# I<u>llinois Geology:</u>

# MEETING THE CHALLENGE OF CHANGE

ILLINOIS STATE GEOLOGICAL SURVEY ANNUAL REPORT 2003



Printed with soybean ink on recycled paper

# LLINOIS GEOLOGY:

# MEETING THE CHALLENGE OF CHANGE

**ANNUAL REPORT 2003** 

ROD R. BLAGOJEVICH, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES JOEL BRUNSVOLD, DIRECTOR

ILLINOIS STATE GEOLOGICAL SURVEY WILLIAM W. SHILTS, CHIEF NATURAL RESOURCES BUILDING 615 EAST PEABODY DRIVE CHAMPAIGN, ILLINOIS 61820-6964 217-333-4747 WEB SITE HTTP//WWW.ISGS.UIUC.EDU

# CONTENTS

FROM THE CHIEF1ACTIVE PROJECTS7PUBLICATIONS25

# FROM THE CHIEF . .

## A TIME OF CHANGE—AND OPPORTUNITY

This past year has been one of significant change, both within the Survey and within the state. Within the Survey, new and skilled employees have joined us as some experienced staff members have retired or moved on. Several new projects are under way, and we are working to secure funding for these areas. Within Illinois, the ongoing political transformation of state government affects us in many ways. We must recognize the opportunities for positive change.

It is our collective task to provide our state government and our parent agency, Illinois Department of Natural Resources (IDNR), with concise, accurate, and compelling information about our scientific programs and their relevance to the taxpayers of Illinois. In recent years, we have increased contact with our federal legislators, various federal agencies, and other state surveys to communicate the message of our scientific capabilities and the resources needed to perform earth science research of critical importance to Illinois citizens.



**ISGS Chief, Bill Shilts** 

### CHALLENGES

The grim economic situation in Illinois and elsewhere is the main challenge to our programs. State revenues that support the General Revenue Fund (GRF) have been seriously reduced, which affects us. Even among our state-funded contract and grant-supported programs, the downturn in tax and fee revenues has affected or has the potential to affect projects presently funded by the Illinois Department of Transportation (IDOT), Illinois Board of Higher Education (IBHE), and Illinois Department of Commerce and Economic Opportunity (IDCEO). We must continue to pursue external funding sources aggressively, particularly within the federal government. We also need to speak with our federal politicians and colleagues in other agencies in an effort to secure their support in acquiring funding for research that we consider critical to the state's economic development and environmental well-being, particularly in the energy management and geological mapping areas.



Members and guests of the Board of Natural Resources listen intently to Mike Chrzastowski and Robert Bauer (not shown) explain the geology and engineering of the unique beach and harbor constructed by Lake Forest during the 1980s. The two also led a discussion of local issues affecting the area, such as the Johns-Manville superfund site and the asbestos fragments that are turning up on the beaches north of Waukegan. The field trip was part of a two-day meeting of the Board and Survey Chiefs/Director, hosted by Board member Ada Nielsen (in hat and sunglasses) and British Petroleum (BP). A portion of the first day's meeting was attended by local Lake Forest officials, press, and BP officials who heard presentations by the Chiefs/Director. The Survey/Center staff heard a presentation on intellectual property assessment by Ada Nielsen and a guest speaker from BP. The trip also presented the group with an extended opportunity to discuss how ISGS research addresses the important geological issues affecting Illinois residents.



Lynne Padovan (left), former Gov. George Ryan's senior advisor for environment and natural resources, received the ISGS Outstanding Advocate Award from Chief Shilts during the Survey's annual award program. Padovan received the award in appreciation of her significant contributions to ISGS research programs through her enthusiastic advocacy of the Survey's mapping, energy, and water programs and the resources needed to support them for the benefit of the people of Illinois.



The Illinois State University Department of Geography-Geology, represented by **Dr. David Malone** and **Dr. Robert Nelson** (right, top to bottom), received the ISGS Outstanding Cooperator Award. The department was honored for its cooperative work over the last year on several ISGS programs funded by an IBHE grant. The geology faculty, headed by Malone, enthusiastically responded to the need for more and better-trained students for three-dimensional geologic mapping programs at the ISGS and nationwide. Malone,

Nelson, and colleagues incorporated ISGS programs into their teaching curricula and organized students to participate in recent ISGS research programs.

For several years, by demonstrating the core research and support capabilities of the Survey, we have been increasing the proportion of our research funded by contracts or grants. Although the current hiring freeze has left some state-funded positions vacant and we have lost several vacant positions permanently, we hope these non-GRF funds will allow us to create new positions and new research capabilities to tackle an even wider range of earth science issues that impact Illinois society. Many of the projects we carried forward successfully over the past year demonstrate these enhanced capabilities, made possible by our funding partners. For example,

- Our three-dimensional (3-D) mapping projects, carried out for IDOT's Route 29 upgrade and for our Central Great Lakes Geologic Mapping Coalition (CGLGMC)funded 3-D mapping in Lake County, are the result of long-term, successful partnerships that present us with opportunities to apply our unique 3-D mapping capability.
- 2. Our geophysics-based exploration of the geologic setting of the Mahomet aquifer in

the University of Illinois' Robert Allerton Park area near Monticello used IBHE funding and Illinois State University students in the cooperative geophysics training program. Seismic profiles revealed that the aquifer is particularly fragile and poorly protected in that area.



As part of a project funded by the Illinois Board of Higher Education, Illinois State University geology student Scott Perkins (left) and ISGS hydrogeologist John Sieving examine sediment data during a drilling operation at Robert Allerton Park. The drilling, done in conjunction with geophysical and seismic surveys, provided data that helped confirm the existence of a hydraulic connection between the Sangamon River and the Mahomet aquifer that may be allowing surface contaminants to enter the aquifer.

- Our successful transfer of 3. the technology needed to use coal waste products led to one project, now in the testing and patent application stage, that provides technology to recover coal fines that are presently wasted. Another project, now in the commercialization phase with a brick manufacturing company, uses coal fly ash, a major component for making "super bricks."
- Our research continues on important energy problems, including U.S. Department of Energy



The full spectrum of ISGS coal research—from resource location and mapping, to efficient and clean coal combustion, to by-product re-use—is featured prominently in a brand new coal display at the Museum of Science and Industry in Chicago. Many of the photographs were provided by ISGS photographer Joel Dexter. The wall in the foreground was the result of an ISGS project mixing Illinois clay with coal combustion fly ash to make bricks with superior characteristics. With support from the **Illinois Clean Coal Institute**, ISGS has been assisting several Illinois brick makers in developing procedures to replace almost one-half of their traditional clay-shale raw materials with fly ash. Currently, tons of fly ash are produced each year by coal-fired power plants and discarded in landfills or tailings ponds.

(U.S. DOE) grants for carbon sequestration and re-evaluation of the potential for coal bed methane production in the Illinois Basin and the IBHE-funded screening of the state for possible power plant and **Illinois Office of Coal Development**-funded survey of carbon dioxide sequestration potential.

5. We have carried out systematic sampling of stream sediments at approximately 500 sites across Illinois, also funded by an IBHE grant, a project that has leveraged analytical funding from the USGS. This sampling project provided us for the first time with a geochemical map of Illinois on which to build our environmental geochemistry programs.

These major projects, started and largely completed over the past year, are just a few among the many that enhance our state and national reputation as an institution with uniquely integrated facilities and expertise, characteristics that allow us to address an increasingly diverse array of earth science issues that affect the everyday lives of our citizens.

## IN THE NEWS: "PROCESS AIMS TO BURY CARBON Emissions: Project May Mean New Life for Depressed Areas," Greg Kline,*The News-Gazette*, Champaign, September 9, 2003.

Reducing or eliminating carbon dioxide  $(CO_2)$  emissions from coal-fired power plants would help make it economical to burn Illinois coal, an abundant state resource that was once an important part of the state's economy, until clean air regulations made Illinois' high-sulfur coal less affordable than coals from western states. With funding from the **U.S. Department of Energy**, an ISGS study of carbon sequestration is under way. The sequestration process, by which  $CO_2$  is piped directly from coal-fired power plants to underground storage, will keep that  $CO_2$  out of the atmosphere while permitting recovery of oil and natural gas. This process also should be useful outside of Illinois, especially in populous nations such as India and China, which burn a large amount of coal.

#### TEAMWORK AND PARTNERSHIPS

Our teams and partnerships have allowed us to solve problems and carry out research that fulfills our two strategic thrusts—"cradle-to-grave" management of carbon and 3-D geologic mapping of Illinois. In addition to projects that use multidisciplinary teams within the Survey, we continue to establish teams that include the other Champaign Surveys and Waste Management and Research Center and that involve state and federal government agencies and state, national, and international universities and research institutions.

During the past year, we have undertaken several important initiatives, some of which have changed the character of our Survey in subtle and not-so-subtle ways.

- **Centers** Our major administrative units are now named "Centers" to reflect more accurately our focus on a specific research, support, or service mission.
- Applied Geophysics Section Our newly formed Applied Geophysics Section is developing innovative techniques for solving earth science problems in Illinois. For example, geophysical data can decrease the cost of 3-D mapping while improving the quality of subsurface interpretations. The section is also finding creative ways to leverage human and material resources to increase the number of geophysical surveys and amount of research that the new section's small core of people are able to do presently.
- Publications, Web Site, and Outreach The Geoscience Information Center has implemented significant changes to the review and editorial process, streamlining it and speeding production of Survey publications and products. The publication process, the rate and types of publications, and the timeliness of release of our information are being examined to make sure that our output is commensurate with our budget requirements. Our Web site is being substantially upgraded to improve user access to a much wider array of research and educational information. Also, an indepth marketing analysis of our outreach efforts and products and information about other Surveys' marketing strategies will guide our future outreach efforts.



Systems Administration and IT Support

Because of a temporary lack of IT support and the state hiring freeze, several of our talented staff members together have assumed additional responsibilities to keep the network and computer systems functioning and up-to-date in software and hardware installations.

• **IBHE Grant** The IBHE grant allowed us to make great progress in three major areas. First, we were able to create an entirely new facility for our geologic records and Sally Denhart, Webmaster; Joel Steinfeldt, editor; and Cindy Briedis, designer, work diligently to improve the design and functionality of the ISGS Web site.

education/outreach units in the I-Building at the South Research Park on the campus of the University of Illinois at Urbana-Champaign (UIUC); public access to our invaluable record holdings is vastly improved as is the work environment for our employees and students who use the facility. As an additional benefit, the two large, vacated spaces in the Natural Resources Building were renovated to serve other needs. The second floor now contains a modern center for high-end Geographic Information System

(GIS) users, other staff, and students, and the first floor now houses the human resources office in a functional, attractive space close to the building's main entrance.

