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ORIGIN AND MISSION OF THE U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey (USGS) 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 fact-finding role of the USGS has grown and has been modified to meet the changing needs of the Nation it serves. The USGS, however, has remained an impartial scientific and technical agency without developmental or regulatory responsibilities. 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 safety and well-being of the public. This information is provided to the public in many forms--including reports, maps, and data bases that provide 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:

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

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

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

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

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

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

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

As the Nation's largest earth-science research agency, the 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 Water Resources Division of the USGS 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:

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

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

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

- Disseminates water data and the results of investigations and research through reports, maps, computerized information services, and other forms of public release.
- Coordinates the activities of all Federal agencies in the acquisition of certain water data.

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

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

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

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

The Water Resources Division is one of three program Divisions and two support Divisions within the USGS (fig. 1). Headquarters of the Water Resources Division is located at the USGS's National Center in Reston, Va., and consists of the Office of the Chief Hydrologist, the Offices of the Assistant Chief Hydrologists for Operations, Program Coordination and Technical Support, Research and External Coordination, Scientific Information Management, and Water Assessment and Data Coordination (fig. 2).

ILLINOIS DISTRICT ORGANIZATION

The Illinois District of the USGS, Water Resources Division, consists of two support units, a special study unit, two operating sections, one Subdistrict Office, and two field headquarters (fig. 3). Personnel are based at the District Office in Urbana, the Subdistrict Office in De Kalb, and at Field Headquarters in Urbana and Mt. Vernon. The District operates with guidance from Regional and National offices in Reston, Va. Offices for research, training, equipment development, and laboratory services, located throughout the United States, provide technical assistance and advice to the District.

Administrative Unit

The Administrative Unit is responsible for the maintenance of and compliance with Federal acquisition regulations, Departmental manuals, and USGS 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.
Figure 1.--U.S. Geological Survey organization chart.
Figure 2. -- Water Resources Division organization chart. Data from U.S. Geological Survey, 1991b.
Figure 3.--Illinois District organization chart and office addresses.
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.

National Water-Quality Assessment Unit

The National Water-Quality Assessment (NAWQA) Unit is responsible for carrying out the goals of the NAWQA program for the upper Illinois River basin NAWQA project. The goals of the NAWQA program are to (1) describe water-quality conditions and trends and (2) identify, describe, and explain causal factors for the observed conditions and trends. The upper Illinois River basin project is one of seven NAWQA pilot studies that will test, and modify as necessary, concepts and approaches in preparation for full implementation of the NAWQA program in the future.

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, and the State. The Section conducts special hydrologic research studies on current water issues such as radiohydrology, sedimentation and erosion, urban hydrology, rainfall-runoff modeling, groundwater quality, U.S. Environmental Protection Agency (USEPA) Superfund site work, water disposal, and stream 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.

Operations Section

The Operations Section designs and implements a network of stream-gaging, water-quality, and sediment 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 provides assistance in the collection of water-resources data in support of projects, conducts special data-collection efforts as needed or requested including major floods, low-flow measurements, and indirect measurements. 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. 4) and report to the Chief, Operations Section.
Figure 4.—Subdistrict and field headquarters areas of responsibility.
De Kalb Subdistrict Office

The De Kalb Subdistrict Office 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 and counties in the northern third of Illinois. The Subdistrict maintains a network of stream-gaging, water-quality, and observation-well sites and directs the data collection, analysis, and compilation of records for those sites for publication in the annual data report.

ILLINOIS DISTRICT FUNDING SOURCES

Funds to support the work performed by the Illinois District, Water Resources Division, are derived from three principal sources—Federal program, Federal-State cooperative program, and other Federal agencies program. Funding from all sources in fiscal year 1991 amounted to about $4,020,000, which was distributed as follows:

The diagram below shows the percentage of the activities for fiscal year 1991 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 to achieve the best use and management of the water resources 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, 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 (Gilbert and Mann, 1991). 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 1991 are listed in table 1.

Other Federal Agencies Program

In this program, the funds are transferred to the USGS as reimbursement for work performed at the request of another Federal agency. These funds are used for a variety of hydrologic-data collection and water-resources investigations such as stream gaging, ground-water-quality assessments, and suspended-sediment monitoring in streams.

WATER CONDITIONS

Illinois generally has adequate supplies of water suitable for most uses. The mean annual precipitation for the 1961-90 period is shown in figure 5. 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.

During 1991, runoff was above normal in the west-central part of the State and normal throughout the rest of the State (fig. 6). Runoff at Pecatonica River at Freeport and Skillet Fork at Wayne City was 100 percent of their median while runoff at Sangamon River at Monticello was 169 percent of its median.
Table 1.—Agencies supporting water-resources activities during fiscal year 1991

<table>
<thead>
<tr>
<th>State Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois Department of Transportation Division of Water Resources</td>
</tr>
<tr>
<td>Illinois Environmental Protection Agency Division of Water</td>
</tr>
<tr>
<td>Illinois Department of Energy and Natural Resources Illinois State Water Survey</td>
</tr>
<tr>
<td>Illinois State Geological Survey</td>
</tr>
<tr>
<td>Illinois Department of Conservation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloomington and Normal Sanitary District</td>
</tr>
<tr>
<td>Forest Preserve District of Cook County</td>
</tr>
<tr>
<td>Forest Preserve District of Du Page County</td>
</tr>
<tr>
<td>Du Page County Department of Environmental Concerns</td>
</tr>
<tr>
<td>Lake County Department of Storm Water Management</td>
</tr>
<tr>
<td>Conservation District of Vermilion County</td>
</tr>
<tr>
<td>The Metropolitan Water Reclamation District of Greater Chicago Division of Research and Development</td>
</tr>
<tr>
<td>Northeastern Illinois Planning Commission</td>
</tr>
<tr>
<td>City of De Kalb</td>
</tr>
<tr>
<td>City of Decatur</td>
</tr>
<tr>
<td>City of Springfield</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Illinois University</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Federal Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of the Army Corps of Engineers Rock Island District St. Louis District Louisville District Chicago District</td>
</tr>
<tr>
<td>U.S. Environmental Protection Agency, Region V</td>
</tr>
</tbody>
</table>
Figure 5.—Average annual precipitation in Illinois, 1961–90. Data from W.M. Wendland and others, 1992.
Figure 6.—Runoff during 1991. Data from U.S. Geological Survey, 1991a.
DATA COLLECTION

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 required 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. Direct measurements of discharge, to verify the stream stage-discharge relation (rating), are performed about every 8 weeks at each continuous-record discharge station. In Illinois, data on discharge and stage were obtained at the following numbers of stations:

