

WATER-RESOURCES ACTIVITIES OF THE  
U.S. GEOLOGICAL SURVEY  
IN ILLINOIS, 1989

Compiled by Mary L. Garrelts

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U.S. GEOLOGICAL SURVEY  
Open-File Report 89-625



Urbana, Illinois

1990

DEPARTMENT OF THE INTERIOR

MANUEL LUJAN, JR., Secretary

U.S. GEOLOGICAL SURVEY

Dallas L. Peck, Director

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For additional information  
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U.S. Geological Survey  
4th Floor  
102 E. Main Street  
Urbana, IL 61801

Copies of this report can be  
purchased from:

U.S. Geological Survey  
Books and Open-File Reports Section  
Federal Center, Building 810  
Box 25425  
Denver, CO 80225

CONTENTS

	Page
Origin and mission of the U.S. Geological Survey.....	1
Mission of the Water Resources Division.....	2
Illinois District organization.....	3
Publications and Data-Management Unit.....	3
Administrative-Services Unit.....	3
Investigations Section.....	5
Network-Operations Section.....	5
Illinois District funding sources.....	5
Federal program.....	7
Federal-State cooperative program.....	7
Other Federal agencies (OFA) program.....	7
Water conditions.....	9
Surface-water data stations.....	9
Discharge and stage stations.....	9
Water-quality stations.....	13
Ground-water data stations.....	13
Data management.....	15
WATSTORE.....	15
NAWDEX.....	17
Descriptions of projects in 1989.....	19
IL-: 001 Surface-water stations.....	20
002 Ground-water stations.....	22
003 Water-quality stations.....	23
004 Sediment stations.....	24
007 Water use.....	26
044 Sheffield unsaturated flow.....	28
075 NAWQA.....	30
077 Description and response of floods.....	32
078 Illinois rainfall-runoff with GIS.....	33
080 USEPA projects.....	35
081 Great Lakes.....	36
082 Stochastic hydrogeology.....	38
083 Rainfall-runoff in Du Page County.....	39
084 NAWQA biological response study.....	40
086 Illinois ground-water quality.....	41
087 Water returns.....	42
089 Rainfall-runoff in Lake County.....	44

## CONTENTS

	Page
Publications.....	46
General information.....	46
Water-resources information.....	46
Streamflow records.....	46
Quality-of-water records.....	47
Ground-water records.....	47
Flood information.....	47
Professional Papers.....	47
Water-Supply Papers.....	48
Circulars.....	50
Hydrologic Investigations Atlases.....	51
Hydrologic-Unit Maps.....	56
Water-Resources Investigations Reports (WRI/NTIS).....	56
Water-Resources Investigations Reports (Books and Open-File Reports Section).....	58
Open-File Reports (Books and Open-File Reports Section).....	61
Water-Resources Investigations/Open-File Reports.....	63
Water-Data Reports.....	65
Miscellaneous publications.....	68
Where to obtain additional information on U.S. Geological Survey programs in Illinois.....	74
References.....	75

## ILLUSTRATIONS

Figure 1. Illinois District organization chart and office addresses.....	4
2-6. Maps showing:	
2. Field headquarter areas of responsibility.....	6
3. Average annual precipitation in Illinois, 1951-80....	10
4. Discharge and stage stations.....	11
5. Average annual runoff, in inches, 1951-80.....	12
6. Water-quality stations.....	14
7. Ground-water-data stations by county.....	16

## TABLES

Table 1. Agencies supporting water-resources activities during fiscal year 1989.....	8
2. Surface-water stations.....	78
3. Ground-water stations by county.....	85

# WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY

IN ILLINOIS, 1989

Compiled 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 (USGS) has grown and has been modified to meet the changing needs of the Nation it serves. The USGS, 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 USGS 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 USGS:

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

- o Participates in the exploration of space and prepares geologic and other maps of the planets and their satellites.
- o Publishes reports and maps, establishes and maintains earth-science data bases, and disseminates earth-science data and information.
- o Provides scientific and technical assistance for the effective use of earth-science techniques, products, and information.
- o Coordinates topographic, geologic, and land-use mapping, digital cartography, and water-data activities.
- o Develops new technologies for the collection, coordination, and interpretation of earth-science data.
- o Provides scientific support and technical advice for legislative, regulatory, and management decisions.
- o Cooperates with other Federal, State, and local agencies, and with academia and industry.

As the Nation's largest earth-science research agency, the USGS 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 other Federal, State, and local agencies:

- o Systematically collects data needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.
- o 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.
- o 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.
- o Disseminates water data and the results of investigations and research through reports, maps, computerized information services, and other forms of public releases.

- o Coordinates the activities of all Federal agencies in the acquisition of certain water data.
- o 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.
- o Acquires, develops, and disseminates information on water-related natural hazards such as droughts, floods, landslides, land subsidence, mudflows, and volcanoes.
- o 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.
- o Supports the provisions of the National Environmental Policy Act of 1969 and manages USGS conduct of natural-resources surveys in response to the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Act) of 1980.

#### ILLINOIS DISTRICT ORGANIZATION

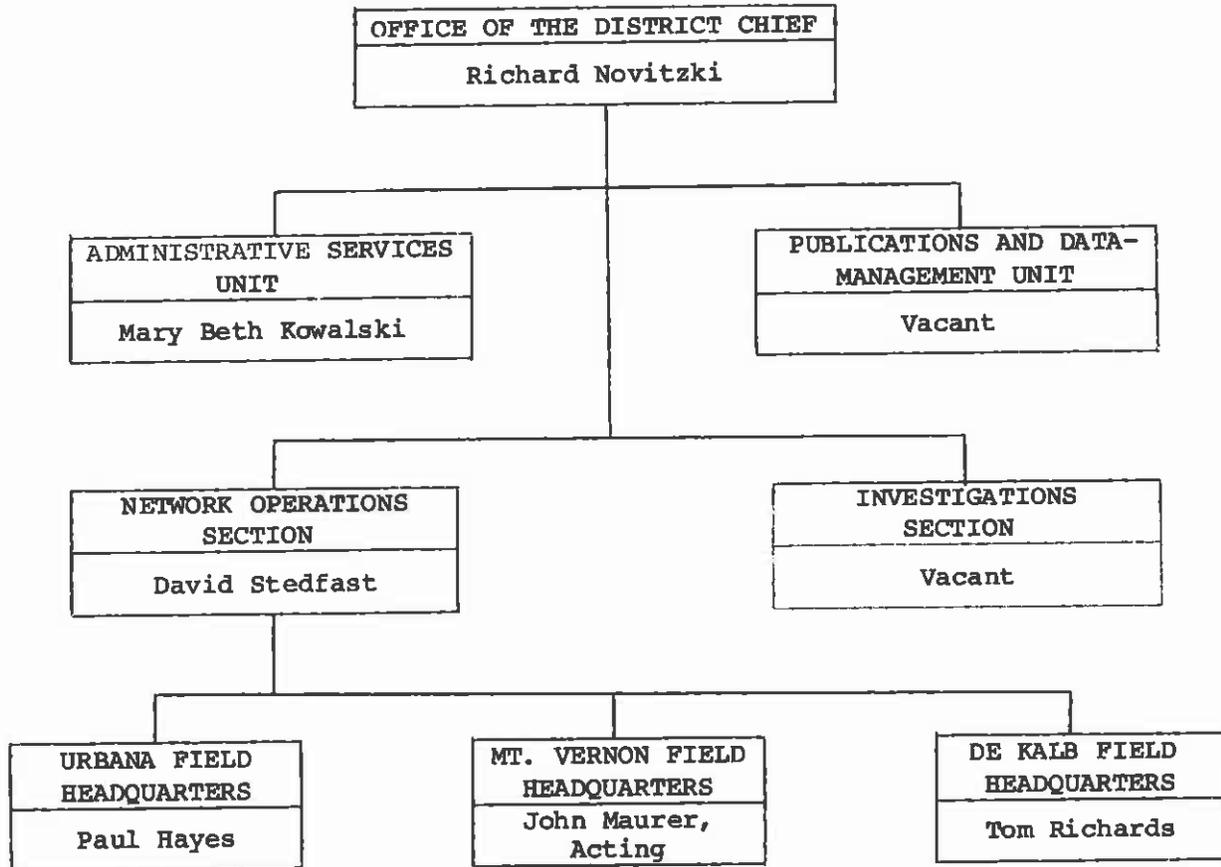
The Illinois District of the U.S. Geological Survey, Water Resources Division, consists of two support units, two operating sections, and three field headquarters (fig. 1). Personnel are based at the District Office and at Field Headquarters in Urbana, Mt. Vernon, and De Kalb. The District operates with 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.



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 and office addresses.