Second, we were able to hire four very experienced individuals who are critical to our mapping and economic geology programs. These new staff members already have allowed us to take several of our programs, particularly geologic mapping, to levels that we could never have achieved a year ago.

Third, we were able to develop and complete critical research projects that we otherwise would

not have had the resources to attempt. In developing liaisons with our state universities using the research part of the grant, we have involved students in our program as never before and have filled some long-standing research gaps.

• University Partners We have revised and upgraded the title and function of the affiliated scientists who collaborate with us on a regular basis. Dr. Bruce Fouke of the Department of Geology at UIUC, a professor who continues to work closely with our staff and students, is our first Board-approved Adjunct Research Associate.

We have also established a memorandum of understanding (MOU) with the Department of Geography at UIUC through which we finance, in addition to our regular intern program, a special intern program for geography students, who work part of their academic year with our scientists. These internships are awarded competitively by the Department.

- Mapping Forums We sponsored well-attended forums highlighting the technology and applications of 3-D geologic mapping, including a workshop prior to the Geological Society of America (GSA) meeting in Denver in October. The workshop was cosponsored by the Geological Survey of Canada, with whom we also have a MOU, and was attended by several scientists from Finland as a result of our MOU with the Finns.
- **IBC** We have cooperated with our Illinois Basin Consortium (IBC) colleagues in Kentucky and Indiana in externally funded programs to evaluate the Basin's coal bed methane potential and the geologic and seismic hazards in the Wabash Valley Seismic Zone, particularly around Evansville, Indiana. Together we have successfully bid to draw a major **U.S. Department of Energy** carbon sequestration project to this region.



From left to right: The Survey's three-dimensional geologic mapping program was advanced by Illinois **Board of Higher Education** funding of new staff members John McLeod, mapping facilitator, and Jane Domier, cartographer, shown here working with student intern Lisa Verhelst. McLeod works with mappers to ensure that high-quality map products are produced in a timely and efficient way. Domier reviews the maps for their compliance to cartographic standards, which include base map information, color selection, and map components.

Our ISGS staff will continue to embrace the team approach to doing research. Integrating teams of scientists, support personnel, and external partners has increasingly become second-nature to most. I hope the day is here, for example, where a principal investigator on a 3-D mapping project would not consider starting it without arranging for drilling support, geophysical surveys, geochemical surveys, bedrock and surficial specialists, GIS support, and financial management support to carry out the project. And, at the end, I would expect that the team would promptly publish its research in Survey papers, online publication series, or external journals.

"Every bit of progress we make in finding clean ways to use Illinois coal to generate electricity means a more reliable energy supply for our entire state and more jobs for central and southern Illinois."

> —Gov. Rod R. Blagojevich Springfield, Illinois

### CONCLUSIONS

Although we are one of 51 state and territorial geological surveys, our Survey is unique in being associated with two other state Surveys, the Waste Management and Research Center, and the State Museum. This combination of research and service expertise for the entire spectrum of natural resources is available to no other state, and it is our challenge to make the citizens who are debating the future course of Illinois state government aware of the unique value we represent. The decline of state revenues over the past year makes this transition not only one of political change, but also one in which the fundamental functions of government are scrutinized and given a value. We have many projects under way that can grow if we can generate funds outside our state appropriation, but competition for such funds is intense, and we will have to be at the "top of our game" to secure them.

6

These budgetary issues and the political realignment in Illinois probably signify a substantial potential for change in the way we do business, but the societal issues we address are well-known to our legislators, and issue-driven research translates well to any administration. I am confident that the strength of the Survey and its people is better known than ever before and that we will play a role that is increasingly important in the lives of our employers—the citizens and institutions of Illinois.

# ACTIVE PROJECTS, 2002–2003

### APPLIED GEOPHYSICS

Enhanced ISGS Borehole Geophysics Program, T.C. Young, A. Dixon-Warren, C.S. Blakley, C.J. Stohr, A.K. Hansel.

Geophysical Exploration of Sand and Gravel Aquifers for Municipal Water Supplies, T.C. Young, C.S. Blakley, M.J. Mushrush.

IBHE Geophysics Mapping, A. Pugin, T.H. Larson, S.L. Sargent, T.C. Young, A.J. Stumpf, K.C. Hackley, S.E. Greenberg, H.-H.E. Hwang, W.C. Beaumont, M.S. Dodd, J.S. Kaczanowski, M.D. Thompson, C.R. Wilson.

The new P-wave landstreamer system, an ISGS innovation that debuted last spring, has been performing well beyond expectations. Two scientists, a technician, and two hourly workers together collected 7 miles of seismic reflection data in northwestern Champaign County in a little over a week. An **IBHE**-funded crew continued collecting data during the summer. A second IBHE-funded crew began field operations using the S-wave landstreamer to target the Ticona Bedrock Valley in LaSalle and Putnam Counties. Several companies have expressed interest in commercial production of the landstreamers and the software programs used to process the data.

Seismic Reflection Survey Near Coal Mines in Saline and Gallatin Counties: A Pilot Project, T. Larson, A. Pugin.

Seismic Reflection Survey in the Ohio River, T. Larson, A. Pugin, S.L. Sargent, J. McBride (Brigham Young University).



IN THE NEWS: "GEOLOGISTS TUNE IN TO HIDDEN CHANNEL: MUNICIPAL OFFICIALS HOPE STUDENTS FIND WATER IN VALLEY BURIED IN ICE AGE," BROCK COOPER, *NEWS TRIBUNE*, LASALLE, JUNE 30, 2003.

Illinois State University graduate students are mapping areas of the Ticona Channel near Lenore and Spring Valley to investigate whether the sand and gravel deposits that fill the channel might be a source of groundwater. The students are using seismic reflection and other methods they learned from ISGS geologists last year during an **Illinois Board of Higher Education**funded study of a portion of the Mahomet aquifer near Allerton Park. Data provided by the landstreamer complement and refine geological interpretations of subsurface materials based on borehole drilling.

#### **CHIEF'S OFFICE**

Three-dimensional Geologic Mapping along Illinois 29, R.C. Berg, E.D. McKay, D.A. Keefer, R.A. Bauer, A.J. Stumpf.

#### COAL

Cleat Development in Illinois Coals, I. Demir, D.G. Morse.

Results from an ISGS study supported by the **IDCEO** indicate that the methane contents of Illinois coals and shales may be 25 to 100% greater than previously thought. Data from the study, including ISGS maps showing the thickness, burial depth, rank, elevation, cleat directions, geological structures, and mined-out areas, can aid companies in locating the best areas for coal bed methane. Because Illinois coal tends to be associated with saline waters, the water from production wells would need to be pumped back underground. Although more work is needed to determine optimal well drilling and completion techniques for local conditions, several companies have requested information about coal bed methane investigations since the report was released.



Drillers remove core at a site near Olney; core samples will be tested for their methane contents.

Commercialization of Fired Bricks with Fly Ash from Illinois Coal (II), M.-I.M. Chou, V.A. Patel, S.-F.J. Chou.

Maintenance of Coal Resource and Mine Data, OMM, R.J. Jacobson, B.Tormey, S.D. Elrick, C.P. Korose.

Manufacturing Energy-Efficient Construction Products from Illinois Coal Fly Ash, S.-F. J. Chou, M.-I.M. Chou, J. Bukowski (UIUC).

National Coal Resources Data System, R.J. Jacobson, S.D. Elrick, R.J. Finley.

7.5-minute Quadrangle Mined-out Area Studies, C.A. Chenoweth, J. Obrad, A.R. Myers.

Update of MINE-INFO Database and Coal Mine Map Source Documentation, R.J. Jacobson, S.D. Elrick, I. Demir.

## IN THE NEWS: "FUTURE BUILDING BLOCKS," GREG KLINE, *THE NEWS-GAZETTE*, CHAMPAIGN, JULY 28, 2003.

An ISGS team, working with UIUC and supported by the Illinois Department of Commerce and Economic Opportunity through the Illinois Clean Coal Institute is finding ways to use discarded fly ash as an ingredient in high-quality building materials. Commercial production has begun of bricks made using a coal fly ash by-product. The bricks are strong, meet or exceed water absorption standards, and have better insulation properties than traditionally made bricks. Preliminary tests suggest that fly ash also can be a value-added component of autoclaved aerated concrete blocks, producing blocks that are energy efficient and airtight.

#### COASTAL GEOLOGY

GeoFramework Chicago Geoscience Poster, M. Chrzastowski, P.K. Carrillo, C.C. Abert, C.K. Nimz, J.A. Steinfeldt.

Urban Coast Initiative, M. Chrzastowski.

"Mike Chrzastowski attended our site tour yesterday at Illinois Beach and as always was a fantastic asset. We are so fortunate to have a scientist with his abilities as part of the DNR team. We could not have pulled the tour off without his help."

> —Stephen K. Davis, Chief Division of Resource Review and Coordination Office of Realty and Environmental Planning Illinois Department of Natural Resources Springfield, Illinois

#### ENERGY AND ENVIRONMENTAL

#### ENGINEERING

A Novel Fine Coal Dewatering Process with Integrated Biomass Utilization, S.S. Chen, L.A. Khan, M. Rostam-Abadi, Y. Lu, C. Manrique.

Demonstration Study of High Sulfur Coal Combustion in Oxygen-Enriched Flue Gas, M. Rostam-Abadi, S.S. Chen, K.M. Henry, Air Liquide, McDermott Technologies.

Design, Fabrication, and Testing of An Automated Motorless, Rotorless (M-R) Cell for Use with the ISGS Washer, L. Khan, W.R. Roy, C. Manrique, S.M. Khandrika, D.G. Eblin.

Optimum Filtration in the ISGS Press Washer with Dewatering Agents, L. Khan, W.R. Roy, C. Manrique, S.M. Khandrika, D.G. Eblin.

Production and Combustion Testing of Biomass-Coal Fuels, M. Rostam-Abadi, K.M. Henry, Water and Oil Technologies, Inc., Pennsylvania State University.

Studies of Advanced Mercury Sorbents and Technologies, M. Rostam-Abadi, S.S. Chen, M. Rood (UIUC), R. Chang (EPRI), URS Corporation, Apogee Scientific, K.M. Henry.

Studies of Coke Deposition and Prevention for TRAGEN Process, S.S. Chen, M. Rostam-Abadi, R. Ruch (Isotech, Inc.), Y. Lu.