<table>
<thead>
<tr>
<th>Station classification</th>
<th>Number of stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream stations..................................</td>
<td>181</td>
</tr>
<tr>
<td>Continuous record:</td>
<td></td>
</tr>
<tr>
<td>Discharge........................................</td>
<td>148</td>
</tr>
<tr>
<td>Stage only........................................</td>
<td>10</td>
</tr>
<tr>
<td>Partial record:</td>
<td></td>
</tr>
<tr>
<td>Peak (maximum) flow only......................</td>
<td>23</td>
</tr>
<tr>
<td>Lake, reservoir, and subimpoundment stations</td>
<td>8</td>
</tr>
<tr>
<td>Stage and contents................................</td>
<td>3</td>
</tr>
<tr>
<td>Stage only........................................</td>
<td>5</td>
</tr>
<tr>
<td>Total.............................................</td>
<td>189</td>
</tr>
</tbody>
</table>

Of the 148 continuous-discharge stations, 135 are part of the surface-water network and the other 13 are used for special projects. The locations of sites where discharge or stage are collected are shown in figure 7, and the types of data collected at each station are shown in table 2 (at end of the report).
Continuous record, stage only

Continuous record with
0 20 40 60 KILOMETERS

Base from U.S. Geological Survey
1:250,000 and 1:1,000,000 Digital Line Graphs
Albers Equal-area Conic projection
Standard parallels 33° and 44°, central meridian -89°

Figure 7.--Discharge and stage stations in (a) Illinois except northeastern Illinois and (b) northeastern Illinois.
Figure 7.--Discharge and stage stations in (a) Illinois except northeastern Illinois and (b) northeastern Illinois--Continued.
Water-Quality Stations

Data collected from 155 water-quality sampling stations, operated jointly by the USGS and the Illinois Environmental Protection Agency (IEPA) during fiscal year 1990, are shown in figure 8 and are listed in table 2.

The 155-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 USGS's National Stream Quality Accounting Network (NASQAN) program; two of these stations are operated by adjacent Districts.

Water-quality samples were collected every 6 weeks except for the NASQAN stations where samples were collected quarterly or bimonthly. The water-quality constituents of interest include the basic cations and anions and selected nutrients and trace metals. Daily or near-daily sediment samples were collected at four stations, and daily sediment-discharge records were computed. The various types of water-quality data were obtained at the following numbers of stations:

<table>
<thead>
<tr>
<th>Data classification</th>
<th>Number of stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical data:</td>
<td></td>
</tr>
<tr>
<td>Water temperature</td>
<td>126</td>
</tr>
<tr>
<td>Specific conductance</td>
<td>126</td>
</tr>
<tr>
<td>pH</td>
<td>126</td>
</tr>
<tr>
<td>Dissolved oxygen</td>
<td>126</td>
</tr>
<tr>
<td>Sediment data</td>
<td>4</td>
</tr>
<tr>
<td>Chemical data:</td>
<td></td>
</tr>
<tr>
<td>Inorganic constituents</td>
<td>126</td>
</tr>
<tr>
<td>Organic constituents</td>
<td>126</td>
</tr>
<tr>
<td>Microbiological data</td>
<td>126</td>
</tr>
</tbody>
</table>

Ground-Water Data Stations

Water levels in wells, discharges of springs and wells, and water-quality analyses are used in assessing ground-water conditions and trends; however, these hydrologic data must be integrated with other observations and ground-water system studies to understand these conditions and trends. In Illinois, the USGS measures water levels in seven observation wells. Four wells, three of which are piezometers, are at the same location but open at different depths. Data also are collected from 50 public-supply wells in the State as part of an ongoing water-quality study in cooperation with the IEPA; water samples are collected annually from these wells.
Figure 8.--Water-quality stations in (a) Illinois except northeastern Illinois and (b) northeastern Illinois.
Figure 8.—Water-quality stations in (a) Illinois except northeastern Illinois and (b) northeastern Illinois—Continued.
The types of data collected for observation and project wells are as follows:

<table>
<thead>
<tr>
<th>Data type</th>
<th>Number of wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water levels</td>
<td>7</td>
</tr>
<tr>
<td>Physical data:</td>
<td></td>
</tr>
<tr>
<td>Water temperature</td>
<td>50</td>
</tr>
<tr>
<td>Specific conductance</td>
<td>50</td>
</tr>
<tr>
<td>pH</td>
<td>50</td>
</tr>
<tr>
<td>Chemical data:</td>
<td></td>
</tr>
<tr>
<td>Inorganic constituents</td>
<td>50</td>
</tr>
<tr>
<td>Volatile organic compounds</td>
<td>50</td>
</tr>
<tr>
<td>Synthetic organic compounds</td>
<td>50</td>
</tr>
</tbody>
</table>

The ground-water stations and types of data collected at each station 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 9.

DATA MANAGEMENT

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

National Water Data Storage and Retrieval System

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-related activities. The system is operated and maintained on the central computer facilities of the USGS at its National Center in Reston, Va., and on computers in District offices throughout the Nation as part of the Distributed Information System. Data may be obtained from WATSTORE through the 48 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

Phone: (703) 648-5215

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

Phone: (217) 398-5353
Figure 9.--Ground-water-data stations by county.
The National Water-Data Exchange (NAWDEX) is an interagency program to facilitate the exchange of water data and to promote the improvement of water-data handling procedures. The participants in the NAWDEX program are Federal, State, and local governments and interstate, academic, and private organizations that collect, store, and use water data. NAWDEX is managed by a Program Office, which is administered by the Water Resources Division. Information on sites for which water data are available, the types of data available, and the organizations that store the data is available from NAWDEX.

Services are available through the Program Office at the USGS National Center in Reston, Va., and a nationwide network of Assistance Centers in all 50 States, the District of Columbia, and Puerto Rico, which provide local and convenient access to NAWDEX facilities. A directory (Blackwell, 1990) 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.

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 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
Phone: (703) 648-6848
Hours: 7:00 to 4:30 eastern time

or

NAWDEX Assistance Center
Illinois
U.S. Geological Survey
Water Resources Division
4th Floor
102 East Main Street
Urbana, IL 61801
Phone: (217) 398-5353
Hours: 8:00 to 4:30 central time
DESCRIPTIONS OF PROJECTS IN 1991
*** 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 145 continuous-record stations, 23 partial-record stations, 12 stage-only stations, and 3 miscellaneous-measurement stations. Published data in the annual data report.

*** PLANS NEXT YEAR *** Continue surface-water data collection with modifications to the network. A new stage-only station in Du Page County will be added to the network. Data loggers with telephone modems will be installed at five continuous-record stations. Publish data in the annual data report.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

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

*** 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 ***

**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 in one well in Du Page County, one well in Cook County, three piezometers and one well in Lake County, and one well in Bureau County. Collected water samples from the Zion well nest in Lake County. Published data in the annual data report.

**PLANS NEXT YEAR** Continue water-level data collection. Add one or two observation wells, to be measured quarterly, to the network. Collect water samples at the new observation well in Bureau County and the Argonne well in Du Page County. Publish data in the annual data report.

