Geologic Information
Cornerstone of Land-Use Decisions


Department of Natural Resources
George H. Ryan Governor
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief
Natural Resources Building
615 East Peabody Drive
Champaign, Illinois 61820-6964
Contents

To the People of Illinois   1
Building the Geologic Information Database   2
Active Projects, 1999–2000   19
Publications   27
For More Information   36
Geologic Information
Cornerstone of Land-Use Decisions

Geologist Dave Grimley logging drill cores at the Survey building
To the People of Illinois

Illinois state and local decision-makers often face tough and conflicting public policy options over competing interests for land, water, mineral, and energy resources. Geologic information is indispensable in supporting the difficult decisions that promote economic growth and address the resource needs of a growing and shifting population while ensuring a high quality of life for future generations. In particular, geologic information is fundamental to wise land- and water-use policy, for resource development and protection, and for the identification and mitigation of potential and existing hazards.

Geologic information has always been important for one major resource issue that Illinois faces: the production and protection of our vital groundwater resources. In Illinois, as in the rest of the country and the world, water quality and supply are increasingly of serious concern. Around many industrialized sites in the state, groundwater can be at risk from improperly contained or discarded chemicals or from poor geologic siting of industrial or agricultural activities. In many agricultural areas in Illinois, groundwater quality in shallow aquifers may be degraded by the routine application of agricultural chemicals. Because contaminated ground-water can enter streams and rivers, surface-water quality also can be degraded in areas where geology is not favorable.

In addition to groundwater, Illinois has greater total potential coal resources (although not presently economically recoverable) than any other state in the country. We also have significant oil resources. Limestone and other construction materials are essential to the building and maintenance of our infrastructure and housing. All of these resources are of economic and environmental concern to the citizens of the state. Identifying and optimizing these resources are critical to the well-being of future generations.

For our society to best manage and protect our resources, increasingly greater precision is needed in the geologic information that we disseminate to the public. This need is the reason behind our programs to map the state’s geology at a detailed scale and in three dimensions. This is part of our job at the Illinois State Geological Survey—to acquire, assemble, interpret, and then provide useful and understandable geologic information to the citizens of Illinois.

Bill Shilts, Chief
Illinois State Geological Survey
Building the Geologic Information Database

Location: Behind the Natural Resources Building, University of Illinois at Urbana-Champaign.
Time: Shortly after dawn.
Activity: Geologists throwing boots, rock hammers, hard hats, topographic maps, and scientific equipment into various vans and four-wheel drive vehicles. Drill rig being fueled.
Destination: Field sites in one or more of the 102 Illinois counties.
Objective: Collect subsurface geologic data to supply the Illinois State Geological Survey database.

By the time this common activity ends and the vehicles move down the road, other scientists and staff are entering the Survey’s offices to begin to work with and interpret data collected on previous expeditions over the past century. Other staff take this interpreted data, catalog and sort it, and package it as easily obtainable maps, publications, and educational materials. This information is then provided to those who need it, such as local government officials and planners, or stored for future use.

The Illinois State Geological Survey has been and continues to be all of these things: an institution, a library, an archive, an outreach effort, and a land survey process. Today, as the information contained within the institution increasingly becomes digital bits, the Survey can be seen as a giant database. This living database is constantly being updated and enlarged with more accurate and detailed information for Illinois citizens who need to know about the Earth’s characteristics.

Whether in the field, within the Natural Resources Building, in Cartherville or the northern field offices, at the Applied Laboratory, field stations, samples libraries, or other offices, ISGS scientists and staff are working on projects from coal to groundwater, from global climate change to new computer mapping technologies, from measuring isotopes in order to find landfill leaks to interpreting and arranging information in drill logs and geographic information system data sets.

This report provides an overview of the Illinois State Geological Survey’s work. Lists of active, ongoing research projects and recent publications constitute the second part of this report, and a list of contact persons can be found on the final page. Our Web site (http://www.isgs.uiuc.edu) also provides access to a wealth of information about Illinois geology and Survey activities.
Anne Faber of the Geological Records Library is cataloging drilling records. Much of the information in the ISGS database is provided by water, oil, gas, and other private drillers around the state. The information they bring in is coded as to content and location. These records number in the hundreds of thousands and date back more than 100 years.

Some data are collected by direct observation. Here, Joe Devera is mapping St. Louis Limestone where it has been exposed in a streambed near Anna.

Chris Stohr uses a level to survey slopes of dredge spoil islands in Peoria Lake. The survey was used to estimate the slope stability of the islands. Other measurements were made using the global positioning system (GPS).

To get needed data to produce useful geological maps, ISGS scientists make frequent research trips to Illinois localities ranging from the middle of our largest cities to some of our most uninhabited areas.

Photos clockwise from upper left: Dave Grimley making field notes in the back of an ISGS vehicle, Dave Grimley and Rod Norby examining exposed glacial deposits in creek bed near Waterloo, Charles Dolan preparing to take soil samples in Chicago, and Russ Jacobson heading out into the field.
Illinois citizens make all kinds of changes on, above, and below the land surface. Tendrils of low-density suburban development stretch outward from city centers often unsupported by adequate geologic knowledge of the land, water, mineral, and other resources consumed, covered, and affected. Illinoisans handle potential contaminants at surface operations that, if spilled, can percolate downward. Refuse is buried beneath the land.

With few natural surface barriers to development, suburban northeastern Illinois now has low-density suburban expansion that rivals that of Los Angeles. The result is environmental change, loss of farmland and natural open space, heavy use of local natural resources, development over construction resources, and high infrastructure costs.

After building their homes, Peoria area subdivision homeowners were surprised to find out that high-quality water supplies were naturally limited in their new location. Limited or poor-quality water supplies also have restricted commercial development in other areas.

The St. Louis Metro East area in Illinois is expanding over some of the most easily polluted karst terrain in the state. Septic system effluent, agricultural chemicals, and animal waste can seep directly into the underground rivers and caves in the limestone that underlies the region, and these caves can collapse under buildings and roads.

The Illinois River, a commercial lifeblood as well as an important wildlife and recreation area, carries a huge sediment load that impedes navigation. Wetlands have been lost to land-use changes in the river’s watershed. Flooding, such as the great flood of 1993, becomes more severe as runoff increases.

