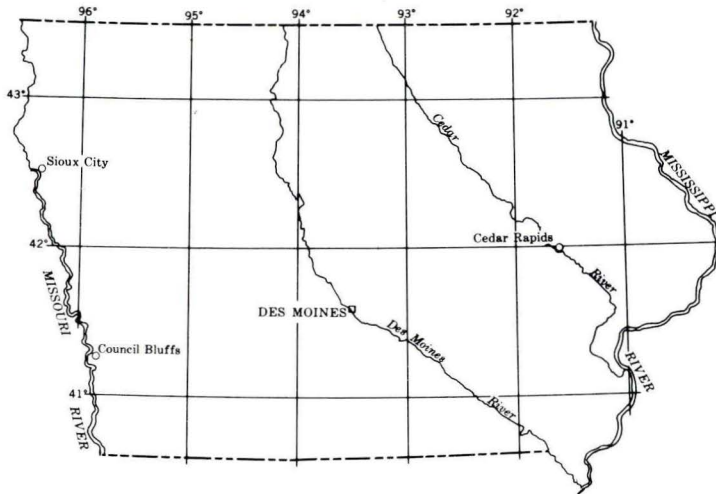


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Water-resources
investigations of the
U.S. Geological Survey
in Iowa, 1982

Water-Resources Investigations of the U.S. Geological Survey in Iowa

in cooperation with the
Iowa Geological Survey
and other
State, Municipal, and Federal Agencies



INQUIRIES MAY BE ADDRESSED TO

District Chief, Water Resources Division
U.S. Geological Survey
269 Federal Building
P. O. Box 1230
Iowa City, Iowa 52244
Telephone: (319) 337-4191
FTS 863-6521


or

State Geologist
Iowa Geological Survey
123 North Capitol Street
Iowa City, Iowa 52240

or

Chief Hydrologist
U.S. Geological Survey
420 National Center
Reston, Virginia 22092






The overall mission of the U.S. Geological Survey's Water Resources Division is to provide the hydrologic information and understanding needed for the best use and management of the Nation's water resources. For more than 85 years, the U.S. Geological Survey has studied the occurrence, quantity, quality, distribution, and movement of the surface and underground water that composes the Nation's water resources. As the principal Federal water-data agency, the Geological Survey collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. This nationwide program, which is carried out through the Water Resources Division's 43 District offices and 4 Regional offices, includes the collection, analysis, and dissemination of hydrologic data and water-use information, areal resource appraisals and other interpretive studies, and research projects. Much of this work is a cooperative effort in which planning and financial support are shared by State and local governments and other Federal agencies.

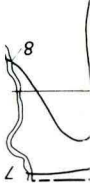
The Geological Survey, through its Office of Water Data Coordination (OWDC), also coordinates the water-data-acquisition activities of other Federal agencies. Information on these Federal activities is consolidated into a "Catalog of Information on Water Data." Many State and local agencies and private organizations that have water-data-acquisition activities also contribute information to this catalog. This information is made available to all users of water data by means of a national network of assistance centers managed by the Geological Survey's National Water Data Exchange (NAWDEX). In **Iowa**, NAWDEX services can be obtained from the District Chief, U.S. Geological Survey, Water Resources Division, and the Iowa Water Resources Data System (IWARDS), Iowa Geological Survey (addresses on cover of this folder). A leaflet explaining NAWDEX services is available from the Assistance Centers or from the NAWDEX Program Office, U.S. Geological Survey, 421 National Center, Reston, VA 22092.