**HEADQUARTERS OFFICE** Urbana, Illinois

**FIELD LOCATION** Illinois Statewide

**PROJECT CHIEF** Charles F. Avery

**PERIOD OF PROJECT** Continuous since April 1982

**PUBLISHED REPORT**
*** PROJECT TITLE *** Quality of Water 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 Water Resources Division laboratories have been reviewed and prepared for publication. Discharge values have been applied to the chemical data where possible. Published data in the annual data report.

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

*** 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 ***


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 base 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 base of sediment data for use in broad Federal and State planning and action programs and to provide data for Federal management of interstate waters.

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

*** SUMMARY OF RESULTS *** Suspended-sediment samples were collected and analyzed, and daily suspended-sediment concentrations and loads were computed for four continuous streamflow sites. Published data in the annual data report.

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

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

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

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

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

*** PUBLISHED REPORTS ***

*** 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), the Illinois Environmental Protection Agency (IEPA), and the USGS. The ISWS will obtain water-withdrawal and delivery data from questionnaires that they send to water users throughout the State. The ISWS and USGS will enter the data into a site-specific data base that is usable to both parties. The USGS will transfer the statewide data into the State Water Use Data System (NEWSWUDS). The IEPA will obtain return data by way of the National Pollutant Discharge Elimination System. The IEPA and USGS will enter the data into the IEPA's data base. The USGS will transfer the statewide data into the NEWSWUDS. The withdrawal, delivery, and return data will be aggregated by water-use category (water supply, commercial, industrial, fossil-fuel power, nuclear power, mining, hydroelectric, and sewage treatment) and location (county, hydrologic unit, and aquifer). Water uses by other categories (domestic, livestock, irrigation, and reservoir evaporation) will be estimated. The aggregations are done to meet State and National data needs.

*** SUMMARY OF RESULTS *** The 1989-90 withdrawal and delivery data were obtained. Data for 1989 were aggregated by category and location and entered into the Aggregated Water Use Data System (AWUDS). For the first time in the history of this program, the USGS assisted the ISWS with data entry and the USGS obtained a copy of the statewide site-specific withdrawal data. The 1990 return data were obtained and entered into the NEWSWUDS. These data were aggregated by category and location and entered into AWUDS. A procedural manual for the manipulation and entry of return data into NEWSWUDS was written. The report, "Determination of Water Use in Rockford and Kankakee Areas, Illinois" was published.
*** PLANS NEXT YEAR ***
(1) Aggregate and enter 1990 water-use data into AWUDS. 
(2) Obtain 1991 water-use data. 
(3) Assign downstream-order numbers to return sites in NEWSWUDS for integration into the National Water Information System (NWIS) site file. 
(4) Improve procedural manual for an open-file report.

*** 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

*** PUBLISHED REPORTS ***


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

*** PROBLEM *** Protecting the quality of the Nation's ground-water and surface-water resources is a priority national concern. The quality of the Nation's water resources has a direct impact on public health and on the economic success of agriculture, industry, and recreation. The impacts of degraded water quality on public health or economic success may be related to short-term or long-term effects. In 1986, the 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) To provide a description of existing water-quality conditions. (2) Develop conceptual models that relate observed conditions to sources and causes. (3) Track long-term trends in water quality. (4) 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. Water samples were collected monthly and suspended-sediment samples were collected bimonthly for analyses for inorganic constituents. The first draft of the analysis of existing water-quality data was completed and sent to Regional NAWQA staff for review. Open-file data reports (OFR) describing streambed-sediment sampling for inorganic constituents (OFR 90-571) and the fixed-station sampling (OFR 91-175) were approved for publication. A paper describing geographic information system (GIS) applications in this study was approved and published in the proceedings of U.S. Environmental Protection Agency (USEPA) GIS conference. The Project Liaison Committee met once to discuss progress and plans. Began a special study to develop prototype for implementing computer modeling into NAWQA studies. Calibrated a diffusion analogy flow (DAFLOW) model for the entire Kankakee River system. Results from analyses of streambed sediment samples for inorganic constituents identified anomalously high concentrations of thorium and four rare-earth elements in parts of the Du Page River basin. These elevated concentrations, which are related to a USEPA Superfund site, were reported to the appropriate Federal and State agencies, and to the Project Liaison Committee.

*** PLANS NEXT YEAR *** Continue sampling at four fixed-stations. Continue to compile and statistically summarize existing water-quality data for the basin. Complete and print analysis of existing water-quality information report. Complete reports for inorganic and organic constituents; continue writing summary reports for other constituent groups.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

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

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

*** PERIOD OF PROJECT *** Continuous since April 1986

*** PLANNED REPORTS ***
Data on agricultural organics in water
Spatial distribution of trace elements in sediment
Analysis of existing water-quality information
Relation of changes in treatment plants to changes in water quality
Sediment and water quality in the upper Illinois River basin
Trace elements in water, sediment, and biota
Organic compounds in water, sediment, and biota
Nutrients, dissolved oxygen, and fecal-indicator bacteria

*** REPORTS IN PROCESS ***
Surface-water-quality assessment of the upper Illinois River basin in Illinois, Indiana, and Wisconsin: Geochemical data report on major and trace elemental analyses of fine-fraction streambed sediments

Spatial distribution of trace elements in the fine-fraction of streambed sediment in the upper Illinois River basin, 1987

Surface-water-quality assessment of the upper Illinois River basin in Illinois, Indiana, and Wisconsin: Data on agricultural organic compounds in water, April 1988 through August 1990

*** PUBLISHED ABSTRACTS ***


*** PUBLISHED REPORTS ***


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

*** PROBLEM *** The U.S. Environmental Protection Agency (USEPA), Region V, has requested that the USGS, Illinois District, provide technical assistance on several Superfund sites within the State. The technical assistance varies from reviewing technical reports submitted to USEPA by their consultants to designing and conducting hydrogeologic investigations at Superfund sites and regional areas of environmental concern.

*** OBJECTIVE *** To provide technical consultation, training, and quality assurance and to conduct investigations for the USEPA under the conditions of the Joint Interagency Agreement.

*** APPROACH *** Design, conduct, and analyze hydrogeologic and water-quality data activities at the Byron Salvage Yard and Parson's Casket Superfund sites. Analyze data collected during investigations at the ACME Solvents and Pagel's Pit sites. Provide technical review on results of work at the HOD Landfill, Superior Street, ACME Solvents, and Pagel's Pit sites. Write a report disclosing results of USGS data analysis of hydrogeologic conditions at ACME Solvents and Pagel's Pit sites.