IN THE NEWS: "COAL WASHERS DRAW INTEREST: UI SYSTEM MAKES SCRAP A USEFUL PRODUCT," GREG KLINE, *THE NEWS-GAZETTE*, CHAMPAIGN, APRIL 22, 2003.

Several companies in Europe and a firm in South Africa want to use the new coal-washing technology, now awaiting patent approval, developed by the ISGS in cooperation with the UIUC. The system permits the recovery of waste coal products.

#### ENGINEERING GEOLOGY

CUSEC State Geologists' Mapping Efforts in the Midwest, R.A. Bauer, W.J. Su.

Development of Geologic Database and Two- and Three-dimensional Geologic Model of Waukegan Lake Front, R.A. Bauer, B.L. Herzog, D.R. Larson, G.T. Homrighous, M.J. Chrzastowski.

Engineering Geology Database, W.J. Su, G.T. Homrighous, R.A. Bauer.

#### **ENVIRONMENTAL SITE ASSESSMENTS**

Historical Road Map of Burnham Park, Chicago, Cook County, C.B. Trask, C.A. Briedis, C.K. Nimz, J. Bachrach (Chicago Park District).

LA 450 Class Preparation and Presentation, P.L. Bannon-Niles, C.B. Trask, G.A. Kientop, D.J. Adomaitis, M.A. Yacucci, M.A. Hart, K.W. Carr, J. Johnson (UIUC), S. Gobelman (IDOT).

"Thanks for all your agency's timely help in getting us to all our deadlines over the years . . . .I have always been impressed by the professionalism of your staff [Environmental Site Assessments Section] and the excellent reports that they have consistently provided us over all these years. You are a credit to the State of Illinois and excellence in government work."

> —Larry Hill, Environmental Coordinator IDOT District 2 Dixon, Illinois

Preliminary Environmental Site Assessment Program for the Illinois Department of Transportation, A. Erdmann, D.J. Adomaitis, P.L. Bannon-Niles, C.W. Beccue, E.L. Bray, R.A.

Bryant, N.I. Caldwell, S. Chakravorty, M.R. Collier, E.T. Collins, C.R. Decker, C.L. Dolan, S.R. Ellis, D.A. Garner, J.W. Geiger, M.A. Hart, G.A. Kientop, A. Leininger, E.T. Plankell, D.R. Schmidt, M.P. Spaeth, C.B. Trask, M.A. Yacucci.

More than 100 sites in an 8-mile stretch of the Eisenhower Expressway (I-290) in Cook County were assessed by the ISGS Environmental Site Assessment section on behalf of **IDOT**. Because of the extensive commercial and industrial development along this stretch of interstate, the sites were assessed for the possible presence of volatile organic compounds, semivolatile organic compounds, heavy metals, and polychlorinated biphenyls (PCBs).



I-290 (looking east) during rush hour in the Chicago metropolitan area.

#### GEOCHEMISTRY

Chemical and Mineralogical Characteristics of Illinois Soils, G.B. Dreher, L.R. Follmer, J.D. Steele.

Contaminant Transport through a Field-Scale Earthen Liner, I. Krapac, T. Willingham (UIUC student), T. Frank (UIUC student), T. Stark (UIUC), C. Werth (UIUC).

Co-operative Geochemical Mapping Agreement: ISGS-USGS, J.B. Risatti, R.C. Berg.

Geochemical Reconnaissance of Illinois, J.B. Risatti, R.C. Berg.

Guidance Document for Conducting Site Assessments at Retail Agrichemical Facilities, W.R. Roy, I.G. Krapac.

Investigation of Mercury Deposition in the Past 100 Years in East-Central Illinois, Y. Zhang, L.R. Henderson, J.D. Steele.

Investigation of Metal and Organic Contaminant Distributions and Sedimentation Rates in Backwater Lakes Along the Illinois River, R.A. Cahill, G.L. Salmon, J.D. Steele, L.R. Henderson, J. Slowikowski (ISWS, Co-PI).

Monitoring the Quality of Groundwater Impacted by Swine Production Facilities, I.G. Krapac, S.-F.J. Chou, W.R. Roy, M.Meyer (USGS), R. Mackie (UIUC), J. Chee (Sanford University/UIUC).

Organic Compounds in Sediments from the Grand Calumet River—Lake Michigan to Lake George, G.L. Salmon, R.A. Cahill, M. Unger (Indiana University/Sanitary District of Hammond).

Possible Geological-Geochemical Controls of Ammonium in Groundwater, W.R. Roy, T.H. Larson, I.G. Krapac.

Sediment Quality and Sedimentation Rates in Backwater Lakes along the Illinois River, R.A. Cahill, J.D. Steele, G.L. Salmon, L.R. Henderson.

Unified Geochemistry Database Development—Planning, J.D. Steele, G.L. Salmon, J.B. Risatti, S.L. Denhart, B.J. Stiff, H. Wang, A. Lecouris.

#### GEOSCIENCE INFORMATION

Classroom CD-ROM of GeoActivities Binder, M.-F. Dufour, C. Briedis, J.M. Dexter, C.K. Nimz, R.C. Vaiden, W.F. Frankie.

Geology of the State Parks Series—Illinois Beach State Park Volume, M.F. Dufour, S.E. Greenberg, M.J. Chrzastowski, J.K. Hines, M.M. Killey, R.C. Vaiden, C.C. Abert, J.M. Dexter, C.K. Nimz, J.A. Steinfeldt, D.L. Byers, J.M. Dexter.

Geology of the State Parks Series—Starved Rock/ Matthiessen Volume, M.F. Dufour, S.E. Greenberg, M.J. Chrzastowski, J.K. Hines, M.M. Killey, R.C. Vaiden, C.C. Abert, J.M. Dexter, C.K. Nimz, J.A. Steinfeldt, D.L. Byers, J.M. Dexter.

An ISGS team has begun writing a new series on the geology of Illinois state parks. The first two volumes, on Starved Rock and Illinois Beach State Parks, will be issued as part of the Survey's 2005 centennial celebration. The books will contain four-color photographs, detailed maps, and illustrations to explain the unique geology of the landscapes and protected habitats in the parks. **IDNR** staff at the parks have been especially cooperative in providing information about the parks.

Public Geological Science Field Trips, W.F. Frankie, R.J. Jacobson, M. Knapp, C.K. Nimz, S. Cromwell.

"Tell all the staff to keep up the good work because these [ISGS public field trips] are really enjoyable, well-planned trips. They are models for those of us who try to plan similar events and they're just downright cool, too."

—Kerry Doyle Edwardsville, Illinois



#### GEOSPATIAL ANALYSIS AND MODELING

Computer Applications Programming, LEGAL Replacement or Rewrite, D.O. Nelson, S.L. Denhart, A. Lecouris, B.J. Stiff, R.J. Krumm, S. Wilson (ISWS), J. Foote (ISWS).

Entry for Testing Purposes, Change 6, S. Denhart.

GIS Database Development, D.O. Nelson, C.C. Abert, L. Smith, C.P. Korose, S.R. Gustison, J.E. Domier, A. Lecouris.

ISGS Working Database Development, B.J. Stiff, A. Lecouris.

Migrate Project Plan Database into Oracle, S. Denhart, B.J. Stiff, D.O. Nelson, M.-F. Dufour, E.D. McKay, M.P. Krick.

Oracle Database and Application Design and Development, A. Lecouris, A. Faber, A.E. Metcalf, B.G. Huff, J. Duncan, B.E. Lemke, B.J. Stiff.

"Thank you [to Sheena Beaverson]! I use Yahoo and never came up with Midewin's Web site. I greatly appreciate your help."

Starved Rock State Park.

—Roy R. Haase Jr Manager, Right of Way and Permits Buckeye Pipe Line Company Emmaus, Pennsylvania

Plotter Support Technical Team, R. Krumm, G.A. Gain, S.K. Beaverson, D.O. Nelson, K.L. Benner, D.L. Byers, S.L. Denhart, S.R. Gustison, R.R. Hansen, J.D. McLeod, R.J. White.

Web Site Redesign and Reorganization, S.L. Denhart, J.A. Steinfeldt, C.A. Briedis, C.K. Nimz.

#### GROUNDWATER GEOLOGY

A Critical and Statistical Evaluation of Characterization Methods for Sites Contaminated through Multiple Discrete Spills, D.A. Keefer.

A Statewide Monitoring Network to Evaluate Pesticide Contamination of Groundwater in Illinois—Installation, Sampling, and Data Analysis, E. Mehnert, W.S. Dey, D.A. Keefer, C. Wilson (ISWS), H.A. Wehrmann (ISWS), C. Ray (University of Hawaii).

Development of a Statewide Database of Hydraulic Conductivity Values from Quaternary Units in Illinois—Year 1, Feasibility Assessment, J.C. Sieving. E.C. Smith, D. Sieving.

Dating of Cave Sediments and Speleothems, S.V. Panno, B.B. Curry, H. Wang, K.C. Hackley, C. Lundstrom (UIUC), J. Zhou (UIUC student).

The ISGS, in conjunction with the UIUC Geology Department, is learning about paleoclimate using stalagmites from southwestern Illinois and southeastern Missouri. The stalagmites are up to 130,000 years old (based on uranium-thorium dating) and contain information about the average temperatures and vegetation types (based on stable carbon and oxygen isotopes). Preliminary results suggest that at least one of the stalagmites bridges a large gap in the paleoclimatic record for this region.

Development of Three-dimensional Visualization Application, D.A. Keefer, M. Dillavou (student).

GeoBit: Groundwater, D.R. Larson, E.C. Smith, C.K. Nimz, J.L. Hannah.

GeoScience Education Series: Field Guide to Illinois Caverns, S.V. Panno, S.E. Greenberg, C.P. Weibel, C.K. Nimz, D.L. Byers.

Groundwater Geology of DeKalb County and the Troy Bedrock Valley, E.C. Smith, R. Vaiden, C.K. Nimz, J.L. Hannah.

Groundwater Resources and Peaker Power Plants in Illinois, D.R. Larson, R.J. Finley.

Groundwater Resources, Regional Assessment of the Lower Illinois River Valley, D.R. Larson, M.J. Mushrush.

Improved Techniques for Modeling and Mapping Variable Geologic Deposits, D.A. Keefer.



Growth ring patterns can be clearly seen on this stalagmite from Illinois Caverns in Monroe County. Indicators of the Origin of Sodium and Chloride in Natural Waters. S.V. Panno, J. Angel, K.L. Hackley, S.E. Greenberg, H.-H.E. Hwang, I.G. Krapac.

ISGS GeoActivities Series: PaleoPacket, R.C. Vaiden, C.K. Nimz, M.W. Knapp.

