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U.S. GEOLOGICAL SURVEY ENERGY RESOURCES PROGRAM NEWSLETTER  
SUMMER 2008 ISSUE

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Thank you for subscribing to the U.S. Geological Survey Energy Resources Program Newsletter. This quarterly newsletter provides the latest news, information, and products from the USGS Energy Resources Program. In addition to recent publications, we are continuing to expand the content available through our redesigned website. Previous newsletter issues have been archived (in PDF format) and are accessible from: <http://energy.usgs.gov/newsletter.html> .

If you have any questions or comments regarding the ERP newsletter, please send an email to: [gd-energyprogram@usgs.gov](mailto:gd-energyprogram@usgs.gov) .

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ENERGY SPOTLIGHT

PRESS RELEASE: CIRCUM-ARTIC RESOURCE APPRAISAL

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90 Billion Barrels of Oil and 1,670 Trillion Cubic Feet of Natural Gas Assessed in the Arctic

The area north of the Arctic Circle has an estimated 90 billion barrels of undiscovered, technically recoverable oil, 1,670 trillion cubic feet of technically recoverable natural gas, and 44

billion barrels of technically recoverable natural gas liquids in 25 geologically defined areas thought to have potential for petroleum.

The U.S. Geological Survey assessment released today is the first publicly available petroleum resource estimate of the entire area north of the Arctic Circle.

These resources account for about 22 percent of the undiscovered, technically recoverable resources in the world. The Arctic accounts for about 13 percent of the undiscovered oil, 30 percent of the undiscovered natural gas, and 20 percent of the undiscovered natural gas liquids in the world. About 84 percent of the estimated resources are expected to occur offshore.

"Before we can make decisions about our future use of oil and gas and related decisions about protecting endangered species, native communities and the health of our planet, we need to know what's out there," said USGS Director Mark Myers. "With this assessment, we're providing the same information to everyone in the world so that the global community can make those difficult decisions."

Of the estimated totals, more than half of the undiscovered oil resources are estimated to occur in just three geologic provinces - Arctic Alaska, the Amerasia Basin, and the East Greenland Rift Basins. On an oil-equivalency basis, undiscovered natural gas is estimated to be three times more abundant than oil in the Arctic. More than 70 percent of the undiscovered natural gas is estimated to occur in three provinces - the West Siberian Basin, the East Barents Basins, and Arctic Alaska.

The USGS Circum-Arctic Resource Appraisal is part of a project to assess the global petroleum basins using standardized and consistent methodology and protocol. This approach allows for an area's petroleum potential to be compared to other petroleum basins in the world. The USGS worked with a number of international organizations to conduct the geologic analyses of these Arctic provinces.

Technically recoverable resources are those producible using currently available technology and industry practices. For the purposes of this study, the USGS did not consider economic factors such as the effects of permanent sea ice or oceanic water depth in its assessment of undiscovered oil and gas resources. The USGS is the only provider of publicly available estimates of undiscovered, technically recoverable oil and gas resources.

Exploration for petroleum has already resulted in the discovery of more than 400 oil and gas fields north of the Arctic Circle. These fields account for approximately 40 billion barrels of oil, more than 1,100 trillion cubic feet of gas, and 8.5 billion barrels of natural gas liquids. Nevertheless, the Arctic, especially offshore, is essentially unexplored with respect to petroleum.

For a podcast interview about the USGS Circum-Arctic Resource Appraisal, listen to episode 55 of CoreCast at <http://www.usgs.gov/corecast/>.

