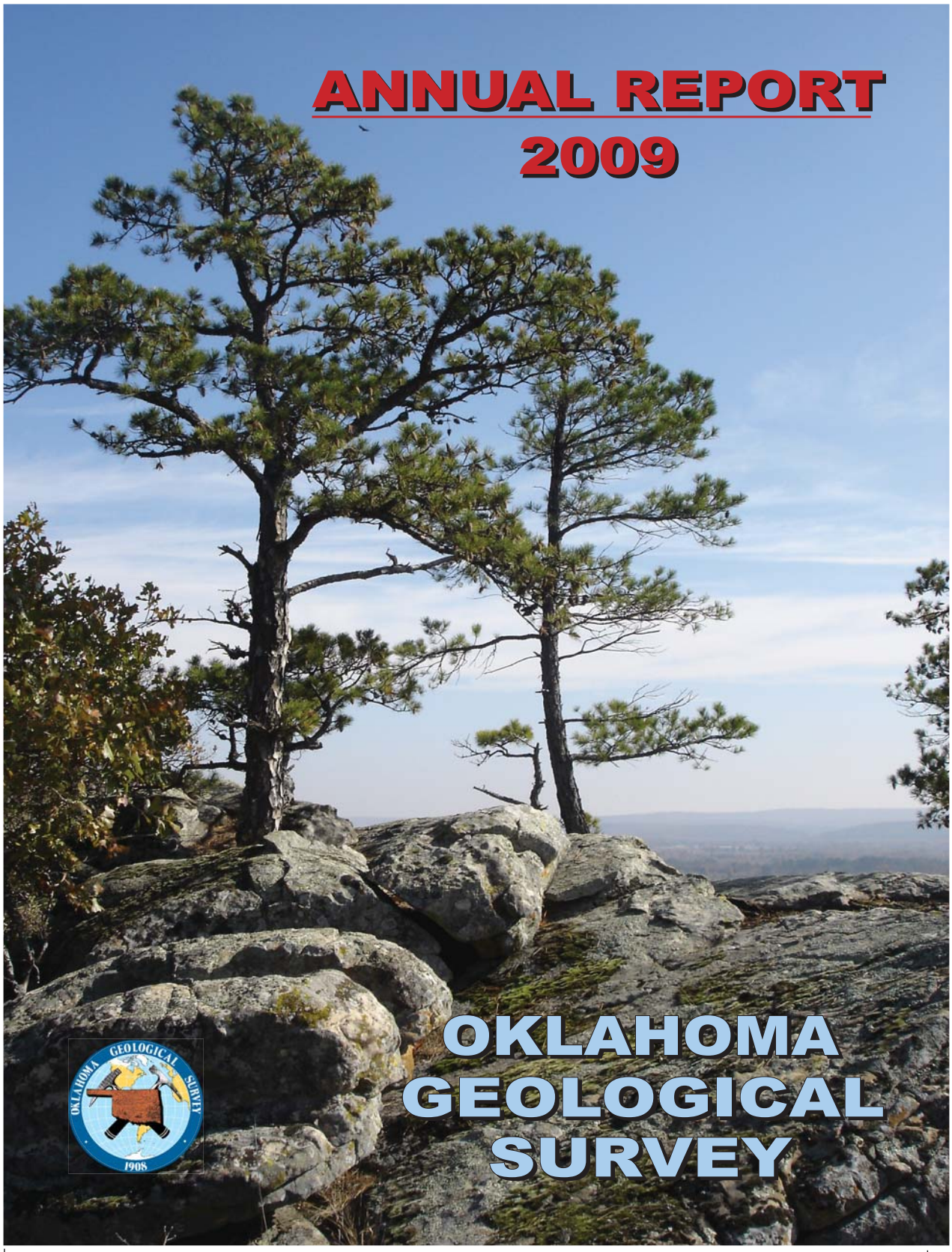
ANNUAL REPORT
2009
OKLAHOMA
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OKLAHOMA GEOLOGICAL SURVEY
1908

For the Oklahoma Geological Survey, 2009 was a productive year

Dr. G. R. Keller

I am happy to say that 2009 was a year of considerable progress for the Oklahoma Geological Survey. We were able to accelerate our efforts to get digital data into the hands of the public and industry. Our modest data preservation grant from the U. S. Geological Survey was renewed at an increased level, and our projects with the Energy Libraries Online (ELO) moved forward under the leadership of Dan Boyd.

As part of the ELO efforts, more than 125,000 strip logs stored in our Oklahoma Petroleum Information Center (OPIC) were scanned. This included a thousand logs from wells for which we had no previous record. As new oil and gas data are made available, prospects of all descriptions can be developed, causing wells to be drilled and boosting production, operator income and state revenues.

