WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN ILLINOIS, 1988

Compiled by Mary L. Garrelts

U.S. GEOLOGICAL SURVEY

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Urbana, Illinois

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DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

U.S. GEOLOGICAL SURVEY

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Federal Center, Box 25425
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WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN ILLINOIS, 1988

By Mary L. Garrelts

ORIGIN AND MISSION OF THE U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey was established by an Act of Congress on March 3, 1879, to provide a permanent Federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain."

Since 1879, the research and factfinding role of the U.S. Geological Survey (Survey) has grown and has been modified to meet the changing needs of the Nation it serves. The Survey, however, has remained principally a scientific and technical agency rather than a developmental or regulatory one. Today's programs serve a diversity of needs and users. The current mission of the Survey is to provide geologic, topographic, and hydrologic information that contributes to the wise management of the Nation's natural resources and that promotes the health, safety, and well-being of the people. This information consists of maps, data bases, and descriptions and analyses of the water, energy, and mineral resources, the land surface, the underlying geologic structure, and the dynamic processes of the Earth. To accomplish its mission, the Survey:

- Conducts and sponsors research in geology, hydrology, mapping, and related sciences.
- Produces and updates geographic, cartographic, and remotely sensed information in graphic and digital forms.
- Describes the onshore and offshore geologic framework and develops an understanding of its formation and evolution.
- Assesses energy and mineral resources, determines their origin and manner of occurrence, and develops techniques for their discovery.
- Collects and analyzes data on the quantity and quality of surface water and ground water, on water use, and on quality of precipitation.
- Assesses water resources and develops an understanding of the impact of human activities and natural phenomena on hydrologic systems.
- Evaluates hazards associated with earthquakes, volcanoes, floods, droughts, toxic materials, landslides, subsidence, and other ground failures, and develops methods for hazards prediction.

- Participates in the exploration of space and prepares geologic and other maps of the planets and their satellites.

- Publishes reports and maps, establishes and maintains earth-science data bases, and disseminates earth-science data and information.

- Provides scientific and technical assistance for the effective use of earth-science techniques, products, and information.

- Coordinates topographic, geologic, and land-use mapping, digital cartography, and water-data activities.

- Develops new technologies for the collection, coordination, and interpretation of earth-science data.

- Provides scientific support and technical advice for legislative, regulatory, and management decisions.

- Cooperates with other Federal, State, and local agencies, and with academia and industry.

As the Nation's largest earth-science research agency, the Survey maintains a long tradition of providing accurate and impartial information to all, which underscores its continued dedication to "Earth Science in the Public Service."

MISSION OF THE WATER RESOURCES DIVISION

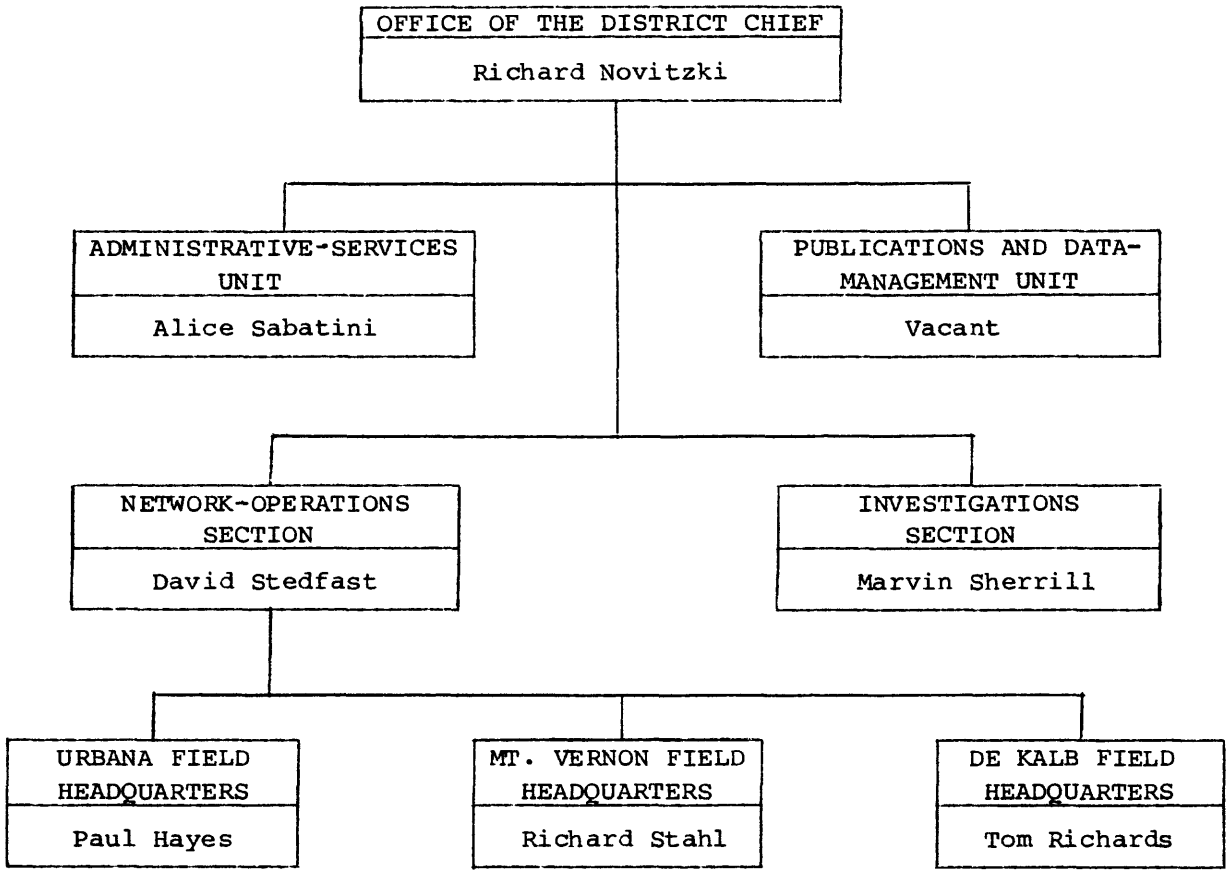
The U.S. Geological Survey has the principal responsibility within the Federal Government to provide the hydrologic information and understanding needed by others to achieve the best use and management of the Nation's water resources. To accomplish this mission, the Water Resources Division in cooperation with State, local, and other Federal agencies:

- Systematically collects data needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.

- Conducts analytical and interpretive water-resources appraisals to describe the occurrence, availability, and physical, chemical, and biological characteristics of surface and ground water and their interrelationship.

- Conducts supportive basic and problem-oriented research in hydraulics, hydrology, and related fields of science and engineering to improve the basis for field investigations and measurement techniques and to understand hydrologic systems sufficiently well to predict quantitatively their response to stress, either natural or manmade.

- Disseminates water data and the results of investigations and research through reports, maps, computerized information services, and other forms of public releases.



District Office	(217) 398-5353	U.S. Geological Survey 102 E. Main Street, 4th Floor Urbana, Illinois 61801
Urbana Field Headquarters	(217) 398-5570	U.S. Geological Survey 102 E. Main Street, 4th Floor Urbana, Illinois 61801
Mt. Vernon Field Headquarters	(618) 242-4495	U.S. Geological Survey Room 231, Federal Building 105 S. Sixth Street Mt. Vernon, Illinois 62864
De Kalb Field Headquarters	(815) 753-1162	U.S. Geological Survey 629 Lincoln Terrace P.O. Box 427 De Kalb, Illinois 60115

Figure 1.--Illinois District organization chart with office addresses.

- Coordinates the activities of all Federal agencies in the acquisition of certain water data.

- Provides scientific and technical assistance in hydrologic fields to State, local, and other Federal agencies, to licensees of the Federal Energy Regulatory Commission, and, on behalf of the U.S. Department of State, to international agencies.

- Acquires, develops, and disseminates information on water-related natural hazards such as droughts, floods, landslides, land subsidence, mudflows, and volcanoes.

- Administers the provisions of the Water Resources Research Act of 1984 which include the State Water Resources Research Institutes and the Research Grants and Contracts programs.

- Supports the provisions of the National Environmental Policy Act of 1969 and manages Geological Survey conduct of natural-resources surveys in response to the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Act) of 1980.

ILLINOIS DISTRICT ORGANIZATION

The Illinois District of the U.S. Geological Survey, Water Resources Division, consists of two support units, two operating sections, and three field headquarters (fig. 1). Personnel are based at the District office and at Field Headquarters in Urbana, Mt. Vernon, and De Kalb. The District operates with guidance from Regional and National offices in Reston, Virginia. Offices for research, training, equipment development, and laboratory services, located throughout the United States, provide technical assistance and advice to the District.

Publications and Data-Management Unit

This support unit assembles reports for review, prepares camera-ready copy for publication, and maintains the District's data files and library. The unit provides data processing services, maintains computer manuals and program catalogs, does computer programming, and assists hydrologists in program selection, application, and modification.

Administrative-Services Unit

The Administrative-Services Unit is responsible for the maintenance of and compliance with Federal acquisition regulations, Departmental manuals, and Bureau and Division operating policies. The Unit provides support services in the areas of administrative management, budget formulation and execution, financial planning and accounting, personnel, procurement, space management, and general office procedures.

Investigations Section

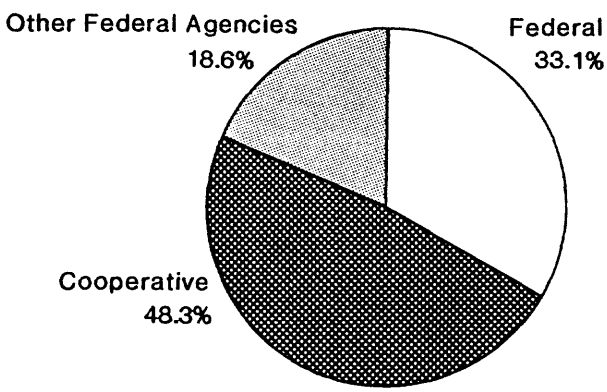
The Investigations Section conducts multi-discipline hydrologic investigations to determine the quantity and quality of surface and ground water and to define and evaluate the extent and availability of water resources of drainage basins, counties, State, and water-resources regions. The Section conducts special hydrologic and research studies on current water issues such as coal hydrology, radiohydrology, sedimentation and erosion, urban hydrology, water disposal, and river quality. Special investigative techniques for water-resource evaluation include the use of test drilling, packer tests, tracers, surface and borehole geophysics, and ground-water and surface-water modeling of flow and solute movement. Personnel prepare and review reports of investigations for both scientific and lay audiences.

Network-Operations Section

The Network-Operations Section designs and implements a network of stream-gaging, water-quality, sediment, and observation-well sites based on data needs. The Section directs the installation and maintenance of equipment, data collection and analysis, and compilation of records for publication in the annual data report. It maintains the drainage-area map file and all hydrologic-data files. The Section conducts special data-collection efforts as needed or on demand including, for example, major floods, low-flow measurements, and indirect measurements, and provides assistance in the collection of water-resources data in support of projects. The Section conducts special projects related to water use and coordinates the water-use program. Field offices are responsible for data collection in their designated areas (fig. 2) and report to the Chief, Network-Operations Section.

ILLINOIS DISTRICT FUNDING SOURCES

Funds to support the work performed by the Illinois District, Water Resources Division, are derived from three principal sources--Federal program, Federal-State cooperative program, and other Federal agencies program. Funding from all sources in fiscal year 1988 amounted to about $3,620,000, which was distributed as follows:



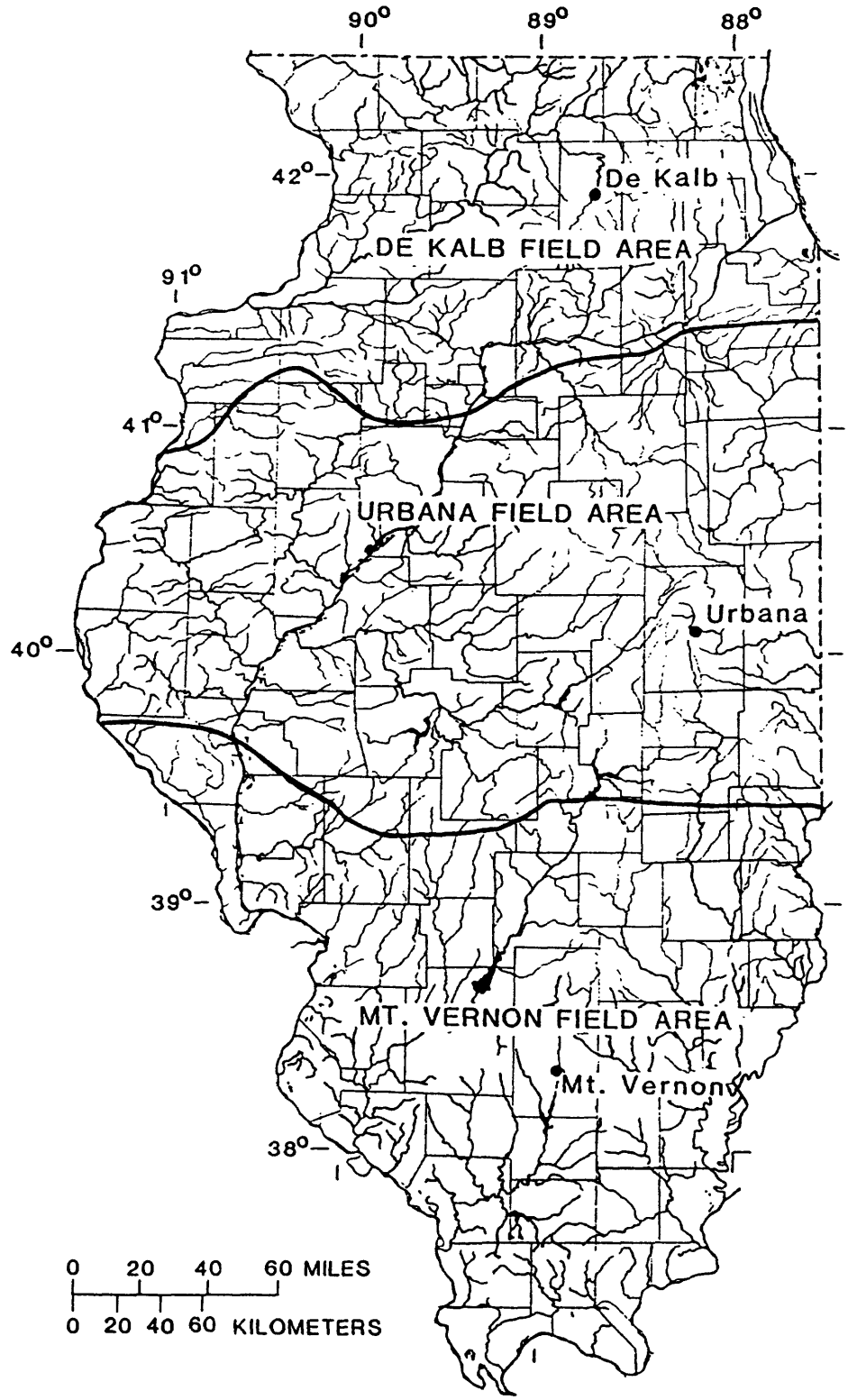
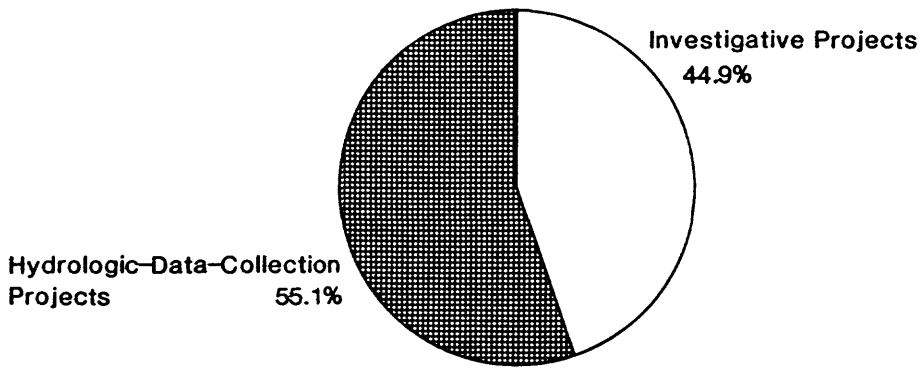


Figure 2.--Field headquarter areas of responsibility.

The diagram below shows the percentage of the activities for fiscal year 1988 in each of the broad categories of hydrologic data collection and water-resource investigations:



The activities are directed toward obtaining the information needed by managers and planners for the solution or alleviation of water problems in Illinois and the Nation.

Federal Program

Funds for the Federal Program are appropriated by the Congress and are specifically identified in the annual Geological Survey budget. These funds are used to support research, data collection, high-priority topical programs including energy-related programs, the coordination of all Federal programs related to collection of water data, and internal support services.

Federal-State Cooperative Program

Federal funds are appropriated by the Congress and used to match those furnished by State and other tax-supported agencies on a 50-50 basis. These funds are used for a variety of hydrologic data-collection activities and water-resources investigations in which the Water Resources Division represents the national responsibilities and the cooperating agencies represent State and local interests. Agencies supporting water-resources activities in Illinois during fiscal year 1988 are listed in table 1.

Other Federal Agencies (OFA) Program

In this program, the funds are transferred to the Geological Survey as reimbursement for work performed at the request of another Federal agency.

Table 1.--Agencies supporting water-resources activities during fiscal year 1988

State Agencies

Illinois Department of Transportation
  Division of Water Resources

Illinois Environmental Protection Agency
  Division of Water Pollution Control
  Division of Public Water Supplies

Illinois Department of Energy and Natural Resources
  Water Survey Division

Board of Trustees of the University of Illinois
  State Water Survey

Local Agencies

Forest Preserve District of Cook County

Forest Preserve District of Du Page County

Du Page County Department of Environmental Concerns

Conservation District of Vermilion County

The Metropolitan Sanitary District of Greater Chicago

Bloomington and Normal Sanitary District

City of Springfield

City of Decatur

City of De Kalb

Federal Agencies

Department of the Army
  Corps of Engineers
    Rock Island District
    St. Louis District
    Louisville District
    Chicago District

Environmental Protection Agency, Region V

WATER CONDITIONS

Illinois generally has adequate supplies of water suitable for most uses. The mean annual precipitation for the 1951-80 period is shown in figure 3. Water is available from several major rivers and lakes within or bordering Illinois and from ground-water sources. In the northern one-third of the State, most municipal water supplies are obtained from ground water, whereas, in the remainder of the State, municipal supplies generally are obtained from surface-water sources. In the southern two-thirds of the State, potable ground water may be obtained locally from shallow alluvium-filled valleys that were eroded into the bedrock by ancestral streams.

The Water Resources Division is the principal Federal agency responsible for providing hydrologic information required for the best utilization and management of the Nation's water resources. The activities of the Illinois District are structured to provide data and information needed to meet these needs.