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CIRCUM-ARCTIC RESOURCE APPRAISAL ASSESSMENT  
RESULTS:

<http://energy.usgs.gov/arctic/>

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The USGS Circum-Arctic Resource Appraisal – Estimates of Undiscovered Oil and Gas North of the Arctic Circle:

The USGS has completed a systematic assessment of the undiscovered conventional oil and gas resources in petroleum provinces north of the Arctic Circle. This Circum-Arctic Resource Appraisal (CARA) is the first publicly available petroleum resource estimate of the Arctic in its entirety. The Arctic continental shelves may constitute the geographically largest unexplored prospective area for petroleum remaining on Earth. The USGS Fact Sheet summarizing the results of this study is accessible from: <http://pubs.usgs.gov/fs/2008/3049/>

Assessment of Undiscovered Petroleum Resources of the North and East Margins of the Siberian Craton:

The USGS recently completed an assessment of potential undiscovered, technically recoverable (assuming the absence of sea ice) crude oil, natural gas, and natural gas liquids (collectively referred to as petroleum) resources in the Yenisey-Khatanga Basin, Lena-Anabar Basin, Lena-Vilyui Basin (northern part), and the Zyryanka Basin Provinces of the northern and eastern margins of the Siberian Craton. Analyses of crude oil and natural gas from producing wells, shows, seeps, and bitumen indicate the presence of mature source rocks in all of the defined assessment units (AU). Major reservoir rocks include Proterozoic and lower Paleozoic carbonate and clastic rocks and upper Paleozoic and Mesozoic clastic rocks. Using a geology-based methodology, the USGS estimated the mean undiscovered, conventional petroleum resources in these provinces to be approximately 28 billion barrels of oil equivalent, including approximately 8 billion barrels of crude oil, 106 trillion cubic feet of natural gas, and 3 billion barrels of natural gas liquids. A USGS Fact Sheet summarizing the results of this assessment is available from: <http://pubs.usgs.gov/fs/2008/3020/>.

Assessment of Undiscovered Oil and Gas Resources of the West Greenland–East Canada Province:

The USGS recently assessed the undiscovered, technically recoverable (assuming the absence of sea ice) oil and gas potential of the West Greenland– East Canada Province as part of the Circum-Arctic Resource Appraisal study. The West Greenland–East Canada Province is essentially the offshore area between western Greenland and eastern Canada, including Baffin Bay, Davis Strait, Lancaster Sound, and Nares Strait west of and including Kane Basin. The tectonic evolution of the West Greenland–East Canada Province led to the formation of several major structural domains that are the geologic basis for the five AUs defined in this study. Using

a geology-based assessment methodology, the USGS estimated a mean of 7.3 billion barrels of oil and a mean of 52 trillion cubic feet of undiscovered natural gas in the West Greenland–East Canada Province north of the Arctic Circle. The USGS Fact Sheet summarizing the results of the assessment can be downloaded from: <http://pubs.usgs.gov/fs/2008/3014/> .

Engineering and Economics of the USGS Circum-Arctic Resource Appraisal Project:  
This topic is covered in a USGS Open-File Report, Engineering and Economics of the USGS Circum-Arctic Oil and Gas Resource Appraisal (CARA) Project. It contains slides from a presentation delivered at the Fourth U.S. Geological Survey Workshop on Reserve Growth of petroleum resources held on March 10-11, 2008. The presentation, in addition to discussing engineering and economic aspects of the Circum-Arctic Resource Appraisal project, placed special emphasis on the costs related to the development of hypothetical oil and gas fields of different sizes and reservoir characteristics in the North Danmarkshavn Basin off the northeast coast of Greenland. Also included in this report are the summary results of a typical “run” to generate the necessary capital and operating costs for the development of an offshore oil field in a basin off the northeast coast of Greenland. The report includes data supplied by IHS Energy, Inc., who granted permission to publish this data. This Open-File Report is accessible at: <http://pubs.usgs.gov/of/2008/1193/> .