Gene Kullmann and his OPIC staff were busy this year with all of the interest in finding more oil and gas.

Interest in coal, minerals, and aggregates continues and Brian Cardott and Stan Krukowski have kept our databases up to date for these commodities.

Another data-related effort this year was the approval of funding for a sizeable Department of Energy geothermal grant. This project involves all of the state geological surveys and will build a nationwide database.

We continued to receive funding from the U. S. Geological Survey for geologic mapping, and Tom Stanley and Julie Chang made considerable progress in the field. They also worked with Russell Standridge to convert their data to a digital product now available on our web site. Our data-related activities allowed us to significantly increase the hiring of students, and this has been a nice development.

We redesigned our web site and have continued to add content to it thanks to the efforts of Connie Smith. For example, we have added more than 100 publications and maps this year. The results are an impressive average of about 12,000 visits per month. We have also cleared out our backlog of publications.

Our outreach efforts were again strong, and Michelle Summers helped organize a robust series of workshops and meetings. In addition, we hosted a large school group from the Mayo School in Tulsa, and Jim Chaplin continued his work with Earth Science teachers. We have worked with the *Daily Oklahoman* Education Partnership to produce a newspaper insert that was sent to hundreds of classrooms. In addition, Neil Suneson, Richard Andrews, and Dan Boyd have continued to teach the subsurface methods class for the ConocoPhillips School of Geology and Geophysics.

We had two retirements this year. Bob Fay retired after 53 years of service to OU and the State of Oklahoma. This made him the longest continuously employed person in the history of the state and the University of Oklahoma. Betty Bellis also retired and passed on the Sigma Gamma Epsilon torch to the current National Secretary-Treasurer.

Finally, we have had a red-letter year on the earthquake monitoring front. Oklahoma experienced a record number of earthquakes that were small but could be felt. This activity attracted a great deal of attention. We were able to close our search for a seismologist to replace Jim Lawson after his untimely death. Austin Holland came aboard on our first working day of 2010 and had an immediate impact. Amie Gibson at the Leonard Observatory had been working way too much since Jim's passing.

Dr. G. Randy Keller, director

Fossil Fuels

Survey geologists work hard to stay in tune with the many new technical, geological, and political issues that can impact Oklahoma's energy industry. They then transfer this information to an audience that includes the geological, engineering, landmen and professional societies; other industry individuals; state and federal agencies; and certainly not last, the general public, including schools, scouts, and civic groups, and city and county officials.

The Survey staff uses technical workshops, field trips, publications, presentations, and the OGS website to make their work available. The Oklahoma oil and gas topics include all aspects of petroleum geology, as well as data access, industry production/activity, and history. All are designed to provide the information necessary to understand, efficiently produce, and conserve Oklahoma's natural resources.