### Investigations Section

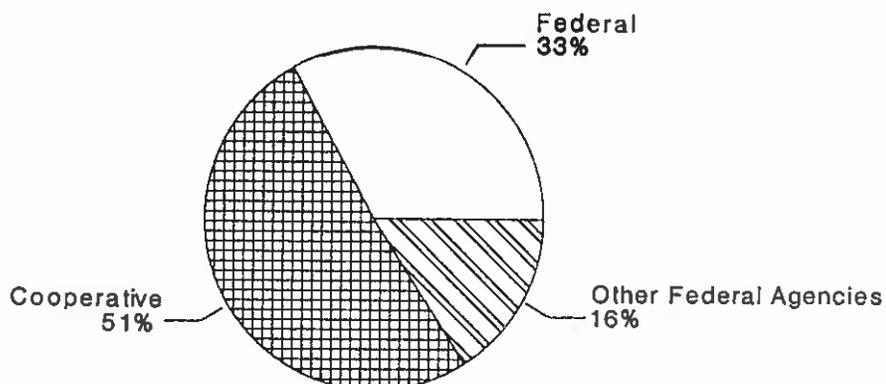
The Investigations Section conducts multi-discipline hydrologic investigations to determine the quantity and quality of surface and ground water and to define and evaluate the extent and availability of water resources of drainage basins, counties, State, and water-resources regions. The Section conducts 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 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 (OFA) program. Funding from all sources in fiscal year 1989 amounted to about \$3,426,000, which was distributed as follows:



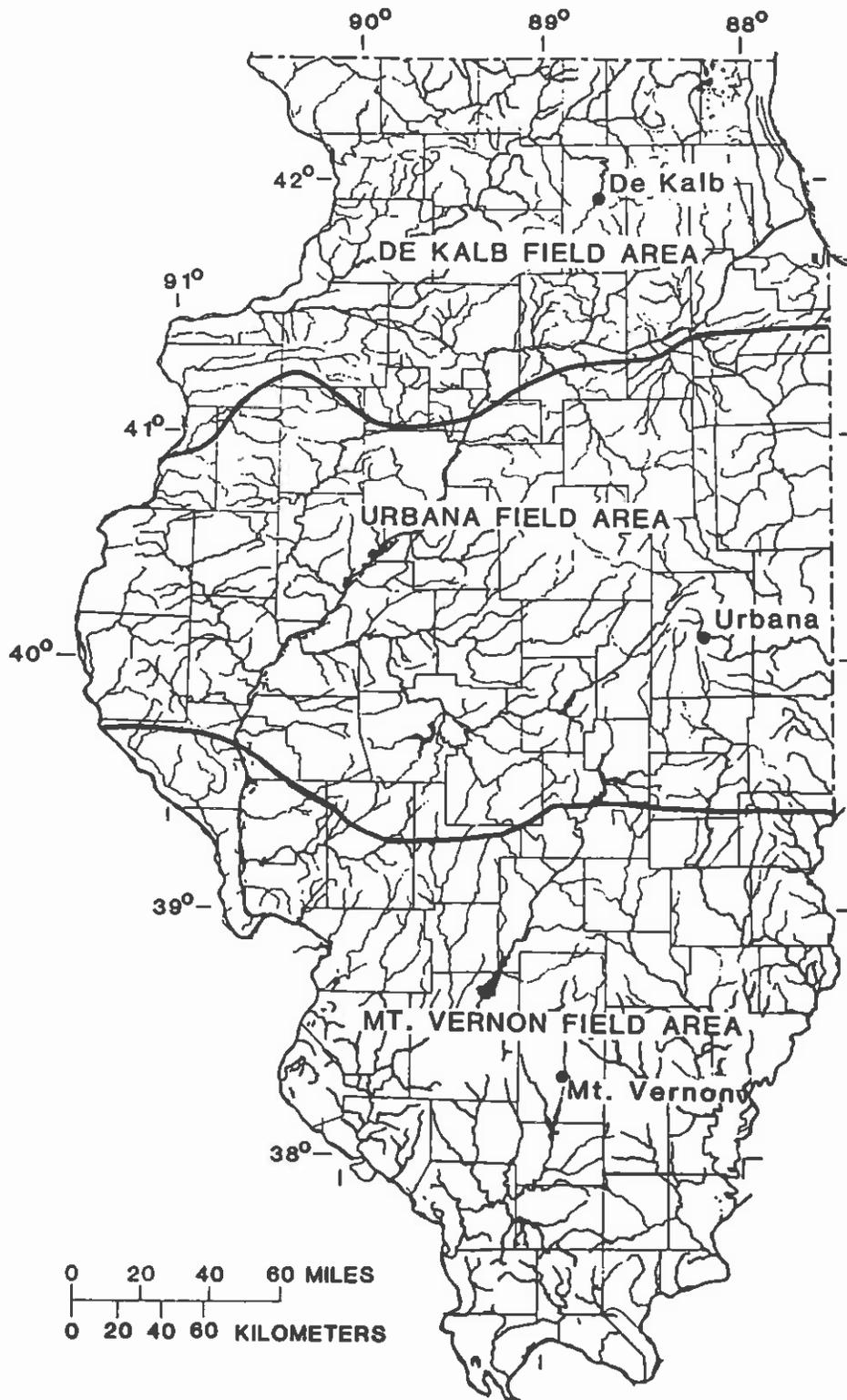
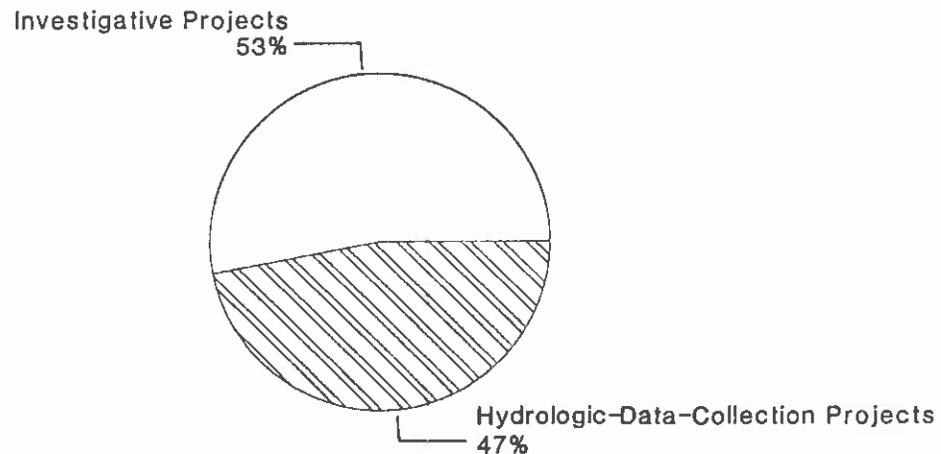


Figure 2.--Field headquarter areas of responsibility.

The diagram below shows the percentage of the activities for fiscal year 1989 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 USGS 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 1989 are listed in table 1.

#### Other Federal Agencies (OFA) Program

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

Table 1.--Agencies supporting water-resources activities  
during fiscal year 1989

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  
State Geological Survey

Local Agencies

Forest Preserve District of Cook County

Forest Preserve District of Du Page County

Du Page County Department of Environmental Concerns

Lake County Department of Planning, Zoning, and  
Environmental Quality

Conservation District of Vermilion County

The Metropolitan Water Reclamation 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 USGS 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:

<u>Station classification</u>	<u>Number of stations</u>
Stream stations.....	173
Continuous record:	
Discharge.....	144
Discharge for 7 months only.....	3
Stage only.....	3
Partial record:	
Peak (maximum) flow only.....	23
Lake and reservoir stations.....	8
Stage and contents.....	3
Stage only.....	5
Total.....	<hr/> 181

The locations of sites where discharge or stage are collected are shown in figure 4, and the types of data collected are shown in table 2 (at end of the report). Average annual runoff for the 1951-80 period is shown in figure 5.

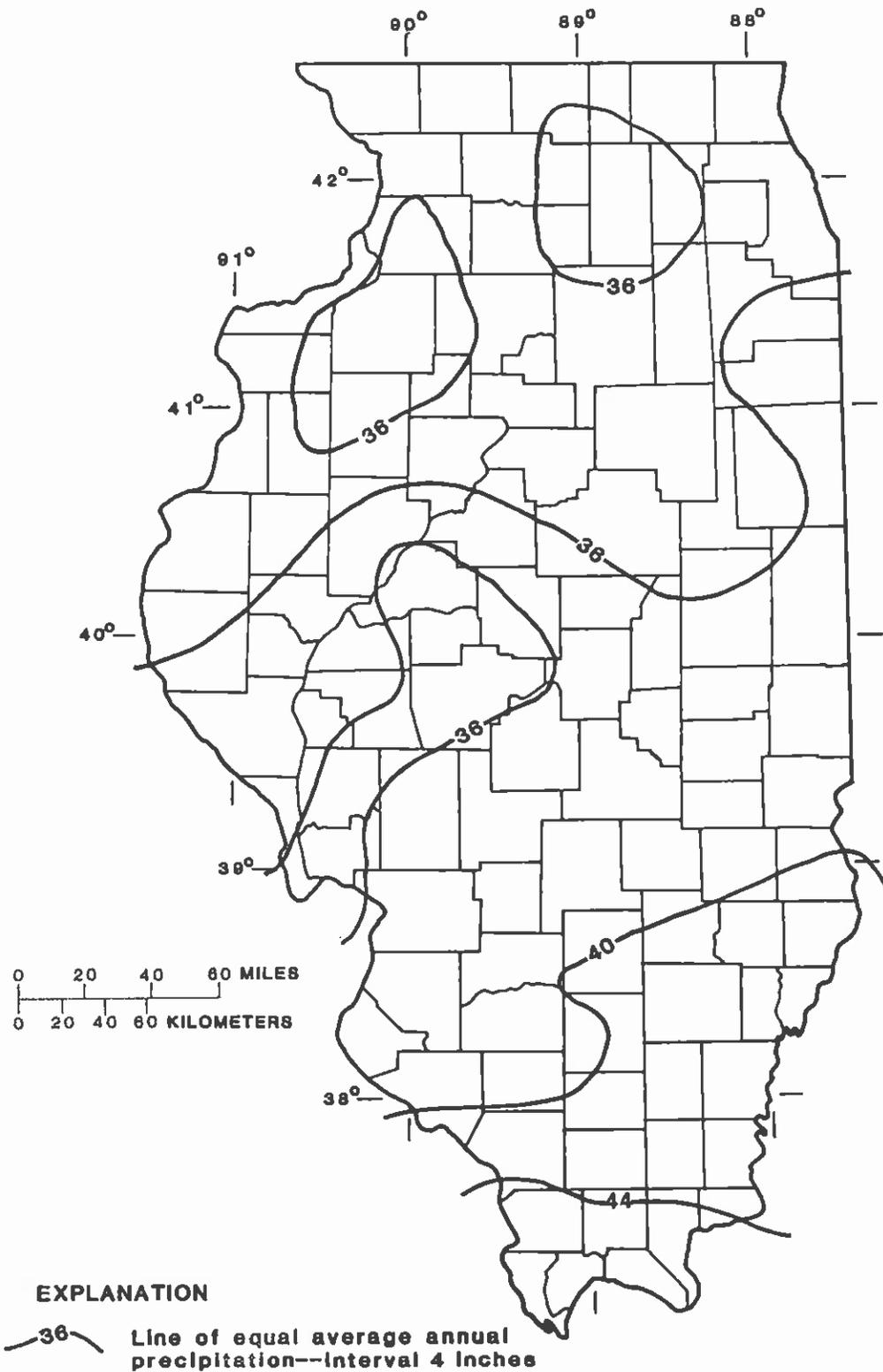


Figure 3.--Average annual precipitation in Illinois, 1951-80  
 (from unpublished map compiled by D. A. Olson,  
 National Oceanic and Atmospheric Administration).

