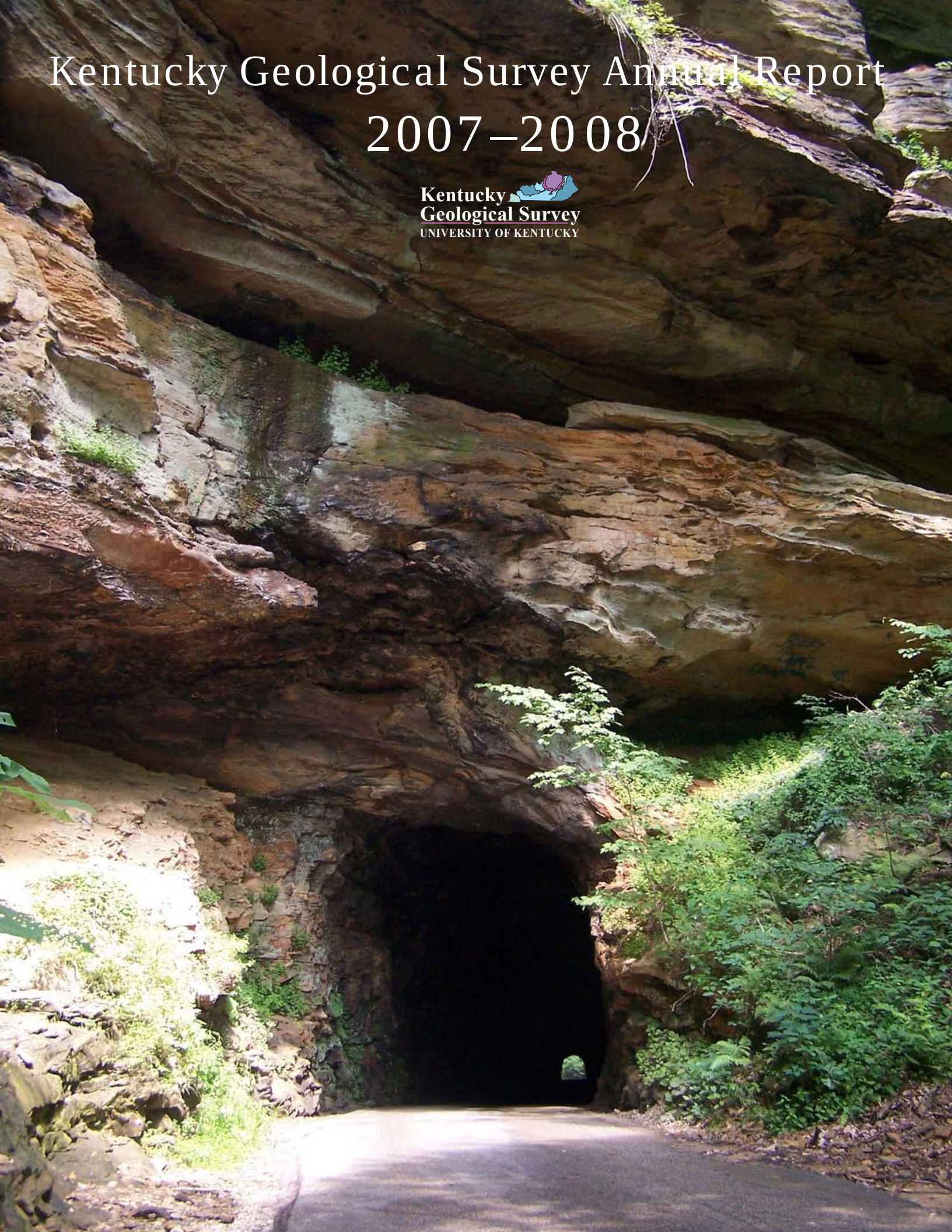
Kentucky Geological Survey Annual Report

2007–2008



Kentucky Geological Survey
UNIVERSITY OF KENTUCKY

Our Mission
is to increase knowledge
and understanding of the mineral,
energy, water resources, geologic hazards,
and geology of Kentucky for the benefit
of the Commonwealth and Nation.

Front Cover:
Nada Tunnel on Ky. 77 in Powell County. The one-lane tunnel was created between 1910 and 1912 with dynamite and steam jackhammers in a sandstone unit of the Breathitt Formation. It was originally intended for a narrow gauge railroad to haul logs to a sawmill in Clay City. It is 13 feet tall, 12 feet wide, and 900 feet long.
Photo by Richard Smath

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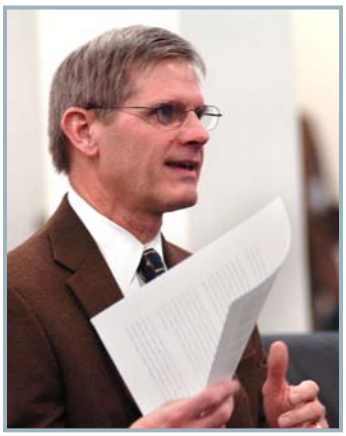


The annual report of the Kentucky Geological Survey is a summary of the projects and accomplishments of this organization over the past fiscal year. We strive to be concise in our reporting and avoid the use of technical jargon as much as possible in order to reach a broad audience. People interested in the Kentucky Geological Survey, its programs, and educational outreach can find an abundance of information on the KGS Web site. The Web site is a portal into maps, publications, geologic data for Kentucky, and recent presentations made by our staff members.

The Kentucky Geological Survey is a mandated program of the state of Kentucky and operates as a center of the University of Kentucky under the Vice President for Research. The mission of KGS is to investigate the minerals, waters, hazards, and geology of Kentucky for the benefit of the citizens of the commonwealth, a mission that has been carried out for more than 154 years. The serious questions concerning energy, water, global climate, and hazards confronting our state, nation, and the world create a situation where geological surveys are more important to society than ever before.

Important measures that show KGS progress and effectiveness include numbers for sponsored projects. In 2007-08, KGS had 25 funded projects for a total amount of grant funding of $2.8 million. This is the highest amount of grant funding in recent history. KGS produced 29 new publications in the various KGS series. The KGS Web site is a valuable tool used by many industries, government agencies, and private citizens to gather geologic information. Last year, users conducted 184,000 online database searches for petroleum, coal, and water data. Most of the data and publications that KGS provides can be downloaded free from our Web site, and over half a million such downloads took place last year. Users can also view KGS data on interactive Web maps, and almost 500 users a day take advantage of this service to meet their needs. KGS added three new staff members in the year ending June 30, 2008.

In a special session in 2007, the Kentucky General Assembly passed HB-1, "AN ACT relating to the advancement of energy policy, science, technology, and innovation in the Commonwealth, making an appropriation therefore, and declaring an emergency." This bill established tax incentives for alternative-fuel and renewable-energy plants to locate in Kentucky and provided funds for research. HB-1 appropriates $5 million for the Kentucky Geological Survey to investigate CO_2 sequestration, enhanced oil recovery, and enhanced Devonian gas recovery. Supporters of this legislation testified in favor of the bill, which passed overwhelmingly, demonstrating how important energy and coal issues are to the future of Kentucky. This is the largest grant in KGS history. A very rewarding aspect of the research on CO_2 sequestration is the partnerships we have formed with companies and individuals also interested in carbon storage.

For the HB-1 research on CO_2 sequestration, deep holes will be drilled in eastern and western Kentucky and projects with oil and gas companies will be initiated to test enhanced recovery technology. As a geologist, I find it very exciting to be a part of a project that will drill 8,250 feet deep in Hancock County, in western Kentucky, penetrating all the Paleozoic rock formations of the Illinois Basin. A tremendous amount of information will be gathered from this project, as well as the other HB-1 projects. The projects will be described in more detail in this report.

In the 2007-08 fiscal year, the state of Kentucky experienced a serious budget deficit that ultimately translated into a 6 percent budget cut for KGS. The unplanned departure of an employee and the planned retirements of three other employees will satisfy the budget cuts without requiring staff layoffs. The loss of these positions will adversely affect our productivity for many years to come, however.