*** SUMMARY OF RESULTS *** (1) Completed analysis of data collected to date at ACME Solvents and Pagel's Pit sites and wrote an administrative report to USEPA. Report has received Headquarter's approval. (2) Provided technical review of reports and work plans at the HOD Landfill, Superior Street, ACME Solvents, and Pagel's Pit sites. (3) Completed field work for study of groundwater/surface-water interactions, Byron Salvage Yard area. (4) Continued field work on studies of hydrogeology and contaminant distribution in fractured dolomite aquifers at Byron Salvage Yard and Parson's Casket sites.

*** PLANS NEXT YEAR *** (1) Complete report writing of Water-Resources Investigations Report for groundwater/surface-water study at the Byron site. (2) Finish data collection and analysis for fractured dolomite aquifer studies at Byron and Parson's Casket sites. (3) Write report drafts and submit for publication.

*** 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
Hydrogeology, Aquifer Tests, Water-Quality Sampling, Byron Salvage Yard

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

with the Rock River near Byron, Illinois, in Programs and abstracts, American
Geophysical Union 1991 Fall Meeting, December 9-13, 1991, San Francisco,
California.

*** PUBLISHED REPORTS ***
Kay, R.T., Ryan, B.J., Mears, E.J., and Yeskis, D.J., 1987, Hydrogeology of the
Byron/Johnson Salvage Yard Superfund site near Byron, Illinois, 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,
89-4081, 55 p.

Kay, R.T., and Earle, J.D., 1990, Determination of hydraulic properties in the
vicinity of a landfill near Antioch, Illinois: U.S. Geological Survey Water-
*** PROJECT TITLE *** Rainfall-Runoff Relations in Three 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 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 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 *** Streamflow and rainfall data collection continued throughout the year. The processing of data collected since 1986 for modeling is 90 percent complete. Rainfall-runoff modeling using the Hydrological Simulation Program--Fortran (HSPF) model continued throughout the year. A data report describing rainfall data collected at project sites during the period 1986-91 is 70 percent complete.

*** PLANS NEXT YEAR *** Continue data collection and analysis through the 1992 water year. Compute and publish streamflow records for 1990 and 1991 water years. Calibrate and verify the HSPF model for each of the watersheds. Begin writing report.

*** HEADQUARTERS LOCATION *** Urbana, Illinois

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

*** PROJECT CHIEF *** James J. Duncker

*** PERIOD OF PROJECT *** October 1987 through September 1992
IL084 NATIONAL WATER-QUALITY ASSESSMENT 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 *** Exploratory data analysis was completed. Preliminary results indicate that habitat effects and water quality might not be partitionable from one another. Further analysis will attempt to define the relative importance of habitat and water quality.

*** PLANS NEXT YEAR *** Complete report.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

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

*** PROJECT CHIEF *** Peter M. Ruhl

*** PERIOD OF PROJECT *** January 1988 through September 1992

*** PLANNED REPORT *** Fish community composition and structure and fish condition factors as related to water and sediment quality in the upper Illinois River basin, Illinois, 1978-86
*** 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 (IEPA) and USGS is the largest statewide ground-water-quality data base. 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 ambient Illinois ground-water quality based on water-quality information from public water-supply wells.

*** APPROACH *** The National Water Information System 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. A statewide ground-water-quality network will be designed and statistically evaluated.

*** SUMMARY OF RESULTS *** Published ground-water-quality data for public-supply wells in annual data report. Created a GIS coverage of 753 public-supply wells open to individual aquifers. Continued sampling 50 wells four times per year for inorganics, nutrients, and metals. Sampled 25 of these wells, which are in unconsolidated material or shallow bedrock, every quarter for pesticides and herbicides. In addition to the network of 50 ambient wells, the USGS helped IEPA select 200 wells for a pesticide network.

*** PLANS NEXT YEAR *** The entire data set of public-supply wells that have principal aquifers will continue to be evaluated to determine the best sample representation for depicting Illinois ground-water quality. The trend sites will be sampled quarterly. Publish the inorganic constituents report.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

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

*** PERIOD OF PROJECT *** Continuous since August 1988

*** COOPERATOR *** Illinois Environmental Protection Agency
*** PLANNED REPORTS ***
Selected inorganic constituent concentrations in public-supply wells in Illinois
Trends in ground-water-quality data for public-supply wells in Illinois

*** PUBLISHED REPORTS ***
resources data--Illinois, water year 1990, Volume 1. Illinois except Illinois

Survey Water-Data Report IL-90-2, 530 p.

IL087 RETURN FLOWS IN STREAMFLOW

*** PROJECT TITLE *** Quantity and Seasonal
Variation of Return Flow in Selected Headwaters
in Illinois, 1988-89

*** PROBLEM *** The effect of return flows
on streamflow is not well known. The quantity of
water returned to streams by water users must be
known to determine effects on streamflow and
stream-water quality. During drought, return
flows may constitute a major part of the stream-
flow. If contaminated, these returns could
prevent the use of streamflow as a water supply.
Information about water returns could provide the
understanding necessary to better manage water
sources and to help resolve water-supply and water-
quality problems in Illinois.

*** OBJECTIVES *** (1) Create a return-flow
data base to complement the water-use data program.
(2) Describe the amount of return flow contained in
streamflow.

*** APPROACH *** Discharge monitoring report data for about 500 commercial,
industrial, and public-supply facilities will be entered from hard copies into
DBASE software on a microcomputer. Data will be entered and merged into the
USGS's State Water-Use Data System (NEWSWUDS) with 770 other sites currently
entered by the Illinois Environmental Protection Agency. Five headwaters of
streams in Illinois will be studied. A headwater 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 head-
water reaches above these gages. Study reaches will be those where return-flow
data are available. The quantities of return flow will be compared to the gaged streamflow for similarities. Also determined will be whether returns have a seasonal variation.

*** SUMMARY OF RESULTS *** Entered 1989 water-return data for 498 facilities into NEWSWUDS. Preliminary investigations show that returns and streamflow seem to be related at Thorn Creek above Glenwood, Illinois. Also, most study reaches show that return flows exceeded streamflows during the drought of 1988. Wrote first draft of report and had it reviewed.

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

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

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

*** PERIOD OF PROJECT *** April 1989 through September 1991

*** COOPERATOR ***
Illinois Environmental Protection Agency

*** REPORT IN PROCESS ***
*** PROJECT TITLE *** Rainfall-Runoff Relations in Nine 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 nine 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 *** Streamflow and rainfall data collected in the five watersheds instrumented last water year was continued throughout this water year. Four additional gages were installed in very small watersheds consisting of a single landcover category. The landcover categories being gaged are agricultural, single-family residential, estate-type residential, and commercial strip. Initial watershed characterization was begun using aerial photography analysis.