Detailed three-dimensional geologic mapping can provide the natural resource information needed for informed planning decisions, particularly in areas of the state, such as those just mentioned, where land-use issues are on the front burner. Illinoisans may now be exceeding the land’s carrying capacity in some areas. In the absence of geologic map data, poorly informed land-use decisions may be made, resulting in significant economic and environmental costs. Many issues related to the protection and use of earth resources have been overlooked in past development but can be overlooked no longer. Land-use decisions should be aided by geologic knowledge of developed and soon-to-be-developed areas. Siting decisions, waste management, groundwater development and management, the protection of water and soils from contamination, and location and assessment of risk from hazards such as landslides, mine subsidence, flooding, and earthquakes are all areas requiring in-depth geologic mapping.
The I-90 Skyway over the Calumet River mouth. Water is needed for many uses in Illinois, from drinking to industrial processing to transportation.

Land use always has consequences. Potentially negative consequences can be better addressed through more detailed geologic information.

Suburban development on the northwestern fringe of the Chicago metropolitan area. This type of expansion removes land from other potential uses and places stress on existing resources.

Large livestock facility in southern Illinois. These sites produce large amounts of animal waste that must be kept out of the groundwater.

Waste landfill near Streator. Geologic information is essential for identifying underlying strata that will contain pollutants and protect the groundwater.

Children filling canteens with groundwater on a geology field trip.
Beneath the smooth and subdued landscape covering much of Illinois, many layers of pebbly clay, silt, and sand and gravel mask a bedrock surface containing hills and deep valleys. These complex, varied deposits were left by the immense continental glaciers that repeatedly advanced and retreated across Illinois in the last 1½ million years. Because these materials lie largely out of sight beneath the land's surface, detailed geologic mapping is necessary to understand how the complex subterranean geology of a given location affects land use.

To meet today's demands for detailed information, maps at 1:24,000 scale (one inch on the map equals 24,000 inches—or 2,000 feet—on the ground) are the national standard. This scale is sufficient to make major local decisions, but less than 6 percent of Illinois has been mapped at the 1:24,000 scale. Most existing maps are at too general a scale (1:500,000) to be useful for local decisions. The 3-D geology of the glacial deposits is mapped in detail for only two of the state's 1,071 quadrangles. For those quadrangles—Villa Grove and Vincennes—the Survey intends to offer a complete array of customized information in the form of maps that are digitally derived from the basic geology.

The geologic databases behind our modern map products can be accessed directly or used to make other maps. For example, maps can be made that show thickness of surficial deposits, bedrock topography, aquifer location, susceptibility of aquifers to contamination, landslide or erosion potential, or how likely materials are to amplify earthquake ground motions. The benefits of these products to decision makers makes mapping a top Survey program.

In order to accelerate the mapping of Illinois by pooling resources and expertise, the Illinois Survey has formed a partnership with the U.S. Geological Survey and the Ohio, Indiana, and Michigan state surveys. This partnership, the Central Great Lakes Mapping Coalition, will improve the efficiency of the Illinois mapping effort and help set regional standards for describing, sampling, characterizing, and interpreting surficial materials. The Coalition's pilot program is underway in the Antioch Quadrangle in Lake County and will lay the groundwork for mapping high-priority areas of the state in a 14-year, intensive mapping program. Although limited federal funds have been made available to the Coalition, the ISGS and other Coalition members are actively seeking the greatly increased funding needed to make this high-priority geologic mapping a reality.
This photo from atop the Bloomington moraine near LeRoy shows that the glaciers left a subtly complex landscape. Geologic data are used to create models, such as one sketched above, that show how complex glacial deposits can be. This complexity explains why there may be no groundwater at one site yet a large supply only a hundred yards away or why a bedrock quarry is suitable where glacial deposits are thin, but not nearby where they are too thick to be removed easily.

The 3-D model at left shows one of many ways in which the digital information collected in these mapping projects can be displayed. Here, the thick Silurian age dolomite is shown beneath the glacial materials in the Villa Grove Quadrangle. Mississippian and Pennsylvanian age rocks, which are beneath the glacial materials and above dolomite, have been removed from the model. The location on the figure where the dolomite almost touches the glacial materials indicates where bedrock is quarried economically just east of Tuscola.

The illustration below shows, for a single quadrangle, some of the variety of map types that can be derived from the basic geologic maps. These are from the same area as the 3-D model and are, clockwise from top, aquifer sensitivity to nitrates, aquifer sensitivity to pesticides, drift thickness (thickness of glacial materials), agricultural soils, bedrock topography, and a digital orthophoto map.
Anticipating the goals of the Central Great Lakes Geologic Mapping Coalition, the Survey began its own long-term project in 1996 to map the surficial and bedrock geology of Illinois in three dimensions at 1:24,000 scale.

To do this, geologists gather information about geologic materials by examining historical drilling records, aerial photographs, surface units at the ground, electrical resistivity measurements, seismic records, and core samples. Other methods are being pioneered as part of the Coalition’s pilot project research in Antioch and in neighboring states.

Archival and field data are collected in digital form or collected by hand and digitized. Then data are analyzed, verified, and entered into large databases. These databases can be used to obtain information directly or to produce highly detailed maps. Because each feature of the digitized maps is tied to extensive databases, geologists can use geographic information system (GIS) computer software to manipulate the data to produce customized maps. These maps are used by city and county planners, utilities, public health agencies, transportation departments, environmental protection agencies, builders and developers, agricultural agencies, mining companies, engineering firms and agencies, and the general public.

For instance, the Survey is gathering and interpreting the kind of 3-D geological information that planners need to assess the consequences of different growth scenarios and projected land uses on their area’s resources. Detailed inventories and maps of regions’ existing geologic resources present ways to monitor the consequences of decisions about land and water use.

Considering site geology in planning decisions ought to result in a better environment for all Illinois citizens:

- Increased protection of water supplies—both surface and groundwater.
- Increased identification of and preservation of access to underground resources: construction aggregates, minerals, and fossil fuels.
- Increased understanding, preservation, and restoration of wetlands and other natural areas.
- Increased ability for avoidance of and recovery from geologic hazards.
- Increased ability to restore brownfields and other environmentally damaged areas to productive use.
- Reduced toxins in lakes, rivers, and streams because of better waste containment.
- Reduced agricultural runoff and increased recharge rates for shallow groundwater aquifers.
Much of the labor involved in developing useful products is in logging, cataloging, and maintaining research samples libraries. When entering materials data into the database, geologists observe and list as many identifiable attributes of the material as possible. Methods include not only direct observation but also a variety of scientific tests that reveal the characteristics of a material. Old and new data are archived in a variety of forms in the Geological Records Library and in the ISGS Library as well as in the electronic databases and in samples libraries.
In Illinois, almost one-third of the water supply comes from buried or surface aquifers. Having access to adequate high-quality groundwater resources is a major issue, particularly in high-population and rapidly growing areas.

