

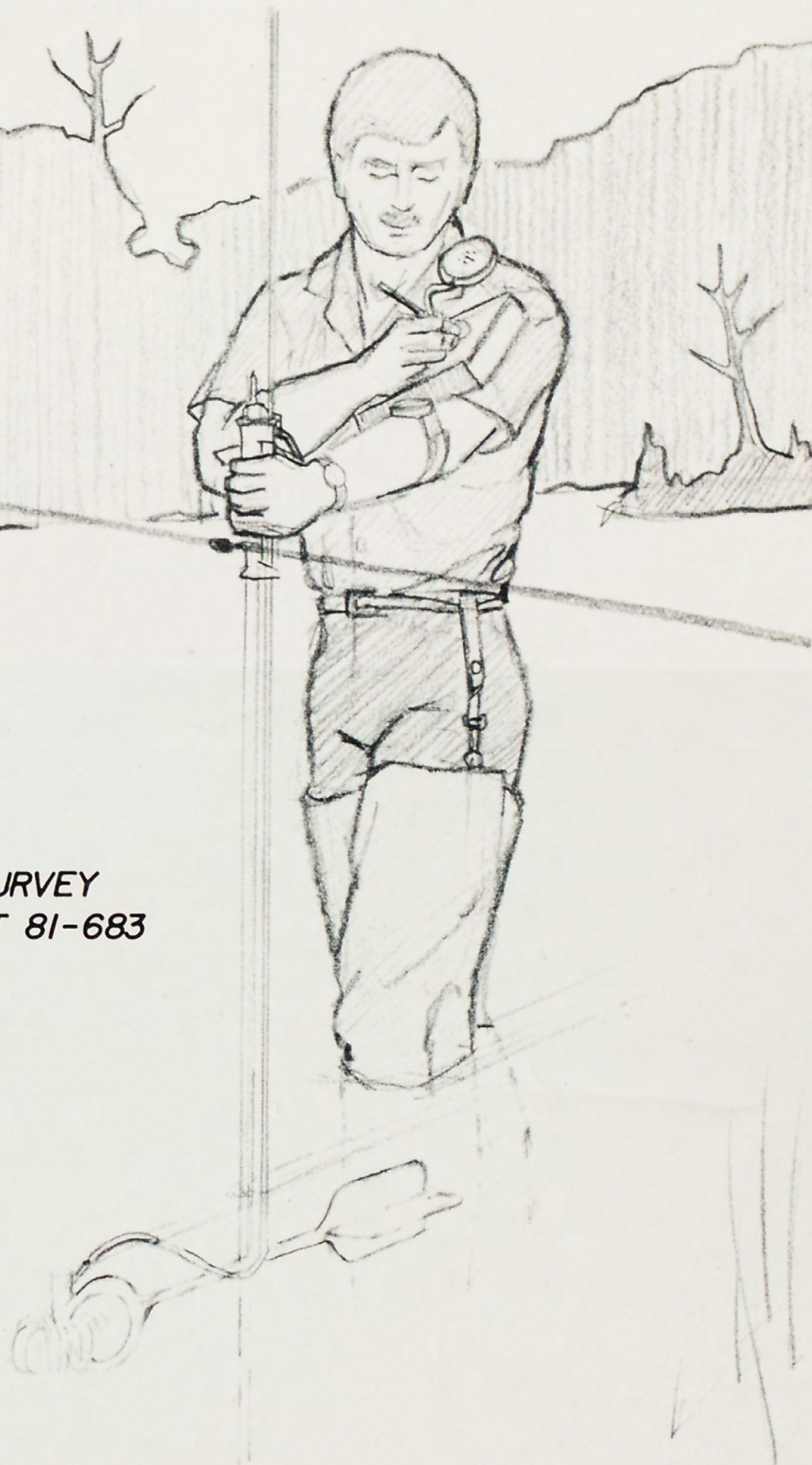
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R290
no. 81-683

**WATER-RESOURCES INVESTIGATIONS
OF THE U. S. GEOLOGICAL SURVEY
IN
MISSOURI**

X

FISCAL YEAR 1981

*U. S. GEOLOGICAL SURVEY
OPEN-FILE REPORT 81-683*



WATER RESOURCES DIVISION BASIC MISSION AND PROGRAM

The mission of the Water Resources Division of the U.S. Geological Survey is to provide the hydrologic information and understanding for the optimum utilization and management of the Nation's water resources for the overall benefit of the people of the United States.

This mission is accomplished, in large part, through cooperation with other federal and non-federal agencies, by:

- Systematically collecting data needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.
- Conducting analytical and interpretative water-resource appraisals describing the occurrence, availability, and the physical, chemical, and biological characteristics of surface and ground water.
- Conducting supportive basic and problem-oriented research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurement techniques and to understand hydrologic systems sufficiently to predict their response to stress, either natural or manmade.
- Distributing the water data and the results of these investigations and research through reports, maps, computerized services, and other forms of public releases.
- Coordinating the activities of federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and ground water.
- Providing scientific and technical assistance in hydrologic fields to other federal, state, and local agencies; to licensees of the Federal Energy Regulatory Commission, and to international agencies on behalf of the Department of State.

*Front cover drawing by
Douglas R. Stark,
Missouri Division of Geology and Land Survey*

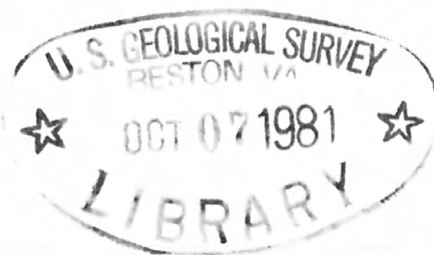


WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY
IN MISSOURI--FISCAL YEAR 1981

Compiled by Wanietia M. Kratzer

U.S. GEOLOGICAL SURVEY

Open-File Report 81-683



Rolla, Missouri
August 1981

Open-file report
United States
Geological Survey

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UNITED STATES DEPARTMENT OF THE INTERIOR

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WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY
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ABSTRACT

Water-resources investigations of the U.S. Geological Survey in Missouri consist of collecting hydrologic data and making interpretative investigations. The data and the results of the investigations are published or released by either the U.S. Geological Survey or by cooperating agencies. This report describes the data-collection activities and investigations in Missouri for the 1981 fiscal year and provides an extensive list of water-resources references for the State of Missouri.

INTRODUCTION

The United States Geological Survey was established on March 3, 1879, in the closing hours of the final session of the 45th Congress; during 1894, a small appropriation was obtained for the specific purpose of "gauging streams and determining the water supply of the United States."

A district office of the U.S. Geological Survey was established in Rolla, Mo., during 1921, when a cooperative program was begun with the Missouri Bureau of Geology and Mines (now the Department of Natural Resources, Division of Geology and Land Survey). In cooperation with other federal and state agencies, the office assesses the quantity and quality of Missouri's water supply, helps coordinate federal water-data acquisition activities, and collects and distributes information about floods and droughts.

The organization of the Missouri district is shown in figure 1.

COOPERATION

The Missouri district and agencies of the State of Missouri have had cooperative agreements for the systematic collection of streamflow records since 1921; about 80 percent of the hydrologic data collected by the U.S. Geological Survey in Missouri is in cooperation with local, state, or federal agencies.

The Department of Natural Resources is the principal state cooperator. Money and services contributed by state agencies are matched by the U.S. Geological Survey with funds authorized specifically for the cooperative program.

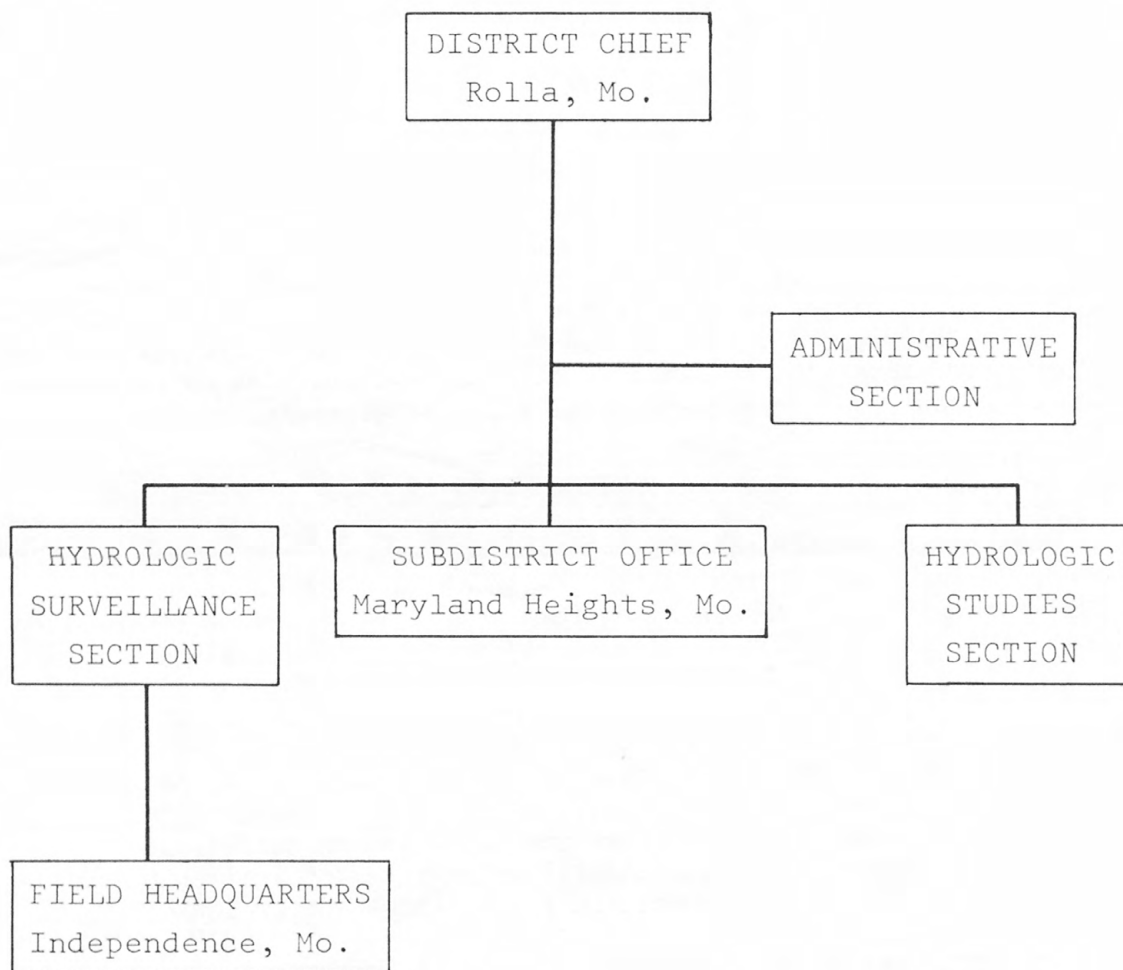


Figure 1.--Organization of the Missouri district.

The collection of surface-water data by the U.S. Geological Survey began during 1903 in Missouri. These and continuing data are the basis for analytical studies that define streamflow parameters and are ultimately used in water management, planning, and design.

The collection of ground-water data in cooperation with the Missouri Division of Geology and Land Survey has been continuous since initiation during October 1963. Many of the published ground-water reports for Missouri are the result of the cooperative program.

A network of water-quality stations is operated to provide water-quality data for planning and action programs. This project has been continuous since it was initiated during 1962, in cooperation with the Missouri Water Pollution Board (now the Department of Natural Resources, Division of Environmental Quality). The Division of Environmental Quality Laboratory analyzes samples collected in the cooperative program. As part of their quality assurance, the Division of Environmental Quality Laboratory routinely analyzes standard reference samples and split samples furnished by the U.S. Geological Survey.

