UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DATA USES AND FUNDING OF THE STREAM-GAGING PROGRAM IN MISSOURI

By Loyd A. Waite

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WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
write to:

District Chief
U.S. Geological Survey
Water Resources Division
1400 Independence Road
Rolla, Missouri 65401
(Telephone: (314) 341-0824)

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CONTENTS

ILLUSTRATIONS

TABLES

CONVERSION FACTORS

For readers who prefer to use metric units, conversion factors for terms used in this report are listed below:

Multiply	By	To obtain
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.2832	cubic meter per second (m^3/s)

The nationwide study consists of three phases. The first phase of the analysis identifies the principal uses of the data and relates these uses to funding sources. In addition, streamflow-gaging stations are categorized by whether data are available to users on a near real-time basis, on a daily basis during floods, on a periodic basis, or at the end of the water year (October 1 to September 30).

The second aspect of the nationwide analysis is to identify less costly alternate methods of furnishing the needed information; among these are flow-routing models and statistical methods. The stream-gaging activity no longer is considered a network of observation points, but rather an integrated information system in which data are provided both by observation and synthesis.

The final aspect of the nationwide analysis involves the use of Kalman-filtering and mathematical-programming techniques to define strategies for the operation of the necessary stations that minimize the uncertainty in the streamflow records for given operating budgets. Kalman-filtering techniques are used to compute uncertainty functions (relating the standard errors of computation or estimation of streamflow records to the frequencies of visits to the streamflow gages) for individual stations. A steepest-descent optimization program uses these uncertainty functions, information on practical stream-gaging routes, the various costs associated with stream gaging, and total operation budget to identify the visit frequency for each station so that total uncertainty in the entire network is minimized.

This report considers only the first phase of the nationwide study; the second- and third-phase analyses will be completed and reported in the future. This report is similar to a pilot study for the State of Maine (Fontaine and others, 1984).

HISTORY OF STREAMFLOW-DATA COLLECTION

The streamflow-data program of the Geological Survey in Missouri increased in relation to an increasing need for water-resources information in the State until 1970 (fig. 1). From 1970 to present (1984) the streamflow-data program has decreased in response to budget restraints and cooperator needs.

The systematic collection of daily river stages in Missouri was begun by Federal agencies on the Mississippi River at St. Louis during 1857. Other stage stations were established by these agencies at several sites on the Mississippi and Missouri Rivers during the late 1870's and the early 1890's. The collection of gage-height records on the Osage River in the vicinity of Bagnell was begun during 1880 by the Missouri River Commission and the Weather Bureau (Skelton and Homyk, 1970).

The Mississippi River Commission began making discharge measurements at St. Louis during 1866, and at other Mississippi and Missouri River stations in Missouri during the 1880's and 1890's. Records of daily discharge for the Mississippi River at St. Louis are available from 1861 to the present (1984). Records of discharge for the Osage River at Bagnell are available since 1880.

During 1903 the Geological Survey began collection of records on the Gasconade River at Arlington, the Meramec River at Meramec and Eureka, and on Greer and Maramec Springs. Curtailment of funds necessitated discontinuance of data collection during 1906.

The University of Missouri Engineering Experiment Station, under the direction of Dr. T. J. Rodhouse, established streamflow-gaging stations on the Current River at Van Buren during 1912, the Gasconade River at Waynesville during 1914, and Bennett Spring during 1916. The purpose of these investigations was to present sufficient data concerning the various phenomena