Assessment of Undiscovered Oil and Gas Resources of the Timan-Pechora Basin Province, Russia:

The USGS recently assessed the undiscovered oil and gas potential of the Timan-Pechora Basin Province in Russia as part of the USGS Circum-Arctic Oil and Gas Resource Appraisal study. Geologically, the Timan-Pechora Basin Province is a triangular-shaped cratonic block bounded by the northeast-southwest-trending Ural Mountains and the northwest-southeast-trending Timan Ridge. The USGS recently estimated mean volumes of remaining undiscovered conventional resources in those portions of the Main Basin Platform AU and Foredeep Basins AU lying north of the Arctic Circle to be 1,668 million barrels of oil, 9,062 billion cubic feet of natural gas, and 204 million barrels of natural-gas liquids. Nearly all of the undiscovered conventional oil resources are estimated to be in the Main Basin Platform AU, and 60 percent of the non-associated gas is estimated to be in the Foredeep Basins AU. The USGS Fact Sheet summarizing the results of this assessment is accessible from: <http://pubs.usgs.gov/fs/2008/3051/> .

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## FEATURES

ALASKA STUDIES:

<http://energy.usgs.gov/alaska/>

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Sedimentology and Sequence Stratigraphy of the Lower Cretaceous Fortress Mountain and Torok Formation Exposed Along the Siksikuk River, North-central Alaska:

Located in the southern foothills of the Brooks Range, an exposure of the Lower Cretaceous Fortress Mountain and Torok Formations along the Siksikpuk River in north-central Alaska provides a rare opportunity to observe the stratigraphic contact between these two formations and to interpret the depositional facies and sequence stratigraphy of the exposed strata. Earlier interpretations regarding these rocks are widely diverse, and their regional stratigraphic relationships remain poorly understood.

The objectives of this study were to (1) describe and interpret the succession of facies exposed there, (2) construct the sequence-stratigraphic framework of those facies, and (3) relate interpretations to the regional paleogeography of the Colville foreland basin. The full report of this study, including a plate (40" x 36" PDF format; 183 Mb) depicting the composite stratigraphic section, gamma-ray profile, and photographs of parts of the Fortress Mountain and Torok Formations exposed along the Siksikpuk River, North-Central Alaska, is available from: <http://pubs.usgs.gov/pp/pp1739/d/> .

#### A Major Unconformity between Permian and Triassic Strata at Cape Kekurnoi, Alaska Peninsula: Old and New Observations on Stratigraphy and Hydrocarbon Potential:

A major angular unconformity separates carbonates and shales of the Upper Triassic Kamishak Formation from an underlying unnamed sequence of Permian agglomerate, volcanoclastic rocks, and limestone near Puale Bay on the Alaska Peninsula. For the first time, the angular unconformity in outcrop is photographically documented from a clearly exposed seacliff ~1.3 mi (2.1 km) west of Cape Kekurnoi in the Karluk C-4 and C-5 1:63,360-scale quadrangles. Current and newly acquired surface and subsurface data on Permian and Triassic rocks of the Puale Bay-Becharof Lake-Wide Bay area are reviewed. The resulting reinterpretation of the Permian and Triassic stratigraphy has economic importance for oil and gas exploration on the Alaska Peninsula and in the Cook Inlet basin.

Reinterpretation of previously obtained subsurface data, in combination with newly acquired field observations, indicates that a major pre-Late Triassic diastrophic event affected rocks of the northern Alaska Peninsula before deposition of the regionally widespread Upper Triassic Kamishak Formation. The oil and gas potential of both Permian and Triassic rocks of the study area has been recognized by the petroleum industry since at least the 1930s. In particular, the Upper Triassic Kamishak Formation includes high source- and reservoir-rock potential. The presence of an angular unconformity separating the Kamishak Formation from underlying Permian limestone and volcanic agglomerate is especially significant because leaching of carbonate-rich intervals within the Permian section by meteoric waters may have occurred along this unconformity surface. Areas where Permian limestone intervals are truncated directly beneath the unconformity represent exploration targets. The Upper Triassic shallow-water biostromal carbonate buildups and lagoonal-facies equivalents deposited above this unconformity surface are potential hydrocarbon reservoirs but may not be present over all Late Triassic paleotopographic highs. The USGS Professional Paper documenting this study is available from: <http://pubs.usgs.gov/pp/pp1739/e/> .