SURFACE-WATER DATA STATIONS

Discharge and Stage Stations

Surface-water discharge (streamflow) and stage (water level) data are collected for general hydrologic purposes such as assessments of water resources, areal analyses, determination of long-term trends, research and special studies, or for management and operational purposes. In Illinois, data on discharge and stage were obtained at the following numbers of stations:

Station classification		Number of stations
Stream stations		167
Continuous record:		
Discharge	135	
Discharge for 7 months only	4	
Stage only	4	
Partial record:		
Peak (maximum) flow only	24	
Lake and reservoir stations		8
Stage and contents	3	
Stage only	5	
Total		175

The locations of sites where streamflow or stage are collected are shown in figure 4, and the types of data collected are shown in table 2. Average runoff for the 1951-80 period is shown in figure 5.

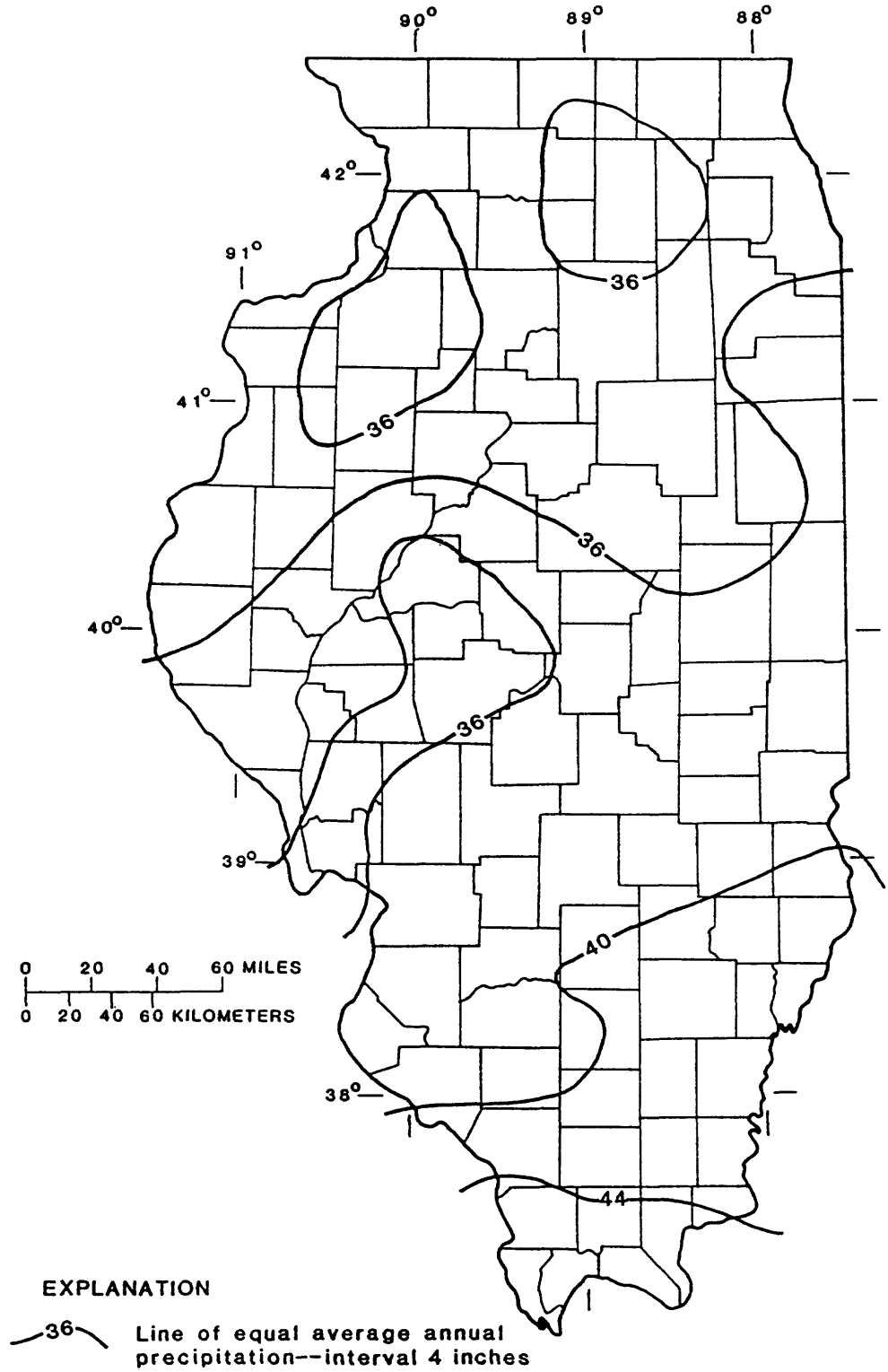


Figure 3.--Average annual precipitation in Illinois, 1951-80 (from unpublished map compiled by D. A. Olson, National Oceanic and Atmospheric Administration).

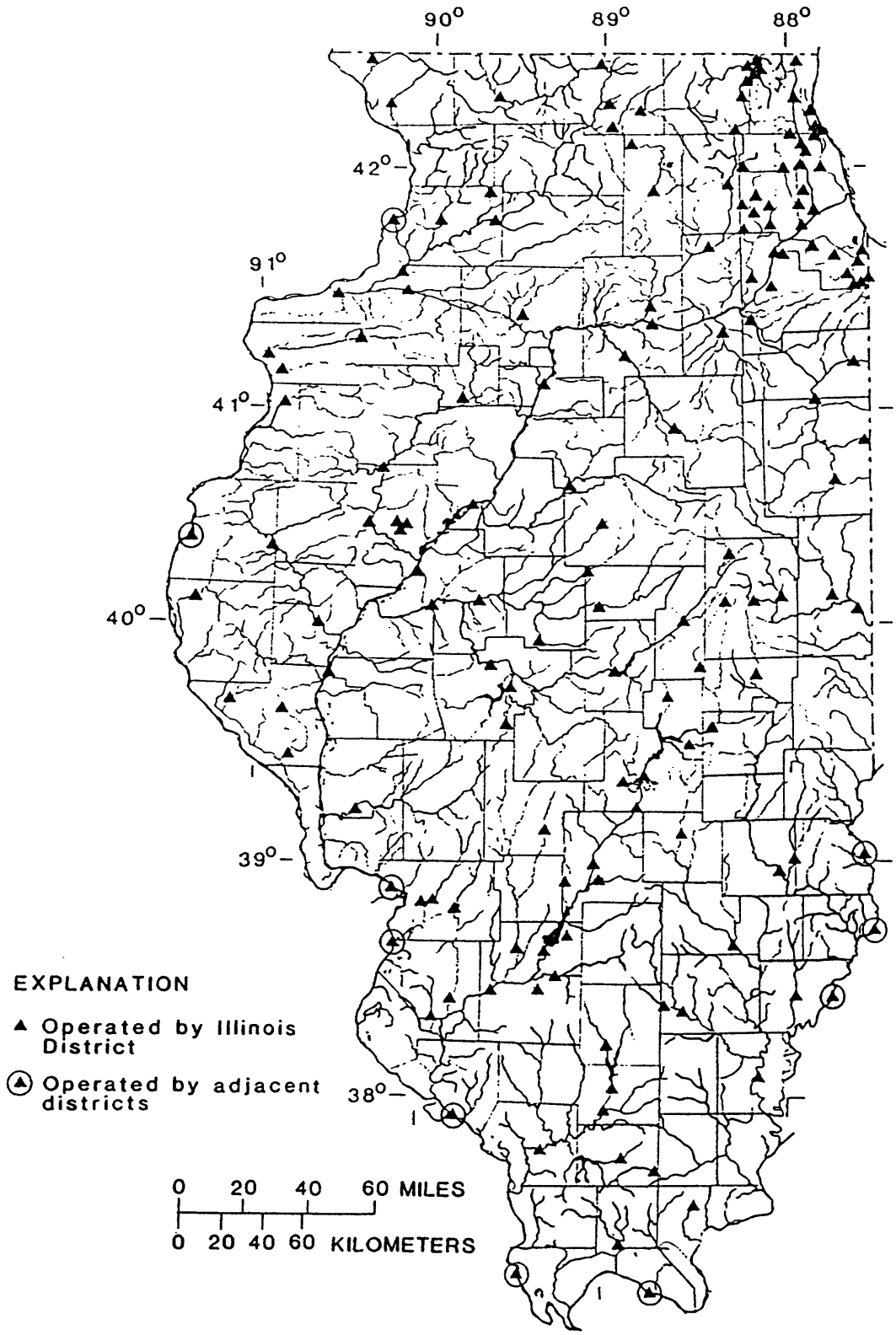


Figure 4.--Discharge and stage stations.

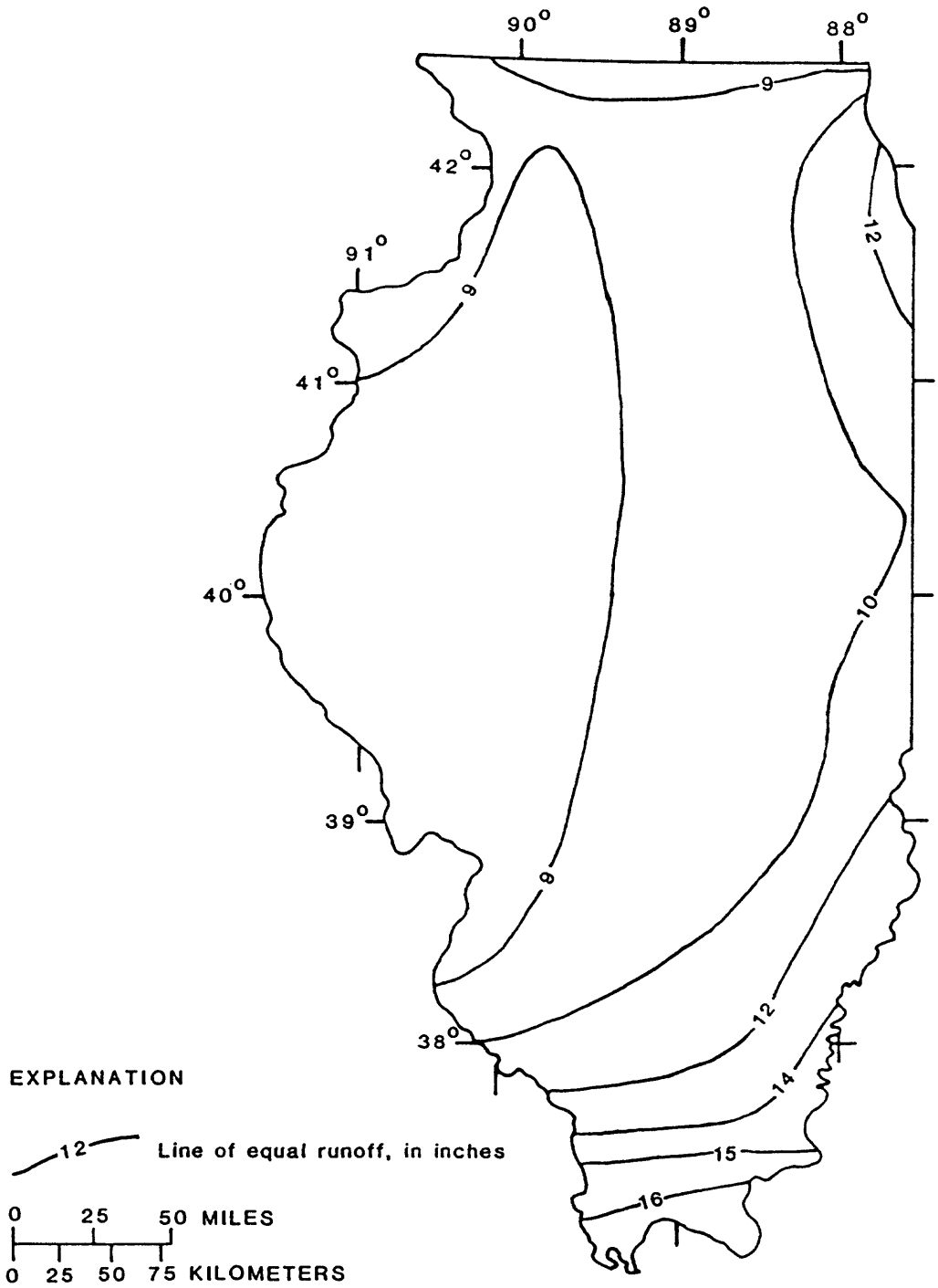


Figure 5.--Average annual runoff, in inches, 1951-80 (from Gebert, Graczyk, and Krug, 1985).

Water-Quality Stations

Data collected from 160 water-quality sampling stations, operated jointly by the U.S. Geological Survey and the Illinois Environmental Protection Agency (IEPA) during fiscal year 1988 are shown in figure 6 and are listed in table 2.

The 160-station network includes three stations operated in cooperation with the Metropolitan Sanitary District of Greater Chicago and 9 stations operated as part of the Survey's National Stream Quality Accounting Network (NASQAN) program. Two of these stations are operated by States adjacent to Illinois. Daily or near-daily sediment samples were collected and daily sediment records are computed at four stations.

Data classification	Number of stations
Physical data:	
Water temperature	160
Specific conductance	160
pH	160
Dissolved oxygen	160
Sediment data	4
Chemical data:	
Inorganic constituents	160
Organic constituents	160
Microbiological data	160

GROUND-WATER DATA SITES

Water levels in wells, discharges of springs and wells, and water-quality analyses are used in monitoring ground-water trends; however, these hydrologic data must be integrated with other observations and ground-water system studies in order to fully assess these trends. In Illinois, the U.S. Geological Survey regularly measures water levels in seven observation wells. Four of the seven wells are piezometers open at different depths at one site. The data for the wells in Cook County are being collected for specific purposes relating to an ongoing hydrologic study.

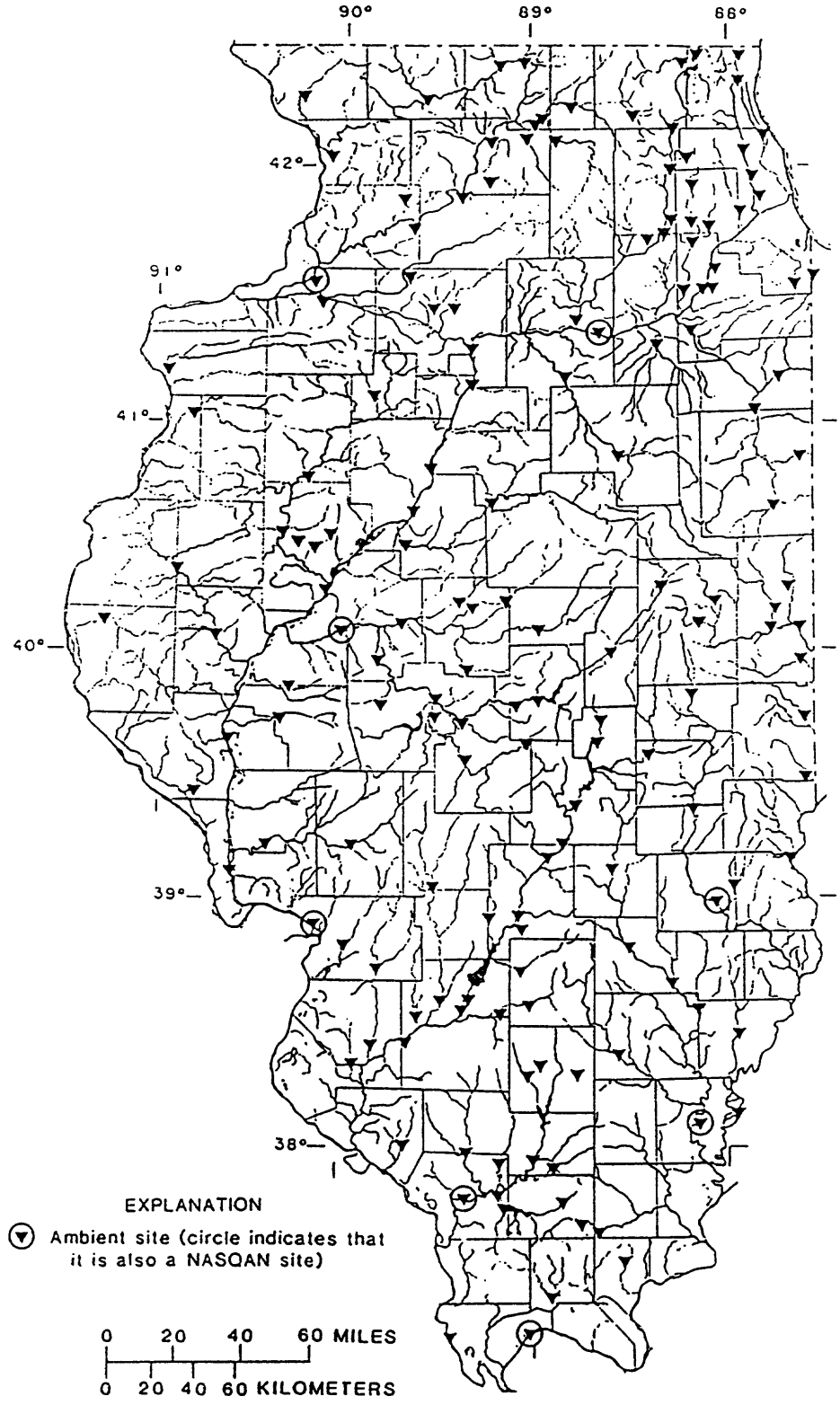


Figure 6.--Water-quality stations.

The types of data collected for observation and project wells are as follows:

Data type	Number of wells
Water levels	24
Physical data:	
Water temperature	17
Specific conductance	17
pH	17
Chemical data:	
Inorganic constituents	17

The ground-water stations and types of data collected are listed in table 3. No water-quality data are regularly collected at the seven observation wells. Numbers of wells, by county, in the water-level observation network are shown in figure 7.

DATA MANAGEMENT

The Water Resources Division manages data from its own activities and from the activities of other water-oriented agencies.

WATSTORE

The National Water Data Storage and Retrieval System (WATSTORE) of the U.S. Geological Survey was established in November 1971 to computerize the water-data system of the U.S. Geological Survey and to provide for more effective and efficient management of its data-releasing activities. The system is operated and maintained on the central computer facilities of the U.S. Geological Survey at its National Center in Reston, Virginia, and on PRIME computers in District offices throughout the Nation as part of the Distributed Information System (DIS). Data may be obtained from WATSTORE through the 46 district offices of the Water Resources Division. General inquiries about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, VA 22092

or

U.S. Geological Survey
Water Resources Division
4th Floor
102 East Main Street
Urbana, IL 61801.