*** PLANS NEXT YEAR *** Continue data collection and analysis. Compute and publish streamflow records for the 1991 water year. Calibrate and verify the Hydrological Simulation Program--Fortran (HSPF) model for each of the watersheds.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

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

*** PROJECT CHIEF *** James J. Duncker

*** 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 REPORT ***
Rainfall-Runoff Relations in Lake County, Illinois

IL091 FLOOD FREQUENCY IN URBAN WATERSHEDS

*** PROJECT TITLE *** Techniques for Flood-Frequency Analysis in Changing Watersheds

*** PROBLEM *** Methods in flood-frequency analysis for planning and design in urbanizing and regulated watersheds rely on the use of state-of-the-art hydrologic and hydraulic models in order to avoid violating the assumptions in traditional frequency analysis methods. These techniques have not been thoroughly tested, and some results have indicated misleading and inconsistent results when applying log-Pearson Type III analysis to simulated flood peaks under various land-use scenarios. There is a need for developing new methodologies for frequency analysis and testing and verifying the new methods and required models.

*** OBJECTIVES *** To explore, develop, and evaluate techniques for determining accurate flood-frequency estimates using hydrologic/hydraulic models in rapidly changing urban watersheds.

*** APPROACH *** This study will be a three pronged effort. The modeling literature will be thoroughly reviewed in order to compare and contrast the available hydrologic and hydraulic models and flood-frequency analysis techniques including the stochastic generation of rainfall for input into a continuous simulation model. This will be carried out by scientists at the Illinois State Water Survey (ISWS). New techniques for flood-frequency analysis will be investigated by scientists at the University of Wisconsin. These will include developing flood recurrence intervals by continuous simulation of long streamflow record to produce a base condition (with calculated frequencies) and comparing alternative scenarios to the base condition by using the same set of storms under the new conditions, performing flood-frequency analysis on flood volumes, and relating flood peaks to volumes. These techniques are to be tested on actual field situations and through Monte Carlo simulations. Finally, the suitability of one-dimensional, unsteady flow modeling to flood-frequency analysis will be investigated. Streamflow record containing events that violate the implicit assumptions of a one-dimensional model will be obtained by (1) operating a dam on a major river in such a manner as to generate a relatively deep wave, and (2) collecting stage and discharge data at a culvert during changing flow conditions and during an overbank event. Dye data will be utilized in order to test the total flow field of the flow model by inputting it to a Langrangian transport model. All efforts will be coordinated in regular meetings with the cooperators and their contractees.
*** SUMMARY OF RESULTS *** The literature review has been completed and published as a report by the ISWS entitled "A Review of Rainfall-Runoff Modeling for Stormwater Management" by Vernon Knapp and others. The first proposed flood-frequency technique has been developed and published as Bradley, A.A., and Potter, K.W., 1991, Flood frequency analysis for evaluating watershed conditions with rainfall-runoff models, Water Resources Bulletin, v. 27, no. 1, p. 83-91. The flood-volume frequency method has been investigated and a paper titled "A new approach to flood-frequency analysis of simulated flows" is being reviewed. A major dye and discharge synoptic was conducted on the Fox River in Illinois with data collected at six continuous-record gages and several other locations. Discharge hydrographs and dye concentrations have been computed in preparation for model calibration and for publication as a hydraulic-model-verification data set. Gaging stations have been established to measure flow at a culvert, backwater, and overbank sections together with upstream and downstream boundaries.

*** PLANS NEXT YEAR *** The model verification for the Fox River data set will be completed. A report containing the model-verification data set will be completed. The small-stream-verification data set will be collected and computed.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

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

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

*** PERIOD OF PROJECT *** October 1989 through September 1992

*** COOPERATOR ***
Du Page County, Department of Environmental Concerns
Illinois Department of Transportation, Division of Water Resources

*** PLANNED REPORTS ***
Data collection methods and data summary for verification of a one-dimensional, unsteady-flow model
*** PROJECT TITLE *** Use of Merged SLAR and TM Imagery to Classify and Map Land Cover and Land Use

*** PROBLEM *** Land cover in the six-county Chicago metropolitan area in northeastern Illinois is undergoing rapid changes in response to substantial economic growth and a rapidly growing suburban population. This area is the site of numerous surface-water, ground-water, and water-quality investigations by both the Illinois District of the USGS and several Federal, State, and local agencies. In addition, a recent and reliable assessment of the wetlands within the study area is critically needed by a variety of State, county, and local agencies. Most existing land cover digital data is outdated and of relatively poor spatial resolution. A critical need exists to update the digital land cover of northeastern Illinois at an improved spatial resolution in a format compatible with the appropriate geographic information system.

*** OBJECTIVES *** (1) Create an updated digital data base of wetlands and other selected land cover features of the six-county northeastern Illinois area at an improved resolution of approximately 0.22 acre per pixel (picture element). (2) Interface the updated land cover digital data base with a GIS that is compatible with the input requirements of District and (or) cooperator computer systems and hydrologic modeling programs.

*** APPROACH *** (1) Merge Side-Looking Airborne Radar (SLAR) imagery with satellite-based Thematic Mapper (TM) imagery. (2) Classify the merged imagery with two techniques: (a) guided clustering and then (b) neural network analysis. Assess accuracy of classification. (3) Convert the classified raster-based imagery to a vector format and load to a GIS. The project will be executed in two distinct phases. The first phase will involve the guided clustering analysis. The second phase will involve the neural network analysis.

*** SUMMARY OF RESULTS *** Operational image processing system brought online. Annotated report outline was written and was approved by cooperators. Three of the eight sections for the first report have been written. Image data rectified and merged, in part.

*** PLANS NEXT YEAR *** Classify the merged TM and SLAR digital imagery into selected target units using a guided-clustering image processing strategy. Perform various statistical tests of classification accuracy (accompanied by ground truthing). Prepare a report of project results for colleague review.

*** HEADQUARTERS OFFICE *** Urbana, Illinois
*** FIELD LOCATION ***  Northeastern Illinois

*** PROJECT CHIEF ***  Robin B. King

*** PERIOD OF PROJECT ***  January 1991 through March 1993

*** COOPERATORS ***
Illinois Department of Conservation
Du Page County
Kane County
Northeastern Illinois Planning Commission

*** PLANNED REPORTS ***
Classification of multisource remote sensor imagery for terrain characterization in northeastern Illinois
Use of an artificial neural network to classify multisource remote sensor imagery

IL094 UNIT VALUES

*** PROJECT TITLE ***  Unit-Values Pilot Study

*** PROBLEM ***  Unit value stage and discharge data are not available in digital form prior to 1965 when stage data were collected in graphic form on strip charts.

*** OBJECTIVES ***  (1) To determine the feasibility, procedures, and software to compute digital unit values from archived graphic charts, and then to transfer that data to a Write Once Read Many (WORM) disk, and (2) to determine realistic cost estimates for converting from graphic to digital format.