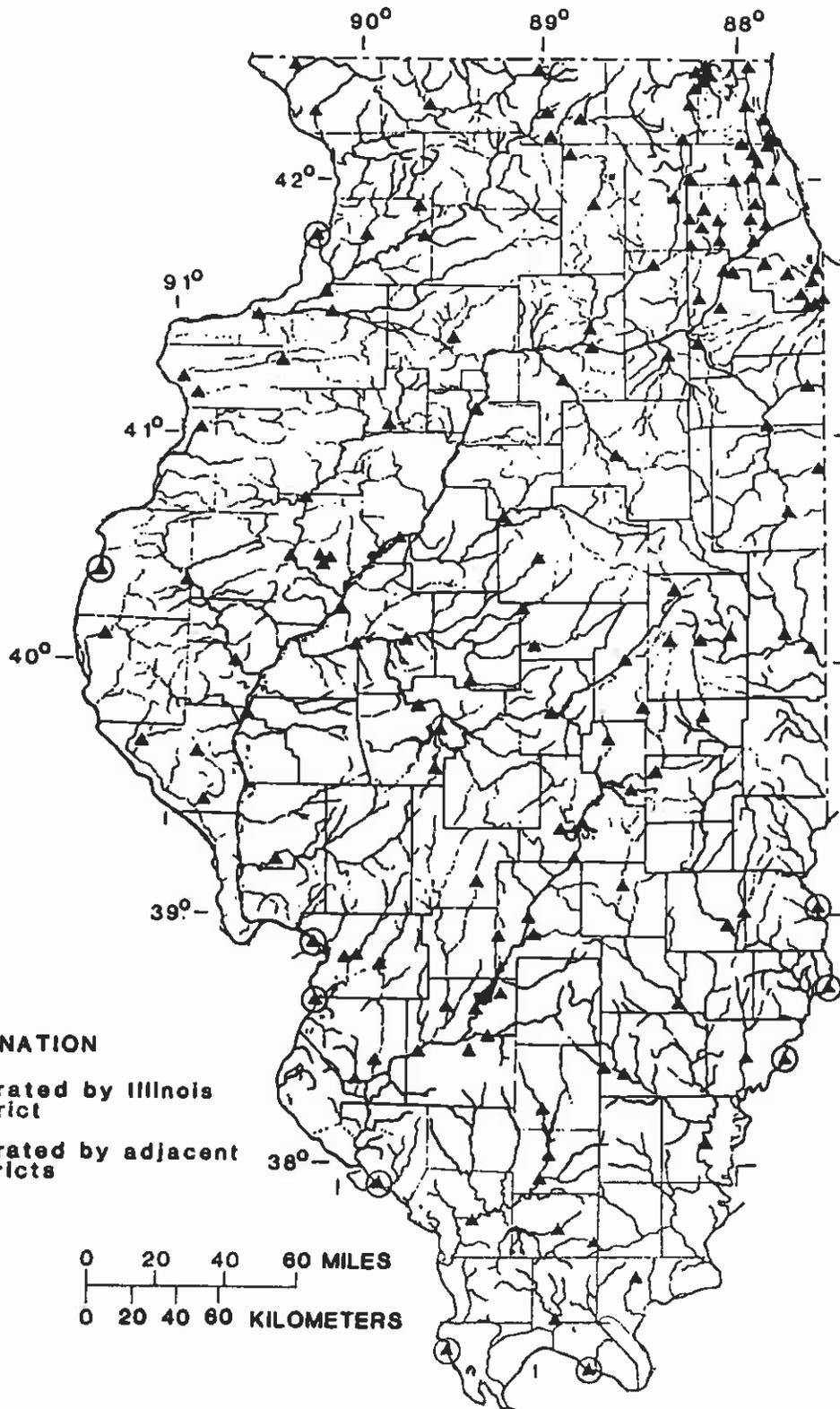


Figure 4.--Discharge and stage stations.

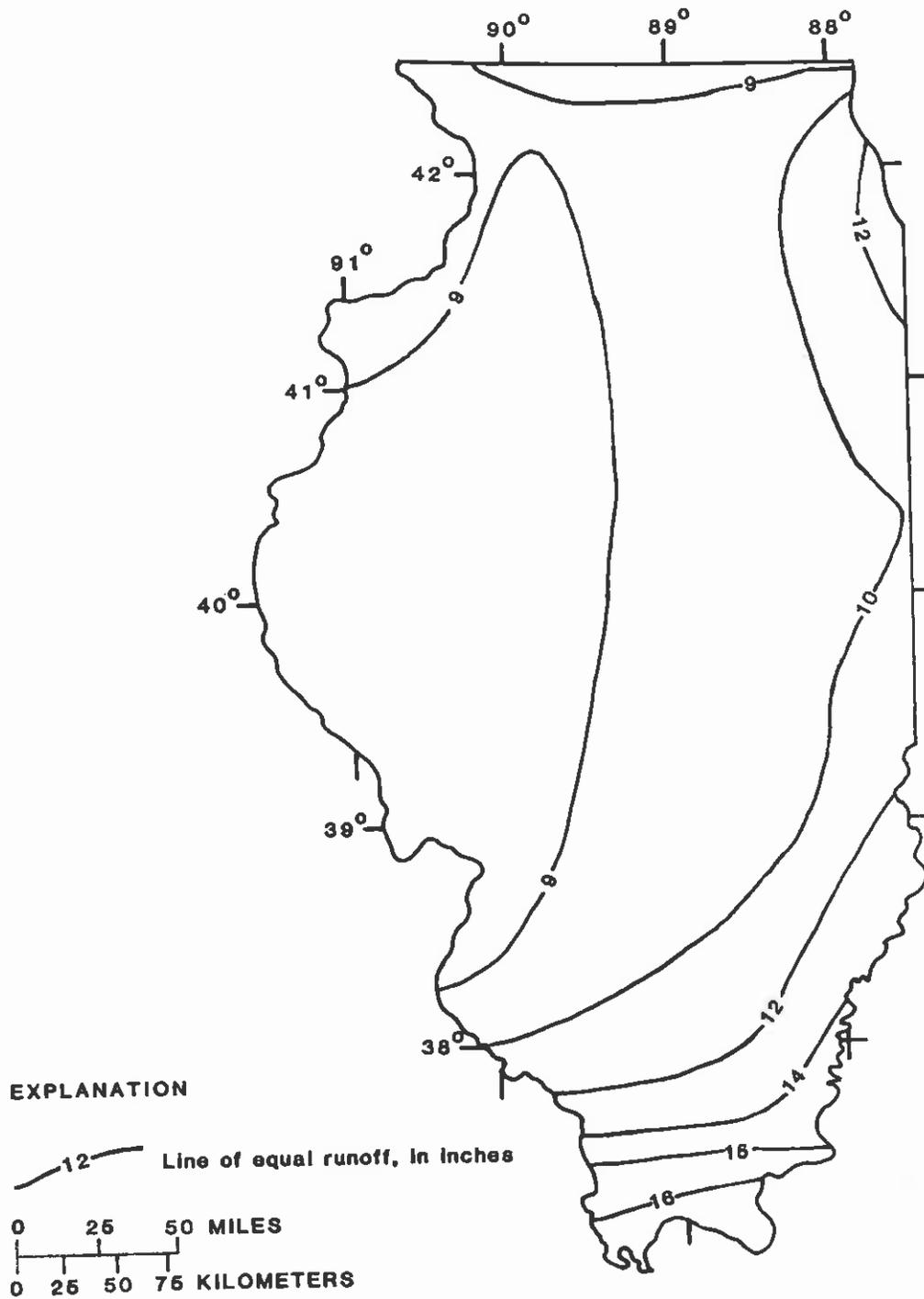


Figure 5.--Average annual runoff, in inches, 1951-80 (from Gebert and others, 1987).

### Water-Quality Stations

Data collected from 149 water-quality sampling stations, operated jointly by the USGS and the Illinois Environmental Protection Agency (IEPA) during fiscal year 1989, are shown in figure 6 and are listed in table 2.

The 149-station network includes 3 stations operated in cooperation with the Metropolitan Water Reclamation 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 adjacent Districts. Daily or near-daily sediment samples were collected, and daily sediment records are computed at four stations.

<u>Data classification</u>	<u>Number of stations</u>
Physical data:	
Water temperature.....	149
Specific conductance.....	149
pH.....	149
Dissolved oxygen.....	149
Sediment data.....	4
Chemical data:	
Inorganic constituents.....	149
Organic constituents.....	149
Microbiological data.....	149

### GROUND-WATER DATA STATIONS

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 to fully assess these trends. In Illinois, the USGS regularly measures water levels in seven observation wells. Four of the seven wells are piezometers open at different depths at one site. Data also are collected from 17 wells in Cook County as part of an ongoing hydrologic study.



Figure 6.--Water-quality stations.

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

<u>Data type</u>	<u>Number of wells</u>
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 (at end of the report). No water-quality data are regularly collected at the seven observation wells. The number of wells, by county, are shown in figure 7.

#### DATA MANAGEMENT

The USGS 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 USGS was established in November 1971 to computerize the water-data system of the USGS 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 USGS at its National Center in Reston, Virginia, and on 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 USGS 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.