A 5.2-magnitude earthquake at Bellmont, Ill., on April 18, 2008, was felt in many parts of Kentucky. Fortunately, there were no fatalities or injuries, but much media attention was focused on earthquakes in the central United States. We held a press conference and spoke to several radio call-in shows about earthquakes. My takeaway message, though, was that scientists must get organized in advance because this was as gentle a trial run as ever could be expected, as our friends and colleagues in China discovered on May 12 when they were hit by an 8.0-magnitude earthquake that took 70,000 lives and left widespread devastation. A KGS seismologist went to China as part of our scientific exchange program with Gansu Province and the Lanzhou Institute of Seismology to see the aftereffects of this tragic event and determine what lessons Kentucky could learn from it.

The Association of American State Geologists, the umbrella organization for all 50 state geological surveys, recently celebrated the 100th anniversary of its founding. I participated by compiling and editing a book, Association of American State Geologists Centennial History: 1908-2008, detailing the history of this organization. A fascinating aspect of summarizing this history is that issues and problems have not changed a great deal; water, energy, hazards, mapping, and minerals have always been important and a priority for society, although the tools and methods have changed a great deal.

KGS staff testified for a number of legislative committees and consulted with State officials in a number of different departments. KGS maintained the State's groundwater monitoring network, seismic monitoring network, well sample and core library, and groundwater data repository, all part of KGS's mandate. The details of these and many other projects are written up in greater detail in this annual report for 2007-08.

The Energy and Minerals Section conducts research on Kentucky's energy resources and needs.

Interest in the development of regional energy resources and the reduction of man-made greenhouse gases continued to dominate the research effort in the section.

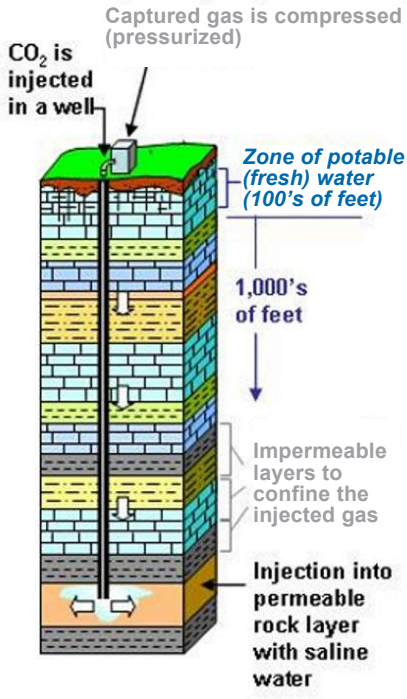
Members of Hancock County Fiscal Court listen as Secretary Len Peters of the Kentucky Cabinet for Energy and the Environment speaks during a public hearing on the planned deep carbon storage project in the county.

Carbon Storage

The 2007 passage of Kentucky House Bill 1 brought KGS the largest single research grant in its history. It primarily provided tax incentives for new coal gasification projects, but it also allocated $5 million to the Survey to study ways of disposing of CO_2 emitted by these facilities and using CO_2 for enhanced oil and gas recovery. The Energy and Minerals Section created the umbrella Kentucky Consortium for Carbon Storage (KYCCS) for developing projects to accomplish these mandates.

HB 1 project status: By the end of the fiscal year, much progress had been made on a project, led by Rick Bowersox and Dave Williams, to drill a deep CO_2 injection test well in western Kentucky, in partnership with a newly formed Western Kentucky Carbon Storage Foundation. Peabody Energy, ConocoPhillips, and E.ON U.S. created this nonprofit foundation to provide expertise and matching funds for the project. The partners developed the project details and acquired drilling rights to a site in Hancock County for an 8,200-foot-deep well to be drilled in 2009 into the Knox Group and Mount Simon Sandstone. Porous zones containing saline water within these formations are considered good candidates for permanent storage of carbon dioxide. Other project partners include Schlumberger Carbon Services; GEO Consultants, LLC; Smith Management Group; and the law firm of Wyatt, Tarrant, and Combs.

Dave Williams, one of the co-project investigators for the western Kentucky deep carbon storage test, leads a meeting of the partners involved in the project.



The deep test will measure the carbon storage capability of formations 8,000 feet underground, well below the depths of potable water, gas, oil, and layers of sealing rock.

KGS has also been working with industry partners to develop a deep saline CO_2 injection test in eastern Kentucky and to test CO_2 enhanced oil and gas recovery across the commonwealth. Underlying Kentucky's coal fields is the Devonian Ohio/New Albany Shale, a black organic-rich shale formation that is a possible sink for CO_2. Injected CO_2 may also displace additional natural gas from this important gas reservoir. Several Devonian shale projects are being evaluated for a demonstration project. The deep CO_2 injection test in eastern Kentucky may involve two sites where existing wells have been offered. KYCCS is also evaluating oil fields for possible use in a pilot CO_2 enhanced oil recovery project. More information

on the KYCCS research can be found on the consortium's Web site, www.kyccs.org.

Other State funding:

KGS also received funding from the Kentucky Energy and Environment Cabinet to study a variety of issues related to sequestration in depleted oil and gas fields and saline aquifers. Investigators Kathy Takacs and Brandon Nuttall analyzed oil fields in Kentucky for EOR suitability and factors affecting enhanced recovery, such as temperature, pressure, and oil gravity. Another important factor influencing oil recovery and sequestration is the interaction between CO_2 and water in the reservoir. Marty Parris analyzed water chemistry in counties having high EOR and sequestration potential. Steve Greb and Mike Solis examined the broader sequestration potential in saline aquifers by compiling maps and cross sections showing depths, thicknesses, and distribution of the most promising saline aquifers along major river corridors. Because seismic data will play a critical role in extending the aquifer analysis beyond the areas of present well control, Jim Drahovzal compiled a map showing the statewide distribution of seismic lines with information such as vendor, data vintage, and acquisition parameters. Finally, in a more detailed analysis of sites for possible future development of advanced coal technologies, Brandon Nuttall led an effort to perform a basic geologic assessment of 32 sites for carbon storage potential, identifying likely storage reservoirs and seals and inventorying well data.

Marty Parris takes a gas sample from an oil well in the Big Andy oil field of eastern Kentucky.

Marty Parris entered the third and final year of his soil gas chemistry project funded by the U.S. Department of Energy. The soil chemistry database being developed will be part of a broader effort to monitor sequestration projects for leakage of injected CO_2. Shallow soil-gas measurements down to 1 meter were completed in the first 2 years at four study sites in eastern Kentucky. Results from the shallow measurements provided the basis for drilling four soil-gas wells to allow gas sampling down to 10 meters below the zone of strong biologic influence. The bulk and isotopic chemistry of gases have been measured under winter conditions, and sampling under summer conditions is scheduled for September 2008.

Work continued on three regional U.S. Department of Energy–sponsored carbon sequestration partnerships that KGS is participating in: the Midwest Regional Carbon Sequestration Partnership, the Midwest Geologic Sequestration Consortium, and the Southeast Regional Carbon Sequestration Partnership. Mike Solis has been working on maps and cross sections of pertinent stratigraphic intervals in support of these projects. The partnerships are critical to understanding regional carbon storage potential, and they provide KGS with access to the newest research and expertise on carbon storage issues.
completed a regional subsurface study of the carbon storage and EOR potential in Leslie and Perry Counties, funded by TECO Energy and Perry County Coal Company. This basic geologic investigation examined four major Big Lime oil fields for sequestration and EOR potential.

Rough Creek Graben Consortium

A dozen energy exploration companies have joined the Rough Creek Graben Consortium, a public/private partnership studying the oil and gas production potential of the graben in western Kentucky. The Kentucky Energy and Environment Cabinet is also participating in the 2-year project, managed by John Hickman.

This fiscal year marked the start of the second phase of the project. Hickman continued gathering and interpreting both available well data and energy-related regional data related to the graben. The USGS is also testing oil samples gathered for the project.

Coalbed Methane in Eastern Kentucky

Cortland Eble, Stephen Greb, and Kathy Takacs are looking at the Eastern Kentucky Coal Field as a potential resource for economic coalbed methane. A core hole was drilled and sampled in June 2008 in Martin County to a depth of 920 feet. Gas is presently being desorbed and sampled for gas species composition. The development of coalbed methane could advance the economy of eastern Kentucky and help meet the growing demand for natural gas.

Beech Fork Mining Company agreed to drill cores at this site in Martin County to help gather information for KGS coalbed methane research.