INTRODUCTION

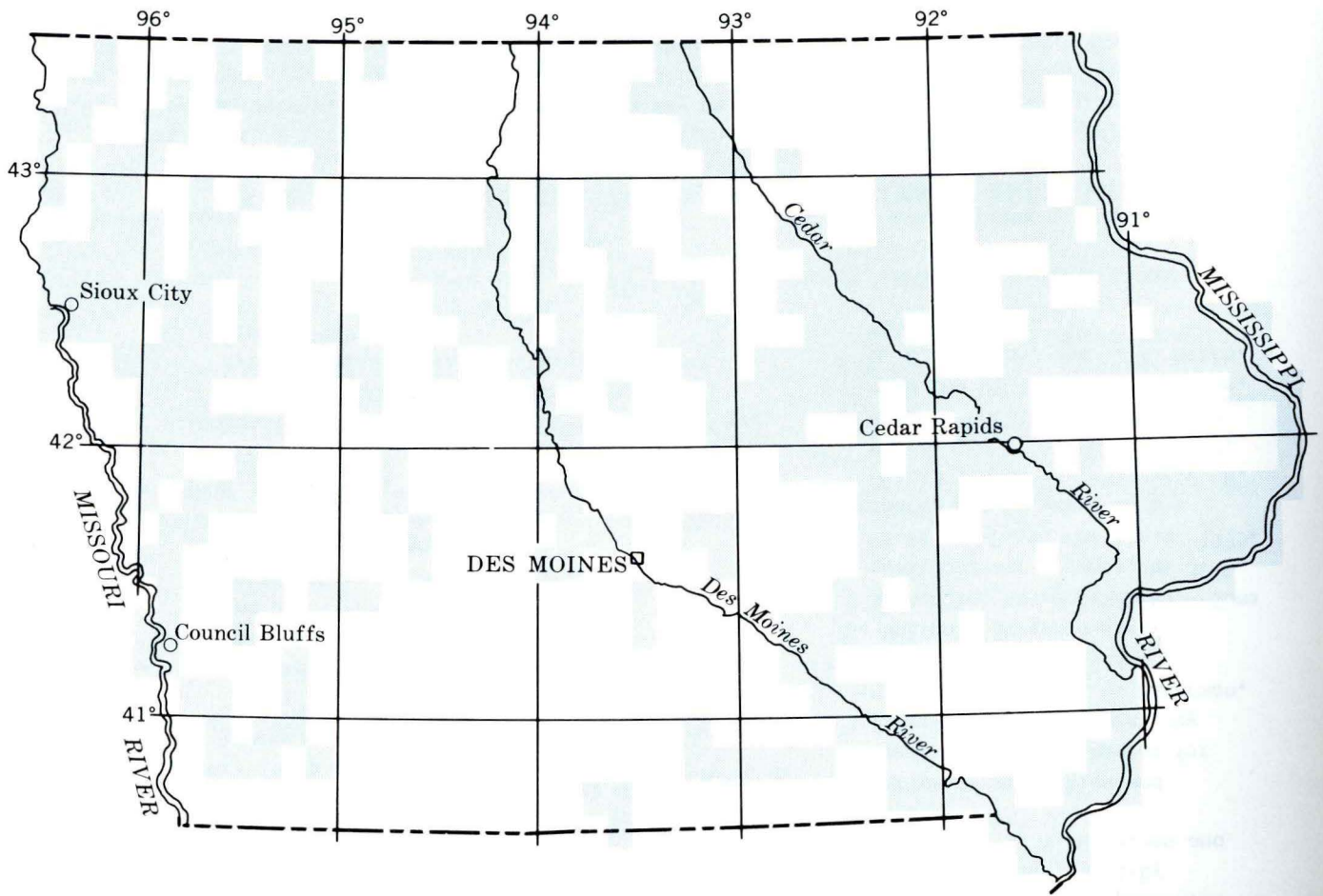


This folder contains a brief description of the water-resources investigations in **Iowa** in which the U.S. Geological Survey participates and a list of selected references. The principal map shows the location of hydrologic-data stations and the extent of the areal hydrologic investigations; the small maps show variations in selected hydrologic characteristics important to Iowa's water resources, and areas within Iowa for which certain types of hydrologic information are available. Additional or more detailed information can be obtained from the District Chief, Water Resources Division, at the address shown on the cover of this folder.

