

AASG Journal 2011-12 Report—Oklahoma Geological Survey

Dr. G. Randy Keller, director

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- *The Oklahoma Geological Survey is a state agency for research and public service located on the Norman Campus of the University of Oklahoma and affiliated with the College of Earth and Energy. The Survey is chartered in the Oklahoma Constitution and is charged with investigating the state's land, water, mineral, and energy resources and disseminating the results of those investigations to promote wise use with sound environmental practices.*

Overview: The fiscal year 2011–2012 was an exciting and interesting time for the Oklahoma Geological Survey. Perhaps the biggest event was a record-breaking earthquake of magnitude 5.6 on November 11. Also at OGS, important improvements were made to the Oklahoma Petroleum Information Center (OPIC), where new roofing and a new air conditioned core viewing area vastly improved the quality of life for many occupants and collections housed there. The Survey also saw changes in office space in Sarkeys Energy Center as some people moved to better offices.

Survey staff have helped out with OU's field geology course conducted each summer at the Bartell Field camp near Cañon City, Colorado; taught petroleum geology classes; given interviews to the media on earthquakes, oil and gas issues, hydraulic fracturing and injector wells; provided speakers to civic and school groups; held workshops and published; addressed committees and talked to citizens; and in general upheld the constitutional mandate to investigate issues and inform Oklahomans about their abundant natural resources.

Seismic Activity: The biggest story for OGS in this time frame, however, was the 11 November earthquake of magnitude 5.6, a new record for Oklahoma besting a 5.5 earthquake in El Reno, west of Oklahoma City, in April of 1952. The November quake was about three miles deep, with the epicenter 44 miles northeast of Oklahoma City. The event happened on the heels of two preceding quakes occurring about 2 a.m. that day, being approximately 4.7 and 3.9. The events were monitored and media interviews fell mostly to Austin Holland, OGS seismologist, who has become a sought-after source of information and well-known media personality because of Oklahoma's rash of earthquakes. Dr. Keller pitches in on many occasions, but Holland seems to be on everyone's speed dial when the ground starts shaking.

FEMA and the Small Business Administration estimated six homes were destroyed, and almost 200 had some damage from the event. In Shawnee, St. Gregory's University Benedictine Hall, built in 1915, suffered the most damage, estimated at \$2.8 million, with some of its hallmark towers being broken off. The SBA estimates it will issue about \$1.7 million in loans and grants for the earthquake damage in the area.

The earthquake was remarkably similar to the 1952 earthquake, which had a similar area where it was felt and similar types of damage reports. Both were felt as far away as Illinois. Residents in Norman were alarmed by the shaking, which produced a good deal of ground motion lasting about 45 seconds and, as some reported, a lot of associated noise.

From July 1, 2011, to April 1, 2012, the OGS recorded almost 2,000 earthquakes in the state. As a result of the EarthScope project, Oklahoma is now home to five broadband state-of-the-art seismic stations, two of which are backbone stations that are part of the Advanced National Seismic System. OGS researchers Amie Gibson and

Jacob Nance keep the Leonard, Oklahoma, observatory and seismometers up and running and aid in getting information out when quakes are felt.

Projects and Programs: The OGS continues its involvement in the USGS National CO₂ Sequestration Assessment Program, which is being led by geologist Rick Andrews. Using structure contour maps depicting the tops of the Arbuckle Group and the Hunton Group in Oklahoma, the project is identifying very favorable areas for CO₂ storage in the state. The Arbuckle is an ideal sink for high-volume storage, while any formation within the Hunton may have good porosity development and lateral/vertical seals making it an excellent candidate for storage compartments. An isopach map of the Hunton and an extensive database containing subsurface formation tops of the Arbuckle and basement rocks are proving to be important tools available to the Survey for this project. The database is dynamic and will be updated continually to reflect new data and provide quality checking of the Survey's existing data.

Dr. Ken Luza continues to be involved with the Tar Creek Superfund Site near Picher, Oklahoma. Luza has worked in the area since the 1980's, publishing, mapping and in general keeping contact with the residents and government agencies as this important and painful story played out for the town of Picher and the surrounding area. As an engineering geologist, he also contributes to projects in other areas of Oklahoma, including issues surrounding water quality in the panhandle.

Dr. Stanley Krukowski keeps track of Oklahoma's mineral resources and works with various professional groups and companies within the state.

Brian Cardott continues to study coal and coalbed methane in general and the Woodford Shale in particular. Cardott has one of the most visited and most updated sections on the OGS website. The increase in drilling for gas shales and shale oil in Oklahoma has made his studies a very valuable and sought after source of information for exploration and production efforts.

