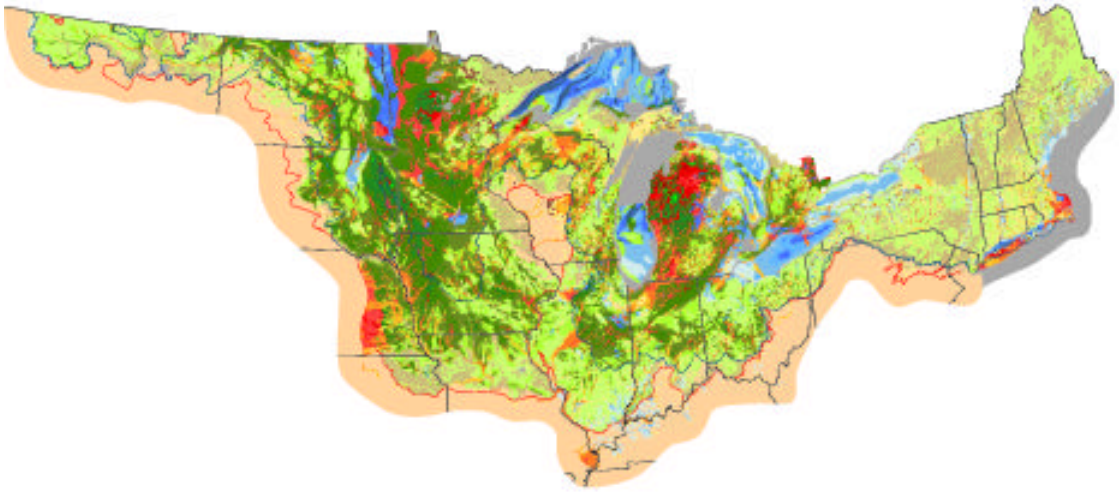
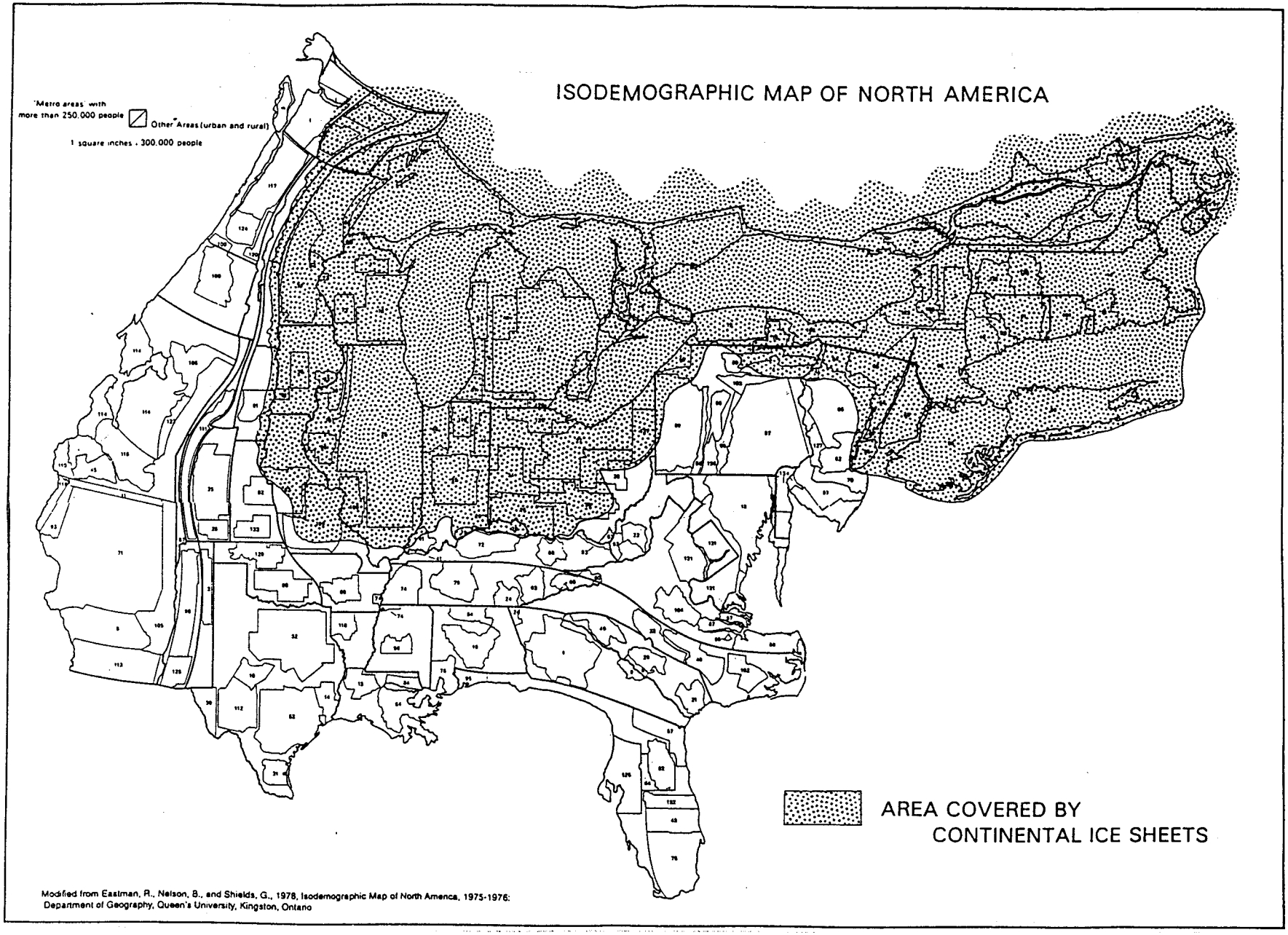
Central Great Lakes States Geologic Mapping Coalition



Glacial Deposits of the Northern United States

Illinois State Geological Survey
Indiana State Geological Survey
Michigan Geological Survey
Ohio Geological Survey
U.S. Geological Survey


ISODEMOGRAPHIC MAP OF NORTH AMERICA
"Metro areas" with more than 250,000 people
"Other" Areas (urban and rural)
1 square inches = 300,000 people
AREA COVERED BY CONTINENTAL ICE SHEETS
Modified from Eastman, R., Nelson, B., and Shields, G., 1978, Isodemographic Map of North America, 1975-1976: Department of Geography, Queen's University, Kingston, Ontario

Central Great Lakes Geologic Mapping Coalition

To unravel the complex glacial geometry common to the four states, to address intense industrial and agricultural issues.

- Issues
  - Ground water for drinking (>50%), irrigation, and manufacturing
  - Ground water contamination & protection
  - Maintaining & expanding the Infrastructure
  - Geologic hazards
- Needs
  - Characterization of aquifers & aquitards
  - Ground water flow modeling
  - Characterization of glacial materials for
    - infrastructure needs
    - assessing geologic hazards

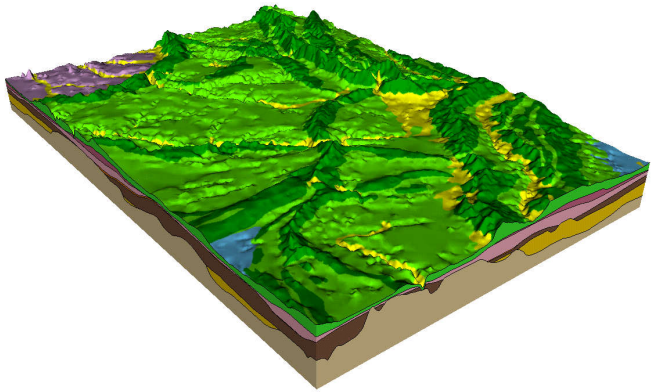
- **Solution**

  3-D digital Geologic Maps

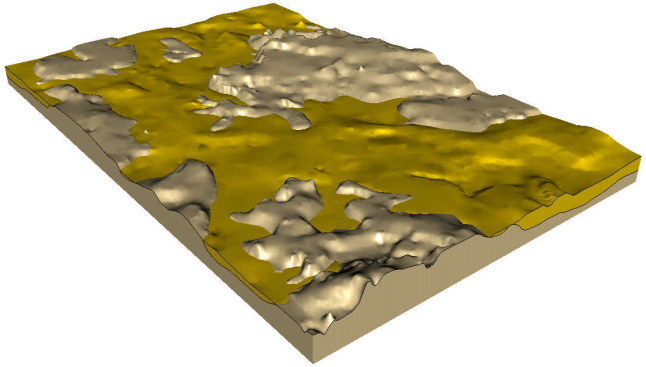
Central Great Lakes Geologic Mapping Coalition - 3D Maps

Human activities occur mostly in the upper few tens of feet of the Earth's surface. In the U.S. mid-continent, these activities take place not on bedrock, but in loose sediment deposited by glaciers. These sediments are up to 1000' thick in places, and vary greatly in texture. In many areas, small, buried sand lenses serve as the sole potable water supply for communities and farms. Improved mapping of these glacial sediments, not just at the land surface, but also in the subsurface (mapping in "3-D") can support long-term planning for community development and resource management.