State and local organizations that assist in collecting hydrologic data through joint-funding agreements are:

- City of Springfield
 - City Utilities
 - Division of Sanitary Services

- Department of Conservation

- Department of Natural Resources
 - Division of Environmental Quality
 - Division of Geology and Land Survey

- Highway and Transportation Commission

- Little River Drainage District

- St. Louis County, Missouri

Federal agencies that assist in collection of records by furnishing funds or services are:

- Environmental Protection Agency

- Federal Energy Regulatory Commission (Union Electric Co. of Missouri)

- National Park Service

- National Weather Service

- Soil Conservation Service

U.S. Department of the Army, Corps of Engineers
Kansas City District
Little Rock District
Rock Island District
St. Louis District
Tulsa District

HYDROLOGIC-DATA PROGRAM

Hydrologic-data stations are maintained by the U.S. Geological Survey throughout Missouri to constitute a network for obtaining records on stream discharge or stage, reservoir and lake storage, spring discharge, and the quality of surface and ground water. The locations of selected key hydrologic data stations are shown in figure 2. All hydrologic-data stations are listed in downstream order in the following table, which shows the cooperating agency and type of data collected. Abbreviations shown in the table are:

Cooperation

CE KC	Corps of Engineers, Kansas City
CE LR	Corps of Engineers, Little Rock
CE RI	Corps of Engineers, Rock Island
CE STL	Corps of Engineers, St. Louis
CE TU	Corps of Engineers, Tulsa
DOC	Department of Conservation
DEQ	Division of Environmental Quality
DGLS	Division of Geology and Land Survey
UE	Union Electric
HTC	Highway and Transportation Commission
NPS	National Park Service
SCS	Soil Conservation Service
SPFD	City of Springfield
STLCO	St. Louis County
USGS	U.S. Geological Survey

Type of Data Collected

C - Chemical
P - Peak stage and peak discharge only
D - Discharge--continuous record of stage and discharge
L - Low flow only
R - Reservoir content
Rr - Rainfall-runoff
S - Sediment
St - Stage only
T - Temperature

Hydrologic-data stations in operation during
fiscal year 1981

Station number	Station name	Cooperation	Type of data
05490600	Des Moines River at St. Francisville	USGS, CE RI	CST
05495000	Fox River at Wayland	CE RI	D
05495100	Big Creek Tributary near Wayland	HTC	P
05496000	Wyaconda River above Canton	HTC, CE RI	D
05497000	North Fabius River at Monticello	CE RI	D
05497300	North Fabius River near Durham	DGLS	L
05497500	Middle Fabius River near Baring	DGLS	P
05498000	Middle Fabius River near Monticello	CE RI	DST
05498300	Middle Fabius River near Durham	DGLS	L
05500000	South Fabius River near Taylor	CE RI	DC
05500500	North River at Bethel	DGLS	P
05501000	North River at Palmyra	CE RI	D
05502000	Bear Creek at Hannibal	CE RI	D
05502300	Salt River at Hagars Grove	CE STL	D
05503500	North Fork Salt River at Hunneywell	DEQ, CE STL	DST
05503800	Crooked Creek near Paris	CE STL	D
05505000	South Fork Salt River at Santa Fe	DEQ, CE STL	DST
05506000	Youngs Creek near Mexico	DEQ	DST
05506190	Middle Fork Salt River at Duncans Bridge	DEQ	DST
05506500	Middle Fork Salt River at Paris	DEQ, CE STL	DST
05506800	Elk Fork Salt River near Madison	CE STL	DST
05507000	Elk Fork Salt River near Paris	DEQ	DST
05507500	Salt River near Monroe City	CE STL	DST
05507600	Lick Creek near Perry	CE STL	DST
05507800	Salt River near Center	CE STL	D
05508000	Salt River near New London	CE STL, USGS	DCST
05508800	Spencer Creek near Frankford	CE STL	D
05509300	Salt River near Ashburn	DGLS	L
05513600	Camp Creek near Elsberry	HTC	P
05514500	Cuivre River near Troy	CE STL	D
05514800	Dardenne Creek at Cottleville	DGLS	Rr
05587500	Mississippi River at Alton, Ill.	CE STL, USGS	DCST
05587550	Mississippi River below Alton, Ill.	USGS	C
06810050	High Creek near Rock Port	DGLS	L
06811600	Rock Creek near Rock Port	DGLS	L

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooper- ation	Type of data
06813000	Tarkio River at Fairfax	DGLS	D
06815575	Squaw Creek near Mound City	DGLS	L
06817500	Nodaway River near Burlington Junction	CE KC	D
06817700	Nodaway River near Graham	DGLS	L
06817800	Nodaway River near Oregon	DEQ, DGLS	CL
06817980	Blacksnake Creek at St. Joseph	HTC	Rr
06818000	Missouri River at St. Joseph	CE KC, USGS	DCST
06818490	Bee Creek near Platte City	DGLS	L
06818900	Platte River at Ravenwood	CE KC	P
06819090	Platte River near St. Joseph	DGLS	L
06819500	One Hundred and Two River at Maryville	DGLS	D
06820460	One Hundred and Two River at Avenue City	DGLS	L
06820480	One Hundred and Two River near St. Joseph	DGLS	L
06820490	Third Fork Platte River near Easton	DGLS	L
06820500	Platte River near Agency	CE KC	D
06821150	Little Platte River at Smithville	CE KC	D
06821190	Platte River at Sharps Station	CE KC, USGS	DCT
06821200	Platte River at Platte City	DGLS	L
06821280	Line Creek at Riverside	CE KC	D
06893000	Missouri River at Kansas City	CE KC	D
06893500	Blue River near Kansas City	CE KC	D
06893520	Blue River near Gregory Boulevard at Kansas City	DEQ	DC
06893560	Brush Creek at Summit Avenue at Kansas City	HTC	Rr
06893564	Brush Creek at Elmwood Avenue at Kansas City	DEQ	DC
06893566	Blue River at Coal Mine Road at Kansas City	DEQ	DC
06893570	Round Grove Creek at Raytown Road in Kansas City	HTC	Rr
06893580	Blue River near St. John Avenue at Kansas City	DEQ	DC
06893600	Rock Creek at Independence	HTC	Rr
06893670	Shoal Creek at Claycomo	CE KC	D
06893680	Mill Creek at Gladstone	HTC	Rr

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooperation	Type of data
06893710	Cates Branch at Liberty	HTC	Rr
06893793	Little Blue River below Longview Damsite in Kansas City	CE KC	D
06893880	Jackson County Lake near Blue Springs	CE KC	D
06893890	East Fork Little Blue River near Blue Springs	CE KC	D
06893900	Little Blue River near Blue Springs	DGLS	L
06894000	Little Blue River near Lake City	CE KC	D
06894680	Sni-A-Bar Creek near Tarsney	DGLS	D
06894800	Sni-A-Bar Creek near Wellington	DGLS	L
06895000	Crooked River near Richmond	CE KC, DGLS	LP
06895500	Missouri River at Waverly	CE KC	D
06896000	Wakenda Creek at Carrollton	CE KC	P
06896182	Wildcat Creek at Stanberry	DGLS	L
06896550	Grand River near Darlington	DGLS	L
06896650	Sampson Creek at Pattonsburg	DGLS	L
06896700	O'Neill Branch at Osborn	HTC	P
06896900	Grand River near Pattonsburg	DGLS	L
06897000	East Fork Big Creek near Bethany	CE KC	P
06897300	Big Creek near Pattonsburg	DGLS	L
06897500	Grand River near Gallatin	CE KC	D
06897520	Marrowbone Creek near Gallatin	DGLS	L
06898200	Thompson River near Trenton	DGLS	L
06898210	Sugar Creek at Brimson	DGLS	L
06899100	Weldon River at Trenton	DGLS	L
06899500	Thompson River at Trenton	CE KC	D
06899680	Grand River at Chillicothe	CE KC	P
06900000	Medicine Creek near Galt	DGLS	D
06900500	Medicine Creek near Sturges	DGLS	L
06900600	Medicine Creek near Wheeling	DGLS	L
06901000	Locust Creek near Milan	DGLS	L
06901300	Moffet Branch near Reger	HTC	P
06901500	Locust Creek near Linneus	DGLS	L
06902000	Grand River near Sumner	CE KC, USGS	DCST
06904050	Chariton River at Livonia	DGLS, CE KC	DL
06904200	Shoal Creek near Mendota	USGS	CS
06904250	Shoal Creek near Glendale	USGS	CS

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooper- ation	Type of data
06904280	North Blackbird Creek near Martistown	USGS	CS
06904290	South Blackbird Creek near Sidney	USGS	CS
06904500	Chariton River at Novinger	CE KC	D
06905000	Chariton River at Elmer	CE KC	P
06905200	Chariton River near Callao	DGLS	L
06905500	Chariton River near Prairie Hill	CE KC, USGS	DCST
06906000	Mussel Fork near Musselfork	CE KC	D
06906190	Long Branch Reservoir near Macon	CE KC	D
06906200	East Fork Little Chariton River near Macon	CE KC, USGS	DCTS
06906250	Unnamed Creek at Ardmore	USGS	CS
06906290	Sinking Creek near Huntsville	USGS	CS
06906300	East Fork Little Chariton River near Huntsville	CE KC	DC
06906315	Sweet Spring Creek near Moberly	DGLS	L
06906330	Middle Fork Little Chariton River near Callao	USGS	CS
06906340	South Fork Claybank Creek near College Mound	USGS	CS
06906360	Middle Fork Little Chariton River near Thomas Hill	USGS	CSRr
06906370	Ash Pond Outflow near Thomas Hill	USGS	CSRr
06906400	Middle Fork Little Chariton River near Thomas Hill	CE KC	P
06906430	Middle Fork Little Chariton River near Prairie Hill	USGS	CSRr
06906460	Muncas Creek near Thomas Hill	USGS	CSRr
06906500	Missouri River at Glasgow	CE KC	St
06907000	Lamine River at Clifton City	CE KC, DGLS	LP
06907080	Brushy Creek Tributary at Sedalia	HTC	Rr
06907100	Muddy Creek near Sedalia	DGLS	L
06907650	Clear Creek near Valley City	DGLS	L
06907700	Blackwater River at Valley City	CE KC	P
06908000	Blackwater River at Blue Lick	CE KC	D
06908420	Salt Fork Blackwater River near Marshall	DGLS	L
06908500	Shiloh Branch near Marshall	HTC	P
06908800	Lamine River near Blackwater	USGS	CST
06909000	Missouri River at Boonville	CE KC	D

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooperation	Type of data
06909400	Cottonwood Creek Tributary near Estill	HTC	P
06909460	Moniteau Creek near Higbee	USGS	CS
06909480	Moniteau Creek near Harrisburg	USGS	CS
06909500	Moniteau Creek near Fayette	CE KC	P
06910230	Hinkson Creek at Columbia	DGLS	D
06910232	Flat Branch at Columbia	HTC	Rr
06910270	Moniteau Creek near Jamestown	DGLS	L
06910405	Cedar Creek near Hallsville	USGS	CS
06910410	Cedar Creek near Columbia	USGS	CS
06910450	Missouri River at Jefferson City	UE	St
06910485	Burris Fork near California	DGLS	L
06910490	South Moreau Creek near Russellville	DGLS	L
06910500	Moreau River near Jefferson City	CE KC	P
06916650	Marais Des Cygnes River near Worland	DEQ	C
06916652	Unnamed Creek at Worland	USGS	CS
06916653	Mulberry Creek at Mulberry	USGS	CSRr
06916654	Unnamed Tributary to Mulberry Creek near Amoret	USGS	CSRr
06916660	Walnut Creek near Foster	USGS	CS
06917640	Dry Wood Creek near Oskaloosa	USGS	CS
06917680	Dry Wood Creek near Deerfield	USGS	CS
06918080	Osage River near Schell City	CE KC, USGS	DCST
06918200	North Fork Panther Tributary near Appleton City	HTC	P
06918210	Panther Creek near Rockville	USGS	CS
06918310	Robinson Branch near Walker	USGS	CS
06918340	Monegaw Creek near Monegaw Springs	DGLS	L
06918420	Sac River at Ash Grove	DGLS	L
06918440	Sac River near Dadeville	CE KC	DT
06918450	Limestone Creek at South Greenfield	DGLS	L
06918460	Turnback Creek above Greenfield	CE KC	DT
06918740	Little Sac River near Morrisville	CE KC	D
06918750	Franca Branch near Brighton	HTC	P
06918990	Stockton Lake near Stockton	CE KC	R
06919000	Sac River near Stockton	CE KC	D
06919020	Sac River below Stockton	CE KC	D
06919200	Sac River Tributary near Caplinger Mills	HTC	P