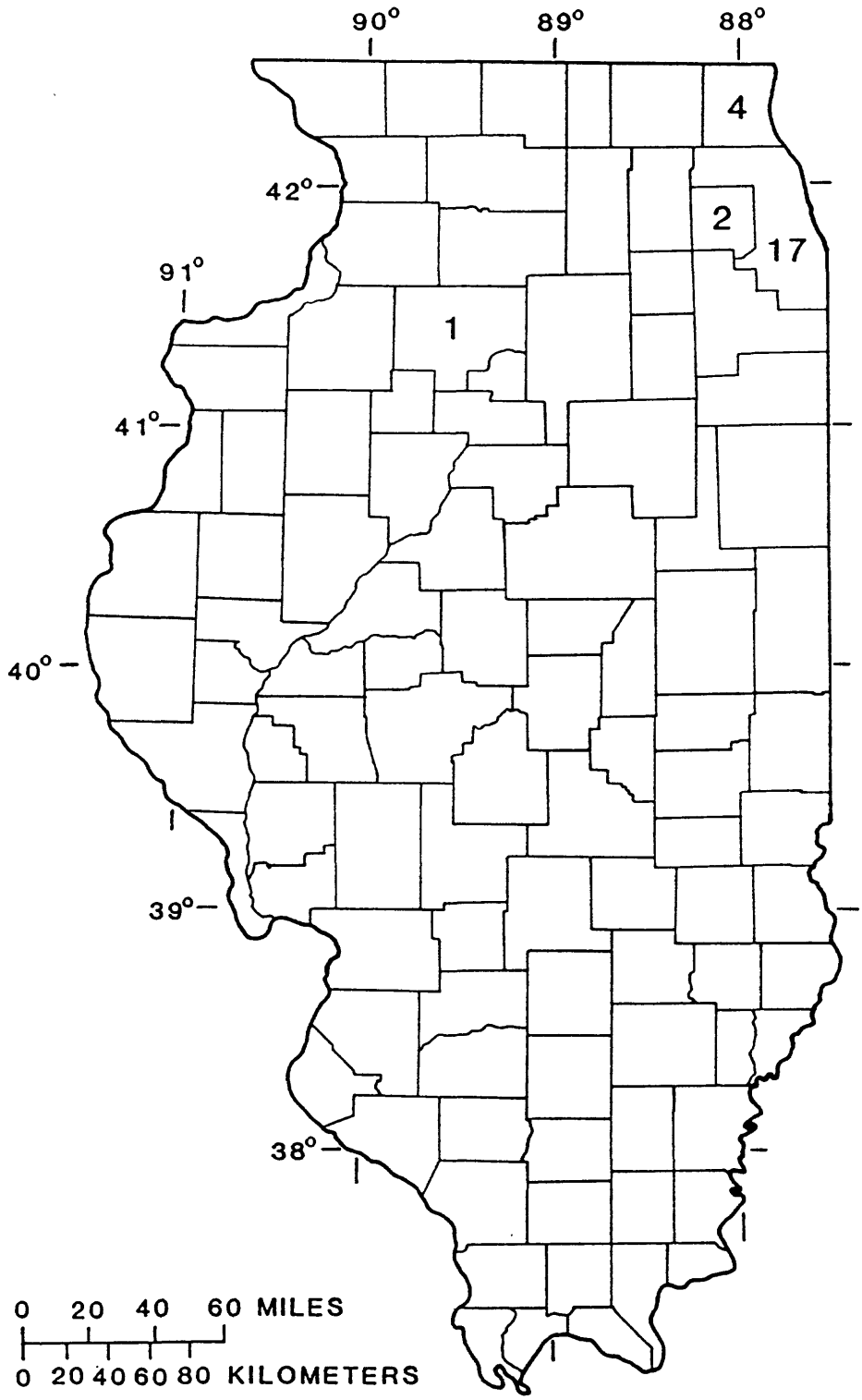


Figure 7.--Number of wells, by county, in the ground-water observation network.

NAWDEX

The National Water-Data Exchange (NAWDEX) is a nationwide program managed by the U.S. Geological Survey to assist users of water data or water-related data in identifying, locating, and acquiring needed data. It is a national confederation of water-oriented organizations working together to make their data more readily accessible and to facilitate a more efficient exchange of water data.

Services are available through a Program Office at the U.S. Geological Survey National Center in Reston, Virginia, and a nationwide network of Assistance Centers in 45 States and Puerto Rico, which provide local and convenient access to NAWDEX facilities. A directory that provides names of organizations and persons to contact, as well as addresses, telephone numbers, and office hours for each of these organizations is available on request (Josefson and Blackwell, 1982).

NAWDEX can assist any organization or individual in identifying and locating water data. To accomplish this service, NAWDEX maintains a computerized Master Water-Data Index (MWDI) which identifies sites for which water data are available, the type of data available for each site, and the organization retaining the data. NAWDEX also maintains a Water-Data Sources Directory identifying organizations from which water data may be obtained. In addition, NAWDEX has direct access to some large water-data bases of its members and has reciprocal agreements for the exchange of services with others.

For additional information concerning the NAWDEX program or its services contact:

Program Office
National Water-Data Exchange (NAWDEX)
U.S. Geological Survey
421 National Center
12201 Sunrise Valley Drive
Reston, VA 22092

Telephone: (703) 648-5663
FTS 959-5663

Hours: 7:45 to 4:15 eastern time

or

NAWDEX ASSISTANCE CENTER
Illinois
U.S. Geological Survey
Water Resources Division
4th Floor
102 East Main Street
Urbana, IL 61801

Telephone: (217) 398-5353
FTS 958-5353

Hours: 8:00 to 4:30 central time

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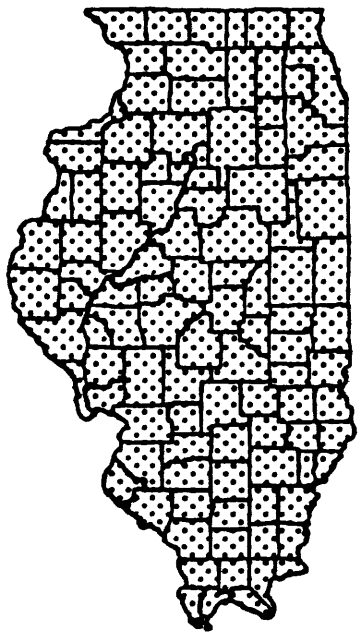
DESCRIPTION OF PROJECTS IN 1988

IL001 SURFACE-WATER STATIONS



*** PROJECT TITLE *** Surface-Water Stations

*** PROBLEM *** Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management, in water-related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water-resources development. To provide this information an appropriate data base is necessary.

*** OBJECTIVES *** A. To collect surface-water data sufficient to satisfy needs for current-purpose uses, such as (1) assessment of water resources, (2) operation of reservoirs or industries, (3) forecasting, (4) disposal of wastes and pollution controls, (5) discharge data to accompany water-quality measurements, (6) compact and legal requirements, and (7) research or special studies.

B. To collect data necessary for analytical studies to define for any location the statistical properties of, and trends in, the occurrence of water in streams, lakes, etc., for use in planning and design.

*** APPROACH *** Standard methods of data collection will be used as described in the report series, "Techniques of Water Resources Investigations of the United States Geological Survey." Partial-record gaging will be used instead of complete-record gaging where it serves the required purpose.

*** SUMMARY OF RESULTS *** Routine data collection of surface water information was done for 134 continuous-record stations, 24 partial-record stations, 9 stage only stations, and 3 miscellaneous measurement stations. About 700 discharge measurements were made at 173 gaged sites during the period June 1 to September 30, 1988, to document drought conditions. Installed CR-10 data loggers with telephone modems at 12 continuous-record stations.

*** PLANS NEXT YEAR *** Continue surface-water data collection with modifications to the network. Install CR-10 data loggers with telephone modems at approximately 10 continuous-record stations. Add two continuous-record stations to the network.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** G. Wayne Curtis

*** PERIOD OF PROJECT *** Continuous since July 1930

*** COOPERATORS ***

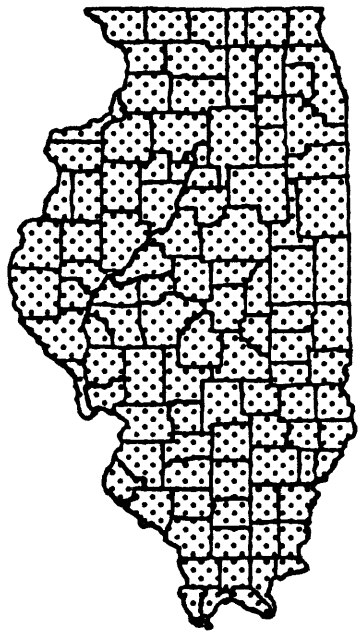
Illinois Department of Transportation, Division of Water Resources
Illinois Department of Energy and Natural Resources, State Water Survey
Metropolitan Sanitary District of Greater Chicago
Bloomington and Normal Sanitary District
Forest Preserve District of Cook County
Forest Preserve District of Du Page County
City of De Kalb
City of Decatur
City of Springfield
U.S. Army Corps of Engineers
Rock Island District
St. Louis District
Louisville District
Chicago District

*** PUBLISHED REPORTS ***

Stahl, R. L., Fitzgerald, K. K., Richards, T. E., and Hayes, P. D., 1988, Water resources data--Illinois, water year 1987, Volume 1. Illinois except Illinois River basin: U.S. Geological Survey Water-Data Report IL-87-1, 482 p.

Fitzgerald, K. K., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1988, Water resources data--Illinois, water year 1987, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-87-2, 492 p.

IL002 GROUND-WATER STATIONS



*** PROJECT TITLE *** Ground-Water Stations

*** PROBLEM *** Water-resource planning and ground-water quantity and quality assessment require a statewide base level of relatively standardized data. In Illinois, concentrated urbanization in the northeastern Chicago area and intense farming and mining in much of the State require monitoring of ground water to assess the the impact of man's activities on existing and potential water uses.

*** OBJECTIVES *** To provide high quality data from a network of monitoring stations across the State and to achieve timely dissemination of data from this network, to all potential users, in a readily usable form.

*** APPROACH *** Coordinate ground-water data gathering efforts with State, local, and other Federal agencies in Illinois. Efforts will be directed to having all participants use current and uniform data collection and reporting procedures. Data collection is planned to meet site-specific needs and to provide a statewide baseline of information from which to evaluate the general status of the State's ground-water quantity and quality.

*** SUMMARY OF RESULTS *** Measured water levels at two wells in Du Page County and one well in Bureau County. Collected water samples from four zones in the deep (3,475 feet) Zion test well in anticipation of including it in the network.

*** PLANS NEXT YEAR *** Continue water-level data collection. Collect water-level data from the four zones in the Zion test well using transducers and a data logger.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

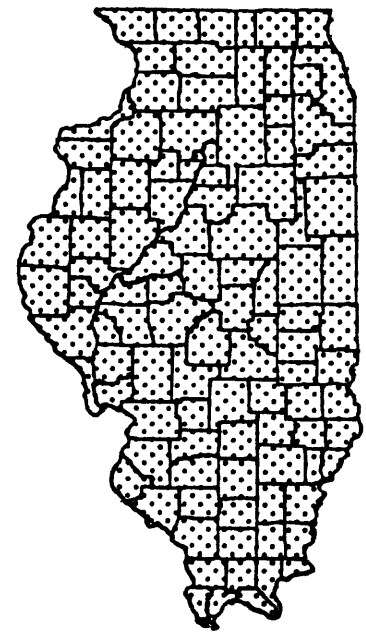
*** PROJECT CHIEF *** Charles F. Avery

*** PERIOD OF PROJECT *** Continuous since April 1982

*** PUBLISHED REPORTS ***

Fitzgerald, K. K., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1988, Water resources data--Illinois, water year 1987, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-87-2, 492 p.

IL003 WATER-QUALITY STATIONS



*** PROJECT TITLE *** Water-Quality Stations

*** PROBLEM *** Water-resource planning and water-quality assessment require a statewide base level of relatively standardized data. In Illinois, dense urbanization, especially in the northeast corner, and intense farming and mining in other parts of the State require monitoring to assess the impact of man's activities on existing and potential water uses.

*** OBJECTIVES *** To provide high quality data from an extensive and coherent network of monitoring stations across the State. To achieve timely dissemination of data from this network, to all potential users, in a readily usable form.

*** APPROACH *** Coordinate surface-water-quality data-gathering efforts among the Survey and State, local, and other Federal agencies in Illinois. Efforts will be directed toward having all participants use current and uniform sampling, analytical, and data reporting procedures. Sampling and data collection are tailored to meet site-specific needs and to supply a baseline of information from which to evaluate the general nature of the State's surface-water quality.

*** SUMMARY OF RESULTS *** Quality assurance (QA) programs applied to field data collection and direct-service laboratory activities with Illinois Environmental Protection Agency (IEPA) have continued. All data from IEPA and Water Resources Division (WRD) laboratories have been reviewed and prepared for publication. Discharge values have been applied to the chemical data where possible.

*** PLANS NEXT YEAR *** Data collection will be discontinued at 49 stations where there are no continuous-discharge records. Continue data collection and quality assurance activities at 107 stations.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** Richard H. Coupe, Jr.

*** PERIOD OF PROJECT *** Continuous since June 1967

*** COOPERATORS ***
Illinois Environmental Protection Agency, Division of Water Pollution Control
Metropolitan Sanitary District of Greater Chicago
Forest Preserve District of Du Page County

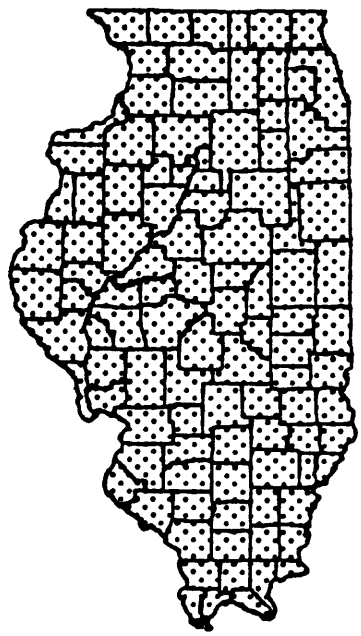
*** PUBLISHED REPORTS ***

Stahl, R. L., Fitzgerald, K. K., Richards, T. E., and Hayes, P. D., 1988, Water resources data--Illinois, water year 1987, Volume 1. Illinois except Illinois River basin: U.S. Geological Survey Water-Data Report IL-87-1, 482 p.

Fitzgerald, K. K., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1988, Water resources data--Illinois, water year 1987, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-87-2, 492 p.

IL004 SEDIMENT STATIONS

*** PROJECT TITLE *** Sediment Stations



*** PROBLEM *** Water-resource planning and water-quality assessment require a nationwide base level of information. Sediment concentrations and discharges in streams must be defined and monitored. A large percentage of the land in Illinois is devoted to agriculture whereby the land is exposed to erosion. Recent studies conducted under Section 208 of Public Law 92-500 have suggested sediment may be a major cause of water-quality degradation in Illinois. Other activities, such as highway construction and industrial and residential development, contribute sediment to streams. Planning and regulatory agencies need a data base for evaluation of sediment transport in streams.

*** OBJECTIVES *** To provide a data bank for evaluating sediment problems in Illinois and a base from which the effectiveness of erosion control programs can be evaluated for their effect on water quality. To contribute to the national bank of sediment data for use in broad Federal and State planning and action programs and to provide data for Federal management of interstate waters.

*** APPROACH *** Establish and operate a network of sediment stations on Illinois streams to develop records of daily discharge of suspended sediment. Suspended-sediment stations will be located at long-term continuous-record surface-water discharge stations and will be used to establish relations between suspended-sediment discharge and surface-water discharge. These relations will be used to estimate long-term suspended-sediment yields of selected basins and predominant land use areas. Supplementary information at most stations will include particle-size determinations of suspended-sediment and bed-material samples.

*** SUMMARY OF RESULTS *** Suspended-sediment samples were collected and analyzed, and daily suspended-sediment concentrations and loads were computed for four sites.

*** PLANS NEXT YEAR *** Prepare and publish the 1988 water year suspended-sediment data. Collect and analyze samples and compute suspended-sediment discharge record for four sites.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** Elmer E. Zuehls, Jr.

*** PERIOD OF PROJECT *** Continuous since January 1976

*** COOPERATORS ***

U.S. Army Corps of Engineers, St. Louis District

*** PUBLISHED REPORTS ***

Stahl, R. L., Fitzgerald, K. K., Richards, T. E., and Hayes, P. D., 1988, Water resources data--Illinois, water year 1987, Volume 1. Illinois except Illinois River basin: U.S. Geological Survey Water-Data Report IL-87-1, 482 p.

Fitzgerald, K. K., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1988, Water resources data--Illinois, water year 1987, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-87-2, 492 p.

IL005 ACID RAIN STUDY

*** PROJECT TITLE *** National Atmospheric Deposition Chemistry Data Base

*** PROBLEM *** Precipitation data from the National Atmospheric Deposition Program (NADP) needs to be stored in the National Water Information System (NWIS) on a PRIME minicomputer so that the data can be accessed by users nationally.

*** OBJECTIVES *** (1) The data received from Colorado State University are to be reformatted for entry into a data base on the Illinois District PRIME. (2) The data will be entered into a data base on the PRIME. (3) The data will be made available to users throughout the Nation.

*** APPROACH *** Each quarter, the National Atmospheric Deposition Program at Colorado State University will put new and updated data on a magnetic tape and send it to the Illinois District. The data will be reformatted and entered into a data base on the District's PRIME minicomputer. This data base interfaces with National Water Information System (NWIS) and is available to outside users.

*** SUMMARY OF RESULTS *** A computer program was written to reformat data received from the National Atmospheric Deposition Program (NADP) at Colorado State University so that the data can be entered into a data base on the Illinois District PRIME minicomputer. Data for the period July 1978 through February 1988 have been entered into the data base.

*** PLANS FOR NEXT YEAR *** Data will be obtained quarterly from the NADP at Colorado State University and will be entered into a data base on the Illinois District PRIME minicomputer. New parameter codes have been obtained, and the data will be reformatted to these new codes.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Topical Research. Scope is Nationwide.

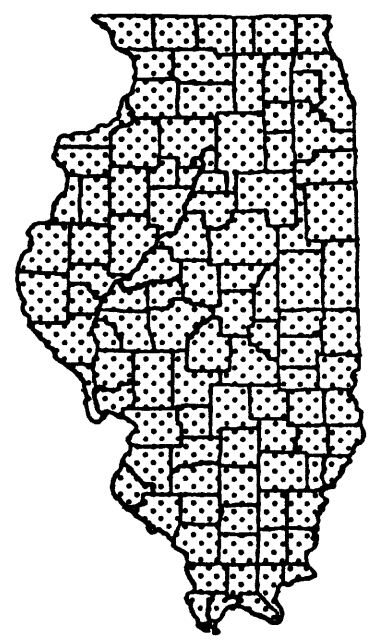
*** PROJECT CHIEF *** Richard H. Coupe, Jr.

*** PERIOD OF PROJECT *** Continuous since May 1986

IL007 WATER USE

*** PROJECT TITLE *** Water Use

*** PROBLEM *** A water supply is adequate or not depending upon present and future demands. Information is being collected in great detail describing the quantity and quality of available water in Illinois. However, water-use inventories generally have been conducted only intermittently or when a water supply has been adversely affected. Competing demands for water in Illinois dictate that adequate water-use information is essential for the proper management of available supplies.



*** OBJECTIVES *** To conduct a comprehensive, continuing, and authoritative water-use inventory throughout the State of Illinois as a basis for present analyses and future projections. To develop and maintain water-use inventories that will meet the data needs of

users at the local, State, and National levels. To collect, store, and disseminate water-use data that will complement the data on availability and quality of the State's water resources. To establish methods of estimating water use.

*** APPROACH *** Responsibilities will be divided between the Illinois State Water Survey (ISWS), Illinois Environmental Protection Agency (IEPA), and the U.S. Geological Survey (USGS). The ISWS will collect water withdrawal and delivery data by mailing questionnaires to water users throughout the State. The responses will be classified by water-use category (domestic, commercial, industrial, mining, fossil-fuel power, nuclear power, hydroelectric, agriculture, and irrigation) and aggregated by category and location (county, hydrologic unit, aquifer, township). These aggregated data will then be entered into the Aggregated Water Use Data System (AWUDS). The USGS will collect, classify, and aggregate return data for entry in the State Water Use Data Systems (NEWSWUDS). This will be accomplished by compiling and manipulating data received from IEPA's National Pollution Discharge Elimination System (NPDES) computer and data files. The USGS will coordinate with the ISWS and the IEPA in the collection of water-use data and maintain standards that will meet National needs.

