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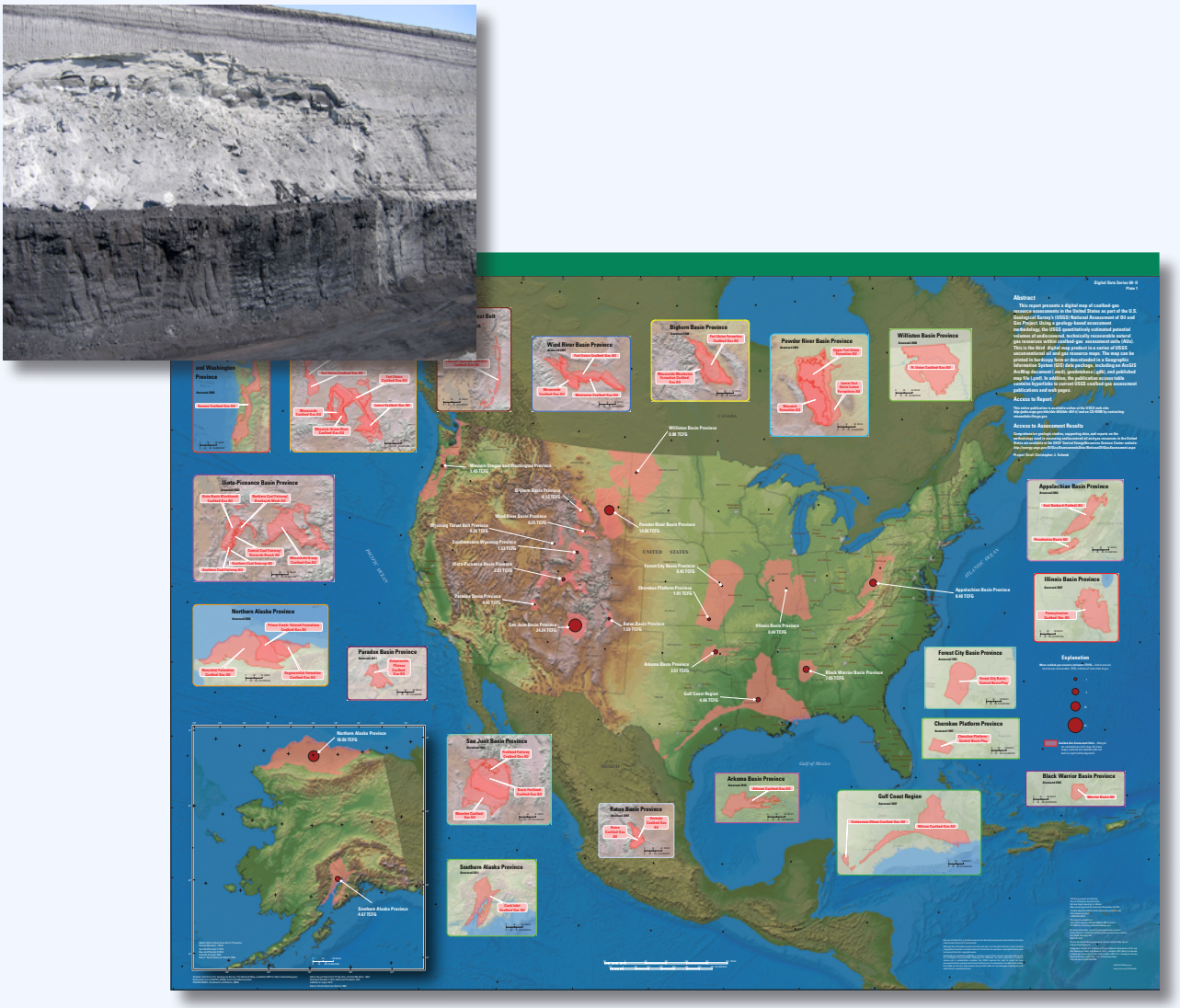
# Map of Assessed Coalbed-Gas Resources in the United States, 2014



Digital Data Series 69–II

U.S. Department of the Interior
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**Cover.** The Anderson coal bed and overburden in the Powder River Basin, Montana. Photograph by David Scott (USGS).