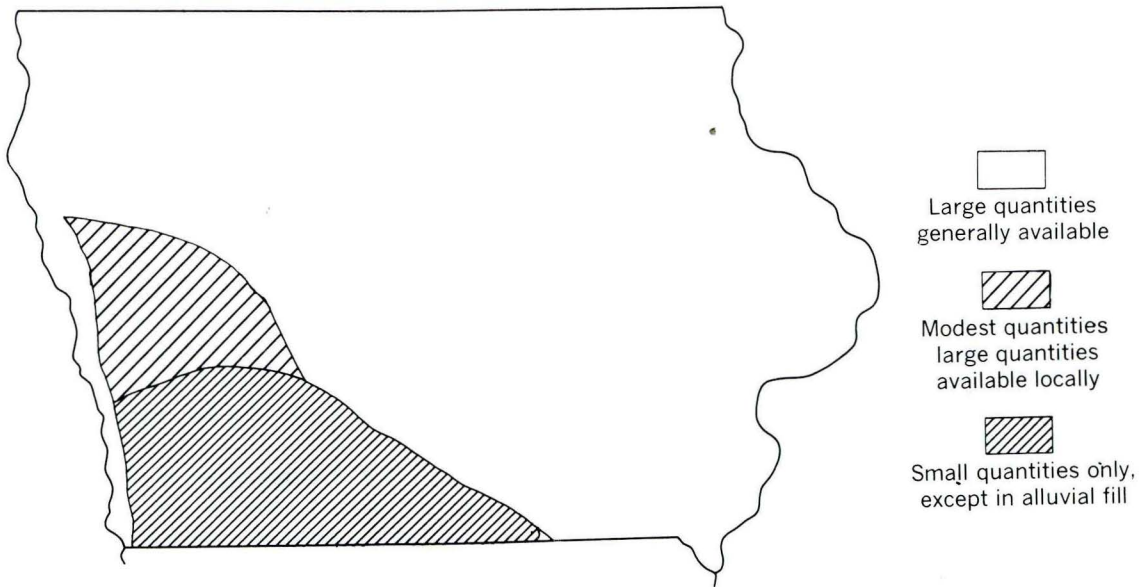
COOPERATORS



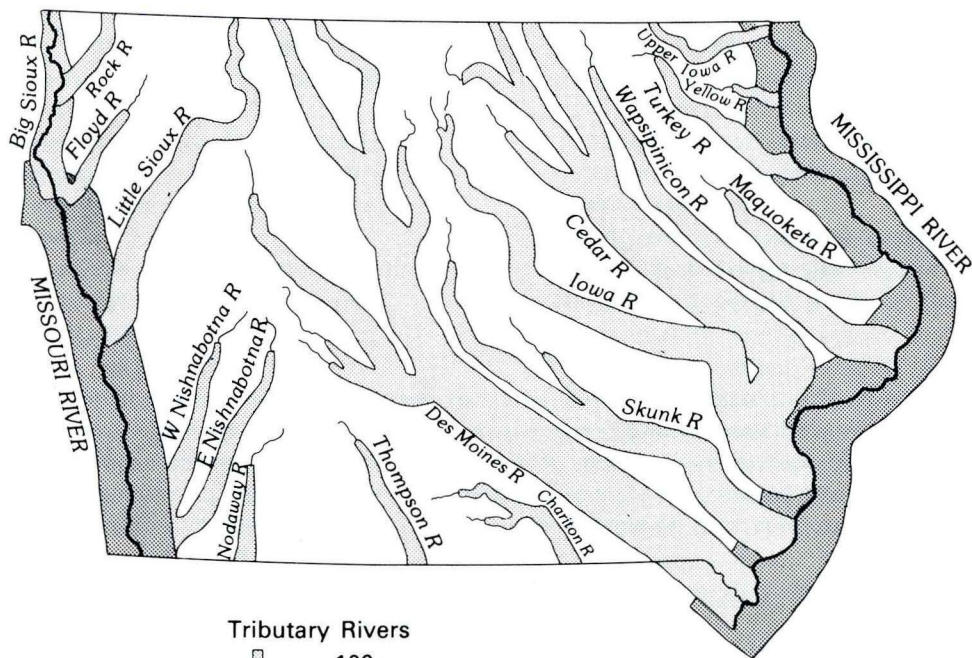
In Iowa, various parts of the U.S. Geological Survey program are conducted in cooperation with: Iowa Geological Survey; Iowa Natural Resources Council; Iowa Department of Transportation, Highway Division, Highway Research Board; Iowa Department of Environmental Quality; University of Iowa, Physical Plant, Institute of Hydraulic Research, and Hygienic Laboratory; Iowa State University, Department of Agricultural Engineering, and Engineering Research Institute; Hospers Rural Water System No. 1; West-Central Iowa Rural Water Association; cities of Ames, Cedar Rapids, Charles City, Clear Lake, Denison, Des Moines, Fort Dodge, Harlan, Iowa City, Marshalltown, Sioux City, Waterloo, and West Des Moines; U.S. Department of Agriculture (Soil Conservation Service); U.S. Department of the Army (Corps of Engineers).



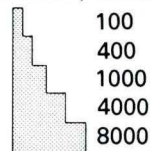
FLOOD-PRONE AREA MAPS COMPLETED IN IOWA



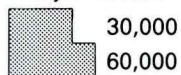
AVAILABILITY OF GROUND WATER



Tributary Rivers



Major Rivers



Width of river indicates average discharge in cubic feet per second

AVERAGE DISCHARGE OF THE PRINCIPAL RIVERS

HYDROLOGIC-DATA PROGRAM

Hydrologic-data stations, at selected key locations throughout **Iowa**, are used by the U.S. Geological Survey to obtain records on stream discharge and stage, reservoir and lake storage, ground-water levels, and the quality of surface and ground water. Each year stations are added and others are discontinued; thus, the Water Resources Division has both current and historical files of hydrologic data. All data collected are stored in the Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) and are available on request to water planners and others involved in making decisions affecting the State's water resources. These data can be retrieved in machine-readable form or in the form of computer-printed tables or graphs, statistical analyses, and digital plots. Local assistance in the acquisition of services or products from WATSTORE can be obtained from the District Chief, Water Resources Division (address on the cover of this folder). For information on data reports that are published annually as part of this program, see the "Selected Literature on Water Resources" section of this folder.

SURFACE WATER

Surface-water discharge (streamflow), stage (water level), and water-quality data are collected for assessment of water resources, areal analyses, determination of long-term trends, research and special studies, or for management and operational purposes. In **Iowa**, data on discharge and stage currently are obtained at the number of stations given in the following table.

| <u>Station classification</u> | <u>Number of stations</u> |
|----------------------------------|---------------------------|
| Stream stations..... | 240 |
| Continuous record: | |
| Discharge and stage..... | 114 |
| Stage only..... | 2 |
| Partial record: | |
| Peak (maximum) flow only..... | 124 |
| Lake and reservoir stations..... | 7 |
| Stage and contents..... | 4 |
| Stage only..... | 3 |
| Total..... | <u>247</u> |

All active continuous-record stream-gaging stations and lake and reservoir stations are shown on the principal map. Partial-record stations are not shown. Records are available for 75 stream-gaging or stage stations that have been discontinued. In addition to the stream-gaging stations, the U.S. Geological Survey also operates 7 continuous precipitation stations throughout the State. These precipitation stations, which are shown on the map, are used in conjunction with the stream-gaging stations for calibrating rainfall-runoff models.

Water-quality data are obtained at 17 of the surface-water stations listed in the preceding table. In addition to monitoring the quality of surface water in Iowa, six of these stations also are part of a U.S. Geological Survey nationwide network known as the National Stream Quality Accounting Network (NASQAN), which is used to detect nationwide trends in water quality. The types of data determined at all water-quality sites are given in the following table. Inasmuch as several types of data may be determined at a particular site and not all types of data are determined at each site, the numbers given in the following table will not equal the total number of stations given earlier.

| <u>Data classification</u> | <u>Number of sites</u> |
|-----------------------------|------------------------|
| Physical data: | |
| Water temperature..... | 17 |
| Specific conductance..... | 17 |
| pH..... | 8 |
| Dissolved oxygen..... | 8 |
| Sediment data..... | 9 |
| Chemical data: | |
| Inorganic constituents..... | 8 |
| Organic constituents..... | 8 |
| Pesticides..... | 1 |
| Radiochemical data..... | 1 |
| Biological data..... | 7 |

Only those stations that are sampled quarterly, or more often, are included in the preceding table and shown on the map. Water-temperature data are collected routinely at all continuous streamflow stations, but this is not reflected in the totals shown above.