Mapping and Characterization of Sand and Gravel Deposits for a Supplemental Groundwater Supply for the Village of Elburn, Kane County, W.S. Dey, A. Pugin, T.H. Larson, S.L. Sargent, T.C. Young, H.A. Wehrman (ISWS), R. Olsen (ISWS).

Mass Flux of Nutrients (Nitrogen and Phosphorus) in Shallow Groundwater/Year 4, E. Mehnert, B.G. Haest, S.L. Sargent, D.A. Keefer, M.J. Mushrush, T.R. Holm (ISWS), R.A. Sanford (UIUC), T.M. Johnson (UIUC), H.-H. E. Hwang.

NIWC Groundwater Chemistry and Microbiology, S.V. Panno.

Principal Aquifers of Illinois Map (1:500,000 statewide), R.J. Rice, R.D. Brower (Emeritus), M.J. Mushrush, A.B. Lecouris, S.L. Denhart, C.C. Abert.

Regional Groundwater Assessment: Metro East Region, E.C. Smith, R.C. Vaiden, J.A. Devera, A.C. Phillips, J.D. Dexter.

The Effect of Land Use on Shallow Groundwater Flow and Quality, W. Dey, S.L. Sargent, E. Mehnert, B. Horst.

Water Resource Investigation for Kane County, Illinois, W. Dey, D.M. Sieving, B.B. Curry, C.C. Abert, E. Mehnert, D.A. Keefer, M.J. Mushrush, A. Davis, D.R. Kolata, S. Meyer (ISWS), D. Walker (ISWS).

A team of scientists and interns, supported by **Kane County** and **IBHE** funding, have completed 10 miles of seismic reflection profile lines in southern Kane County. The new data refine previous mapping of the St. Charles Bedrock Valley, an important local and regional aquifer that is narrow and difficult to map. The valley was located in one area but appeared to be absent in some other areas where previous mapping had shown it to be present. If confirmed, this finding will change the county's bedrock topography and aquifer availability maps significantly.

## INDUSTRIAL MINERALS AND RESOURCE ECONOMICS

14



Aggregate Resource Mapping in the St. Louis Metro East Region of Illinois, Cahokia and Columbia Quadrangles, Z. Lasemi, R.D. Norby.

A Research Report on the Role of Aggregates in the Illinois Economy, S.B. Bhagwat.

Interns examine core in Kane County during a **Kane County**-funded study of water resources. The core helped scientists refine their interpretations of seismic data. Clay and Shale Resources of Peoria County, Z. Lasemi, R.E. Hughes, C.P. Weibel, H.E. Leetaru.

With the assistance of funding from the **Illinois Clean Coal Institute**, ISGS geologists are looking for potential deposits of clay and shale in the Peoria area, where a manufacturer has proposed building a new plant that will make high-quality fired bricks. In order to operate successfully, though, the plant requires nearby sources of low-sulfur, non-calcareous shale and fireclay. The new plant would use a shale fly ash by-product in the brick formulation, which would reduce the amount of waste that must be disposed of while boosting the local economy.

Compilation of Illinois Gravel Mineralogy, T.J. Kemmis, J. Masters, L.R. Smith.

Development of Improved Mineralogical Methods, R.E. Hughes, B.B. Curry, H.D.



Zakaria Lasemi (left) and Pius Weibel examine an outcrop near Peoria.

Glass, M. Hynes (Illinois Transportation Archaeology Research Program [ITARP], Ancient Technology and Archaeological Materials [ATAM]), Z. Lasemi, D.G. Mikulic, R.D. Norby, B. Seyler, H.Wang, S.U. Wisseman (ATAM), T. Emerson (UIUC, ITARP).

With the cooperation of the ISGS, which gathers information on all non-fuel minerals, the **USGS** has released results of the 2001 mineral industry surveys for Illinois. Because of the great impact these minerals have on infrastructure, every dollar's worth of mineral consumed contributes \$550 directly and indirectly to Illinois' Gross State Product. The value of non-fuel minerals in Illinois has been estimated to be \$911 million, 17<sup>th</sup> among the states, with crushed stone accounting for 46% of the total value; portland cement, about 25%; and sand and gravel, 14%. Illinois ranked first among the states in production of industrial sand and tripoli, fourth in fuller's earth (absorbent clay), eighth in lime, and 10<sup>th</sup> in portland cement.

Economics of Sustainable Mining, S.B. Bhagwat.



Birk-McCrite tripoli quarry in Alexander County.

Economics of Underground Mining of Limestone, S.B. Bhagwat, Z. Lasemi, M. Dunn (CONCO Western Mining Co.).

#### Environmental Management Education in India, S.B. Bhagwat.

Fox River Valley Reconnaissance, T.J. Kemmis, L.R. Smith.

ISGS geologists are conducting a detailed examination of sand-and-gravel sequences at locations along the Fox River valley. The scientists are documenting the valley's glacial past, previous river conditions, and major flood events, information that can be used as a basis to predict the nature and extent of the area's sand and gravel deposits. These resources are vital for Chicago area groundwater and construction supplies.

Green River Lowland Reconnaissance, T.J. Kemmis, A. Bettis (University of Iowa), R. Anderson (Augustana College), L.R. Smith.

Illinois River Valley Reconnaissance, T.J. Kemmis, E. Hajic, L.R. Smith.

Mapping in Southeastern Wisconsin, D. Mikulic.

Mississippian Reefs and Bioherms in the Illinois Basin and Adjacent Regions: Paleogeographic and Economic Implications, Z. Lasemi, R.D. Norby.

Regional Cross Section of the Mississippian Units in the Aggregate Resource Rich Area of Southwestern Illinois, Z. Lasemi, R.D. Norby.

Silurian Geology of West-Central Illinois, D. Mikulic, R.D. Norby, J. Kluessendorf (University of Wisconsin-Madison), T. Butcher (University of Portsmouth).

**16** Subsurface Silurian Lithostratigraphy of Northeastern Illinois, D. Mikulic.

#### ISOTOPE GEOCHEMISTRY

ty your talented staff, especially to Mr. [Zakaria] Lasemi . . . in putting together this meaningful showing of Illinois' natural wealth." —Florence M. Sallwasser Niles, Illinois

"I wish to convey my appreciation

and gratitude for professional

services [assistance with a rock and mineral display] rendered by

Calcification of Plant-Respired CO<sub>2</sub> and Its Significance in Climate Change Study in Illinois, H. Wang.

Chanute Air Force Base Reconnaissance Study for Conceptual Hydrologic Model, K.C. Hackley, S.E. Greenberg, H.-H.E. Hwang.

Determination of the Dominant Sources of Nitrate in Wells and Springs of the Sinkhole Plain Using Nitrogen and Oxygen Isotopes, KC. Hackley, S.V. Panno, H.-H.E. Hwang,

Determination of Whether Leachate from a Municipal Landfill has Impacted Shallow Groundwater Monitoring Wells, K.C. Hackley, S.V. Panno, S.E. Greenberg, H.-H.E. Hwang.



Aerial photograph showing sand and gravel pit, Fox River valley.

Effect of Urban Growth on Groundwater Quality in McHenry County Based on Chemical and Isotopic Assessment, H.-H. E. Hwang, K.C. Hackley, S.V. Panno, D. Walgren, J.D. Steele.

ISGS staff are analyzing the chemical composition of groundwater and the stable isotope composition of nitrate in groundwater to determine its relationships to land use. In the study's first phase, data from

two large databases (more than 38,000 records) from the Illinois State Water Survey and McHenry County Health Department were coupled with land use information using Arc GIS software and plotted on maps. Areas showing high nitrate concentrations are being sampled and subjected to chemical and isotopic analyses.

Isotope Evidence of Long-Term El Niño/Southern Oscillation Cycles in Illinois During the Last Glaciation, H. Wang, S.E. Greenberg.

Investigation of the Age of Recharge of Groundwater to Mahomet Valley Aquifer Using Geochemical Techniques, K.C. Hackley, S.V. Panno, P.K. Carrillo.

Loess Stratigraphy and Uranium Series Dating in Southern Illinois, H. Wang, L.R. Follmer.

Mass Flux of Nutrients (Nitrogen and Phosphorus) in Shallow Groundwater—Assessment of Denitrification

in Shallow Groundwater by Isotopic Methods, H.-H.E. Hwang, T. Johnson (UIUC), W. Beaumont (UIUC).

Radiocarbon Dating at the ISGS: Review of the Past Thirty Years, J. Liu (Emeritus).

The Application of Nitrogen and Oxygen Isotopes of Nitrate to Identify the Sources and the Degree of Denitrification of Nitrate Levels in Illinois Groundwater, K. C. Hackley, H.-H.E. Hwang, P.K. Carrillo, G. Roadcap (ISWS; principal investigator), T. Johnson (UIUC).

#### LIBRARY AND PUBLIC

#### INFORMATION

Collection of Priority Well Logs (Beating the Bushes for Logs), A. Faber, B.E. Lemke, A.E. Metcalf, K. Burris.

Institutional Digital Publications Filing Cabinet, M. Krick, C.K. Nimz, D.L. Byers, C.A. Briedis, P.K. Carrillo, J.L. Hannah, M.W. Knapp.

National Geological Map Database Data Entry, M. Krick.

Online Publication Catalog, M. Krick, C.K. Nimz, D.L. Byers,

"This communication with you is to express my gratitude for the fine service and professionalism with which each of them [Mary Krick and Rod Norby] addressed my queries. They were courteous, knowledgeable, efficient, prompt, and very, very helpful every step of the way. They are to be commended for the manner in which they interact with the public."

—Miriam A. Romero Las Vegas, NV

Drew Walgren (left) and H.-H. Ellen Hwang sampling McHenry County groundwater to determine its composition.



-

#### OIL AND GAS

The oil and gas industry should receive a boost from a **U.S. DOE**-funded PUMP II project in progress at the ISGS. The Survey will provide data management, mapping technology and methodology, and Internet programming to enable petroleum producers to more quickly and easily identify areas of the state with high potential for increased oil production. The information should prove useful in identifying underdeveloped areas in and around existing oil fields.

Annual Report of Oil Field Statistics, B.G. Huff, R.D. Lipking.

Characterization and Regional Analysis of Cypress and Pennsylvanian Sandstone Reservoirs, B. Seyler, J.P. Grube, B.G. Huff, R.E. Hughes, D.L. Byers, J.A. Steinfeldt.

Development of Color-Coded Pay Zone Maps, S.R. Gustison, J.E. Crockett, P.M. Johanek.