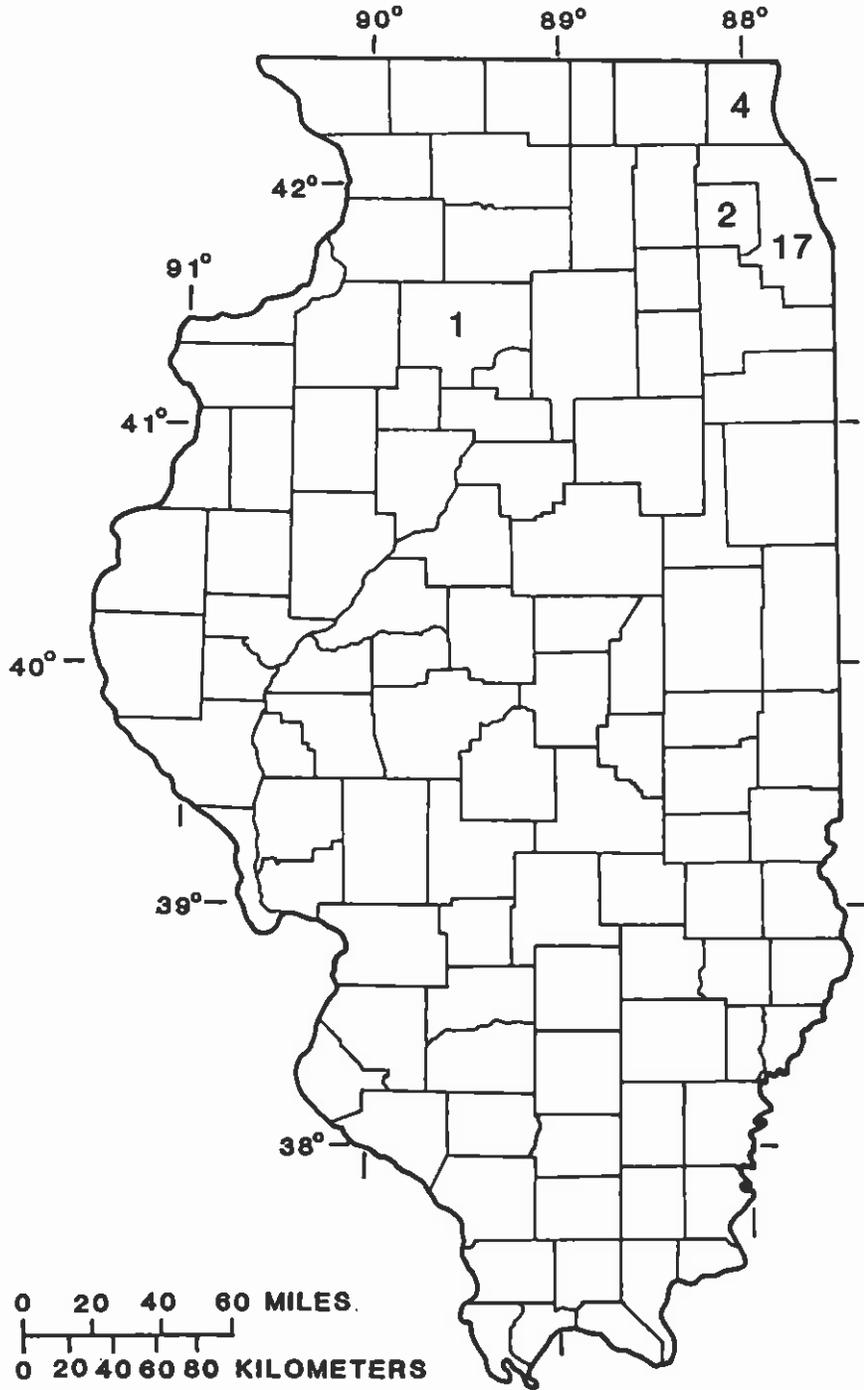


Figure 7.--Ground-water-data stations by county.

NAWDEX

The National Water-Data Exchange (NAWDEX) is a nationwide program managed by the USGS 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 USGS 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).

The NAWDEX program 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. The NAWDEX program 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 1989

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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 136 continuous-record stations, 23 partial-record stations, 9 stage-only stations, and 3 miscellaneous-measurement stations. Installed CR-10 data loggers with telephone modems at 10 continuous-record stations.

\*\*\* PLANS NEXT YEAR \*\*\* Continue surface-water data collection with modifications to the network. Add 8 continuous-record stations equipped with CR-10 data loggers and phone modems, 1 continuous-stage station equipped with CR-10 data logger and phone modem, and 18 continuous rain-gage stations equipped with CR-10 data loggers 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  
The Metropolitan Water Reclamation District of Greater Chicago  
Bloomington and Normal Sanitary District  
Conservation District of Vermilion County  
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., Coupe, R. H., Richards, T. E., and Hayes, P. D., 1989, Water resources data--Illinois, water year 1988, Volume 1. Illinois except Illinois River basin: U.S. Geological Survey Water-Data Report IL-88-1, 413 p.

Coupe, R. H., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1989, Water resources data--Illinois, water year 1988, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-88-2, 556 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 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, three piezometers and one well in Lake County, and one well in Bureau County.

\*\*\* PLANS NEXT YEAR \*\*\* Continue water-level data collection. Drop one of the wells in Du Page County and add 1 or 2 more observation wells to the network.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

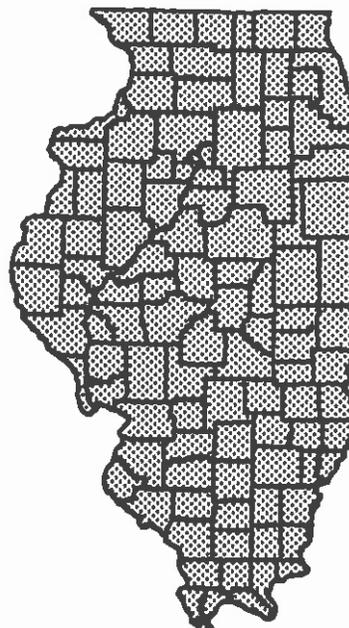
\*\*\* FIELD LOCATION \*\*\* Illinois Statewide

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

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

\*\*\* PUBLISHED REPORTS \*\*\*

Coupe, R. H., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1989, Water resources data--Illinois, water year 1988, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-88-2, 556 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 northeastern 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 USGS 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 programs applied to field data collection and direct-service laboratory activities with Illinois Environmental Protection Agency (IEPA) have continued. All data from IEPA and USGS laboratories have been reviewed and prepared for publication. Discharge values have been applied to the chemical data where possible.

\*\*\* PLANS NEXT YEAR \*\*\* Continue data collection and quality assurance at the same number of stations as last year.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

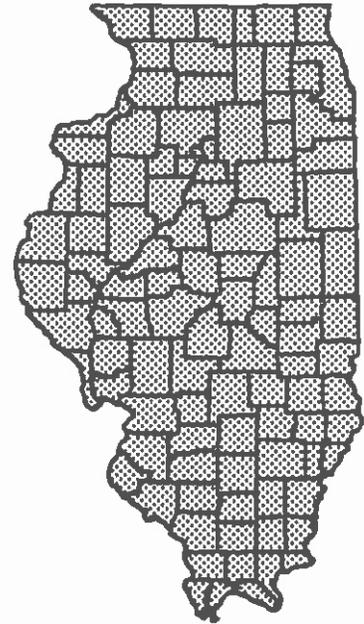
\*\*\* FIELD LOCATION \*\*\* Illinois Statewide

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

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

\*\*\* COOPERATORS \*\*\*

Illinois Environmental Protection Agency, Division of Water Pollution Control  
The Metropolitan Water Reclamation District of Greater Chicago  
Forest Preserve District of Du Page County



\*\*\* PUBLISHED REPORTS \*\*\*

Stahl, R. L., Coupe, R. H., Richards, T. E., and Hayes, P. D., 1989, Water resources data--Illinois, water year 1988, Volume 1. Illinois except Illinois River basin: U.S. Geological Survey Water-Data Report IL-88-1, 413 p.

Coupe, R. H., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1989, Water resources data--Illinois, water year 1988, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-88-2, 556 p.

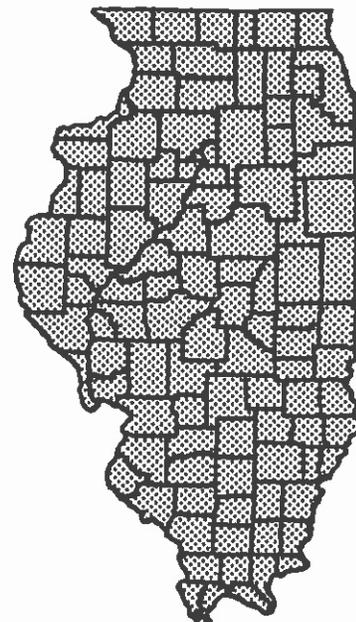
IL004 SEDIMENT STATIONS

\*\*\* 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 to evaluate 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 sampling continues. Sediment discharge relations were observed at times of low flow and storm events.

\*\*\* PLANS NEXT YEAR \*\*\* Continue sediment monitoring at four continuous-streamflow stations. Publish data in Illinois' annual data report.

\*\*\* 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 \*\*\*

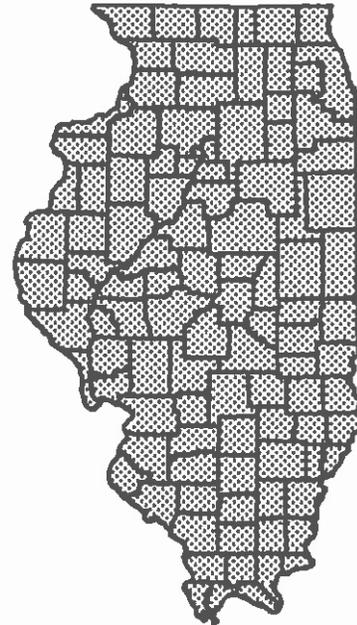
Stahl, R. L., Coupe, R. H., Richards, T. E., and Hayes, P. D., 1989, Water resources data--Illinois, water year 1988, Volume 1. Illinois except Illinois River basin: U.S. Geological Survey Water-Data Report IL-88-1, 413 p.

Coupe, R. H., Hayes, P. D., Richards, T. E., and Stahl, R. L., 1989, Water resources data--Illinois, water year 1988, Volume 2. Illinois River basin: U.S. Geological Survey Water-Data Report IL-88-2, 556 p.