Dr. Neil Suneson continues his work in the Ouachita Mountains, Arbuckle Uplift, and Wichita Mountains areas, adding to the knowledge base of these complex and fascinating areas. Suneson was hired in 1986 at the beginning of COGEMAP and since has worked in virtually every area of Oklahoma. In addition to basic research, he also helps teach class number 4233: Subsurface Methods; spends a great deal of time with students and their theses, and is an instructor at OU's Field Camp.

Dr. Kyle Murray joined the Survey staff in November of 2011, and brings with him a grant to investigate water resource geospatial infrastructure for oil shale development. Also at the OGS he will be looking at the application of GIS to water resource studies, as well as investigating the many other aspects of groundwater.

Dr. Keller and his team of Kevin Crain and Vikram Jayaram are studying the deep structure of Oklahoma and surrounding areas and building 3-D geological models based on geological and geophysical constraints. Along with the OGS projects and programs, Keller is always busy with students, media interviews, administrative issues, speaking engagements, and all the other tasks that come along with his positions and titles as: Professor and Edward Lamb McCollough Chair in Geology and Geophysics, State Geologist of Oklahoma, and Director of the Oklahoma Geological Survey.

In other areas, the Survey is completing work on a grant from the National Geological and Geophysical Data Preservation Program administered by the USGS. This fourth year of the project was centered around

completing work with the Survey's collection of mud logs. The Survey now has header information for the more than 3,300 mud logs that are inventoried with the listings currently available for examination in the Data Library at OPIC. Users can view the information or download it as a Microsoft Excel file. Previous work for this effort involved metadata describing almost 9,000 individual rock core samples maintained at OPIC. The purpose of the project is to assist in archiving geological and geophysical data and sample collections held by the state surveys and making this information commonly available.

Oklahoma Petroleum Information Center (OPIC): Great progress was achieved this year, resulting in a more comfortable and user-friendly place for patrons and staff to work. The core viewing area was enclosed, providing about 5,000 sq. ft. of heated, air conditioned (a life-saver in Oklahoma's 113-degree summer!), and well-lighted space in which to examine core. The area also has Wi-Fi, 450 ft. of core layout tables and an extensive core-photography area.

Also added to the complex were a new Spectral Gamma Logger that scans core as it passes on a conveyor belt, and an upgraded imaging tube for the X-ray imaging lab. While the number of visitors has remained relatively constant, the core lay-out numbers, cores plugged, and cores slabbed counts are up significantly over previous years.

To help with getting the information in an accessible form, Richard Tarver has joined OPIC as a research technician. An OU graduate, Richard is experienced in web-based databases and has five years of experience in database construction and management.

Mapping: STATEMAP, with OGS geologists Dr. Tom Stanley and Dr. Julie Chang, marks its 15th anniversary at the Survey in 2012. The project's goals are detailed mapping at 1:24,000 around urban areas and digital maps at 1:100,000 scale available to the public. These smaller-scale maps also are part of the ongoing effort to create a new digital 1:500,000-scale geologic map of the state. Russell Standridge of OGS works with Stanley and Chang on the GIS and cartography.

To date, the OGS has completed more than 41 detailed 7.5' geologic maps at a scale of 1:24,000 and 16 reconnaissance maps at 1:100,000. These are available on the website and in hard copy and digital format upon request. This reconnaissance project is complete for the southwestern part of the state and is moving northwest to southeast with plans to complete at least one 1° sheet annually.

Other News and Events: OGS former Director Dr. Charles J. Mankin was recognized at the annual AASG meeting for his very important contributions to the establishment of the National Geologic Mapping Act of 1992 (http://ncgmp.usgs.gov/about/ngm_act/ngmact1992.html). This act established the funding for STATEMAP, which is the Survey's largest annual research grant. STATEMAP's 20th anniversary was a major focus of the AASG meeting and now the best proposal submitted to this program each year will be given the Charles J. Mankin Award, with the name of the winner added to a nice plaque.

Dr. Mankin also was, along with other State Geologists, a driving force in the COGEOMAP program which was a forerunner of STATEMAP. The Survey worked with the USGS and the Arkansas Geological Commission on this effort to map the Ouachita Mountains of southeastern Oklahoma and southwestern Arkansas. Proposals were issued by the USGS in 1984 and the project got underway in Federal Fiscal Year 1985. The 22 quadrangle maps of COGEOMAP and the STATEMAP products can be seen at <http://ogs.ou.edu/level2-geomapping.php>

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Dr. Kenneth S. Johnson, who served as OGS Associate Director for more than 20 years, received the AASG Distinguished Service Award at the annual meeting in 2012. Johnson's service to the geological community was based on his broad knowledge of geology, good humor, writing skills, and willingness to pitch in wherever needed. Although he has been retired from OGS for more than 10 years, he still maintains an office and is available for consultation and corporate knowledge when needed.