The perspective diagram on the facing page is derived from a digital geologic map database, a Geographic Information System (GIS). This GIS is for east-central Illinois, and includes the Mahomet and Ancient Mississippi Valley aquifer deposits shown in gold on the right. These sandy deposits were derived from ancient river beds that were buried beneath the generally finer-grained deposits of the glaciers. The Mahomet-Ancient Mississippi aquifers contain ground-water supplies for cities (such as Champaign/Urbana) and for farms in the region. The location of the aquifers is determined by drilling and constructing the digital 3-D geologic map database shown here. This database is used for ground-water modeling and assessing aquifer contamination potential. In addition, the database may be projected, "sliced," and "peeled" to help decision-makers visualize the location and extent of aquifer deposits.



The entire block of glacial materials is shown (the topography is greatly exaggerated, to shown the surface features -- the "ridges" are glacial moraines, where the ice briefly paused, depositing a thicker pile of sediment.)



This image shows only the lowest glacial unit, the Mahomet and Ancient Mississippi Valley aquifers (in yellow), lying within a buried bedrock valley carved by glaciers and river water. The tan color shows the bedrock uplands, on either side of the buried valley. Lying above this surface are 100-200 feet of glacial till and sandy aquifers.

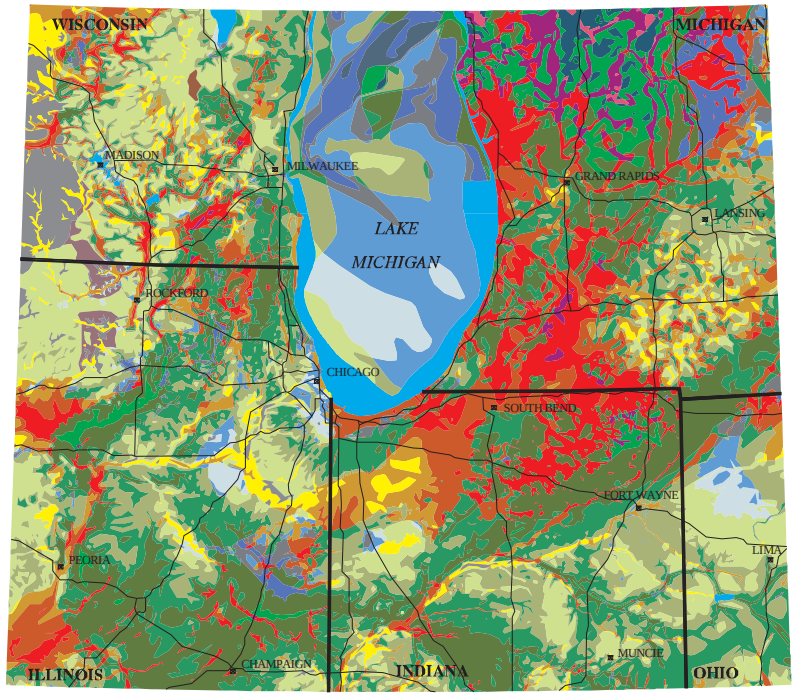
Example #2 -- Selected images of the "block" of glacial sediments in east-central Illinois. [Note: this map area is mostly included in Example #1, lower-left corner.] Products will be a paper map folio and various digital files to be used for ground-water modeling and other applications (see "http://ncgmp.usgs.gov/ecill").

Central Great Lakes Geologic Mapping Coalition - Contamination Potential Maps

Human activities occur mostly in the upper few tens of feet of the Earth's surface. In the U.S. midcontinent, these activities take place not on the bedrock, but in loose sediment deposited by glaciers. These sediments provide abundant ground-water resources for the region, yet they are also especially sensitive to contamination.

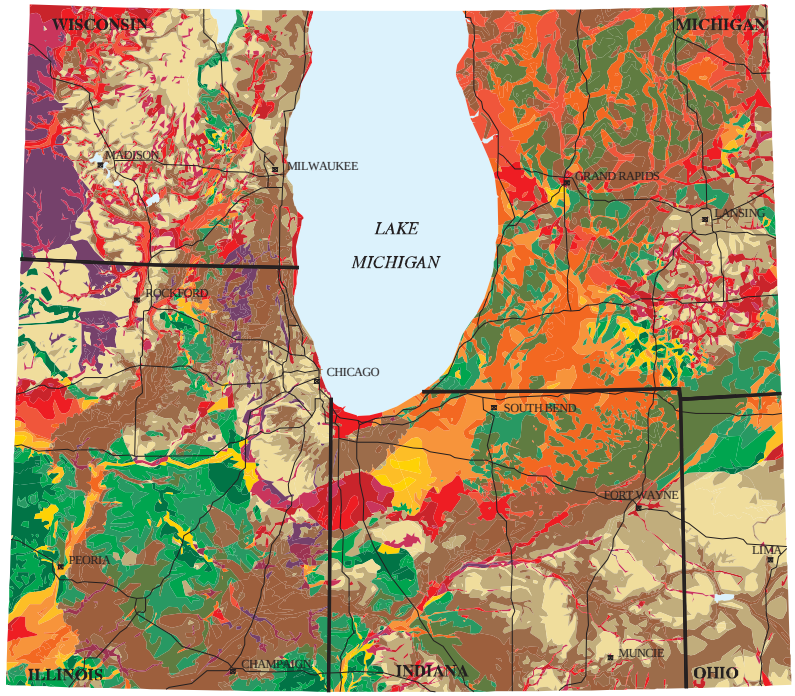
The diagrams on the facing page show how a digital geologic map (left) can be converted into a more user-friendly contamination potential map (right). Regional maps such as this are useful for broad planning, but cannot solve site-specific problems. The latter require more detailed geologic data, typically collected at 1:24,000-scale. Examples of uses for this regional map include:

- regional mapping of aquifer contamination potential
- prioritizing areas to search for evidence of pre-historic earthquakes
- improved information on the distribution of geologic materials for land-use planning



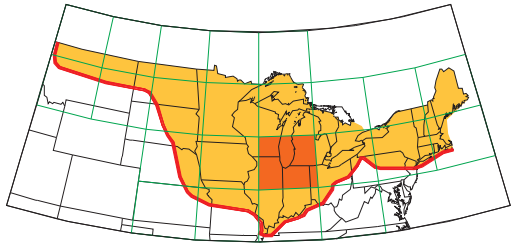
Example #1 -- Part of a regional, 3-D map of the glaciated United States east of the Rockies.

* green = glacial till
* blue = clay
* yellow-red = sand
- light colors = thin sediment
- dark colors = thick sediment



Potential for aquifer contamination, interpreted from map at left.

* purple & red = higher potential
* brown = moderate potential
* green = lower potential



GEOLOGIC MAPS AND DERIVATIVE PRODUCTS

These two examples show 1) a map of the glacial (surficial) geology and 2) a map derived from 3-dimensional mapping of the glacial deposits of the Villa Grove, 1:24,000 quadrangle in Illinois. The maps are products of a pilot project to work out the methods and products of 3-dimensional mapping initiated in 1996 by the Illinois State Geological Survey. The large orange area at the south end of the surficial geology map represents a sandy delta built into a shallow lake that existed in front of the retreating glacier about 15,000 years ago. This sandy sediment and the glacial sediments beneath it are particularly susceptible to leaching of nitrates from any fertilizer applications, suggesting that particular care must be taken to minimize potential groundwater problems in that area. By combining the surface map with subsurface information from 3-dimensional mapping, the areas with potential nitrate leaching problems are seen to be much more extensive than the surface geology alone would suggest.