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 \*\*\* (1) Acquire water-use information throughout the State of Illinois as a basis for present analyses and future projections. (2) Develop and maintain a water-use data base that will be responsive to the data needs of users at local, State, and national levels. (3) 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 \*\*\* In cooperation with the ISWS, 1987 withdrawal, delivery, and consumptive-use data were entered into AWUDS and checked. In cooperation with the IEPA, 1987 return data were entered into NEWSWUDS and AWUDS and checked. Three sections of the proposed 1990 National Guidelines report were written.

\*\*\* PLANS NEXT YEAR \*\*\* (1) Get Rockford-Kankakee report and 1990 National Guidelines approved. (2) Enter 1988 water-use data into NEWSWUDS and AWUDS. (3) Propose an expanded water-use project that will provide an avenue for verifying data and establishing estimating methods.

\*\*\* 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 \*\*\*

Determining Water Use for Rockford and Kankakee, Illinois

\*\*\* 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 Lonquist,  
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.

\*\*\* 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 \*\*\* The report "Water and tritium movement through the unsaturated zone at a low-level radioactive-waste disposal site near Sheffield, Illinois, 1981-85" was approved for publication as an Open-File Report pending release as a Water-Supply Paper. The report "Effects of low-level radioactive waste on water chemistry in the unsaturated zone at a disposal site near Sheffield, Illinois, 1982-84" was forwarded to Region for Director's approval. The report "Water and leachate movement through the unsaturated zone of a low-level radioactive-waste disposal site near Sheffield, Illinois, 1986-87" is in colleague review.

\*\*\* PLANS NEXT YEAR \*\*\* Prepare annotated outline and complete final data report.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

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

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

\*\*\* PERIOD OF PROJECT \*\*\* October 1980 through September 1990

\*\*\* PLANNED REPORT \*\*\*

Construction Data for U.S. Geological Survey Observation Wells at the Low-Level Radioactive-Waste Disposal Site near Sheffield, Illinois

\*\*\* REPORTS IN PROCESS \*\*\*

Effects of Disposal of Low-Level Radioactive Waste on Water Chemistry in the Unsaturated Zone at a 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, 1981-85

Water and Leachate Movement Through the Unsaturated Zone at a Low-Level Radioactive-Waste Disposal Site near Sheffield, Illinois, 1986-87

\*\*\* 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., 1989, Seepage through a hazardous-waste trench cover in Beard, L. R., and others, eds., Journal of Hydrology: v. 108, no. 1-4, June 1989, p. 213-234.

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.

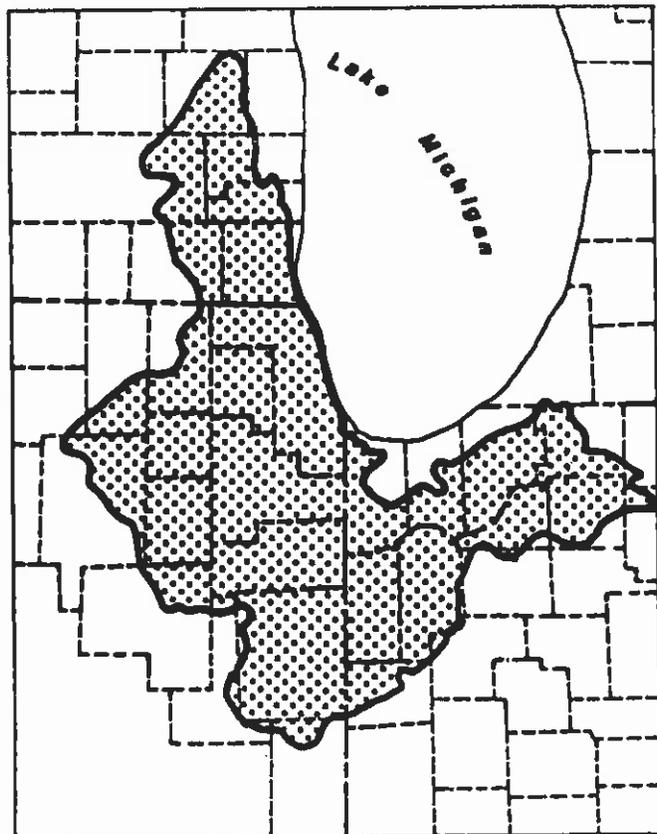
Healy, R. W., deVries, M. P., and Sturrock, A. M., Jr., 1987, Evapotranspiration and microclimate at a low-level radioactive-waste disposal site in northwestern Illinois: U.S. Geological Survey Open-File Report 86-301, 88 p.

Healy, R. W., Gray, J. R., deVries, M. P., and Mills, P. C., 1989, Water balance at a low-level radioactive-waste disposal site in Water Resources Bulletin: American Water Resources Association, v. 25, no. 2, p. 381-390.

#### IL075 NAWQA

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

\*\*\* PROBLEM \*\*\* Protection of the quality of the Nation's groundwater 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 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. An analysis of the river cross-section survey data was performed to document mixing characteristics. Two basin-wide synoptic surveys were completed. First, an ecosystem survey and tissue analysis at 12 to 20 sites. Second, trace organic compounds in bottom material were sampled for at 60 sites. Most of the statistical work for the report on the analysis of existing water-quality data was completed and several chapters written. The project liaison committee met twice to discuss project documents, plans, and coordination.

\*\*\* PLANS NEXT YEAR \*\*\* Continue fixed-station sampling. Continue to compile and statistically summarize existing water-quality information. Complete draft report that describes results of analysis of existing information. Continue to meet with the project liaison committee. Begin writing reports for synoptic surveys that have been completed.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

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

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

\*\*\* PERIOD OF PROJECT \*\*\* April 1986 through 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 \*\*\*

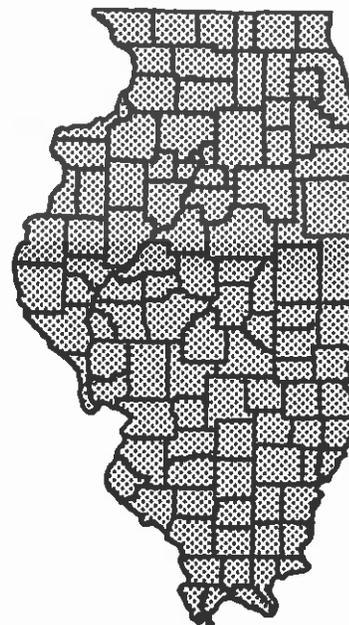
Mades, Dean M., 1987, Surface-water-quality assessment of the upper Illinois River basin in Illinois, Indiana, and Wisconsin: Project description: U.S. Geological Survey Open-File Report 87-473, 39 p.

Steffeck, D. W., and Striegl, R. G., 1989, An inventory and evaluation of biological investigations that relate to stream-water quality in the upper Illinois River basin of Illinois, Indiana, and Wisconsin: U.S. Geological Survey Water-Resources Investigations Report 89-4041, 54 p.

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 \*\*\* A set of large storms that caused flooding of large areal extent was analyzed via data collection and modeling. A report was colleague-reviewed that detailed the hydrologic characteristics of two of the storms. Simulation of the flooding with a rainfall-runoff model, using calibrated and regionalized parameters, indicated that the model is less sensitive to parameter error for large storms.

\*\*\* PLANS NEXT YEAR \*\*\* Complete and publish report.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

\*\*\* FIELD LOCATION \*\*\* Illinois Statewide

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

\*\*\* PERIOD OF PROJECT \*\*\* October 1986 through September 1989

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

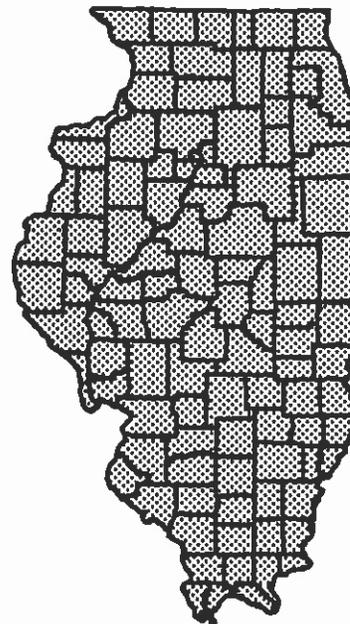
\*\*\* REPORT IN PROCESS \*\*\*  
Floods of June 13-14, 1981, and December 2-7, 1982, in Illinois

#### IL078 ILLINOIS RAINFALL-RUNOFF WITH GIS

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

\*\*\* PROBLEM \*\*\* Estimates of rainfall-loss function (infiltration) parameters are required when the HEC-1 model is used to compute discharge hydrographs for ungaged basins. The current procedures to estimate infiltration parameters from basin, soil, and climatologic characteristics, as well as the rainfall-loss functions need to be evaluated to determine the transferability of parameters to ungaged basins.

\*\*\* OBJECTIVE \*\*\* To quantitatively document techniques to estimate infiltration parameters from basin, soil, and climatologic characteristics. The accuracy of current techniques and the uncertainty in the rainfall-loss functions will be quantified.



\*\*\* APPROACH \*\*\* Data set of calibrated parameters for over 600 hydrographs at 98 basins throughout Illinois were used to quantify uncertainty in rainfall-loss functions. The GIS data base of land use, soils, elevation, precipitation, and temperature were used to examine relations between infiltration parameters and these characteristics. Literature search will identify other estimation techniques for infiltration.

\*\*\* SUMMARY OF RESULTS \*\*\* Completed development of GIS data base. Analyses indicate that model parameters are not correlated to basin, soil, or climatologic characteristics. Reports describing GIS data base and statistical results are complete and in review.