Petroleum geologist Dan T. Boyd left the Survey after 11 years to pursue a long-standing dream of returning to the international petroleum arena in Doha, Qatar. Dan will be missed for his broad knowledge of petroleum geology and the industry, for his many publications, maps and projects, and for his willingness to take all of those calls, letters and e-mails from the general public. The OGS wishes Dan and his wife Starla the best in their new adventure.

Geologist Brittany Pritchett has joined the Survey after finishing her M.S. degree at OU. She will be working with Rick Andrews on data compilation efforts for petroleum, geothermal, and CO₂ sequestration studies, as well as developing her own research program.

Long-time Survey staff member David O. Pennington retired at the end of 2011. David had for more than 30 years played an important role by helping with workshops and other meetings, pitching in on any project when asked, and keeping mail flowing and the fleet of vehicles serviced and moved.

Office staff member Jennifer Veal retired also, but returned to work on a part-time basis. Janise L. Coleman also finished her career at the OGS, having been with the Survey for twenty years. We will miss these staff members on a daily basis, but wish them well in their new adventures.

Public Service, Outreach and Education: The Survey provides speakers for many events in the state and nationally: Civic, school and scout groups, legislative groups, professional organizations and many other gatherings call on OGS staff to present information. The staff also leads many field trips for professional and educational groups during the year. As always, the Survey responds to numerous calls, e-mails and office visits from citizens who need information about everything from a rock or fossil they found, suspected gold on their property or mineral rights they have inherited. It is a task that everyone takes seriously and a service the OGS does its best to provide.

In October of 2011 the OGS issued its fourth Newspapers in Education program titled: *OKLAHOMA ROCKS! The Making of a Landscape*. The 16-page publication was provided to enrolled schools free of charge, 25 copies per classroom, along with 6 lessons in the Daily Oklahoman newspaper, an online teacher's guide, and classroom activities incorporated with the material. The project, sponsored by the *Daily Oklahoman*, has been extremely successful and reaches more than 350 schools throughout all areas of the state. More than a thousand extra copies are available to the OGS for scout and educational groups, and civic and professional organizations where they are distributed throughout the year.

In recent times, Dr. Keller and seismologist Austin Holland have spent a good deal of their time in media interviews and as speakers dealing with earthquakes in general and the topics of fracturing in drilling along with the topic of injection wells and seismic events. Although time consuming, both Keller and Holland make a great effort to dispel much of the misinformation that surrounds this subject.

Meetings Workshops: The OGS staff routinely attends various national, state and professional meetings during the year as guests, speakers and panelists. The Survey also conducts technical workshops that have an extensive

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following, and in this time period were held for capacity crowds at each session, with long waiting lists of potential attendees. The workshops are a major activity at the Survey, and have a loyal following in industry and academia.

Among the scheduled events last fiscal year were:

Shales Moving Forward, July 21, 2011, 253 attendees.

This very popular workshop, coordinated by Prof. Carl Sondergeld from OU's Mewbourne School of Petroleum and Geological Engineering, was the third in an extremely popular series focusing on shales. The eight speakers and six posters focused on the theme that all shales are not the same, and that new technologies are resulting in more successful exploration, drilling and production programs. Presenters discussed actual field experiences from the Haynesville shale play and the deep Anadarko Woodford wells, while speakers from academia discussed the latest in research into geologic properties and technologies. For a more detailed discussion go to: http://ogs.ou.edu/pubsscanned/NOTES/2011Vol71_3.pdf

Mississippian Workshop, August 2, 2011, (273 attendees, workshop was a repeat of one in May).

Structural & Stratigraphic Oil and Gas, March 7, 2012, (256 attendees).

Participation in the **Oklahoma Aggregates Association Annual Meeting and Field Trip**, January 24–25, Oklahoma City.

Aggregates Day at the State Capitol.

GIS Day at the State Capitol.

Water Day at the State Capitol.

Publications:

EP10: *Dot-to-Dot Activities for Grades 1–6*, by Jim Chaplin.

GB37: *Desmoinesian Coal Deposits in part of the Arkoma Basin, Eastern Oklahoma*, by Samuel A. Friedman.

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