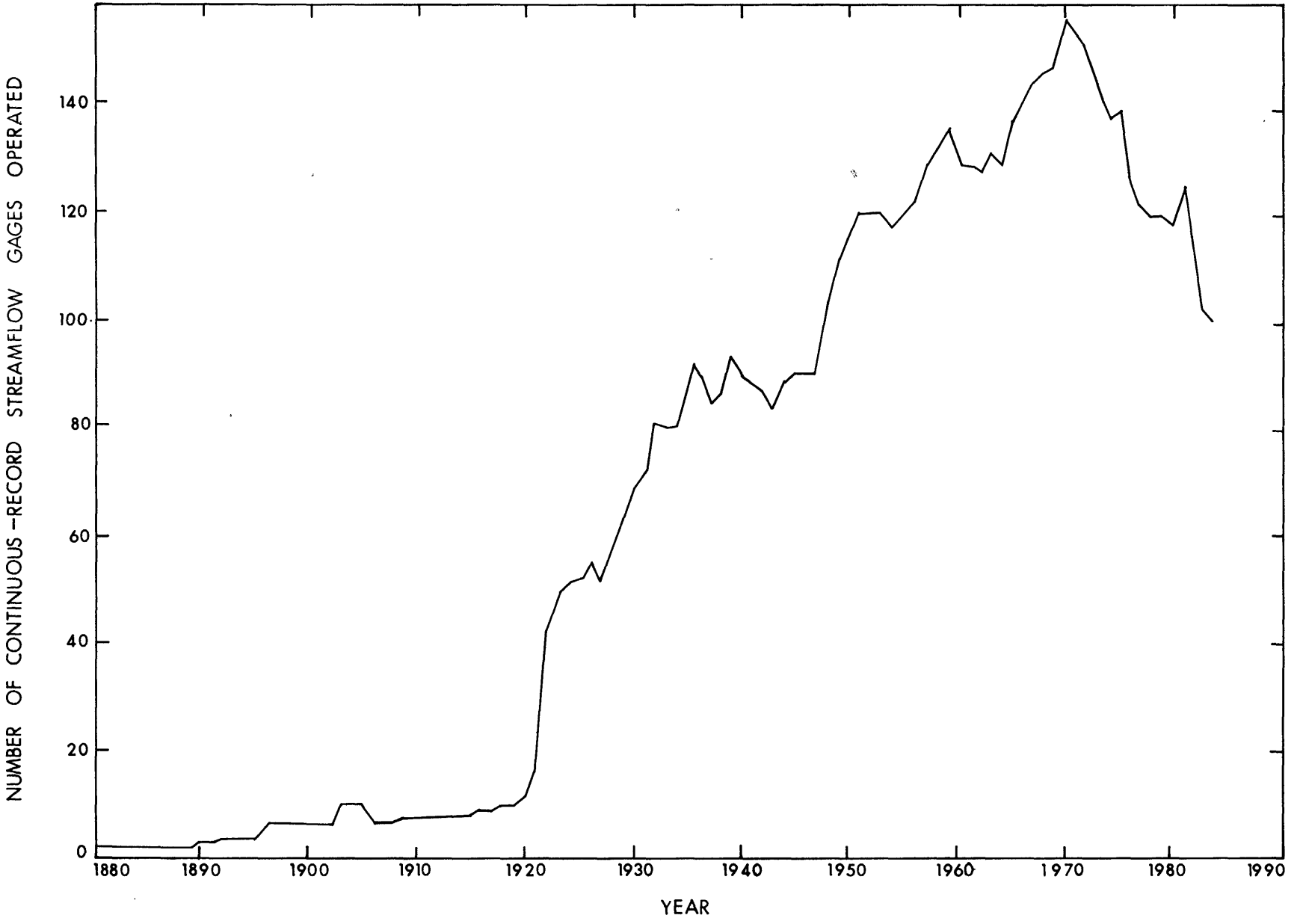

Figure 1.--History of continuous-record streamflow gaging in Missouri.

relating to streamflow in Missouri streams as well as establish relationships from which more trustworthy conclusions could be drawn and on which various kinds of hydraulic work could safely depend. Upon completion of Dr. Rodhouse's study during 1920 these stations were discontinued.

During 1921 the 51st General Assembly of the Missouri State Legislature passed Senate Bill No. 372, which provided that "the board of managers of the Bureau of Geology and Mines is hereby directed to make a survey of the water resources of the State, including the determination of water power, flood-prevention, area of watersheds, underground water supply, chemical composition of waters, and to show locations where power can be generated, and the amount and character of lands that would be inundated by the erection of dams to secure water power. To do this, gaging stations shall be established and such surveying and other field work shall be done as may seem necessary. The chemist of the Bureau shall make all necessary analyses to determine the character of the water of streams and underground water supplies. The work, so far as possible, shall be done in cooperation with the United States Geological Survey and other Government and State Bureaus, and the progress attained shall be printed and reported to the 52nd General Assembly and, if the work be continued, to succeeding General Assemblies, in the biennial report of the State Geologist."

