point on the map you want to identify. A list of parameters will be shown including sample ID, location and type, data from proximate, ultimate and petrography analysis, and trace element values.

Please note that a value of -99999 indicates that no data is available for the selected point.



FINDING A FEATURE OR LOCATION

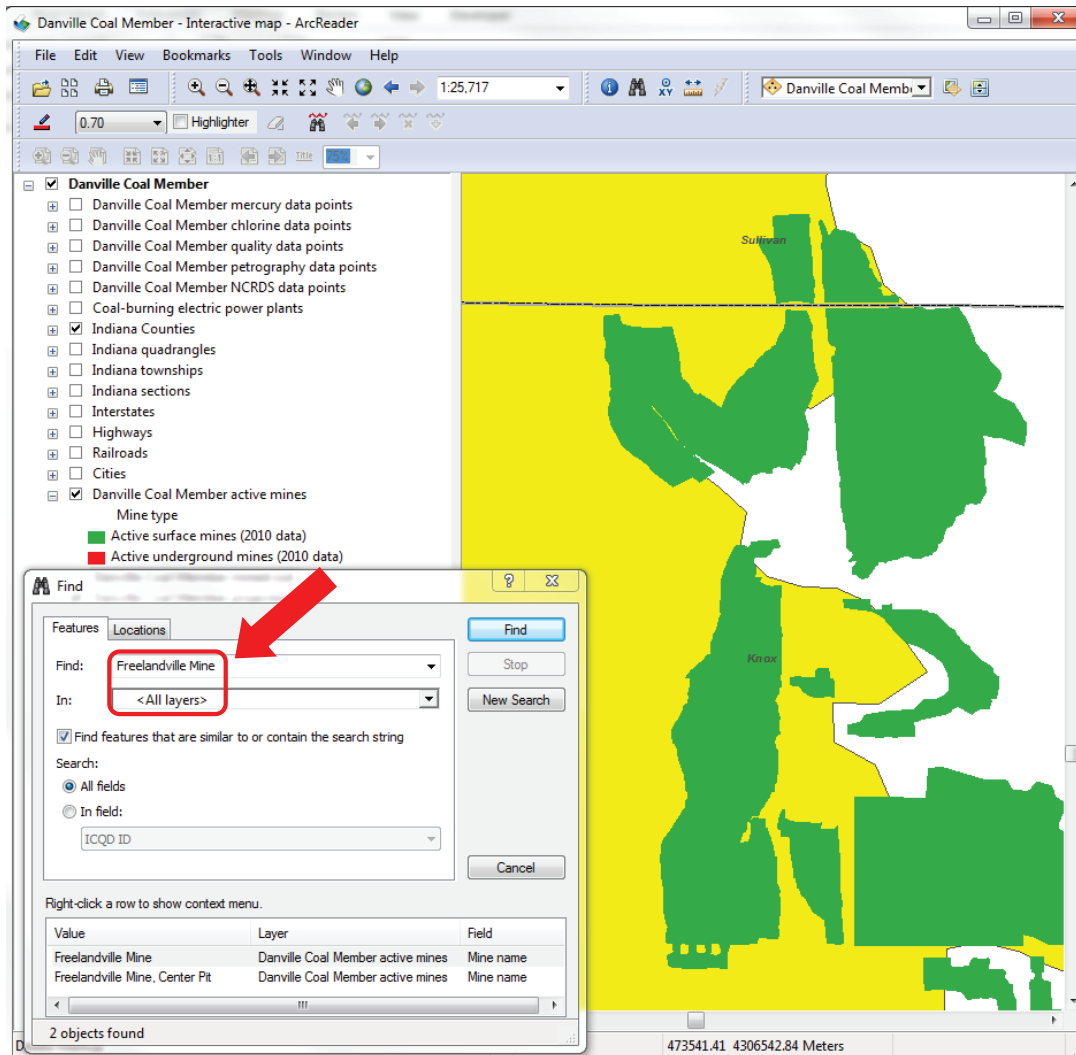
ArcReader can easily find a feature based on its name. Click on the Find tool. The Find dialog box appears.