*** APPROACH ***  A review of 10 continuous-stage chart records and a list of the problems to create unit values for these stations will be made. From the 10 records, 3 test records will be selected and digitized. The digitized stage will have shifts and streamflow ratings applied to create unit discharges. Finally, these data will be transferred to a WORM disk.

*** SUMMARY OF RESULTS ***  A review of 10 representative continuous-stage graphic records and a list of the problems to create unit values for these stations were made. From these records, four test records were selected and
digitized. The digital paper tapes were processed into unit stage values for one
station. The digitized stage will have shifts and streamflow ratings applied to
create unit discharges. These data need to be transferred to a WORM disk.

*** PLANS NEXT YEAR *** Data needs to be loaded on WORM disk. Complete
report.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** Lawrence J. Mansue

*** PERIOD OF PROJECT *** December 1990 through September 1991

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

*** PLANNED REPORT ***
Unit Values of Stage and Discharge from Historical Data

IL095 CHLORINE ISOTOPES

*** PROJECT TITLE *** Chlorine Stable
Isotope Composition of Brines from the Lower
Paleozoic Sediments of the Illinois Basin

*** PROBLEM *** In some parts of the
Illinois Basin, surface water and shallow drinking
water aquifers have been contaminated by saline
waters from lower Paleozoic sediments. A recent
study of saline formation water in the Michigan
Basin suggests that saline formation waters have a
distinguishable chlorine isotope composition. If
so, chlorine isotope composition could be used to
trace saline formation waters in the Illinois
Basin and other sedimentary basins in the Midwest.

*** OBJECTIVES *** (1) To determine the
isotopic variability in the Illinois Basin for
purposes of tracing saline water contamination in
fresh-water aquifers. (2) To search for charac-
teristic isotope signatures for major formation
groups. (3) To determine if formation waters of
similar age in adjacent basins have the same chlorine isotope ratios.
*** APPROACH *** (1) Literature review of chlorine isotopes and the Illinois Basin. (2) Collect about 20 formation-water samples from Paleozoic sediments and overlying aquifers. (3) Analyze the samples for major chemical constituents, trace elements, and strontium and chlorine isotopes. (4) Analyze about 15 saline-water samples, which were previously collected from the Alberta, Michigan, and Appalachian Basins, for chlorine isotopes. (5) Evaluate the results of the analyses and write journal article.

*** SUMMARY OF RESULTS *** The literature review of studies involving chlorine stable isotopes and geochemistry of the Illinois Basin was completed. Interesting examples of similar studies in the Michigan Basin and basins along the Gulf coast were evaluated. Over 20 samples from Paleozoic sediments, overlying aquifers, and springs were taken. Procedures were established and equipment and supplies were obtained for splitting the samples and analyzing for major chemical constituents, trace elements, chlorine and strontium isotopes. Sample analysis has begun.

*** PLANS NEXT YEAR *** Complete the analysis of the collected samples and of about 15 other water samples collected from the Alberta, Michigan, and Appalachian Basins for chlorine isotopes. Evaluate the results of the analyses with respect to chronostratigraphic variability and isotopic composition within the Illinois Basin and between the Illinois Basin and adjacent basins. Write a journal article to present the findings of the investigation.

*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Illinois Statewide

*** PROJECT CHIEF *** Angel M. Martin, Jr.

*** PERIOD OF PROJECT *** June 1991 through September 1992

*** COOPERATOR *** Northern Illinois University
*** PROJECT TITLE *** Hydrogeology and Contaminant Assessment in the Southeast Chicago Area

*** PROBLEM *** The U.S. Environmental Protection Agency, Region V, has requested that the USGS, Illinois District, conduct an investigation designed to define the hydrogeologic and water-quality conditions in the southeast Chicago area. This area has significant surface water and ground-water contamination which presents a significant potential hazard.

*** OBJECTIVES *** (1) Characterize the hydrology of the surface-water and shallow ground-water system in the area of southeast Chicago. (2) Characterize water quality in the area. (3) Identify the nature and extent of a potential non-aqueous phase liquid layer, if present, in the study area.

*** APPROACH *** Conduct one or more synoptic water-level surveys in the study area. Conduct drilling, soil-gas surveys, and water-quality sampling to determine the presence and type of contamination present in the study area.


*** HEADQUARTERS OFFICE *** Urbana, Illinois

*** FIELD LOCATION *** Southeast Chicago

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

*** PERIOD OF PROJECT *** September 1991 through September 1993

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

*** PLANNED REPORT *** Results of the water-level survey and soil-gas sampling and the interpretation of the hydrology and contaminant distribution in the study area.
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. The list, however, does include all publications produced by the Illinois District Office. Many of these publications are available for inspection at the District Office in Urbana and at large public and university libraries.

General Information

The USGS 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 (phone 303-236-7476).

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 in 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


Professional Papers

Professional Papers are comprehensive formal reports of significant and lasting scientific interest and include results of resource studies and of geologic, hydrologic, or topographic investigations. Professional Papers are sold by the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225 (phone 303-236-7476).

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

P 492  Thermal springs of the United States and other countries of the world--

P 813-A  Summary appraisals of the Nation's ground-water resources--Ohio Region,

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


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**Water-Supply Papers**

Water-Supply Papers are formal reports dealing with all aspects of hydrology, including quality, recoverability, and use of water resources; statistical reports on streamflow, floods, ground-water levels, and water quality; and collections of short papers on related topics. Water-Supply Papers are sold by the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225 (phone 303-236-7476).

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,

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

W 1370-B  Floods of October 1954 in the Chicago area, Illinois and Indiana, by

W 1473  Study and interpretation of the chemical characteristics of natural

W 1669-O  Ground-water conditions at Argonne National Laboratory, Illinois,

W 1669-S  Yearly variations in runoff for the conterminous United States,

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


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.


Circulars

Circulars contain technical or nontechnical information of popular interest including timely administrative or scientific information. Circulars are available free of charge from the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225 (phone 303-236-7476).


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


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


Hydrologic Investigations Atlases

Hydrologic Investigations Atlases may contain a wide range of hydrologic and hydrogeologic data of regional and national interest, such as streamflow, ground water, water quality, and extent of flooding. 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-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.


Hydrologic-Unit Maps

Hydrologic-Unit Maps have been developed for each State and depict the major hydrologic regions, subregions, accounting units, and cataloging units used for the collection and organization of hydrologic data. 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).

Water-Resources Investigations Reports (WRI/NTIS)

Water-Resources Investigations Reports contain hydrologic information, mainly of local interest, intended for quick release to the public in book or map format. The following reports are available for inspection at the Urbana, Ill., and Reston, Va., 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 (phone 217-398-5353).