*** SUMMARY OF RESULTS *** Methods for estimating deliveries, releases, consumptive use, and conveyance losses and gains based on water-use data were developed for Kankakee and Rockford, Illinois, and may be used to estimate water uses for other cities in Illinois. Several coefficients for estimating domestic deliveries were similar among six communities. Discharge measurements made at several industrial sites demonstrated varying reliability of industrial release data. However, other measurements showed that sewage treatment return data were reliable. In cooperation with the ISWS, the 1986 water withdrawal, delivery, return, and consumptive-use data for Illinois were entered into the AWUDS. In cooperation with the IEPA, the 1986 water-return data for Illinois have been collected and entered into NEWSWUDS. A water-use summary report was prepared for the National Water Summary Water-Supply Paper. A report entitled "Water Withdrawls in Illinois, 1986" was prepared by ISWS in cooperation with USGS.

*** PLANS NEXT YEAR *** Get Director's approval for National Water Summary and Rockford/Kankakee reports. Enter 1987 water withdrawal, delivery, return, and consumptive-use data into AWUDS. Enter 1987 water-return data into AWUDS and NEWSWUDS. Gather water-return data for minor industrial facilities from discharge monitoring reports.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** John K. LaTour

*** PERIOD OF PROJECT *** Continuous since March 1978

*** COOPERATORS ***
Board of Trustees of the University of Illinois, State Water Survey
Illinois Environmental Protection Agency

*** REPORT IN PROCESS ***
Water Use in Kankakee and Rockford, Illinois, in 1984

*** PUBLISHED REPORTS ***

Kirk, J. R., Water withdrawals in Illinois, 1978: Champaign, Ill., Illinois State Water Survey Circular 140, 34 p.

Kirk, J. R., Jarboe, Jacquelyn, Sanderson, E. W., Sasman, R. T., and Lonnquist, Carl, 1982, Water withdrawals in Illinois, 1980: Champaign, Ill., Illinois State Water Survey Circular 152, 47 p.

Kirk, J. R., Sanderson, E. W., and Sasman, R. T., 1984, Water withdrawals in Illinois, 1982: Champaign, Ill., Illinois State Water Survey Circular 161, 43 p.

Kirk, J. R., Hlinka, K. J., Sasman, R. T., and Sanderson, E. W., 1985, Water withdrawals in Illinois, 1984: Champaign, Ill., Illinois State Water Survey Circular 163, 43 p.

Kirk, J. R., 1987, Water withdrawals in Illinois, 1986: Champaign, Ill., Illinois State Water Survey Circular 167, 43 p.

IL043 EROSION AT SHEFFIELD SITE

*** PROJECT TITLE *** Erosion and Landform Modification at Sheffield, Illinois, Low-Level Radioactive-Waste Disposal Site

*** PROBLEM *** Long-term retention of low-level radioactive wastes at the Sheffield radioactive-waste disposal site requires maintenance of the integrity of burial trenches and their caps as erosion reduces the surface and removes soil from exposed trench walls. Erosion can cause the following problems: (1) Reduction of stability of caps because of steepened slopes caused by gully and channel erosion; (2) slope failure due to infiltration; (3) encroachment of valleys upon trenches because of long-term landform modification; and (4) increased sediment yield to streams because of increased runoff and decreased cover.

*** OBJECTIVES *** (1) To determine rainfall-runoff relations for the site; (2) measurement of sediment yield and determination of the relationship of sediment discharge to runoff for the site; (3) determination of the types and rates of geomorphic change within the area; (4) determination of potential for erosion and slumping and identification of specific problem areas; and (5) development of a data base to which changes caused by changing practices on the site can be compared.

*** APPROACH *** Gaging stations equipped with stage recorders and automatic samplers will be established to collect data to compute sediment discharge from four watersheds of less than 10 acres, three of which will be located on-site to evaluate erosion rates, and one located off-site as an experimental control. Runoff and sediment discharge from four small watersheds (each under an acre in size), two located within the control watershed, will be computed from data obtained by decaport divisor systems. Five recording rain gages will provide rainfall distribution data for the site and control watershed. Photographic surveys and channel cross sections will be made to aid in defining land-surface changes. Data describing precipitation, runoff, and sediment discharge will be used with a precipitation-runoff model to evaluate long-term sediment yields from the study areas.

*** SUMMARY OF REPORTS *** This project is complete except for the report.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** North-central Illinois

*** PROJECT CHIEF *** John R. Gray

*** PERIOD OF PROJECT *** October 1980 to September 1986
October 1987 to March 1988

*** PLANNED REPORT ***
Runoff, Sediment Transport, and Landform Modifications at Sheffield, Illinois

*** PUBLISHED ABSTRACTS ***
Erosion and land modification studies at a low-level radioactive-waste disposal facility near Sheffield, Illinois, by J. R. Gray, in Abstracts, Illinois Water Resources Conferece, Illinois Water: Planning for the Future, April 7-8, 1983, De Kalb, Illinois.

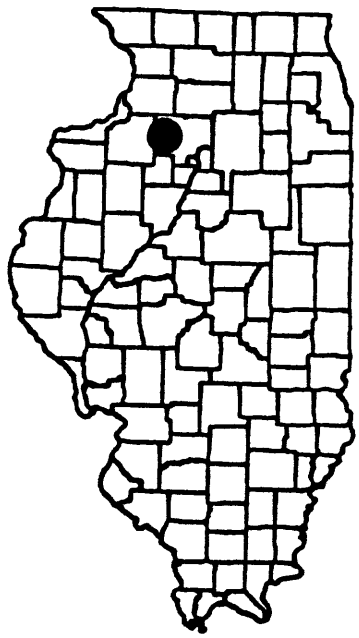
Runoff, sediment transport, and surface collapse at a low-level radioactive-waste burial site near Sheffield, Illinois, by J. R. Gray and C. A. Peters, in Proceedings of the 1985 Symposium on Surface Mining, Hydrology, Sedimentology, and Reclamation, December 9-13, 1985, Lexington, Kentucky, p. 389.

*** PUBLISHED REPORTS ***
Runoff, sediment transport, and landform modifications near Sheffield, Illinois, by J. R. Gray, in Proceedings of the Sixth Annual Participants' Information Meeting, DOE Low-Level Waste Management Program, September 11-13, 1984, Denver, Colorado, CONF-8409115, p. 534-544.

Collapse and erosion at the low-level radioactive-waste burial site near Sheffield, Illinois, by J. R. Gray and L. L. McGovern, in Proceedings of the Seventh Annual Participants' Information Meeting, DOE Low-Level Waste Management Program, September 11-13, 1985, Las Vegas, Nevada, CONF-8509121, p. 737-753.

Landform modifications at a nuclear-waste burial site, by J. R. Gray, in Proceedings of the Fourth Federal Interagency Sedimentation Conference, Volume 1, March 1986, Las Vegas, Nevada, p. 3-93 to 3-102.

IL044 SHEFFIELD UNSATURATED FLOW



*** PROJECT TITLE *** Hydrology of Unsaturated Flow through Porous Media at the Low-Level Radioactive-Waste Disposal Site near Sheffield, Illinois

*** PROBLEM *** In developing criteria to be used in selecting future radioactive-waste disposal sites and improving operations at current sites, it is necessary to understand the mechanisms that control transport of radionuclides by soil moisture flow in unsaturated porous media. Research in this area has been directed mainly towards theoretical aspects and laboratory experiments of soil moisture movement in the root zone. The tunnel at Sheffield, beneath four trenches, offers the opportunity to study moisture movement in a field situation through as much as 35 feet of unsaturated sediments. Instruments will be installed on the land surface and in the tunnel to obtain data on soil moisture movement to the water table and any radionuclide migration from trenches to the water table. Existing techniques and instrumentation will have to be modified to fit unusual conditions.

*** OBJECTIVES *** To qualify and quantify the mechanisms that control the movement of water and transport of radionuclides from disposal trenches through the unsaturated zone to the water table. The soil moisture data will provide a basis for research on burial site design and construction techniques. As an example, these data would provide the basis for evaluating new trench cap construction techniques for reducing infiltration and in the design of radionuclide waste trenches.

*** APPROACH *** Soil moisture and suction data will be obtained in the field using a neutron soil moisture probe and tensiometers. Soil moisture chemistry will be determined from samples collected with soil suction lysimeters. Gamma spectral logging will be used to monitor changes in radionuclide content of soil and soil water. Evapotranspiration will be computed using data obtained from a meteorological station. Tracers will be used to determine dispersivities. A model of unsaturated moisture flow will be used.

*** SUMMARY OF RESULTS *** Data from gravity lysimeters, tensiometers, and wells were analyzed and arranged in tables and figures for inclusion in final report. Meteorologic and trench-cover soil-moisture data were analyzed and used to prepare an estimated water budget. The influence of the tunnel on unsaturated flow below two trenches was analyzed by computer simulation. A paper titled "Leachate Movement Through Unsaturated Sand at a Low-Level Radioactive-Waste Disposal Site in Northwestern Illinois" was prepard for a Department of Energy Conference.

*** PLANS NEXT YEAR *** Complete manuscript draft and submit for colleague review and Director's approval.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** North-central Illinois

*** PROJECT CHIEF *** Patrick C. Mills

*** PERIOD OF PROJECT *** October 1980 to September 1989

*** REPORTS IN PROCESS ***

Hydrogeochemistry of the Unsaturated Zone at a Low-Level Radioactive-Waste Disposal Site near Sheffield, Illinois, 1982-84

Water and Tritium Movement Through the Unsaturated Zone at a Low-Level Radioactive-Waste Disposal Site near Sheffield, Illinois

Soil-Moisture Regime of a Hazardous-Waste Trench Cover

Water Balance at a Low-Level Radioactive-Waste Disposal Site

*** PUBLISHED ABSTRACTS ***

Infiltration through trench caps at a low-level radioactive-waste disposal site, by R. W. Healy, in Proceedings of the National Conference on Advances in Infiltration, December 12-13, 1983, Chicago, Illinois, American Society of Agricultural Engineers Publication 11-83, p. 376.

Water chemistry in the unsaturated zone at a low-level radioactive-waste disposal site near Sheffield, Illinois, by Charles A. Peters, in 29th Annual Midwest Groundwater Conference, October 1-3, 1984, Lawrence, Kansas.

*** PUBLISHED REPORTS ***

Preliminary results of a study of the unsaturated zone at the low-level radioactive-waste disposal site near Sheffield, Illinois, by R. W. Healy, in Proceedings of the Fifth Annual Participants' Information Meeting, DOE Low-Level Waste Management Program, August 30-September 1, 1983, Denver, Colorado, CONF-8308105, p. 669-673.

Study of the unsaturated zone at a low-level radioactive-waste disposal site, by R. W. Healy, C. A. Peters, M. P. deVries, P. C. Mills, and D. L. Moffett, in Proceedings of the Characterization and Monitoring of the Vadose (Unsaturated) Zone, National Water Well Association, December 8-10, 1983, Las Vegas, Nevada, p. 820-830.

Chemistry of pore water in the unsaturated zone at a low-level radioactive-waste disposal site near Sheffield, Illinois, by Charles A. Peters, in Proceedings of the NWWA Conference on Characterization and Monitoring of the Vadose (Unsaturated) Zone, November 19-21, 1985, Denver, Colorado, p. 272-282.

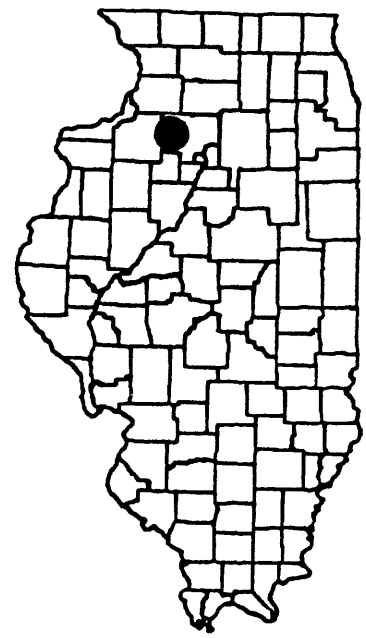
Water and tritium movement in variably saturated glacial deposits near Sheffield, Illinois, by P. C. Mills and R. W. Healy, in Proceedings of the FOCUS Conference on Midwestern Ground Water Issues, April 21-23, 1987, Indianapolis, Indiana, p. 169-186.

Leachate movement through unsaturated sand at a low-level radioactive-waste disposal site in northwestern Illinois, in Proceedings, Session III: Disposal Technology and Facility Development, Tenth Annual Low-Level Waste Management Conference, August 30 to September 1, 1988, Denver, Colorado, p. 54-68.

Healy, R. W., deVries, M. P., and Striegl, R. G., 1986, Concepts and data-collection techniques used in a study of the unsaturated zone at a low-level radioactive-waste disposal site near Sheffield, Illinois: U.S. Geological Survey Water-Resources Investigations Report 86-4228, 37 p.

Healy, R. W., deVries, M. P., and Sturrock, A. M., Jr., 1987, Evapotranspiration and microclimate at a low-level radioactive-waste disposal site in northwestern Illinois: U.S. Geological Survey Open-File Report 86-301, 88 p.

IL063 GAS TRANSPORT--SHEFFIELD



*** PROJECT TITLE *** Transport of Radioactive Gases and Exchange of ^{14}C in the Unsaturated Zone at a Low-Level Radioactive-Waste Disposal Site, Sheffield, Illinois

*** PROBLEM *** Development of site and management criteria for the underground disposal of radioactive wastes requires that mechanisms that control the transport of radionuclides to off-site areas be understood, and that the relative importance of identified transport pathways be quantified. Analyses of field data collected during fiscal years 1984 and 1985 indicated that $^{14}CO_2$ transport may be inhibited relative to CO_2 transport. The mechanism for that inhibition is not known.

*** OBJECTIVES *** To identify the major gas species responsible for the transport of radionuclides in the unsaturated zone; to determine the horizontal concentration gradient of carbon-14 dioxide and tritiated water vapor in a porous sand deposit adjacent to buried radioactive wastes; to calculate the rate of mass transport of radioactive gases in the unsaturated sand using measured concentration data; and to test the hypothesis that $^{14}CO_2$ diffusion may be inhibited by carbon-isotope exchange to the transport medium.

*** APPROACH *** Soil gas sampling tubes will be installed in glacial deposits along a line perpendicular to buried radioactive wastes. Collected gases will be analyzed to determine the partial pressures of major gases in the soil atmosphere. Carbon gases and water vapor will be separated from the soil

atmosphere and the radioactivity of individual gases will be measured. Partial pressure and radioactivity data will be used to calculate the mass transport of radioactive gases through the unsaturated zone near the burial site. The potential ^{14}C exchange capacity for geologic deposits collected from the site will be tested by batch experiments.

*** SUMMARY OF RESULTS *** A report on the data collection and analysis has been approved. A second report documenting a diffusion model for the determination of gas transport parameters at field scale has been sent to Region for approval. Additional analyses have been conducted.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** North-Central Illinois

*** PROJECT CHIEF *** Robert G. Striegl

*** PERIOD OF PROJECT *** October 1983 to September 1988

*** REPORT IN PROCESS ***

A Numerical Solution for the Diffusion Equation in Hydrogeologic Systems

*** PUBLISHED ABSTRACTS ***

Transport of methane in the unsaturated zone by Robert G. Striegl and Audrey L. Ishii, in Ground Water, v. 25, no. 5, September-October 1987, p. 611.

Diffusion of radioactive carbon dioxide in the unsaturated zone near buried low-level radioactive waste, by Robert G. Striegl, in Ground Water, v. 25, no. 5, September-October 1987, p. 613.

Methane diffusion in the unsaturated zone near buried low-level radioactive waste, by Robert Striegl and Audrey Ishii, in EOS Transactions, American Geophysical Union, v. 68, no. 16, April 21, 1987, p. 318.

*** PUBLISHED REPORTS ***

Methods for determining the transport of radioactive gases in the unsaturated zone, by R. G. Striegl, in Proceedings of the Sixth Annual Participants' Information Meeting, DOE Low-Level Waste Management Program, September 11-13, 1984, Denver, Colorado, CONF 84-09115, p. 579-587.

Variability in the partial pressures of gases in the unsaturated zone adjacent to a low-level radioactive-waste disposal site near Sheffield, Illinois, by R. G. Striegl and P. M. Ruhl, in Proceedings of the Seventh Annual Participants' Information Meeting, DOE Low-Level Waste Management Program, September 11-13, 1985, Las Vegas, Nevada, CONF-8509121, p. 725-736.

Striegl, R. G., 1988, Distribution of gases in the unsaturated zone at a low-level radioactive-waste disposal site near Sheffield, Illinois: U.S. Geological Survey Water-Resources Investigations Report 88-4025, 69 p.

IL067 FRACTURED-ROCK HYDROLOGY

*** PROJECT TITLE *** Ground-Water Flow and Tritium Movement in Fractured Dolomite near Chicago, Illinois

*** PROBLEM *** Tritium is present in the dolomite aquifer beneath a formerly used low-level radioactive-waste disposal site located in a forest preserve near Chicago. Tritium movement is known on a large scale, but specific flow paths are not known because the dolomite is fractured. Determining the hydrogeologic factors that govern rates and directions of ground-water flow and tritium movement will yield needed information that is transferable to other disposal sites.

*** OBJECTIVES *** (1) Determine fracture geometry. (2) Quantify hydraulic properties of the fractured rock. (3) Quantify flow rates and directions and the transport properties of the rock. (4) Evaluate the applicability of the discrete-fracture approach to the data. (5) Evaluate the applicability of the continuum approach to the data.

*** APPROACH *** (1) Drill about seven test wells. (2) Run borehole-geophysical logs in each well. (3) Perform aquifer tests using packers. (4) Perform tracer tests using packers. (5) Evaluate and analyze data. (6) Design and use ground-water flow and solute transport models to evaluate applicability of discrete-fracture and continuum approaches.

*** SUMMARY OF RESULTS *** Conducted additional field work (hydraulic and tracer tests). Two papers summarizing interpretation of borehole-geophysical, hydraulic, and tracer-test data are in review stage. Presented and had published a conference paper that summarized the study and results.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Northeastern Illinois

*** PROJECT CHIEF *** James R. Nicholas

*** PERIOD OF PROJECT *** October 1984 to September 1988

*** PLANNED REPORT ***

Ground-Water Flow and Tritium Movement in Fractured Dolomite near Chicago, Illinois

*** PUBLISHED ABSTRACTS ***

Theory and application of hydraulic testing in a fractured dolomite near Chicago, Illinois, by D. L. Moffett, J. R. Nicholas, and A. M. Shapiro, in Proceedings of the 31st Annual Midwest Ground Water Conference, October 27-29, 1986, Little Rock, Arkansas.

Hydraulic characteristics of a jointed dolomite beneath a low-level radioactive-waste disposal site, by J. R. Nicholas and A. M. Shapiro, in EOS Transactions, American Geophysical Union, v. 67, no. 16, April 22, 1986, p.