GROUND WATER

Water levels in wells and water-quality data are key characteristics in monitoring ground-water trends; however, these hydrologic characteristics must be integrated with other observations and ground-water system studies in order to have the fullest meaning and usefulness. In **Iowa**, the U.S. Geological regularly monitors a number of wells (called observation wells). Other wells, which are known as project wells, are used for specific (generally short-term) studies and, although they are not part of the basic observation-well network, data obtained from them also are available. The number of wells currently being measured is given in the following table.

| <u>Station classification</u> | <u>Number of sites</u> |
|--------------------------------------|------------------------|
| Observation wells: water levels..... | 92 |
| Project wells: | |
| Water levels..... | 54 |
| Water quality..... | 130 |

Ground-water-observation stations are shown on the map; project wells are not shown.

Water-quality data are obtained at 130 of the project wells listed in the preceding table. The types of data determined at these sites include water temperature, specific conductance, pH, and inorganic constituents. Selected samples are analyzed for radionuclides. Water-quality sampling sites are located in the north-central and west-central project areas; none are shown on the map.

HYDROLOGIC INVESTIGATIONS

Hydrologic investigations include areal resource appraisals, data collection other than that which is part of the Hydrologic-Data Program, and research activities. Current investigations in Iowa are listed below; generally, the areal projects are outlined on the principal map, whereas the statewide and topical projects are not.

SHOWN ON MAP

- A. Hydrology of glaciated carbonate terranes.
Determine the quantity and quality of flow into, through, and out of carbonate rocks for planning safe water-resource development.
- B. Hydrology of Area 38, northern Great Plains coal province, Iowa and Missouri.
Summarize the available hydrologic data for coal province of Iowa and Missouri.
- C. Water resources of north-central Iowa.
Determine water availability, quality, and use in the area.
- D. Baseline water quality in the coal region of Iowa.
Define the water quality of the water resources for predevelopment conditions so that effects of development on water quality can be evaluated.
- E. Hydrology of the Cretaceous-Quaternary aquifer system in west-central Iowa.
Evaluate availability and quality of water from the Dakota and Quaternary-age aquifers in the area.
- F. Sedimentation study of Lake Panorama.
Assess the impact of the stream runoff on the sedimentation of Lake Panorama and evaluate the sediment regimen of the Middle Raccoon River basin.

NOT SHOWN ON MAP

- Iowa water-use data system.
Establish a water-use system which will contain documentation of the sources of water supply, where and how water is being used, how much is being consumed, and how much is returned for later use.
- Flood profiles of Iowa streams.
Define profiles of a record flood and floods of selected frequency along principal streams of Iowa.
- Flood hazard mapping.
Delineate on topographic maps the extent of areas that would be inundated by a 100-year flood (a flood having 1 chance in 100 of being equaled or exceeded in any year) or an outstanding historic flood near communities having populations greater than 2,500.
- Northern Midwest Regional Aquifer-System Analysis--Iowa.
Evaluate the water-supply potential of the Cambrian-Ordovician aquifer(s) and determine the aquifer response to changes in ground-water development.
- Ground-water quality monitoring network.
Identify aquifers and geographic areas with water-quality problems; establish criteria and priorities for selection of monitoring sites; choose water-quality parameters and frequency of monitoring; and provide interim field sampling for the University Hygienic Lab.
- Water problems of urbanizing areas.
Develop or improve techniques for analyzing urban drainage systems and predicting urban watershed response.

SELECTED LITERATURE ON WATER RESOURCES

Because the number of publications pertaining to water resources in Iowa is large, the publications listed below were selected to show the types of information available to those interested in or in need of water facts. Many of these publications are available for inspection at the offices listed on the front page of this folder and at large public and university libraries. The publications are grouped as follows: I. Publications of the U.S. Geological Survey; II. Publications of State agencies prepared by or in cooperation with the U.S. Geological Survey; and III. Other publications, such as technical journals.

I. PUBLICATIONS OF THE U.S. GEOLOGICAL SURVEY (USGS)

General Information.-- The U.S. Geological Survey announces all its publications in the monthly report "New Publications of the Geological Survey." Subscriptions to this monthly listing are available upon request to the 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 here. Prepayment is required; obtain information on price and availability 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 are available for fiscal years beginning with 1975 and 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 in the professional paper series "Geological Survey Research" (see under heading "USGS Professional Papers"). A pamphlet entitled "Geologic and Water-Supply Reports and Maps for Iowa," which lists reports on the geology and water resources of Iowa, is available upon request to the U.S. Geological Survey, 420 National Center, Reston, VA 22092.

Water Resources Information.--A monthly summary of the national water situation is presented in the "National Water Conditions" [formerly called the "Water Resources Review"]. Water-resource investigation folders (similar to this one) are available for each of the 50 States and Puerto Rico and the Virgin Islands. Both publications are available on request to the U.S. Geological Survey, 420 National Center, Reston, VA 22092.

Beginning with the 1971 water year, **streamflow data**, **water-quality data** for surface and ground water, and **ground-water level data** for each State are combined and published in the annual series "U.S. Geological Survey Water-Data Reports." See section "U.S. Geological Survey Water-Data Reports available only through NTIS" for a listing of these reports.