Surficial Geology, Villa Grove Quadrangle

up to 20 feet of stratified silt with sand and clay lenses	Cahokia Formation (postglacial river and stream sediment)
1-4 feet of massive silt overlying up to 11 feet of stratified sand and silt	Peoria Silt (1-4 feet) over Dolton facies of the Henry Formation (windblown silt [loess] overlying delatic sand)
1-4 feet of massive silt overlying up to 20 feet of laminated silt with clay lenses	Peoria Silt over Equality Formation (windblown silt overlying lake sediment)
1-4 feet of massive silt over silt loam diamicton	Peoria Silt over Batestown Member of the Lemont Formation (windblown silt overlying till)
Water	
Surface Mine	

0 2
Miles
0 2
Kilometers

Aquifer Sensitivity to Nitrate Leaching
Villa Grove Quadrangle

Very high
High
Moderate
Somewhat low
Low
Very low
Disturbed land

0 2
Miles
0 2
Kilometers

Aquifer Characterization for Ground-Water Protection
Allen County, Indiana

Issue: Ground water serves as the drinking water supply for 72 percent of the population in Indiana. Developing plans and implementing procedures to protect this precious natural resource is one of the most pressing issues for our state.

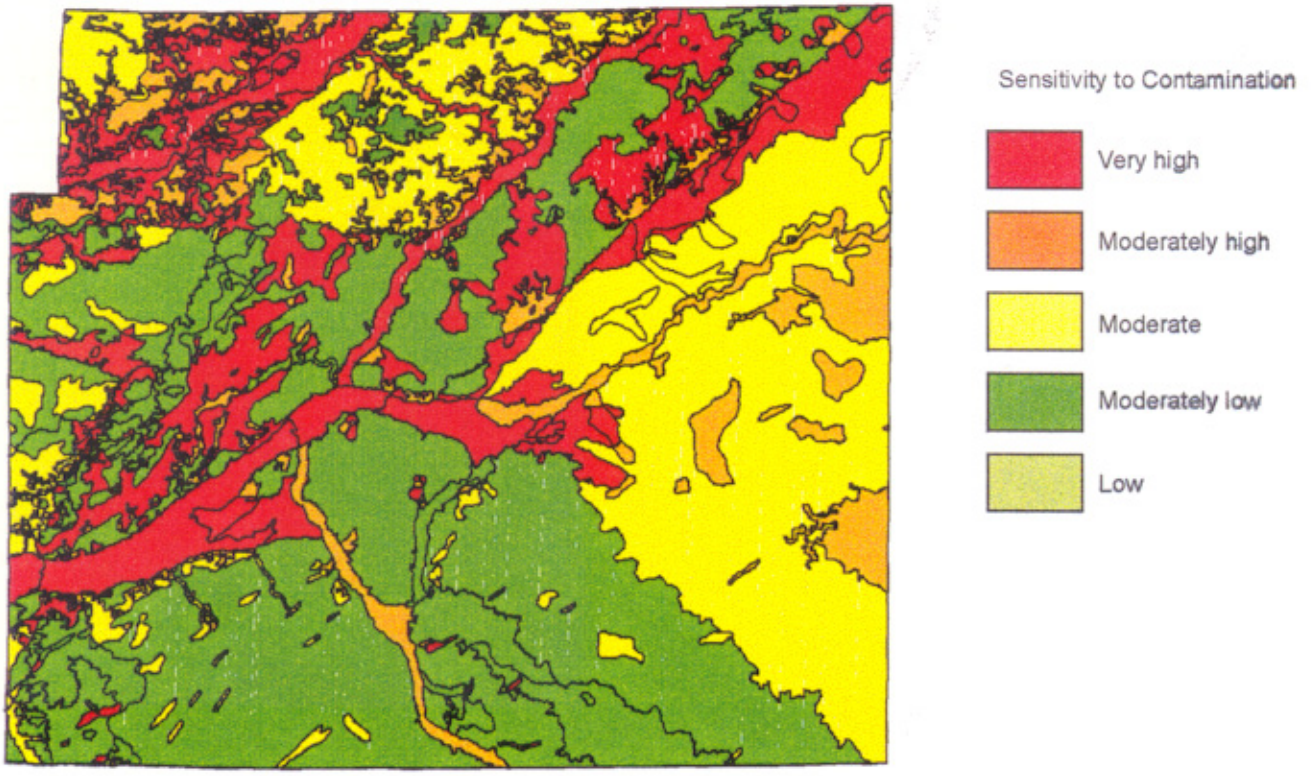
The Indiana Geological survey is performing three-dimensional geologic mapping throughout the state for the purpose of characterizing the aquifers and aquitards for the primary purpose of ground-water protection (e.g., well-head protection program). This work is carried out in cooperation with state, county, and local governments. The Indiana Department of Environmental Management depends on the geologic information that we provide in order for them to carry out their mandates.

Owing to the humid climate and abundant precipitation (approximately 35 to 40 inches per year), the growing reliance on ground water in Indiana is unlikely to be threatened by inadequate quantity in the near future. Although a few widely scattered localities do exist where ground-water availability is somewhat limited, a far more significant threat is the potential for contamination of productive aquifers by activities located in areas where the ground water is naturally susceptible to pollution. The high economic, societal, and environmental costs of polluted ground water are well known and far exceed the relatively minimal costs associated with preventing ground-water contamination. For example, several million dollars reportedly have been spent attempting to clean up soil and ground-water contamination at just one Superfund site in Allen County, whereas the cost of aquifer characterization in Allen County is less than $200,000. Growing recognition of these costs, coupled with the highly publicized nature of many incidents of ground-water contamination and the identification of a wide variety of potential contaminants and activities that can negatively impact ground-water quality (U.S.E.P.A., 1980; Pye and Kelly, 1984), have led to a heightened awareness of the need to protect ground-water quality on the part of concerned citizens.

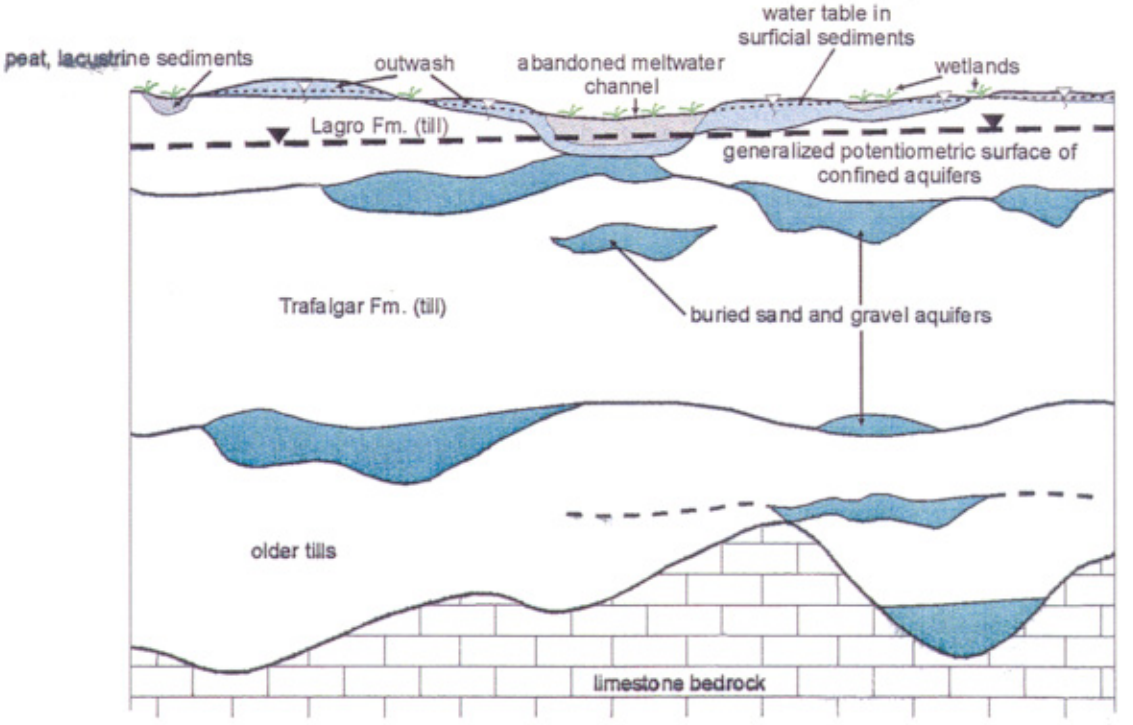
This study was initiated at the request of several Allen County agencies in order to provide information needed to understand and protect the ground-water resources of the county. The results are designed to be incorporated into the land-use planning process and can be used for a wide variety of planning and screening activities.