The Illinois State Geological Survey is currently addressing water issues in numerous ways:

- Obtaining three-dimensional, detailed geologic information about the thickness and areal extent of aquifers and the materials that confine them. Contamination potential varies according to specific geologic conditions.
- Understanding geologic materials helps geologists identify where water is likely to be found, often in subsurface sand and gravel materials of glacial origin. During the past year, Survey scientists provided water location assistance to individual homeowners and to counties and communities around the state, including Sterling, Metropolis, and Gifford.
- Studying the properties of various soils and geologic materials to understand how substances move through them, their filtering capacity, and other properties.
- Sampling lake and river sediments to determine whether they contain contaminants or can be used safely for land application.
- Using isotope analysis to pinpoint water contamination type, level, and sources.
- Working to understand and preserve watersheds and wetlands. Specific combinations of hydrogeologic and ecologic conditions are studied using teams of scientists from many disciplines.
- Studying industrial brownfields, landfills, and large agricultural facilities for contaminants and potential infiltration into water supplies.
- Encouraging safe siting of waste-disposal or waste-generating facilities away from aquifers and geologic hazards.

Such information can be used to answer questions such as these:

- Will there be sufficient groundwater supplies to sustain existing residential subdivisions as well as to allow for growth?
- Should residences rely on private wells and septic systems, or should public systems be provided?
- Are the geologic materials capable of supplying large, sustainable groundwater supplies needed for industry, manufacturing, and energy generation?
- Will a livestock/animal waste lagoon contaminate the local groundwater?
- Will heavy pumping of wells have an adverse effect on available groundwater resources?
- Do geologic conditions minimize the possibility of groundwater contamination from a municipal landfill?
- Can wetlands be restored and maintained effectively?
- How will new construction or land uses affect water recharge areas?
Geologist Tim Young and geophysical assistant Shay Beanland interpret electrical earth resistivity (EER) contours at different depths. These data were part of an EER survey for Gifford’s municipal water source.

The Mahomet aquifer, one of the most bountiful resources in Illinois, supplies water for 15 central Illinois counties and their 810,000 residents. The aquifer has become a focus of the newly formed Mahomet Aquifer Consortium, a coalition of private and public interests dedicated to understanding, protecting, and preserving the aquifer by acquiring needed information about it now. The inset map at top shows the occurrence of high arsenic concentrations in water pumped from the Mahomet aquifer. The steady decline in aquifer water levels at Champaign (graph at right) is due to pumpage, which has nearly tripled since the 1950s.

No resource is more important to Illinois than high-quality water. We have been fortunate to have plentiful supplies, but actions now are needed to make sure these supplies are protected and continue to be adequate over the long term.

Electrical generation plants, such as this one at Clinton, use enormous amounts of water for cooling. Expansion of generating capacity, particularly of proposed new natural gas-fired cogeneration plants, will likely increase water use on the hottest days when water use is already high. Some existing plants do not recycle water.
The potential contamination of groundwater through improper disposal of industrial, agricultural, household, and medical wastes is just one of the major earth hazards now being addressed by ISGS scientists. Many other real and potential dangers are also currently being investigated:

**Earthquakes:** Although major earthquakes are not frequent in the Midwest, the potential exists for major damage to structures, particularly in the southern portion of the state. As participants in the Central U.S. Earthquake Consortium, ISGS geologists have been mapping the characteristics of near-surface materials to determine which combinations are likely to amplify ground motions or liquefy during an earthquake in the New Madrid Seismic Zone. ISGS geologists also are studying ancient faults elsewhere in the state and comparing recent earthquakes with historical records to determine whether earthquakes are occurring in new patterns, whether old faults are being reactivated, and whether these faults have the potential to cause an earthquake. These types of information are essential for good engineering decisions and emergency preparations.

**Karst features:** Survey geochemists, hydrologists, and geophysicists are studying and characterizing karst terrain in the southern and western portions of Illinois. In karst topography, which is full of fractured rock, sinkholes, disappearing streams, springs, and caves, the subsurface can suddenly collapse as water dissolves subsurface rocks. Because karst can allow surface water to enter shallow aquifers without being filtered, geologists recommend avoiding dense development, uncontrolled waste dumping, and other practices that can pollute surface and groundwater. Field observations, sampling, and mapping efforts in the area provide the geologic information planners and municipal water companies need to ensure a safe drinking water supply.

**Landslides and erosion:** Erosion and land slumping cause significant problems around Illinois lakes and rivers that have steep or sloping land areas at their edge. ISGS geologists are sampling sediments and studying erosion patterns around Lake Michigan to determine the effects of wave action, of engineering structures to prevent erosion, and of development on the shoreline. Peoria Lake sediments are being sampled, chemically analyzed, and additionally tested to determine their origin and whether they are contaminated or can be used elsewhere safely and productively.
Jack Liu and Hue-Hwa Hwang of the renowned Isotope Geochemistry Laboratory perform stable isotope analyses on the new high-speed, fully automated isotope ratio mass spectrometer. The fast, accurate analytical capabilities of the new instrument have allowed the ISGS to reduce the per sample cost of certain stable isotopic analyses by nearly 90%. Among other applications, these analyses are used to identify, measure, plot, and locate the source of pollution moving through the soil or groundwater.

Erosion and the resultant silting of eroded soils are a serious problem in the Illinois River Valley. Dredging is a solution to silting, but sometimes there are high levels of contamination in dredged materials, which require special handling. The photo at left shows riprap installed at a highly eroded site in Cass County near the Illinois River Valley. Photos below show dredging of Lake Peoria. Fortunately, contamination levels have so far been found to be very low in this dredged material.

The map above shows glacial materials and their propensity to amplify seismic waves and even liquify during earthquakes. The dark gray along the rivers is the most vulnerable geologic setting.

Karst formations are sometimes described as being like Swiss cheese. Water dissolves limestone to create myriad pathways, caves, and sinkholes. Above, photographer Joel Dexter (foreground) accompanies ISGS geologists Sam Panno and Pius Weibel who are mapping water flows through karst caves in Monroe County in southwestern Illinois.

Jack Liu and Hue-Hwa Hwang of the renowned Isotope Geochemistry Laboratory perform stable isotopic analyses on the new high-speed, fully automated isotope ratio mass spectrometer. The fast, accurate analytical capabilities of the new instrument have allowed the ISGS to reduce the per sample cost of certain stable isotopic analyses by nearly 90%. Among other applications, these analyses are used to identify, measure, plot, and locate the source of pollution moving through the soil or groundwater.
Recent spikes in energy prices remind us that fossil fuels are still important to the state and U.S. economies. Fortunately, Illinois has one of the largest deposits of potential fuel (coal) in the country, and basic research into coal, as well as petroleum and gas technologies, reserves, and storage is ongoing.