Staff in the Water Resources Section help communities with water supplies, water-related health issues, and mapping of groundwater basins.

With funding from the Kentucky Infrastructure Authority, KGS Water Resources staff continued work to identify sources of public water supplies for small communities and rural neighborhoods. The Survey directed the drilling and completed hydraulic testing of two wells for the Harlan County city of Evarts and hydraulically tested an existing well. Section staff also sited a new well for the community of Wallins in Harlan County, and has designed hydraulic tests for the city of Campton in Wolfe County. KGS has also collaborated with Greenville in Muhlenberg County in the city's initial efforts to drill high-yield wells. KGS is providing information to Marion concerning the use of abandoned, underground fluorspar mines as potential water supplies for the Crittenden County city.

Cane Run Watershed

In 2006, the Kentucky Division of Water targeted the Cane Run watershed as one of four watersheds for clean-up under the State's nonpoint-source pollution program. This watershed begins in Lexington and ends in Scott County where Cane Run discharges into North Elkhorn Creek. Because of the karst bedrock, Cane Run only flows during times of sufficient rainfall, normally in the spring. The remainder of the time, most water is recharged to an underground conduit system. KGS is leading an effort to locate sites to monitor the underground conduit carrying groundwater from the Lexington area to Royal Springs, the major water supply for Georgetown in Scott County. Electrical-resistivity and spontaneous-potential geophysics are being used to help pinpoint the location of the active conduit at three locations. An initial round of 15 exploratory boreholes was drilled to help interpret the geophysical results. This work is being carried out in cooperation with the University of Kentucky's College of Agriculture and the Department of Earth and Environmental Sciences.

Rorry Henderson of the U.S. Geological Survey and Randy Paylor of the Water Resources Section conduct a shallow seismic survey at the Kentucky Horse Park in March, 2008 as part of the Cane Run Watershed project.

Selenium Concentrations in the Aquatic Environment

With funding from the Kentucky Division of Water, the Water Resources Section is developing a database for selenium concentrations in water and fish tissue from the Eastern Kentucky Coal Field. Groundwater has been hypothesized to be moving through bedrock and areas of coal-mine spoil, dissolving selenium initially concentrated in the coals during their formation. The groundwater eventually discharges to surface waters, where selenium may metabolize and bioaccumulate into toxic forms and concentrations in the food chain. Fourteen of the proposed 15 surface-water sites have been sampled. The total number of samples includes 37 water and 29 fish tissue samples, for which seven forms of selenium were analyzed, along with standard chemical analyses to help define the hydrogeochemical environment. The data will be interpreted in the latter part of 2008.

A property owner in Franklin County looks at the damage to his driveway from a cover-collapse sinkhole which staff in the Water Resources Section investigated in April 2008.

Groundwater Conditions in the Cumberland Gap Tunnel

The Water Resources Section, in coordination with Federal and State agencies, completed dye tracing, monitoring programs, and installation of flow meters to gather information on groundwater beneath the road surface in the Cumberland Gap Tunnel in southeastern Kentucky at the Tennessee border. Hydrogeochemical data collection and analyses indicate that groundwater dissolution of the limestone roadbase aggregate is a principal cause of pavement subsidence in five major zones of both the northbound and southbound bores of the tunnel that carries U.S. 25E under Cumberland Gap National Historic Park. Remediation measures are being considered by the Kentucky Transportation Cabinet.

Karst Annual Activity Summary for 2007-08

Several geophysical tools (electrical resistivity, spontaneous potential, and microgravity) for determining the rate of formation of cover-collapse sinkholes were tested in the field in cooperation with the UK Department of Earth and Environmental Sciences. This activity is part of a continuing effort to identify potential sinkhole sites. A paper was presented on the topic to the Kentucky Water Resources Annual Symposium in March 2008. Currens made significant progress on the development of a karst model ordinance to be offered to Kentucky communities. A first draft was written and circulated for KGS review. This project received a grant from the UK Commonwealth Collaboratives program, which rewards researchers who identify significant problems in the state and work to solve them.

Research continued on the Karst Development Index/Karst Potential Index methodology. The methodology will be applied to evaluate digital geologic maps of Kentucky for karst development.

Public service also continued to be a major activity in the karst program. KGS employees are members-at-large of the Bluegrass Regional Planning Commission. KGS staff on the Kentucky Speleological Society Board of Representatives continued to work with the State Division of Water for production of additional karst groundwater basin maps. They responded to many citizen reports concerning cover-collapse sinkholes at prospective building sites, spring development, flooded crawl-spaces, and water-well drilling in karst areas.

Jim Currens responds to one of many calls he receives each year about problems with sinkholes affecting private property.

Water Resources staff helped to re-survey this cave in Scott County, allowing them to test several geophysical methods for use in karst geology.

The Geologic Mapping Group was upgraded to "section" status during the year, as its members developed new map products for the state.

The Kentucky Geological Survey and a variety of State and local agencies constantly need new or refined geologic mapping of the state, including map products to help them with assessments of hazards and resources. The KGS Geologic Mapping Section works to meet those needs with a variety of products. The creation of the new section was formalized on January 1, 2008. William Andrews, formerly a member of the Geospatial Analysis Section, became section head. The section includes three other staff in the Lexington office and two members in the Henderson office. The group has been working for several years on geologic mapping projects funded by the annual U.S. Geological Survey STATEMAP program and Kentucky State agencies.

The STATEMAP program continues to be the primary funding source for KGS geologic mapping projects. During the fiscal year, the KGS received $234,000 from STATEMAP to support new Quaternary geologic mapping in both eastern and western Kentucky. KGS field mappers Ron Counts and Scott Waninger completed new mapping in three 7.5-minute quadrangles in McLean, Webster, and Union Counties. This work will contribute to efforts to assess seismic hazard and geotechnical characterization of the unconsolidated deposits in western Kentucky.

Matt Crawford and Mike Murphy completed new mapping of two 7.5-minute quadrangles in Perry County, which will provide a foundation for slope-stability modeling in the eastern part of the state. Tom Sparks completed a digital compilation of the bedrock geology in the Evansville 30 x 60 minute quadrangle.

Matt Crawford works on an early draft of his map of Mammoth Cave National Park, a project funded by the National Park Service.

Ron Counts and Matt Crawford examine soil know as residuum during a mapping field trip in the Hazard area.

Crawford also worked with staff of Mammoth Cave National Park to develop a geologic map of the park with a grant from the National Park Service. The large 30 x 70 inch map presents the geologic issues of Mammoth Cave in language the general public can understand and depicts features such as karst and sinkholes while also discussing water-quality protection, cave formation, and how plant and animal life interact with the geology of the region. The park staff plans to use the map, which KGS will publish, as a guide when they lead field trips for college-level classes visiting the park. The map draft won recognition as the best poster at the 2008 Kentucky GIS Conference.

The Geologic Mapping Section is also supporting two student mapping projects in Kentucky, which are funded by the U.S. Geological Survey's EDMAP program. Morehead State University and Northern Kentucky University each have students doing mapping projects similar to the KGS eastern Kentucky STATEMAP project. KGS personnel are supplying data and field

support for the student mappers.

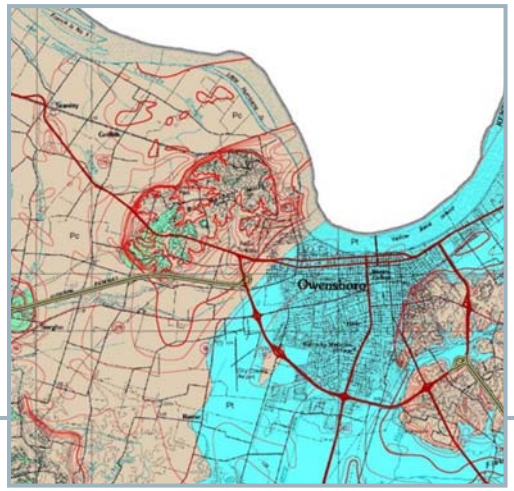
Steve Martin continued to develop a fracture mapping database supported by the Kentucky Transportation Cabinet. He is examining orientation and spacing of roadcut and natural fractures in selected areas of central and eastern Kentucky. The information will be useful for a variety of projects from slope design for road projects to water and petroleum exploration.