Instrumentation and field methods for hydraulic and tracer tests in discrete fractures in northeastern Illinois, by M. P. deVries, in Program and Abstracts, International Conference on Fluid Flow in Fractured Rocks, May 15-18, 1988, Atlanta, Georgia.

Overview of a hydrogeologic study of fractured dolomite in northeastern Illinois by J. R. Nicholas, in Program and Abstracts, International Conference on Fluid Flow in Fractured Rocks, May 15-18, 1988, Atlanta, Georgia.

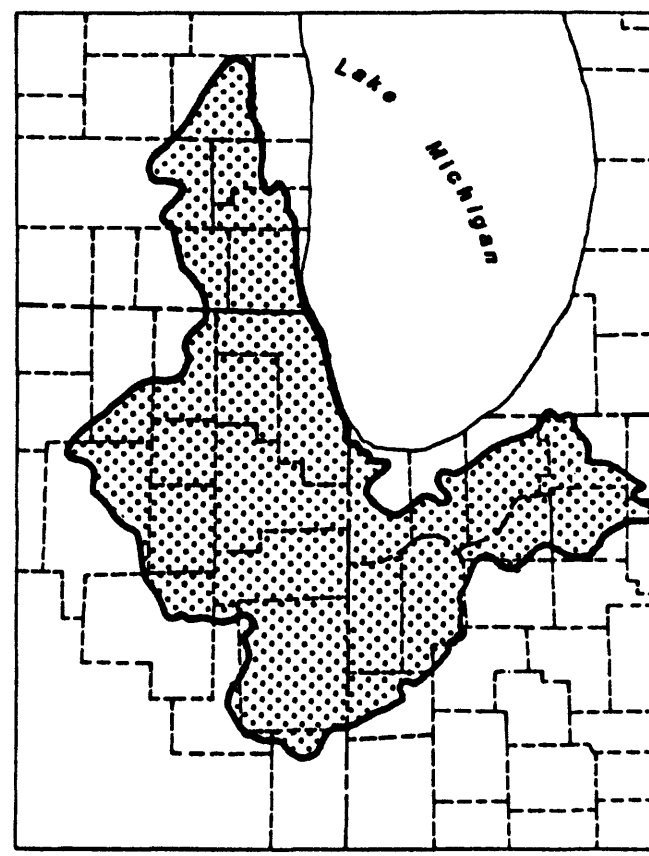
*** PUBLISHED REPORTS ***

Estimating fracture connectivity using measurements of borehole temperatures during pumping, by S. E. Silliman, J. R. Nicholas, and A. M. Shapiro, in Proceedings of the FOCUS Conference on Midwestern Ground Water Issues, April 21-23, 1987, Indianapolis, Indiana, p. 231-248.

IL075 NAWQA

*** PROJECT TITLE *** Upper Illinois River Basin Water-Quality Assessment

*** PROBLEM *** Protection of the quality of the Nation's ground-water and surface-water resources is a priority national concern. The quality of the Nation's water resources has a direct impact on public health and on the economic success of agriculture, industry, and recreation. The impacts of degraded water quality on public health or economic success may be related to short-term or long-term effects. In 1986, the U.S. Geological Survey (USGS) initiated a National Water Quality Assessment (NAWQA) Program to help address problems related to degraded water quality. This program is in a pilot phase that will test, and modify as necessary, concepts and approaches in preparation for possible full implementation in the future. The Upper Illinois River Basin project is one of seven pilot water-quality studies initiated in the pilot phase of the NAWQA program.



*** OBJECTIVES *** (1) Provide a description of existing and past trends in surface-water-quality conditions. (2) Develop conceptual models that relate observed conditions to the sources and causes. (3) Verify the description of trends in conditions. (4) Track long-term trends in water quality. (5) Reduce the uncertainty of the description of trends. (6) Improve the understanding of the linkage between causative factors and water quality.

*** APPROACH *** A liaison committee consisting of representatives of Federal, State, and local agencies will be formed to provide a forum for the USGS to inform interested parties of NAWQA plans and findings, to seek advice, to identify existing data and reports, and to establish collaborative efforts to supplement the NAWQA program. Existing data and reports will be compiled and summarized to provide a description of past and current trends in conditions. Descriptive information that may aid in the interpretation of trends will be compiled. Simple statistical methods, such as regression analysis, will be used to relate observed trends to the descriptive information. New data will be collected from the operation of a fixed-location river-sampling station network and from synoptic surveys. Reports describing project plans, data, and findings will be published.

*** SUMMARY OF RESULTS *** The project work plan was updated and timelines for major work elements were revised. The fixed-station sampling program was continued in cooperation with the Illinois Environmental Protection Agency (IEPA). Samples of water and suspended sediment were collected and analyzed for inorganic constituents on a monthly frequency and during a record drought condition. Thirty-two river cross-section surveys were performed to document mixing characteristics. Two basin-wide synoptic surveys were completed. First, dissolved oxygen, nutrients, chlorophyll, and E. Coli concentrations were measured at 70 sites over a 2-week period. Second, trace organic compound concentrations in water were measured at 38 sites. Most of the statistical work for the report on the analysis of existing water-quality data was completed and several chapters were written. The project Liaison Committee met twice to discuss project documents, plans, and coordination.

*** PLANS NEXT YEAR *** Continue fixed-station sampling and cross-section surveys. Continue to compile and statistically summarize existing water-quality information. Write draft report that describes results of analysis of existing information. Identify manmade organic compounds that will be targeted for study, revise work plan to include a detailed description for studies of these compounds, and perform reconnaissance surveys to document their existence in the basin. Continue to meet with the project Liaison Committee.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Upper Illinois River Basin

*** PROJECT CHIEF *** Stephen F. Blanchard

*** PERIOD OF PROJECT *** April 1986 to September 1990

*** PLANNED REPORTS ***
Water-quality conditions in the study area
Water-quality conditions based on analysis of existing information

*** PUBLISHED ABSTRACT ***

Methods for selecting bottom-material sampling sites in the upper Illinois River basin, by Paul J. Terrio, in Program and Abstracts, Illinois State Section of the American Water Resources Association, 1987 Annual Conference, April 28-29, 1987, Champaign, Illinois, p. 32.

*** PUBLISHED REPORT ***

Mades, Dean M., 1987, Surface-water-quality assessment of the upper Illinois River basin in Illinois, Indiana, and Wisconsin: Project description: U.S. Geological Survey Open-File Report 87-473, 39 p.

IL076 SHEFFIELD COMPREHENSIVE REPORT

*** PROJECT TITLE *** Hydrology and Radionuclide Movement at a Low-Level Radioactive-Waste Disposal Site, Sheffield, Illinois

*** PROBLEM *** No document is available that either describes the methods and results from all research conducted at the Sheffield site, or integrates and provides an interpretation of these results. Until such a document is available, it is unlikely the full value of research at the site will be realized. The following topics have been studied at Sheffield: meteorology, surface hydrology, geology and saturated zone hydrology and unsaturated zone hydrology, chemistry and gas transport.

*** OBJECTIVE *** To write a single comprehensive report describing research and results at the Sheffield site.

*** APPROACH *** The study will be completed in the following three phases: (1) literature search, (2) summary of study results and derivation of conclusions, and (3) presentation of results. A research panel comprised of investigators in the Illinois District will conduct the three phases of work. A review panel comprised of former project chiefs and others familiar with low-level radioactive wastes will review the research panel's work.

*** SUMMARY OF RESULTS *** The planned report was submitted for and has received Director's approval.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** North-central Illinois

*** PROJECT CHIEF *** Barbara J. Ryan

*** PERIOD OF PROJECT *** April 1986 to September 1988

*** PLANNED REPORTS ***

Results of Hydrologic Investigations at a Low-Level Radioactive-Waste Disposal Site near Sheffield, Illinois

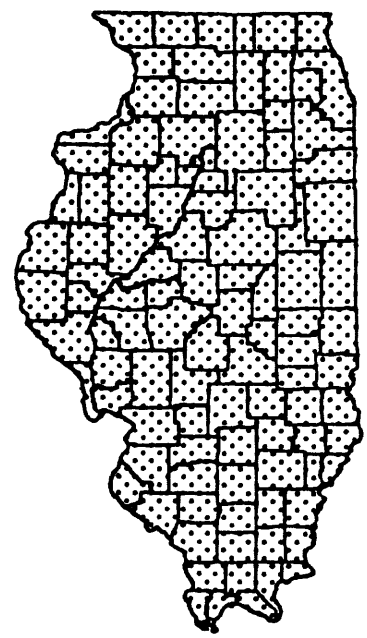
*** PUBLISHED ABSTRACT ***

Lessons learned from research at a low-level radioactive-waste disposal site near Sheffield, Illinois, by B. J. Ryan and M. G. Sherrill, in Proceedings of the 31st Annual Midwest Ground Water Conference, October 27-29, 1986, Little Rock, Arkansas.

IL077 DESCRIPTION AND RESPONSE OF FLOODS

*** PROJECT TITLE *** Description and Hydrologic Response Simulation of Floods in Illinois

*** PROBLEM *** State and local water-resource planners frequently use certain large storms (storms that resulted in floods of 50- to 100-year recurrence intervals) for design and evaluation purposes. Coupled with available climatologic and hydrologic data associated with these storms, the HEC-1 flood-hydrograph model is often used to predict drainage-basin response to large storms. A detailed description of characteristics and response of large storms is a necessary prerequisite for their application in planning purposes. In addition, it is necessary to determine the applicability of the HEC-1 model and associated parameter-estimating techniques (developed using storms of much smaller magnitude and frequency) to large storms.



*** OBJECTIVES *** Describe the climatologic and hydrologic characteristics associated with the four large storms that resulted in floods of 50- to 100-year recurrence intervals in Illinois. Determine the applicability of rainfall-loss and unit-hydrograph parameter-estimating techniques developed using storms of small recurrence intervals to these large storms.

*** APPROACH *** Description of four large storms and resulting floods. Areal extent of storms mapped and gaging stations identified. Climatological conditions and hydrologic data described. HEC-1 model and previously developed parameter-estimating techniques will be used to simulate the discharge hydrograph for each storm in drainage basins from previous studies that are in the path of the storms. Peak discharge converted to peak stage.

*** SUMMARY OF RESULTS *** Meteorological and hydrological analyses and a draft report for the June 1981 and December 1982 storms were completed. The data for the September-October 1986 and August 1987 storms have been collected and analyses have begun.

*** PLANS NEXT YEAR *** Complete analyses of the two additional storms and the hydrologic model response and incorporate into report.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

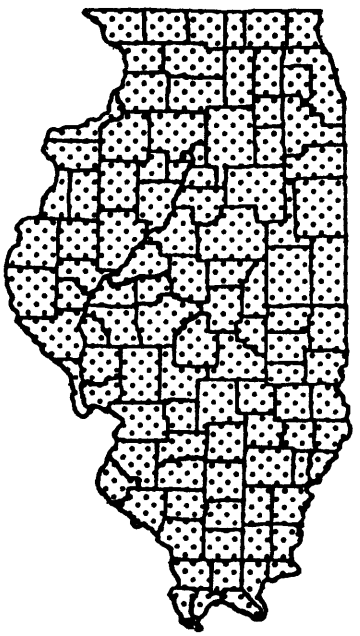
*** PROJECT CHIEF *** Audrey L. Ishii

*** PERIOD OF PROJECT *** October 1986 to September 1989

*** COOPERATOR ***
Illinois Department of Transportation, Division of Water Resources

*** PLANNED REPORTS ***
Description and Hydrologic Response Simulation of Floods in Illinois

IL078 ILLINOIS RAINFALL-RUNOFF WITH GIS



*** PROJECT TITLE *** Unit-Hydrograph and Rainfall-Loss Parameter Estimation Using Basin and Soil Characteristics

*** PROBLEM *** Estimates of unit-hydrograph and rainfall-loss function parameters are required when the HEC-1 flood-hydrograph model is used for computing discharge hydrographs. There is a need to examine basin and soil characteristics other than those available in WATSTORE (National Water Data Storage and Retrieval System) in relation to the unit-hydrograph and rainfall-loss function parameters in the development of estimating techniques. Geographic Information System (GIS) procedures could be used to relate basin and soil characteristics to the basin-averaged unit-hydrograph and rainfall-loss function parameters.

*** OBJECTIVE *** To develop estimating techniques for the basin-average unit-hydrograph and rainfall-loss function parameters by relating these parameters to basin and soil characteristics.

*** APPROACH *** Data collection and analysis: Digitize drainage area maps, compute basin and soil characteristics data available in GIS (data not available in local GIS will be digitized and computed).

Development of parameter-estimating techniques: Relate unit-hydrograph and rainfall-loss parameters to basin and soil characteristics using statistical methods.

Evaluation of parameter-estimating techniques: Hydrograph characteristics evaluated for 36 independent uncalibrated gaged basins.

*** SUMMARY OF RESULTS *** Have digitized drainage divides for 80 percent of maps necessary for drainage basins. Have obtained digital soils map and evaluation data for State. Have obtained National Oceanic and Atmospheric Administration (NOAA) precipitation and temperature data for Illinois and have developed digital map of an estimater of antecedent soil moisture. Have joined adjacent maps to form complete basin and overlain with soils, land use, and antecedent moisture data for one-third of necessary basins. Have developed format for statistical analysis file and began assembling for completed basins.

*** PLANS NEXT YEAR *** Complete compilation of drainage basin data into statistical analysis file. Develop parameter-estimation techniques by statistically relating rainfall-loss parameters to basin and soil characteristics. Complete report and submit for approval.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** Arthur R. Schmidt

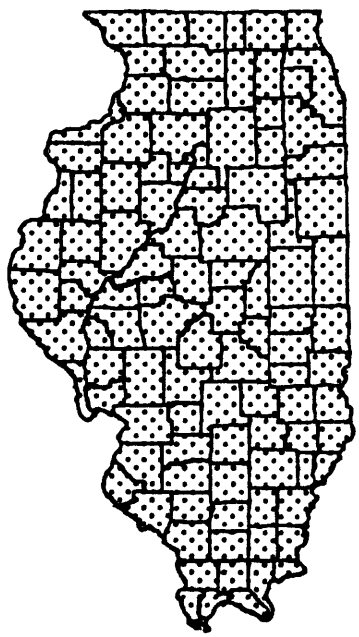
*** PERIOD OF PROJECT *** October 1986 to September 1989

*** COOPERATOR ***
Illinois Department of Transportation, Division of Water Resources

*** PLANNED REPORTS ***
Techniques to Estimate Unit-Hydrograph and Rainfall-Loss Parameters

IL080 USEPA PROJECTS

*** PROJECT TITLE *** USGS/USEPA Interagency Agreement Projects



*** PROBLEM *** The U.S. Environmental Protection Agency (USEPA), Region V, has requested that the U.S. Geological Survey (USGS), Illinois District, provide technical assistance on several Superfund Sites within the State. The technical assistance varies from designing and conducting aquifer tests in fractured rock to reviewing technical reports submitted to USEPA by their consultants.

*** OBJECTIVE *** To provide technical consultation, training, and quality assurance and to conduct research for the USEPA under the conditions of the joint interagency agreement.

*** APPROACH *** For fiscal year 1988, provide technical assistance on how to design, conduct, and analyze an aquifer test adjacent to the H.O.D. Landfill in Antioch, Illinois. Provide technical oversight for all field work conducted at the Acme Solvents and Pagel's Pit sites. Provide technical review on results of work at the Acme Solvents and Pagel's Pit sites.

*** SUMMARY OF RESULTS *** Finished writing report on hydrogeology and aquifer testing at the Byron/Johnson salvage yard. Completed work at H.O.D. Landfill. Work included providing technical assistance on an aquifer test at the site, analysis of aquifer test data, and completion of a letter-type administrative report. Health surveillance programs were initiated for two people; two others received hazardous waste site safety training. Completed oversight of monitoring well installation and several rounds of water-quality sampling at Acme Solvents and Pagel's Pit sites.

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** Robert T. Kay

*** PERIOD OF PROJECT *** Continuous since March 1986

*** COOPERATOR ***
U.S. Environmental Protection Agency, Region V

*** PLANNED REPORTS ***
Determination of hydraulic properties in the vicinity of a landfill in Antioch, Illinois, December 1987

*** REPORT IN PROCESS ***
Hydrogeology and aquifer testing at the Byron/Johnson Salvage Yard Superfund site near Byron, Illinois

*** PUBLISHED ABSTRACT ***
Hydraulic testing in two aquifers at a superfund site near Byron, Illinois, by B. J. Ryan, R. T. Kay, and K. A. Wallace, in Program with Abstracts, 32nd Annual Midwest Ground Water Conference, October 28-30, 1987, Madison, Wisconsin.

*** PUBLISHED REPORT ***
Hydrogeology of the Byron/Johnson Salvage Yard Superfund site near Byron, Illinois, by R. T. Kay, B. J. Ryan, E. J. Mears, and D. J. Yeskis, in Proceedings of the ASCE Water Resources Symposium, October 21-22, 1987, Rosemont, Illinois

IL081 GREAT LAKES

*** PROJECT TITLE *** Great Lakes Basin Ground-Water Contamination

*** PROBLEM *** The Great Lakes and their drainage basins contain the world's largest supply of fresh water. There are many possible sources of contamination to the Great Lakes via ground water, but no comprehensive data base contains or evaluates the vast amount of information available for use in protecting this vital water resource. National interest and concern in the Great Lakes establishes a need to address this problem.

*** OBJECTIVE *** To define the major hydrologic regimes of the Great Lakes Basin and to delineate these areas as having significant potential for ground-water contamination and to evaluate the significance of contaminant movement to the lakes from those areas.

*** APPROACH *** Available existing information and maps will be collected and evaluated for the purpose of defining and delineating natural hydrogeologic regimes of the basin. That information will then be synthesized into interpretive maps depicting parameters such as surficial and bedrock geology, permeability and thickness of surficial materials, ground-water flow characteristics, aquifer utilization, land use, well locations or water quality, and sources of contamination. These parameter maps would then be used to construct an interpretive contamination potential map of the basin.

*** SUMMARY OF RESULTS *** Bibliography was completed. Two indexes--author and subject--were developed. Report writing is completed. Michigan municipal well information was collected. Authors are reviewing report. A continuation proposal was submitted to USEPA, Great Lakes National Program Office.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** United States portion of the Great Lakes basin

*** PROJECT CHIEF *** Kelly L. Norton

*** PERIOD OF PROJECT *** January 1987 to December 1987

*** PLANNED REPORT ***

Bibliography of Hydrogeologic Studies and the Application of GIS to Ground-Water Contamination Evaluation, Great Lakes

IL082 STOCHASTIC HYDROGEOLOGY

*** PROJECT TITLE *** Stochastic Analysis of Flow and Transport in a Fractured Dolomite

*** PROBLEM *** There is a lack of field investigations, both in single fractures and in fracture networks, which can be used to assess the accuracy and utility of available stochastic theories of flow and transport in fractured rock. Also, practical field methods of determining the stochastic properties of fractures are needed.

*** OBJECTIVES *** (1) Develop models of flow and transport where the heterogeneity within each fracture is treated as a stochastic process. (2) Test these models with field-scale experiments. (3) Devise field methods for objective 2.