Geographic Information System Approach for Play Portfolios, Illinois Basin, B. Seyler, B.G. Huff, J.P. Grube, D. Coleman, M.L. Borino, S.R. Gustison, S.K. Beaverson, R.J. Krumm, A.E. Metcalf, A.C. Faber, A.B. Lecouris, C.P. Korose, W.J. Nelson, D.G. Morse, R.D. Lipking.

Mid-continent Interactive Digital Carbon Atlas and Relational Database (MIDCARB); Illinois portion, B. Seyler, D. Nelson, A.B. Lecouris, R.J. Jacobson, S.L. Denhart, C.P. Korose, B.G. Huff, I. Demir, J.P. Grube, R.D. Lipking, P.M. Johanek.

Monthly Drilling Report/GIS Approach, B. Huff, S.R. Gustison.

Mt. Simon Gas Storage Characterization - Department of Energy, D.G. Morse, H.E. Leetaru.

In a **U.S. DOE**-funded study of the Mount Simon Sandstone in northern Illinois, ISGS geologists clarified the regional geology at Manlove Field, Champaign County, and Herscher Field, Kankakee County. Using state-of-the-art software, well logs, and core samples, the geologists created three-dimensional models

of reservoir porosity in these fields. This information will be useful to utilities in northern Illinois who use the permeable and porous Mount Simon for gas storage.

Oil and Gas Development Maps, S.R. Gustison.

Oil and Gas Drilling Report in GIS Format, B.G. Huff.

Petroleum Technology Transfer Council (PTTC) - U.S. Department of Energy, D.G. Morse, S.R. Gustison, B.G. Huff, J.E. Crockett, B. Seyler, P.M. Johanek, H.E. Leetaru, J.P. Grube.

Preliminary Screening of the Geologic Potential for CO<sub>2</sub> Sequestration in Illinois, R.J. Finley, S.R. Gustison, J. Lim, Y.S. Chang.



3-D porosity model of the Manlove Gas Storage Field.

#### PUBLISHING, DESIGN, AND PHOTOGRAPHY

Annual Report, C.K. Nimz, J.A. Steinfeldt, J.M. Dexter, P.K. Carrillo, K.A. Mercer, J.H. Goodwin.

Central Great Lakes Mapping Coalition CD Sampler and Information Kit, C.A. Briedis, C.K. Nimz, J.M.Dexter.

Digital Slide Archive and Database, J.K. Hines.

Geoscience Education Series 16: Rocks and Minerals of Illinois Revision, W.F. Frankie, C.K. Nimz, P.K. Carrillo, J.M. Dexter, J.A. Steinfeldt.

Rock hounds are sure to enjoy the updated guide to Illinois rocks and minerals to be released late in 2003. This popular publication has been expanded to include more information about the geological forces creating these underground treasures that are so useful in every aspect of our daily lives. Full-color photographs of specimens, brief descriptions, advice for collecting and identifying samples, and identification keys are just some of the features of this guide.

ISGS Year End Multimedia Presentation, J.M. Dexter.

Mapping Video, J.M. Dexter.

PowerPoint Presentation Modules, J.K. Hines.

2004, 2005 Calendars, J.M. Dexter, C.A. Briedis.

#### QUATERNARY GEOLOGY

A Pilot Study for Methods and Standards Development for Three-dimensional Mapping of the Antioch Quadrangle, Lake County, Illinois, M.L. Barnhardt, R.C. Berg, A.K. Hansel, A.J. Stumpf, A. Dixon-Warren, C.J. Stohr, D.E. Luman, B.J. Stiff, V.J. Amacher, D.R. Larson, M.E. Barrett, J.E. Domier, R.A. Bauer, W.-J. Su.

ISGS mappers have completed all of their field work and 3-D modeling for the Antioch 7.5-minute Quadrangle. This project is the pilot study for the **Central Great Lakes Geologic Mapping Coalition**. The mission of the Coalition is to facilitate the geologic mapping of the Great Lakes region to provide it with detailed information that can be used to guide urban planning and land

3-D Model with a surface drape showing Antioch Quadrangle location and major water bodies.



Flurite.



elevatio in feet

800

700

600

use decisions. During the pilot project, Coalition members worked together to develop and implement standard protocols for (1) database development and information transfer to the public; (2) field work, including drilling, sample description, and data entry; (3) techniques for verifying data point locations and sources; (4) integration of information from geophysical and mapping techniques; and (5) 3-D mapping of the Quaternary deposits from land surface to bedrock. The geologists are reporting on the various protocols, recommendations, database development, and core description methods.

ArcIMS Internet Web Site to Serve Historical Aerial Photographs, D.E. Luman, D.M. Lund, S.K. Beaverson, R.J. White.

Scanned images of about 4,800 historical aerial photographs taken between 1936 and 1941 are now available for viewing on the Natural Resources Geospatial Data Clearinghouse portion of the ISGS Web site (http://www.isgs.uiuc.edu). Scanned through IDOT- and IDNRsupported projects, the images were made available to the public through the partial support of the **U.S. Army** Corps of Engineers. The images cover 14 counties: Champaign, Cook, DuPage, Kane, Kendall, Knox, Lake, Marshall, McHenry, Peoria, Putnam, Vermilion, Will, and Woodford. Users can select, download, and print copies of the images, creating stereo pairs of photographs to use in analyzing the Illinois surface of 70 years ago. By

20



comparing these photos to modern ones, geographers, soil scientists, geologists, and others can study changes in land use over time. This project also permanently protects and preserves these important historical images for which negatives no longer exist.

Historical aerial photograph of a portion of UIUC campus, including ISGS (arrow), taken June 19, 1940.

Assessment of ASTER-based DEM and Shuttle SRTM Data as Input to a Large-scale Geologic Mapping Program Situated in Midwestern Continental Glacial Terrain, D.E. Luman.

Bedrock Topography of the Crystal Lake 7.5-minute Quadrangle, B.B. Curry.

Clay Mineral Database, M.M. Killey, H.D. Glass, D. Sieving.

Delineation of Hydric Soils by Magnetic Susceptibility, D. Grimley, N. Arruda (NRES student).

Development of a Long-Term Resource Monitoring Plan for the Illinois River Basin, A.C. Phillips, M.V. Miller, G.E. Pociask, L.R. Smith, P. Brown (INHS).

Dunlap Mapping, C.P. Weibel, A.J. Stumpf, A. Pugin, T.H. Larson.

Geoscience Education Series: Groundwater: A Vital Illinois Resource, M.M. Killey, D.R. Larson,

J.A. Steinfeldt, M.W. Knapp, C.K. Nimz, J.M. Dexter.

Designed to inform Illinois citizens, teachers, planners, and government officials about the state's groundwater resources, this publication uses easy-to-read text, many photographs, and clear, concise drawings to explain the importance of using today's groundwater resources wisely to ensure future generations have them to enjoy as well. The book explains aquitards, aquifers, groundwater movement and supply, wells, and water quality while it dispels common misconceptions about groundwater.

Geoscience Education Series: Land Use, M.M. Killey, R.C. Berg, M.W. Knapp, J.A. Steinfeldt, C.K. Nimz, J.M. Dexter.

Illinois Interagency Landscape Classification (IILCP), D.E. Luman, D.M. Lund.

Incorporating Electronic Logs of Wells and Borings Obtained by the Quaternary Section into the ISGS Database, C.J. Stohr.

INQUA 2003 Field Trip, A.K. Hansel, A.J. Stumpf, M.E. Barrett, E.D. McKay, Minnesota Geological Survey, Iowa Geological Survey, University of Wisconsin-Madison, Northeastern University-Boston, Geological Society of America, International Union for Quaternary Research Association.

A boy plays in the spray of water generated by special playground equipment at Hessel Park in Champaign. Groundwater supplies many aquatic recreational facilities in Illinois.

Klumpen: Meso-scale Features of Soils, L.R. Follmer, J.M. Dexter.

Mapping Geochemical Trends of Surficial Materials in Illinois, A. Dixon-Warren.

Metro East STATEMAP, J.A. Devera, F.B. Denny, D.A. Grimley, A.C. Phillips, J.R. Aud, J.A. Duncan.

Oak Hill Mapping, C.P. Weibel.

Pre-Illinoian Sediments in Illinois, M.M. Killey, M.E. Barrett, A. Dixon-Warren.

Reconstruction of Past Climate, Vegetation, and Lake Conditions at the Brewster Creek Site, DuPage County, Illinois, B.B. Curry.

Sedimentology, Provenance, and Paleoecology of the Wisconsin Episode Slackwater Lake Sediment in the St. Louis Area, B.B. Curry, A.C. Phillips, D.A. Grimley.

Spring Bay Mapping, C.P. Weibel, A.J. Stumpf, M.E. Barrett.



Tim Kemmis (left) and Andrew Stumpf installing flags marking planned drilling locations during Spring Bay mapping



STATEMAP Geologic Mapping in Illinois: Surficial Geology of the Grayslake Quadrangle, A.J. Stumpf, M.L. Barnhardt, B.J. Stiff, A.K. Hansel, M.E. Barrett, J.R. Aud, J.L. Hutmacher, C.J. Stohr, S.A. Wildman, D.E. Luman, T.J. Kemmis, A. Pugin, J.A. Duncan.

Stream Channel Dynamics Assessment, A.C. Phillips, B. Rhoads (UIUC).

Summary of Illinois River Basin Landforms and Topographic Regions, A.C. Phillips, L.R. Smith, P. Anderson (ISU).

Surficial and Engineering Geology of the Collinsville 7.5-minute Quadrangle, A.C. Phillips, M.E. Barrett, P.K. Carrillo.

Surficial Geology and Bedrock Topography of the Elgin 7.5-minute Quadrangle, B.B. Curry, J.A. Duncan.

Surficial Geology and Bedrock Topography of the Hampshire 7.5-minute Quadrangle, B.B. Curry.

Surficial Geology of the Ames 7.5-minute Quadrangle, G. Schofner, J.A. Devera.

Surficial Geology of the Crystal Lake 7.5-minute Quadrangle, B.B. Curry.

McHenry County is seeking additional municipal water supplies and asked the ISGS for assistance. McHenry County Board of Health officials, a consulting engineer, and a representative from the McHenry County Defenders office reviewed preliminary ISGS geologic map products for the Crystal Lake Quadrangle and discussed mapping progress in the county. The county especially needs information about the sand and gravel deposits that may be water-containing aquifers. After reviewing the ISGS products, the officials praised their variety and content and made useful suggestions about how to advertise the availability of the maps to potential users. The officials indicated they would like access to the original data and electronic map products to use on a computer during field work.

Surficial Geology of the French Village 7.5-minute Quadrangle, D.A. Grimley, M.E. Barrett, P.K. Carrillo.