Records of discharge of streams, and contents (or stage) of lakes and reservoirs were first published in a series of USGS water-supply papers entitled, "Surface Water Supply of the United States." Through September 30, 1960, these water-supply papers were in an annual series and then in a multiyear series for 1961-65 and 1966-70. Records of chemical quality, water temperatures, and suspended sediment were published from 1941 to 1970 in an annual series of water-supply papers entitled, "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of water-supply papers entitled, "Ground-water levels in the United States." Water-supply papers may be consulted in the libraries of the principal cities in the United States or may be purchased from the Eastern Distribution Branch, U.S. Geological Survey, 604 South Pickett Street, Alexandria, VA 22304. Pamphlets (mentioned under "General Information") listing the reports for each State by number and title also may be obtained on request from that address.

Methods for estimating the magnitude and frequency of **floods** for selected streams are given in the water-supply paper series "Magnitude and Frequency of Floods in the United States" (W1671-1689), which includes reports released in parts by drainage basins; data for Iowa are in Parts 5 and 6. The U.S. Geological Survey also outlines flood-prone areas on topographic maps as part of a nationwide Federal program for managing flood losses. Parts of these topographic maps showing flood-prone urban areas have also been published in urban-area pamphlets. In Iowa, 408 topographic maps and 38 urban-area pamphlets have been completed. (See map in this folder: "Flood-prone area maps completed in Iowa") Information on these maps and pamphlets is available on request from the District Chief.

Iowa".) Information on these maps and pamphlets is available on request from the District Chief, Water Resources Division, at the address shown on the cover of this folder.

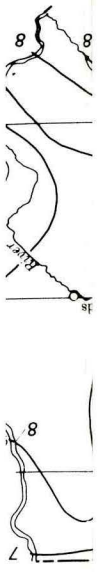
USGS PROFESSIONAL PAPERS

Professional papers are sold by the U.S. Geological Survey, Branch of Distribution, 604 South Pickett Street, Alexandria, VA 22304.

- 
- P 813-B. Summary appraisals of the Nation's ground-water resources--Upper Mississippi Region, by R. M. Bloyd, Jr. 1975.
- P 813-Q. Summary appraisals of the Nation's ground-water resources--Missouri Basin Region, by O. J. Taylor. 1978.
- P 937. The 1973 Mississippi River basin flood; Compilation and analyses of meteorologic, streamflow, and sediment data, by E. H. Chin, John Skelton, and H. P. Guy. 1975.
- P 1050. Geological Survey Research 1977. 1978.
- P 1100. Geological Survey Research 1978. 1979.
- P 1110 -M-DD. The Mississippian and Pennsylvanian (Carboniferous) Systems in the United States, part M-Iowa, by Matthew J. Avcin and Donald L. Koch. 1979.
- P 1130. Hydrologic and Human Aspects of the 1976-77 Drought, by Howard F. Matthai. 1979.
- P 1150. Geological Survey Research 1979. 1980.
- P 1175. Geological Survey Research 1980. 1981.
- P 1275. Geological Survey Research 1981. 1982.

USGS WATER SUPPLY PAPERS

Water-supply papers are sold at the above-listed Alexandria, Va., address.

- 
- W 293. Underground water resources of Iowa, by W. H. Norton and others. 1912.
- W 1260-B. Floods of April 1952 in the Missouri River basin, by U.S. Geological Survey. 1955.
- W 1260-C. Floods of 1952 in the basins of the upper Mississippi River and Red River of the North, by U.S. Geological Survey. 1955.
- W 1300. The industrial utility of public water supplies in the United States, 1952--Part 2, States west of the Mississippi River, by E. W. Lohr and S. K. Love, 1954.
- W 1308. Compilation of records of surface waters of the United States through September 1950--Part 5, Hudson Bay and Upper Mississippi River basin. 1959.
- W 1309. Compilation of records of surface water of the United States through September 1950--Part 6-A, Missouri River basin above Sioux City, Iowa, 1959.
- W 1310. Compilation of records of surface water of the United States through September 1950--Part 6-B, Missouri River basin below Sioux City, Iowa. 1958.
- W 1320-A. Floods of June 1953 in northwestern Iowa, by U. S. Geological Survey. 1955.
- W 1370-A. Floods of June 1954 in Iowa, by I. D. Yost. 1958.
- W 1473. Study and interpretation of the chemical characteristics of natural waters, 2d edition, by J. D. Hem. 1970.