*** APPROACH *** (1) Design and construct field equipment. (2) Conduct hydraulic and tracer tests in discrete fractures. (3) Use field data to assess available models. (4) If necessary, modify available models or design new ones.

*** SUMMARY OF RESULTS *** Completed all but 2 weeks of field work. Tracer test data conform neither to the advection-dispersion model nor a simple channel model. One paper evaluating applicability of channel model has been accepted by a journal for publication.

*** PLANS NEXT YEAR *** Complete field work, analysis, and writing.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Northeastern Illinois

*** PROJECT CHIEF *** James R. Nicholas

*** PERIOD OF PROJECT *** October 1987 to September 1989

*** PLANNED REPORT ***
Stochastic analysis of flow and transport in a fractured dolomite aquifer

IL083 RAINFALL-RUNOFF MODELING TECHNIQUES

*** PROJECT TITLE *** Modeling Techniques for Water-Surface-Profile Computations and Rainfall-Runoff Relations in Northeastern Illinois

*** PROBLEM *** Single-event design-storm techniques have traditionally been used in water-resources design and management. However, continuous-simulation rainfall-runoff models are being used more and more by planners and engineers. There is a need to evaluate the use of continuous-simulation models as opposed to event-oriented techniques. There also is a need to collect data for adequately calibrating a continuous model.

In addition, dynamic-wave models are being used increasingly in hydrologic situations where they have not received rigorous field testing. There also is a need to compare the results of a dynamic-wave model with the results of a more commonly used step-backwater model.

*** OBJECTIVES *** (1) Apply a dynamic-wave model coupled with a continuous rainfall-runoff model on small watersheds using data collected from the field. (2) Calibrate a continuous rainfall-runoff model using data collected at several small watersheds in northeastern Illinois. (3) Test a dynamic-wave model that incorporates flow in the flood plain using data collected in the field.

*** APPROACH *** Streamflow and meteorologic data will be collected in four watersheds in northeastern Illinois. Continuous records of stage and discharge will be collected in each watershed. At least three rain gages per watershed will be installed. In two of the watersheds, stage will be collected at various points on the main-stem channel. These data will be used to calibrate the rainfall-runoff and dynamic-wave models.

A continuous simulation rainfall-runoff model will be calibrated and verified for each watershed. A subset of the collected data will be set aside for verification. A dynamic-wave model and a step-backwater model will be independently calibrated for two watersheds. Results of these two hydraulic models will be compared.

*** SUMMARY OF RESULTS *** Three watersheds have been selected for study. Gaging stations and instrumentation have been installed. Streamflow records have been computed for each of these stations. Analysis of precipitation and streamflow records has begun.

*** PLANS NEXT YEAR *** Continue data analysis. Write report describing preliminary rainfall-runoff relations. Begin calibration of rainfall-runoff model. Decide which watershed will be used to study the dynamic-wave model. Begin data collection in that watershed.

*** HEADQUARTERS LOCATION *** Urbana, Illinois

*** FIELD LOCATION *** Northeastern Illinois

*** PROJECT CHIEF *** Kevin A. Oberg

*** PERIOD OF PROJECT *** October 1987 to September 1991

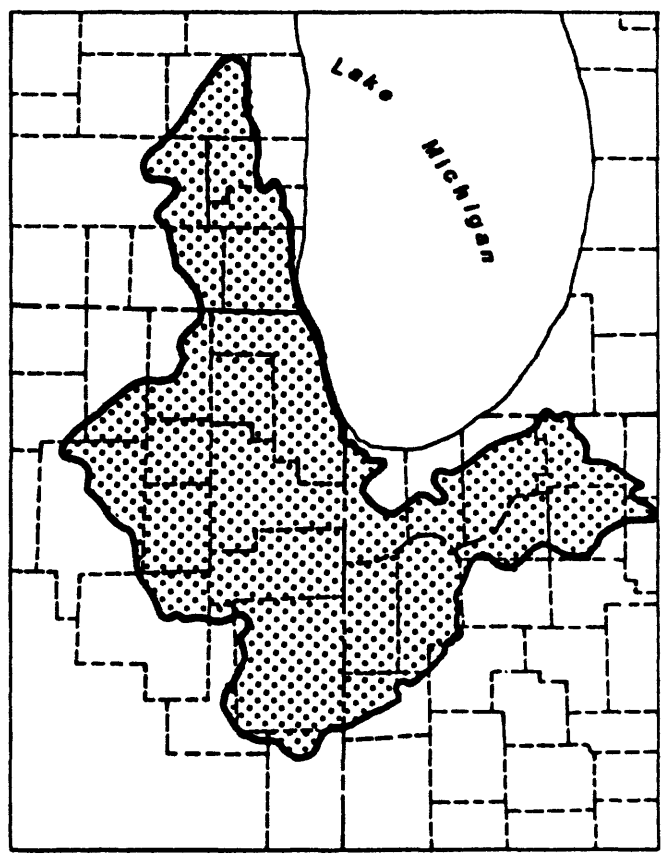
*** COOPERATOR ***
Du Page County Department of Environmental Concerns

*** PLANNED REPORTS ***
Rainfall-runoff relations at three small watersheds in Du Page County, Illinois

Rainfall-runoff relations and water-surface profile computations on small watersheds in northeastern Illinois

IL084 ANALYSIS OF BIOLOGICAL DATA

*** PROJECT TITLE *** Analysis of Existing Biological Data for the Upper Illinois River Basin



*** PROBLEM *** Implementation of the surface water component of the National Water Quality Assessment (NAWQA) Program requires the use of biological information to aid in the interpretation of water-quality data and enhance the understanding of changes in stream quality. Although the incorporation of biological monitoring into water-quality assessments is generally accepted as being important, there is no consensus as to the specific kinds of biological information that are necessary to accurately evaluate changes in stream quality. Although descriptively accurate, biological information may be quantitatively intangible for evaluating changes in water.

*** OBJECTIVES *** To analyze existing data to describe relations between the chemical measure of water quality and the distribution, abundance, community structure, and organism health of aquatic macrobiota. To obtain a better understanding of the kinds of biological infor-mation and analyses that might be useful for regional water-quality assessments.

*** APPROACH *** Assemble existing biological data from some 200 different sources identified in an earlier inventory. Construct a computerized biological data base. Analyze the relation between biological information regarding distribution, abundance, community structure, organism health, and bioaccumulation of chemicals and water-chemistry data. Several techniques including ordination and classification of the biological data will be used. Interpret findings based on the physical habitat, toxicological information, and biological relations. Publish a report describing the project findings.

*** SUMMARY OF RESULTS *** Assembled historical biological information, inventoried fish population samples, and began constructing computerized fish population data base. Conducted preliminary analysis showing feasibility of using multivariate ordination technique to summarize data on fish assemblages in the basin.

*** PLANS NEXT YEAR *** Assemble water-quality data that corresponds to selected fish population data. Analyze relations between fish assemblages, organism health, and water and sediment chemistry. Write report.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Upper Illinois River Basin

*** PROJECT CHIEF *** Stephen F. Blanchard

*** PERIOD OF PROJECT *** January 1988 to March 1990

*** PLANNED REPORTS ***
Project Results

*** PROJECT TITLE *** Rainfall-Runoff Relations for Large Watersheds in Du Page County, Illinois

*** PROBLEM *** The development of a comprehensive, county-wide storm-water management program in Du Page County requires an understanding of rainfall-runoff relations. A recent study (IL083) initiated in cooperation with Du Page County, focused on watersheds with drainage areas of 20 square miles or less. Rainfall-runoff relations for larger watersheds within the county have not been determined.

*** OBJECTIVES *** To determine rainfall-runoff relations for three large watersheds within Du Page County using statistical and hydrologic simulation techniques.

*** APPROACH *** Three large watersheds, Salt Creek, East Branch Du Page River, and West Branch Du Page River, have been selected for study. Three stream-gaging stations and a number of rain gages will be installed to collect rainfall and streamflow data. The data collected will be used to calibrate a rainfall-runoff model, which will be used to determine rainfall-runoff relations.

*** SUMMARY OF RESULTS *** The installation and instrumentation of one of three stream-gaging stations was completed prior to the start of the 1989 water year. An additional rain gage has been installed in the watershed of the East Branch Du Page River to provide a more detailed distribution of precipitation data.

*** PLANS NEXT YEAR *** Project plans for the 1989 water year include the completion of stream-gage and rain-gage installations for the West Branch Du Page River and Salt Creek, and data collection and analysis for the 1989 annual report. Work on one report will be initiated.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Northeastern Illinois

*** PROJECT CHIEF *** Kevin A. Oberg

*** PERIOD OF PROJECT *** July 1988 to September 1991

*** COOPERATOR ***
Du Page County Department of Environmental Concerns

*** PLANNED REPORTS ***
Modeling Rainfall and Runoff on Large Watersheds in Du Page County, Illinois

PUBLICATIONS

PUBLICATIONS

Because the number of publications pertaining to water resources in Illinois is large, the publications listed below were selected to show the types of information available to those interested in, or in need of, water facts. Many of these publications are available for inspection at the District Office in Urbana and at large public and university libraries.

General Information

The U.S. Geological Survey announces all its publications in a monthly catalog "New Publications of the U.S. Geological Survey." Free subscriptions to this list are available from U.S. Geological Survey, 582 National Center, Reston, VA 22092. All publications are for sale unless specifically stated otherwise (prices, which are subject to change, are not included in this report). Prepayment is required and information on price and availability should be obtained from listed sales offices before placing an order. The "U.S. Geological Survey Yearbook" provides a comprehensive description of the Federal Government's largest earth-science agency; copies may be purchased at the address where professional papers are sold (see below). Summaries of research in progress and results of completed investigations are published each fiscal year, beginning in 1978, in the professional paper series "Geological Survey Research." A pamphlet entitled "List of Geological Survey Geologic and Water-Supply Reports and Maps for Illinois," which includes reports on the geology of Illinois and other water-resources reports, is available free, upon request, from U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225.

Water-Resources Information

A monthly summary of the national water situation is presented in "National Water Conditions." It is available free, on request, from the Hydrologic Information Unit, U.S. Geological Survey, 419 National Center, Reston, VA 22092.

Beginning with the 1971 water year, a new publication series entitled "U.S. Geological Survey Water-Data Reports," combined under one cover streamflow data, water-quality data for surface and ground water, and ground-water level data for each State. For Illinois, the title is "Water Resources Data for Illinois - Water Year 19XX: U.S. Geological Survey Water-Data Report IL-XX-1 and IL-XX-2" (XX represents water year published).

Prior to the 1971 water year, records of streamflow, ground-water levels, and quality of water were published as Geological Survey Water-Supply Papers as explained below.

Streamflow Records

Records of daily flows of streams prior to 1971 were published in reports from the Water-Supply Paper series "Surface-Water Supply of the United States,"

which were released in numbered parts as determined by natural drainage basins. Until 1961 this was an annual series; monthly and yearly summaries of these data were compiled in two reports: "Compilation of Records of Surface Waters of the United States through September 1950" and "Compilation of Records of Surface Waters of the United States, October 1950 to September 1960." For the period 1961-70, 5-year compilations were published. Data for Illinois are published in Parts 3, 4, and 5.

Quality-of-Water Records

Data on quality of surface water prior to 1971 were published annually in the Water-Supply Paper series "Quality of Surface Waters of the United States," which also was released in numbered parts as determined by natural drainage basins. Data for Illinois are in Parts 3, 4, and 5.

Ground-Water Records

Ground-water levels and artesian pressures in observation wells prior to 1975 were reported by geographic areas in a 5-year Water-Supply Paper series. Data for Illinois are in "Ground-Water Levels in the United States, North-Central States."

Flood Information

Methods for estimating the magnitude and frequency of floods for streams in Illinois are given in Water-Resources Investigations Report 87-4207, "Technique for Estimating Flood-Peak Discharges and Frequencies on Rural Streams in Illinois," by G. W. Curtis.

The U.S. Geological Survey also outlines flood-prone areas on topographic maps as part of a nationwide Federal program for managing flood losses. Information on these maps is available from the District Chief, Water Resources Division, Urbana, Illinois.

Professional Papers

Professional papers are sold by the Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver, CO 80225.

P 218 Geology and mineral resources of the Hardin and Brussels quadrangles (in Illinois), by W. W. Rubey. 1952.

P 448-H Low-flow characteristics of streams in the Mississippi embayment in Tennessee, Kentucky, and Illinois, by P. R. Speer, W. J. Perry, J. A. McCabe, O. G. Lara, and others, with a section on Quality of the water by H. G. Jeffery. 1965.

P 492 Thermal springs of the United States and other countries of the world--A summary, by G. A. Waring. 1965.

P 813-A Summary appraisals of the Nation's ground-water resources--Ohio Region, by R. M. Bloyd, Jr. 1974.

P 813-B Summary appraisals of the Nation's ground-water resources--Upper Mississippi Region, by R. M. Bloyd, Jr. 1975.

P 813-J Summary appraisals of the Nation's ground-water resources--Great Lakes Region, by W. G. Weist, Jr. 1977.

P 1100 Geological Survey Research, 1978, by the U.S. Geological Survey. 1978.

Water-Supply Papers

Water-Supply Papers are sold at the above-listed Denver, Colorado, address.

W 334 The Ohio Valley flood of March-April 1913, including comparisons with some earlier floods, by A. H. Horton and H. J. Jackson. 1913.

W 838 Floods of Ohio and Mississippi Rivers, January-February 1937, by N. C. Grover; with a section on flood deposits of the Ohio River, January-February 1937, by G. R. Mansfield. 1938.

W 1260-C Floods of 1952 in the basins of the Upper Mississippi River and Red River of the North. 1955.

W 1299 The industrial utility of public water supplies in the United States, 1952--Part 1, States east of the Mississippi River, by E. E. Lohr and S. K. Love. 1954.

W 1370-B Floods of October 1954 in the Chicago area, Illinois and Indiana, by W. S. Daniels and M. D. Hale. 1958.

W 1473 Study and interpretation of the chemical characteristics of natural water, 2d edition, by J. D. Hem. 1970.

W 1669-O Ground-water conditions at Argonne National Laboratory, Illinois, 1948-60, by D. B. Kowles, W. J. Drescher, and E. F. LeRoux. 1963.

W 1669-S Yearly variations in runoff for the conterminous United States, 1931-60, by M. W. Busby. 1963.

W 1797 Has the United States enough water?, by A. M. Piper. 1965.

W 1800 The role of ground water in the national water situation, by C. L. McGuinness. 1963.

W 1812 Public water supplies of the 100 largest cities in the United States, 1962, by C. N. Durfor and Edith Becker. 1964.

W 1838 Reservoirs in the United States, by R. O. R. Martin and R. L. Hanson. 1966.

W 1871 Water data for metropolitan areas in the United States--A summary of data from 222 areas compiled by W. J. Schneider. 1968.

W 1899-I Streamflow from the United States into the Atlantic Ocean during 1931-60, by C. D. Bue. 1970.

W 1990 Annotated bibliography on artificial recharge of ground water, 1955-67, by D. C. Signor, D. J. Growitz, and William Kam. 1970.

W 2002 Water in urban planning, Salt Creek basin, Illinois, by A. M. Spieker. 1970.

W 2005 Model hydrographs, by W. D. Mitchell. 1972.

W 2020 Subsurface waste disposal by means of wells--A selective annotated bibliography, by D. R. Rima, E. B. Chase, and B. M. Myers. 1971.

W 2078 Some chemical characteristics of mine drainage in Illinois, by L. G. Toler. 1982.

W 2226 Low-level radioactive-waste burial at the Palos Forest Preserve, Illinois: Geology and hydrology of the glacial drift, as related to the migration of tritium, by J. C. Olimpio. 1984.

W 2250 National Water Summary 1983--Hydrologic events and issues, by U.S. Geological Survey. 1984.

W 2262 A system for measuring surface runoff and collecting sediment samples from small areas, by J. R. Gray and M. P. deVries, in Meyer, E. L., ed., Selected papers in the hydrologic sciences. 1984.

W 2269 Traveltime and longitudinal dispersion in Illinois streams, by Julia B. Graf. 1986.

W 2275 National Water Summary 1984--Hydrologic events, selected water-quality trends, and ground-water resources, by U.S. Geological Survey. 1985.

W 2300 National Water Summary 1985--Hydrologic events and surface-water resources, by U.S. Geological Survey. 1986.

W 2301 Relation between quality of urban runoff and quality of Lake Ellyn at Glen Ellyn, Illinois, by R. G. Striegl and E. A. Cowan. 1987.

W 2325 National Water Summary 1986--Hydrologic events and ground-water quality, by U.S. Geological Survey. 1988.

W 2333 Tritium migration from a low-level radioactive-waste disposal site near Chicago, Illinois, by J. R. Nicholas and R. W. Healy. 1988.

Circulars

Single copies of circulars still in print are available free from the above-listed Denver, Colorado, address.

C 216 Water resources of the St. Louis area, Missouri and Illinois, by J. R. Searcy, R. C. Baker, and W. H. Durum. 1952.

C 456 Estimated use of water in the United States, 1960, by K. A. MacKichan and J. C. Kammerer. 1961.

C 476 Principal lakes of the United States, by C. D. Bue. 1963.

C 536 Are we running out of water?, by R. L. Nace. 1967.

C 554 Hydrology for urban land planning--A guidebook on the hydrologic effects of urban land use, by L. B. Leopold. 1968.

C 556 Estimated use of water in the United States, 1965, by C. R. Murray. 1968.

C 601-A Water for the cities--The outlook, by W. J. Schneider and A. M. Spieker. 1969.

C 601-C Flood hazard mapping in metropolitan Chicago, by J. R. Sheaffer, D. W. Ellis, and A. M. Spieker. 1970.

C 601-D Water as an urban resource and nuisance, by H. E. Thomas and W. J. Schneider. 1970.

C 601-E Sediment problems in urban areas, by H. P. Guy. 1970.

C 601-F Hydrologic implications of solid-waste disposal by W. J. Schneider. 1970.

C 601-G Real-estate lakes, by D. A. Rickert and A. M. Spieker. 1972.

C 601-H Role of water in urban planning and management, by W. J. Schneider, D. A. Rickert, and A. M. Spieker. 1973.

C 601-I Water facts for planners and managers, by J. H. Feth. 1973.

C 601-J Extent and development of urban flood plains, by W. J. Schneider and J. E. Goddard. 1974.

C 601-K An introduction to the processes, problems, and management of urban lakes, by L. J. Britton, R. C. Averett, and R. F. Ferreira. 1975.

C 631 Disposal of liquid wastes by injection underground--Neither myth nor millennium, by A. M. Piper. 1969.

C 643 Reconnaissance of selected minor elements in surface waters of the United States, October 1970, by W. H. Durum, J. D. Hem, and S. G. Heidel. 1971.

C 645 A procedure for evaluating environmental impact, by L. B. Leopold, F. E. Clarke, B. B. Hanshaw, and J. R. Balsley. 1971.

C 676 Estimated use of water in the United States in 1970, by C. R. Murray and E. B. Reeves. 1972.

C 703 Water demands for expanding energy development, by G. H. Davis and L. A. Wood. 1974.

C 719 The National Stream Quality Accounting Network (NASQAN)--Some questions and answers, by J. F. Ficke and R. O. Hawkinson. 1975.

C 765 Estimated use of waters in the United States in 1975, by C. R. Murray and E. B. Reeves. 1977.