\*\*\* PLANS NEXT YEAR \*\*\* Perform literature search on infiltration estimation techniques. Write and publish reports on infiltration as well as reports on data base and statistics.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

\*\*\* FIELD LOCATION \*\*\* Illinois Statewide

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

\*\*\* PERIOD OF PROJECT \*\*\* October 1986 through September 1989

\*\*\* COOPERATOR \*\*\*

Illinois Department of Transportation, Division of Water Resources

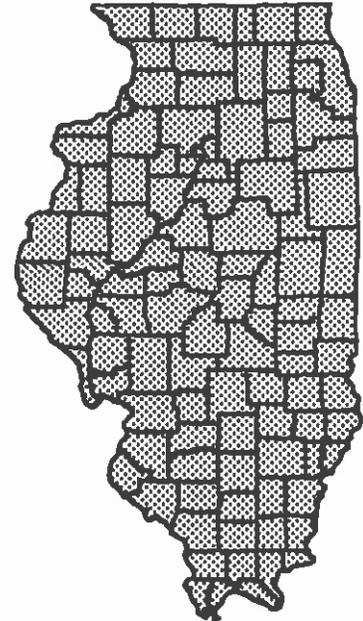
\*\*\* PLANNED REPORTS \*\*\*

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 \*\*\* Provide technical assistance on how to design, conduct, and analyze an aquifer test. Provide technical oversight for all field work. Provide technical review on results of work.

\*\*\* SUMMARY OF RESULTS \*\*\* (1) Published report "Hydrogeology and Results of Aquifer Testing at the Byron Salvage Yard (WRIR 89-4081). (2) Received approval for report on results of the aquifer testing in Antioch, Illinois (WRIR 89-4124). (3) Continued oversight of water-quality data collection and aquifer testing at ACME Solvents and Pagel's Pit sites. Analyzed data collected to date and wrote an Administrative Report to USEPA. (4) Provided technical review of reports and work plans at the ACME and Pagel's Pit sites.

\*\*\* PLANS NEXT YEAR \*\*\* (1) Begin personnel detail to provide technical support for ground-water investigations at hazardous-waste disposal sites, USEPA, Region V, Chicago. (2) Begin study of ground-water/surface-water interactions, Byron Salvage Yard area. (3) Complete data collection and report writing for Acme/Pagel sites.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

\*\*\* 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 \*\*\*

Ground-Water/Surface-Water Interactions, Byron Salvage Yard Area

\*\*\* REPORT IN PROCESS \*\*\*

Determination of hydraulic properties in the vicinity of a landfill near Antioch, 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

Kay, R. T., Olson, D. N., and Ryan, B. J., 1989, Hydrogeology and Results of Aquifer Tests in the Vicinity of a Hazardous-Waste Disposal Site near Byron, Illinois: U.S. Geological Survey Water-Resources Investigations Report 89-4081, 55 p.

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 \*\*\* Original report in colleague review. New funds from International Joint Commission (IJC) to look at pesticides in the Great Lakes Region by hydrologic unit utilizing Resources for the Future (RFF) data and U.S. Geological Survey digital coverages.

\*\*\* PLANS NEXT YEAR \*\*\* Finish informal IJC pesticide GIS map of hydrologic unit. Submit original report for Director's approval.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

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

\*\*\* PROJECT CHIEF \*\*\* Kelly L. Warner

\*\*\* PERIOD OF PROJECT \*\*\* January 1987 through September 1990

\*\*\* REPORT IN PROCESS \*\*\*

Bibliography of Hydrogeologic Studies and an Application of a Geographic Information System, Great Lakes basin, United States

\*\*\* 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 deter-  
mining 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 hydraulic and tracer tests. Ground-  
water flow model was set up. A new method for determining hydraulic properties  
of fractured dolomite by using a 2-minute aquifer pump test was developed.

\*\*\* PLANS NEXT YEAR \*\*\* Finish solute transport modeling; publish required  
reports.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

\*\*\* FIELD LOCATION \*\*\* Northeastern Illinois

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

\*\*\* PERIOD OF PROJECT \*\*\* October 1987 through September 1989

\*\*\* PLANNED REPORT \*\*\*

Stochastic analysis of flow and transport in a fractured dolomite aquifer



IL083 RAINFALL-RUNOFF IN DU PAGE COUNTY

\*\*\* PROJECT TITLE \*\*\* Rainfall-Runoff Relations in Large and Small Watersheds in Du Page County, Illinois

\*\*\* PROBLEM \*\*\* Little information about the variation in time and space of rainfall and corresponding storm runoff exists in Du Page County. The development of a comprehensive, county-wide storm water management program in Du Page County requires an understanding of rainfall-runoff relations. Actual runoff data are needed for developing rainfall-runoff relations.

\*\*\* OBJECTIVES \*\*\* (1) Determine rainfall-runoff relations in three large and three small watersheds using observed data and rainfall-runoff modeling. (2) Analyze differences in rainfall-runoff relations between watersheds and relate differences to causative factors such as land use.

\*\*\* APPROACH \*\*\* Streamflow and meteorologic data will be collected in three small and three large 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. Other pertinent data, such as land use and soil type, will be obtained from existing sources. These data will be used to calibrate a continuous simulation rainfall-runoff model for each watershed. A subset of the data collected will be set aside for verification.

\*\*\* SUMMARY OF RESULTS \*\*\* Additional streamflow and precipitation gages have been installed in both large and small watersheds to provide better coverage and more detailed hydrologic information. Streamflow and precipitation records for 1989 have been computed. Analysis of streamflow and precipitation records has begun. Modeling of one small basin has been initiated.

\*\*\* PLANS NEXT YEAR \*\*\* Continue data collection and analysis. Complete report describing observed rainfall-runoff relations. Continue modeling calibration for the three small watersheds. Complete FY 89 streamflow records. Coordinate synoptic discharge measurements on several reaches to aid modeling.

\*\*\* HEADQUARTERS LOCATION \*\*\* Urbana, Illinois

\*\*\* FIELD LOCATION \*\*\* Du Page County, Illinois

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

\*\*\* PERIOD OF PROJECT \*\*\* October 1987 through September 1991

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



\*\*\* PLANNED REPORTS \*\*\*

Observed Rainfall-Runoff Relations in Three Small Watersheds in Du Page County, Illinois  
Simulated Rainfall-Runoff Relations for Small and Large Watersheds in Du Page County, Illinois

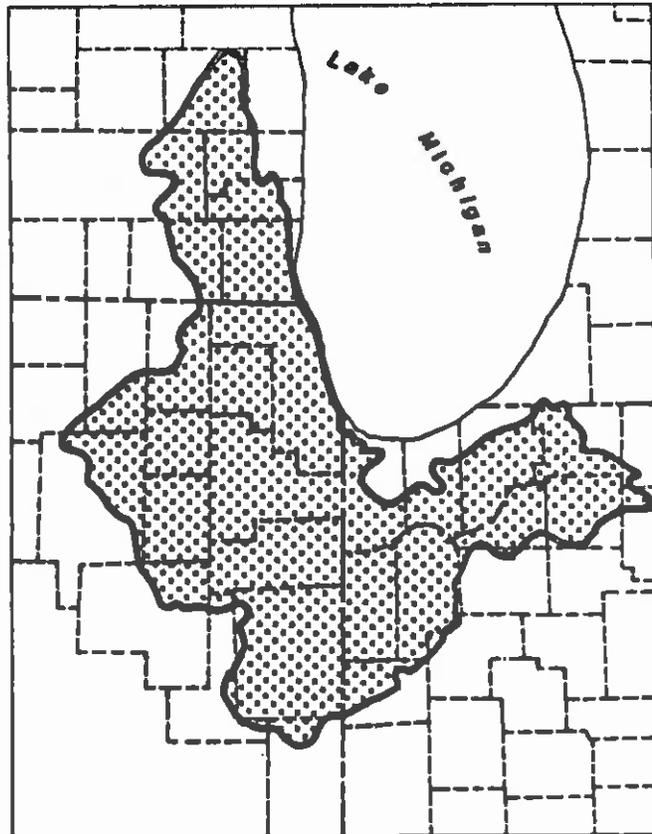
IL084 NAWQA BIOLOGICAL RESPONSE STUDY

\*\*\* 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 information 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 fish community and water-quality data; determined its spatial and temporal coverage. Selected subset of comparable data, constructed computerized data base, and conducted preliminary analyses.

\*\*\* PLANS NEXT YEAR \*\*\* Complete statistical analyses and write report.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

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

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

\*\*\* PERIOD OF PROJECT \*\*\* January 1988 through March 1990

\*\*\* PLANNED REPORTS \*\*\*

Project Results

#### IL086 ILLINOIS GROUND-WATER QUALITY

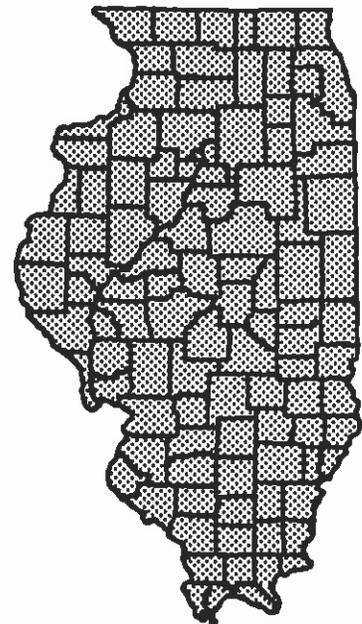
\*\*\* PROJECT TITLE \*\*\* A Statistical and Graphical Description of Illinois Ground-Water Quality

\*\*\* PROBLEM \*\*\* The public water-supply well information collected by the Illinois Environmental Protection Agency and U.S. Geological Survey is the largest statewide water-quality data bank. This information has never been statistically or graphically summarized. The new Illinois Ground Water Protection Act mandates new and continued assessment of Illinois ground-water quality.

\*\*\* OBJECTIVE \*\*\* To statistically and graphically present Illinois ground-water quality based on water-quality information from public water-supply wells.

\*\*\* APPROACH \*\*\* The National Water Information System (NWIS) statistical packages and a Geographic Information System (GIS) will give accurate tabular and graphic representation of Illinois ground water. Other explanatory statistics may be applied. Correlations and special trends will be explored.

\*\*\* SUMMARY OF RESULTS \*\*\* Finished work for FY 89. This included numerous statistical summaries and maps of constituents. Displayed poster session for IEPA at public meeting. IEPA has decided to give low priority to a report of this work. We are waiting for continued funding.