Example 1: Finding the Freelandville Mine on a map

Make sure the Danville Coal Member active mines layer is turned on. In the Find text box, type "Freelandville Mine" and choose "<All layers>" from the "In" layers drop-down list. Click "Find." All the features that contain the name "Freelandville Mine" will be displayed in the result section of the window.

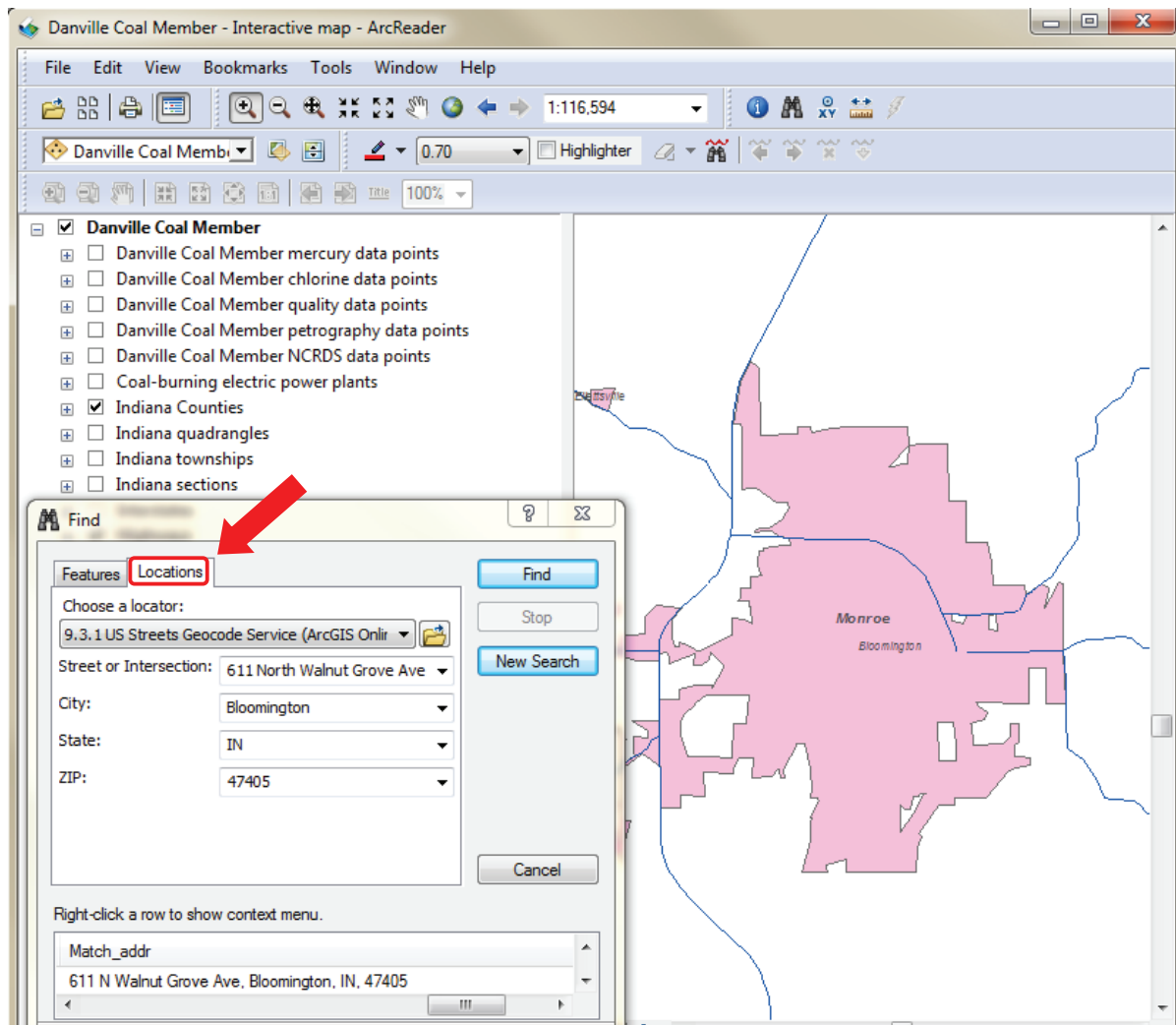
Right-click the displayed result to locate the feature on the map and access information about it.