## Geologic Map of the Point Lay Quadrangle, Alaska:

Arctic Alaska hosts a spectrum of geology and a wealth of natural resources matched by few areas on Earth. The need for detailed geologic maps is considerable, not only as a basis for petroleum and mineral exploration, but also for land-use planning and the mitigating of the environmental impacts related to resource development.

The USGS performed the initial systematic mapping of the geology of Alaska's North Slope, including the northern front and foothills of the Brooks Range, between 1944 and 1953. Since that time, numerous geologic maps of individual quadrangles, or parts of quadrangles, have been published by the USGS and by the Alaska Division of Geological and Geophysical Surveys. Until now, no attempt was made to produce an integrated set of geologic maps using a uniform scale, cartographic standards, and a standardized stratigraphic nomenclature. SIM-2817 is a set of digital geologic maps comprising individual 1:250,000 quadrangles, each assigned a unique letter (for example, this map of the Point Lay quadrangle is Scientific Investigations Map -2817-E). The objective is to provide a new unified set of geologic maps of the north flank and foothills of the Brooks Range using a uniform scale and cartographic style, as well as a consistently applied stratigraphic nomenclature.

The Point Lay quadrangle (1:250,000) is located on the western Arctic North Slope of Alaska. This map, prepared in cooperation with the Alaska Division of Oil and Gas, Anchorage, Alaska, and Alaska Division of Geological and Geophysical Surveys, Fairbanks, Alaska, is the latest product resulting from a USGS effort to capture, in digital format, quadrangles across the entire width of northern Alaska. The Point Lay quadrangle spans the transition from the deformed rocks of the foothills of the northern Brooks Range northward into the undeformed rocks of the Arctic coastal plain. In the course of preparing this map, previous stratigraphic and structural interpretations were revised with the aid of modern high-resolution color-infrared aerial photographs. This map and accompanying GIS data package are accessible from the following website: <http://pubs.usgs.gov/sim/2008/2817-E/>.

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### APPALACHIAN BASIN STUDIES:

[http://energy.er.usgs.gov/regional\\_studies/appalachians/](http://energy.er.usgs.gov/regional_studies/appalachians/)

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Geologic Cross Section E-E' through the Appalachian Basin from the Findlay Arch, Wood County, Ohio, to the Valley and Ridge Province, Pendleton County, West Virginia:

Geologic cross section E-E' is the first in a series of planned USGS cross sections to document and improve understanding of the geologic framework and petroleum systems of the Appalachian Basin. The section provides a regional view of the structural and stratigraphic framework of the basin from the Findlay arch in northwestern Ohio to the Valley and Ridge province in eastern West Virginia, a distance of approximately 380 miles.



Cross section E–E' updates earlier geologic cross sections through the central Appalachian Basin. Although previously published cross sections through parts of the basin show varying degrees of structural and stratigraphic detail, they are more limited in geographic extent and in the stratigraphic interval portrayed. Although specific petroleum systems in the Appalachian Basin are not identified on cross section E–E', many of their key elements (such as source rocks, reservoir rocks, seals, and traps) can be inferred from the lithologic units, unconformities, and geologic structures shown. Other aspects of petroleum systems (such as the timing of petroleum generation and preferred migration pathways) may be evaluated by burial history, thermal history, and fluid-flow models based on information shown on the cross section. Cross section E–E' also provides a general framework for the coal-bearing section and may be used as a reconnaissance tool to identify possible geologic structures and strata for the subsurface storage of liquid waste or for the sequestration of carbon dioxide. The cross section (available in PDF format as two separate sheets, 17.2 Mb and 12.4 Mb) and accompanying map pamphlet are available for download from: <http://pubs.usgs.gov/sim/2985/> .