Partners: The primary partners for this project were Allen County Department of Planning Services and the Indiana Department of Natural Resources, Division of Water. However, our customers who need reliable three-dimensional geologic data in an easily accessible format and geologic maps and their derivatives at a scale of 1:24,000 include: Indiana Departments of Environmental Management, Natural Resources, Transportation, Health, State Emergency Management Agency, and Office of the State Chemist; county and municipal planning groups; the engineering community, mineral aggregate producers, water well drilling contractors and developers.

HYDROGEOLOGY OF ALLEN COUNTY



Hydrogeologic regions in Allen County, Indiana showing sensitivity to contamination.



Schematic diagram showing typical hydrostratigraphic relationships among surficial sediments, shallow water table, and the potentiometric surface.

SITING FOR LOW-LEVEL RADIOACTIVE WASTE DISPOSAL IN ILLINOIS

LACK OF GEOLOGIC INFORMATION COSTS ILLINOIS $110 MILLION

From 1987 to 1992, the State of Illinois was involved in a process to find a suitable location for a low-level radioactive waste disposal facility in accordance with federal and state mandates. One of the roles of the Illinois State Geological Survey was to provide small-scale statewide coverages of information restricting the selection of candidate areas/sites. A primary consideration for dismissal of areas/sites was the presence of aquifers. Statewide screening maps were based primarily on existing data, most of which were displayed on maps at scales of 1:250,000 -1:500,000. Although three- dimensional large-scale (1:62,500-1:24,000) geologic maps, were used in the state-wide screening, these maps existed only in restricted areas of north-central Illinois.

Based on the state-wide screening maps, a "politically acceptable" site was chosen for detailed characterization near the town of Martinsville, in Clark County. Regional maps showed "no known aquifers." However, during exploratory test drilling, two sand and gravel aquifers were discovered within a previously unknown bedrock valley. Unfortunately, because of political pressures, drilling and site characterization continued with the "hope" that aquifers were not continuous and that modeling would "prove" the site to be acceptable. Unfortunately again, this was not the case. After several years of trying to find a site and then characterizing one, only for the site to be rejected and the process begun again, the State spent about 85 million dollars. An additional $25,000,000 has been spent since 1992 and still no disposal facility has been sited.

Had detailed three-dimensional mapping at a scale of 1:24,000 been available during the screening phase for selecting suitable sites, the sand and gravel aquifers within the buried bedrock valley near Martinsville would have been delineated and the site that was characterized would NOT have been considered in the first place. Screening WOULD have directed site characterization to areas where there was documented evidence that aquifers were not present. The State of Illinois would be $110, 000, 000 richer.

OHIO FACT SHEET
for the
Central Great Lakes Surficial Geology Mapping Coalition

What is the Central Great Lakes Surficial Geology Mapping Coalition (CGLSGMC)?

The state geological surveys of Ohio, Michigan, Indiana, and Illinois, have formed a partnership with the U.S. Geological Survey for the purpose of producing urgently needed, detailed, three-dimensional surficialmaterials maps of the central Great Lakes states. This partnership is called the Central Great Lakes Surficial Geology Mapping Coalition.

What are three-dimensional surficial-materials maps?

Surficial materials include all unconsolidated geologic materials overlying bedrock. In the Great Lakes region, most surficial materials were deposited directly by glaciers or as a consequence of glaciation. Nonglaciogenic surficial materials include recent stream deposits and materials weathered directly from bedrock. Surficial materials in Ohio range from a few inches to several hundred feet thick with thicknesses of 50 to 100 feet being common in the two-thirds of the state which has been glaciated.

Traditional geologic maps of surficial materials depict the distribution of glacial and non-glacial sediments comprising only the uppermost few feet of the land. Such maps are based primarily on interpretation of landforms and soil characteristics, and field examination of materials exposed in shallow excavations and eroded stream banks. Traditional surficial-materials maps are considered to be two dimensional because they provide information only on the aerial distribution of uppermost materials and not materials at depth.

Recent advances in computer technology and geographic information systems (GIS), together with improved drilling and geophysical technology, now make it possible and practical to gather, display, and analyze earth-science information in ways never before possible, including the ability to characterize and geometrically depict geologic units lying at great depths below the surface. Maps which simultaneously depict the aerial distribution and thickness of unconsolidated materials lying between the Earth's surface and bedrock are called three-dimensional surficial-materials maps.

Why is there a critical need for three-dimensional surficial-materials maps in Ohio and other Great Lakes states?

Nearly one-third of the Nation's population, one-half of its heavy industry, and 90% of its fresh water are located in the glaciated terrain of the Great Lakes states. Aquifers in glacial sediments provide drinking water to more than half of the region's households. Modem, three-dimensional geologic maps of surficial materials accurately delineate the location and dimensions of glacial aquifers thereby providing municipalities and industries essential information required for ground-water exploration and development, and providing state environmental protection agencies with the information they require to protect these aquifers from contamination.

Aggregate (sand, gravel, and crushed stone) for new construction and infrastructure maintenance is produced from mineral resources within or immediately underlying glacial materials. Michigan, Illinois, and Ohio are traditionally among the Nation's largest aggregate-producing and consuming states. Surficial-materials maps provide the essential geologic information needed to develop land-use plans that allow for future economical production of aggregate near the urban centers where most aggregate is consumed.

Liquefaction of surficial materials in the midcontinent earthquake region extending along the Ohio and Mississippi River corridors from St. Louis to Cincinnati represents one of the heartland's greatest, and least understood, geologic hazards. Three-dimensional geologic maps delineate the location and extent of materials prone to liquefaction during an earthquake and provide a rational basis for emergency-response planning and development of effective building codes.

Landslides due to slope failure in unconsolidated materials along the glacial margin are the primary cause of building and highway failure in the Cincinnati metropolitan area and cause Cincinnatians to incur the largest

landslide losses (on a per capita basis) of any American urban area. Three-dimensional maps of surficial materials depict the aerial extent of slide-prone materials and can be used by communities to define areas where permits for new construction require builders to address slope-stability concerns in the project design and construction process.

How has the lack of modern surficial-materials maps impacted Ohio?

Failure to adequately consider surficial materials costs Ohioans millions of dollars annually due to property damage and construction/maintenance cost overruns. For example:

- Failure to recognize and adequately account for karst terrain and related surficial deposits along the Upper Scioto West Interceptor Sewer Project in Columbus caused $14 million in cost overruns due to downtime and additional costs required to extricate a tunnel boring machine from unconsolidated materials whose presence could have been predicted through three-dimensional characterization of surficial materials and geophysical surveys along the project corridor.
- Failure to account for thick, unconsolidated lake deposits overlying an abandoned underground mine along Interstate Route 70 in eastern Ohio led to catastrophic collapse of the highway. Repair of the highway cost $3.8 million and required 6 months to complete.
- Failure to account for karst terrain and related deposits along a portion of State Route 33 in Logan County, Ohio, resulted in an $800,000 cost overrun in a project to add new lanes to the highway.
- The lack of adequate surficial-materials information for northern Portage County, Ohio, contributed to a major housing development being built on what has been called the Cleveland area's highest-quality sand and gravel deposit. This valuable deposit of sand and gravel is now permanently precluded from production.

What agencies will benefit most by a surficial-materials mapping program?