# Map of Assessed Coalbed-Gas Resources in the United States, 2014

By U.S. Geological Survey National Assessment of Oil and Gas Resources Team,
and Laura R.H. Biewick, compiler

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**U.S. Department of the Interior**
**U.S. Geological Survey**

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# Map of Assessed Coalbed-Gas Resources in the United States, 2014

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## Abstract

This report presents a digital map of coalbed-gas resource assessments in the United States as part of the U.S. Geological Survey's (USGS) National Assessment of Oil and Gas Project. Using a geology-based assessment methodology, the USGS quantitatively estimated potential volumes of undiscovered, technically recoverable natural gas resources within coalbed-gas assessment units (AUs). This is the third digital map product in a series of USGS unconventional oil and gas resource maps. The map plate included in this report can be printed in hardcopy form or downloaded in a Geographic Information System (GIS) data package, including an ArcGIS ArcMap document (.mxd), geodatabase (.gdb), and published map file (.pmf). In addition, the publication access table contains hyperlinks to current USGS coalbed-gas assessment publications and Web pages.

## Introduction

The U.S. Geological Survey (USGS) carries out scientific investigations and assessments of geologically based energy resources, including unconventional resources (for example, shale gas, tight gas, unconventional oil, and coalbed methane). These scientific studies are used to evaluate and assess the quality and distribution of energy resource accumulations and the undiscovered, technically recoverable energy resource potential of the United States (U.S.). This publication summarizes the results of the U.S. coalbed-gas assessment in a geospatial map and data package.

The total petroleum system (TPS) is the basic geologic unit of the oil and gas assessment; it includes all of the essential elements and processes needed for oil and gas accumulations to exist, including the presence of source and reservoir rocks, hydrocarbon generation and migration, traps and seals, and undiscovered accumulations. An assessment unit (AU) is a mappable volume of rock within a total petroleum system in which discovered and undiscovered resource accumulations are relatively similar with respect to geology, exploration strategy, and risk characteristics (Ahlbrandt, 2000). Comprehensive geologic studies, supporting data, and reports on the methodology used in assessing undiscovered oil and gas resources in the United States are available at the USGS Central Energy Resources Science Center Web site at: *http://energy.usgs.gov/OilGas/AssessmentsData/NationalOilGasAssessment.aspx*.

## Print Map

The map of coalbed-gas resources is available as a static Portable Document Format (.pdf) file and as an interactive map. These products are available at *http://pubs.usgs.gov/dds/dds-069/dds-069-ii/* or *http://dx.doi.org/10.3133/ds69ii*. The software used to create this digital map product includes: Environmental Systems Research Institute, Inc. (Esri) ArcGIS 10, Python, Adobe Photoshop CS5.1, Illustrator CS5.1, and Acrobat 7.0.

To access the hardcopy .pdf map, click on the map graphic shown in figure 1. Adobe Acrobat Reader software is recommended to view the .pdf map and is available for download free-of-charge at *http://get.adobe.com/reader/*.


**Figure 1.** The hardcopy .pdf map is designed to be printed on a 46 x 35 inch map sheet. The map graphic links to the tight-gas resources hardcopy map. *Link.*

## Web Services

This report also includes a Web map service. To access the coalbed-gas Web service, visit the USGS National Assessment of Oil and Gas Resources Web site at *http://energy.usgs.gov/OilGas/AssessmentsData/NationalOilGasAssessment.aspx.*

## Download Maps and Data

The map of assessed coalbed-gas resources is available as a GIS map and data package that can be downloaded from the USGS Web site: *http://pubs.usgs.gov/dds/dds-069/dds-069-ii/* or *http://dx.doi.org/10.3133/ds69ii*. The ArcMap document, whose filename contains an .mxd extension, is the main component of the GIS data package, and is used to analyze geospatial data, symbolize features, and create maps. The .mxd file needs Esri's ArcGIS 10 or a newer version of the desktop software (Esri, 2000). Using the published .mxd and the ArcGIS Publisher extension (Esri, 2008a) in ArcMap, a special file called a published map file was created. Published map files contain a .pmf extension, and can be accessed using any ArcGIS (Esri, 2000) desktop product, including the free-of-charge ArcReader (Esri, 2008b) application. ArcMap and ArcReader offer different ways to view a map, in which one can perform map-based tasks. ArcReader provides basic tools for map viewing, printing and querying of geospatial data. More advanced geospatial processing is available in the ArcGIS suite of geospatial processing programs, including ArcMap.