\*\*\* PLANS NEXT YEAR \*\*\* Depends on project funding. Project will be funded, but the level of funding is uncertain.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

\*\*\* FIELD LOCATION \*\*\* Illinois Statewide

\*\*\* PROJECT CHIEF \*\*\* Kelly L. Warner

\*\*\* PERIOD OF PROJECT \*\*\* August 1988 through September 1989

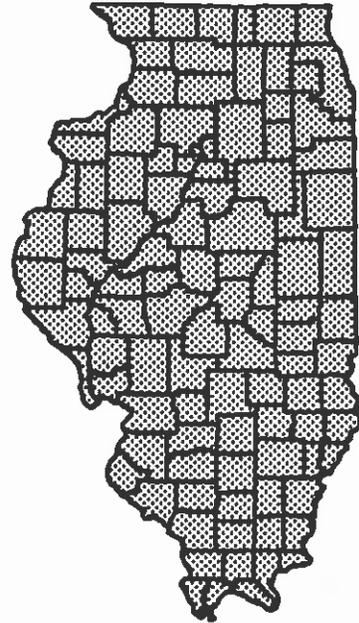
\*\*\* COOPERATOR \*\*\*

Illinois Environmental Protection Agency

#### IL087 WATER RETURNS

\*\*\* PROJECT TITLE \*\*\* The Percentage of Return Flow in Selected Headwaters in Illinois

\*\*\* PROBLEM \*\*\* There is a need to understand the amount of water returned to Illinois streams. The effect of return flows on streamflow quantity, quality, and ultimately water supply is unknown. The consequences of return flows on streamflow during drought is especially important because returns may constitute a major part of sustained flows in urban streams during drought conditions. The National Water Quality Assessment project and the Du Page County Runoff project in the Illinois District of the U.S. Geological Survey (USGS) are in need of return data to determine man's effect on loads in streams and on streamflow. Water-return information could help provide the understanding necessary to manage water resources and to resolve future water supply and demand issues in Illinois.



\*\*\* OBJECTIVES \*\*\* (1) Create a return-flow data base to complement the water-use data program. (2) Determine the significance of return flows in selected streams in Illinois.

\*\*\* APPROACH \*\*\* Discharge monitoring report data for about 500 commercial, industrial, public-supply, and industrial facilities will be entered from hard copies into software on a microcomputer. Data will be entered monthly and merged into the USGS's State Water-Use Data System (NEWSWUDS) with 770 other sites currently entered by the Illinois Environmental Protection Agency (IEPA).

Several (2-5) stream reaches in Illinois will be studied to evaluate the significance of returns. A stream reach above the most upstream USGS continuous-record gaging station will be considered a potential study reach. Return data will be retrieved from NEWSWUDS by geographic location for the stream reaches above these gages. Study reaches will be those where return data are available. The significance of returns will be evaluated by determining the quantities of return flow in the gaged streamflow. The percentage of total monthly streamflow that was actually return flow will be documented to show the seasonal variation of the significance of return flows.

\*\*\* SUMMARY OF RESULTS \*\*\* Entered 7 months of monthly return-flow data for 498 commercial and industrial facilities.

\*\*\* PLANS NEXT YEAR \*\*\* Prepare annotated outline. Evaluate the significance of return flow in several stream reaches in Illinois. Write the report.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

\*\*\* FIELD LOCATION \*\*\* Illinois Statewide

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

\*\*\* PERIOD OF PROJECT \*\*\* April 1989 through September 1990

\*\*\* COOPERATOR \*\*\*  
Illinois Environmental Protection Agency

\*\*\* PLANNED REPORTS \*\*\*  
The Percentage of Return Flow in Selected Headwaters in Illinois

IL089 RAINFALL-RUNOFF IN LAKE COUNTY

\*\*\* PROJECT TITLE \*\*\* Rainfall-Runoff Relations in Eight Watersheds in Lake County, Illinois

\*\*\* PROBLEM \*\*\* Lake County is an urbanizing county north of Chicago. State legislation, partly prompted by recent record flooding, has given the county responsibility for stormwater management. To address this responsibility, the county needs knowledge of the rainfall-runoff relations for its watersheds, and how these relations may be influenced by changing land-use and engineering constraints.

\*\*\* OBJECTIVES \*\*\* (1) Determine the rainfall-runoff relations for eight watersheds in Lake County. (2) Define the rainfall-runoff relations for major land-use categories and soil types prevalent in the county.

\*\*\* APPROACH \*\*\* (1) Establish a network of rainfall- and streamflow-gaging stations. (2) Calibrate and verify a distributed-parameter rainfall-runoff model using the collected data. (3) Relate the hydrologic and hydraulic characteristics of the watersheds to the rainfall-runoff relations of the watersheds with regression analysis.

\*\*\* SUMMARY OF RESULTS \*\*\* Five streamflow-gaging stations have been installed and initial discharge measurements made. Rain-gage equipment has been located at 18 sites in the county with 5 sites instrumented to measure snowfall. The sites have been entered into local GIS coverages.

\*\*\* PLANS NEXT YEAR \*\*\* Information on the physical characteristics of the gaged basins will be collected to aid in the calibration of a rainfall-runoff model. The stage-discharge relations for the gaging stations will be defined.

\*\*\* HEADQUARTERS OFFICE \*\*\* Urbana, Illinois

\*\*\* FIELD LOCATION \*\*\* Lake County, Illinois

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

\*\*\* PERIOD OF PROJECT \*\*\* June 1989 through September 1993

\*\*\* COOPERATOR \*\*\*

Lake County Department of Planning, Zoning, and Environmental Quality  
Illinois Department of Transportation, Division of Water Resources

\*\*\* PLANNED REPORTS \*\*\*

Rainfall-Runoff Relations in Lake County, Illinois



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**PUBLICATIONS**

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## 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.

#### 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 J. 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 Relations 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 2327 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. 1989.
- 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

Copies of circulars still in print are available 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.
- C 953 Erosion and landform modification at a low-level radioactive-waste disposal facility near Sheffield, Illinois, by J. R. Gray, in Glysson, G. D., ed., Proceedings of the Advanced Seminar on Sedimentation, August 15-19, 1983, Denver, Colorado. 1987.
- C 953 Measurement of bedload discharge in nine Illinois streams with the Helley-Smith sampler, by J. B. Graf, in Glysson, G. D., ed., Proceedings of the Advanced Seminar on Sedimentation, August 15-19, 1983, Denver, Colorado. 1987.

#### 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, [north-eastern] 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.
- HA-89. Floods in Joliet quadrangle, [northeastern] Illinois, by H. E. Allen and T. A. Wyerman. 1964.
- HA-90. Floods in Harvey quadrangle, [northeastern] Illinois, by H. E. Allen and V. J. May. 1964.
- HA-142. Floods in Geneva quadrangle, [northeastern] Illinois, by A. W. Noehre and G. L. Walter. 1965.
- HA-143. Floods in Lombard quadrangle, [northeastern] Illinois, by H. E. Allen and V. J. May. 1964.
- HA-144. Floods in Wadsworth quadrangle, [northeastern] Illinois--Wisconsin, by A. W. Noehre. 1964.
- HA-145. Floods in Palos Park quadrangle, northeastern Illinois, by A. W. Noehre and R. T. Mycyk. 1966.
- HA-146. Floods in Romeoville quadrangle, [northeastern] Illinois, by A. W. Noehre and G. L. Walter. 1965.
- HA-147. Floods in Elgin quadrangle, [northeastern] Illinois, by V. J. May and H. E. Allen. 1965.
- HA-148. Floods in Wheaton quadrangle, northeastern Illinois, by V. J. May and H. E. Allen. 1965.
- HA-149. Floods in Sag Bridge quadrangle, northeastern Illinois, by A. W. Noehre and G. L. Walter. 1966.
- HA-150. Floods in Barrington quadrangle, [northeastern] Illinois, by A. W. Noehre, G. L. Walter, and H. E. Allen. 1965.
- HA-151. Floods in Fox Lake quadrangle, northeastern Illinois, by A. W. Noehre, V. J. May, and G. L. Walter. 1965.

- HA-152. Floods in Tinley Park quadrangle, northeastern Illinois, by H. E. Allen. 1965.
- HA-153. Floods in Blue Island quadrangle, northeastern Illinois, by H. E. Allen. 1966.
- HA-154. Floods in Naperville quadrangle, [northeastern] Illinois, by H. E. Allen and V. J. May. 1965.
- HA-194. Generalized map showing annual runoff and productive aquifers in the conterminous United States, compiled by C. L. McGuinness. 1964.
- HA-199. Preliminary map of the conterminous United States showing depth to and quality of shallowest ground water containing more than 1,000 parts per million dissolved solids, by J. H. Feth and others. 1965.
- HA-200. Chemical quality of public water supplies of the United States and Puerto Rico, 1962, by C. N. Durfor and Edith Becker. 1964.
- HA-202. Floods in West Chicago quadrangle, northeastern Illinois, by H. E. Allen and V. J. May. 1965.
- HA-203. Floods in Streamwood quadrangle, northeastern Illinois, by V. J. May and H. E. Allen. 1965.
- HA-204. Floods in Mokena quadrangle, northeastern Illinois, by A. W. Noehre. 1965.
- HA-205. Floods in Lake Calumet quadrangle, northeastern Illinois, by H. E. Allen. 1966.
- HA-206. Floods in River Forest quadrangle, northeastern Illinois, by V. J. May. 1966.
- HA-207. Floods in Wauconda quadrangle, northeastern Illinois, by H. E. Allen. 1966.
- HA-208. Floods in Lake Zurich quadrangle, northeastern Illinois, by A. W. Noehre and R. T. Mycyk. 1966.
- HA-209. Floods in Steger quadrangle, northeastern Illinois, by H. E. Allen. 1966.
- HA-210. Floods in Normantown quadrangle, northeastern Illinois, by V. J. May. 1966.
- HA-211. Floods in Manhattan quadrangle, northeastern Illinois, by H. E. Allen and R. T. Mycyk. 1966.
- HA-212. Annual runoff in the conterminous United States, by M. W. Busby. 1966.
- HA-226. Floods in Antioch quadrangle, northeastern Illinois, by A. W. Noehre and G. L. Walter. 1966.