The ODNR, Division of Geological Survey provides geologic information to more than 14,000 customers each year including federal, state, and local governments, industries, and citizens. Primary government-agency users of three-dimensional geologic maps would include: U.S. Geological Survey Divisions of Water Resources and Biological Resources, Federal and Ohio Emergency Management Agencies, U.S. Environmental Protection Agency, Ohio Department of Transportation, Ohio Environmental Protection Agency, Ohio Water Resources Council, Ohio Department of Health, County Soil and Water Conservation Districts, and Ohio Department of Natural Resources. Private-industry users of three-dimensional geologic maps would include: industrial mineral producers, clay-product manufacturers, ground-water explorationists, and geotechnical consultants. Citizens requesting geologic information to evaluate suitability of rural property for new home and business construction, water-well development, and mineral-resource development also will be primary beneficiaries of a program to develop modem three-dimensional maps of surficial materials.

What resources will the ODNR, Division of Geological Survey contribute to the Central Great Lakes Surficial Geology Mapping Coalition?

Four mapping geologists from the ODNR Division of Geological Survey will be assigned full-time to the Central Great Lakes Surficial Geology Mapping Coalition. In addition to mapping, these geologists will be responsible for training new mapping geologists and will assist in laboratory development. The Division's publication staff will develop necessary base maps and assist in the design, digitization, and delivery of mapping products, and train new cartographic personnel. Division GIS/database computer-specialists will oversee database design, quality control of digital products, and the development of the three-dimensional surficial geology information delivery system for Ohio. The Division will dedicate laboratory and sample archive space in its Geologic Sample Repository (to be completed 12/98) for analysis of core and samples collected by mapping personnel. The Division's exploratory drilling rigs will be made available to U.S. Geological Survey drilling crews for the purpose of drilling bore holes used for sample collection and geophysical logging.

How will this aggressive program of geologic mapping by the Central Great Lakes Surficial Geology Mapping Coalition be funded?

If adequate funding is made available for the National Cooperative Geologic-Mapping Program (P.L. 105-36), the five geological surveys are in firm agreement to move dynamically forward, under the aegis of a new FEDMAP program to be established by the U.S. Geological Survey, to cooperatively produce the surficial-geology maps and information which are essential for informed environmental decisions and responsible economic development.

Central Great Lakes Geologic Mapping Coalition

- Why now ?
  - New Technology
    - Geologic maps + 3-D Geographic Information Systems (GIS) to Support Government and Industry
  - Economic and Societal Growth
    - over 30% of the Nation's heavy industry
    - 15% of the Nation's population
    - Agriculture - including Corn Belt
  - We can not afford to wait!

Appendix

- USGS National Cooperative Geologic Mapping Program Information
- Chronology of Events
- Great Lakes Geologic Mapping Forum - 3/24/98
- Geologic Mapping Advisory Committees
  - Illinois
  - Indiana
  - Ohio
  - Michigan
- Illinois State Statistics

Promotion of Quaternary 3-D Geologic Mapping:
Chronologic Chain of Events 1996 to Present

- Spring 1996 Bill Shilts (State Geologist, Illinois Geological Survey) and Norm Hester (State Geologist, Indiana Geological Survey) met with Pat Leahy (Chief Geologist, USGS), Steve Bohlen (Associate Chief Geologist for Science), John Pallister (Coordinator, National Cooperative Geologic Mapping Program), Dick Poore (Coordinator, Global Change and Climate History Program) and Jim Quick (Chief Scientist, Eastern Geologic Mapping Team) to discuss opportunities for developing a program in surficial processes.

- Spring 1996 Shilts and Hester made presentations on the benefits of 3D mapping of glacial deposits for the Surficial Processes Workshop held by the Geologic Division in Denver, Colorado.

- Fall 1996 Shilts, Hester, and Tom Berg (State Geologist, Ohio Geological Survey) met with Leahy, Pallister and others in Reston, VA to discuss need for geologic evaluation and mapping of Quaternary deposits in North Central U.S. Introduced the demographic maps as a demonstration of need for addressing societal concerns.

- Fall 1996 Berg, Hester and Shilts met with Pallister and Quick at GSA meeting in Denver, Colorado to initiate a draft proposal for Quaternary mapping in the North Central U.S. and to discuss plans for a Geologic Mapping Forum to be held in Indianapolis, Indiana.

- Spring 1997 State Geological Surveys of Illinois, Indiana, and Ohio organized forum on "Understanding the Geologic Basis of our Environmental and Economic Problems" at Indiana University at Indianapolis Conference Center. Introduced the concept of a Central Great Lakes Geologic Mapping Coalition at workshop following the forum.

- Spring 1997 Berg, Hester, Pallister, and Shilts met with Jeff Burnham, Senior Legislative Assistant for Senator Lugar (R, IN to discuss the value of our work to the agricultural industry.

- Spring 1997 Hester and Shilts made presentations on glacial geology to the participants in a USGS experiment called "Surf School" designed to retrain geologists for Quaternary mapping.

- Summer 1997 Berg, Bohlen, Leahy, Pallister, Shilts meet and discussed Coalition at AASG meeting in Portland, Maine

- Summer 1997 Leahy and Shilts discuss model for multi-state support for the Coalition.

- Fall 1997 Berg, Hester, and Shilts met with Jeff Burnham, Senator Lugar's office, to demonstrate the application of geologic mapping to the needs of the agricultural industry.

- Fall 1997 Berg, Hester and Shilts met with Pallister and Peter Lyttle (Associate Coordinator, National Cooperative Geologic Mapping Program) during the National GSA meeting to discuss plans for making a presentation to Senator Lugar's staff.

- Fall 1997 Leahy and Pallister met in Bloomington with Federal and State geological survey representatives to plan a geologic mapping program for the Coalition.

- Winter 1998 Briefing in Washington D.C. for Senator Lugar's staff by Hester, Pallister, and Silts on the benefits of a Coalition

- Winter 1998 Hester met with President Myles Brand (Indiana University) to provide a briefing on the value of the Coalition to Indiana and the north central US; and to describe the need for an accelerated geologic mapping program for Indiana.

- Winter 1998 Shilts, Hester, Berg, Fitch (phone) met at USGS headquarters in Reston, VA with members of the Coalition to plan future presentations for congressional delegations of the Great Lakes Region.

- Winter 1998 Bob Hatcher (member NCGMP Federal Advisory Com.), Hester, Wayne Newell (USGS Research Geologist), Pallister met with Vice President Christopher Simpson (Indiana University), who worked in federal relations, to seek advice and support in securing funding for the Coalition.

- Spring 1998 Pallister and Bill Alley (Chief, Office of Ground Water) include Coalition plan in the Ground-Water Resources Initiative white paper for presentation at USGS manager's meeting in Reston.

- Spring 1998 Berg, Hester, and Shilts presentation of Coalition Plan for staff of Sen. Lugar and Rep. Regula.

- Spring 1998 Hester and Pallister met with Indiana Dept. of Commerce to discuss Coalition,

- Spring 1998 Reception for entire congressional delegation at the Rayburn Building to display the geologic mapping activities for the entire U.S.

- Spring 1998 Hester meeting with Don Weaver and V. P. Palmer (Indiana University) to discuss budget request for an accelerated geologic mapping program for Indiana

- Spring 1998 Berg, Hal Fitch (State Geologist, Michigan Geological Survey),Hester, Jim McNeal (Staff Scientist, National Cooperative Geologic Mapping Program), Pallister, Shilts and John Steinmetz (State Geologist of Indiana to replace Hester when he retires at the end of June) met with Division heads of Federal Environmental Protection Agency (EPA) Region 5 to discuss the benefits of Coalition initiative to EPA.

- Summer 1998 Briefed USGS Acting Director Tom Casadevall on the Coalition.

- Summer 1998 Newell and Byron Stone (USGS Research Geologist) conduct field trip to Bering Glacier, Alaska, to study glacial processes and sedimentology.

- Summer 1998 Representatives of all five geological surveys meet for up to two weeks in the field to continue the "Surf School" effort begun the previous summer to help retrain geologists for mapping glacial deposits, based on Bering Glacier model.

- Fall 1998 Shiltz and Steinmetz briefed Mark Schaefer (DOI Deputy Assistant Secretary for Water and Science) on Coalition.