At the beginning of the 1922 fiscal year, the Bureau entered into a cooperative agreement with the Geological Survey for the systematic collection of streamflow records in the State. Under this agreement the collection of daily stage and discharge was begun at 39 streamflow sites and 5 springs. Of the 39 streamflow sites established during 1921, records for 12 sites are continuous to this date (1984). Records are continuous at two of the five springflow stations established during 1921.

A network of data-collection platforms that provide near real-time data through a satellite-data-relay system are currently (1984) being installed at 60 streamflow-gaging stations. This network may change as needs for data increase.

CURRENT STREAM-GAGING PROGRAM

During 1983, 100 continuous-record streamflow-gaging stations were operated by the Geological Survey in Missouri. The cost of operating these 100 continuous-record streamflow-gaging stations during 1983 was $633,345.

Thirty-five crest-stage gages, 1 stage-only or miscellaneous station, 9 lake-stage stations, 24 continuous water-quality stations (including 1 lake), and 30 water-quality partial-record stations also were operated by the Geological Survey in Missouri. The present (1984) analysis includes only the 100 continuous-record streamflow-gaging stations. However, partial-record and water-quality stations will be considered during future phases of the analysis because the activities associated with operating, maintaining, and measuring flow at these stations are included in the hydrographers' work schedules when they visit the 100 continuous-record streamflow-gaging stations.

The responsibility for data collection and records computation for the 100 continuous-record streamflow-gaging stations is shared by the district office at Rolla, and field headquarters at Independence and Maryland Heights. Areas of responsibility are designed to minimize time and travel to the streamflow-gaging stations for which the offices are responsible and to increase the opportunity to obtain measurements of discharge throughout the full range of flow. Locations of these offices, the assigned areas of responsibility, and the locations of continuous-record streamflow-gaging stations are shown in figure 2. The official Geological Survey eight-digit downstream-order station number and name of each station are given in table 1.