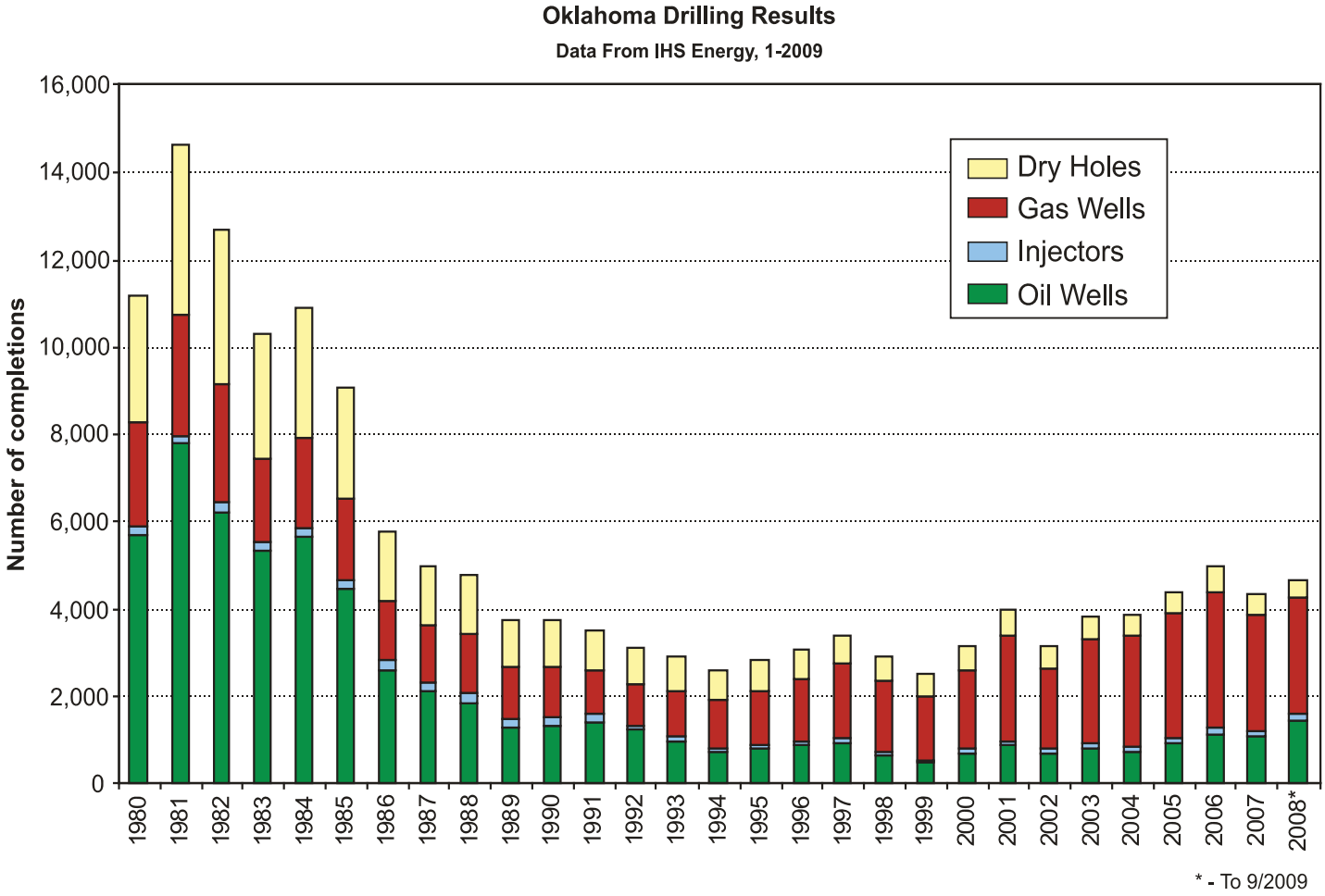
Energy related inquiries continue to come from the public at a rate of about one per day. Requests for information come from a broad spectrum of individuals, including industry professionals, students, academics and the general public. Inquiries come mostly from Oklahoma, but many originate from other states and countries.

The vast bulk of questions center on oil and gas data issues, with the remainder more geologically focused. Data issues include where and how to access drilling/leasing activity, well location and completion information, oil/gas/water production volumes, and unraveling a complex stratigraphic nomenclature.

Geological questions deal with the hydrocarbon potential of various geological provinces and stratigraphic intervals, reservoir characterization to aid in exploration for and development of certain reservoir types, as well as a wide variety of other general geological information.

The OGS also receives questions from individuals and firms about mineral rights. Some of these are people who have inherited land or rights and have no idea where to begin a search for further information.

Sometimes a phone conversation or an e-mail will suffice; sometimes the contacts are referred to an OGS publication, and sometimes they are directed to other sources of information or county and state groups who may be able to provide the answers or services needed.