ISGS geologists over many decades have worked and continue to work in finding and characterizing Illinois coal, gas and oil, and other economically critical materials such as sand and gravel and high-quality stone. Geologists have worked diligently to transfer knowledge about new technologies and to share well and mine information with industry. Geologists have also worked with industry in other areas, such as natural gas storage in sandstone reservoirs in Illinois, an important supply of gas for the heating season. ISGS economists have studied the economic value of minerals and construction aggregates and the potential effects of energy deregulation on the Illinois energy industries.

Locating and characterizing inventories of vital minerals and construction materials at their source are also part of the Survey’s work. Construction materials such as dolomite and limestone rock or glacially deposited sand and gravel can become very expensive when shipped even relatively short distances. And because many of the large deposits of these materials are being encroached upon by urban expansion, it is especially important to identify and protect these resources for present and future needs.

In applied research, many projects are underway. In one, ISGS chemical engineers are working with Illinois industry to develop a process for converting corn fiber, a by-product from making ethanol, into an effective activated carbon that is able to remove mercury emissions from coal power plant flue gases. Other materials, including old tires and pistachio shells, are also being converted and tested for effectiveness. This program has been reported by national and international media. In another, ISGS scientists are helping Illinois coal meet environmental standards by using new cleaning methods to reduce ash, sulfur, and other hazardous air pollutants. Also, ISGS chemists and engineers are working to help develop processes to manufacture bricks with Illinois coal fly ash. These bricks have excellent color and physical consistency and are comparable in strength and appearance to popular high-quality brick. Productive uses for fly ash could help to reduce waste and lower the cost of using Illinois coal in power plants.
Innovations in the areas of energy and chemical and environmental engineering are routine for ISGS engineers at the Applied Research Laboratory, which was just awarded its sixth patent. Scott Chen, Massoud Rostam-Abadi, and Tony Lizzio are shown feeding corn fiber waste after ethanol production into a rotary kiln to produce activated carbon. The team is converting a variety of waste by-products into activated carbon, which can remove mercury emissions from coal power plant flue gases.

William Roy and Jimmie Cooper are shown behind the process optimization unit, constructed by ISGS researchers and staff. The unit can produce a high-surface area lime sorbent used to remove air pollutants from flue gases at coal-fired power plants.

Sand and gravel operation near Collinsville, Illinois. Essential for construction, these materials are extracted mostly from glacial deposits. Finding easily mined sources close to points of use is an important factor in keeping building cost economical.

This photograph taken from a recent ISGS study is a microscopic view of kaolinite and quartz crystals in a sandstone formation in southern Illinois. Understanding the porosity and structure of sandstones can help determine the potential of finding reservoirs of oil.

Petroleum refinery at Wood River, Illinois.

Coal-fired electric generation plant along shores of Lake Michigan in Lake County.
At the end of the long process that begins with the assembly and interpretation of data are the widely varied products and services that the Illinois State Geological Survey provides for the citizens of Illinois.

With computerization, a large variety of maps can be produced on demand to serve the exact needs of local governmental bodies, business, and industry. These map products, though, are still only one part of the catalog of publications available from the Survey on almost any geological topic relevant to Illinois. One recent set of publications is the *ISGS GeoActivities Series* for teachers. The 200-page compilation includes about 40 educational, hands-on activities that help K–12 teachers meet Illinois standards for teaching about geology. The activities were developed by ISGS staff, other professional geologists, and Illinois science teachers for use by the ISGS in teacher-training workshops and by K–12 teachers in their classrooms.

These and other products and publications are increasingly becoming available on the Internet for fast, efficient, and low cost transfer of information.

In addition, there are many other outreach and education activities at the Survey. In one short period this spring, ISGS scientists:

- provided technical information and photographs of Chicago beaches to the *St. Louis Post Dispatch* for a special travel section devoted to Chicago visitor attractions
- conducted a half-day geology workshop for 21 K–5 teachers at Dr. Howard Elementary School in Champaign
- presented two geology field trips for a total of about 250 people at Siloam Springs State Park
- attended the Near and Far Sciences in Illinois (NFSI) Teacher Showcase held in the Capitol Building in Springfield
- provided information to a *Chicago Tribune* reporter about petroleum production in southern Illinois and the increase in exploration and drilling activity caused by the increase in oil prices over the last six months
- lectured on evidence for dinosaurs in Illinois at the Earth Day celebration held at the National Shrine of Our Lady of the Snows in Belleville
- proctored the Illinois Science Olympiad regional competition "Road Scholars" test. The "Road Scholars" section tested students' abilities to interpret and use topographic and highway maps
- gave 30-minute presentations on rocks, minerals, and fossils to southern Illinois school groups all day long for each of the four days of Stewardship Week at the UI Forest Resource Center, Simpson...
Each year the Survey leads four field trips that allow the interested public to learn about and explore the state’s most interesting geological features and the problems and opportunities associated with these features. Myrna Killey uses ISGS maps to explain to field trip participants what they will be seeing at this year’s trip to Siloam Springs State Park in western Illinois. Part of the trip included looking for geodes in rocky stream beds.

Every fall, during Earth Science Week, the Survey helps put on the highly popular Natural Resources Quiz Bowl for local elementary and secondary students. This year’s event featured sixth, seventh, and eighth graders at Champaign’s Jefferson Middle School.

The ISGS home page on the World Wide Web is an excellent portal to much of the information the Survey has available to the public. You can find the page at http://www.isgs.uiuc.edu/.

In order to help students meet the new Illinois science education standards, ISGS outreach staff have developed a number of programs, including curriculum materials for elementary and secondary teachers.
"Development and protection of our state's resources, particularly water, are nearly impossible without detailed knowledge of the subsurface."

—William W. Shilts,
Chief, Illinois State Geological Survey

The Illinois State Geological Survey produces information. Like any product, information is assembled out of raw materials by people applying knowledge and then is shipped down the pipeline to market, in this case the public and private bodies, as well as individual citizens who need geologic information to make informed decisions. At the same time, the Survey exists as a public institution, financed by public investment and only partly through the sales of its products.