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooperation	Type of data
06919500	Cedar Creek near Pleasant View	CE KC	D
06919900	Sac River near Caplinger Mills	CE KC	D
06920500	Osage River at Osceola	CE KC	St
06920600	Weaubleau Creek near Osceola	DGLS	L
06921000	Pomme de Terre River near Bolivar	DGLS	L
06921070	Pomme de Terre River near Polk	CE KC, DGLS	D
06921200	Lindley Creek near Polk	CE KC	DT
06921325	Pomme de Terre Lake near Hermitage	CE KC	R
06921350	Pomme de Terre River near Hermitage	CE KC	D
06921590	South Grand River at Archie	CE KC	D
06921600	South Grand River near Urich	USGS	CS
06921720	Big Creek at Blairstown	CE KC	P
06921770	South Grand River near Clinton	USGS	CS
06921800	Granddaddy Creek near Urich	HTC	P
06921810	Bear Creek near Montrose	USGS	CS
06921850	Deepwater Creek near Deepwater	USGS	CS
06922100	Sand Creek near Calhoun	USGS	CS
06922140	Sand Creek at Calhoun	USGS	CS
06922180	Tebo Creek near Calhoun	USGS	CS
06922200	Tebo Creek at Leesville	CE KC	C
06922450	Osage River below Harry S. Truman Dam	CE KC	D
06922500	Osage River at Warsaw	CE KC	St
06922580	Big Turkey Creek near Warsaw	DGLS	L
06922780	Deer Creek near Edwards	DGLS	L
06923200	Niangua River near Buffalo	DGLS	L
06923250	Niangua River near Windyville	DGLS	L
06923500	Bennett Spring at Bennett Springs	DGLS	D
06923900	Niangua River near Eldridge	DGLS	L
06925200	Starks Creek at Preston	HTC	P
06925250	Little Niangua River near Macks Creek	DGLS	L
06925440	Grandglaize Creek near Brumley	DGLS	L
06925445	Gravois Creek at Gravois Mills	DGLS	L
06925500	Lake of the Ozarks near Bagnell	DGLS	R
06926000	Osage River near Bagnell	UE	D
06926160	Saline Creek near Tuscumbia	DGLS	L
06926250	Little Tavern Creek near St. Elizabeth	DGLS	L

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooper- ation	Type of data
06926500	Osage River near St. Thomas	UE	DCT
06926510	Osage River below St. Thomas	USGS	CST
06926700	Maries River near Vienna	DGLS	L
06926820	Little Maries River near Vienna	DGLS	L
06927000	Maries River at Westphalia	DGLS, CE KC	LP
06927520	Bailey Creek at Morrison	DGLS	L
06927580	Gasconade River near Hartville	DGLS	L
06927600	Wheeler Branch near Mountain Grove	HTC	P
06927650	Beaver Creek near Manes	DGLS	L
06927730	Osage Fork at Rader	DGLS	L
06927750	Osage Fork near Orla	DGLS	L
06927800	Osage Fork at Drynob	DGLS	D
06928000	Gasconade River near Hazelgreen	DGLS	LP
06928300	Roubidoux Creek at Fort Leonard Wood	DGLS	L
06928500	Gasconade River near Waynesville	DGLS	L
06928600	Gasconade River near Hooker	DEQ	C
06928900	Big Piney River near Houston	DEQ	C
06929300	Big Piney River near Licking	DGLS	L
06930000	Big Piney River near Big Piney	DGLS	D
06930450	Big Piney River at Devils Elbow	DEQ	C
06930800	Gasconade River above Jerome	USGS	CST
06932000	Little Piney Creek at Newburg	DGLS	D
06933500	Gasconade River at Jerome	DGLS	D
06933790	Spring Creek near Vichy	DGLS	L
06934000	Gasconade River at Rich Fountain	CE KC	P
06934500	Missouri River at Hermann	CE KC, USGS	DCST
06934700	Loutre River at McKittrick	DGLS	L
06935300	Charette Creek near Marthasville	DGLS	L
06935830	Caulks Creek at Highway CC, St. Louis County	STL CO	Rr
06935880	Smith Creek at Mason Road, St. Louis County	STL CO	Rr

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooper- ation	Type of data
06935890	Creve Coeur Creek at Highway 340, St. Louis County	STL CO	Rr
06935955	Fee Fee Creek at McKelvey Road, St. Louis County	STL CO	Rr
07005000	Maline Creek at Bellfontaine Road in Bellfontaine Place	CE STL	Rr
07010000	Mississippi River at St. Louis	CE STL	DST
07010016	River des Peres at Hafner Place in University City	CE STL	Rr
07010044	Deer Creek at Warson Road in Ladue	CE STL	Rr
07010086	Deer Creek at Big Bend Boulevard in Maplewood	CE STL	Rr
07010120	Gravois Creek near Kirkwood	DGLS	L
07010155	Gravois Creek at Teshire Road at Sappington	CE STL	Rr
07010350	Meramec River at Cook Station	DGLS	D
07010500	Maramec Spring near St. James	DGLS	D
07011200	Love Creek near Salem	HTC	P
07011600	Love Branch at Rolla	HTC	Rr
07013000	Meramec River near Steelville	CE STL	D
07014100	Courtois Creek at Courtois	DGLS	L
07014130	Indian Creek at Courtois	DGLS	L
07014500	Meramec River near Sullivan	DEQ, CE STL	DC
07014800	Indian Creek near St. Clair	DGLS	L
07015000	Bourbeuse River near St. James	DGLS	D
07015720	Bourbeuse River near Highgate	CE STL	D
07015780	Little Bourbeuse River near Sullivan	DGLS	L
07015800	Langenberg Branch near Rosebud	HTC	P
07016000	Bourbeuse River near Spring Bluff	DGLS	D
07016500	Bourbeuse River at Union	CE STL	D
07017115	Fox Creek at Old Highway 66, St. Louis County	STL CO	Rr
07017200	Big River at Irondale	CE STL	D
07017650	Fourche-A-Renault Creek near Potosi	DGLS	L
07017800	Mineral Fork near Potosi	DGLS	L
07017900	Old Mines Creek near Potosi	DGLS	L
07018000	Big River near DeSoto	CE STL	D

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooperation	Type of data
07018500	Big River near Byrnesville	CE STL	D
07019000	Meramec River near Eureka	CE STL, USGS	DCST
07019035	Forby Creek at Highway 109, St. Louis County	STL CO	Rr
07019100	Fishpot Creek at Old Ballwin Road, St. Louis County	STL CO	Rr
07019120	Fishpot Creek at Hanna Road, St. Louis County	STL CO	Rr
07019180	Grand Glaize Creek at Dougherty Ferry Road, St. Louis County	STL CO	Rr
07020100	Establishment Creek at Bloomsdale	DGLS	L
07020250	River aux Vases near St. Genevieve	DGLS	L
07020270	Saline Creek near Minnith	CE STL	DST
07020300	Saline Creek near St. Marys	DGLS	L
07020500	Mississippi River at Chester, Ill.	CE STL	DST
07020600	Apple Creek at Appleton	DGLS	L
07020860	Cape la Croix at Highway 61 in Cape Girardeau	CE STL	Rr
07020870	Cape la Croix at Bloomfield in Cape Girardeau	CE STL	Rr
07020950	Castor River near Cascade	DGLS	L
07020970	Bear Creek near Lowndes	DGLS	L
07021000	Castor River at Zalma	DGLS	D
07021500	Little Whitewater River near Millersville	DGLS	L
07021530	Byrd Creek near Jackson	DGLS	L
07021800	Headwater Diversion Channel near Allenville	DGLS	L
07022000	Mississippi River at Thebes, Ill.	CE STL, USGS	DCST
07024100	Wilkerson ditch near East Prairie	DGLS	L
07024150	St. James ditch at East Prairie	DGLS	L
07036090	Twelvemile Creek near Annapolis	DGLS	L
07036100	St. Francis River near Annapolis	DGLS	L
07037200	Crane Pond Creek near Annapolis	DGLS	L
07037500	St. Francis River near Patterson	DGLS	D
07040700	Ditch 9 near Gideon	DGLS	L
07040800	Main ditch 6 east of Malden	DGLS	L
07040850	Main ditch near Bernie	DGLS	L

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooperation	Type of data
07040900	Main ditch 2 at Malden	DGLS	L
07041050	Main ditch near Malden	DGLS	L
07041100	Main ditch at Holcomb	DGLS	L
07042400	Main ditch 1 near Matthews	DGLS	L
07042500	Little River ditch 251 near Lilbourn	DGLS	D
07043000	Castor River at Aquilla	DGLS	D
07043050	Ditch 24 at Heagy	DGLS	L
07043100	Old Channel ditch 1 near Chafee	DGLS	L
07043500	Little River ditch 1 near Morehouse	DGLS	D
07046001	Little River ditches near Kennett	DEQ	C
07046510	Pemisco Bayou near Holland	DGLS	L
07046520	Main ditch 1 near Deering	DGLS	L
07050540	James River near Northview	DGLS	L
07050560	Panther Creek near Northview	DGLS	L
07050580	James River near Strafford	CE LR	D
07050700	James River near Springfield	DGLS	D
07050750	James River near Nixa	DGLS	D
07050800	Maple Grove Branch near Ozark	HTC	P
07051600	James River near Wilsons Creek	DEQ	C
07052000	Wilsons Creek at Scenic Drive at Springfield	SPFD	Rr
07052050	North Fork Wilsons Creek at Highways 13 and 166 at Springfield	SPFD	Rr
07052100	Wilsons Creek near Springfield	SPFD	DCT
07052160	Wilsons Creek near Battlefield	SPFD	DCT
07052250	James River near Boaz	DEQ	C
07052260	Finley Creek near Linden	DGLS	L
07052360	Crane Creek near Galena	DGLS	L
07052500	James River at Galena	CE LR	D
07052900	Flat Creek near Cape Fair	DGLS	L
07053400	Table Rock Lake near Branson	DGLS, CE LR	R
07053500	White River near Branson	RECORDS FURNISHED BY CORPS OF ENGINEERS	D
07053700	Lake Taneycomo at Branson	DEQ	C
07053850	Swan Creek at Garrison	DGLS	L
07054020	Beaver Creek near Ava	DGLS	L
07054040	Beaver Creek near Bradleyville	DGLS	L
07057470	North Fork River near Dora	DGLS	L
07057480	Spring Creek near Sycamore	DGLS	L
07057500	North Fork River near Tecumseh	CE LR	D

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooper- ation	Type of data
07057680	Hunter Creek at Vera Cruz	DGLS	L
07057700	Bryant Creek near Evans	DGLS	L
07058000	Bryant Creek near Tecumseh	CE LR	D
07061300	East Fork Black River at Lesterville	DGLS	D
07061500	Black River near Annapolis	CE LR	D
07062000	Clearwater Lake near Piedmont	CE LR	R
07062500	Black River at Leeper	CE LR	D
07063000	Black River at Poplar Bluff	CE LR	D
07063100	Lake Slough near Qulin	DGLS	L
07063130	Menorkenut Slough near Qulin	DGLS	L
07064400	Montauk Springs at Montauk	NPS	C
07064440	Current River below Montauk State Park	NPS	C
07064480	Ashley Creek near Montauk State Park	DGLS	L
07064520	Big Creek at Cedar Grove	DGLS	L
07064530	Welch Spring near Akers	NPS	C
07064540	Gladden Creek at Akers	DGLS	L
07064555	Pulltite Spring near Round Spring	NPS	C
07064750	Sinking Creek near Shannondale	DGLS	L
07064770	Barren Creek near Shannondale	DGLS	L
07065000	Round Spring at Round Spring	NPS	C
07065050	Big Creek near Round Spring	DGLS	L
07065500	Alley Spring at Alley	NPS	C
07065950	Mahans Creek at West Eminence	DGLS	L
07066000	Jacks Fork at Eminence	DGLS	D
07066100	Shawnee Creek near Eminence	DGLS	L
07066110	Jacks Fork above Two Rivers	NPS	C
07066510	Current River above Powder Mill	NPS	C
07066520	Blair Creek near Round Spring	DGLS	L
07066550	Blue Spring near Eminence	NPS	C
07066600	Rocky Creek near Eminence	DGLS	L
07066750	Pine Valley Creek near Van Buren	DGLS	L
07066800	Sycamore Creek near Winona	HTC	P
07066990	Pike Creek at Van Buren	DGLS	L
07067000	Current River at Van Buren	DGLS	D
07067500	Big Spring near Van Buren	DGLS, NPS	DC