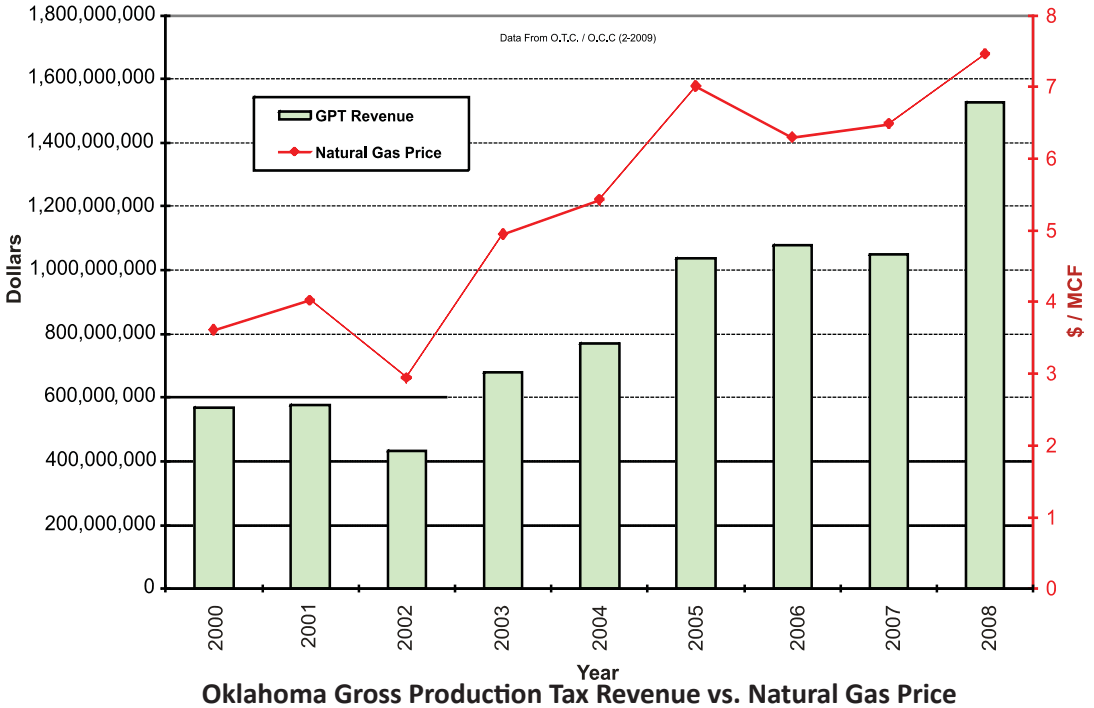


* - To 9/2009

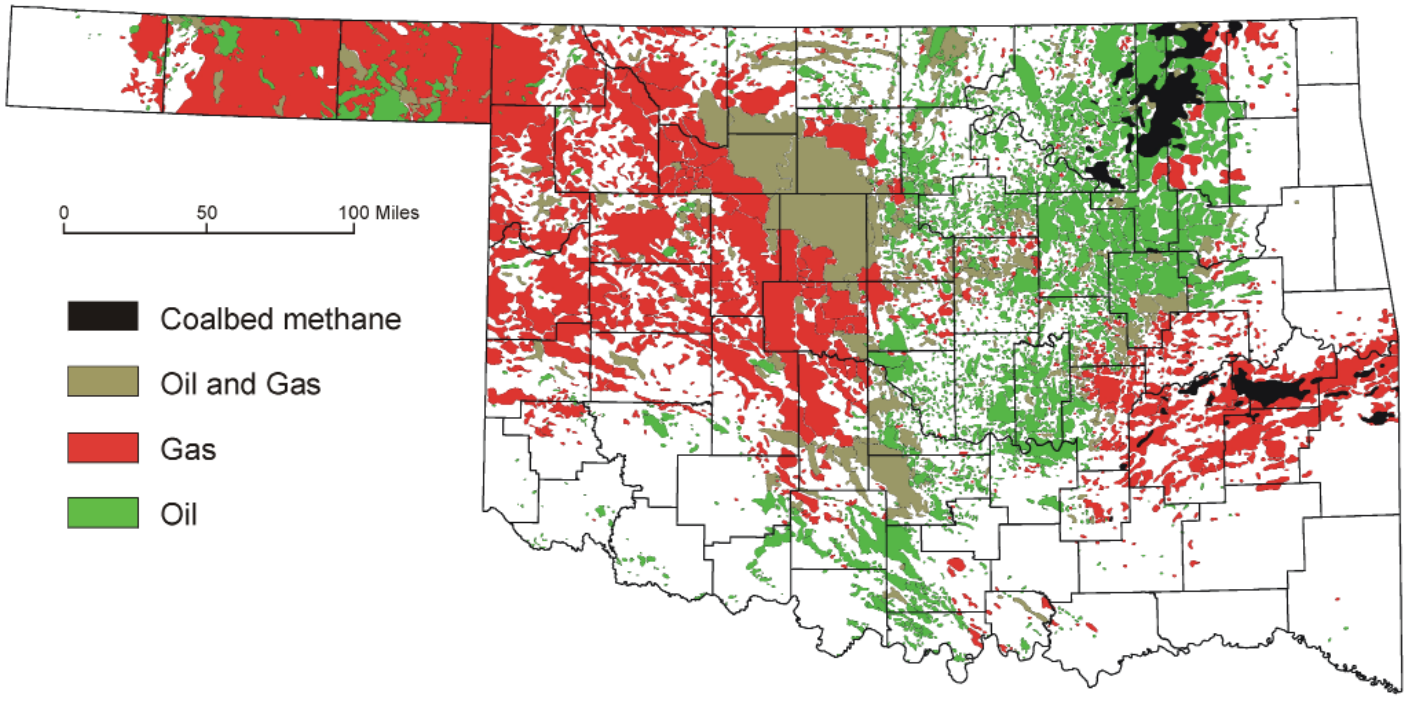
Coal and Gas Shales

Gas Shales: Unconventional gas resources (e.g. coalbed methane and shale gas) contribute to the total energy needs of Oklahoma. About 46 percent of Oklahoma's electricity comes from natural-gas-fired power plants.

Based on completion reports (Form 1002A) submitted to the Oklahoma Corporation Commission then recorded from IHS Energy, Brian J. Cardott, OGS coal geologist, compiles and evaluates Oklahoma gas shale activity, providing valuable information to industry on favorable areas to explore.