A difficult problem in economics is that it is very hard to set a value on public investments in information because many of its benefits are intangible and yet to be realized. In a related study, published as a special report this year, ISGS economists have tackled this challenge. The economists surveyed over 500 users of Kentucky’s 1:24,000 maps; Kentucky is the only state so far to be mapped in its entirety at a scale of 1:24,000. The cost of Kentucky's maps was $90 million in 1999 dollars. In a rigorous economic analysis of the results, the ISGS economists determined that the benefits of producing and enabling access to the kind of information in geologic maps are enormous, at least 25 times and perhaps as much as 39 times the cost, in real dollar values. These benefits are only those that can be measured in real money and don't include the many more intangible benefits of scientific knowledge.

This finding is a strong endorsement of the Survey's goal of continuing to build the geologic information database and to provide timely and useful information as the foundation to make informed decisions about land, water, mineral, and energy use.
Active Projects, 1999–2000

Applied Geochemistry
Adsorption and Desorption of Eu, Sr, and Cr by Soil Components, W.R. Roy, P. Huggins (U of I student)
Anthropogenic Pb in Soils in the Chicago Area: Its Deposit History, Pathways, and Effects on Human Health, Y. Zhang
Chemical and Mineralogical Characteristics of Illinois Soils, G.B. Dreher, Y. Zhang, L.R. Follmer, R.E. Hughes, G.L. Salmon, J.D. Steele
Contaminant Transport Through a Field-scale Earthen Liner, I.G. Krapac, W.S. Dey, A. Valocchi (University of Illinois [U of I]), C. Werth (U of I), D. Daniel (U of I), B. Jellerichs (U of I student), J. Lee (U of I student)
Effect of Copper, Iron, and Aluminum on the Polymerization of Hexachlorocyclopentadiene (C-56), S.-F.J. Chou
Factors Affecting Pathogen Contamination of Non-community Water Wells, J.B. Risatti, R.C. Berg
Graphite Furnace Method Development for Determination of Pb, Cd, As, and Se in Sediment and Soil Digests and Waters, J.D. Steele
Microbial Dechlorination of PCBs in Sediments from Waukegan Harbor, J.B. Risatti, G.L. Salmon
Nitrate Formation in Earth Materials in Mammoth Cave, Kentucky, I.G. Krapac, R. Olson (Division of Science and Research Management, Mammoth Cave National Park, KY)
Organic Compounds in Sediments from Near-shore Lake Michigan, G.L. Salmon
Organic Compounds in Sediments from the Grand Calumet River: Lake Michigan to Lake George, G.L. Salmon, N.T. Unger (Sanitary District, Hammond, IN)
Organic Contaminants in Air Samples Collected along Lake Michigan, G.L. Salmon
Participation in NASA Astrobiology Program, J.B. Risatti
Partitioning of Methane by Microbial Metabolism Pathways in Volo Bog, J.B. Risatti
Sediment Geochemistry of Illinois Portion of Grand Calumet River, R.A. Cahill, G.L. Salmon
Sediment Geochemistry of Lake DePue, R.A. Cahill, G.L. Salmon
Sediment Geochemistry of Upper Peoria Lake, R.A. Cahill, G.L. Salmon, J.D. Steele
Transport of Agrichemicals in Alluvial Aquifers and Nitrate Attenuation by a Riparian Woodland: Effects of Flooding, J.B. Risatti, E. Mehnert

Chief's Office, Mapping
Central Great Lakes Geologic Mapping Coalition Technical Team, R.C. Berg
Geologic Mapping: Optimizing Environmental Protection and Resource Exploration, R.C. Berg
Coal Section
Anomalously High Moisture Contents of Low-Sulfur Illinois Coals: Occurrence and Causes, H.H. Damberger, R.D. Harvey
Availability of Coal Resources for Future Mining in Illinois, C.G. Treworgy, C.A. Chenoweth, C.P. Korose, D. North
Behavior of Mineral Matter at Three Types of Power Plants Burning Illinois Coals, I. Demir
Coal Quality Patterns of Illinois Basin Coals, H.H. Damberger, I. Demir, R.D. Harvey
McNairy Formation, Cretaceous–Tertiary Boundary, and the Search for Dinosaurs in Illinois and Missouri, R.J. Jacobson, J.M. Masters, J.A. Devera, G. Darrough (Missouri Ozark Dinosaur Project), M. Fix (University of Missouri, St. Louis), J. Utgaard (Southern Illinois University)
Mined-out Area Maps for Rock Island County, C.A. Chenoweth
Mined-out Area Maps for St. Clair County: Freeburg and Collinville Quadrangles, C.A. Chenoweth, S.D. Elrick
Mined-out Area Maps for St. Clair County: French Village and O'Fallon Quadrangles, C.A. Chenoweth
Mineralogical and Chemical Composition of Inorganic Matter in Marketed Illinois Coal, I. Demir, R.E. Hughes
Occurrence and Origin of Coal Bed Methane and of Coal Mine Gas in Active and Abandoned Coal Mines of Illinois, H.H. Damberger, I. Demir, R.J. Finley

Coastal and Wetlands Geology
Compilation and Interpretation of Hydrologic and Geologic Data at State Nature Preserves and Natural Areas, J.J. Miner, W.S. Dey, M.M. Miller, R.C. Berg, R.A. Locke (Illinois State Water Survey [ISWS]), H.A. Wehrmann (ISWS)
Hydrogeologic Consultation, Review, and Monitoring of the Stern's Road Fox River Bridge Crossing Site, J.J. Miner

Energy and Environmental Engineering
Conversion of Corn By-products into High-value Activated Carbon, A.A. Lizzio, S. Desai (U of I), M.J. Rood (U of I)
Development of a Spiral Column to Clean Fine Coal, L.A. Khan
Development of Low-cost Mercury Sorbents, M. Rostam-Abadi, S.S. Chen, M.J. Rood (U of I), H.-C. Hsi (U of I), R. Chang (EPRI), C. Richardson (URS Radian), S. Sjostram (Apogee)
Effects of Chlorine in Coal on Furnace-wall Corrosion under Low NO_x Condition, M.-I.M. Chou, M. Luo
Illinois Basin Coal Sample Program, K.M. Henry

Proposal on Dust and Odor Problems Challenging the Animal Farming Industry, A.A. Lizzio, S.S. Chen

Scale-up of ISGS Froth Washer for Testing in a Commercial Plant, L.A. Khan

Recycling Waste Tire Rubber into Value-added Products for Air Quality Applications, M. Rostam-Abadi, M.J. Rood (U of I), C. Lehmann (U of I)

**Engineering Geology**

CUSEC State Geologists Mapping Efforts in the Midwest, R.A. Bauer, R.J. Nagy

Development of a Geophone/Geoprobe System for Downhole Shear-Wave Measurements, W.-J. Su, R.A. Bauer