Hydrologic-data stations in operation during
fiscal year 1981--continued

Station number	Station name	Cooperation	Type of data
07067800	Current River below Hawes Campground	NPS	C
07068000	Current River at Doniphan	DEQ, CE LR	DC
07068200	North Prong Little Black River at Hunter	HTC	P
07068250	Middle Fork Little Black River at Grandin	SCS	DT
07068300	North Prong Little Black River near Grandin	SCS	D
07068350	South Prong Little Black River at Grandin	DOC	P
07068380	Little Black River near Grandin	SCS	DCST
07068470	Beaverdam Creek near Fairdealing	DOC	P
07068510	Little Black River below Fairdealing	SCS	DCST
07068540	Logan Creek at Oxly	SCS	DCST
07068560	Ditch 2 near Sinsabaugh	SCS	PCST
07068600	Little Black River at Success, Ark.	SCS	DCST
07068863	Fourche River near Poynor	DOC	DT
07071000	Greer Spring at Greer	RECORDS FURNISHED BY U.S. FOREST SERVICE	D
07071500	Eleven Point River near Bardley	DOC, DGLS	D
07071850	Frederick Creek near Myrtle	DGLS	L
07185500	Stahl Creek near Miller	HTC	P
07185700	Spring River at LaRussell	DGLS	D
07186000	Spring River near Waco	CE TU, DEQ	DC
07186080	Center Creek near Wentworth	DGLS	L
07186200	Center Creek near Fidelity	DGLS	L
07186400	Center Creek near Carterville	DEQ, DGLS	DC
07186480	Center Creek near Smithfield	DEQ	C
07187000	Shoal Creek above Joplin	CE TU	D
07188660	Mikes Creek at Powell	DGLS	L
07188840	Little Sugar Creek at Pineville	DGLS	L
07188860	Indian Creek at McNatt	DGLS	L
07189000	Elk River at Tiff City	DEQ ¹	DC
07189090	Buffalo Creek near Tiff City	DGLS	L
07189100	Buffalo Creek at Tiff City	DGLS	L

¹Discharge records furnished by Oklahoma District.

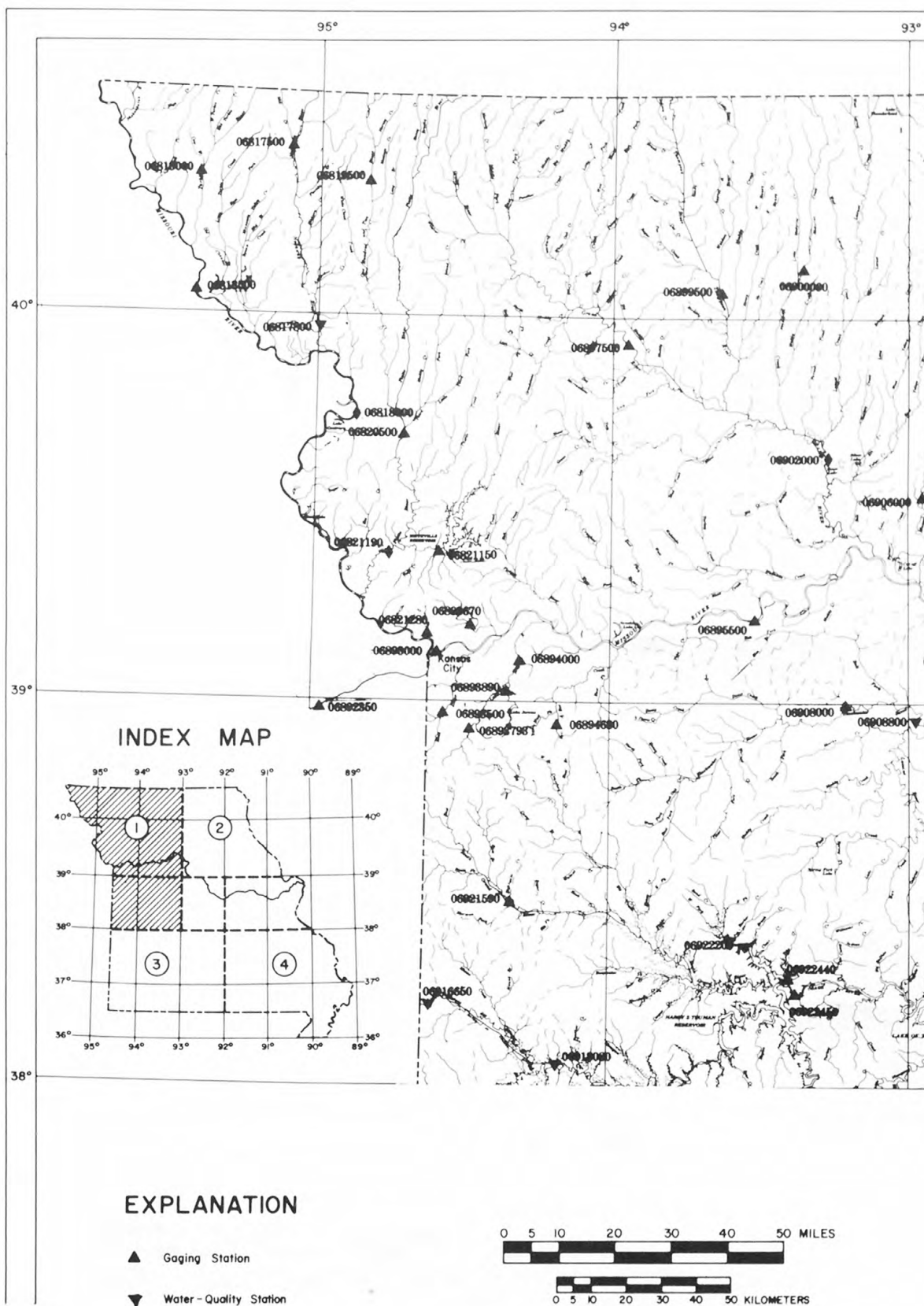


Figure 1.--Locations of hydrologic-data stations, 1981.

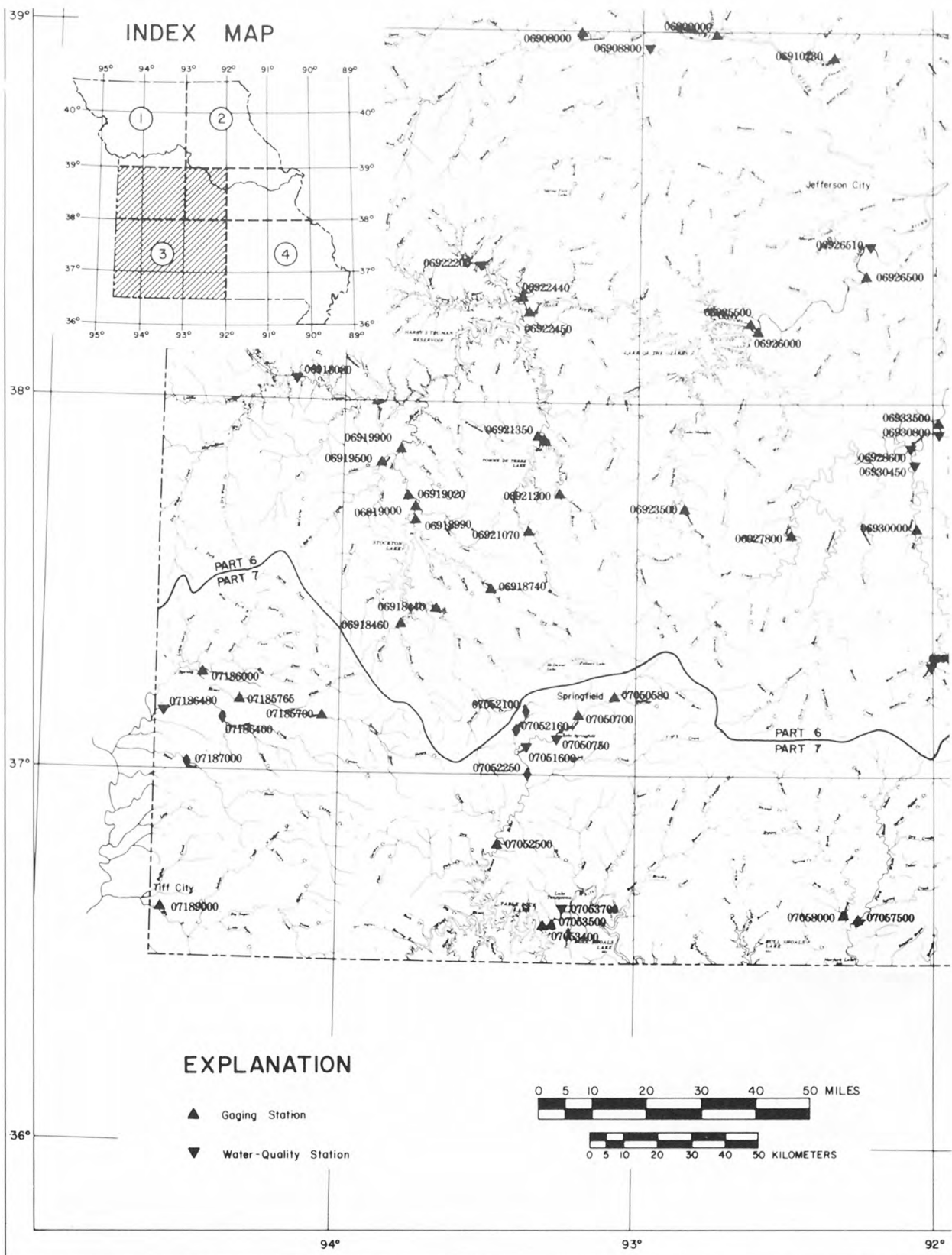


Figure 2.--Locations of hydrologic-data stations, 1981--continued.