Hydrologic Investigations Atlases

Hydrologic Investigations Atlases and other maps are sold by the U.S. Geological Survey, Map Distribution Section, Federal Center, Box 25286, Denver, CO 80225 (phone 303 236-7477).

HA-39. Floods in the Little Calumet River basin, near Chicago Heights, [northeastern] Illinois. 1960.

HA-61. Stream composition of the conterminous United States, by F. H. Rainwater. 1962.

HA-67. Floods in Arlington Heights quadrangle, [northeastern] Illinois, by D. W. Ellis, H. E. Allen, and A. W. Noehre. 1963.

HA-68. Floods in Elmhurst quadrangle, [northeastern] Illinois, by D. W. Ellis, H. E. Allen, and A. W. Noehre. 1963.

HA-69. Floods in Highland Park quadrangle, [northeastern] Illinois, by D. W. Ellis, H. E. Allen, and A. W. Noehre. 1963.

HA-70. Floods in Aurora North quadrangle, [northeastern] Illinois, by D. W. Ellis, H. E. Allen, and A. W. Noehre. 1963.

HA-71. Floods in Wheeling quadrangle, [northeastern] Illinois, by D. W. Ellis, H. E. Allen, and A. W. Noehre. 1963.

HA-85. Floods in Park Ridge quadrangle, [northeastern] Illinois, by D. W. Ellis, H. E. Allen, and A. W. Noehre. 1963.

HA-86. Floods in Hinsdale quadrangle, [northeastern] Illinois, by D. W. Ellis, H. E. Allen, and A. W. Noehre. 1964.

HA-87. Floods in Palatine quadrangle, [northeastern] Illinois, by H. E. Allen, D. W. Ellis, and D. E. Long. 1964.

HA-88. Floods in Libertyville quadrangle, [northeastern] Illinois, by A. W. Noehre, D. W. Ellis, and D. E. Long. 1964.

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HA-200. Chemical quality of public water supplies of the United States and Puerto Rico, 1962, by C. N. Durfor and Edith Becker. 1964.

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HA-362. Floods in Channahon quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre, 1971.

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HA-463. Floods in Marengo South quadrangle, northeastern Illinois, by H. E. Allen. 1972.

HA-464. Floods in Riley quadrangle, northeastern Illinois, by R. T. Mycyk and R. S. Grant. 1972.

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HA-495. Floods in Marengo North quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre. 1973.

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Hydrologic-Unit Maps

Hydrologic unit maps and other maps are sold by the U.S. Geological Survey, Map Distribution Section, Federal Center, Box 25286, Denver, CO 80225 (phone 303 236-7477).

U.S. Geological Survey, 1975, Hydrologic unit map of Illinois--1974.

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The following reports are available for inspection at the Illinois and Reston, Virginia, offices of the U.S. Geological Survey. The reports may be purchased either as microfiche or hard copy from the National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161 (phone 703 487-4650); the NTIS ordering number is given in parentheses at the end of the citation. Further information about these reports may be obtained from the District Chief, WRD, Urbana, Illinois.

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WRI 77-104. Frequency analysis of Illinois floods using observed and synthetic streamflow records, by G. W. Curtis, 1977. (PB 277350/AS)

WRI 77-117. Technique for estimating magnitude and frequency of floods in Illinois, by G. W. Curtis, 1977. (PB 277255/AS)

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WRI 82-13. Time of concentration and storage coefficient values for Illinois streams, by J. B. Graf, George Garklavs, and K. A. Oberg, 1982. (PB82-219320)

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(Books and Open-File Reports Section)

The following reports are available for inspection in the Urbana, Illinois, and Reston, Virginia, offices of the U.S. Geological Survey. They may be purchased from the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225 (phone 303 236-7476).

82-4047. Hydrologic effects of storing liquified sewage sludge on strip-mine land, Fulton County, Illinois, by G. L. Patterson, 1982.

82-4073. Runoff, sediment transport, and water quality in a northern Illinois agricultural watershed before urban development, 1979-81, by H. E. Allen, Jr. and J. R. Gray, 1984.

83-4048. Water in sand and gravel deposits in McHenry County, Illinois, by J. R. Nicholas and J. T. Krohelski, 1984.

83-4125. Hydrogeology of a low-level radioactive-waste disposal site near Sheffield, Illinois, by J. B. Foster, J. R. Erickson, and R. W. Healy, 1984.

83-4136. Measurement of bedload discharge in nine Illinois streams with the Helley-Smith sampler, by J. B. Graf, 1983.

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84-4003. Estimates of long-term suspended-sediment loads in Bay Creek at Nebo, Pike County, Illinois, 1940-80, by T. R. Lazaro, K. K. Fitzgerald, and L. R. Frost, Jr., 1984.

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84-4123. Cost effectiveness of the U.S. Geological Survey's stream gaging program in Illinois, by D. M. Mades and K. A. Oberg, 1984.

84-4165. Hydrogeology of the Cambrian-Ordovician aquifer system at a test well in northeastern Illinois, by J. R. Nicholas, M. G. Sherrill, and H. L. Young, 1987.

84-4180. Quality of water in the alluvial aquifer, American Bottoms, East St. Louis, Illinois, by D. C. Voelker, 1984.

84-4183. Hydrogeologic setting east of a low-level radioactive-waste disposal site near Sheffield, Illinois, by J. B. Foster, George Garklavs, and G. W. Mackey, 1984.

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84-4311. Low-flow characteristics of streams in the Kishwaukee River Basin, Illinois, by H. E. Allen, Jr. and E. A. Cowan, 1985.

84-4355. A gazetteer of surface-mine lakes, Eastern Interior Coal Province, Illinois, by D. C. Voelker, 1985.

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85-4344. Assessment of low-flow water quality in the Du Page River, Illinois, by W. O. Freeman, A. R. Schmidt, and J. K. Stamer, 1986.

86-4008. Estimating generalized skew of the log-Pearson Type III distribution for annual peak floods in Illinois, by Kevin A. Oberg and Dean M. Mades, 1987.

86-4072. Evaluation of the U.S. Geological Survey's gaging-station network in Illinois, by D. M. Mades and K. A. Oberg, 1986.

86-4112. Channel-storage/discharge relations for the Peoria and La Grange Dams on the Illinois River in Illinois, by George Garklavs, A. R. Klinger, and D. M. Mades, 1986.

86-4153. Hydrogeology, ground-water flow, and tritium movement at a low-level radioactive-waste disposal site near Sheffield, Illinois, by George Garklavs and R. W. Healy, 1986.

86-4156. Technique for predicting ground-water discharge to surface coal mines and resulting changes in head, by L. S. Weiss, D. L. Galloway, and A. L. Ishii, 1986.

86-4323. Assessment of low-flow water quality in Richland Creek, Illinois, by W. O. Freeman and A. R. Schmidt, 1986.

87-4024. Assessment of water quality and factors affecting dissolved oxygen in the Sangamon River, Decatur to Riverton, Illinois, summer 1982, by Arthur R. Schmidt and John K. Stamer, 1987.

87-4106. Traveltime and dispersion in the Illinois River, Marseilles to Peoria, Illinois, by E. E. Zuehls, 1987.

87-4151. Investigation of techniques to estimate rainfall-loss parameters for Illinois, by Linda S. Weiss and Audrey L. Ishii, 1987.

87-4207. Technique for estimating flood-peak discharges and frequencies on rural streams in Illinois, by G. W. Curtis, 1987.

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The following reports are available for inspection in the Urbana, Illinois, and Reston, Virginia, offices of the U.S. Geological Survey. They may be purchased from U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225 (phone 303 236-7476).

77-867. Sediment transport to the Fox Chain of Lakes, Illinois, by T. P. Brabets, 1977.

79-210. Water-table contour map of land reclamation site, Fulton County, Illinois, by R. F. Fuentes and G. L. Patterson, 1979.

79-1545. Preliminary report on the hydrogeology of a low-level radioactive-waste disposal site near Sheffield, Illinois, by J. B. Foster and J. R. Erickson, 1980.

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81-1009. Stage-discharge relations at dams on the Illinois and Des Plaines Rivers in Illinois, by D. M. Mades, 1981.

82-645. Determination of ultimate carbonaceous BOD and the specific rate constant (K_1), by J. K. Stamer, J. P. Bennett, and S. W. McKenzie, 1983.

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82-1001. Proceedings--Illinois Water-Data-Users Meeting, Peoria, Illinois, February 23-24, 1982, by L. G. Toler, 1982.

83-213. Floods of December 1982 and January 1983 in central and southern Mississippi River basin, by V. B. Sauer and J. M. Fulford, 1983.

83-926. Geologic and hydrologic data collected during 1976-1984 at the Sheffield low-level radioactive-waste disposal site and adjacent areas, Sheffield, Illinois, by J. B. Foster, George Garklavs, and G. W. Mackey, 1984.

84-584. Illinois ground-water observation network - A preliminary planning document, by L. R. Frost, Jr., Michael O'Hearn, J. P. Gibb, and M. G. Sherrill, 1984.

84-603. Effects of urban runoff on Lake Ellyn at Glen Ellyn, Illinois, by R. G. Striegl, 1985.

84-856. Measurement of ground water velocity using Rhodamine WT dye near Sheffield, Illinois, by George Garklavs and L. G. Toler, 1985.

85-98. Measurement of bedload discharge in nine Illinois streams with the Helley-Smith sampler, by J. B. Graf, in Proceedings of the Advanced Seminar on Sedimentation, August 15-19, 1983, Denver, Colorado, p. 67-68.

85-98. Erosion and landform modification at a low-level radioactive-waste disposal facility near Sheffield, Illinois, by J. R. Gray, in Proceedings of the Advanced Seminar on Sedimentation, August 15-19, 1983, Denver, Colorado, p. 37-39.

85-629. Sources of climatologic, hydrologic, and hydraulic information in the Illinois River basin, Illinois, Indiana, and Wisconsin, by G. W. Curtis, 1986.

86-130. Water resources activities in Illinois, 1985, by M. L. Garrelts, 1986.

86-301. Evapotranspiration and microclimate at a low-level radioactive-waste disposal site in northwestern Illinois, by R. W. Healy, M. P. deVries, and A. M. Sturrock, Jr., 1987.

86-416(W). Observation-well network in Illinois, 1984, by D. C. Voelker, 1986.

87-39. Water-resources activities in Illinois, 1986, by Mary L. Garrelts, 1987.

87-473. Surface-water-quality assessment of the upper Illinois River basin in Illinois, Indiana, and Wisconsin: Project description, by Dean M. Mades, 1987.

87-538. Water-quality data from the observation-well network in Illinois, 1985-87, by D. C. Voelker, D. J. Oberg, and M. J. Grober. 1988.

87-543. Data-collection methods and data summary for the assessment of water quality in Cedar Creek, west-central Illinois, by R. D. McFarlane, W. O. Freeman, and A. R. Schmidt, 1987.

87-698. Water-resources activities in Illinois, 1987, by M. L. Garrelts. 1988.

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The following reports are available from the District Office, 4th Floor, 102 East Main Street, Urbana, IL 61801:

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81-403. Hydrology of Area 35, Eastern Region, Interior Coal Province, Illinois and Kentucky, by E. E. Zuehls, G. L. Ryan, D. B. Peart, and K. K. Fitzgerald, 1981.

81-636. Hydrology of Area 25, Eastern Region, Interior Coal Province, Illinois, by E. E. Zuehls, G. L. Ryan, D. B. Peart, and K. K. Fitzgerald, 1981.

82-858. Hydrology of Area 29, Eastern Region, Interior Coal Province, Illinois, by K. K. Fitzgerald, C. A. Peters, and E. E. Zuehls, 1983.

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84-707. Hydrology of Area 27, Eastern Region, Interior Coal Province, Illinois, by E. E. Zuehls. 1987.

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The following reports are available for inspection only in the Urbana, Illinois, office of the U.S. Geological Survey. Further information about these reports may be obtained from the District Chief, WRD, 4th Floor, 102 East Main Street, Urbana, IL 61801.

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Curtis, G. W., 1969, Statistical summaries of Illinois streamflow data.

Kirk, J. R., 1987, Water withdrawals in Illinois, 1986.

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----- 1982, Water withdrawals in Illinois, 1980.

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Kirk, J. R., and Sanderson, E. W., 1982, Illinois water inventory program.

Lara, O. G., 1970, Low-flow frequencies of Illinois streams.

Mitchell, W. D., 1948, Unit hydrographs in Illinois.

----- 1950, Water-supply characteristics of Illinois streams.

----- 1954, Floods in Illinois--Magnitude and frequency.

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Prugh, B. J., Jr., 1976, Depth and frequency of floods in Illinois.

Sieber, C. R., 1970, A proposed streamflow-data program for Illinois.

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The water-data reports listed below may be purchased as hard copy or microfiche from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161 (phone 703 487-4650). They are available for inspection only at the Illinois and Reston, Virginia, offices of the U.S. Geological Survey. The PB number in parentheses is the NTIS ordering number.

IL-71-1. Water Resources Data for Illinois--Water Year 1971, by U.S. Geological Survey, 1972. (PB 288019/AS)

IL-72-1. Water Resources Data for Illinois--Water Year 1972, by U.S. Geological Survey, 1973. (PB 288018/AS)

IL-73-1. Water Resources Data for Illinois--Water Year 1973, by U.S. Geological Survey, 1974. (PB 288020/AS)

IL-74-1. Water Resources Data for Illinois--Water Year 1974, by U.S. Geological Survey, 1975. (PB 288021/AS)

IL-75-1. Water Resources Data for Illinois--Water Year 1975, by U.S. Geological Survey, 1976. (PB 254434/AS)

IL-76-1. Water Resources Data for Illinois--Water Year 1976, by U.S. Geological Survey, 1977. (PB 266379/AS)

IL-77-1. Water Resources Data for Illinois--Water Year 1977, by U.S. Geological Survey, 1978. (PB 283562/AS)

IL-78-1. Water Resources Data for Illinois--Water Year 1978, Volume 1, Illinois except Illinois River basin, by U.S. Geological Survey, 1979. (PB 296416/AS)

IL-78-2. Water Resources Data for Illinois--Water Year 1978, Volume 2, Illinois River basin, by U.S. Geological Survey, 1979. (PB 296417/AS)

IL-79-1. Water Resources Data for Illinois--Water Year 1979, Volume 1, Illinois except Illinois River basin, by U.S. Geological Survey, 1980. (PB80-207004)

IL-79-2. Water Resources Data for Illinois--Water Year 1979, Volume 2, Illinois River basin, by U.S. Geological Survey, 1980. (PB80-205230).

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IL-81-1. Water Resources Data - Illinois--Water Year 1981, Volume 1, Illinois except Illinois River basin, by U.S. Geological Survey, 1982. (PB83 119966)

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IL-82-1. Water Resources Data - Illinois--Water Year 1982, Volume 1, Illinois except Illinois River basin, by R. L. Stahl, K. K. Fitzgerald, T. E. Richards, and P. D. Hayes, 1983. (PB84-120112)

IL 82-2. Water Resources Data - Illinois--Water Year 1982, Volume 2, Illinois River basin, by T. E. Richards, P. D. Hayes, R. L. Stahl, and K. K. Fitzgerald, 1983. (PB84-120120)

IL 83-1. Water Resources Data - Illinois--Water Year 1983, Volume 1, Illinois except Illinois River basin, by R. L. Stahl, K. K. Fitzgerald, T. E. Richards, and P. D. Hayes, 1984. (PB85-125755)

IL 83-2. Water Resources Data - Illinois--Water Year 1983, Volume 2, Illinois River basin, by K. K. Fitzgerald, P. D. Hayes, T. E. Richards, and R. L. Stahl, 1984. (PB85-127363)

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IL-87-1. Water Resources Data - Illinois--Water Year 1987, Volume 1, Illinois except Illinois River basin, by R. L. Stahl, K. K. Fitzgerald, T. E. Richards, and P. D. Hayes. 1988. (PB89-111728)

IL-87-2. Water Resources Data - Illinois--Water Year 1987, Volume 2, Illinois River basin, by K. K. Fitzgerald, P. D. Hayes, T. E. Richards, and R. L. Stahl. 1988. (PB89-111736)

Miscellaneous Publications

The following abstracts and reports were presented at meetings of scientific and professional organizations. Typically they summarize the principal conclusions of an author's current work but contain little supporting data. These publications are not available from the U.S. Geological Survey.

Hydrogeology of a low-level radioactive-waste disposal site near Sheffield, Illinois, by J. R. Erickson, published in the program of the North-Central Section, Geological Society of America, 14th annual meeting, April 10-11, 1980, Bloomington, Indiana, p. 225.

Anisotropic ground-water movement and tritium migration in glacial drift beneath a low-level radioactive-waste burial site, Argonne, Illinois, by J. C. Olimpio, published in the program of the North-Central Section, Geological Society of America, 14th annual meeting, April 10-11, 1980, Bloomington, Indiana, p. 253.

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Lessons learned in a hydrogeological case at Sheffield, Illinois, by J. B. Foster, in Proceedings of the Symposium on Low-Level Waste Disposal, Site Characterization and Monitoring, June 16-17, 1982, Arlington, Virginia, NUREG/CP-0028, CONF-820674, Vol. 2, p. 237-244.

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Ground-water conditions at a low-level radioactive-waste disposal site near Sheffield, Illinois, by R. W. Healy and J. B. Foster, in Abstracts, Illinois Water Resources Conference, Illinois Water: Planning for the Future, April 7-8, 1983, De Kalb, Illinois.

Northern Midwest regional aquifer study in Illinois, by M. G. Sherrill, in Abstracts, Illinois Water Resources Conference, Illinois Water: Planning for the Future, April 7-8, 1983, De Kalb, Illinois.

Erosion and land modification studies at a low-level radioactive-waste disposal facility near Sheffield, Illinois, by J. R. Gray, in Abstracts, Illinois Water Resources Conference, Illinois Water: Planning for the Future, April 7-8, 1983, De Kalb, Illinois.

Water information systems of the U.S. Geological Survey, by A. W. Noehre, in Abstracts, Illinois Water Resources Conference, Illinois Water: Planning for the Future, April 7-8, 1983, De Kalb, Illinois.

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Effects of an urban lake on stormwater runoff and quality, by R. G. Striegl, in Proceedings of Urban Effects on Water Quality and Quantity, October 20-21, 1983, Urbana, Illinois, Illinois Department of Energy and Natural Resources Document No. 84/06, p. 74-83.

Study of the unsaturated zone at a low-level radioactive-waste disposal site, by R. W. Healy, C. A. Peters, M. P. deVries, P. C. Mills, and D. L. Moffett, in Proceedings of the Characterization and Monitoring of the Vadose (Unsaturated) Zone, National Water Well Association, December 8-10, 1983, Las Vegas, Nevada, p. 820-830.

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Predicting ground-water drainage to surface mines, by L. S. Weiss and D. L. Galloway, in Proceedings of Water for Resource Development, ASCE Hydraulics Division Specialty Conference, August 14-17, 1984, Coeur d' Alene, Idaho, p. 184-188.

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Hydrogeology of the Byron/Johnson Salvage Yard Superfund site near Byron, Illinois, by R. T. Kay, B. J. Ryan, E. J. Mears, and D. J. Yeskis, in Proceedings of the ASCE Water Resources Symposium, October 21-22, 1987, Rosemont, Illinois.