- Fall 1998 Sarah Gerould (Coordinator, Integrated Natural Resource Science Program), Ken Hollett (Associate Chief, Office of Ground Water), Pallister briefed OMB examiner Michele Jesperson on the USGS the Integrated Science for Sustainable Ecosystems initiative, including the role of the Coalition

- Fall 1998 McNeal and Steinmetz with Bruce Mason (Executive Director of the Indiana Mineral Aggregates Association, Inc. and Chair of the Geologic Mapping Advisory Committee for Indiana), John Henriksen (Executive Director of the Illinois Association of Aggregate Producers), John Schuler (Manager – Governmental Affairs and Public Relations, Martin Marietta Aggregates) Howard Pugh (Employee Relations/Safety Manager, Martin Marietta Aggregates), and Randi Wille (Meyer Material Company, Des Plaines, IL) briefed staffers from seven Illinois and Indiana delegations including Congressman Mark Souder (R-4th, IN) on the Coalition.

- Fall 1998 Hester (Staff Scientist for the National Cooperative Geologic Mapping Program), Lyttle, Shilts discussed Coalition and the potential for cooperative efforts with Charles Whitmore (Director of NRCS Midwest Region).

Great Lakes Geologic Mapping Coalition

- USGS - National Cooperative Geologic Mapping Program
  - Reauthorized by Congress August 5, 1997 as P.L. 105-36
  - Federal-State University Partnerships - Leverages resources & aligns priorities
  - Funding history:

FY	Request	Authorization	Appropriation
97	$21.9 M		$21.9 M
98	$20.2 M	$26 M	$22.2 M*
99	$20.9 M	$28 M	$22.5 M*
00	$???	$30 M	$???

* $1.7 M restored by Congress

Organizations Represented at Great Lakes Geologic Mapping Forum
University Place Conference Center, IUPUI, Indianapolis-Monday, March 24, 1997

Federal Agencies

g

NRCS-USDA
Region V, US EPA
U.S. Environmental Protection Agency
U.S. Forest Service
U.S. Geological Survey
- Geological Division
- Biological Resources Division
- National Mapping Division
- Water Resources Division

Corporations and Professional Associations

Bethlehem Steel
CEI Environmental
CHUBB Group Insurance Companies
Daniel and Associates, Inc.
Engineering and Testing Services, Inc.
EOC Environmental Services
GAI Consultants
Gerity Miller, Inc.
Heritage Environmental Services, Inc.
Illinois Fertilizer and Chemical Association
Indiana Coal Council
Indiana Gas Company
Indiana Mineral Aggregates Association
Indiana Water and Waste Association
Indianapolis Water Co.
Malcolm Pirnie Inc.
Northern Illinois Water Corporation
Ortman Drilling, Inc.
Ozark Mahoning Co.
R.E. Blattert Associates
Rhodes Incorporated
Sagamore Environmental Services, Inc.
Schramm, Inc.
SES Environmental
Sigma Consultants
Solar Sources, Inc.
State Farm Insurance
Strata Power Co.
Summit Risk Service
VanRhennen and Associates
Vulcan Materials
Wabash Resources and Consulting, Inc.

State Agencies

Indiana Department of Commerce-Office of Energy Policy
Indiana Department of Environmental Management

Indiana Department of Natural Resources
- Division of Reclamation
- Division of Soil Conservation
- Division of Water

Indiana Department of Transportation
Indiana Farm Bureau, Inc.
Indiana Geological Survey
Indiana State Department of Health
Indiana State Emergency Management Agency
Office of Indiana State Chemist
Illinois Department of Natural Resources-Office of Scientific Research and Analysis
Illinois Environmental Protection Agency
Illinois Department of Agriculture
Illinois Department of Transportation
Illinois State Water Survey
Illinois State Geological Survey
Ohio Department of Natural Resources-Division of Geological Survey

City, County, Regional Offices and Departments

Allen County Department of Planning Services, Indiana
Boone County Area Planning Commission and Board of Zoning Appeals, Indiana
Dupage County Forest Preserve District, Illinois
Indianapolis Metropolitan Planning Division
Indianapolis Department of Public Works
Indianapolis Water Company
LaGrange County Health Department, Indiana
Marion County Health Department, Indiana
Monroe County Solid Waste Management District, Indiana
Montgomery Environmental
Vanderburgh County Building Commission, Indiana

Colleges and Universities

Central State University-Earth Science Department
College of Lake County-Geology Department
Hanover College
Illinois State University
Indiana State University-Geology Department
IPFW, Department of Geosciences
IUPUI Geology Department
IUPUI Geography Department
IUPUI Center for Urban Policy and the Environment
Northeastern Illinois University
Purdue University-Department of Earth and Atmospheric Sciences
Purdue University-Department of Agronomy
Southern Illinois University-Department of Geology
University of Illinois-Geology Department
University of Cincinnati-Department of Geology
University of Wisconsin

Others

Hoosier Environmental Council
Nature of Illinois Foundation

MEMBERS OF THE ILLINOIS GEOLOGIC MAPPING ADVISORY COMMITTEE (IGMAC)

VALDAS V ADAMKUS
REGIONAL ADMINISTRATOR
US EPA REGION 5 MC R19J
77 WEST JACKSON BLVD
CHICAGO IL 60604-3590

RICHARD C ANDERSON
DEPARTMENT OF GEOLOGY
AUGUSTANA COLLEGE
ROCK ISLAND IL 61201
309/794-7218

GORDON APPEL
IL DEPT OF NUCLEAR SAFETY
1035 OUTER PARK DRIVE
SPRINGFIELD IL 62704
217/785-0512

MICHAEL ARBISE
IL EMERGENCY MANAGEMENT AGENCY
110 EAST ADAMS
SPRINGFIELD IL 62706
217/782-6229

CHARLES E AVERY
WATER RESOURCES DIVISION IL DISTRICT
US GEOLOGICAL SURVEY
102 E MAIN ST 4TH FLOOR
URBANA IL 61801
217/344-0037

J MAICHLE BACON DIRECTOR
MCHENRY COUNTY HEALTH DEPT
2200 NORTH SEMINARY
WOODSTOCK IL 60098
815/334-4575

MS RITA BAIR
IL PROGRAM MANAGER
US EPA REGION 5 MC WG16J
77 WEST JACKSON BLVD
CHICAGO IL 60604-3590

LARRY BENGAL
IL DEPT OF NATURAL RESOURCES
300 W JEFFERSON ST SUITE 300
PO BOX 10137
SPRINGFIELD IL 62791-0137
217/782-1689

PROFESSOR ALAN BAHARLOU CHAIRMAN
DEPT OF GEOGRAPHY & GEOLOGY
EASTERN ILLINOIS UNIVERSITY
CHARLESTON IL 61920
217/581-2626

JAMES BLUMTHAL
IL OIL & GAS ASSOCIATION
BOX 419
OLNEY IL 62450
618/395-7023

MICHAEL P BRUEN
NORTH-CENTRAL SECTION AEG
HARZA ENGINEERING CO
233 SOUTH WACKER DR
CHICAGO IL 60606-6392
312/831-3093

PHILLIPS BUS EXECUTIVE DIRECTOR
KANE COUNTY DEVELOPMENT BOARD
719 SOUTH BATAVIA AVENUE
GENEVA IL 60134
708/232-3480

PETER L CALENGAS CHAIRMAN
DEPARTMENT OF GEOLOGY
WESTERN ILLINOIS UNIVERSITY
MACOMB IL 61455
309/298-1151

GARY R CLARK
OFFICE OF WATER RESOURCES
IL DEPT OF NATURAL RESOURCES
3215 EXECUT:,'=- PARK DRIVE
SPRINGFIELD IL 62794-9484
217/785-3334