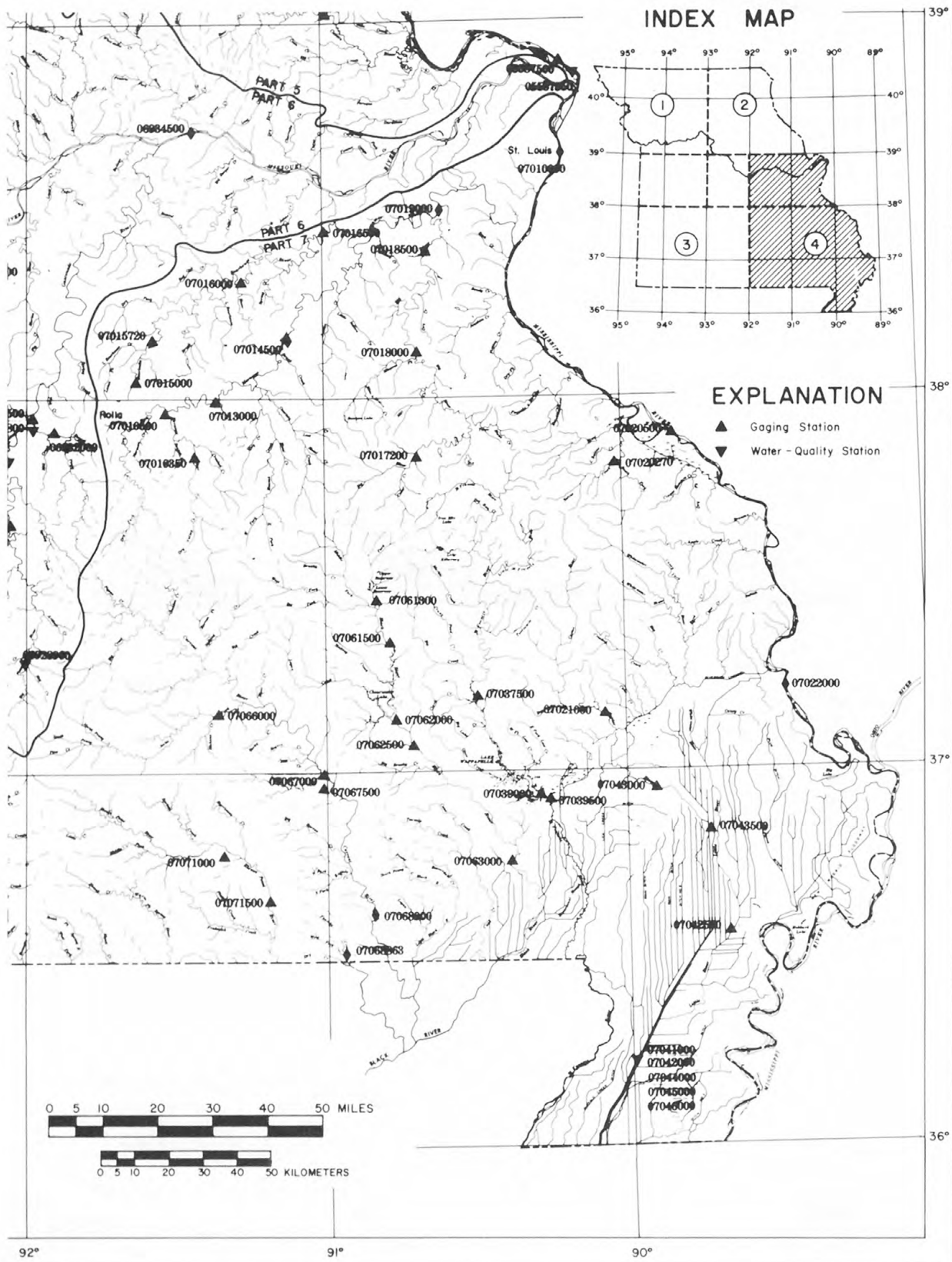


Figure 2.--Locations of hydrologic-data stations, 1981--continued.

MISSOURI DISTRICT PROJECTS

Missouri district projects address a wide range of hydrologic needs. Projects are designed and planned with the cooperators to be responsive to the needs of people in Missouri. The following pages give information on all project now in progress.

PROJECT TITLE: COLLECTION OF SURFACE-WATER DATA MØ 00-001

COOPERATORS: City of Springfield, Division of Sanitary Services
City of Springfield Utilities
Department of Conservation
Department of Natural Resources
Division of Environmental Quality
Division of Geology and Land Survey
Highway and Transportation Commission
Little River Drainage District
National Weather Service
Union Electric Company of Missouri
U.S. Army, Corps of Engineers

LOCATION: Statewide

PROJECT CHIEF: L. A. Waite

PROBLEM: Surface-water information is needed for surveillance, planning, design, hazard warning, and 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, water-resources development, and waste disposal.

OBJECTIVES: (1) To collect surface-water data sufficient to satisfy needs for current-purpose uses, such as assessment of water resources; operation of reservoirs or industries; forecasting; disposal of wastes, both common and nuclear, and pollution controls; discharge data to accompany water-quality measurements; compact and legal requirements; and research or special studies.
(2) To collect data necessary for analytical studies to understand cause-effect relations and define the trends and statistical properties of streamflow.

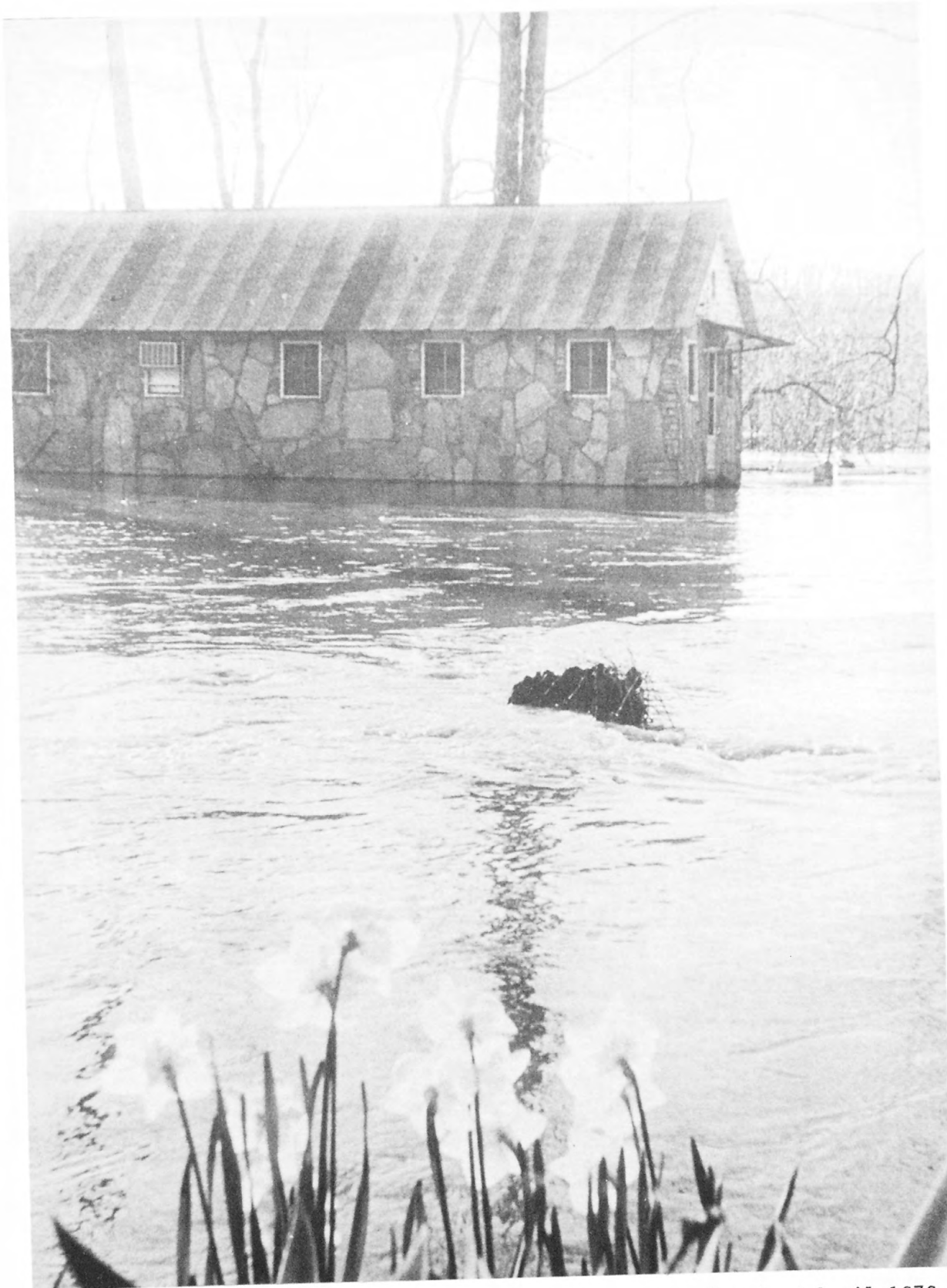
APPROACH: Standard methods of data collection will be used as described in the series "Techniques of Water-Resources Investigations of the U.S. Geological Survey." Partial-record gaging will be used instead of complete-record gaging where it serves the required purpose.

COLLECTION OF SURFACE-WATER DATA--continued

PROGRESS AND
SIGNIFICANT
RESULTS: Streamflow data were collected as scheduled.

PLANS FOR
NEXT YEAR: Collection of data to continue.

REPORT: U.S. Geological Survey, 1981, Water-resources data for Missouri,
water year 1980: U.S. Geological Survey Water-Data Report
MO 80-1 [published annually].



View of Gasconade River downstream from Jerome, Mo., flood of April 1979
*Photograph courtesy of
Vance Heflin, Rolla, Mo.*

PROJECT TITLE: COLLECTION OF GROUND-WATER DATA MØ 00-002

COOPERATOR: Department of Natural Resources
Division of Geology and Land Survey

LOCATION: Statewide

PROJECT CHIEF: L. F. Emmett

PROBLEM: Ground-water information is needed to evaluate the effects of climatic variations on recharge to and discharge from the aquifer systems, to provide a data base from which to measure the effects of development, to assist in the prediction of future supplies, and to provide data for management of the resource.

OBJECTIVES: (1) To collect data sufficient to provide a long-term data base so that the general response of the hydrologic system to natural climatic variations and induced stresses is known and potential problems can be defined soon enough to allow proper planning and management. (2) To provide a data base against which the short-term records acquired in areal studies can be analyzed.

APPROACH: Evaluation of regional geology allows broad, general definition of aquifer systems and their boundary conditions. Within this framework, data will be collected to help define stresses on the system and the hydrologic properties of the aquifers. The data-collection network will be refined as records accumulate and detailed areal studies of the ground-water system more closely define the aquifers, their properties, and the stresses to which they are subjected.

PROGRESS AND
SIGNIFICANT
RESULTS: Ground-water site schedules have been entered into the National Data Storage and Retrieval System (WATSTORE) for all counties except St. Louis County. Quality-of-water data in the WATSTORE file have been updated for all wells north of the Missouri River. Borehole geophysical logs have been run on 18 deep wells open to the Cambrian and Ordovician aquifers.

PLANS FOR
NEXT YEAR: Complete the update of quality-of-water data in the WATSTORE file. Establish a network of wells along a part of the fresh-saline water interface. Water levels, water quality, and water use will be measured.

PROJECT TITLE: COLLECTION OF QUALITY-WATER DATA MØ 00-003

COOPERATORS: City of Springfield
Department of Conservation
Department of Natural Resources
Division of Environmental Quality
National Park Service
U.S. Army, Corps of Engineers

LOCATION: Statewide

PROJECT CHIEF: P. W. Cross

PROBLEM: Water-resource planning and water-quality assessment require a statewide and nationwide base of relatively standardized information. For planning and realistic assessment of the water resources, the chemical and physical quality of the rivers and streams must be defined and monitored.

OBJECTIVES: To provide water-quality data for planning and action programs and to provide data for state and federal management of interstate and international waters.

APPROACH: Operation of a network of water-quality stations to measure chemical concentrations, loads, and time trends as required by planning and management agencies.

PROGRESS AND
SIGNIFICANT
RESULTS: The water-quality network where samples are collected monthly include 14 National Stream Quality Accounting Network (NASQAN) stations, 15 stations in cooperation with the Division of Environmental Quality, and 1 station in cooperation with the Corps of Engineers. The biannual monitoring program with the National Park Service also is continued, and two monitors were operated in cooperation with the city of Springfield. All data collection continued on schedule.

PLANS FOR
NEXT YEAR: The water-quality network will continue approximately the same as the previous year.

REPORT: U.S. Geological Survey, 1981, Water-resources data for Missouri, water year 1980: U.S. Geological Survey Water-Data Report MO 80-1 (published annually).

PROJECT TITLE: SEDIMENT STATIONS MØ 00-004

COOPERATOR: U.S. Army, Corps of Engineers

LOCATION: Statewide

PROJECT CHIEF: W. R. Berkas

PROBLEM: Water-resources planning and water-quality assessment require a nationwide base level of relatively standardized information. Sediment concentrations and discharges in Missouri's rivers and streams need to be defined and monitored.

OBJECTIVES: Provide a national bank of sediment data for use in broad federal and state planning and action programs, including federal and state management of interstate and international waters.

APPROACH: Establish and operate a network of sediment stations to provide spatial and temporal averages and trends of sediment concentration, sediment discharge, and particle size of sediment being transported by rivers and streams.

PROGRESS AND SIGNIFICANT RESULTS: Samples were collected on a continuing basis at three stations and the records were prepared for publication in the annual water-data report.