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WHERE TO OBTAIN ADDITIONAL INFORMATION ON U.S. GEOLOGICAL SURVEY PROGRAMS IN ILLINOIS

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TABLES 2 and 3

Table 2.--Surface-Water Stations

Abbreviations for types of data collected are:

- C - Crest stage - peak-stage and peak-discharge record only.
- CQ - Chemical quality.
- D - Discharge - continuous record of stage and discharge.
- D7 - Discharge - continuous record of stage and discharge for months of March through September.
- DS - Discharge with auxiliary slope gage - continuous record of stage and discharge.
- R - Lake contents - furnished by U.S. Army Engineers, St. Louis District.
- S - Stage - continuous record of stage.
- S/8 - Stage at 0800 hours.
- SD - Suspended sediment.

Station No.	Station	Type of data
03336645	Middle Fork Vermilion River above Oakwood, Ill.	D,CQ
03336900	Salt Fork near St. Joseph, Ill.	D,CQ
03337000	Boneyard Creek at Urbana, Ill.	D
03337700	Saline Branch near Mayview, Ill.	CQ
03338097	Salt Fork near Oakwood, Ill.	CQ
03338780	North Fork Vermilion River near Bismarck, Ill.	CQ
03339000	Vermilion River near Danville, Ill.	D,CQ
03339147	Little Vermilion River near Georgetown, Ill.	CQ
03341414	Brouilletts Creek near St. Bernice, Ind.	CQ
03341540	Sugar Creek near Elbridge, Ill.	CQ
03341920	Wabash River at Hutsonville, Ill.	CQ
03343395	Embarras River at Camargo, Ill.	CQ
03343400	Embarras River near Camargo, Ill.	D
03344000	Embarras River near Diona, Ill.	C,CQ
03344500	Range Creek near Casey, Ill.	C
03345500	Embarras River at Ste. Marie, Ill.	D,CQ
03346000	North Fork Embarras River near Oblong, Ill.	D,CQ
03378000	Bonpas Creek at Browns, Ill.	D,CQ
03378635	Little Wabash River near Effingham, Ill.	D,CQ
03378900	Little Wabash River at Louisville, Ill.	C,CQ
03379500	Little Wabash River below Clay City, Ill.	D,CQ
03379600	Little Wabash River at Blood, Ill.	CQ
03380475	Horse Creek near Keenes, Ill.	D
03380500	Skillet Fork at Wayne City, Ill.	D,CQ
03381495	Little Wabash River at Main Street at Carmi, Ill.	CQ
03381500	Little Wabash River at Carmi, Ill.	DS
03382090	Sugar Creek near Stonefort, Ill.	CQ
03382100	South Fork Saline River near Carrier Mills, Ill.	D,CQ
03384450	Lusk Creek near Eddyville, Ill.	D,CQ
03385000	Hayes Creek at Glendale, Ill.	C

Table 2.--Surface-Water Stations--Continued

Station No.	Station	Type of data
03612000	Cache River at Forman, Ill.	D,CQ
05414820	Sinsinawa River near Menominee, Ill.	D
05418950	Apple River near Elizabeth, Ill.	CQ
05419000	Apple River near Hanover, Ill.	D
05420100	Plum River at Savanna, Ill.	CQ
05435500	Pecatonica River at Freeport, Ill.	D,CQ
05435800	Pecatonica River at Harrison, Ill.	CQ
05437500	Rock River at Rockton, Ill.	D,CQ
05437695	Keith Creek at Eighth Street at Rockford, Ill.	D7
05438201	Kishwaukee River at GP Rd at Garden Prairie, Ill.	CQ
05438250	Coon Creek at Riley, Ill.	C,CQ
05438500	Kishwaukee River at Belvidere, Ill.	D
05438600	Kishwaukee R above South Branch nr Perryville, Ill.	CQ
05439000	South Branch Kishwaukee River at De Kalb, Ill.	D
05439500	South Branch Kishwaukee River nr Fairdale, Ill.	D,CQ
05440000	Kishwaukee River near Perryville, Ill.	D,CQ
05440520	Killbuck Creek near New Milford, Ill.	CQ
05440700	Rock River at Byron, Ill.	CQ
05442020	Kyte River at Daysville, Ill.	CQ
05442200	Rock River at Grand Detour, Ill.	CQ
05443500	Rock River at Como, Ill.	D7,CQ
05444000	Elkhorn Creek near Penrose, Ill.	D,CQ
05446000	Rock Creek at Morrison, Ill.	C
05446500	Rock River near Joslin, Ill.	D,CQ
05447100	Green River near Deer Grove, Ill.	CQ
05447500	Green River near Geneseo, Ill.	D,CQ
05448000	Mill Creek at Milan, Ill.	D7
05466000	Edwards River near Orion, Ill.	D
05466500	Edwards River near New Boston, Ill.	D,CQ
05467000	Pope Creek near Keithsburg, Ill.	D7
05468500	Cedar Creek at Little York, Ill.	C
05469000	Henderson Creek near Oquawka, Ill.	D,CQ
05495500	Bear Creek near Marcelline, Ill.	D,CQ
05502020	Hadley Creek near Barry, Ill.	C
05512500	Bay Creek at Pittsfield, Ill.	D
05513000	Bay Creek at Nebo, Ill.	CQ
05520500	Kankakee River at Momence, Ill.	D,CQ
05525000	Iroquois River at Iroquois, Ill.	D,CQ
05525500	Sugar Creek at Milford, Ill.	D,CQ
05526000	Iroquois River near Chebanse, Ill.	D,CQ

Table 2.--Surface-Water Stations--Continued

Station No.	Station	Type of data
05527500	Kankakee River near Wilmington, Ill.	D,CQ
05527800	Des Plaines River at Russell, Ill.	D,CQ
05528000	Des Plaines River near Gurnee, Ill.	D,CQ
05528500	Buffalo Creek near Wheeling, Ill.	D
05529000	Des Plaines River near Des Plaines, Ill.	D,CQ
05529500	McDonald Creek near Mount Prospect, Ill.	D
05530000	Weller Creek at Des Plaines, Ill.	D
05530590	Des Plaines River near Schiller Park, Ill.	CQ
05530990	Salt Creek at Rolling Meadows, Ill.	D
05531500	Salt Creek at Western Springs, Ill.	D,CQ
05532000	Addison Creek at Bellwood, Ill.	D,CQ
05532500	Des Plaines River at Riverside, Ill.	D,CQ
05533000	Flag Creek near Willow Springs, Ill.	D
05533400	Sawmill Creek near Lemont, Ill.	D
05534050	Des Plaines River at Lockport, Ill.	CQ
05534500	North Branch Chicago River at Deerfield, Ill.	D,CQ
05535000	Skokie River at Lake Forest, Ill.	D
05535070	Skokie River near Highland Park, Ill.	D
05535500	West Fork of N Br Chicago River at Northbrook, Ill.	D
05536000	North Branch Chicago River at Niles, Ill.	D,CQ
05536195	Little Calumet River at Munster, Ind.	CQ
05536215	Thorn Creek at Glenwood, Ill.	D
05536235	Deer Creek near Chicago Heights, Ill.	D
05536255	Butterfield Creek at Flossmoor, Ill.	D
05536265	Lansing ditch near Lansing, Ill.	D
05536275	Thorn Creek at Thornton, Ill.	D,CQ
05536290	Little Calumet River at South Holland, Ill.	D
05536340	Midlothian Creek at Oak Forest, Ill.	D
05536500	Tinley Creek near Palos Park, Ill.	D
05536995	Chicago Sanitary and Ship Canal at Romeoville, Ill.	D,CQ
05537000	Chicago Sanitary and Ship Canal at Lockport, Ill.	CQ
05537500	Long Run near Lemont, Ill.	D
05539000	Hickory Creek at Joliet, Ill.	D,CQ
05539900	West Branch Du Page River near West Chicago, Ill.	D,CQ
05540060	Kress Creek at West Chicago, Ill.	D
05540095	West Branch Du Page River near Warrenville, Ill.	D,CQ
05540200	St. Joseph Creek at Lisle, Ill.	D
05540210	East Branch Du Page River at Rt. 34 at Lisle, Ill.	CQ
05540275	Spring Brook at 87th Street near Naperville, Ill.	D,CQ
05540290	Du Page River near Naperville, Ill.	CQ

Table 2.--Surface-Water Stations--Continued

Station No.	Station	Type of data
05540500	Du Page River at Shorewood, Ill.	D,CQ
05542000	Mazon River near Coal City, Ill.	D,CQ
05543500	Illinois River at Marseilles, Ill.	D,CQ
05546700	Fox River near Channel Lake, Ill.	CQ
05547000	Channel Lake near Antioch, Ill.	S
05547500	Fox Lake near Lake Villa, Ill.	S
05548000	Nippersink Lake at Fox Lake, Ill.	S
05548280	Nippersink Creek near Spring Grove, Ill.	D,CQ
05548500	Fox River at Johnsburg, Ill.	S
05549000	Boone Creek near McHenry, Ill.	C
05549500	Fox River near McHenry, Ill.	S
05550000	Fox River at Algonquin, Ill.	D,CQ
05550500	Poplar Creek at Elgin, Ill.	D,CQ
05551000	Fox River at South Elgin, Ill.	CQ
05551200	Ferson Creek near St. Charles, Ill.	D
05551540	Fox River at Montgomery, Ill.	CQ
05551700	Blackberry Creek near Yorkville, Ill.	D,CQ
05552500	Fox River at Dayton, Ill.	D,CQ
05554000	North Fork Vermilion River near Charlotte, Ill.	C
05554490	Vermilion River at McDowell, Ill.	CQ
05554500	Vermilion River at Pontiac, Ill.	D
05555300	Vermilion River near Leonore, Ill.	D,CQ
05556200	Illinois River at Hennepin, Ill.	CQ
05556500	Big Bureau Creek at Princeton, Ill.	D,CQ
05557000	West Bureau Creek at Wyanet, Ill.	C,CQ
05557500	East Bureau Creek near Bureau, Ill.	C
05558300	Illinois River at Henry, Ill.	D
05558995	Illinois River at Lacon, Ill.	CQ
05559900	Illinois River at Water Company at Peoria, Ill.	CQ
05563000	Kickapoo Creek near Kickapoo, Ill.	C
05563500	Kickapoo Creek at Peoria, Ill.	C
05563800	Illinois River at Pekin, Ill.	CQ
05567000	Panther Creek near El Paso, Ill.	C
05567500	Mackinaw River near Congerville, Ill.	D
05567510	Mackinaw River below Congerville, Ill.	CQ
05568000	Mackinaw River near Green Valley, Ill.	C
05568005	Mackinaw River below Green Valley, Ill.	CQ
05568500	Illinois River at Kingston Mines, Ill.	DS
05568800	Indian Creek near Wyoming, Ill.	D,CQ
05569500	Spoon River at London Mills, Ill.	D,CQ

Table 2.--Surface-Water Stations--Continued

Station No.	Station	Type of data
05570000	Spoon River at Seville, Ill.	D,CQ
05570360	Evelyn Branch near Bryant, Ill.	D,CQ
05570370	Big Creek near Bryant, Ill.	D,CQ
05570380	Slug Run near Bryant, Ill.	D,CQ
05570500	Illinois River at Havana, Ill.	D
05570520	Illinois River at Power Company at Havana, Ill.	CQ
05570910	Sangamon River at Fisher, Ill.	D,CQ
05572000	Sangamon River at Monticello, Ill.	D
05572125	Sangamon R at Allerton Park nr Monticello, Ill.	CQ
05573540	Sangamon River at Route 48 at Decatur, Ill.	D,CQ
05573650	Sangamon River near Niantic, Ill.	CQ
05573800	Sangamon River at Roby, Ill.	CQ
05574500	Flat Branch near Taylorville, Ill.	CQ
05575500	South Fork Sangamon River at Kincaid, Ill.	C,CQ
05576000	South Fork Sangamon River near Rochester, Ill.	DS
05576022	South Fork Sangamon River below Rochester, Ill.	CQ
05576500	Sangamon River at Riverton, Ill.	D,CQ
05577500	Spring Creek at Springfield, Ill.	D
05577505	Spring C at Burns Lane Bridge at Springfield, Ill.	CQ
05578000	Sangamon River at Petersburg, Ill.	CQ
05578500	Salt Creek near Rowell, Ill.	D,CQ
05579500	Lake Fork near Cornland, Ill.	D,CQ
05580000	Kickapoo Creek at Waynesville, Ill.	D,CQ
05580500	Kickapoo Creek near Lincoln, Ill.	C,CQ
05580950	Sugar Creek near Bloomington, Ill.	D
05581500	Sugar Creek near Hartsburg, Ill.	C,CQ
05582000	Salt Creek near Greenview, Ill.	D,CQ
05583000	Sangamon River near Oakford, Ill.	D,CQ
05584400	Drowning Fork at Bushnell, Ill.	C
05584500	La Moine River at Colmar, Ill.	D,CQ
05585000	La Moine River at Ripley, Ill.	D,CQ
05585275	Indian Creek at Arenzville, Ill.	CQ
05585500	Illinois River at Meredosia, Ill.	D
05586000	North Fork Mauvaise Terre Creek nr Jacksonville, Ill.	C
05586040	Mauvaise Terre Creek near Merritt, Ill.	CQ
05586100	Illinois River at Valley City, Ill.	CQ,SD
05586500	Hurricane Creek near Roodhouse, Ill.	C
05586690	Macoupin Creek near Macoupin, Ill.	CQ
05587000	Macoupin Creek near Kane, Ill.	D,CQ
05587060	Illinois River at Hardin, Ill.	CQ,S/8

Table 2.--Surface-Water Stations--Continued

Station No.	Station	Type of data
05587900	Cahokia Creek at Edwardsville, Ill.	D,CQ
05588000	Indian Creek at Wanda, Ill.	D
05590000	Kaskaskia Ditch at Bondville, Ill.	D
05590800	Lake Fork at Atwood, Ill.	D
05591200	Kaskaskia River at Cooks Mills, Ill.	D,CQ,SD,S/8
05591500	Asa Creek at Sullivan, Ill.	CQ
05591550	Whitley Creek near Allenville, Ill.	D,S/8
05591700	West Okaw River near Lovington, Ill.	D,CQ,S/8
05591950	Lake Shelbyville near Shelbyville, Ill.	R
05592000	Kaskaskia River at Shelbyville, Ill.	D,CQ
05592050	Robinson Creek near Shelbyville, Ill.	D,S/8
05592100	Kaskaskia River near Cowden, Ill.	D,CQ,S/8
05592195	Beck Creek at Herrick, Ill.	CQ
05592500	Kaskaskia River at Vandalia, Ill.	D,CQ,S/8
05592600	Hickory Creek near Bluff City, Ill.	S,CQ
05592800	Hurricane Creek near Mulberry Grove, Ill.	D,CQ,S/8
05592900	East Fork Kaskaskia River near Sandoval, Ill.	D,CQ,S/8
05592990	Carlyle Lake near Carlyle, Ill.	R
05593000	Kaskaskia River at Carlyle, Ill.	D
05593010	Kaskaskia River below Carlyle, Ill.	CQ
05593505	Crooked Creek near Odin, Ill.	CQ
05593520	Crooked Creek near Hoffman, Ill.	D,CQ
05593575	Little Crooked Creek near New Minden, Ill.	D
05593600	Blue Grass Creek near Raymond, Ill.	C
05593785	Shoal Creek near Walshville, Ill.	CQ
05593900	East Fork Shoal Creek near Coffeen, Ill.	D
05594000	Shoal Creek near Breese, Ill.	D,CQ,S/8
05594090	Sugar Creek at Albers, Ill.	CQ
05594100	Kaskaskia River near Venedy Station, Ill.	D,CQ,SD,S/8
05594450	Silver Creek near Troy, Ill.	D,CQ
05594800	Silver Creek near Freeburg, Ill.	D,CQ,S/8
05595200	Richland Creek near Hecker, Ill.	D,CQ,S/8
05595540	Marys River at Welge, Ill.	CQ
05595700	Big Muddy River near Mt. Vernon, Ill.	CQ,S
05595730	Rayse Creek near Waltonville, Ill.	D,CQ,S/8
05595765	Big Muddy Subimpoundment nr Waltonville, Ill.	S/8
05595820	Casey Fork at Mt. Vernon, Ill.	D,S/8
05595830	Casey Fork at Rt. 37 near Mt. Vernon, Ill.	CQ
05595860	Casey Fork Subimpoundment near Bonnie, Ill.	S/8
05595950	Rend Lake near Benton, Ill.	R

Table 2.--Surface-Water Stations--Continued

Station No.	Station	Type of data
05597000	Big Muddy River at Plumfield, Ill.	DS,CQ
05597040	Pond Creek at West Frankfort, Ill.	CQ
05597280	Little Muddy River near Elkville, Ill.	CQ
05597500	Crab Orchard Creek near Marion, Ill.	D,CQ
05598050	Crab Orchard C below CO Lake nr Carterville, Ill.	CQ
05598245	Crab Orchard Creek near Carbondale, Ill.	CQ
05599200	Beaucoup Creek near Vergennes, Ill.	CQ
05599500	Big Muddy River at Murphysboro, Ill.	DS,CQ,SD
05600000	Big Creek near Wetaug, Ill.	C

Table 3.--Ground-Water Stations by County

Abbreviations for type of data collected are:

L - Ground-water level measurement.
Q - Ground-water quality determination.
B - Well characteristics.

Station number	Local well name	Ownership	Type of data
	BUREAU COUNTY		
412220089280301	16N9E-16.8e	Private	L
	COOK COUNTY		
414208087544501	Palos Forest Preserve DH-1	Federal	L,Q,B
414222087543601	Palos Forest Preserve DH-2	Federal	L,Q,B
414227087543701	Palos Forest Preserve DH-3	Federal	L,Q,B
414230087544201	Palos Forest Preserve DH-4	Federal	L,Q,B
414231087544001	Palos Forest Preserve DH-13	Federal	L,Q,B
414232087544101	Palos Forest Preserve DH-7	Federal	L,Q,B
414235087543901	Palos Forest Preserve DH-5	Federal	L,Q,B
414235087544001	Palos Forest Preserve DH-8	Federal	L,Q,B
414236087544001	Palos Forest Preserve DH-16	Federal	L,Q,B
414237087543901	Palos Forest Preserve DH-6	Federal	L,Q,B
414237087543902	Palos Forest Preserve DH-17	Federal	L,Q,B
414238087544001	Palos Forest Preserve DH-9	Federal	L,Q,B
414238087544002	Palos Forest Preserve DH-11	Federal	L,Q,B
414238087544003	Palos Forest Preserve DH-14	Federal	L,Q,B
414238087544004	Palos Forest Preserve DH-15	Federal	L,Q,B
414238087544101	Palos Forest Preserve DH-12	Federal	L,Q,B
414239087544101	Palos Forest Preserve DH-10	Federal	L,Q,B
	DU PAGE COUNTY		
414217087592801	37N11E-9.8c1	Federal	L
414236087583301	37N11E-9.2f1	Federal	L
	LAKE COUNTY		
422803087475301	46N12E-14.6g1	Federal	L
422803087475302	46N12E-14.6g2	Federal	L
422803087475303	46N12E-14.6g3	Federal	L
422803087475304	46N12E-14.6g4	Federal	L