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GIS DATA FINDER:

<http://energy.usgs.gov/search.html>

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As a continuing effort to respond to customer feedback and improve the accessibility of information, products, and services from our website, the USGS Energy Resources Program has recently implemented the GIS Data Finder search capability. This new application enables customers to search or browse through the Program's extensive collection of GIS-related products including Maps, GIS Datasets and Internet Map Services from a single portal. This streamlines the web navigation process and makes it easier to locate spatial information. Users of this new application can discover, access, and download products based on a variety of product attributes including spatial location, content type, keyword or research topic. Through the main search portal, <http://energy.usgs.gov/search.html>, one can also search for and access ERP publications and online databases.

We are continuing to expand the functionality and search criteria available through the GIS Data Finder. If there are questions or comments regarding this search capability, please send an email to [datamgt@usgs.gov](mailto:datamgt@usgs.gov) .

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NATIONAL OIL AND GAS ASSESSMENT:

<http://energy.cr.usgs.gov/oilgas/noga/>

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**!!NEW CD-ROM!!**

Areas of Historical Oil and Gas Exploration and Production in the United States,  
USGS-DDS-69-Q:

This new report, available online and in a CD-ROM, contains maps and associated spatial data showing historical oil and gas exploration and production in the United States. Maps are available both as a static Portable Document Format (PDF) file, and as an interactive map that is accessible online. This map compilation is an updated version of a USGS map published by

Mast and others in USGS I-Map Publication 2582 (1998). In addition to a hardcopy map, the data were refined and made more accessible using Geographic Information System (GIS) tools. Because of the proprietary nature of many oil and gas well databases, the United States was divided into cells one-quarter square mile and the production status of all wells in a given cell was aggregated. Base-map reference data are included, using the USGS National Map, the USGS and American Geological Institute (AGI) Global GIS, and a World Shaded Relief map service from the ESRI Geography Network. A hardcopy map was created to synthesize recorded exploration data from 1859 to 2005. In addition to the hardcopy map, the data were refined and made more accessible through the use of GIS tools. The cell data are included in a GIS database constructed for spatial analysis via the USGS Internet Map Service or by importing the data into GIS software. The USGS internet map service provides a number of useful and sophisticated geoprocessing and cartographic functions via an internet browser. Also included is a video clip of U.S. oil and gas exploration and production through time. The online version of this report is accessible via the following website: <http://pubs.usgs.gov/dds/dds-069/dds-069-q/>. For hard copy CD-ROM requests, please send an email to: [eteamdisks@usgs.gov](mailto:eteamdisks@usgs.gov).

#### Burial History, Thermal Maturity, and Oil and Gas Generation History of Source Rocks in the Bighorn Basin, Wyoming and Montana:

This report summarizes the burial history, thermal maturity, and timing of petroleum generation at eight locations for seven key source-rock intervals throughout the Bighorn Basin, a large Laramide (Late Cretaceous through Eocene) structural and sedimentary basin that encompasses about 7,500 square miles in north-central Wyoming and south-central Montana. The resulting data and interpretations were conducted in support of a USGS effort to assess the undiscovered oil and gas resources of the basin. Also modeled was the timing of cracking to gas of Phosphoria-sourced oil in the Permian Park City Formation reservoirs at two well locations. Within the basin boundary, the Phosphoria is thin and only locally rich in organic carbon; it is thought that the Phosphoria oil produced from Park City and other reservoirs migrated from the Idaho-Wyoming thrust belt to the west.

The thermal maturity of source rocks is greatest in the deep central part of the Bighorn Basin and decreases to the south, east, and north toward the basin margins. Modeling results indicate that in the deepest areas, (1) the onset of petroleum generation from Cretaceous rocks occurred from early Paleocene through early Eocene time, (2) peak petroleum generation from Cretaceous rocks occurred during Eocene time, and (3) onset of gas generation from the Fort Union Formation occurred during early Eocene time and peak generation occurred from late Eocene to early Miocene time. The gas generated from the cracking of oil does not contribute significantly to the overall gas potential of the basin, according to the models. Only in the deepest part did the oil generated from the Lower Cretaceous Thermopolis and Upper Cretaceous Mowry Shales start generating gas from secondary cracking, which occurred in the late Eocene to Miocene. The full report documenting this study is available from: <http://pubs.usgs.gov/sir/2008/5037/>.