- W 1669-S. Yearly variations in runoff for the conterminous United States, 1931-60, by M. W. Busby. 1963.
- W 1728. Compilation of records of surface waters of the United States, October 1950 to September 1960--Part 5, Hudson Bay and Upper Mississippi River basin. 1964.
- W 1729. Compilation of records of surface waters of the United States, October 1950 to September 1960--Part 6-A, Missouri River basin above Sioux City, Iowa. 1964.
- W 1730. Compilation of surface waters of the United States, October 1950 to September 1960--Part 6-B, Missouri River basin below Sioux City, Iowa. 1964.
- 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 1804. Drought of the 1950's with special reference to the Midcontinent, by R. L. Nace and E. J. Pluhowski. 1965.
- W 1812. Public water supplies of the 100 largest cities in the United States, 1962, by C. N. Durfor and Edith Becker. 1964.
- W 1813. Flood peak runoff and associated precipitation in selected drainage basins in the United States, by Tate Dalrymple. 1965.
- W 1838. Reservoirs in the United States, by R. O. R. Martin and R. L. Hanson. 1966.
- W 1839-O. A hydrogeologic study of the ground-water reservoirs contributing base runoff to Four Mile Creek, east-central Iowa (Tama County), by G. R. Kunkle. 1968.
- W 1849. Roughness characteristics of natural channels, by H. H. Barnes, Jr. 1967.
- W 1850-A. Floods of March-May 1965 in the upper Mississippi River basin, by D. B. Anderson and I. L. Burmeister. 1970.
- W 1871. Water⁶ data for metropolitan areas in the United States--A Summary of data from 222 areas, compiled by W. J. Schneider. 1968.
- W 1887. Maximum floodflows in the conterminous United States, by L. R. Crippen and C. D. Bue. 1977.
- W 1899-G. Measurement of mixing characteristics of the Missouri River between Sioux City, Iowa, and Plattsmouth, Nebraska, by Nobuhiro Yotsukura, H. B. Fischer, and W. W. Sayre. 1970.
- W 1914. Surface Water Supply of the United States, 1961-65--Part 5, Hudson Bay and Upper Mississippi River basins. 1971.
- W 1919. Surface Water Supply of the United States, 1961-65--Part 6, Missouri River Basin, 1969.
- W 1990. Annotated bibliography on artificial recharge of ground water, 1955-67, by D. C. Signor, D. J. Growitz, and William Kam. 1970.
- W 2020. Subsurface waste disposal by means of wells--A selective annotated bibliography, by D. R. Rima, E. B. Chase, and B. M. Myers. 1971.
- W 2028. A national study of the streamflow data-collection program, by M. A. Benson and R. W. Carter. 1973.
- W 2114. Surface water supply of the United States, 1966-1970--Part 5, Hudson Bay and Upper Mississippi River basins. 1976.
- W 2119. Surface water supply of the United States, 1966-70--Part 6, Missouri River basin. 1972 (1973).

USGS CIRCULARS

Single copies of circulars still in print are available on request from the above-listed Alexandria, Va., address.

- C 44. Large rivers of the United States, by U.S. Geological Survey. 1949.
- C 476. Principal lakes of the United States, by C. D. Bue. 1963.
- C 643. Reconnaissance of selected minor elements in surface waters of the United States, October 1970, by W. H. Durum, J. D. Hem, and

- C 554. Hydrology for urban land planning--
A guidebook on the hydrologic effects of urban land use, by L. B. Leopold. 1968.
- C 601-A. Water for the cities--The outlook, by W. J. Schneider and A. M. Spieker. 1969.
- C 601-D. Water as an urban resource and nuisance, by H. E. Thomas and W. J. Schneider. 1970.
- C 601-E. Sediment problems in urban areas, by H. P. Guy. 1970.
- C 601-F. Hydrologic implications of solid-waste disposal, by W. J. Schneider. 1970.
- C 601-G. Real-estate lakes, by D. A. Rickert and A. M. Spieker. 1972.
- C 601-H. Role of water in urban planning and management, by W. J. Schneider, D. A. Rickert, and A. M. Spieker. 1973.
- C 601-I. Water facts and figures for planners and managers, by J. H. Feth. 1973.
- C 601-J. Extent and development of urban flood plains, by W. J. Schneider and J. E. Goddard. 1974.
- C 601-K. An introduction to the processes, problems, and management of urban lakes, by L. J. Britton, R. C. Averett, and R. F. Ferreira. 1975.
- C 631. Disposal of liquid wastes by injection underground--Neither myth nor millenium, by A. M. Piper. 1969.
- C 645. A procedure for evaluating environmental impact, by L. B. Leopold and others. 1971.
- C 670. Fluvial-sediment discharge to the oceans from the conterminous United States, by W. F. Curtis, J. K. Culbertson, and E. B. Chase. 1973.
- C 685. Dissolved-solids discharge to the oceans from the conterminous United States, by D. K. Leifeste. 1974.
- C 703. Water demands for expanding energy development, by G. H. Davis and L. A. Wood. 1974.
- C 715-A. A practical framework for river-quality assesment, by D. A. Rickert and W. G. Hines. 1975.
- C 715-B. Formulation and use of practical models for river-quality assesment, by W. G. Hines and others. 1975.
- C 715-E. Selection of streamflow and reservoir-release models for river-quality assesment, by M. E. Jennings, J. O. Shearman, and D. P. Bauer. 1976.
- C 719. The National Stream Quality Accounting Network(NASQAN)--Some questions and answers, by J. F. Ficke and R. O. Hawkinson. 1975.
- C 765. Estimated use of water in the United States in 1975, by C. R. Murray and E. B. Reeves. 1977.
- C 777. A guide to obtaining information from the USGS, by P. F. Clarke, H. E. Hodgson, and G. W. North. Revised, 1982.

USGS WATER-RESOURCES INVESTIGATIONS (WRI) REPORTS

Reports in this series are available for inspection at the Iowa and Reston, Va., offices of the U.S. Geological Survey. The report listed below may be purchased either as microfilm or hard copy from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161; the NTIS ordering number is given in parenthesis at the end of the citation. Further information about WRI reports may be obtained from the District Chief, Water Resources Division, at the address shown on the cover of this folder.