Illinois Loess: Geology and Its Engineering Implications, W.-J. Su, L.R. Follmer


Seismic Microzonation of the Carbondale–Murphysboro Area in Southern Illinois, S.-J. Su, L.R. Follmer

Seismic-Wave Velocity Database in Southern Illinois for Microzonation Mapping, W.-J. Su, R.A. Bauer, L.R. Follmer

**Environmental Site Assessments**


**Geospatial Analysis and Modeling**

Geologic Assistance for Siting Solid Waste Disposal Facilities, Jo Daviess County (R.J. Krumm, C.S. McGarry)

Geologic Assistance for Siting Solid Waste Disposal Facilities, Lake County (M.H. Riggs)


Geologic Assistance for Siting Solid Waste Disposal Facilities, McLean County (M.H. Riggs)

Geologic Assistance for Siting Solid Waste Disposal Facilities, Stephenson County (R.J. Krumm, C.S. McGarry)

Map Illinois: The Illinois Natural Resources Geospatial Data Clearinghouse, M.H. Riggs, S.K. Beaverson

Plan for Processing, Archiving, and Distributing USGS DOQs for Illinois, R.J. Krumm, D.W. Luman

**Groundwater Geology**

American Bottoms Groundwater Resources Map, E.C. Smith

An Examination of Pesticide Occurrence in Shallow Dug and Bored Wells—Are High Detection Rates Related to On-field Applications?: Year 3, E. Mehnert, W.S. Dey, D.A. Keefer, H.A. Wehrmann (ISWS), S.D. Wilson (ISWS), J. (ISWS)

Aquifer Assessment: De Kalb County, T.H. Larson
Aquifer Assessment: Metro East, T.H. Larson, M.J. Mushrush, E. Smith, R.C. Vaiden
Bacterial Contamination of Karst Aquifers, S.V. Panno, C.P. Weibel
Columbia Landfill: Isotopic and Chemical Study, S.V. Panno, K.C. Hackley, C.P. Weibel
Educational Posters: Illinois Fossils and Illinois Cross Section, R.C. Vaiden, K.L. Benner
Geobits: Plate Tectonics and Build Illinois, R.C. Vaiden
Groundwater Basins of the Sinkhole Plain, S.V. Panno, C.P. Weibel, T. Aley (Ozark Underground Laboratory, Protem, MO)
Groundwater Geology of the Buried Mahomet Bedrock Valley Aquifer System, Focusing on De Witt and Piatt Counties, Illinois, D.R. Larson, B.L. Herzog, M.J. Mushrush
Healey Street Flood Impoundment Basin Test Hole and Piezometer, D.R. Larson, T.C. Young
Illinois Caverns Field Guide, S.V. Panno, S.E. Greenberg, C.P. Weibel
Loss of Specific Capacity within a High-capacity Well in the NIWC Western Field, Phase 2: Determining the Responsible Chemical and Biological Mechanisms, E. Mehnert, K.C. Hackley, D.R. Larson, M.J. Mushrush, S.V. Panno, T.C. Young
Mechanism of Transport of Nutrients in Alluvial Aquifers during Normal and Flood Conditions, E. Mehnert
Significance of Colloids in the Transport of Atrazine: A Preliminary Investigation, E. Mehnert, J.B. Risatti
Surface Geophysical Services to Municipalities and ISGS Projects
The Role of Flooding and Land Use Practices on Erosion Rates and Agrichemical Loading in the Southwestern Illinois Sinkhole Plain, S.V. Panno, K.C. Hackley

Industrial Minerals and Resource Economics
Aggregate Resources, Sequence Stratigraphy, and Depositional Facies of Mississippian Carbonates, Western Illinois, Z. Lasemi, R.D. Norby
AGI Paper on Clay Minerals and Educational Series, D.M. Moore
Analysis of Electricity Markets in the U.S.: Degree of Market Integration, V. Ipe
Benefits and Costs of Kentucky's Geologic Mapping Program, S.B. Bhagwat
Carbonate Textures in the Buckhorn Dolomite of Northwestern Illinois, D.M. Moore
Chlorite-Chlorite/Smectite-7 Angstrom/Chlorite-Corrensite Problem, D.M. Moore
Chlorite, Chlorite/Smectite, Vermiculite Problem, D.M. Moore
Coal and Fly Ash Studies, R.E. Hughes
Correlation between Soil Texture and Crop Yield, D.M. Moore
Development of Coal Mining Software for USGS Coal Availability Programs, S.B. Bhagwat
Directory of Mineral Producers in Illinois, V. Ipe, J.M. Masters, L. Smith
Economics of Aggregate Industry in Illinois: Current Trends and Future Prospects for the Industry, V. Ipe
Economics of Underground Mining vs. Surface Mining of Limestone under Varying Geologic Conditions in Illinois, S.B. Bhagwat
Environmental Policies and Regulation: Trust Funds for Pollution Management, V. Ipe
Geoarchaeological Studies, R.E. Hughes
Illuvial Clay Films = Transorted Clay, D.M. Moore
Mapping the Bedrock Geology of Southeastern Wisconsin, D.G. Mikulic, T. Evans (Wisconsin Geological and Natural History Survey), R. Peters (Wisconsin Geological and Natural History Survey), K. Massie-French (Wisconsin Geological and Natural History Survey)
Mineralogical Characterization of Archaeological Materials Using a Portable Spectrometer, R.E. Hughes
Mineralogical Investigations, R.E. Hughes, P.J. DeMaris
Natural Gas Production and Distribution Statistics for Illinois, V. Ipe
Non-point Source Pollution Management: Economic Analysis of Ecological Approaches, V. Ipe
Pipestone Paper for American Scientist, D.M. Moore
Potential Impact of the "Illinois First" Initiative on Illinois' Aggregate Industries, S.B. Bhagwat
Sand and Gravel Resource Modeling: Vincennes Quadrangle, Carroll County, McHenry County, Southernmost Illinois, J.M. Masters
Silurian Geology and Aggregate Resources of West-Central Illinois, D.G. Mikulic, A. Butcher (University of Portsmouth)
Silurian Graptolite Project, D.G. Mikulic
Silurian Lithostratigraphy and Biostratigraphy of Illinois, D.G. Mikulic, R.D. Norby, J.K. Kluessendorf (U of I)
St. Peter Sandstone Diagenesis in the Illinois Basin, D.M. Moore
Stagnation in Sand and Gravel Production in Illinois: Its Causes and Implications, S.B. Bhagwat
Water Resources in Illinois: Supply, Demand, and Prices, V. Ipe