Surficial Geology of the Granite City 7.5-minute Quadrangle, A.C. Phillips, C.J. Stohr, M.E. Barrett.



Surficial Geology of the Kellerville and Fishhook 7.5-minute Quadrangles, M.L. Barnhardt, M.M. Killey, D.E. Luman, T.J. Kemmis, J.D. McLeod.

Surficial Geology Map of the Crystal Lake 7.5-minute Quadrangle Map

Surficial Geology of the Maple Park 7.5-minute Quadrangle, D.A. Grimley, M.E. Barrett, P.K. Carrillo.

Surficial Geology of the Pingree Grove 7.5-minute Quadrangle, D.A. Grimley, M.E. Barrett, P.K. Carrillo.

Surficial Geology of the Waterloo 7.5-minute Quadrangle, A.C. Phillips, M.E. Barrett.

Three-dimensional Geologic Mapping of the Fox Lake Quadrangle, M.L. Barnhardt, R.C. Berg, A.K. Hansel, A.J. Stumpf, A. Dixon-Warren, C.J. Stohr, D.E. Luman, B.J. Stiff, V.J. Amacher, D.R. Larson, M.E. Barrett, T.J. Kemmis.

Vincennes Mapping Project, M.L. Barnhardt, D.E. Luman, C.P. Weibel, J.D. McLeod, R.A. Bauer, W.-J. Su.

Williamson County Quaternary Mapping, L. Follmer, W.J. Nelson, S. Indorante (USDA-NRCS), M. McCauley (USDA-NRCS), M. Barrett.

#### SEDIMENTARY AND CRUSTAL PROCESSES

Two boreholes were drilled in far-southern Illinois by the ISGS drilling team as part of the **National Earthquake Hazards Reduction Program.** Sites were selected based on seismic reflection profiles. The deeper of the two holes passed through several faults and showed evidence of soil liquefaction, perhaps caused by earthquakes. The shallower hole did not provide clear evidence of that deformation. Core samples and downhole geophysical logging will provide information for earthquake hazard analyses for the New Madrid Seismic Zone.

Curation and Management of the ISGS Paleontological Collections, R.D. Norby, D.G. Mikulic, R. Hansen.

Geologic Map of the Bethalto 7.5-minute Quadrangle, J.A. Devera, D.A. Grimley.

Geologic Map of the Cache and Cairo 7.5-minute Quadrangles, W.J. Nelson, J.R. Aud.

Geologic Map of the Cypress 7.5-minute Quadrangle, W.J. Nelson, J.A. Devera.

Geology of the Elsah, Grafton, and Alton 7.5-minute Quadrangles, F.B. Denny, J.A. Devera, D.A. Grimley, Z. Lasemi, R.D. Norby, E.C. Smith, J.M. Dexter.

Geologic Map of the Vienna Quadrangle, W.J. Nelson, J.R. Aud, J.D. McLeod, J.A. Devera.

Geologic Map (Surficial and Bedrock) of the Edwardsville 7.5-minute Quadrangle, J.A. Devera, F.B. Denny, A.C. Phillips, J.R. Aud.

Geologic Map (Surficial and Bedrock) of the Granite City 7.5-minute Quadrangle, J.A. Devera, F.B. Denny.

Geologic Map (Surficial and Bedrock) of the Oakville 7.5-minute Quadrangle, J.A. Devera, F.B. Denny.

Geologic Map (Surficial and Bedrock) of the Prairietown 7.5-minute Quadrangle, J.A. Devera, A.C. Phillips, D.A. Grimley, J.R. Aud.

Geologic Mapping (Bedrock and Surficial) of Williamson County, W.J. Nelson, J.R. Aud, S.A. Wildman.

Geology of Illinois, ISGS Centennial Volume, D.R. Kolata, M. Leighton, J. McBride, D.G. Mikulic, J.A. Devera, Z. Lasemi, R.D. Norby, W.J. Nelson, R.J. Jacobson, A.K. Hansel, B. Seyler, B.G. Huff, D.G. Morse, J.P. Grube, B.L. Herzog, T.H. Larson, S.V. Panno, R.C. Berg, M.J. Chrzastowski, R.A. Bauer, R.A. Cahill, C.P. Weibel, M.A. Barnhardt, M.V. Miller, J.J. Miner, E.D. McKay, D.R. Larson, G.B. Dreher, T.J. Kemmis, R.E. Hughes, W.-J. Su, W.R. Roy, K.C. Hackley, B.B. Curry, H.Wang.

Illinois Fossil Poster, D.R. Kolata, R.D. Norby, J.L. Hannah, C.K. Nimz.

Regional Study of Benoist Sandstone, H.E. Leetaru.

Silurian Biostratigraphy of Northeastern Illinois and Southeastern Wisconsin, R.D. Norby, D.G. Mikulic.

State of Illinois Bedrock Geology Map Revision, D.K. Kolata, C.C. Abert, D.L. Byers.

Stratigraphic Framework of the Paleozoic Succession in Lake and Cook Counties, Northeastern Illinois, D.R. Kolata, H.E. Leetaru, M.L. Sargent (Emeritus).

## WETLANDS GEOLOGY

Providing Hydrogeologic Assistance to IDOT Regarding Wetlands and Other Issues, M.V. Miller, J.J. Miner, C.S.

Fucciolo, S.E. Benton, K.W. Carr, B.A. Watson, K.D. Weaver, B.J. Robinson, G.E. Pociask, P.J. Sabatini, K.Hart, R.A. Cahill, D.R. Larson.



associate geologist; Dennis Kolata, geologist; and Daniel Byers, graphic designer, with draft of the statewide Illinois bedrock geology map.

Providing Hydrogeologic Assistance to the Illinois Nature Preserves Commission and IDNR, J.J. Miner, R. Locke, K.D. Weaver, G.E. Pociask.

ISGS geologists, Illinois State Water Survey scientists, and IDNR officials participated in a meeting hosted by the Village of Bartlett this past spring. The group met with representatives of the Illinois Nature Preserves Commission, Bluff City Materials, Vulcan Materials, Office of Mines and Minerals, Patrick Engineering, and others to discuss actions that are expected to protect the Bluff Springs Fen. Scientific studies are ongoing.

24



Bluff Springs Fen.

# PUBLICATIONS

(Released to the public from July 1, 2002, to June 30, 2003)

## **ISGS SERIES**

#### **ANNUAL REPORT**

Illinois Geology: Science for Society Illinois State Geological Survey Annual Report. 2002. 136 p.

#### BULLETIN

Bulletin 107 Sequence Stratigraphy of the Lower Chesterian (Mississippian) Strata of the Illinois Basin. W.J. Nelson, L.B. Smith, and J.D. Treworgy with contributions by L.C. Furer and B.D. Keith. 2002. 70 p. plus 7 cross section plates on CD-ROM.

This detailed report and expansive cross sections together provide a regional description of the intricate layers of rock that constitute the lower Chesterian strata in the Illinois Basin. Because these rocks account for three-fourths of the cumulative oil and gas production in the Basin, an understanding of the complex stratigraphy of these 11 sequences and 49 parasequences will assist in the search for oil and gas in Illinois, Indiana, and Kentucky.



#### CIRCULAR

Circular 561 Mineralogy and Diagenesis of the Pennsylvanian Browning Sandstone on the

BULLETIN 107 Generalized cross section of lower Chesterian rocks from the Ozark Dome to the Cincinnati Arch.

Western Shelf of the Illinois Basin. D.M. Moore. 2003. 13 p.

#### ENVIRONENTAL GEOLOGY

Environmental Geolology 154 Regional Distribution of Some Elements in Illinois Soils. Y. Zhang and J.K. Frost. 2002. 41 p.

**Environmental Geology 155** Groundwater Geology of De Witt, Piatt, and Northern Macon Counties, Illinois. D.R. Larson, B.L. Herzog, and T.H. Larson. 2003. 35 p.

A cooperative project between the Mahomet Valley Water Authority (MVWA) and the ISGS helped

answer concerns of individuals and communities in Piatt and De Witt Counties about the ability of the Mahomet aquifer to meet current and future water demands from municipalities, industry, large new livestock management facilities, and irrigation. The vast Mahomet aquifer, which extends across the mid portion of the state, provides water supplies to many central Illinois communities. Information gained through ISGS mapping of the hydrogeological setting of the aquifer helps the MVWA plan water use appropriately, such as encouraging drilled wells, which are



less susceptible to contamination and provide a more reliable water supply than bored wells do.

ENVIRONMENTAL GEOLOGY 155 Drilling a large-diameter well.

**Environmental Geology 156** Water Quality and Agrichemical Loading in Two Groundwater Basins of Illinois' Sinkhole Plain. S.V. Panno, W.R. Kelly, C.P. Weibel, I.G. Krapac, and S.L. Sargent. 2003. 36 p.

#### FIELD TRIP GUIDEBOOKS

**FT 2002-B** Guide to the Geology of the Apple River Canyon State Park and Surrounding Area of Northeastern Jo Daviess County, Illinois. W.T. Frankie and R.S. Nelson. 2002. 88 p.

Nearly 600 people participated in the ISGS geological field trip experiences during the 2002–2003 season. The ISGS geologists helped increase public awareness of the state's geological and environmental issues in very different settings of the Apple River Canyon State Park area in northwestern Illinois and the Midewin National Tallgrass Prairie and Mazonia/Braidwood State and Fish Wildlife Areas near Joliet.

**FT 2003-A** Guide to the Geology of the Joliet Area Including the Midewin National Tallgrass Prairie and the



Des Plaines and Mazonia/Braidwood State Fish and Wildlife Areas, Will and Portions of Grundy and Kankakee Counties, Illinois. W.T. Frankie and R.S. Nelson. 2003. 100 p.

**FT 2002-B** Fossil hunting in Youngbluth quarry, Jo Daviess County.

#### **GEOSCIENCE EDUCATION SERIES**

Geoscience Education Series 15 Guide for Beginning Fossil Hunters. C. Collinson. 2002. 48 p.

#### ILLINOIS GEOLOGIC QUADRANGLE MAPS

**IGQ Metropolis-SG** Surficial Geology, Metropolis Quadrangle, Massac County, Illinois. W.J. Nelson, J.M. Masters, and L.R. Follmer. 2002. Scale, 1:24,000. Size, 2 sheets,  $43 \times 31$  inches.