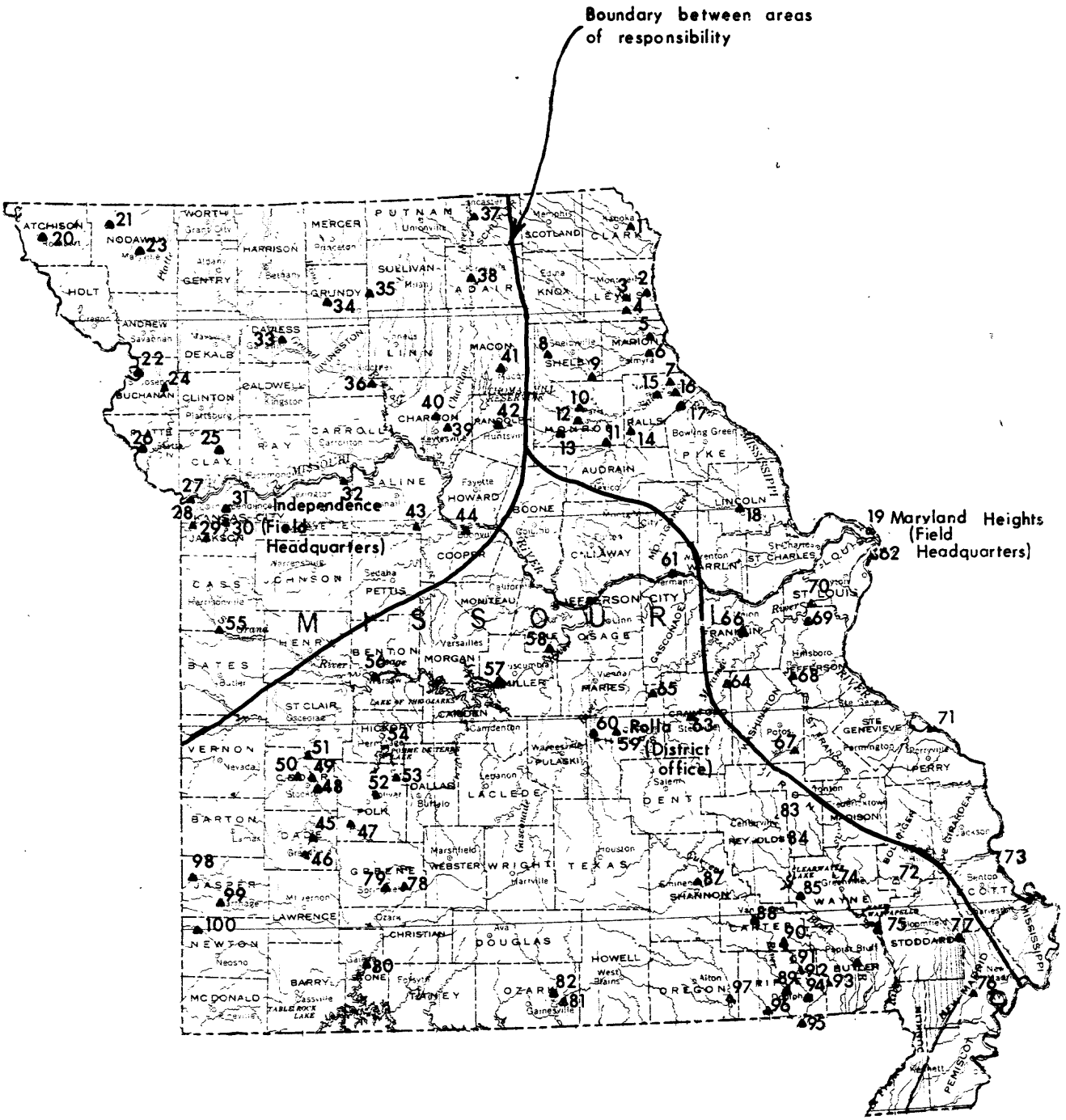

Figure 2.--Location of continuous-record streamflow-gaging stations, district office, field headquarters, and areas of responsibility. (Numbers refer to stations shown in table 1.)

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program
[mi^2, square mile; ft^3/s, cubic feet per second]

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
1	05495000	Fox River at Wayland, Missouri	400	February 1922-	251
2	05496000	Wyaconda River above Canton, Missouri	393	October 1932-September 1972, October 1979-	238
3	05497000	North Fabius River at Monticello, Missouri	452	February 1922-	285
4	05498000	Middle Fabius River near Monticello, Missouri	393	July 1945-	265
5	05500000	South Fabius River near Taylor, Missouri	620	October 1934-	401
6	05501000	North River at Palmyra, Missouri	373	December 1934-	252
7	05502000	Bear Creek at Hannibal, Missouri	31.0	October 1938-September 1942, October 1947-	20.0
8	05502300	Salt River at Hagers Grove, Missouri	365	September 1974-	280
9	05503500	North Fork Salt River near Hunnewell, Missouri	626	April 1930-September 1931, October 1931-September 1940 [a], March 1966-October 1970, October 1979-	403
10	05503800	Crooked Creek near Paris, Missouri	80.0	March 1966-(Prior to 1979 published by U.S. Army, Corps of Engineers)	(b)

See footnotes at end of table.

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
11	05505000	South Fork Salt River at Santa Fe, Missouri	298	October 1939- [c]	195
12	05506500	Middle Fork Salt River at Paris, Missouri	356	October 1939-	246
13	05506800	Elk Fork Salt River near Madison, Missouri	200	October 1968-	172
14	05507600	Lick Creek at Perry, Missouri	104	March 1966- [d]	(b)
15	05507800	Salt River near Center, Missouri	2,350	April 1963-	(b)
16	05508000	Salt River near New London, Missouri	2,480	February 1922-	1,691
17	05508805	Spencer Creek below Plum Creek near Frankford, Missouri	206	March 1930-September 1936, October 1961- (Prior to 1978, fragmentary record)	(b)
18	05514500	Cuivre River near Troy, Missouri	903	February 1922-July 1972, May 1979-	651
19	05587500	Mississippi River at Alton, Illinois	171,500	October 1927-	101,300
20	06817500	Tarkio River at Fairfax, Missouri	508	March 1922-	201
21	06813000	Nodaway River near Burlington Junction, Missouri	1,240	March 1922-	558

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
22	06818000	Missouri River at St. Joseph, Missouri	420,300	August 1928-	40,200
23	06819500	One-Hundred and Two River at Maryville, Missouri	515	October 1932-	226
24	06820500	Platte River near Agency, Missouri	1,760	May 1924-August 1930, May 1932- [e]	921
25	06821150	Little Platte River at Smithville, Missouri	234	June 1965-	158
26	06821190	Platte River at Sharps Station, Missouri	2,380	December 1978-	(b)
27	06893000	Missouri River at Kansas City, Missouri	485,200	October 1897-	54,950
28	06893500	Blue River near Kansas City, Missouri	188	May 1939-	148
29	06893793	Little Blue River below Longview damsite, Missouri	50.7	August 1966-	38.3
30	06893890	East Fork Little Blue River near Blue Springs, Missouri	34.4	October 1974-	24.8
31	06894000	Little Blue River near Lake City, Missouri	184	March 1948-	147
32	06895500	Missouri River at Waverly, Missouri	487,200	October 1928-	49,650