**Isotope Geochemistry**

Carbon and Oxygen Isotope Geochemistry of Calcite in Cleats of Coal Seams, C.L. Chou
Determination of Nitrate Sources in Sinkhole Plain of Southeastern Illinois, K.C. Hackley, S.V. Panno, H.H. Hwang
Geochemistry of Sulfur and Trace Elements in Coal, C.L. Chou
Groundwater Ages and Recharge Areas of the Mahomet Valley Aquifer, K.C. Hackley, S.V. Panno, J.D. Steele
High-resolution Climate Change Study in the Mississippi River Valley, H. Wang, L.R. Follmer
Method Development for $^{14}$C-Age Model of Paleosol Stratigraphy, H. Wang, L.R. Follmer
Microbial Degradation and Diversity, S.M. Shiffer
Removal of Sulfur and Chlorine from Illinois Coal by Wet-grinding and Selective Flocculation, C.L. Chou
Saline Groundwater Study in Southwestern Illinois, H.H. Hwang
Source of CO$_2$ in Houses in Wood Dale, Illinois, K.C. Hackley
Trace Element Abundances and Geochemistry of Paleozoic Carbonate Rocks, C.L. Chou

**Oil and Gas**

Computerization of Oil and Gas Development Maps, A. Sanders, T. Davis

Cypress Sandstone Regional Study, J.P. Grube, T. Davis

Geneva Dolomite Research, B. Seyler, J.P. Grube

Geologic Characterization of Mt. Simon Sandstone Gas Storage Reservoir, D.G. Morse, T. Davis, B.G. Huff, A. Sanders, B. Seyler


Hillsboro Gas Storage Field, B.G. Huff

Illinois Basin Source Rocks, D.G. Morse, M.D. Lewan (Denver Federal Center)

Operation of Midwest Regional Office of PTTC (US Department of Energy contract), D.G. Morse, T. Davis, B. Seyler, A. Sanders, E.M. Coleman, B.L. Renfrew

Tar Springs Reservoir and Area Geology, D.G. Morse

**Quaternary Geology**


Access to Surface Exposures and Excavations of Outside Agencies and Firms for ISGS Geologists, C.J. Stohr

Acquisition of Cores, Samples, and Other Data Collected by State Agencies, Geotechnical Firms, and the Mining Industry, C.J. Stohr

Age and Environment of Petersburg Silt (Illinois Episode) and Older Lacustrine and Eolian Silts in Southwestern Illinois Related to Mapping Efforts on St. Louis Metro East Area, D.A. Grimley, A.C. Phillips

Clay Mineral Map and Data Compilation, M.M. Killey, H.D. Glass

Education Series Publication on Groundwater, M.M. Killey, D. Larson

Geologic Mapping of 7.5-Minute Quadrangles: Crystal Lake, Curry, C.J. Stohr, R.C. Vaiden

Geologic Mapping of 7.5-Minute Quadrangles: Dunlap, C.P. Weibel

Geologic Mapping of 7.5-Minute Quadrangles: Galesburg East and Appleton, M.L. Barnhardt

Geologic Mapping of 7.5-Minute Quadrangles: Geological and Landslide Potential Map for the Collinsville Quadrangle, A.C. Phillips

Geologic Mapping of 7.5-Minute Quadrangles: McHenry, B.B. Curry, C.J. Stohr, R.C. Vaiden

Geologic Mapping of 7.5-Minute Quadrangles: Oak Hill, C.P. Weibel, C.C. Abert

Geologic Mapping of 7.5-Minute Quadrangles: Peotone Airport, B.B. Curry, D.A. Grimley

Giant City State Park Geology, C.P. Weibel

Hydric Soils Delineation by Magnetic Susceptibility in Wetland Areas, D.A. Grimley

Hydrology, Surface Water Quality, and Paleohydrology of Nelson Lake, Kane County, Illinois, B.B. Curry, W.S. Dey, M.L. Sargent

Illinois Interagency Land Cover Program, D.W. Luman

Mapping of the Surficial Geology of Twelve Quadrangles in Southern Illinois, L.R. Follmer

McHenry County Geology for Planning, B.B. Curry

Paleohydrology/Paleoclimate Seed Grant Application to Purdue's PRIME Lab for Be-10 Assays, B.B. Curry
Pre-Illinoian Deposits of Western Illinois, M.M. Killey, H.D. Glass
Sampling and Geophysically Logging Commercially Drilled Holes, C.J. Stohr, T. Larson, T.C. Young
Sedimentologic and Stratigraphic Investigation of American Bottoms Using Geophysical Techniques and Borings, A.C. Phillips, T. Larson
Sedimentology and Ice Sheet Dynamics, A.K. Hansel
Springs of Illinois, C.P. Weibel
STATEMAP Quadrangle Mapping in Illinois (Beecher West and Steger), B.B. Curry
STATEMAP Quadrangle Mapping in Illinois (Chicago Metro West Area)(Elgin 7.5 Quad), B.B. Curry
STATEMAP Quadrangle Mapping in Illinois (Chicago Metro West Area)(Maple Park Quad), B.B. Curry, D.A. Grimley

Sedimentary and Coastal Processes
Conodont Genus Lochriea, R.D. Norby
Development of K–12 Geology Curriculum Materials, J.D. Treworgy, R.C. Vaiden, S.E. Greenberg
Fossils of Illinois: The Ordovician System, D.R. Kolata
General Processing and Interpretation of Seismic Data for Illinois Basin and Vicinity, J.H. McBride, D.R. Kolata
Geologic Mapping of 7.5-Minute Quadrangles: Cache, W.J. Nelson, J.M. Masters
Geologic Mapping of 7.5-Minute Quadrangles: Cairo, W.J. Nelson, J.M. Masters
Geologic Mapping of 7.5-Minute Quadrangles: Cypress, J.A. Devera, W.J. Nelson
Geologic Mapping of 7.5-Minute Quadrangles: Metropolis, W.J. Nelson, J.M. Masters
Geologic Mapping of 7.5-Minute Quadrangles: Paducah Northeast, W.J. Nelson, F.B. Denny
Geologic Mapping of 7.5-Minute Quadrangles: Pulaski, W.J. Nelson, J.M. Masters
Investigation of the Structural Framework of the Middle to Upper Crust in the Wabash Valley Seismic Zone with High-quality Seismic Reflection Profiles, J.H. McBride, R.J. Krumm, L.R. Smith
Ordovician and Silurian K-bentonites in North and South America and Europe, D.R. Kolata
Presenting Near and Far Sciences in Illinois Teacher Workshops, J.D. Treworgy, M.J. Chrzaszowsk, A.C. Phillips, R.C. Vaiden
Regional Study of Benoist Sandstone, H.E. Leetaru
Revision of the State of Illinois 1:500,000 Geologic Map, D.R. Kolata, W.J. Nelson
Seismotectonic Studies of the Southern Illinois Basin Using Data from Existing Seismic Reflection Lines and a New PANDA Seismic Array Experiment, J.H. McBride
STATEMAP Quadrangle Mapping in Illinois (Millstadt 7.5-Minute Quadrangle), J.A. Devera, C.C. Abert, M.L. Barnhardt, F.B. Denny