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


WRI 78-22,23,24. 3-volume set (PB 282673/AS)

WRI 78-78. Water quality in the Sugar Creek basin, Bloomington and Normal, Illinois, by B.J. Prugh, Jr. 1978. (PB 288359/AS)


WRI 79-23,24,25. 3-volume set (PB 299911/AS)


**Water-Resources Investigations Reports**
*(Books and Open-File Reports Section)*

The following Water-Resources Investigations Reports are available for inspection in the Urbana, Ill., and Reston, Va., 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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Open-File Reports

Open-File Reports are informal manuscripts, maps, and other material made available to the public. The following reports are available for inspection in the Urbana, Ill., and Reston, Va., offices of the U.S. Geological Survey. They may be purchased from U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, CO 80225 (phone 303-236-7476).


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


Surface-water quality of the upper Illinois River basin in Illinois, Indiana, and Wisconsin--analysis of existing information by S.F. Blanchard, p. 5.

Relations between fish populations and water quality in the upper Illinois River basin in Illinois, Indiana, and Wisconsin--analysis of existing information, by P.M. Ruhl and R.G. Striegl, p. 80-81.


Using a geographic information system to relate human and natural factors to stream-water quality in the upper Illinois River basin in Illinois, Indiana, and Wisconsin, by F.A. Stanke, p. 96.


The following reports are available from the District Office, U.S. Geological Survey, 4th Floor, 102 East Main Street, Urbana, IL 61801 (phone 217-398-5353).


Miscellaneous Reports

The following miscellaneous reports were developed in cooperation with other State of Illinois agencies and published by those agencies. The reports are available for inspection only at the District Office of the U.S. Geological Survey. Information about these reports may be obtained from the District Chief, U.S. Geological Survey, WRD, 4th Floor, 102 East Main Street, Urbana, IL 61801 (phone 217-398-5353).

Curtis, G.W., 1969, Statistical summaries of Illinois streamflow data.
Mitchell, W.D., 1948, Unit hydrographs in Illinois.
----- 1950, Water-supply characteristics of Illinois streams.
----- 1954, Floods in Illinois--Magnitude and frequency.
----- 1957, Flow duration of Illinois streams.
Prugh, B.J., Jr., 1976, Depth and frequency of floods in Illinois.
The annual State Water-Data Report contains surface- and ground-water data for Illinois that has been collected by the USGS in cooperation with other Federal, State, and local agencies. The water-data reports listed below are available free of charge, while supplies last, from the District Chief, U.S. Geological Survey, 102 E. Main Street, Urbana, IL, 61801 (phone 217-398-5353). They may also 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). The NTIS ordering number is given in parentheses at the end of the citation.


The following abstracts and papers by Geological Survey personnel were printed in non-Geological Survey publications. Typically, they summarize the principal conclusions of an author's current work but contain little supporting data. These publications are not available from the U.S. Geological Survey.

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

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


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


Interpretation of tracer tests conducted in an areally extensive fracture in a northeastern Illinois dolomite, by A.M. Shapiro, in Programs and Abstracts, International Conference on Fluid Flow in Fractured Rocks, May 15-18, 1988, Atlanta, Georgia.

Leachate movement through unsaturated sand at a low-level radioactive-waste disposal site in northwestern Illinois, by P.C. Mills and M.P. deVries, in Proceedings, Session III—Disposal technology and facility development, Tenth Annual DOE Low-Level Waste Management Conference, August 30 to September 1, 1988, Denver, Colorado, p. 54-68.


Wetland hydrologic and hydraulic research: Where we have been and where we need to go, by R.P. Novitzki, in Abstracts, Annual Conference of the Illinois Section of the American Water Resources Association, October 2, 1989, Peoria, Illinois.


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

In addition to the reports and abstracts listed above, further information may be obtained regarding water, maps, and geology by contacting the following offices of the U.S. Geological Survey:

**WATER**

District Chief  
U.S. Geological Survey  
4th floor  
102 East Main Street  
Urbana, Illinois 61801

Phone: (217) 398-5353

**MAPS**

Chief, Mid-Continent Mapping Center  
Earth Science Information Center  
U.S. Geological Survey  
1400 Independence Road  
Rolla, Missouri 65401

Phone: (314) 341-0851

** GEOLOGY**

Assistant Chief Geologist, Eastern Region  
U.S. Geological Survey  
953 National Center  
Reston, Virginia 22092

Phone: (703) 648-6660

**GENERAL INFORMATION**

Public Inquiries Office  
U.S. Geological Survey  
Room 1-C-402  
503 National Center  
12201 Sunrise Valley Drive  
Reston, Virginia 22092

Phone: (703) 648-6892
REFERENCES


TABLES 2 and 3
Table 2.—Surface-water stations for which data are collected by the Illinois District of the U.S. Geological Survey

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.
DS  - Discharge with auxiliary slope gage - continuous record of stage and discharge.
R   - Lake contents - furnished by U.S. Army Corps of Engineers, St. Louis District.
S   - Stage - continuous record of stage.
S/8 - Stage at 0800 hours.
SD  - Suspended sediment.

<table>
<thead>
<tr>
<th>Station No.</th>
<th>Station name</th>
<th>Type of data</th>
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</thead>
<tbody>
<tr>
<td>03336645</td>
<td>Middle Fork Vermilion River above Oakwood, Ill.</td>
<td>D,CQ</td>
</tr>
<tr>
<td>03336900</td>
<td>Salt Fork near St. Joseph, Ill.</td>
<td>D,CQ</td>
</tr>
<tr>
<td>03337000</td>
<td>Boneyard Creek at Urbana, Ill.</td>
<td>D</td>
</tr>
<tr>
<td>03338780</td>
<td>North Fork Vermilion River near Bismarck, Ill.</td>
<td>D,CQ</td>
</tr>
<tr>
<td>03339000</td>
<td>Vermilion River near Danville, Ill.</td>
<td>D,CQ</td>
</tr>
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<td>03341920</td>
<td>Wabash River at Rutsonville, Ill.</td>
<td>CQ</td>
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<tr>
<td>03343395</td>
<td>Embarras River at Camargo, Ill.</td>
<td>CQ</td>
</tr>
<tr>
<td>03343400</td>
<td>Embarras River near Camargo, Ill.</td>
<td>D</td>
</tr>
<tr>
<td>03344000</td>
<td>Embarras River near Diona, Ill.</td>
<td>C,CQ</td>
</tr>
<tr>
<td>03344500</td>
<td>Range Creek near Casey, Ill.</td>
<td>C</td>
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<tr>
<td>03345500</td>
<td>Embarras River at Ste. Marie, Ill.</td>
<td>D,CQ</td>
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<tr>
<td>03346000</td>
<td>North Fork Embarras River near Oblong, Ill.</td>
<td>D,CQ</td>
</tr>
<tr>
<td>03378000</td>
<td>Bonpas Creek at Browns, Ill.</td>
<td>D,CQ</td>
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<td>03378635</td>
<td>Little Wabash River near Effingham, Ill.</td>
<td>D,CQ</td>
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<tr>
<td>03378900</td>
<td>Little Wabash River at Louisville, Ill.</td>
<td>C,CQ</td>
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<tr>
<td>03379500</td>
<td>Little Wabash River below Clay City, Ill.</td>
<td>D,CQ</td>
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<td>03380500</td>
<td>Skillet Fork at Wayne City, Ill.</td>
<td>D,CQ</td>
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<tr>
<td>03381495</td>
<td>Little Wabash River at Main Street at Carmi, Ill.</td>
<td>CQ</td>
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<td>03381500</td>
<td>Little Wabash River at Carmi, Ill.</td>
<td>DS</td>
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<tr>
<td>03382100</td>
<td>South Fork Saline River near Carrier Mills, Ill.</td>
<td>D,CQ</td>
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<td>03384450</td>
<td>Lusk Creek near Eddyville, Ill.</td>
<td>D,CQ</td>
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<tr>
<td>03385000</td>
<td>Hayes Creek at Glendale, Ill.</td>
<td>C</td>
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<tr>
<td>03612000</td>
<td>Cache River at Forman, Ill.</td>
<td>D,CQ</td>
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<td>03612500</td>
<td>Ohio River at Lock and Dam 53, near Grand Chain, Ill.</td>
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<tr>
<td>05414820</td>
<td>Sinsinawa River near Menominee, Ill.</td>
<td>D</td>
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</table>