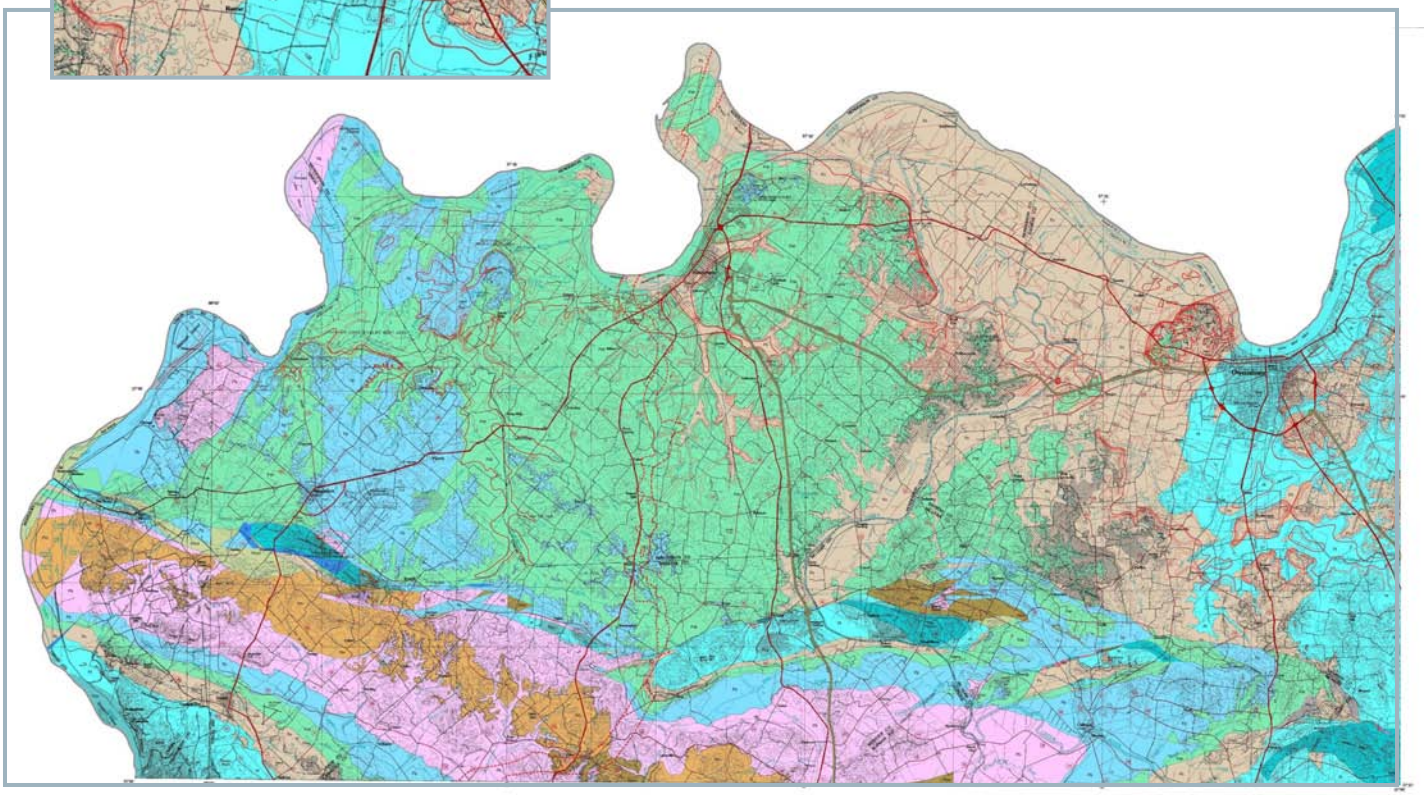
Matt Crawford has begun to design and develop a comprehensive landslide inventory and database, in cooperation with John Kiefer, Jerry Weisenfluh, and the KGS Web page design team. The new database will store and catalog information about the location, size, movement, and damages associated with landslides across Kentucky.

Mike Murphy examines a landslide in the Owensboro area.

During a field trip for his fracture-mapping project, Steve Martin examines a fracture just off Kentucky state road 32 in Elliott County.

This "Bedrock Geologic Map of Parts of the Evansville and West Frankfort 30 x 60 Minute Quadrangles, Western Kentucky" was completed by Tom Sparks and Steve Martin.





Events in Kentucky and abroad drew renewed attention to the earthquake hazard and the Geologic Hazards Section's work.

Beginning the morning of April 18 with a 5.2-magnitude tremor, a series of earthquakes near Belmont in southeastern Illinois shook much of the Midwest and attracted public and news media attention. The first tremor was the largest one ever recorded in the Wabash Valley seismic zone. Minor nonstructural damage occurred in some older downtown Louisville buildings. The event was followed by over 30 aftershocks over a three-week period, and seismic activity continued in the area through the end of the fiscal year. Six of the aftershocks ranged from 3.0- to 4.6-magnitude. With the help of the University of Kentucky Public Relations office, KGS scheduled a news briefing the morning of the first earthquake. Director Jim Cobb discussed the earthquake threat in the Midwest and answered questions.

KGS Director Jim Cobb speaks to the media on the morning of April 18, 2008, when a 5.2- magnitude earthquake in the Wabash Valley seismic zone shook much of the Midwest, including Kentucky.

Geologic Mapping Section Head William Andrews went to the State Emergency Operations Center in Frankfort to answer questions from State agencies and help them monitor later seismic activity. Using the online displays of seismic recordings from instruments in the Kentucky Seismic and Strong-Motion Network, Andrews helped quickly confirm the occurrence of a 4.6-magnitude aftershock later that morning. His trip to Frankfort also prompted a discussion of how KGS should be integrated into activation plans for the EOC in future events, including damaging earthquakes, landslides, and other geologic incidents.

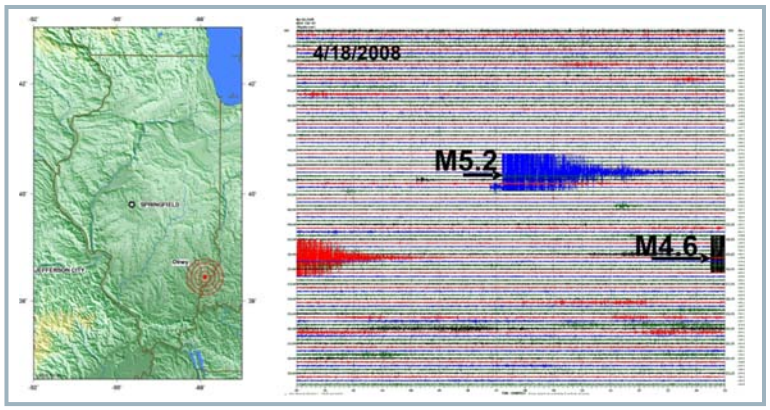
As aftershocks continued to be recorded three days after the April 18 earthquake, the news media visited the Survey for more interviews. A Lexington TV news crew interviews Assistant State Geologist John Kiefer on April 21.

Seismic Network

The Kentucky Seismic and Strong-Motion Network of 28 seismic instruments placed throughout Kentucky is operated jointly by KGS and UK's Department of Earth and Environmental Sciences. The network monitors earthquakes in the central United States and records larger earthquakes throughout the world. It includes 19 short-period, one-component seismometers (weak-motion) and nine strong-motion accelerometers including two vertical strong-motion arrays. The public can view earthquake recordings from 12 of the instruments in near-real time on the KGS Web site at www.uky.edu/KGS/geologichazards/equake3.htm.

The strong-motion instruments recorded 56 earthquakes in the region. Two earthquake epicenters were located in Kentucky, near Blandville. The largest earthquake during the fiscal year was the April 18, 2008, Belmont, Ill., earthquake. Several hundred earthquakes of smaller magnitude were recorded by the weak-motion instruments.