Oklahoma Gross Production Tax Revenue vs. Natural Gas Price



OGS Map of Coalbed Methane, Oil and Gas Fields in Oklahoma

Isoreflectance maps are published for the Anadarko Basin and are in preparation for southern and eastern Oklahoma.

Cardott and others are evaluating the source and timing of post-oil bitumen filling fractures in the Woodford Shale and Mount Scott granite in southern and southwestern Oklahoma. This important work has implications for oil and gas generation and migration.

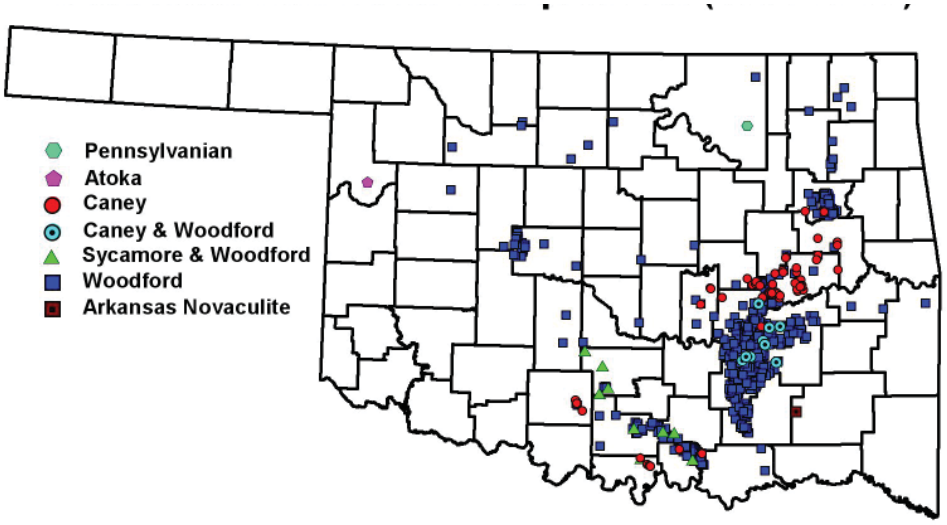
Coal

Coal production, imports, and use in Oklahoma: About 47 percent of Oklahoma's electricity comes from coal-fired power plants. OGS geologists estimate there are 8 billion short tons of remaining identified bituminous coal resources (coal in the ground) in Oklahoma, whereas there are 1.6 billion short tons of demonstrated reserves (coal that is economically recoverable) in Oklahoma, according to the Energy Information Administration (EIA). Cardott annually evaluates Oklahoma coal production, reported from the Oklahoma Department of Mines, by coal quantity, company, mine, seam, quality, and rank.

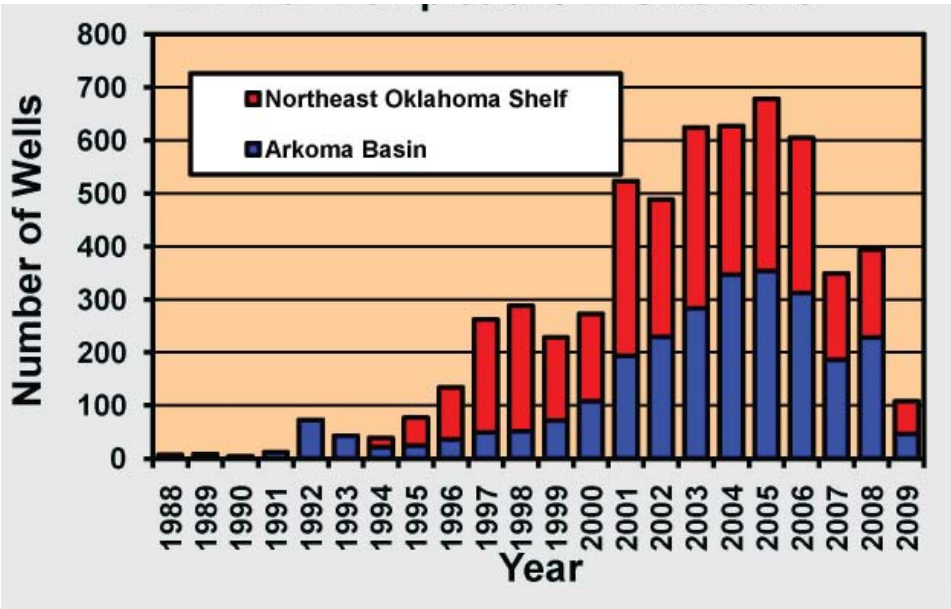
Four mining companies produced about 1.5 million short tons of bituminous coal at eight mines in five counties in Oklahoma in 2008. In 2007 (year of latest data from EIA), four utilities imported 18.7 million short tons of subbituminous coal from Wyoming for use in five Oklahoma coal-fired power plants.