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
33	06897500	Grand River near Gallatin, Missouri	2,250	June 1921-	1,170
34	06899500	Thompson River at Trenton, Missouri	1,670	June 1921-September 1923, August 1928-[f]	951
35	06900000	Medicine Creek near Galt, Missouri	225	July 1921-September 1975, October 1977-	145
36	06902000	Grand River near Sumner, Missouri	6,880	October 1923-	3,863
37	06904050	Chariton River at Livonia, Missouri	864	May 1974-	719
38	06904500	Chariton River at Novinger, Missouri	1,370	October 1930-September 1952, October 1954-	825
39	06905500	Chariton River near Prairie Hill, Missouri	1,870	October 1928-[g]	1,210
40	06906000	Mussel Fork near Musselfork, Missouri	267	October 1948-December 1951, October 1962-	232
41	06906200	East Fork Little Chariton near Macon, Missouri	112	September 1971-	107
42	06906300	East Fork Little Chariton River near Huntsville, Missouri	220	October 1962-	243
43	06908000	Blackwater River at Blue Lick, Missouri	1,120	June 1922-September 1933, May 1938-	712

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
44	06909000	Missouri River at Boonville, Missouri	501,700	October 1925-	59,260
45	06918440	Sac River near Dadeville, Missouri	257	June 1966-	213
46	06918460	Turnback Creek above Greenfield, Missouri	252	September 1965-	235
47	06918740	Little Sac River near Morrisville, Missouri	237	October 1968-	210
48	06919000	Sac River near Stockton, Missouri	1,160	July 1921-	959
49	06919020	Sac River at Highway J below Stockton, Missouri	1,292	October 1973-	1,012
50	06919500	Cedar Creek near Pleasant View, Missouri	420	April 1923-September 1926, October 1948	294
51	06919900	Sac River near Caplinger Mills, Missouri	1,810	October 1974-	1,230
52	06921070	Pomme De Terre River near Polk, Missouri	276	October 1968-	241
53	06921200	Lindley Creek near Polk, Missouri	112	April 1957-	87.4
54	06921350	Pomme De Terre River near Hermitage, Missouri	615	August 1960-	457

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
55	06921590	South Grand River at Archie, Missouri	356	October 1969-	248
56	06922450	Osage River below Truman Dam at Warsaw, Missouri	7,856	May 1978-	(2)
57	06926000	Osage River near Bagnell, Missouri	14,000	October 1880-	9,574
58	06926500	Osage River near St. Thomas, Missouri	14,500	August 1931-	9,933
59	06932000	Little Piney Creek at Newburg, Missouri	200	October 1928-	151
60	06933500	Gasconade River at Jerome, Missouri	2,840	April 1903-July 1906, [h] January 1923-	2,485
61	06934500	Missouri River at Hermann, Missouri	524,200	October 1897-	80,050
62	07010000	Mississippi River at St. Louis, Missouri	697,000	January 1861-	178,300
63	07013000	Meramec River near Steelville, Missouri	781	October 1922-	564
64	07014500	Meramec River near Sullivan, Missouri	1,475	September 1921-September 1933, October 1943-	1,166
65	07015720	Bourbeuse River near High Gate, Missouri	135	July 1965-	118

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
66	07016500	Bourbeuse River at Union, Missouri	808	June 1921-	634
67	07017200	Big River at Irondale, Missouri	175	July 1965-	173
68	07018000	Big River near DeSoto, Missouri	718	October 1948-	659
69	07018500	Big River at Byrnesville, Missouri	917	October 1921-	835
70	07019000	Meramec River near Eureka, Missouri	3,788	August 1903-July 1906, October 1921-	3,060
71	07020500	Mississippi River at Chester, Illinois	708,600	October 1927-	186,700
72	07021000	Castor River at Zalma, Missouri	423	January 1920-	511
73	07022000	Mississippi River at Thebes, Illinois	713,200	October 1932-[i]	192,500
74	07037500	St. Francis River near Patterson, Missouri	956	October 1920	1,103
75	07039500	St. Francis River at Wappapello, Missouri	1,311	October 1940-	1,536
76	07042500	Little River ditch 251 near Lilbourn, Missouri	235	October 1945-	324