PLANS FOR NEXT YEAR: Continue the same program.

REPORT: U.S. Geological Survey, 1981, Water-resources data for Missouri, water year 1980: U.S. Geological Survey Water-Data Report MO 80-1 (published annually).

PROJECT TITLE: A WATER USE DATA-COLLECTION AND REPORTING PROGRAM FOR MISSOURI MØ 79-007

COOPERATOR: Department of Natural Resources
Division of Geology and Land Survey

LOCATION: Statewide

PROJECT CHIEF: L. D. Hauth

PROBLEM: As population increases in an area and industry expands to meet the needs of that population, demand for and use of water will increase. This places a two-fold stress on the water supply. The increased demand may decrease availability, and increased use may degrade the quality. Therefore, any water-resource assessment must take water use into account.

OBJECTIVES: To establish a program to systematically collect data on the withdrawal and return of water for all types of water uses. The program will provide a broad data base from which many types of analyses can be made. In addition to obtaining a greater knowledge of the overall hydrologic effects of increased withdrawals from the water system, data obtained through the program will be added to the national water use data base to assist in the national water-resources assessment.

APPROACH: Water use data, collected by measurement and through a voluntary questionnaire-reporting technique, will be obtained first from a seven-county area, representative of the state's overall uses. The results of this study will be used to develop a strategy for collecting and evaluating data from the entire state. These first data also will be used to test a system of data storage and retrieval to insure the categorizing, indexing, and reporting accuracies. As data collection expands to statewide, a network of measurement sites will be maintained to continually monitor the accuracy of the volunteer report data.

PROGRESS AND SIGNIFICANT RESULTS: Telecommunications have been established between the field office terminal and headquarter's computer of the Missouri Department of Natural Resources. Final debugging of the software is underway on the state water use data base. Software is being developed to accommodate reporting of water use questionnaires that are received from users. First-time questionnaires are being reevaluated to improve data collection.

A WATER USE DATA-COLLECTION AND REPORTING PROGRAM FOR MISSOURI--continued

PLANS FOR
NEXT YEAR: Continue mailing questionnaires for water use information and assemble and load files for water use data. Analyze return data for accuracy.

REPORTS: Planned: Annual State reports summarizing yearly water uses for each water use category.

PROJECT TITLE: HYDROLOGY OF STREAMS IN ST. LOUIS COUNTY MØ 70-017

COOPERATOR: St. Louis County, Department of Highways and Traffic

LOCATION: St. Louis County, Missouri

PROJECT CHIEF: T. W. Alexander

PROBLEM: The population of St. Louis County is increasing, and rapid development of rural areas is resulting in storm-water drainage problems. A flood-frequency report, 100-year flood profiles, and flood-prone area maps were prepared to aid in designing roads, developing zoning ordinances, planning channel improvement, protecting flood plains, and other uses. As rapid development of rural areas continues, additional data need to be collected to update flood information.



OBJECTIVE: The objective is to update the estimate of the effects of increasing urbanization on runoff from small streams in St. Louis County, Mo.

APPROACH: Continuous rainfall-runoff data will continue to be collected at approximately 13 gaging stations. The longer-termed data base will be used to update flood-frequency curves. A linear multiple regression method will be used to indicate the overall effect of urbanization within the basins.

PROGRESS AND SIGNIFICANT RESULTS: Gaging stations, crest-stage gages, and precipitation stations have been installed. The St. Louis County flood-frequency report, 100-year profiles, and flood-prone area maps have been completed and released to the cooperator, updating all station frequency.

PLANS FOR NEXT YEAR: Continue data collection and make selected analyses.

REPORTS: Spencer, D. W., and Alexander, T. W., 1978, Techniques for estimating the magnitude and frequency of floods in St. Louis County, Missouri: U.S. Geological Survey Water-Resources Investigations 78-139, 23 p.

Planned: Magnitude and frequency of floods in St. Louis County, Missouri: Water-Resources Investigations series.

PROJECT TITLE: WATER FOR IRRIGATION IN AUDRAIN COUNTY, MISSOURI MØ 78-032

COOPERATOR: Department of Natural Resources
Division of Geology and Land Survey

LOCATION: Northeastern Missouri

PROJECT CHIEF: L. F. Emmett

PROBLEM: Water for irrigation in Audrain County is from surface reservoirs and deep wells. The surface reservoirs generally impound less than 100 acre-feet, consequently they may not be adequate in dry years. Because an apparent interface between fresh and saltwater in the deep aquifer extends through northern Audrain County, there is concern that increased pumping of ground water could cause water quality to deteriorate.



OBJECTIVES: Evaluate the water resources of Audrain County to determine the availability and quality of water for irrigation. Determine the possibilities for saltwater encroachment as a result of pumping from the deep aquifer and monitor the effects of increased withdrawal of ground water from the deep aquifer.

APPROACH: A compilation will be made of hydrogeologic information in the files and in the literature. Wells in Audrain County will be inventoried, with emphasis on locating wells on the saltwater side of the interface. Water use, water-level, water-quality, and aquifer characteristics data will be collected to supplement file data. File data will be compiled to define surface-water characteristics and will be augmented by reconnaissance of streams during a low-flow period to document low-flow characteristics.

PROGRESS AND
SIGNIFICANT
RESULTS: Interpretative report in preparation.

PLANS FOR
NEXT YEAR: Project completed.

REPORTS: Knight, R. D., and Emmett, L. F., 1980, A progress report on determining the effects of pumping from the Cambrian-Ordovician aquifer in the Audrain County area, Missouri: Missouri Division of Geology and Land Survey Open-File Report 3, 10 p.

WATER FOR IRRIGATION IN AUDRAIN COUNTY, MISSOURI--continued

REPORTS: Knight, R. D., and Emmett, L. F., 1981, Water for irrigation in the Audrain County area, Missouri: Missouri Division of Geology and Land Survey Water Resources Report (in preparation).



*Photograph courtesy of
Geography Assistance Program*

PROJECT TITLE: EFFECTS OF URBAN RUNOFF AND WASTEWATER EFFLUENT ON WILSONS CREEK AND JAMES RIVER NEAR SPRINGFIELD, MISSOURI MØ 78-035

COOPERATOR: City of Springfield, Missouri

LOCATION: Southwestern Missouri,
Christian and Greene Counties

PROJECT CHIEF: John Skelton

PROBLEM: The quality of water in Wilsons Creek and James River has been degraded by effluent from the Southwest Wastewater-Treatment Plant and storm runoff from residential, business, and industrial areas. The Southwest Wastewater-Treatment Plant was upgraded during October 1977, and is designed to improve water quality in Wilsons Creek and James River. Water-quality data collected before and after October 1977 need to be compared.



OBJECTIVES: Summarize and interpret rainfall, streamflow, and water-quality data collected from Wilsons Creek and James River before and after the new wastewater-treatment plant went into operation. Describe changes in quality of Wilsons Creek and James River with respect to effluent discharge, rainfall, runoff, and time.

APPROACH: Samples for physical properties, common inorganic constituents, major nutrients, and bacteria will be collected monthly from James River upstream and downstream from Wilsons Creek and analyzed to indicate the effects of Wilsons Creek on James River. Continuous discharge, water temperature, specific conductance, dissolved oxygen, and pH data will be collected for Wilsons Creek upstream and downstream from the Southwest Wastewater-Treatment Plant, and the James River downstream from Wilsons Creek. The results of the analyses will be evaluated to show progressive downstream changes caused by effluent discharge and storm runoff. Continuous rainfall and discharge data from several sites will be correlated with water-quality data and used to evaluate the possibilities of estimating peak flows and flood volumes.

Two reports are planned: One describing conditions before upgrading of the wastewater-treatment plant and the second summarizing and describing conditions after upgrading.

EFFECTS OF URBAN RUNOFF AND WASTEWATER EFFLUENT ON WILSONS CREEK AND
JAMES RIVER NEAR SPRINGFIELD, MISSOURI--continued

PROGRESS AND Second report was completed and reviewed.
SIGNIFICANT
RESULTS:

PLANS FOR Project will be completed. The second report will be
NEXT YEAR: published in the Water-Resources Investigations series.

REPORTS: Berkas, W. R., 1980, Effects of urban runoff and wastewater
 effluent on Wilsons Creek and James River near Springfield,
 Missouri: U.S. Geological Survey Water-Resources Investigations
 80-27, 31 p.

 Berkas, W. R., 1981, Streamflow and water-quality conditions,
 Wilsons Creek and James River, Springfield area, Missouri:
 U.S. Geological Survey Water-Resources Investigations
 (in review).

PROJECT TITLE: REGIONAL HYDROGEOLOGY OF AQUIFERS OF CAMBRIAN AND ORDOVICIAN AGE IN PARTS OF MINNESOTA, WISCONSIN, IOWA, ILLINOIS, INDIANA, AND MISSOURI MØ 79-036

PROJECT CHIEF: Walter L. Steinhilber, Madison Wisconsin
Project coordinator in Missouri--Leo F. Emmett

LOCATION: Northern Missouri and other states

PROBLEM: The northern Midwest is underlain by a continuous aquifer system formed of rocks of Paleozoic age. This system supplies water for municipal, agricultural, industrial, and domestic uses. Increasing use of water has caused the public to be concerned about the effects of pumping from the system and about the availability of water supplies. The problems causing public concern can be better solved if there is an understanding of how withdrawals at one place may affect the uses of water at another place. The system is poorly understood on a regional scale, partly because not all hydrologic facts have been related to each other by a conceptual model.



OBJECTIVES: To provide regional concepts that will allow evaluation of the aquifer's water-supply potential and its response to projected development schemes. More specifically, the study will be designed to: (1) provide data that help describe the geologic, hydrologic, and chemical quality of the aquifer system, (2) estimate past and future withdrawals from the aquifer system and determine present withdrawals, and (3) develop a conceptual model of the aquifer system.

APPROACH: In cooperation with the Missouri Division of Geology and Land Survey compile and evaluate selected data as they may relate to regional flow systems. Resultant concepts and data may then be used to select logical hydrologic boundaries for a digital-computer model of the regional flow system. The model might then be used to test the validity of the concepts and for its predictive capability.

REGIONAL HYDROGEOLOGY OF AQUIFERS OF CAMBRIAN AND ORDOVICIAN AGE IN PARTS
OF MINNESOTA, WISCONSIN, IOWA, ILLINOIS, INDIANA, AND MISSOURI--continued

PROGRESS AND SIGNIFICANT RESULTS: Water use data (historical and current) have been collected. Water samples for chemical analysis have been collected, and preliminary work has been done in developing a digital model.

PLANS FOR NEXT YEAR: A report describing the model and the area modeled will be completed.

REPORT: Planned: U.S. Geological Survey Water-Supply Paper describing the model and the area modeled.

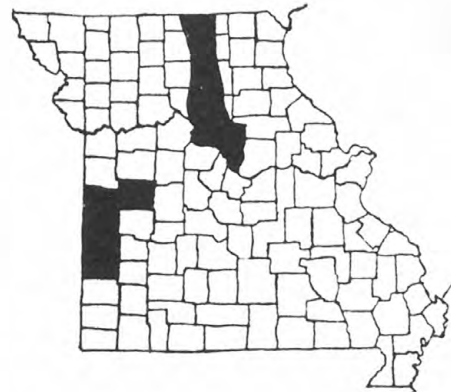
PROJECT TITLE: HYDROLOGIC AND WATER-QUALITY CHARACTERISTICS OF STREAMS AND SHALLOW AQUIFERS IN COAL-MINING AREAS OF MISSOURI MØ 79-038

COOPERATOR: Federal Program

LOCATION: North-central and western Missouri

PROJECT CHIEF: J. H. Barks

PROBLEM: Missouri produces several million tons of coal each year. Recent legislation requires that the adverse effects of mining be minimized through detailed planning and control measures. To comply with the regulations, it is necessary to define the hydrologic characteristics of streams and aquifers in coal-mining areas.



OBJECTIVE: To provide general hydrologic information on the environmental setting of coal provinces of Missouri. This information should aid state and federal regulatory agencies in making pre-mining decisions regarding coal mining and improve their ability to predict regional impacts of mining.