- WRI 78-11. Effects of urban development on the flood-flow characteristics of the Walnut Creek basin, Des Moines metropolitan area (Polk County), Iowa, by O. G. Lara. (PB-284 093/AS)

USGS WATER-DATA REPORTS AVAILABLE ONLY THROUGH NTIS

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

IA-71-1. Water year 1971 (PB-288 644/8ST)
IA-72-1. Water year 1972 (PB-288 645/5ST)
IA-73-1. Water year 1973 (PB-288 646/3ST)
IA-74-1. Water year 1974 (PB-288 647/1ST)
IA-75-1. Water year 1975 (PB-251 858/7ST)
IA-76-1. Water year 1976 (PB-266 992/7ST)

IA-77-1. Water year 1977 (PB-287 072/3ST)
IA-78-1. Water year 1978 (PB-116 676)
IA-79-1. Water year 1979 (PB-80-180 532)
IA-80-1. Water year 1980
IA-81-1. Water year 1981 (PB-83-105 601)

USGS HYDROLOGIC INVESTIGATIONS ATLASES

Hydrologic Investigations Atlases (and other maps of areas west of the Mississippi River) are sold by the Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225.

- | | |
|--|--|
| HA-53. Floods at Des Moines, Iowa, by R. E. Myers. 1963. | HA-217. General availability of ground water and depth to water level in the Missouri River basin, by G. A. LaRocque, Jr. 1966. |
| HA-61. Stream composition of the conterminous United States, by F. H. Rainwater. 1962. | HA-235. Temperature of surface waters in the conterminous United States, by J. F. Blakey. 1966. |
| HA-194. Generalized map showing annual runoff and productive aquifers in the conterminous United States, compiled by C. L. McGuinness. 1964. | HA-282. River discharge to the sea from the shores of the conterminous United States--A contribution to the International Hydrologic Decade, compiled by Alfonso Wilson and K. T. Iseri. 1967. |
| HA-200. Chemical quality of public water supplies of the United States and Puerto Rico, 1962, by C. N. Durfor and Edith Becker. 1964. | HA-332. Travel of solutes in the lower Missouri River, by J. E. Bowie and L. R. Petri. 1969. |
| HA-212. Annual runoff in the conterminous United States, by M. W. Busby. 1966. | |

USGS HYDROLOGIC UNIT MAPS

Hydrologic unit maps are sold at the above-listed Denver address.

U.S. Geological Survey, 1976, Hydrologic unit map of Iowa-1974.

USGS MISCELLANEOUS INVESTIGATIONS SERIES

Maps in miscellaneous investigations series are sold by Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver CO 80225.

- | | |
|--|---|
| I-717. Bedrock topography of east-central Iowa, by R. E. Hansen. 1972. | I-1080. Bedrock topography of north-central Iowa, by R. E. Hansen. 1978. |
| I-763. Bedrock topography of south-central Iowa, by J. W. Cagle. 1973. | I-1222. Bedrock topography of southwest Iowa, by L. V. A. Sendlein and J. L. Gilmore. 1980. |
| I-808. Bedrock topography of southeast Iowa, by R. E. Hansen. 1973. | |
| I-933. Bedrock topography of northeast Iowa, by R. E. Hansen. 1975. | |

USGS OPEN-FILE REPORTS AND MAPS

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II. PUBLICATIONS OF IOWA STATE AGENCIES PREPARED BY OR IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY

Reports published by the Iowa Geological Survey are available from that organization at the address shown on the cover of this folder. Information about reports published by the Iowa Natural Resources Council may be obtained from that organization at Henry A. Wallace State Office Building, East 9th and Grand, Des Moines, Iowa 50319. Inquiries about the reports published by the Highway Research Board should be addressed to the Iowa Department of Transportation, Highway Division, 826 Lincoln Way, Ames, Iowa 50010.

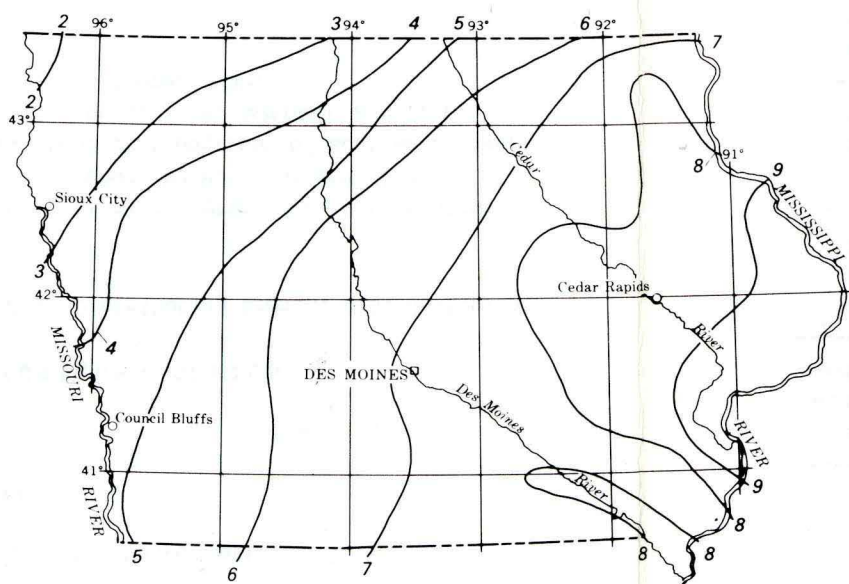
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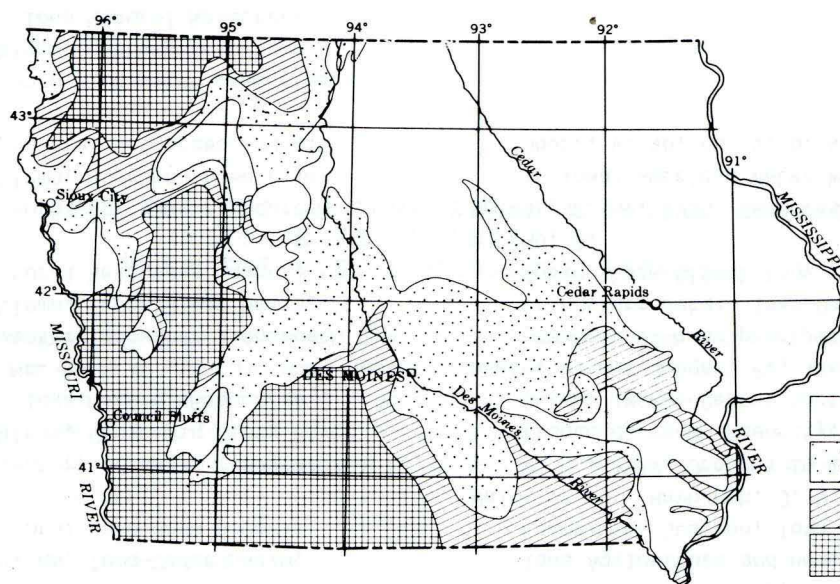
III. OTHER PUBLICATIONS