Funding was secured late in the fiscal year for deep borehole instruments for the Central United States Seismic Observatory, to be installed early



The KGS seismic instrument at Henderson, Ky. recorded the first earthquake, a 5.2-magnitude event, on the morning of April 18, as well as the 4.6-magnitude aftershock a few hours later. The epicenter of those events and the dozens of later aftershocks was in southeastern Illinois, in the Wabash Valley seismic zone.

in the new fiscal year. The observatory consists of four cased boreholes that will be seismically instrumented for the future establishment of a vertical three-dimensional seismic observatory. The deepest is a 594-meter borehole through the sediment overburden and into bedrock. The observatory is located near the most active part of the New Madrid Seismic Zone and should provide the maximum amount of data in the shortest period of time. It will be one of three existing deep vertical accelerometer observatories on Earth, and the only one in a seismically active intraplate setting.

China quake triggers visit

An 8.0-magnitude earthquake struck China's Sichuan Province on May 12, causing over 80,000 deaths, many injuries, and massive destruction in the epicentral area. It also brought an invitation to Geologic Hazards Section Head Zhenming Wang to travel to the affected areas in June for post-earthquake investigations. KGS and the Lanzhou Institute of Seismology in the China Earthquake Administration have had a research relationship since 2005, which had already resulted in several exchange trips between the two.

Wang spent 10 days in the area of the epicenter investigating how structures performed in the event and examining the relationship between building code provisions and the damage to structures. In one location, Dujiangyan, where most buildings were constructed for a lower level of ground motions, Wang found 90 percent of the structures damaged and about 100 of them completely collapsed. Yet elsewhere in the region, communities such as Chengdu suffered little damage as a result of lower ground shaking.

Wang is originally from Fuzhou in Fujian Province in southeastern China. He was interviewed by Lexington-area news media both before and after this trip and presented an hour-long seminar at KGS shortly after his return to discuss lessons to be learned from the earthquake both in China and in the central United States. He discussed the need to apply scientific information to seismic hazard estimates and to develop appropriate building codes and construction practices.

The exchange with the Lanzhou Institute has included several trips by KGS staff to China to conduct seminars and visit earthquake-prone regions, as well as similar trips to KGS by Chinese seismic experts. Two Chinese researchers have also spent a year as visiting scholars at KGS.

Geologic Hazards Section Head Zhenming Wang found much damage in the area of the epicenter of China's May 12 earthquake when he traveled to Sichuan Province in June.

A family tries to continue living among the ruins its home very near the epicenter.

Chinese soldiers helped in the initial response and recovery efforts in the mountainous areas most affected by the earthquake.

People pick through the pile of concrete that remains from a building which completely collapsed.

KGS staff hosted events at the Survey, organized professional gatherings, and responded to requests for outreach and education during the year.

Eastern Section, AAPG meeting

KGS and the Kentucky Society of Professional Geologists served as the hosts and organizers for the 2007 annual meeting of the Eastern Section, American Association of Petroleum Geologists, September 16–18.

The organizing committee included: Dave Harris, *General Chair*; Jim Drahovzal, *Technical Program Chair;* Tom Sparks, *Finance Chair*; Steve Greb, *Field Trips;* Marty Parris, *Workshops*; Mike Lynch, *Publicity;* John Hickman, *Registration;* Brandon Nuttall, *Webmaster;* Patrick Gooding, *Judging Chair;* Richard Smath/Bart Davidson, *Audio/Visual;* Meg Smath/Collie Rulo, *Graphics/Media;* Ann Watson, *Spouse Programs.*

With help from the Lexington Convention and Visitors Bureau, the effort attracted 540 attendees to the meeting at the Lexington Convention Center. The gathering featured field trips and seminars in various parts of Kentucky, a variety of on-site sessions, exhibits, award ceremonies, and programs for spouses of attendees.

The crowd visits booths at the AAPG meeting in September.

KGS Helps State Park Upgrade Museum

Ann Watson and Steve Greb worked with Pioneer Museum staff at Blue Licks Battlefield State Resort Park to upgrade the museum's displays before its August 2007 reopening. They helped the park locate additional geologic specimens from the region for the museum's displays.

Ann Watson adjusts new displays at the Blue Licks Battlefield State Resort Park.

Alabama State Geologist Delivers Annual Lecture

Alabama State Geologist Berry H. "Nick" Tew visited KGS on April 9 to give the annual Donald C. Haney Distinguished Lecture. With his topic *"The Geology and Future Resources of Alabama,"* he discussed various aspects of Alabama's coal and oil resources and energy-related activities, such as carbon storage research. Tew mingles with some of the crowd who came to the Mining and Mineral Resources Building on the UK campus for his lecture.

KGS Annual Seminar Focuses on Carbon Research and Policy

Over 100 people gathered at the KGS Well Sample and Core Library on May 23 for the 48th Annual Seminar. With staff in the Energy and Minerals Section busy on a variety of carbon storage and enhanced resource recovery projects, this

year's seminar focused on carbon dioxide research and policy. Nine speakers from KGS, other research entities, state agencies, and private corporations talked about carbon capture and storage research, the progress of regional carbon storage partnerships, and the legal and regulatory issues surrounding the topic.

CAER Energy Fair

Steve Greb and Leah Barth conducted experiments and demonstrations at a KGS display for an energy fair sponsored by the Center for Applied Energy Research in January. They showed students some of the properties of carbon dioxide and its deep geologic storage in porous rocks. Two hundred fifth and sixth graders from Fayette County schools attended the event on the UK campus.

Harrison School Career Day

Energy and Minerals Section geologist Kathryn Takacs talks to young students at Harrison Elementary School in Lexington in May. She and Leah Barth showed them rocks, fossils, and Leah's dinosaur egg during the school's Career Day program.

Living Lands and Waters

Geologic Mapping Section Head William Andrews speaks on the geology of the Ohio River Valley to participants in Living Lands and Waters, a program to restore and protect U.S. waterways and bring environmental education to communities across the country. The program's staff moored their boats along the Ohio River near Louisville in March.

National Energy Education Development Project

Brandon Nuttall of the Energy and Minerals Section talks to teachers about oil and gas in Kentucky at a stop in the Big Andy oil field during the June field trip of the National Energy Education Development Project. The project promotes energy education among educators, governments, and the business community.

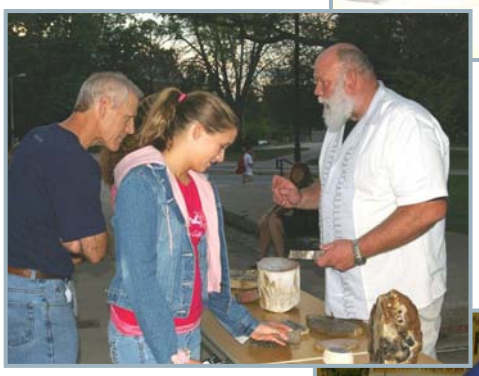
Annual Open House Draws 200 to KGS

In the middle of Earth Science Week 2007, KGS invited the public to its annual open house. Displays on geologic and other earth science topics were set up on the first two floors of the Mining and Mineral Resources Building, as about 200 people visited.

Several groups of students came with lists of questions, whose answers could only be found at certain displays. Plenty of visitors found themselves drawn—but not too closely—to the regular display of snake and reptiles. Representatives of the Kentucky Paleontological Society, the Kentucky Water Resources Research Institute, and others joined KGS staff with displays at the event.









The Survey continued to issue new reports, maps, and other publications while adding to the capabilities and data on its Web pages.

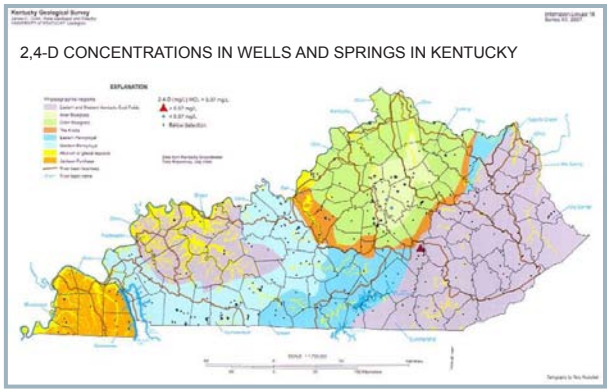
KGS staff published a variety of maps and reports during 2007–08, from three new geologic quadrangle maps to water quality reports and geologic maps for land-use planning.