Example 2: Finding a specific place

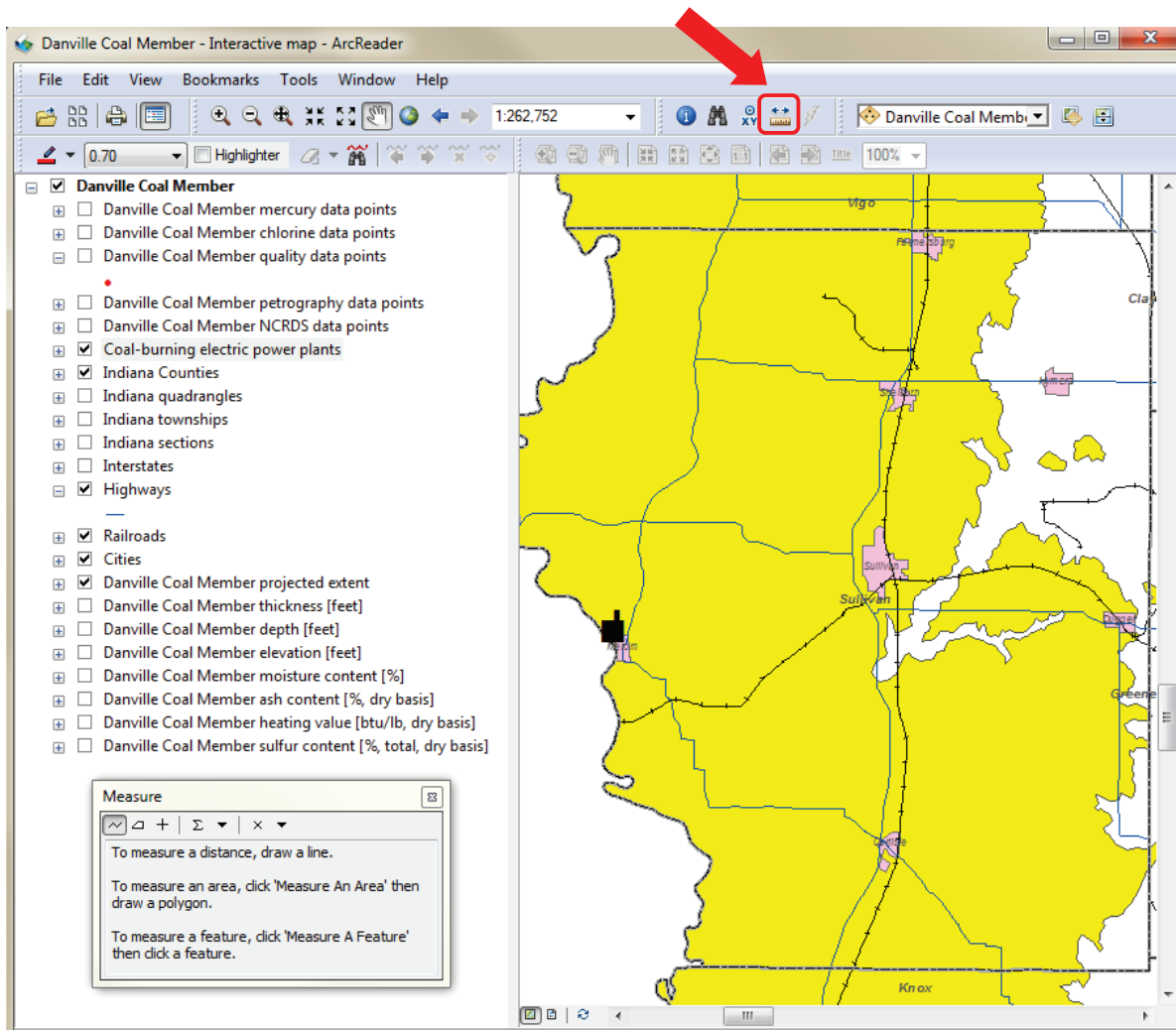
In this example, we will find the location of the Indiana Geological Survey. In the Find window, choose the “Locations” tab. From the drop-down list, choose “9.3.1 US Streets Geocode Service” and type the address you want to find. Click the Find button.