RICHARD COBB
IEPA DIV OF PUBLIC WATER SUPPLIES
1340 N NINTH
SPRINGFIELD IL 62703
217/785-9470

JERRY DALSIN
IL DEPT OF PUBLIC HEALTH
535 W JEFFERSON FLOOR 4
SPRINGFIELD IL 62761
217/782-4977

GEORGE M DIRKES
IL ASSOC OF AGGREGATE PRODUCERS
522 W BURLINGTON AVENUE
LAGRANGE IL 60525
708/354-8838

PETER DIXON
NORTH-CENTRAL SECTION AEG
HARZA ENGINEERING CO
233 SOUTH WACKER DR
CHICAGO IL 60606-6392
312/831-3000

STEVEN P ESLING
SIU DEPT OF GEOLOGY
CARBONDALE IL 62901
618/453-7363

MARK FISCHER
NIU DEPARTMENT OF GEOLOGY
DEKALB IL 60115
815/753-0827

DANIEL FITZPATRICK DISTRICT CHIEF
USGS WATER RESOURCES DIV IL DISTRICT
221 NORTH BROADWAY AVENUE
URBANA IL 61801
217/344-0037

WARREN D GOETSCH CHIEF
BUREAU OF LABORATORIES
IL DEPT OF AGRICULTURE
STATE FAIRGROUNDS
SPRINGFIELD IL 62794-9281
217/785-8217

JOHN M HEALY
IL SOC OF PROF ENGINEERS
HANSON ENGINEERS INC
1525 SOUTH SIXTH STREET
SPRINGFIELD IL 62703
217/788-2450

WILL HINSMAN
ENERGY & ENVIRONMENTAL ASSESSMENT
ILLINOIS DEPT OF NATURAL RESOURCES
524 S SECOND ST
SPRINGFIELD IL 62701-1787
217/782-0481

GEORGE HUDAK
OFFICE OF GROUND WATER
US EPA REGION 5 MC WD17J
77 WEST JACKSON BLVD
CHICAGO IL 60604-3590

PROFESSOR JAMES G KIRCHNER
ISU DEPT OF GEOG RAP HY- GEOLOGY
NORMAL IL 61761
309/438-8922

MARK KUECHLER
IL DEPT OF PUBLIC HEALTH, REGION 6
2125 SOUTH FIRST STREET
CHAMPAIGN IL 61820
217/333-6914

WILLIAM J LANG PRESIDENT
STRATA POWER INC
153 S HARRISON
AURORA IL 60506
630/844-3331

BOB LEMEN
NATIONAL MAPPING DIVISION
MIDCONTINENT MAPPING CENTER
US GEOLOGICAL SURVEY MS308
1400 INDEPENDENCE ROAD
ROLLA MO 65401
314/341-0896

PETER LYTTLE
DEPUTY IN CHARGE STATEMAP
US GEOLOGICAL SURVEY
NATIONAL CENTER WGS MS908
:12201 SUNRISE VALLEY DRIVE
RESTON VA 22092

ERIC LIVINGSTON
OZARK-MAHONING CO, MINING DIVISION
BOHN STREET
ROSICLARE IL 62982
618/285-6282

BRENT MANNING
DEPT OF NATURAL RESOURCES
524 SOUTH SECOND ST
SPRINGFIELD IL 62701-1787
217/785-0075

STEPHEN MARSHAK
UI DEPT OF GEOLOGY
302 NATURAL HISTORY
1301 W GREEN MC-102
CHAMPAIGN IL 61820
217/333-7705

PROFESSOR FREDERICK MARSHALL
CHAIRMAN DEPT OF EARTH SCIENCES
PRINCIPIA COLLEGE
ELSAH IL 62028
618/374-2131

DR LYLE D MCGINNIS
ES 372/TR2 ARGONNE NATIONAL LAB
9700 S CASS
ARGONNE IL 60431
708/972-8722

ROBERT L MCLEESE STATE SOIL SCIENTIST
USDA SOIL CONSERVATION SERVICE
1902 FOX DRIVE
CHAMPAIGN IL 61820
217/398-5265

BRUCE MCMILLAN DIRECTOR
IL STATE MUSEUM
STATE MUSEUM BLDG ROOM 200
SPRINGFIELD IL 62706
217/782-7386

WILLIAM MELVILLE
OFFICE OF GROUND WATER
US EPA REGION 5 MC WQS16J
77 WEST JACKSON BLVD
CHICAGO IL 60604-3590

JEANNE MILLIN
FEDERAL EMERGENCY MANAGEMENT AGEN
175 W JACKSON, 4TH FLOOR
CHICAGO IL 60604

JOHN S MOORE
COAL DEVELOPMENT & MARKETING
IL DEPT COMMERCE & COMMUNITY AFFAIRS
325 WEST ADAMS STREET ROOM 300
SPRINGFIELD IL 62704-1892
217/785-2800

ROBERT OLSHANSKY
UNIVERSITY OF ILLINOIS
DEPT OF URBAN & REGIONAL PLANNING
611 E LORADO TAFT DR #111
CHAMPAIGN IL 61820
217/333-8703

JAMES E PALMER
AIPG IL-IN SECTION
SIGMA CONSULTANTS
PO BOX 1515
MATTOON IL 61938
217/235-1616

ANDREW H RORICK
FOREST GEOLOGIST/MINERAL EXAMINER
USDA FOREST SERVICE
901 S COMMERCIAL STREET
HARRISBURG IL 62946
618/253-7114

SCOTT SCHMITZ
OFF. OF MINES & MINERALS
IL DEPT OF NATURAL RESOURCES
300 WEST JEFFERSON SUITE 300
P 0 BOX 10197
SPRINGFIELD IL 62701-0197
217/782-7676

ALAN SHAPIRO
SOC OF MINING, METALLURGY & EXPLORATION
VULCAN MATERIALS CO
747 EAST 22ND ST SUITE 200
LOMBARD IL 60148
708/482-7000

ARLYN SHERWOOD
ILLINOIS STATE LIBRARY
300 S SECOND STREET
SPRINGFIELD IL 62701-1796
217/782-5823

ROBERT A SINCLAIR
518 WATER SURVEY RESEARCH CENTER
2204 SOUTH GRIFFITH DRIVE
CHAMPAIGN IL 61820
217/333-4952

JOSEPH S SPIVEY PRESIDENT
IL COAL ASSOCIATION
212 SOUTH SECOND ST
SPRINGFIELD IL 62701
217/528-2092

MARK STERRETT
IL DEPT OF PUBLIC HEALTH
2125 SOUTH FIRST ST
CHAMPAIGN IL 61820
217/333-6914

PROF SETH STEIN CHAIRMAN
DEPT OF GEOLOGICAL SCIENCES
NORTHWESTERN UNIVERSITY
EVANSTON IL 60201
708/491-3238

ROBERT STEWART
SOC OF PETROLEUM ENGINEERS
C/O STEWART PRODUCERS INC
BOX 546 IST BANK& TRUST BLDG
MT VERNON IL 62864
618/244-3754

JAMES STRATTON
DEPT OF GEOGRAPHY AND GEOLOGY
EASTERN ILLINOIS UNIVERSITY
CHARLESTON IL 61920
217/581-2626

ALAN V STUEBER
DEPT OF GEOGRAPHY & EARTH SCIENCES
SOUTHERN ILLINOIS UNIVERSITY
EDWARDSVILLE IL 62026-1001
618/692-3620

PAUL TERPSTRA
OFFICE OF MINES AND MINERALS
ILLINOIS DEPT OF NATURAL RESOURCES
300 W JEFFERSON SUITE 300
SPRINGFIELD IL 62791-0137
217/782-4970

JOHN UTGAARD
DEPT OF GEOLOGY
SOUTHERN ILLINOIS UNIVERSITY
CARBONDALE IL 62901
618/453-7377

DR AUGUST KOSTER VAN GROOS CHAIR
DEPARTMENT OF GEOLOGICAL SCIENCES
UNIVERSITY OF ILLINOIS AT CHICAGO
845 W TAYLOR ST
CHICAGO IL 60607-7059

DONALD R VONNAHME
OFFICE OF WATER RESOURCES
IL DEPT OF NATURAL RESOURCES
3215 EXECUTIVE PARK DRIVE
SPRINGFIELD IL 62794-9484
217/782-2152

KELLY WARNER
US GEOLOGICAL SURVEY IL DISTRICT
102 E MAIN ST 4TH FLOOR
URBANA IL 61801

BILL WARREN
GEOLOGY DEPARTMENT
UNIVERSITY OF ILLINOIS-SPRINGFIELD
PUBLIC AFFAIRS CENTER ROOM 556
SPRINGFIELD IL 62794-9243