## **!!NEW CD-ROM!!**

Petroleum Systems and Geologic Assessment of Undiscovered Oil and Gas, Hanna, Laramie, and Shirley Basins Province, Wyoming and Colorado, USGS-DDS-69-K:

In 2005, the USGS assessed the undiscovered oil and gas resource potential of the Hanna, Laramie, and Shirley Basins Province in Wyoming and northeastern Colorado. The assessment was based on the general geologic elements used to define a total petroleum system—hydrocarbon source rocks (source rock maturation, hydrocarbon generation and migration), reservoir rocks (sequence stratigraphy and petrophysical properties), and hydrocarbon traps (trap formation and timing). The summary results of the assessment are available from: <http://pubs.usgs.gov/fs/2005/3125/> . Recently, the USGS released a detailed report containing additional information and interpretive research in support of this assessment. The online version of this report is accessible via the following website: <http://pubs.usgs.gov/dds/dds-069/dds-069-k/> . For hard copy CD-ROM requests, please send an email to: [eteamdsk@usgs.gov](mailto:eteamdsk@usgs.gov) .

## Energy Policy and Conservation Act (EPCA) Phase III Inventory Report:

The third phase of the Energy Policy and Conservation Act (EPCA) Inventory of oil and natural gas resources was delivered to Congress and released to the public in May 2008. This inventory is the culmination of a multiagency collaborative effort that includes the USGS, Bureau of Land Management, U.S. Forest Service, Department of Energy, and Energy Information Administration. This effort is in response to legislative mandates in Section 604 of the Energy Policy and Conservation Act of 2000, and further amended by Section 364 of the Energy Policy Act of 2005. These mandates called for an inventory of all onshore Federal lands to identify: “the United States Geological Survey estimates of the oil and gas resources underlying these lands; and the extent and nature of any restrictions or impediments to the development of the resources...”.

This EPCA Phase III Inventory report, entitled Inventory of Onshore Federal Oil and Natural Gas Resources and Restrictions to Their Development, represents the first truly national assessment of the restrictions and impediments to oil and gas exploration and development. The basis for the inventory came from USGS assessments for undiscovered, technically recoverable oil and gas. The report includes (1) all onshore Federal lands within the United States and areas covered in detail by the Phase II inventory of 2006 that have been updated where needed, and (2) six additional areas (Central and Southern Alaska, Eastern Oregon-Washington, and the Ventura, Williston, and Eastern Great Basins). The results show that 279 million acres of Federal lands are within areas mapped as having oil and natural gas potential. These lands contain an estimated 31 billion barrels of oil and 231 trillion cubic feet of natural gas. The report provides an inventory of the extent and nature of limitations to the development of these resources, but does not make any policy recommendations in response to its findings. The EPCA III inventory report and supporting GIS data are accessible from:

[http://www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/EPCA\\_III.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/EPCA_III.html)

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URANIUM:

<http://energy.cr.usgs.gov/other/uranium/>

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### Uranium in Surface Waters and Sediments Affected by Historical Mining in the Denver West 1:100,000 Quadrangle, Colorado:

With the recent resurgence of uranium exploration and mining activities in the United States, a renewed need has developed for publicly available uranium information. The USGS has currently underway an effort to rescue, compile, and make publically available legacy data and interpretations from past USGS studies related to uranium mines, geology, and environmental investigations not published prior to project completion. These studies include information about the origin of deposits in mining districts presently under scrutiny by exploration interests, the U.S. uranium resource base, and exploration areas not yet well investigated.