The results will be displayed in the Find window. Right-click the correct item and choose “Zoom to” to locate the place on the map.



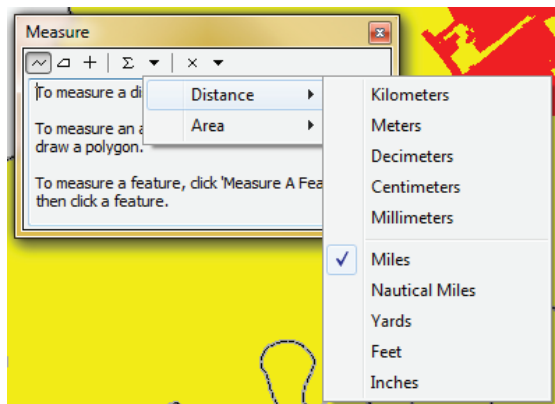
MEASURING DISTANCE

To measure areas or distances use the Measure tool from the toolbar menu. The Measure dialog box appears.



Choose units by clicking on the  icon. Depending on your type of measurement, choose Measure Line  or Measure an Area tool .

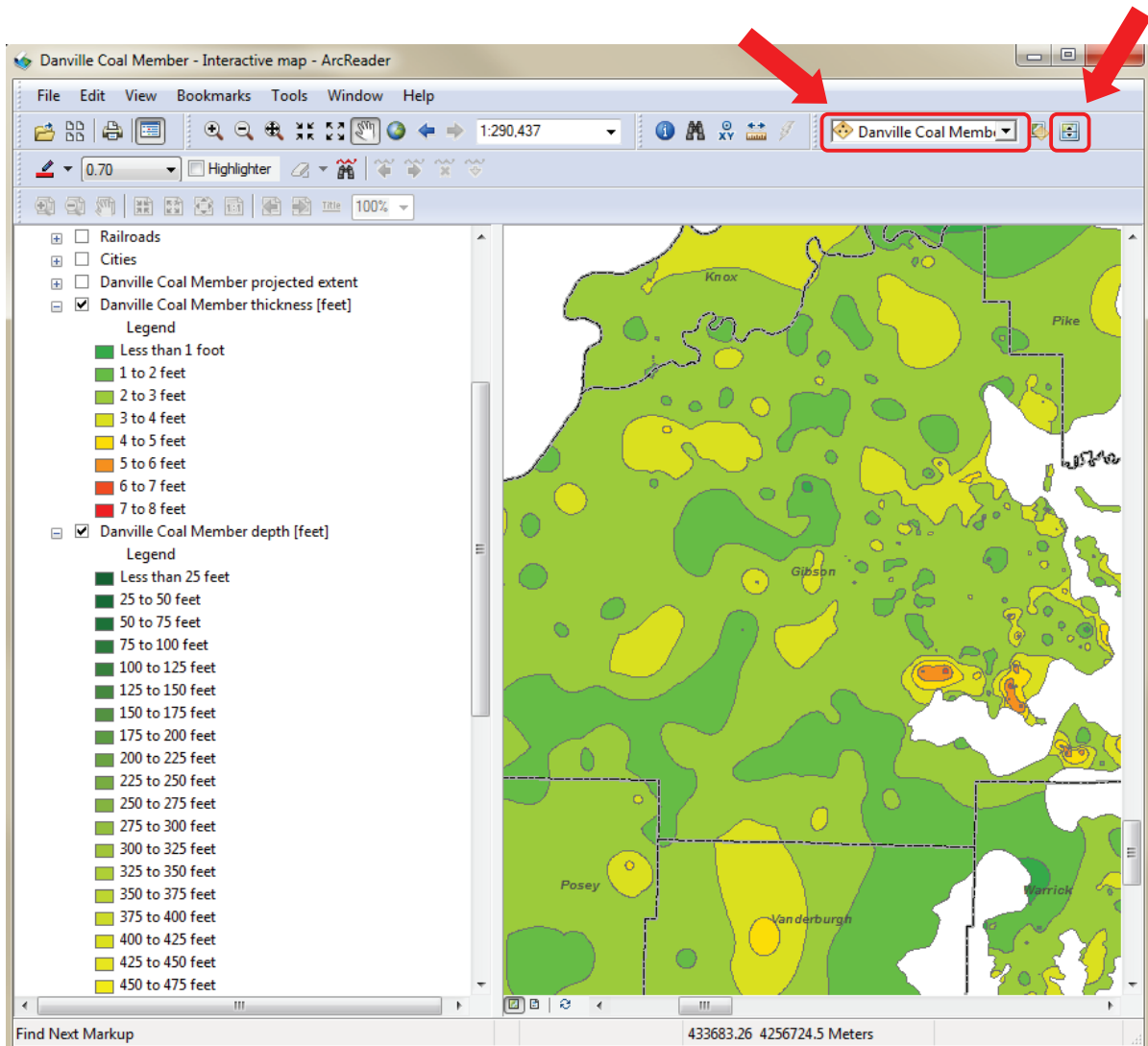
Click on the map and drag the line. The result will be displayed in the Measure dialog box.