Oklahoma has a vast amount of coal resources for future uses. At current consumption rates of about 21 million short tons per year, Oklahoma alone (excluding imports) has enough coal reserves for 75 years. To put these amounts in perspective, cumulative production of coal from Oklahoma/Indian Territory is 292 million short tons since 1873.

Coal channel and grab samples are collected from active coal mines and



Oklahoma gas shale completions, 1939–2009.



CBM well completions in Oklahoma, 1988 through 2009..

analyzed for chemistry, petrography, and rank for evaluation of coal quality for applications to future utilization (combustion, carbonization, conversion). Stratigraphic and analytical data are compiled in the National Coal Resources Data System through a grant from the U.S. Geological Survey.

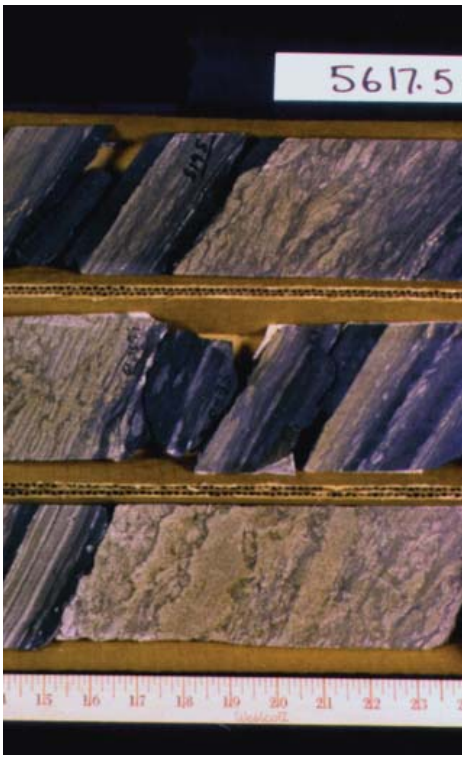
Coal data is made available to the public on the OGS Web site: **www.ogs.ou.edu/level3-coal.php.**

Rank: Cardott is working on the first Hartshorne coal surface to subsurface rank map for applications to coal utilization, coalbed methane exploration, and basin analysis (preliminary map is available on the OGS Web site. **www.ogs.ou.edu/fossilfuels/images/coalrankmap2009.pdf.**

Geologically, the Hartshorne is the oldest commercial coal in Oklahoma, with most CBM wells in the Arkoma Basin drilled to the Hartshorne.

Cardott and Jane L. Weber, OGS database coordinator, also added

Gene Kullman prepares core for thin slab conventional radiography. With use of the proper technique, it is possible to show enough detail to see the fibers in paper.



A box of core ready for examination at OPIC. Six new layout tables and an additional 96 ft of lighting gives visitors more room and better visibility.

northern Oklahoma, a workshop on the Simpson formation, and the Glen Cole cross sections for northeastern Oklahoma.

They assist students and faculty members with various projects, and prepare material and maps for the OGS Web site.

Oklahoma Petroleum Information Center (OPIC)

In 2009, the Oklahoma Petroleum Information Center saw an increase of 12 percent in the number of people using the facility. This includes the general public as well as people from industry and academia. Academic use was up 10 percent with a 13 percent increase in the number of industry users. The use of the core library was up a dramatic 37 percent, with well-data usage increasing 16 percent.

OPIC added 6 tables in the layout area, which brings the facility up to 450 ft of table space. OPIC also added another 96 ft of lights over the layout tables, giving users greater visibility to examine material.

A big improvement at OPIC was made to the well-log library by widening the aisles and adding more than 80 new cabinets, bringing the total number of legal-size cabinets in the library to 812. All of the strip logs have been scanned, and along with the core analysis data are now available on the Energy Libraries Online Web site. **www.energylibrariesonline.com**

OPIC received new donations of 1,227 boxes of well cuttings from 544 wells. Only a couple of new wells with core have been added this past year.

All of the strip logs have been scanned and, along with the core analysis data, are available to users on the Energy Libraries Online Web site: www.energylibrariesonline.com. In addition, an internal database with a full inventory of well samples is now in place; and other databases have been developed to store data such as plug removal, cores gamma scanned, photos taken, and any other work performed or data generated.

OPIC is gaining the ability to know what each box contains; the condition of the material therein; whether any analytical data exists; and the specific information on depth.

OPIC has come a long way since its beginnings in 2002, and many plans are being made to make the collections bigger and more accessible.

Geophysical Studies

After the death of Dr. James E. Lawson, chief geophysicist, in 2008, the facility was staffed by Amie Gibson and Jake Nance. The Survey has hired an additional seismologist, Austin Holland, who came on board in January of 2010.