As one example of this effort, a USGS Scientific Investigations Report was recently published documenting the findings from a geochemical sampling study of 82 stream waters and 87 stream sediments within mountainous areas immediately west of Denver, Colorado. The primary purpose was to evaluate the effects of geology and past mining on the concentration and distribution of uranium. The legacy geochemical data from this study are augmented by more recent, but limited, measurements of uranium isotopes in water and observations of the mode of occurrence of uranium and thorium in sediments to supplement the geochemical data.

In general, historical metal sulfide mining and associated uranium mining within central portions of the Denver West quadrangle have not produced highly elevated concentrations of uranium in local stream sediments. However, fine-grained sediments collected from Ralston Creek several kilometers downstream from the Schwartzwalder uranium mine, in the foothills of the Rocky Mountain Front Range, have locally anomalous concentrations of uranium and contain rare particles of uraninite and radium-bearing barite that are the products of mining-related activities. The  $U_{234}/U_{238}$  activity ratio (AR) of acid mine drainage in the quadrangle is less than 1.0 and is distinct from AR values greater than 1.0 in local stream waters. Selective chemical extractions of iron-oxyhydroxides in sediments followed by uranium isotopic analysis to determine this AR may provide a means of tracking the downstream transport of iron- and uranium-rich precipitates produced during neutralization of acid drainage. The methodologies applied in this regional-scale study are readily transferable to other sites and scales of investigation and could contribute to the design of future studies that attempt to describe uranium abundance and mobility in uranium-mineralized and mined areas. The full report documenting the findings from this study, including images from sampling sites, is available from: <http://pubs.usgs.gov/sir/2007/5246/>.

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OTHER NEWS

RECENT PUBLICATIONS:

**Assessment of Undiscovered Biogenic Gas Resources, North-Central Montana Province**

U.S. Geological Survey Fact Sheet 2008-3036

<http://pubs.usgs.gov/fs/2008/3036/>

**Hydrocarbon Source Rocks in the Deep River and Dan River Triassic Basins, North Carolina**

U.S. Geological Survey Open-File Report 2008-1108

<http://pubs.usgs.gov/of/2008/1108/>

**Preliminary Toxicological Analysis of the Effect of Coal Slurry Impoundment Water on Human Liver Cells**

U.S. Geological Survey Open-File Report 2008-1143

<http://pubs.usgs.gov/of/2008/1143/>

**Reserve Growth of Alberta Oil Pools**

U.S. Geological Survey Open-File Report 2008-1194

<http://pubs.usgs.gov/of/2008/1194/>

**The Yampa Bed—A Regionally Extensive Tonstein in the Williams Fork Formation, Northwestern Piceance Creek and Southern Sand Wash Basins, Colorado**

U.S. Geological Survey Scientific Investigations Report 2008-5033

<http://pubs.usgs.gov/sir/2008/5033/>

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CUSTOMER SATISFACTION SURVEY – ENERGY RESOURCE PROGRAM NEWSLETTER:

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The USGS recently conducted a survey to evaluate customer satisfaction and to gather customer feedback with respect to the Energy Resources Program Newsletter. This quarterly newsletter is intended to help recipients access the information and internet services from the ERP website by highlighting the latest ERP research activities, publications, and information resources.

The USGS ERP values its customers, so the advice given will help us improve our science products and their delivery. We thank those who responded to the survey and provided their comments.

Survey respondents were asked to rate their satisfaction with various aspects of the Newsletter as well as their overall satisfaction. In addition, respondents were asked what newsletter features they use, how they use the information and what decisions were affected by the information. We are currently studying the feedback received from this survey and will provide a summary of results in an upcoming Newsletter issue, along with actions that will be taken in response to our customer feedback. If you did not take the survey, but have feedback that you would like to share, please provide comments via the interactive survey on our web site (<http://energy.usgs.gov/survey.html>).