Address inquiries about the availability of these reports to the publisher. Most reports are available at large public and university libraries.

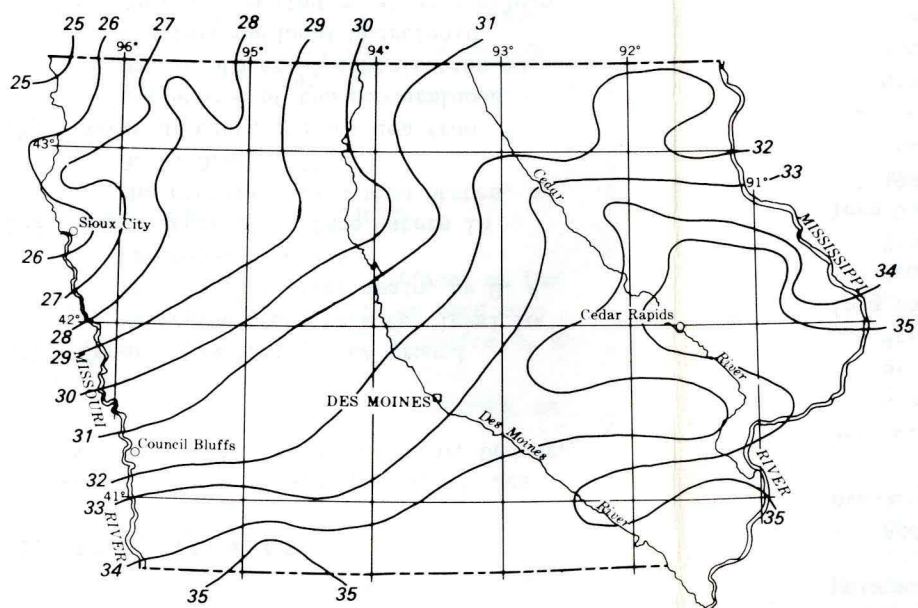
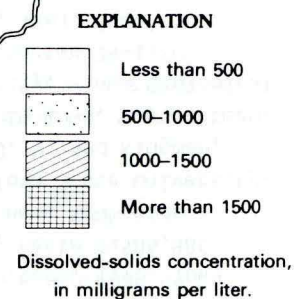
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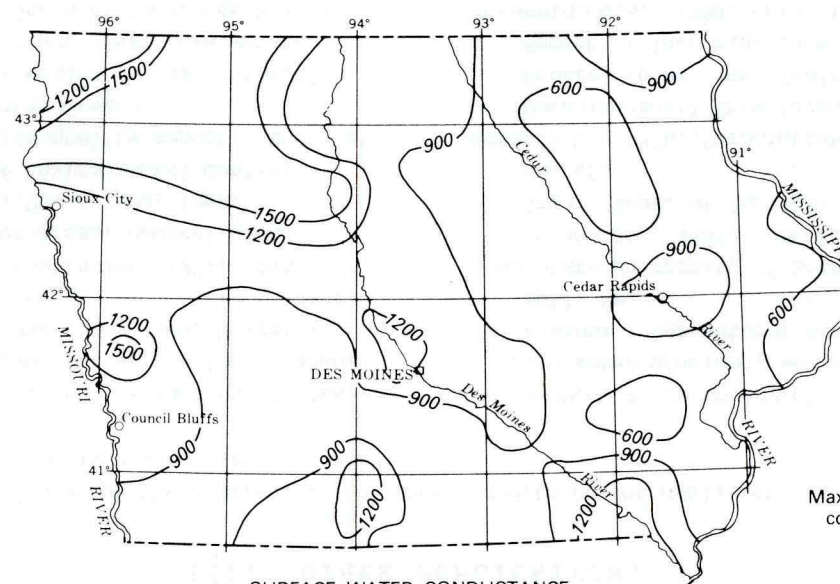
AVERAGE ANNUAL RUNOFF, IN INCHES



AREAS WHERE WATER WITH THE MINIMUM DISSOLVED-SOLIDS CONTENT IS AVAILABLE FROM BEDROCK AQUIFERS



NORMAL ANNUAL PRECIPITATION, IN INCHES, 1941-70
(Data from Iowa Department of Agriculture, State Climatologist)



SURFACE WATER CONDUCTANCE