The final 19 maps in the series of Geologic Maps for Land-Use Planning were completed after several years of effort. Managed by Dan Carey of the Geospatial Analysis Section, the maps have been created for each Kentucky county to help local officials, developers, and property owners understand the geology of their home county and how it can affect human activities. Over 500 copies of these maps have been sent to teachers around Kentucky as a result of a "maps to teachers" project developed by Carey. A positive response from teachers who were offered the maps at the 2007 Kentucky Science Teachers Association conference inspired the service that provides free copies for classrooms and libraries in all Kentucky schools. An additional 150 maps have been sent to educators in University if Kentucky agricultural extension offices and Kentucky Conservation Districts.

Staff of the Marion County Conservation District use a copy of "Generalized Geologic Map for Land-Use Planning: Marion County" to teach children about the geology of the area.

Web services continue growth

Public access to KGS geologic information through Web-based database searches and geologic maps on the Internet continues to grow every year. This past year, over 300,000 visitors to the Internet map service were served, 184,000 database searches were conducted, and almost 600,000 data files and publications were downloaded. This represents a 25 percent increase in service over previous years. As in the past, the most frequently accessed data were oil and gas related records.



This Kentucky groundwater quality map is one of the new KGS publications available free on the KGS web site.

A number of new enhancements were added this year to the KGS Web page, "Search Databases and Publications." Users can now download USGS digital elevation models from the KGSGeoPortal for a specific view extent. This simplifies the process of determining which DEM files are needed to obtain coverage for a given area. In addition, a complete overhaul of the criteria-based database search pages was completed. Search options were added and made more flexible to allow users to find just the data they need. A new map link was added to all search results pages to allow users to view a quick Google map with the identified site posted. Finally, a new search function was added to provide access to a variety of descriptions from the 1:24,000-scale geologic maps of Kentucky. Users can search descriptions by keywords, and view a geologic map highlighting units that contain the descriptive attribute of interest.

In May, uncut wireline logs of oil and gas wells, known as "e-logs," became available at the online KGS oil and gas data search page. Such logs had already been available for view and download, but many are too long to be displayed as a continuous image and were cut into manageable sections. A number of free and commercially available computer applications will display the uncut e-logs.

The KGS office in Henderson offers geologic services and water-related health research to the western part of Kentucky.

Dave Williams administers the KGS office in Henderson and has also been heavily involved in the project to drill a deep test well for carbon dioxide storage in the Western Kentucky Coal Field. He coordinated with several private companies and the site owner as the project developed. (See Energy and Minerals section for more on this project.) Williams also participates in regional earthquake preparedness and other outreach activities.

Water and Health Issues

Glynn Beck is involved in two studies of water-related health issues. He will oversee a new project, funded through the Southeast Center for Agricultural Health and Injury Prevention, to determine the relationship between groundwater quality and the health of Kentuckians using it for domestic purposes. The project, a joint effort with the University of Kentucky College of Public Health, will characterize the health status of about 600 households relying on groundwater for their drinking-water supply through a survey of their known health conditions. It will seek to correlate water-quality data and the health conditions to determine possible patterns related to concentrations of nitrate, herbicides, and bacteria. Findings from this study will help to inform policy-makers about the benefit of regularly testing domestic water wells and will increase knowledge of groundwater quality in various hydrogeologic settings of the Jackson Purchase Region.

Ron Counts and Scott Waninger work on a western Kentucky project in May 2008 using the Henderson office's Giddings drill rig.

Scott Waninger takes a surface water sample in McClean County for one of the many water quality projects conducted out of the Henderson office.

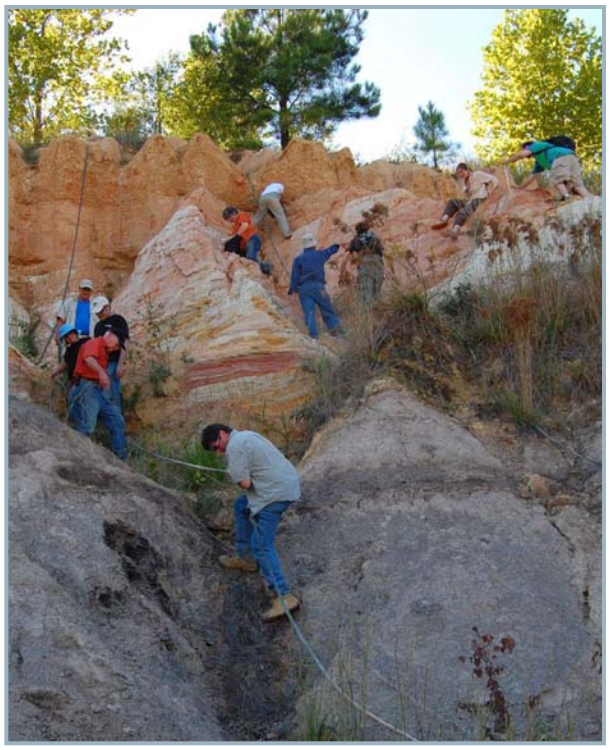
The Kentucky Water Resources Research Institute and U.S. Geological Survey have funded a separate field study of shallow groundwater quality and its relationship to certain diseases. Twenty to 30 private wells will be monitored in conjunction with Marshall County's local health laboratory. A doctoral-level epidemiology student in the College of Public Health will research the link between the presence of coliform bacteria and surface contaminants such as nitrates and pesticides and diseases connected with water contamination. Many wells in Marshall County are contaminated with bacteria and nitrates.

Beck trains the students who do field work for these projects. He also helps UK civil engineering faculty and students to develop research proposals for a National Science Foundation EPSCoR (Environmental Program to Stimulate Competitive Research) grant administered by the Civil Engineering Department. He participated in four EPSCoR projects to sample water wells and groundwater in Hickman County and conduct a hydrogeochemical study at Diamond Caverns near Mammoth Cave.

Possible Fault Scarp Found

Ron Counts, a member of the Geologic Mapping Section working in the Henderson office, discovered what appeared at first to be a terrace scarp while mapping in the Uniontown area, though the feature seemed unusual for its surroundings. With the help of Ed Woolery of the UK Department of Earth and Environmental Sciences and Roy Van Arsdale of the University of Memphis, geophones were set up to gather seismic data, which indicated offset Quaternary sediments, suggesting that the feature is, in fact, a fault scarp. Counts plans to dig trenches at the site and submit an application for a federal grant for additional drilling and other work on the scarp.

Counts also led about 30 graduate students and faculty from the University of Cincinnati Geology Department on their fall field trip in the lower Ohio River Valley. He showed the group features of the area he has been mapping and working in for the last 5 years, and visited a gravel pit and abandoned ball clay pit in the Jackson Purchase Region.



University of Cincinnati geology students examine formations in western Kentucky during their field trip.

Counts expects to be able to drill cores for mapping projects more efficiently in the future with an upgrade to the Henderson office's Giddings drill rig completed during the year. The upgrade resulted in a 50 percent increase in power for the rig and the ability to set PVC hole casing, which can be used to install shallow monitoring wells, and collect downhole gamma-ray logs or downhole shear-wave profiles.

Paul Potter, professor emeritus in the Geology Department at the University of Cincinnati talks to the department's students in an active gravel pit near Mayfield during their western Kentucky field trip, which was led by Ron Counts of the Henderson office.

Researchers, consultants, and students use the Well Sample and Core Library's growing collection of geologic specimens for academic and commercial work.

The KGS well sample and core library is the only facility of its kind located in Kentucky. People and companies engaged in energy exploration and production who want to study rock material must visit this facility, which contains samples and rock cores from over 25,000 well locations throughout Kentucky. Use of this geologic data results in reduced development and exploration time, lower exploration cost, increased efficiency and greater safety. Most of this geoscience data is not available elsewhere and is usually cost prohibitive to obtain.

A tremendous increase in use of the KGS Well Sample and Core Library continued during the fiscal year as oil prices soared to record highs. Research was conducted on a wide range of rock types including black shales, tar sands, and deeply buried limestones and sandstones. Visitors not only came from around the state but from surrounding states and as far away as Michigan, Texas, Oklahoma, Arizona, and New York. There were four international visitors. Three came from England to sample material for research, and one traveled from Indonesia to study the facility's operation.