IGQ Sugar Grove-BT Topographic Map of the Bedrock Surface, Sugar Grove 7.5-minute

Quadrangle, Kane County, Illinois. B.B. Curry. 2003. Scale, 1:24,000. Size, sheet  $44 \times 32$  inches. High-quality, verified water-well data, test borings, and seismic refraction data were used by ISGS mappers to produce a three-dimensional view of the bedrock surface topography of the Sugar Grove Quadrangle in Kane County. Officials in that county want to know whether the area's bedrock aquifers contain groundwater to supplement yields from surface water and shallow drift aquifers, an information need intensified by the county's rapidly growing population. ISGS mapping showed that formations in some areas are not consistent or uniform in their transitions, which points out the need for additional, more detailed geological investigations to refine

geological interpretations.



# ILLINOIS MAP SERIES

**Illinois Map 11** Illinois Surface Topography. D.E. Luman, L.R. Smith, and C.C. Goldsmith. 2003. Scale, 1:500,000.

The new 1:500,000 Illinois Surface Topography map shows the state's land surface at an unprecedented level of detail, revealing regional structures and landforms that were too subtle to be recognized in the past on individual topographic maps. Digital elevation data were used to create a three-dimensional visualization of the terrain of the entire state, and the vertical scale was exaggerated twenty times to highlight the low relief of Illinois' relatively flat landscape. The lighting, shading, and color tinting techniques used in the map's production allow the reader to spot easily landscape features such as floodplains, hills, river valleys, and glacial moraines. For instance, the large sand dunes of Mason County and the prominent end moraines in Bureau, Lee, and McLean Counties can be easily seen. Scientists viewing the map for the first time quickly noticed several landforms they hadn't seen before, including the unusual ridged topography along Interstate 39 in eastern Winnebago County.

**IGQ SUGAR GROVE-BT** Three-dimensional view of bedrock valleys, Sugar Grove Quadrangle.

The full-color,  $54 \times 36$ -inch map should be interesting to a wide range of Illinois residents and especially useful to educators, planners, scientists, business, farmers, and government bodies. These groups need information about the geological record visually written on the Illinois landscape and an understanding of how that history applies to societal issues, such as water and resource location, land use, and hazards assessments.



#### ILLINOIS MINERALS

**Illinois Minerals 123** Effects of Coal-bound Chlorine on Furnace-wall Corrosion under Low No<sub>v</sub> Conditions. M.-I.M. Chou, W.R. Roy, E.S. Robitz Jr., S.C. Kung, and K.K. Ho. 2002. 10 p.

**Illinois Minerals 124** Availability of the Danville, Jamestown, Dekoven, Davis, and Seelyville Coals for Mining in Selected Areas of Illinois. C.P. Korose, C.G. Treworgy, R.J. Jacobson, and S.D. Elrick. 2002. 44 p.

**Illinois Minerals 125** Advanced Characterization of Forms of Chlorine, Organic Sulfur, and Selected Trace Elements in Available Coals from Operating Illinois Mines. M.-I.M. Chou, I. Demir, S.B. Bhagwat, F.E. Huggins, G.P. Huffman, and K.K. Ho. 2003. 12 p.

**Illinois Minerals 126** Water Resources in Illinois: Demand, Prices, and Scarcity Rents. V.C. Ipe and S.B. Bhagwat. 2003. 11 p.

Using a study of Chicago area water as an example, ISGS economists indicate that water in Illinois generally is available and inexpensive, but that the trend toward increased consumption and underpricing may lead to shortages in upcoming decades. The study provides a sound understanding of how to determine the true cost of water—including the cost of its location, purification,



and delivery. Charging consumers accordingly may help cities plan for future needs, encourage water conservation, and minimize or delay water shortages.

ILLINOIS MINERALS 126 Chicago skyline.

**Illinois Minerals 127** Availability of the Colchester Coal for Mining in Northern and Western Illinois. C.P. Korose, S.D. Elrick, and R.J. Jacobson. 2003. 21 p.

ISGS Coal Section geologists have released the final volume of their USGS-sponsored series reporting on the statewide availability of Illinois coal seams. The Colchester Coal is significant as a widespread "marker" bed, one that helps geologists identify the rocks above and below it, but generally is too thin for underground commercial mining. Whether the Colchester will be surface-mined eventually



depends on several factors, including demand, costs of mining and transportation to market, and competition from competing fuels.

ILLINOIS MINERALS 127 Bucket wheel excavator removing overburden from the Colchester Coal, Freeman United Coal Co. Industry Mine, McDonough County, Illinois, 1989.

#### ILLINOIS PETROLEUM

**Illinois Petroleum 158.** The Origin of Prolific Reservoirs in the Geneva Dolomite (Middle Devonian), West-Central Illinois Basin. B. Seyler, J.P. Grube, and Z. Lasemi. 36 p.

ISGS researchers have provided new information about the geologic factors relating to the Geneva Dolomite in Marion County, Illinois. Their findings are applicable to the Geneva as it occurs elsewhere in Illinois and Indiana. Understanding the structural characteristics of the Geneva, noted for its prolific oil reservoirs, is essential for those wanting to use new technologies to re-examine old fields or to discover and develop economically significant quantities of oil in the mature Illinois Basin.



#### Illinois Petroleum 159. Benoist

Sandstone Reservoirs in South-Central Illinois. H.E. Leetaru and K. Mize. 2003. 24 p.

Using the Boyd and Dix South Field in Jefferson County as examples, this publication explains some of the challenges of recovering additional oil from the low-relief Benoist sandstone reservoirs in the Illinois Basin. Because the Basin has been heavily explored already, knowledge about the remaining oil-bearing structures and strategies for economically recovering oil from them is needed in order

#### ILLINOIS PETROLEUM 158

Hydrocarbon entrapment in the Geneva Dolomite.

to recover additional resources. The report focuses on oil production and its relationship with facies architecture, reservoir characteristics, and previous reservoir management techniques.



## Open File Series

**OFS 2002-3** Annual Report for Active IDOT Wetland Compensation and Hydrologic Monitoring Sites, September 1, 2001, to September 1, 2002. C.S. Fucciolo, S.E. Benton, K.W. Carr, D.B. Ketterling, M. Lake, M.V. Miller, J.J. Miner, G.E. Pociask, B.J. Robinson, P. Sabatini, B.A. Watson, and K.J. Werner. 2002. 341 p. (CD-ROM)

**OFS 2002-4** The Geochemistry of Groundwater from the Shallow Bedrock in Central Vermilion County, Illinois. E. Mehnert and G.B. Dreher. 2002. 45 p. (CD-ROM)

# Illinois Petroleum 159

Cross section showing the thickening and thinning of the Benoist sandstone reservoir at Dix South Field. Scouring into the underlying shale can be seen. SP indicates spontaneous potential. **OFS 2002-5** A Hydrogeologic Procedure for Evaluating Wetland Restoration and Creation Sites. J.J. Miner, M.V. Miller, and C.S. Fucciolo. 2003. 21 p.

**OFS 2003-1** A Progress Report on the Chemical Composition of Soils in Illinois: Cores 11 through 26. G.B. Dreher, L.R. Follmer, and Y. Zhang. 2003. 128 p. (CD-ROM)

**OFS 2003-2** Evaluation of 1988–2002 Lake Bottom Changes in the Vicinity of North Point Marina. M.J. Chrzastowski. 2003. 51 p. (CD-ROM)

**OFS 2003-3** A Progress Report on the Description of the Geology and Chemical Composition of Soils in Illinois: Cores 27 through 51. G.B. Dreher, L.R. Follmer, and Y. Zhang. 2003. 128 p. (CD-ROM)

**OFS 2003-4** Fairmont City Potential Wetland Compensation Site: Hydrogeologic Characterization Report, Collinsville Road: Fairmont City, St. Clair County, Illinois (Federal Aid Project 1999). S.E. Benton and B.A. Watson. 2003. 43 p. (CD-ROM)

**OFS 2003-5** Reservoir Characterization and 3-D Models of Mt.

Simon Gas Storage Fields in the Illinois Basin: Annual Technical Progress Report [October 1, 2001–September 30, 2002]. D.G. Morse. 2003. 37 p. (CD-ROM)

**OFS 2003-8** A Park in the Making: The History of Illinois Beach State Park. P.L. Bannon-Niles. 2003. 36 p.

**OFS 2003-9** Final Hydrogeologic Characterization Report, Stallings Wetland Compensation Site (Former Leuhmann Property), Madison County, IL (FAP 14). B.J. Robinson, D.B. Ketterling, and C.S. Fucciolo. 2003. 75 p.

OFS 2003-10 Illinois Mineral Industry, 1996–1998. V.C. Ipe and S.B. Bhagwat. 2003.

**OFS 2003-11** Grand Detour Potential Wetland Compensation Site: Hydrogeologic Characterization Report: Grand Detour, Ogle County, Illinois, Section 13, T22N, R9E (Federal Aid Project 742). S.E. Benton. 2003. 25 p. (CD-ROM)

#### REPRINTS

**Reprint 2002-A** Water Level Fluctuations in an Urban Pond: Climatic or Anthropogenic Impact? S.E. Benton. (Reprinted from the Journal of the American Water Resources Association, v. 38, no. 1, p. 43–54.)

**Reprint 2002-B** The Earthquake of 2 September 1999 in Northern Illinois: Intensities and Possible Neotectonism. T.H. Larson. (Reprinted from Seismological Research Letters, v. 73, no. 5, p. 732–738.)



# OFS 2003-1, OFS 2003-3

The statewide soil sampling project is nearing completion, with only 11 sites still to be sampled in northeastern Illinois in Lake, McHenry, and Will Counties. ISGS scientists, including Gary Dreyer (above), have already collected cores from 126 sites in Illinois that provide a reference set documenting the composition and environmental health of soils around the state. **Reprint 2003-A** Hydrostratigraphic Modeling of a Complex, Glacial-Drift Aquifer System for Importation into MODFLOW. B.L. Herzog, D.R. Larson, C.C. Abert, S.D. Wilson, and G.S. Roadcap. (Reprinted from Ground Water, v. 41, no. 1, p. 57–65.)

#### CONTRACT REPORTS

32

Morse, D.G. 2002. Reservoir Characterization and 3-D Models of Mt. Simon Gas Storage in the Illinois Basin, Annual Technical Progress Report. October 1, 2001–September 30, 2002. 37 p. KAM 5/13/2003.

### OUTSIDE PUBLICATIONS

Amon, J.A., C.A. Thompson, Q.J. Carpenter, and J. Miner. 2002. Temperate Zone Fens of the Glaciated Midwestern USA. Wetlands, v. 22, no. 2, p. 301–317.

Barnhardt, M.L., with contributions by L.R. Smith and S. Medlin. 2003. Modern Soils and the Landscape—Influences on Habitat and Agriculture. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 22–29.