During 2009, 43 felt earthquakes were reported , which is the highest number since the OGS has been keeping records. Official records have been kept from 1969, although some data exists from 1897–1969. Ten of these events were felt in Oklahoma and Lincoln Counties in a swarm of earthquakes that occurred in the Jones and Harrah areas in October of 2009.

The OGS received an estimated 1,300 earthquake-felt reports submitted online alone by citizens in 2009. Each felt report is cataloged and assigned an intensity rating based on the Modified Mercalli Intensity Scale, then are used to justify and define the intensity of the felt earthquake That information is published each year in *Oklahoma Geology Notes* and on the website.

This fiscal year the Observatory sent more than 287 earthquake images to the media and citizens upon their request. Because of the popularity of

Other Geological Programs

Along with other activities, the Survey is becoming involved with geothermal studies. Richard Andrews is leading the project, and will attend a workshop on the subject in 2010.

CO_2 sequestration is another expanding area of interest, and the Survey is applying for a grant to use both existing OGS information and studies and new research to examine this important issue. The project is a cooperative effort among the state geological surveys and the USGS and will make good use of OGS materials and well data that are available at OPIC.

Database efforts include projects related to three grants: One from the USGS that Jane Weber, OGS database coordinator, is working on incorporates waterflood data; a database on gravity that involves both Randy Keller and Dan Boyd; and Dan Boyd's projects that include the digitizing of sample logs and the Glen Cole cross-section project, both in cooperation with ELO.

Earth Science Education

The Survey participated in the *Daily Oklahoman*'s Newspapers in Education program in 2009 through the *Destinations Oklahoma* publication along with Career Tech and the Oklahoma Alliance for Geographic Education. The publication came out in September, and coincided with the launch of the new OGS website.

NIE has developed award-winning programs that are provided to more than 15,000 students in more than 800 schools at no cost due to the support of sponsors. These publications reach upward of 172,000 readers statewide. The *Oklahoman* publishes 10 to 20 special NIE programs every year in addition to providing daily delivery of the electronic edition of the newspaper to schools. After publication, all the material is still available on the NIE Web site.
http://nie.newsok.com/

Destinations Oklahoma included a printed 12-page student workbook with text and illustrations, a teacher guide that is online, and additional activities, materials and links that were in the newspaper and are available on the NIE web. A set of 25 workbooks is delivered to each classroom that requests one, and other materials are delivered in e-mails and available on the website.

The material in *Destinations Oklahoma* related geology and geography to the five different regions of Oklahoma that as designated by the tourism department. The publication was well received and the program is an excellent way to reach Oklahoma school children and their parents with information about Oklahoma geology and our natural resources.

The Survey will participate in another NIE project called OKLAHOMA ROCKS! in the spring of 2010, and will provide all of the content for that publication. The project is being funded by generous contributions from the Oklahoma City Geological Foundation and the Oklahoma Society of Land Surveyors. To see both projects go online to:
http://nie.newsok.com/

The OGS offers teacher workshops, field trips, special learning and lesson-plan sessions, and in-class visits as part of the special programs available to teachers from James R. Chaplin, OGS geologist.

As part of that effort, the Tulsa Mayo Demonstration School visited the Survey in 2009 and enjoyed a number of presentations about geology and energy by the OGS staff.

Dr. Ken Luza, OGS engineering geologist, helps conduct birdseed mining sessions that are so popular with children. Luza also appears frequently in television interviews reassuring Oklahomans that today's earthquake doesn't mean the "big one" is on the way.

Meetings and Outreach

All OGS staff are involved in public service. Questions, problems and an occasional rock are brought in by walk-in visitors, while phone calls and e-mails generate daily responses to requests for information and assistance.

Through meetings and workshops, the OGS makes its research available in forums that also allow for questions and discussions, and give industry, academia, and the public an opportunity to meet and exchange ideas.

The OGS conducts workshops and field trips for many different groups. These trips are run for industry, academia, and the public sector.

Some of the most popular field trips are the ones Jim Chaplin runs for groups of earth science teachers in Oklahoma.

Michelle J. Summers, technical project coordinator, along with Jane L. Weber, database coordinator, Sue B. Crites, *Geology Notes* editor, and Tammie K. Creel, administrative assistant, plan and coordinate efforts to transfer technical information to industry. Many events and meetings involve as much as one-half of the Survey staff.

Neil Suneson, left in red shirt, Dan Boyd, center rolling out map, and Rick Andrews, right, orient the participants on an OGS field trip.

An eager group of geologists heads toward the spectacular outcrop while on an OGS field trip. Every effort is made to provide groups with informational materials, food and drink, comfortable vehicles, and enough trip leaders to answer everyone's questions.