APPROACH: Information will be obtained during a systematic three-phase program. The first phase will be the description of the physical setting; the second will be the collection of synoptic and continuous ground-water, streamflow, and water-quality data; and the third will be an analysis of data and reporting of interpretative results.

PROGRESS AND SIGNIFICANT RESULTS: A report describing the physical setting, climate, hydrology, coal-mining practices, and additional data needed for the project area was published during fiscal year 1980. Reference and trend stations were implemented and synoptic samples were collected at several stream sites. Preparation was made to use precipitation, slope, soil type, and land use information to model surface-water flow in two basins in the coal-mining areas of Missouri.

PLANS FOR NEXT YEAR: A network of surface-water and water-quality stations will continue to be operated in the project areas. Synoptic data will continue to be collected at wells and streams. Selected data will be digitized and used to model surface-water flow from two streams. Preparation will continue on two coal-hydrology reports.

HYDROLOGIC AND WATER-QUALITY CHARACTERISTICS OF STREAMS AND SHALLOW AQUIFERS
IN COAL-MINING AREAS OF MISSOURI MØ 79-038--continued

REPORTS: Vaill, J. E., and Barks, J. H., 1980, Physical environment and hydrologic characteristics of coal-mining areas in Missouri: U.S. Geological Survey Water-Resources Investigations 80-67, 33 p.

Planned: Water-Resources Investigations series:
Reconnaissance of coal areas in Missouri.

Water-Resources Investigations series:
Hydrology of coal areas in Missouri.



PROJECT TITLE: THE EFFECTS OF LAND IMPROVEMENT PRACTICES ON THE SURFACE-WATER RESOURCES OF THE LITTLE BLACK RIVER BASIN, MISSOURI MØ 80-040

COOPERATOR: Soil Conservation Service

LOCATION: Little Black River basin,
south-central Missouri

PROJECT CHIEF: W. R. Berkas.

PROBLEM: The Soil Conservation Service has been authorized to implement various types of water-land improvement practices in the Little Black River basin. Quantitative determinations are needed to evaluate the hydrologic consequences of these practices. The Soil Conservation Service has requested the assistance of the U.S. Geological Survey in the collection of data and the evaluation and documentation of the project effects on runoff characteristics, water quality, water temperatures, and sediment loads in the Little Black River basin.



OBJECTIVES: Determine and document the short-term and long-term effects of the proposed Soil Conservation Service project on runoff characteristics, water quality, water temperatures, and sediment loads in the Little Black River basin.

APPROACH: A data-collection network will consist of 10 sites. Daily discharge will be determined at 6 of the sites, daily sediment at 5 sites, continuous water temperature at 4 sites, water quality at 6 sites, peak flow at 3 sites, and partial-record discharge and sediment at 1 site. A low-flow seepage run will be made in the basin. Recent geomorphic changes will be identified by field reconnaissance. Data will be collected before and after implementation of the Soil Conservation Service's land-improvement structures.

PROGRESS AND SIGNIFICANT RESULTS: Data collection continued at water-quality monitors, water-quality stations, and sediment stations. Field reconnaissance was made to determine recent geomorphic changes.

PLANS FOR NEXT YEAR: The data collected during fiscal year 1981 will be analysed and presented in a progress report. Data collection will continue.

REPORTS: Annual Progress Report: A progress report was submitted to the Soil Conservation Service during February 1981.

PROJECT TITLE: SOURCE AND CHARACTERISTICS OF SEDIMENT IN THE UPPER SALT RIVER BASIN, MISSOURI MØ 80-041

COOPERATOR: Department of Natural Resources
Division of Environmental Quality

LOCATION: Salt River basin, northeastern Missouri

PROJECT CHIEF: W. R. Berkas

PROBLEM: The Missouri statewide 208 report identified sediment as the principal nonpoint-source pollutant in Missouri streams. However, the estimated sediment yields were based on empirical relationships rather than actual data. The Salt River basin was selected for a study to collect instream sediment information for comparison with the empirically estimated sediment yields.



OBJECTIVES: Characterize the stage of erosion and sedimentation in the basin and relate various types of soil to sediment delivery to streams and sediment transport from lower-order to higher-order streams.

APPROACH: Recent geomorphic changes will be identified by field reconnaissance. Five discharge and daily sediment-sampling stations will be operated on the five major tributaries in the upper Salt River basin. Delivery predictions will be made as a function of the types of erosion and compared to data collected. Possibly, a vigil network will be established in the basin to monitor long-term changes; these stations would be measured every 10 years.

PROGRESS AND SIGNIFICANT RESULTS: Data collection continued at the sediment-collection stations and field reconnaissance was made to determine recent geomorphic changes.

PLANS FOR NEXT YEAR: The data collected during fiscal year 1981 will be analysed and presented in a progress report. Data collection will continue.

REPORTS: A progress report was submitted to the Soil Conservation Service during May 1981.

Planned: Water-Resources Investigations series: Source and characteristics of sediment in the upper Salt River basin, Missouri.

PROJECT TITLE: SEDIMENT STUDIES ON THE MISSISSIPPI RIVER AND ITS TRIBUTARIES, SAVERTON, MO., TO THE OHIO RIVER MØ 80-042

COOPERTOR: U.S. Army, Corps of Engineers

LOCATION: Mississippi River,
Saverton, Mo. to the Ohio River

PROJECT CHIEF: W. R. Berkas

PROBLEM: Man's activities have accelerated erosion of sloping lands and probably have resulted in increased amounts of sediment being delivered to the Mississippi River. Sediment aggrades near the mouth of streams tributary to the pooled reaches, but both aggradation and degradation occur in the open reaches of the river, depending upon its rate of flow. Little is understood about the sediment characteristics or the capacity of the river and its tributaries to transport sediment.



OBJECTIVES: Provide information that can be used in a river system management plan, which will be developed to incorporate total river resources requirements while being responsive to problems enumerated by the public and private sectors. This project will provide estimates of annual sediment loads for selected tributaries and at various points on the main stem, a sediment budget, and information needed to evaluate the feasibility of modeling sediment transport by the river.

APPROACH: Sediment-sampling stations will be established at the downstream gaging stations on the principal tributary streams in Missouri and at three locations on the Mississippi River. Samples of suspended sediment will be collected daily. Cross-sectional samples of suspended sediment and bed material will be collected monthly or as flow conditions warrant. Sediment-discharge curves will be prepared and used to provide estimates of annual sediment loads and to develop a sediment budget.

PROGRESS AND SIGNIFICANT RESULTS: All the sediment-sampling stations have been installed and samples are being collected on a regular basis. Cooperating agencies are meeting monthly, and progress is being made toward the final publication.

SEDIMENT STUDIES ON THE MISSISSIPPI RIVER AND ITS TRIBUTARIES, SAVERTON, MO.,
TO THE OHIO RIVER MØ 80-042--continued

PLANS FOR The sediment sampling will continue and cooperating agencies
NEXT YEAR: will continue to meet.

REPORT: Sediment transport in the Mississippi River and tributaries:
 Report by Great River Environmental Action Team (GREAT III).
 (Report in preparation.)

PROJECT TITLE: FLOW-DURATION HYDROGRAPHS FOR MISSOURI STREAMS MØ 80-044

COOPERATOR: Department of Natural Resources
Division of Geology and Land Survey

LOCATION: Statewide

PROJECT CHIEF: L. D. Hauth

PROBLEM: Flow-duration data describe the probability of occurrence of various rates of flow and can be used to help solve problems dealing with water supply, power development, and dilution or disposal of wastes. Missouri regulates waste disposal into streams based on low-flow and flow-duration data. At the present (1981) the U.S. Geological Survey provides these data only on a station-by-station basis as requested.

OBJECTIVES: To provide, in one report, statistical analysis of surface-water data collected in Missouri since 1903 as flow-duration tables and hydrographs in place of the current fragmentary distribution of data.

APPROACH: Files of daily discharge will be searched and evaluated to determine the amount and applicability of the data. Using computer programs, two products will be prepared: (1) flow-duration tables and hydrographs will be developed and plotted, and (2) flow-duration characteristics will be regressed against basin characteristics to test for relationships that may be used to estimate daily, monthly, and annual flow-duration frequency.

PROGRESS AND
SIGNIFICANT
RESULTS: Plotting of daily flow-duration hydrographs is 90 percent complete. A report is being prepared and plans are being made for publication.

PLANS FOR
NEXT YEAR: Complete the project.

REPORTS: Planned: U.S. Geological Survey Open-File Report:
Flow-duration data for Missouri.

PROJECT TITLE: HYDROGEOCHEMICAL EFFECTS OF STRIP MINING COAL IN THE PRAIRIE HILL AREA, NORTH-CENTRAL MISSOURI MØ 80-045

COOPERATOR: Federal program

LOCATION: North-central Missouri

PROJECT CHIEF: J. H. Barks

PROBLEM: Information about the chemical reactions that take place as water moves through spoil piles and natural rocks is insufficient to predict the effects of coal mining on the geochemistry of ground water. A prerequisite to determining the reactions and the resulting water quality is an accurate description of the mineralogy of the natural rocks and an understanding of the three-dimensional flow and water-quality system in the natural rocks and spoils.



OBJECTIVE: Develop the capability to predict water-quality changes resulting from strip mining of high-sulfur bituminous coal in a humid climate.

APPROACH: An investigation will be carried out in two phases. The first phase will include a well inventory and drilling and testing as needed to describe a conceptual model of the ground-water flow system and water-quality variations within the flow system. During the second phase, aquifer tests, core analyses, and water-quality analyses will be made. Results will be used to describe the three-dimensional flow system and a model of the geochemical reactions and resulting concentrations of major organic constituents.

PROGRESS AND SIGNIFICANT RESULTS: Cooperation was established with appropriate federal and state agencies, universities, and Associated Electric Coop, Inc. Compilation of existing data and drilling and testing of a deep hole were started. Water and bottom-material samples were collected at four stream sites during low flow. The water samples were analyzed for common constituents, trace elements, and suspended sediment; the bottom-material samples were analyzed for trace elements and coal.

HYDROGEOCHEMICAL EFFECTS OF STRIP MINING COAL IN THE PRAIRIE HILL AREA,
NORTH-CENTRAL MISSOURI MØ 80-045--continued

PLANS FOR
NEXT YEAR:

Mineralogic, hydraulic, and water-quality testing will be done for selected intervals. Three spoil piles of significantly different ages will be selected and four test holes will be drilled along the flow gradient at each spoil pile. These holes will be cored, logged, and completed as piezometers. Mineralogic, hydraulic, and water-quality testing will be done at each hole and routine water-level and water-quality measurements will begin. The data will be analyzed to develop a conceptual model of the ground-water flow and water-quality system.

REPORTS:

Planned--Water-Resources Investigations series: A conceptual model of the three-dimensional flow and water-quality system in the Prairie Hill coal-mining area, north-central Missouri.

Water-Resources Investigations series:
Hydrogeochemical effects of strip mining coal in the Prairie Hill area, north-central Missouri.



PROJECT TITLE: MISSOURI SMALL-STREAMS ANALYSIS MØ 81-046

COOPERATOR: Missouri Highway and Transportation Commission

LOCATION: Statewide

PROJECT CHIEF: L. D. Hauth

PROBLEM: Streamflow information has been collected on small rural streams in Missouri since 1948 and on small urban streams since 1976. A recent evaluation of the rural streamflow data indicates that further data collection would not improve statistical relationships that are used to predict floodflows. As a result, efforts must be directed toward determining better predictive tools and more definitive basin parameters. Requirements necessary for rainfall-runoff modeling have been met in the urban data-collection part of the program. Data evaluation and analysis by way of rainfall-runoff model calibration are now needed.

OBJECTIVE: Emphasize data analysis and thereby provide statistical or other predictive tools.

APPROACH: Urban data will be evaluated and then used to calibrate a rainfall-runoff model. Long-term peak-flow data will be generated through the calibrated model at each site and used to develop relationships defining floodflows at ungaged urban areas of Missouri.