Barnstable, D.C. 2003. Potential for Geologic Hazards. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 65.

Bauer, R.A., with contributions by L.R. Smith and S.M. Medlin. 2003. Landslides. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 77–80.

Berg, R.C. 2002. Geoenvironmental Mapping for Groundwater Protection in Illinois, U.S.A. *in* P.T. Bobrowsky, Geoenvironmental Mapping: Methods, Theory and Practice. A.A. Balkema Publishers, p. 273–293.

Cahill, R.A., and W.C. Bogner. 2002. Investigation of Metal Distributions and Sedimentation Patterns in Lake DePue and Turner Lake. Illinois Water Management and Research Center, Research Report RR-98, 97 p.

DiMichelle, W.A., T.L. Phillips, W.J. Nelson. 2002. Place vs. Time and Vegetational Persistence: A Comparison of Four Tropical Mires from the Illinois Basin during the Height of the Pennsylvanian Ice Age. International Journal of Coal Geology, v. 50, nos. 1–4, p. 43–72.

Goodwin, J.H. 2003. Additional Readings. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 81.

Goodwin, J.H., with contributions by L.R. Smith and S. Medlin. 2003. Mineral Resources. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 54–58.

Granthoff, G.H., and D.M. Moore. 2002. Characterization of the Waukesha Illite: A Mixed-Polytype Illite in the Clay Mineral Society Repository. American Mineralogist, v. 87, nos. 11–12, p. 1557–1563.

Herzog, B.L., D.R. Larson, C.C. Abert, S.D. Wilson, and G.S. Roadcap. 2003. Hydrostratigraphic Modeling of a Complex, Glacial-Drift Aquifer System for Importation into MODFLOW. Ground Water, v. 41, no. 1, p. 57–65.

Hsing-Cheng Hsi, M.J. Rood, M. Rostam-Abadi, S. Chen, and R. Chang. 2002. Mercury Adsorption Properties of Sulfur-Impregnated Adsorbents. Journal of Environmental Engineering, v. 128, no. 11, p. 1080–1089.

Keefer, D.A. 2003. Potential for Contamination of Groundwater Resources. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 65–71.

Killey, M.M., with contributions by L.R. Smith and S. Medlin. 2003. Glacial and Surface Geology. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 14–21.

Killey, M.M., with contributions by L.R. Smith and S. Medlin. 2003. Landscape Features and Natural Areas with Geologic Features of Interest. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 30–32.

Killey, M.M., and W.W. Shilts. 2002. Introduction: Influence of Geology and Soil on Ecosystem Development. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 1–6.

Krapac, I.G., W.S. Dey, W.R. Roy, C.A. Smyth, W. Storment, S.L. Sargent, and J.D. Steele. 2002. Impacts of Swine Manure Pits on Groundwater Quality. Environmental Pollution, v.120, 475–492.

Larson, D.R., E. Mehnert, and B.L. Herzog. 2003. The Mahomet Aquifer: A Transboundary Resource in East-Central Illinois: Water International, v. 28, no. 2, p. 170–179.

Larson, T.H. 2002. The Earthquake of 2 September 1999 in Northern Illinois: Intensities and Possible Neotectonism. Seismological Research Letters, v. 73, no. 5, p. 732–738.

Larson, T.H., with contributions by L.R. Smith and S.M. Medlin. 2003. Regional Earthquake History. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 75–77.

Lasemi, Z., S.B. Bhagwat, T.J. Kemmis, R.E. Hughes, D.G. Mikulic, and I. Demir. 2003. State Activities: Illinois. Mining Engineering, v. 55, no. 5, p. 69–73.

Leetaru, H.E., and R.A. Kamal, conveners. 2002. AAPG Summit on Teaching Petroleum Geology, Where Do We Go From Here? March 8–9, 2002, Houston, Texas. Sponsored by the American Association of Petroleum Geologists, 45 p.

Luman, D.E. 2003. Appendix B: Principal Land Cover of the La Moine River Assessment Area by Subbasin. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 86–102.

Luman, D.E., with contributions by L.R. Smith and S. Medlin. 2003. Land Cover Inventory. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 33–52.

Menzies, J., and W.W. Shilts. 2002. Chapter 8, *in* J. Menzies, ed., Subglacial Environments: Oxford, Butterworth-Heinmann, p. 183–278.

Mikulic, D.G., and J. Kluessendorf. 2002. The Crisis in Geological Collections. Geotimes, v. 47, no. 6, p. 24–26.

Miller, M., L. Suloway, and L. Keefer. 2002. Wetlands. Shawnee Area Assessment, Volume 2: Water Resources. Illinois Department of Natural Resources, p. 5–11.

Panno, S.V., K.C. Hackley, H.-H. Hwang, S. Greenberg, I.G. Krapac, S. Landsberger, and D.J. O'Kelly. 2002. Determination of the Sources of Na and Cl Contamination in Natural Waters: Preliminary Results. Proceedings of the 12<sup>th</sup> Annual Research Conference of the Illinois Groundwater Consortium, Carbondale, IL, 26 p. Published on-line (http://www.siu.edu/orda/ iqc/proceedings/02/panno.pdf).

Rafsanjani, H.H., E. Jamshidi, and M. Rostam-Abadi. 2002. A New Mathematical Solution for Predicting Char Activation Reactions. Carbon, v. 40, no. 8, p. 1167–1171.

Shilts, W.W. 2002. Illinois. The State Geologists Journal, v. 54, p. 24–27.

Smith, L.R. 2003. Appendix A: Overview of Databases. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 82–85.

Thorleifson, L.H, and R.C. Berg, convenors. 2002. Three-dimensional Geological Mapping for Groundwater Applications, workshop extended abstracts. Geological Survey of Canada Open File 1449, 87 p.

Vaiden, R.C., and R.J. Rice. 2003. Aquifer Delineation. La Moine River Area Assessment, Volume 1: Geology. Illinois Department of Natural Resources, p. 59–64.

**34** Wang, H., R.E. Hughes, J.D. Steele, S.W. Lepley, and J. Tian. 2003. Correlation of Climate Cycles in Middle Mississippi Valley Loess and Greenland Ice. Geology, v. 31, no. 2, p. 179–182.

Weibel, C.P. 2002. Evolution of the Boundaries Used to Map Pennsylvanian Cyclothemic Sequences in Illinois, USA *in* L.V. Hills, C.M. Henderson, and E.W. Bamber, eds., Carboniferous and Permian of the World: Compte Rendu, Quatorzième Congrès International de Stratigraphie et de Géologie du Carbonifère et Permien. Canadian Society of Petroleum Geologists, Memoir 19, p. 239–251.

Weibel, C.P., with contributions by L.R. Smith and S.M. Medlin. 2003. Bedrock Geology. La Moine River Area Assessment; Volume 1: Geology. Illinois Department of Natural Resources, p. 8–13.

Werner, K.J., and J.B. Zedler. 2002. How Sedge Meadow Soils, Microtopography, and Vegetation Respond to Sedimentation. Wetlands, v. 22, no. 3, p. 451–466.

#### FOR MORE INFORMATION

#### Illinois State Geological Survey

615 East Peabody Drive Champaign, IL 61820-6964 217/333-4747 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

John D. McLeod, Mapping Facilitator 217/244-2524 mcleod@isgs.uiuc.edu

Marie-France Dufour, Director Geoscience Information Center 217/333-5115 dufour@isgs.uiuc.edu

Robert J. Finley, Director Energy and Earth Resources Center 217/244-8369 finley@isgs.uiuc.edu

Gerald E. Glogowski, Director Administrative Services Center 217/244-2403 gglo@isgs.uiuc.edu

Beverly L. Herzog, Director Environmental Geosciences Center 217/244-2788 herzog@isgs.uiuc.edu

Michael V. Miller, Director Transportation and Environment Center 217/333-7093 miller@isgs.uiuc.edu

APPLIED GEOCHEMISTRY James B. Risatti 217/333-5103 risatti@isgs.uiuc.edu

#### APPLIED GEOPHYSICS Timothy H. Larson 217/244-2775 tlarson@isgs.uiuc.edu

#### BUSINESS AND FINANCIAL SERVICES Debra A. Griest 217/244-2390 griest@isgs.uiuc.edu

COAL Thomas R. Moore 217/244-2409 moore@isgs.uiuc.edu

COASTAL GEOLOGY Michael J. Chrzastowski 217/244-2194 chrzasto@isgs.uiuc.edu

COMPUTING SERVICES Richard R. Hansen 217/333-5101 hansen@isgs.uiuc.edu

#### NETWORK/WORK STATIONS, WEB PAGE DEVELOPMENT Sally L. 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

GEOLOGICAL RECORDS UNIT 217/333-5109

GEOLOGICAL SAMPLES LIBRARY 217/333-3567

#### GEOSCIENCE OUTREACH AND PUBLIC FIELD TRIPS Wayne T. Frankie 217/244-2427 frankie@isgs.uiuc.edu

GEOSPATIAL ÅNALYSIS 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 Zakaria Lasemi 217/244-6944 Iasemi@isgs.uiuc.edu

INFORMATION OFFICE, MAPS, PUBLICATIONS SALES 217/244-2414

ISOTOPE GEOCHEMISTRY Keith C. Hackley 217/244-2396 hackley@isgs.uiuc.edu

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

OIL AND GAS Beverly Seyler 217/244/2389 seyler@isgs.uiuc.edu

PETROLEUM TECHNOLOGY TRANSFER COUNCIL, MIDWEST REGIONAL OFFICE Steven R. Gustison 217/244-9337 gustison@isgs.uiuc.edu

PUBLISHING, DESIGN, AND 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 K. Hansel 217/333-5852 hansel@isgs.uiuc.edu

SEDIMENTARY AND CRUSTAL

PROCESSES Dennis R. Kolata 217/244-2189 kolata@isgs.uiuc.edu

SHOP SERVICES, DRILLING, AND VEHICLE OPERATIONS Chris R. Wilson 217/333-6849 wilson@isgs.uiuc.edu

WETLANDS GEOLOGY James J. Miner 217/244-5786 miner@isgs.uiuc.edu

Equal opportunity to participate in programs of the Illinois Department of Natural Resources (IDNR) and those funded by the U.S. Fish and Wildlife Service and other agencies is available to all individuals regardless of race, sex, national origin, disability, age, religion, or other non-merit factors. If you believe you have been discriminated against, contact the funding source's civil rights office and/or the Equal Employment Opportunity Officer, IDNR, 524 S. 2nd, Springfield, IL 62701-1787; 217/785-0067; TTY 217/782-9175.