USING THE SWIPE TOOL

It is often useful to see how certain layers overlay other layers. The Swipe tool allows you to see a layer underneath another layer without turning it off in the table of contents.

Click the Swipe button on the data toolbar.



In this example, to see Danville Coal Member depth underneath its thickness, choose the thickness layer from the drop-down list box (the top layer). Place the Swipe tool on the map; the pointer will turn into an arrow that points in the direction of the swipe. Click and drag the mouse. Layers can be swiped vertically and horizontally, depending on the position of the tool.

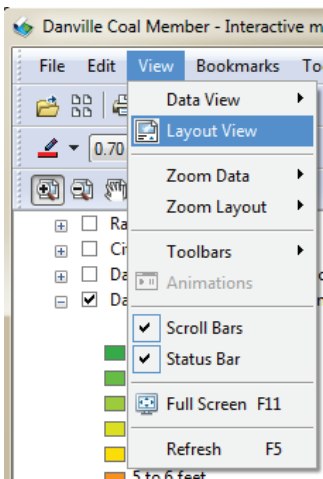
PRINTING THE MAP

ArcReader can display a map in either the Data view or Layout view. These two views have different functionalities: the Data view shows the contents of a data frame and the Layout view shows the map as it would appear if printed.

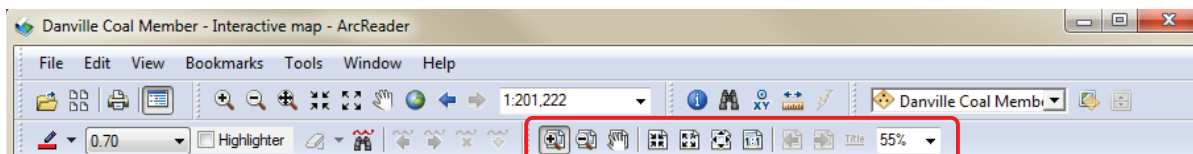
To switch between the views, click on “View” in the menu bar.

When printing from Data view, the data will print as it appears in the ArcReader display. It is important to switch to Layout view because the region that is printed can vary, depending on which view you are in.

Layout view also contains elements that cannot be printed out when in Data view, such as the map title, scale, and legend.



When in the Layout view, a Layout toolbar is activated. It contains a tool for navigating in the Layout view. The layout tools in the Layout toolbar are similar to the tools in the Data toolbar. They allow you to change the way the page is displayed. Notice that the data tools are still accessible for changing the view of the data within the data frame.



After switching to Layout view, the page includes a title, legend, and scale bar.

Because of the program's limitations, we recommend that you turn on only the layers that you wish to print. To print the map, go to Page Setup from the File menu to choose printer, page orientation, and size.

DANVILLE COAL MEMBER