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Table 2.--Surface-water stations for which data are collected by the Illinois District of the U.S. Geological Survey--Continued

<table>
<thead>
<tr>
<th>Station No.</th>
<th>Station name</th>
<th>Type of data</th>
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<tbody>
<tr>
<td>05418950</td>
<td>Apple River near Elizabeth, Ill.</td>
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<td>05419000</td>
<td>Apple River near Hanover, Ill.</td>
<td>D</td>
</tr>
<tr>
<td>05420500</td>
<td>Mississippi River at Clinton, Iowa</td>
<td>CQ</td>
</tr>
<tr>
<td>05435500</td>
<td>Pecatonica River at Freeport, Ill.</td>
<td>D,CQ</td>
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<tr>
<td>05437500</td>
<td>Rock River at Rockton, Ill.</td>
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<td>05438250</td>
<td>Coon Creek at Riley, Ill.</td>
<td>C,CQ</td>
</tr>
<tr>
<td>05438500</td>
<td>Kishwaukee River at Belvidere, Ill.</td>
<td>D</td>
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<tr>
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<td>Kishwaukee R above South Branch nr Perryville, Ill.</td>
<td>CQ</td>
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<td>South Branch Kishwaukee River at De Kalb, Ill.</td>
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<td>05439500</td>
<td>South Branch Kishwaukee River nr Fairdale, Ill.</td>
<td>D,CQ</td>
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<td>05440000</td>
<td>Kishwaukee River near Perryville, Ill.</td>
<td>D,CQ</td>
</tr>
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<td>05443500</td>
<td>Rock River at Como, Ill.</td>
<td>D,CQ</td>
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<td>05444000</td>
<td>Elkhorn Creek near Penrose, Ill.</td>
<td>D,CQ</td>
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<tr>
<td>05446000</td>
<td>Rock Creek at Morrison, Ill.</td>
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<td>Mill Creek at Milan, Ill.</td>
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<td>Edwards River near New Boston, Ill.</td>
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<td>Mill Creek at Old Mill Creek, Ill.</td>
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<td>Bull Creek near Libertyville, Ill.</td>
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<td>Indian Creek at Prairie View, Ill.</td>
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<td>Buffalo Creek near Wheeling, Ill.</td>
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<td>Des Plaines River near Des Plaines, Ill.</td>
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<td>Weller Creek at Des Plaines, Ill.</td>
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Table 2.--Surface-water stations for which data are collected by the Illinois District of the U.S. Geological Survey--Continued

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<td>Flag Creek near Willow Springs, Ill.</td>
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<td>05533400</td>
<td>Sawmill Creek near Lemont, Ill.</td>
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<td>05534500</td>
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<td>Skokie River at Lake Forest, Ill.</td>
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<td>Little Calumet River at Munster, Ind.</td>
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<td>West Branch Du Page River near Warrenville, Ill.</td>
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<td>Spring Brook at 87th Street near Naperville, Ill.</td>
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Table 2.—Surface-water stations for which data are collected by the Illinois District of the U.S. Geological Survey—Continued

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<tr>
<th>Station No.</th>
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<th>Type of data</th>
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<td>Channel Lake near Antioch, Ill.</td>
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<td>05547500</td>
<td>Fox Lake near Lake Villa, Ill.</td>
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<td>05547755</td>
<td>Squaw Creek at Round Lake, Ill.</td>
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Table 2.--Surface-water stations for which data are collected by the Illinois District of the U.S. Geological Survey--Continued

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<td>Kaskaskia River near Venedy Station, Ill.</td>
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<td>05594450</td>
<td>Silver Creek near Troy, Ill.</td>
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<td>05594800</td>
<td>Silver Creek near Freeburg, Ill.</td>
<td>D,S/8,CQ</td>
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<td>05595200</td>
<td>Richland Creek near Hecker, Ill.</td>
<td>D,S/8,CQ</td>
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<tr>
<td>05595700</td>
<td>Big Muddy River near Mt. Vernon, Ill.</td>
<td>S</td>
</tr>
<tr>
<td>05595730</td>
<td>Rayse Creek near Waltonville, Ill.</td>
<td>D,S/8,CQ</td>
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<tr>
<td>05595765</td>
<td>Big Muddy Subimpoundment nr Waltonville, Ill.</td>
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<td>05595820</td>
<td>Casey Fork at Mt. Vernon, Ill.</td>
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<td>05595830</td>
<td>Casey Fork at Rt. 37 near Mt. Vernon, Ill.</td>
<td>CQ</td>
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<td>05595860</td>
<td>Casey Fork Subimpoundment near Bonnie, Ill.</td>
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<td>Rend Lake near Benton, Ill.</td>
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<td>Big Muddy River at Plumfield, Ill.</td>
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<td>Crab Orchard Creek near Marion, Ill.</td>
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<td>Big Muddy River at Murphysboro, Ill.</td>
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<td>05600000</td>
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<tr>
<td>07022000</td>
<td>Mississippi River at Thebes, Ill.</td>
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Table 3. Ground-water stations, by county, for which data are collected by the Illinois District of the U.S. Geological Survey

Abbreviations for type of data collected are:
L - Water level.
Q - Water quality.

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<td>Thomson Well No. 4</td>
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Table 3.--Ground-water stations, by county, for which data are collected by
the Illinois District of the U.S. Geological Survey--Continued

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WHITE COUNTY

WHITESIDE COUNTY

WILL COUNTY

WINNEBAGO COUNTY