Use of the library's resources provides opportunities for research, development, and exploration and often results in new discoveries and redevelopment of old oil and gas fields. Conclusions reached using this data allow informed planning decisions and provide solutions to scientific issues and problems.

KGS Advisory board and Carbon Sequestration Consortium joint meeting at the Well Sample and Core library.

The resources are readily available to rework old reservoirs, reevaluate environmental concerns, and forecast natural hazards as new technologies and extraction techniques are developed. Examination of well samples and cores provides a greater chance of exploration success, resulting in greater national energy security.

Ray Daniel and Ryan Pinkston retrieving cores from the field in Lee County to be used in a CO_2 and methane gas study.

KGS Well Sample and Core Library hosted the Kentucky Mining Institute's Mining Rescue Competition in August. Mine Rescue Teams await their turn to compete.

Fiscal year 2007-08:

- Over 820 telephone requests for information were received.
- More than 1,000 researchers, geologist, consultants, students, academics, operators and the public visited the facility.
- More than 300,000 feet of core and well cuttings were examined.
- More than 350,000 feet of core and well cuttings from 128 wells were added to the collection.

KGS researchers, state agencies, and the University of Kentucky depend on the Survey's laboratory for a variety of materials analyses.

The KGS Laboratory Services specialize in environmental analysis of water, coal, rocks and minerals, and other natural resources. Research by KGS staff, students, and faculty at the University of Kentucky and Kentucky government agencies depends on the laboratory for analysis. All results are added to the Survey's database so they enhance the KGS mission to serve the public. KGS uses a laboratory information system to track sample status from log-in to final reporting.

> A total of 2,285 samples were sent to the lab for analysis during the fiscal year.

Several projects by KGS staff and other researchers at the University of Kentucky involve analyzing samples of water from wells around Kentucky to determine levels of nitrates, chlorides, herbicides, and other chemicals. For the past decade, hundreds of water samples from the Jackson Purchase Region of western Kentucky have been analyzed by the laboratory in an ongoing project overseen by Glynn Beck of the KGS Henderson office to determine possible sources of pollution for rural users of domestic water wells.

Cortland Eble of the Energy and Minerals Section examines a polished block of coal under a laboratory microscope.

Cortland Eble, in the Energy and Minerals Section, sends coal samples from his coalbed methane research for analysis, and Marty Paris, whose work includes surface and shallow monitoring of the migration of CO_2 and methane gas, uses the services of the lab in his research.

The volunteer Kentucky Water Watch Program collects samples from streams around the state twice each year and sends them to the KGS Laboratory for analysis. Local Water Watch member groups, including schools and community organizations, work to protect the quality of streams, rivers, lakes, and wetlands.

KGS researchers and students in the UK Department of Earth and Environmental Sciences use X-ray fluorescence and X-ray diffraction instruments in the laboratory for identification and analysis of geologic samples. Students from other colleges also conduct activities such as texture or thin-film analysis.

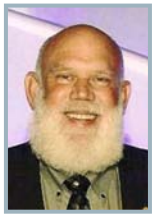
Undergraduate student J. D. Stucker, of the UK Department of Earth and Environmental Sciences, uses KGS Laboratory instruments to analyze samples of black shale for their carbon content.

Steve Mock injects a sample into a gas chromatography instrument in the lab to determine its properties.

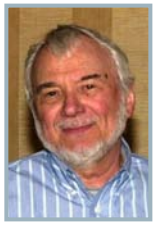
KGS staff receive state and national recognition for their outstanding work.

Dave Williams, who manages the KGS office in Henderson, received the 2008 Lifetime Achievement Award from the Kentucky Section of the American Institute of Professional Geologists (AIPG). The Lifetime Achievement Award has been given since 1996 to AIPG-KY members whose career work has played a substantial role in benefiting the geologic community and the state.

Doug Curl of the KGS Geospatial Analysis Section was named recipient of the 2008 Geologist of the Year Award from the Kentucky Section of the American Institute of Professional Geologists. Curl has developed the KGS online geologic databases for disseminating information freely to the public, and he has created Internet map tools for exploring the data. AIPG-KY has give its Geologist of the Year Award since 1997 for outstanding work during the previous year.



Patrick Gooding, KGS Well Sample and Core Library Manager, received the 2008 Distinguished Member of the House Award from the American Association of Petroleum Geologists House of Delegates. The award recognizes unique or exemplary service to the House of Delegates through committee work. Patrick is in his fourth term as chair of the Credentials Committee of the House of Delegates and also serves as chair of the AAPG Preservation of Geoscience Data Committee.



Henry Francis manages the KGS Laboratory and was presented an Award of Merit from the Committee on Coal and Coke of ASTM International, previously known as the American Society for Testing and Materials. The Award of Merit and accompanying title of "fellow" is the highest organizational honor for individual contributions to standards activities.

Steve Fisher serves on the Kentucky Agricultural Water Quality Authority, Interagency Technical Advisory Committee on Groundwater, and the National Water Quality Monitoring Council.

Jonathan McIntyre was elected treasurer/secretary of the Association of Engineering Geologists, Ohio River Valley Section.

William Andrews is a member of the Financial Assistance Committee for the National Geologic and Geophysical Data Preservation Program of the U.S. Geological Survey.

Jim Currens received a $10,000 Commonwealth Collaboratives Grant from UK to help him write and promote the adoption of a model local ordinance guiding development on karst terrain.

Steve Mock was elected to his first three-year term in the University of Kentucky Staff Senate, after serving for two years as a senator at-large. He serves on the Senate's Staff Issues Committee

Jim Cobb received the Presidential Recognition Award at the Association of American State Geologists annual meeting in June 2008. He was also elected vice president of AASG, and he serves on the American Geological Institute Finance Committee.

John Kiefer was Elected Chair of the Ohio River Valley Section of the Association of Engineering Geologists, serves on the Board of Directors, and as chair of the Education Committee of McConnell Springs Environmental Education Park. He is also a member of the Lexington-Fayette County Environmental Commission and a Director representing Kentucky of the Ohio River Basin Consortium for Research and Education.

KGS Staff 2007–08

State Geologist's Office

Cobb, Jim Geologist / State Director
Kiefer, John Asst State Geologist
Haney, Don State Geologist Emeritus
Lynch, Mike Technology Transfer Officer
Hower, Judy Temporary Technician

Administrative Section

Silvers, Jackie Administrative Staff Officer II
Long, Mandy Administrative Support Associate I
Phillips, Gwen Staff Support Associate II

Energy and Minerals Section

Harris, Dave, Section Head
Anderson, Warren Geologist V
Barth, Leah Geological Technician
Bowersox, Rick Geologist IV
Daugherty, Shannon Student worker
Drahovzal, Jim Temporary professional
Eble, Cortland Geologist V
Greb, Steve Geologist V
Hickman, John Geologist IV
Nuttall, Brandon Geologist V
Parris, Marty Geologist V
Solis, Mike Geologist I
Takacs, Kathy Geologist I

Geologic Hazards Section

Wang, Zhenming Section Head
Lu, Yuxia, Temporary researcher
McIntyre, Jonathan Geologist IV
Woolery, Ed Temporary Professional

Geoscience Information Section

Cordiviola, Steve Section Head
Adams, Elizabeth Student Worker
Banks, Roger Stores Supervisor
Briland, Sarah Staff Supp Associate I
Coleman, Matt Student Worker
Farwell, Mike Student Worker
Hounshell, Terry Chief Cartographic Illus
McElhone, Jim Information Technology Manager I
Pulliam, Carrie Geologist II
Rulo, Collie Senior Graphic Design Technician
Smath, Meg Geologist III
Thompson, Mark C. Information Technology Manager I
Trapp, Fielding Student Worker
Watson, Anna Geologist II

Geospatial Analysis Section

Weisenfluh, Jerry Section Head
Carey, Dan Geologist V
Curl, Doug Geologist III
Fedorchuk, Nick Temporary Technician
Floyd, Julie Student Worker
Hunt, Heather Student Worker
Lambert, Jason Student Worker
Louden, Bryan Student worker
Overfield, Bethany Geologist II
Reynolds, Joshua Student Worker
Rivers, Monte, Temporary Technician
Sergeant, Rick Geologist IV
Smath, Richard Geologist III
Sparks, Tom Geologist III
Wang, Rebecca IS Technology Support Spec III