There are two ArcMap documents contained in this report: (1) CoalbedGasMap2014.mxd, and (2) CoalbedGasMap2014simplified.mxd. CoalbedGasMap2014.mxd is a complex ArcGIS project used to build, design, and export the .pdf map. Multiple data frames enable the advanced user to navigate each province area; upon initial launch, this file tends to be much slower than subsequent map starts. CoalbedGasMap2014simplified.mxd is designed for a novice GIS user to easily navigate and utilize the data.

The digital map layout of both the .mxd and the .pmf, contains a map window with a series of layers in the table of contents frame on the left side of the navigation screen. Within the table of contents, select the box to the left of each layer or group of layers to display the features in map view. Click the "+" sign to the left of each layer, group, or data frame to display the symbology or the list of layers within that group or data frame. To deselect the entire group, ctrl-click the check box to the left of any one of the AU names. Ctrl-click again to toggle the check boxes on for the entire group.

By default, the map is displayed in **Layout View**, and the **Contiguous U.S.** (lower 48) is the active data frame. **Layout View** is designed to work with the map layout and graphic elements, such as titles, north arrows, and scale bars, along with the data frame, all of which are arranged on a page. **Data View** is designed for exploring, displaying, and querying the data sets presented on your map, which is displayed in real-world coordinates (Esri, 2011). Navigation between **Layout View** and **Data View** is available from the **View** drop-down menu.

Labels and annotation for the AUs are included as separate layers that can be toggled on and off, as deemed appropriate for a particular map display. In the simplified .mxd, the 'Coalbed-Gas AU Annotation' layer when visible, shows all coalbed-gas AU names. Users may wish to zoom into a particular area of interest, in which case, individual province labels available within each province group, can be toggled on and the AU annotation layer can be toggled off (made invisible).

ArcMap documents (.mxd) and published map files (.pmf) can be enhanced by including auxiliary base map layers, many of which are available as ArcGIS services (for example, shaded relief, world imagery; Esri, 2010). Several base layers are visible upon opening the map document, and set up as the default view. An important base layer, geologic units from the Geologic Map of North America (Reed and others, 2005; Garrity and Soller, 2009), is included for additional geologic context. Because many of these base layers are very large files, toggling these layers off can hasten map display while navigating the interactive map. Once an appropriate map graphic has been created, or area of interest has been isolated, the addition of one or more of the base layers can enhance the final map product or view.

All geospatial datasets are stored in file geodatabase (Esri, 2012; CoalbedGas2014.gdb and BaseLayers.gdb) and shapefile format in a World Geodetic System (WGS) 1984 or a North American Datum (NAD) 1983 projection, which are standard projections for distributing geospatial data. The polygons in CoalbedGas2014.gdb represent the coalbed-gas AUs that have been defined and assessed by the USGS. An important aspect of this map product is that it does not require extensive GIS expertise or highly specialized equipment to use.

The Metadata folder contains coalbed-gas data documentation in *XML, html,* and *text* format. The base map layers have metadata incorporated from the published sources. Reference or base layers from "The National Atlas of the United States of America" (U.S. Department of the Interior (DOI), 2008) include: state and county boundaries, streams, water bodies, and urban areas in the United States. For the ArcGIS.com Web services (formerly ArcGIS Online; Esri, 2010), data descriptions, sources, and credits are stored as layer properties.

## Summary

The USGS map of the principal coalbed-gas resources in the United States displays the occurrence of this important resource in many regions across the country. Estimates of the coalbed-gas resource, especially the portion that is technically recoverable, are likely to change over time as our geologic understanding of the resource characteristics increases and with further advances in recovery methods. New information can be readily added to the digital baseline developed for the USGS National Assessment of Oil and Gas project. The ability to view, edit, create, and analyze geospatial data can enhance and increase our understanding of coalbed-gas resources and assessments.

## Acknowledgments

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