OGS PUBLICATIONS IN 2009

- *Special Publication 2008-2. Geomagnetic Results, Secular Variation, and Archaeomagnetic Chronology, United States and Mesoamerica, Including Archaeomagnetic Data and Time Assignments. Robert L. Dubois, Emeritus. January 23, 2009.*

- *Information Series 13. The Barite Roses of Oklahoma, by David London. February 18, 2009.*

- *Circular 112B. Stratigraphic and Structural Evolution of the Ouachita Mountains and Arkoma Basin, Southeastern Oklahoma and West-Central Arkansas: Application to Petroleum Explorations: 2004 Field Symposium. Technical Papers. Neil H. Suneson, Ibrahim Çemen, and Roger M. Slatt, Editors. March 29, 2009.*

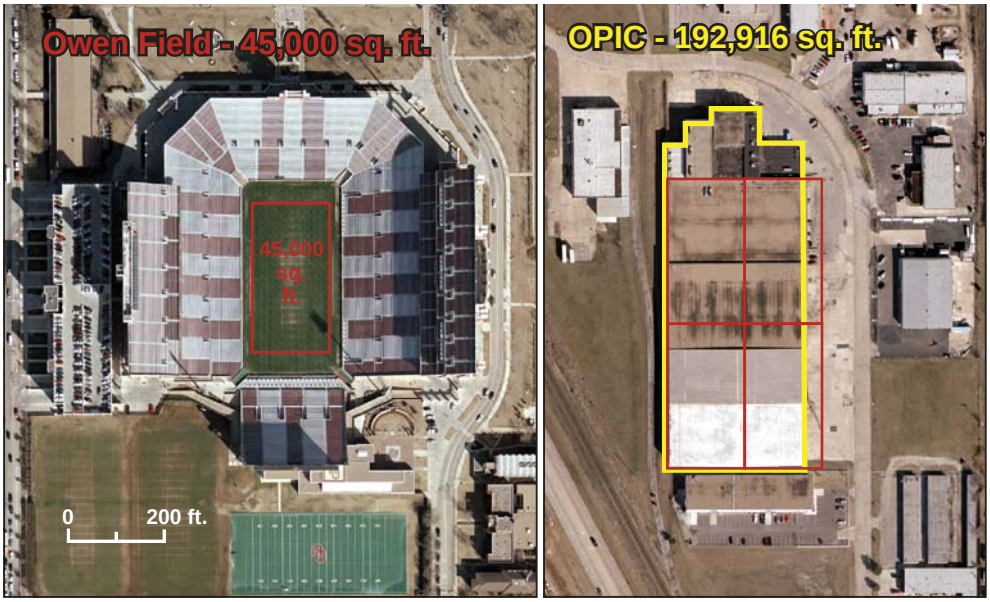
- *Special Publication 2008-1. Stratigraphic Guide to Oklahoma Oil and Gas Reservoirs, by Dan T. Boyd. Laminated Chart. May 27, 2009.*

- *Oklahoma Geology Notes, Vol. 68, Nos. 3 and 4 (combined). July 10, 2009.*

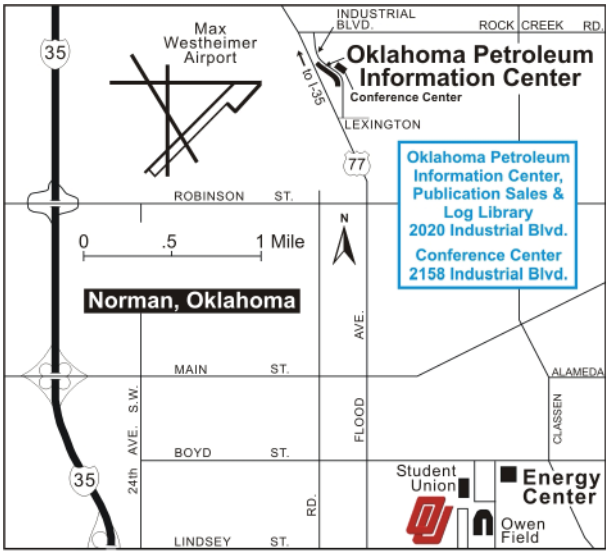
- *Circular 111. Morrow and Springer in the Southern Midcontinent, 2005 Symposium. Richard D. Andrews, Editor. July 22, 2009.*

- *Oklahoma Geology Notes, Vol. 69, No. 1. August 10, 2009. Boyd. November 2008.*

For more publications information:
www.ogs.ou.edu/pubs.php
or call 405/325-1299



OPIC, which contains the Publication Sales Office, resides in 192,916 square feet of space, which is slightly more than 4 football fields in size. Out of that 18,750 square feet is office space, and the rest is warehouse space for cores and samples.



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