Geologic Mapping Section

Andrews, William, Section Head
Crawford, Matt Geologist III
Martin, Steve Geologist III
Murphy, Mike Geologist II

Laboratory Services

Francis, Henry Scientist II / Laboratory Manager
Backus, Jason Scientist II
Mitchell, Andrea Scientist I
Mock, Steve Scientist I
Roberts, Kevin Student Worker
Wilhelm, Brent Student Worker

Water Resources Section

Dinger, Jim Section Head
Currens, Jim Geologist V
Davidson, Bart Geologist IV
Fisher, Steve Geologist V
Fogle, Alex Geologist III
Guo, Lifeng Geologist IV
Paylor, Randy Geologist II
Webb, Steve Geologist II

Well Sample and Core Library

Gooding, Patrick Geologist IV / Manager
Daniel, Ray Principal Research Analyst
Pinkston, Ryan Research Analyst

Western Kentucky Office at Henderson

Williams, Dave Section Head
Beck, Glynn Geologist IV
Berdine, Jane Staff Supp Associate I
Counts, Ron Geologist III (Geologic Mapping Section)
Kotter, Dan Geological Tech
Waninger, Scott Geological Tech (Geologic Mapping Section)

Kentucky Geological Survey
Summary of Grants and Contracts
Fiscal Year 2007-2008

A. Participation of KGS in Grants and Contracts Funded by Local, State, and Federal Agencies as well as Industry.

1. "Computerized Coal Resources Data for the National Coal Resources Data System." Budget period 7/1/07- 6/30/08. Award $80,000 as funding for an additional year of multi-year projects on Coal Resources Data. Award includes four sub-awards totaling $65,000. Total award to date $1,404,614. Funding agency – U.S. Geological Survey

2. "Chemical Analysis of Groundwater Samples Taken from the Kentucky Groundwater Network." Budget period 7/1/06- 6/30/08. This is a continuation of a project started 2/1/95. Current year pro-rated award $15,700. Total award $31,400 for current project. Total award to date $899,912. Funding agency – Kentucky Natural Resources and Environmental Protection Cabinet

3. "Quarternary and Surficial Geological Mapping for Multiple Applications in Kentucky." Award of $234,228 for budget period 5/15/07-5/14/08. Current year pro-rated award $214,709. This is the 12th year funding of the National Mapping Project. Total award to date $2,251,597. Funding agency – U.S. Geological Survey

4. "Communications Specialist Liason for the Kentucky Board of Registration for Professional Geologists." Budget period 7/1/07- 6/30/08. Award $15,000. Funding agency – Kentucky Board of Registration for Professional Geologists

5. "Groundwater Education, Training, and Technology Transfer." Budget period 7/1/03-6/30/10. Current year no additional funding, Total award $450,000. Funding agency – Kentucky Natural Resources and Environmental Protection Cabinet

6. "Midwest Geological Sequestration Consortium." Budget period 10/1/05-9/30/07. Current year pro-rated $40,353. Total award $322,823. Funding agency – U.S. Department of Energy through the Illinois State Geological Survey

7. "Operation of the Mid-American Integrated Seismic Network - UK." Budget period 2/1/07-1/31/10. Total award $108,171. Current year pro-rated $20,435 with total award of $35,031 for budget period 2/1/07-1/31/08. Funding agency – U.S. Geological Survey

8. "Groundwater Quality Monitoring for Nonpoint Source Chemicals in the Jackson Purchase Region of Kentucky." Budget period 11/1/04-6/30/08. Current year no cost extension only. Total award $85,000. Funding agency – Kentucky Natural Resources Environmental Protection Cabinet

9. "A Systems Approach to Identifying Exploration and Development Opportunities in the Illinois Basin: Digital Portfolio Plays in Under-Explored Lower Paleozoic Rock." Budget period 9/24/05-9/23/08 with total award $197,498. Current year pro-rated $53,410. Funding agency – U.S. Department of Energy through University of Illinois

10. "Geochemical Analysis of Surface and Shallow Gas Flux and Composition Over a Proposed Carbon Sequestration Site in Eastern Kentucky." Project period 7/15/05-1/14/08 with total award of $277,989. Current year pro-rated $55,598. Funding agency – U.S. Department of Energy

11. "Southeast Ky: Coals as CO2 Sequestration Reservoirs" (part of Southeast Regional Carbon Sequestration Partnership Phase 2 Project). No cost extension for current year. Project period 10/1/05-9/30/07. Total award of $66,000. Funding agency - Virginia Polytechnic Institute and State University

12. "Seed Grant – Exploring for Economic Coal Bed Methane in Eastern Kentucky." Budget period 2/15/06-12/31/07. Current year pro-rated $22,500. Total award $86,250. Funding agency – Governor's Office of Energy Policy

13. "Kentucky Part of Phase 2 of the Midwest Regional Carbon Sequestration Partnership." Project period 10/1/05- 9/30/09. Total award $285,732. Current year pro-rated $120,546. Funding agency – Battelle Memorial Institute

14. "Hydrogeochemistry of Tunnel Roadbed Subsidence." Budget period 7/1/07-3/31/08. Total award of $94,100. Funding agency – Tunnel Management, Inc.

15. "Integrating Geotechnical Drill Hole Data with Geologic Information." Budget period 7/1/06-6/30/08. Total award $250,000. Current year award $125,000. Funding agency – Kentucky Transportation Cabinet

16. "Geotechnical Guide to Cored Rock in Kentucky." Budget period 7/1/06-6/30/08. Total award $100,000. Current year award $50,000. Funding agency – Kentucky Transportation Cabinet

17. "Mapping Karst Groundwater Basins for Radcliffe as a Groundwater Quality Management Tool." Budget period 10/1/06-9/30/07. Total award $62,525. Funding agency – City of Radcliffe, Kentucky

18. "Selenium Occurrence and Bioaccumulations in the Eastern Kentucky Coal Fields." Budget period 2/16/07-6/30/08. Current year pro-rated $52,384. Total award $69,845. Funding agency – Kentucky Department of Environmental Protection

19. "Rough Creek Graben Consortium." Budget period 8/1/07-2/28/08. Total award $64,169. Funding agency – Governor's Office of Energy Policy

20. "Rough Creek Graben Deep Gas Consortium." Budget period 3/1/07-2/28/09. Total award $222,340. Current year pro-rated $111,170. Funding agency – Multiple Industry Sponsors

21. "Evaluation of Geologic CO2 Sequestration Potential and CO2 Enhanced Oil Recovery in Kentucky." Budget period 8/1/07-6/30/08. Total award $163,446. Funding agency - Governor's Office of Energy Policy

22. "Inventory of Current Collection Resources and Data Preservation at the Kentucky Geological Survey." Budget period 7/1/07-9/30/07. Total award $5,000. Funding agency – U.S. Geological Survey

23. "Research Into Enhanced Oil and Gas Recovery Carbon Dioxide" HB1. Budget period -10/15/07 – 6/30/08. Project period 10/15/07 – 6/30/11. Total award $5,000,000. Current year pro-rated $1,250,000. Funding agency - Governor's Office of Energy Policy

24. "Development of Community Water Sources." Budget period 7/1/07-6/30/08. Total award $50,000. Funding agency - Kentucky Infrastructure Authority

25. "Enhancement of the PI/Dwights (IHS Energy) Oil Production Data for Kentucky." Budget period 7/1/07-6/30/08. Total award $52,221. Funding agency – IHS Energy Group

B. Participation in Grants Administered by Other Units of the University of Kentucky

1. "Cane Run Watershed Groundwater Component." Cooperative study with the University of Kentucky College of Agriculture. Project period 7/1/07-6/30/08. Total award $50,000. Funding agency – Kentucky Division of Water

2. "A Model Ordinance for the Guidance of Development on Karst Land." Project period 1/1/08-6/30/09. Total award $10,000. Current year pro-rated $3,000. Funding source – UK Commonwealth Collaborative

Total Amount of Grants and Contracts Awarded - $2,790,785

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Copy Editor: Meg Smath
Design and Layout: Collie Rulo

Kentucky Geological Survey
UNIVERSITY OF KENTUCKY
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