The small rural streamflow network will be reduced to two streamgaging stations to sample long-term trends. Streamflow characteristics for all rural basins (areas ranging from 0.1 to 21.3 square miles), together with their various physical or dimensionless basin characteristics, will be used to determine the most effective model and most descriptive basin characteristic for defining floodflows at ungaged rural areas of Missouri.

PROGRESS AND SIGNIFICANT RESULTS: Data for one streamgaging station have been analyzed and computer files are being loaded in preparation for model calibration.

PLANS FOR NEXT YEAR: Continue model calibration of remaining streamgaging-station data.

REPORTS: Planned: Water-Resources Investigations series:
Transferability of flood-frequency relationships
for urban areas of Missouri.

PROJECT TITLE: HYDROGEOLOGY OF THE PALEOZOIC AQUIFERS IN SOUTHERN MISSOURI
MØ 81-047

COOPERATOR: Federal program

LOCATION: Southern Missouri

PROJECT CHIEF: D. G. Jorgenson,
Lawrence, Kansas.

L. F. Emmett, project
coordinator in Missouri.

PROBLEM: Increased use of ground water
has led to conflicts among
water users. In addition a
new awareness of the potential
for contamination and water-
quality deterioration is
increasing the need to under-
stand water-quality variations.

Public demand eventually can be expected to result in schemes
to manage the resource to obtain maximum use with minimum
deterioration.

Successful management plans must be based on factual data
collated in a quantitative description of the flow system.
Such an understanding does not now exist, but is a prereq-
uisite to further progress in the development of the resource.

OBJECTIVES: The objectives are to provide the regional aquifer study with
concepts and data that will allow evaluation of the aquifer's
water-supply potential and to evaluate the aquifer's response
to projected development schemes. More specifically, the
study will be designed to: (1) Describe the geologic,
hydrologic and water-quality characteristics, and the
hydrologic boundaries of the aquifers; (2) Develop a
regional data base on water use, including hydrologic and
geologic parameters; (3) Describe the past, present, and
future problems associated with water use; and (4) Evaluate
the aquifer's responses to possible future changes in land
use and pumpage.



HYDROGEOLOGY OF THE PALEOZOIC AQUIFERS IN SOUTHERN MISSOURI
MØ 81-047--continued

APPROACH: From existing data construct preliminary digital model of southern Missouri. Test conceptual model and determine sensitivity of system to transmissivity, storage, vertical permeability, and boundaries. Use model to select areas for supplemental hydrogeologic data collection. Attempt to delimit recharge areas using geologic concepts and streamflow data. Use hydrograph separation techniques and ground-water levels to estimate discharge to streams. Refine digital model of the aquifer using revised estimates of recharge, discharge, and water use. Determine location and movement of fresh-saltwater interface in response to pumpage. If practical, use computer simulation techniques to predict saltwater movement in response to use.

PROGRESS AND SIGNIFICANT RESULTS: Geologic data for about 200 sites have been entered into the Central Midwest Regional Aquifer System Analysis (CM RASA) lithologic data base. Borehole geophysical logs have been run at 14 sites; sites have been entered into geophysical data base.

PLANS FOR NEXT YEAR: Evaluate and summarize all published information about ground water in the area. Evaluate and summarize water-quality data for the Cambrian, Ordovician, and Mississippian aquifers. Construct preliminary digital model of southern Missouri from existing data.

REPORT: Planned--Water-Resources Investigations series:
A conceptual model of the Cambrian and Ordovician aquifers, southern Missouri.

PROJECT TITLE: GROUND-WATER RESOURCES IN BARTON, BATES, AND VERNON COUNTIES
MØ 81-048

COOPERATOR: Department of Natural Resources
Division of Geology and Land Survey

LOCATION: Western Missouri

PROJECT CHIEF: L. F. Emmett

PROBLEM: Ground water for supplemental irrigation in Barton, Bates, and Vernon Counties comes from deep wells open to the Roubidoux Formation and the Gasconade Dolomite. All public-supply wells in the area are open to these same formations. The fresh-saltwater boundary extends through the area and limited data indicate that there may be seasonal as well as long-term movement of the saltwater. There is concern that additional withdrawal of ground water for irrigation may lower the potentiometric surface and possibly cause saltwater encroachment.



OBJECTIVE: Determine the availability and quality of ground water and the possibilities for saltwater encroachment as a result of pumping from the deep aquifer (Roubidoux Formation and Gasconade Dolomite).

APPROACH: Compile and evaluate existing hydrogeologic information. Inventory all large-capacity wells and sufficient additional wells to construct potentiometric maps. Collect and analyze water samples for major inorganic constituents and selected radioelements. Determine location and movement of fresh-saltwater interface in response to pumping. Monitor water levels and collect water samples from wells near the interface. Aquifer tests, borehole geophysical logging, and packer testing will be run at selected sites. Prepare digital model of flow system and predict potentiometric surface for given pumping regime. Prepare interpretative report describing hydrologic boundaries of the aquifers and their geologic, hydrologic, and water-quality characteristics.

PROGRESS AND SIGNIFICANT RESULTS: Compiled, published, and filed hydrogeologic information for the area. Inventoried all public-supply and irrigation wells. Established a network of wells for periodic water-level measurement, collection of water samples for chemical analysis, and collection of water use data.

GROUND-WATER RESOURCES IN BARTON, BATES, AND VERNON COUNTIES
MØ 81-048--continued

PLANS FOR
NEXT YEAR: Continue data collection and evaluation of data from network wells.

REPORT: Planned: Water-Resources Investigations series:
Ground-water resources of Barton, Bates,
and Vernon Counties.

PROJECT TITLE: CHARACTERISTICS OF URBAN RUNOFF IN THE BLUE RIVER BASIN IN KANSAS CITY, MISSOURI MØ 81-049

COOPERATOR: Department of Natural Resources
Division of Environmental Quality

LOCATION: Western Missouri

PROJECT CHIEF: J. H. Barks

PROBLEM: Nonpoint-source pollution is a major problem in urban areas of Missouri. Stormwater-control systems may be at least a partial solution to the problem. However, these systems cannot be efficiently designed and used until a monitoring method has been developed that will evaluate the potential pollution sources, such as downtown, industrial, residential, and undeveloped areas, with respect to relative contributions of pollutants from each source. It is possible that runoff from some areas will not need to be treated, thus leading to substantial savings in the construction and operation of treatment plants.



OBJECTIVE: Characterize the quality of storm runoff from a large basin draining a predominantly metropolitan area. This information will be used to develop methods for establishing monitoring programs for other urban basins to define broad areas that contribute major contaminants so that stormwater-control systems can be efficiently designed.

APPROACH: Samples will be collected by automatic samplers during the complete storm hydrographs and composited on a discharge-weighted basis to four samples per site. The samples will be analyzed for constituents considered important, based on earlier synoptic sampling. Graphical and comparison techniques will be used to determine the major pollutants and their relation to land use.

PROGRESS AND SIGNIFICANT RESULTS: Land use hydrologic information was compiled for the Blue River basin. One rain gage and four stage and automatic sampling stations were established in the basin. One set of base-flow water samples was collected for analysis of parameters included in the National Urban Runoff Program list.

CHARACTERISTICS OF URBAN RUNOFF IN THE BLUE RIVER BASIN IN KANSAS CITY,
MISSOURI MØ 81-049--continued

PLANS FOR During fiscal year 1982, automatic samplers will be installed
NEXT YEAR: and operated at four storm-sewer locations representing
 different land uses. Graphical and comparison techniques will
 be used to determine the major pollutants and their relation
 to land use.

REPORT: Planned--Water-Resources Investigations series:
 Characteristics of urban runoff in the Blue River
 basin in Kansas City, Missouri.

PROJECT TITLE: HYDROLOGY OF COAL AREA 38, WESTERN REGION, INTERIOR PROVINCE, IOWA AND MISSOURI MØ 81-051

COOPERATOR: Federal program

LOCATION: Northern Missouri and southern Iowa

PROJECT CHIEF: John Skelton

PROBLEM: Coal area 38, which includes the Grand, Thompson, and Chariton Rivers in northern Missouri, contains significant coal reserves that are being developed at an accelerated pace. Mining companies are required by law to analyze the hydrologic effects of proposed activities and take appropriate measures to minimize adverse effects. All applications for permits to mine must include a description of the geology, hydrology, and water quality and quantity for all lands within the proposed mine-plan area, the adjacent area, and the general area. There is a need for information about the water resources of Area 38 that is comprehensive in scope and easily understood.



OBJECTIVE: Summarize available hydrologic information for Coal Area 38 in northern Missouri and southern Iowa and provide extensive references to sources of additional and more detailed information in a report that can be used by the coal-mining industry, regulatory agencies, and consultants.

APPROACH: The Missouri and Iowa districts will collaborate to compile available information and prepare text and illustrations. A topic outline will be developed, based on coal hydrology reports from other sections of the country, but oriented to the hydrology and problems of Area 38. Regional hydrology will be emphasized and sources of information will be cited. No new information will be collected.

PROGRESS AND SIGNIFICANT RESULTS: New project.

HYDROLOGY OF COAL AREA 38, WESTERN REGION, INTERIOR PROVINCE, IOWA
AND MISSOURI MØ 81-051--continued

PLANS FOR THIS YEAR: The topic outline for the report will be prepared and topics assigned to contributors. A work shcedule for completion of all sections of the report will be established. Each contributor will assemble information for their assigned topics and will begin summarizing and interpreting the information for presentation.

REPORT: Planned--Water Resources Investigations series:
Hydrology of Area 38, Western Region, Interior
Coal Province, Iowa and Missouri.

SOURCES OF INFORMATION

Selected references on water resources in Missouri are listed on the following pages; many of these references are available for inspection at the offices of the U.S. Geological Survey and the Division of Geology and Land Survey in Rolla, Mo. New reports published by the Geological Survey are announced monthly in "New Publications of the Geological Survey." Subscriptions to this monthly list are available on request to the U.S. Geological Survey, 329 National Center, Reston, Va. 22092.

Professional papers, water-supply papers, bulletins, and the Geological Survey's annual report are sold by the U.S. Geological Survey Branch of Distribution, 1200 South Eads Street, Arlington, Va. 22092 (authorized agent of the Superintendent of Documents, Government Printing Office). Circulars are free on request to the U.S. Geological Survey, National Center, Reston, Va. 22092. Water-resources investigations folders for each of the 50 states and Puerto Rico also are free on request. Hydrologic investigations atlases, hydrologic unit maps, and other maps pertaining to Missouri are sold by the U.S. Geological Survey, Branch of Distribution, Bldg. 41, Denver Federal Center, Lakewood, Colo. 80225.

Records of streamflow, ground-water levels, and quality of water were published for many years as Geological Survey Water-Supply Papers. Beginning with the 1975 water year, however, this series was replaced by the U.S. Geological Survey Water-Data Report series. This series combines under one cover for each state: streamflow data, water-quality data for surface and ground water, and ground-water-level data from the basic network of observation wells. For Missouri the title is, "Water-Resources Data for Missouri - Water Year 1980: U.S. Geological Survey Water-Data Report MO-80-1." Other publications series of general interest also are explained on the following pages. Further information about these publications can be obtained from the District Chief, U.S. Geological Survey, Missouri district, Rolla, Mo. 65401.

The bibliography contains a comprehensive list of reports describing the water resources of Missouri. Summary statements about the immediate national water situation are presented in the "Water Resources Review," which is issued monthly. The review may be obtained free on application to the U.S. Geological Survey, 420 National Center, Reston, Va. 22092.

Indexes to the "Catalog of Information on Water Data" are available free from the District Chief in Rolla, or the Office of Water Data Coordination, U.S. Geological Survey, 417 National Center, Reston, Va. 22092.

Open-file reports are available for inspection at the office from which the report originated. Flood-prone area maps may also be obtained from the Missouri district office.

The Geological Survey National Center maintains a library with an extensive earth-sciences collection. Local libraries may obtain books, periodicals, and maps through interlibrary loan by writing to: U.S. Geological Survey Library, 12201 Sunrise Valley Drive, Reston, Va. 22092.



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RESTON, VIRGINIA*

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