STATEMAP Quadrangle Mapping in Illinois (St. Louis Metro East Area) (Grafton 7.5-Minute Quadrangle), J.A. Devera, C.C. Abert, F.B. Denny


STATEMAP Quadrangle Mapping in Illinois (St. Louis Metro East Area) (Elsah 7.5-Minute Quadrangle), J.A. Devera, C.C. Abert, F.B. Denny

STATEMAP Quadrangle Mapping in Illinois (St. Louis Metro East) (French Village 7.5-Minute Quadrangle), J.A. Devera, C.C. Abert, R.A. Bauer, F.B. Denny, D.A. Grimley, A.C. Phillips, R.J. Nagy, S.-J. Su

Ste. Genevieve Regional Study, H.E. Leetaru

Stratigraphic Framework of the Middle and Upper Ordovician Rocks of Northern Illinois, D.R. Kolata, H.E. Leetaru

Studies of Crustal Deformation Using Seismic Reflection Data, J.H. McBride


Tradewater Cross Sections, W.J. Nelson
Publications

Illinois State Geological Survey Series

Environmental Geology

Field Trip Guidebooks


Geoscience Education


Illinois Geologic Quadrangle Maps


Illinois Maps

Illinois Minerals

Open File Series

Reprints


Other Publications


Final Contract Reports and Other Public Documents


**Outside Publications**


Su, W.-J., 2000. Cover Photo [The track and field at a middle school in Taiwan which was disrupted by 2 meters of upward thrust fault movement as a result of the magnitude 7.3 Chi-Chi Earthquake of September 21, 1999.] AEG News, Association of Engineering Geologists, vol. 42, no. 4.


For more information

Illinois State Geological Survey
615 East Peabody Drive Champaign,
Illinois 61820
217/333-ISGS
isgs@isgs.uiuc.edu
http://www.isgs.uiuc.edu

Chief's Office
William W. Shilts, Chief
217/333-5111
shilts@isgs.uiuc.edu
E. Donald McKay III, Chief Scientist
217/333-0044
mckay@isgs.uiuc.edu

Richard C. Berg, Director
Geologic Mapping Program
217/244-2776
berg@isgs.uiuc.edu

Jonathan H. Goodwin, Assistant to
the Chief for Strategy and Planning
217/333-5855
goodwin@isgs.uiuc.edu

Jennifer K. Hines, Implementation
and Communication Coordinator
217/244-2410
hines@isgs.uiuc.edu

Gerald E. Glogowski, Head
Administrative Group
217/244-2403
gglo@isgs.uiuc.edu

Michael V. Miller, Acting Head
Center for Transportation and
the Environment
217/333-7093
miller@isgs.uiuc.edu

Robert J. Finley, Head
Economic Geology Group
217/244-8389
finley@isgs.uiuc.edu

Beverly L. Herzog, Head
Environmental Geology Group
217/244-2788
herzog@isgs.uiuc.edu

Marie-France Dufour, Head
Information Delivery Group
217/333-5855
dufour@isgs.uiuc.edu

Applied Geochemistry
Gary B. Dreher
217/244-2527
dreher@isgs.uiuc.edu

Business and Financial Services
Debra A. Giest
217/244-2390
giest@isgs.uiuc.edu

Coal
Russell J. Jacobson
217/244-2426
jacobson@isgs.uiuc.edu

Coastal Geology
Michael J. Chrzastowski
217/244-2194
chrzasto@isgs.uiuc.edu

Computing Services
PC Installations/Software
Kerry M. Riley
217/244-2524
riley@isgs.uiuc.edu

Network/Work Stations,
Web Page Development
Sally Denhart
217/333-5102
denhart@isgs.uiuc.edu

Energy and Environmental
Engineering
Massoud Rostam-Abadi
217/244-4977
massoud@isgs.uiuc.edu

Engineering Geology
Robert A. Bauer
217/244-2394
bauer@isgs.uiuc.edu

Environmental Site Assessments
Anne L. Erdmann
217/244-2502
erdmann@isgs.uiuc.edu

Geologic Samples Library
217/333-3567

Geological Records Library
217/333-5109

Geoscience Education, Outreach,
and Public Field Trips
Wayne T. Frankie
217/244-2427
frankie@isgs.uiuc.edu

Geospatial Analysis and Modeling
Robert J. Krumm
217/333-4085
krumm@isgs.uiuc.edu

Groundwater Geology
Edward Mehnert
217/244-2765
mehnert@isgs.uiuc.edu

Human Resource Office
Linda M. Cunningham
217/244-2402
cunning@isgs.uiuc.edu

Industrial Minerals and Resource
Economics
Randall E. Hughes
217/244-0080
hughes@isgs.uiuc.edu

Information Office, Maps
Publications Sales
217/244-2414

Isotope Geochemistry
Chao-Li (Jack) Liu
217/244-2192
jliu@isgs.uiuc.edu

Library
217/333-5110
library@isgs.uiuc.edu

Maintenance, Operations, Design
Joseph S. Kaczanowski
217/244-5006
joek@isgs.uiuc.edu

Oil and Gas
Beverly Seyler
217/244-2389
seyler@isgs.uiuc.edu

Petroleum Technology Transfer
Council
Midwest Regional Office
Richard J. Geier
217/244-9337
geier@isgs.uiuc.edu

Publications, Graphics, Photography
Cheryl K. Nimz
217/265-5194
nimz@isgs.uiuc.edu

Public Information
Mary P. Krick
217/244-2787
krick@isgs.uiuc.edu

Quaternary Geology
Ardith Hansel
217/333-5852
hansel@isgs.uiuc.edu

Sedimentary and Crustal Processes
Dennis R. Kolata
217/244-2189
kolata@isgs.uiuc.edu

Wetlands Geology
James J. Miner
217/244-5786
miner@isgs.uiuc.edu