JOHN R WASHBURN
DESIGN & ENVIRONMENT ROOM 330
IL DEPT OF TRANSPORTATION
2300 SOUTH DIRKSEN PARKWAY
SPRINGFIELD IL 62764
217/782-7074

WILLIAM P WHITE
IL DEPT OF NATURAL RESOURCES
LINCOLN TOWER PLAZA RM 310
524 SOUTH SECOND
SPRINGFIELD IL 62701-1787
217/782-3715

MIKE WIANT
ILLINOIS STATE MUSEUM
SPRING AND EDWARDS
SPRINGFIELD IL 62706
217/785-0134

DR DEREK WINSTANLEY CHIEF
ILLINOIS STATE WATER SURVEY
.102 WSRC 2204 S GRIFFITH DR
CHAMPAIGN IL 61820
217/244-5459IL

KAREN WITTER
OFFICE OF SCIENTIFIC RESEARCH & ANALYSIS
ILLINOIS DEPT OF NATURAL RESOURCES
524 SOUTH SECOND STREET 4TH FL
SPRINGFIELD IL 62701-1787
217/524-9506
THOMAS F ZIMMERMAN CHIEF
DIVISION OF PLANNING & ANALYSIS
IL EMERGENCY MANAGEMENT AGENCY
110 EAST ADAMS
SPRINGFIELD IL 62706
217.782-4448

MEMBERS OF THE INDIANA GEOLOGIC MAPPING ADVISORY COMMITTEE

Norman C. Hester (ex officio)
Indiana Geological Survey
611 North Walnut Grove
Bloomington, Indiana 47405

Matt Atkinson
625 North 9th Street
Petersburg, Indiana 47567

Paul Ehret
Dept. of Nat. Res., IGC South, W256
402 West Washington Street
Indianapolis, Indiana 46204

Shawn Gallagher
Gallagher Drilling,
Box 3046, 115 SE 3rd Street
Evansville, Indiana 47730

Robert Hall
IUPUI, Dept. of Geology
723 West Michigan Street
Indianapolis, Indiana 46202

Richard Harris
112 Charmwood
Evansville, Indiana 47715

Rosemarie Hansell
Marion County Health Dept.
3838 No. Rural Street, 5th Floor
Indianapolis, Indiana 46205

Jim Hebenstreit
Dept. of Nat. Res., IGC South, W264
402 West Washington St.
Indianapolis, Indiana 46204

Bruce Mason, Chairperson
Indiana Mineral Aggregates Associates
9595 North Whitley Dr, Suite 205
Indinapolis, Indiana 46240-1308

J. Nathan Noland
Indiana Coal Council
701 Harrison Bldg., 143 W. Market
Plainfield, Indiana 46168

Niles Parker
Dept. of Comerce, Energy Policy Div
One North Capital Avenue
Indianapolis, Indiana 46204

Andrew Rorick
USDA Forest Service
901 South Commercial
Harrisburg, Illinois 62946

Karyl Schmidt, Vice Chairperson
IN Dept. of Environmental Mgmt-
105 S. Meridian Street
Indianapolis, Indiana 46206-6015

Lee J. Suttner
Dept. of Geological Sciences
1005 E. 10th Street
Bloomington, Indiana 47405

Lindsay Swain
USGS, WRI)
5957 Lakeside Blvd.
Indianapolis, Indiana 46278

Charles Wier
8023 S. Zikes Road
Bloomington, Indiana 47401

Thomas Straw
Neef Lesueur House
404 Church Street
New Harmony, Indiana 47631

David Odor and/or Dan Rimstidt
PSI Energy
1000 E. Main Street
Plainfield, IN 46168

Dennis Gordon and/or Kim Bowman
Allen County Dept. of Planning Services
City County Building, 6' Floor
1 East Main Street
Ft. Wayne, IN 46802

Pat Haugh
IN Dept. of Transportation
100 North Senate Avenue
Indianapolis, Indiana 46204-2218

Niles Parker, Program Manager
Energy Policy Division
Department of Commerce
One North Capitol Avenue
Indianapolis, IN 46204

Bill Zinsmeister
Department of Geology
Purdue University
West Lafayette, IN 47907

MEMBERS OF THE MICHIGAN GEOLOGIC MAPPING ADVISORY COMMITTEE

Dave Frey
Land Information Access Ass.
322 Munson Avenue
Traverse City, Michigan 49686
616-929-3696

Tom Seagall
MI Rural Water Association
7008 Soapstone
Lansing, Michigan 48917
517-327-0399

Tom McClain
University of Michigan Flint Campus
Regional Groundwater Cntr, #529 MSB
Flint, Michigan 48502

Sean Duffey
Nat. Res. Conservation Service
1405 South Harrison Road
East Lansing, Michigan 48823
517-337-1245

Terry McNeil
Michigan Dept. of Transportation
Materials & Technology Bldg, Box 30049
Lansing, Michigan 48909
517-322-1206

Kevin Kincare
MI Dept. of Environmental Quality
Geological Survey Div., 735 E. Hazel
Lansing, Michigan 48912
517-334-6970

MEMBERS OF THE OHIO GEOLOGIC MAPPING ADVISORY COMMITTEE

E. Scott Blair
Ohio State University
275 Mendenhall Lab, 125 S. Oval Mall
Columbus, Ohio 43210-1178
614-292-6197

Mark R. Boardman
Geology Department
Miami University
Oxford, Ohio 45046
513-529-3216

Michael T. Puskarich
Cravat Coal Company
40580 Cadiz-Piedmont Road
Cadiz, Ohio 43907
614-942-4656

William M. Rike
Consulting Geologist
P.O. Box 763
Worthington, Ohio 43085
614-882-4570

Mark R. Rowland
Burgess & Niple, Limited
5085 Reed Road
Columbus, Ohio 43220
614-459-2050

Ronald M. Tipton
The France Stone Company
8130 Brint Road, PO Box 278
Sylvania, Ohio 43560-0278
419-882-0123

Jenny Rytel
3945 Ki oka Avenue
Columbus, Ohio 43320
614-442-7557

STATE OF ILLINOIS STATISTICS

Population (1996): 11.8 million: 8 million in the Chicago megalopolis

Gross State Product (1996): $365 billion (5% of U.S. Gross National Product)
If it were a country, Illinois would have the 12th largest economy in the world, and it is second to California in the number of corporate headquarters of Fortune 500 companies.

Number of 1:24,000 scale USGS Quadrangles: 1071

Acres: 36 million

Superfund Information for Illinois

NPL superfund Sites:	39
Proposed NPL Sites:	12
Notice Response Active Sites:	130
SPAPL (State Superfund):	100
Volunteer Clean-up:	1000

Some Superfund Costs

LaSalle Electric Utility:	$50 million
Crab Orchard PCB:	$46 million
A&F Materials:	$15 million
Parsons (Belvidere)	$5 million
SE Rockford	$40 million
Velsicol	about $30 million
Johnson Outboard (Waukegan)	$30 million to $40 million

Note: The cost cleanup of these 7 sites in Illinois is ***more than twice*** the cost of the proposed mapping program for the 4 states over 17 years.

The average site costs about $ 15 million to cleanup today, and considering the older sites which historically have been the worst, the overall average cost clean-up is about $20 million per site. At this rate, the cost of clean-up for just the superfund sites is about a half billion dollars.

"Political pollster Peter Hart call Illinois '...the best bellwether state in America. It is a state that has it all: north, south, urban, rural, black, white, hispanic. What usually plays well nationally plays pretty well in Illinois.' By extension, what plays out in Illinois very often has national parallels-." (p. 10)

Northeastern Illinois Planning Commission noted that "over two decades the region's population (including Chicago and the collar counties) increased by only 4.1 percent while residential land consumption jumped 45 percent ... These two forces-decentralized activity and increasing land consumption-have produced the opposite of our vision: a region beset by traffic congestion, higher housing costs, polluted streams and contaminated soils, abandonment of older communities, and the loss of prime.farmland and open space..." (P.25)

Source of Quotes: Gove, Samuel K. and James D. Nowlan, 1996,. Illinois Politics and Government. University of Nebraska Press.