- HA-227. Floods in Sugar Grove quadrangle, northeastern Illinois, by H. E. Allen. 1966.
- HA-228. Floods in Plainfield quadrangle, northeastern Illinois, by V. J. May and R. J. Schafish. 1966.
- HA-229. Floods in Elburn quadrangle, northeastern Illinois, by H. E. Allen. 1966.
- HA-230. Floods in Grayslake quadrangle, northeastern Illinois, by V. J. May, A. W. Noehre, and G. L. Walter. 1967.
- HA-231. Floods in Frankfort quadrangle, northeastern Illinois, by R. T. Mycyk. 1967.
- HA-232. Floods in Pingree Grove quadrangle, northeastern Illinois, by H. E. Allen. 1967.
- HA-233. Floods in Zion quadrangle, northeastern Illinois, by V. J. May and R. T. Mycyk. 1967.
- HA-234. Floods in Waukegan quadrangle, northeastern Illinois, by R. T. Mycyk and V. J. May. 1967.
- HA-235. Temperature of surface waters in the conterminous United States, by J. F. Blakey. 1966.
- HA-251. Floods in Peotone quadrangle, northeastern Illinois, by H. E. Allen. 1967.
- HA-252. Floods in Berwyn quadrangle, northeastern Illinois, by A. W. Noehre and G. L. Walter. 1967.
- HA-253. Floods in Crystal Lake quadrangle, northeastern Illinois, by V. J. May and R. T. Mycyk. 1967.
- HA-254. Floods in Elwood quadrangle, northeastern Illinois, by H. E. Allen and R. T. Mycyk. 1967.
- HA-255. Floods in McHenry quadrangle, northeastern Illinois, by R. T. Mycyk and G. L. Walter. 1968.
- HA-256. Floods in Woodstock quadrangle, northeastern Illinois, by H. E. Allen. 1968.
- HA-257. Floods in Beecher West quadrangle, northeastern Illinois, by H. E. Allen. 1968.
- HA-282. River discharge to the sea from the shores of the conterminous United States--A contribution to the International Hydrological Decade, compiled by Alfonso Wilson and K. T. Iseri. 1967.
- HA-301. Floods in Dyer quadrangle, northeastern Illinois, by H. E. Allen. 1968.
- HA-302. Floods in Beecher East quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre. 1969.

- HA-303. Floods in Richmond quadrangle, northeastern Illinois, by R. T. Mycyk and G. L. Walter. 1969.
- HA-304. Floods in Wilton Center quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre. 1969.
- HA-305. Floods in Symerton quadrangle, northeastern Illinois, by H. E. Allen, A. W. Noehre, and L. D. Hauth. 1970.
- HA-306. Floods in Wilmington quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre. 1971.
- HA-361. Floods in Huntley quadrangle, northeastern Illinois, by G. L. Walter and R. T. Mycyk. 1971.
- HA-362. Floods in Channahon quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre, 1971.
- HA-363. Floods in Hebron quadrangle, northeastern Illinois, by H. E. Allen and R. S. Grant. 1971.
- HA-449. Floods on Loop Creek and Richland Creek, near Belleville, [southwestern] Illinois, by J. D. Camp. 1972.
- HA-458. Floods in Maple Park quadrangle, northeastern Illinois, by R. T. Mycyk and G. L. Walter. 1972.
- HA-459. Floods in Hampshire quadrangle, northeastern Illinois, by R. T. Mycyk and M. D. Duerk. 1972.
- 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.
- HA-472. Floods in Big Rock quadrangle, northeastern Illinois, by R. T. Mycyk G. L. Walter, and B. L. McDonald. 1973.
- HA-495. Floods in Marengo North quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre. 1973.
- HA-496. Floods in Harvard quadrangle, northeastern Illinois, by H. E. Allen and A. W. Noehre. 1973.
- HA-497. Floods in Garden Prairie quadrangle, northeastern Illinois, by R. T. Mycyk and R. S. Grant. 1973.
- HA-498. Floods in Capron quadrangle, northeastern Illinois, by R. S. Grant and M. D. Duerk. 1973.
- HA-710. Average annual runoff in the United States, 1951-80, by W. A. Gebert, D. J. Graczyk, and W. R. Krug. 1987.

## 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.

## Water-Resources Investigations Reports (WRI/NTIS)

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, U.S. Geological Survey, 4th Floor, 102 E. Main Street, Urbana, IL 61801.

- WRI 13-75. Drainage areas for Illinois streams, by K. M. Ogata, 1975. (PB 246298/AS)
- 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)
- WRI 78-22. Chemical analyses of surface water in Illinois, 1958-74, Volume I, Des Plaines River basin and Lake Michigan, by R. W. Healy and L. G. Toler, 1978. (PB 282674/AS)
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- WRI 78-78. Water quality in the Sugar Creek basin, Bloomington and Normal, Illinois, by B. J. Prugh, Jr., 1978. (PB 288359/AS)
- WRI 79-23. Chemical analyses of surface water in Illinois, 1975-77, Volume I, Des Plaines River basin and Lake Michigan, by David Grason and R. W. Healy, 1979. (PB 299912/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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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).

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- 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.
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- 83-4265. Runoff and water-quality characteristics of surface-mined lands in Illinois, by T. P. Brabets, 1984.
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- 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.
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- 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.
- 84-4205. U.S. Geological Survey research in radioactive waste disposal, fiscal year 1982, by Robert Schneider and N. J. Trask, 1984. (Sheffield, Illinois, by J. B. Foster, R. W. Healy, and J. R. Gray, p. 90-93, and Argonne National Laboratory site, Illinois, by J. R. Nicholas, p. 93-95.)

- 84-4256. Hydrology of a surface coal mined area in Randolph County, Illinois, by J. V. Borghese and A. R. Klinger. 1984.
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- 85-4228. Concepts and data-collection techniques used in a study of the unsaturated zone at a low-level radioactive-waste disposal site near Sheffield, Illinois, by R. W. Healy, M. P. deVries, and R. G. Striegl. 1986.
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- 86-4008. Estimating generalized skew of the log-Pearson Type III distribution for annual peak floods in Illinois, by K. A. Oberg and D. 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.
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- 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.
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- 87-4226. Discharge ratings for control structures at McHenry Dam on the Fox River, Illinois, by G. G. Fisk. 1988.
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- 88-4141. Assessment of processes affecting low-flow water quality of Cedar Creek, west-central Illinois, by A. R. Schmidt, W. O. Freeman, and R. D. McFarlane. 1989.
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- 79-210. Water-table contour map of land reclamation site, Fulton County, Illinois, by R. F. Fuentes and G. L. Patterson, 1979.
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- 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.
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- 88-318. Results of hydrologic research at a low-level radioactive-waste disposal site near Sheffield, Illinois, edited by B. J. Ryan. 1989.
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- 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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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, 5285 Port Royal Road, 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 NTIS ordering number is given in parentheses at the end of the citation.

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

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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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TABLES 2 and 3

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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.	D, 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
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
03612000	Cache River at Forman, Ill.	D, CQ

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

Station No.	Station	Type of data
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
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
05442020	Kyte River at Daysville, 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
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

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

Station No.	Station	Type of data
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
05531300	Salt Creek at Elmhurst, 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
05540130	West Branch Du Page River near Naperville, Ill.	D
05540160	East Branch Du Page River near Downers Grove, Ill.	D
05540195	St. Joseph Creek at Route 34 at Lisle, Ill.	D
05540200	St. Joseph Creek at Lisle, Ill.	D
05540210	East Branch Du Page River at Rt. 34 at Lisle, Ill.	CQ
05540250	East Branch Du Page River at Bolingbrook, Ill.	D
05540275	Spring Brook at 87th Street near Naperville, Ill.	D, CQ

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

Station No.	Station	Type of data
05540290	Du Page River near Naperville, Ill.	CQ
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	Person 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
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
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.	D
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
05570000	Spoon River at Seville, Ill.	D,CQ

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

Station No.	Station	Type of data
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.	S/8, CQ
05587900	Cahokia Creek at Edwardsville, Ill.	D,CQ

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

Station No.	Station	Type of data
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,S/8,CQ,SD
05591500	Asa Creek at Sullivan, Ill.	CQ
05591550	Whitley Creek near Allenville, Ill.	D,S/8
05591700	West Okaw River near Lovington, Ill.	D,S/8,CQ
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,S/8,CQ
05592500	Kaskaskia River at Vandalia, Ill.	D,S/8,CQ
05592575	Hickory Creek near Brownstown, Ill.	D,S/8
05592600	Hickory Creek near Bluff City, Ill.	CQ
05592800	Hurricane Creek near Mulberry Grove, Ill.	D,S/8,CQ
05592900	East Fork Kaskaskia River near Sandoval, Ill.	D,S/8,CQ
05592990	Carlyle Lake near Carlyle, Ill.	R
05593000	Kaskaskia River at Carlyle, Ill.	D
05593010	Kaskaskia River below Carlyle, 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,S/8,CQ
05594090	Sugar Creek at Albers, Ill.	CQ
05594100	Kaskaskia River near Venedy Station, Ill.	D,S/8,CQ,SD
05594450	Silver Creek near Troy, Ill.	D,CQ
05594800	Silver Creek near Freeburg, Ill.	D,S/8,CQ
05595200	Richland Creek near Hecker, Ill.	D,S/8,CQ
05595540	Marys River at Welge, Ill.	CQ
05595700	Big Muddy River near Mt. Vernon, Ill.	S,CQ
05595730	Rayse Creek near Waltonville, Ill.	D,S/8,CQ
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
05597000	Big Muddy River at Plumfield, Ill.	DS,CQ
05597500	Crab Orchard Creek near Marion, Ill.	D,CQ

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

Station No.	Station	Type of data
05598050	Crab Orchard C below CO Lake nr Carterville, 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