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
77	07043500	Little River ditch 1 near Morehouse, Missouri	450	October 1945-	527
78	07050580	James River near Strafford, Missouri	165	October 1973-	153
79	07050700	James River near Springfield, Missouri	246	October 1955-	215
80	07052500	James River at Galena, Missouri	987	October 1921-	942
81	07057500	Northfork River near Tecumseh, Missouri	561	October 1944-	706
82	07058000	Bryant Creek near Tecumseh, Missouri	570	October 1944-	511
83	07061300	East Fork Black River at Lesterville, Missouri	94.5	January 1960-	108
84	07061500	Black River at Annapolis, Missouri	484	April 1939-	568
85	07062500	Black River at Leeper, Missouri	987	June 1921-	954
86	07063000	Black River at Poplar Bluff, Missouri	1,245	October 1936-September 1937, October 1939-	1,286
87	07066000	Jacks Fork at Eminence, Missouri	398	October 1921-	441

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
99	07186400	Center Creek near Carterville, Missouri	232	June 1962-	188
100	07187000	Shoal Creek above Joplin, Missouri	427	October 1941-	390

a Published as "Salt River near Hunnewell."
b No mean annual flow published, less than 5 years of streamflow record.
c October 1969 to September 1975 published as "near Santa Fe."
d Prior to October 1979, gage heights only by St. Louis District Corps of Enginners.
e May 1924 to August 1930 published as "at Agency."
f June 1921 to September 1923 published as "near Hickory."
g Prior to October 1953 published as "near Keytesville."
h April 1903 to July 1906 published as "at Arlington."
i Prior to April 1941 published as "at Cape Girardeau."

Table 1.--Selected hydrologic data for 100 continuous-record streamflow-gaging stations in the 1983 surface-water program--Continued

Map no. (fig. 2)	USGS station no.	Streamflow-gaging station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
88	07067000	Current River at Van Buren, Missouri	1,667	October 1912-	1,859
89	07068000	Current River at Doniphan, Missouri	2,038	October 1918-	2,712
90	07068250	Middle Fork Little Black River at Grandin, Missouri	6.85	October 1980-	(b)
91	07068300	North Prong Little Black River near Grandin, Missouri	39.4	April 1980-	(b)
92	07068380	Little Black River near Grandin, Missouri	79.5	May 1980-	(b)
93	07068510	Little Black River below Fairdealing, Missouri	194	May 1980-	(b)
94	07068540	Logan Creek at Oxly, Missouri	37.5	August 1980-	(b)
95	07068600	Little Black River at Success, Missouri	386	October 1980-	(b)
96	07068863	Fourche Creek near Poynor, Missouri	87.2	January 1976-	104
97	07071500	Eleven Point River near Bardley, Missouri	793	October 1921-	752
98	07186000	Spring River near Waco, Missouri	1,164	April 1924-	844

Ø. Used by U.S. Geological Survey for hydrologic studies
1. Long-term index-gaging station
2. Flood forecasting - U.S. Weather Service
3. U.S. Army, Corps of Engineers - Rock Island District
4. Department of Natural Resources - Division of Environmental Quality
5. Daily suspended-sediment station
6. U.S. Army, Corps of Engineers - St. Louis District
7. Collection of basic records program
8. U.S. Soil Conservation Service
9. National Stream-Quality Accounting Network station
10. Department of Natural Resources - Division of Geology and Land Survey
11. U.S. Army, Corps of Engineers - Kansas City District
12. Union Electric
13. U.S. Army, Corps of Engineers - Little Rock District
14. Springfield City Utilities
15. U.S. Army, Corps of Engineers - Tulsa District

USES, FUNDING, AND AVAILABLILTIY OF CONTINUOUS-RECORD STREAMFLOW DATA

The relevance of a streamflow gage is defined by uses made of data collected from the gage. The uses of data from each gage in the Missouri streamflow-gaging program were identified from a survey of uses of data from known data users. The survey documented the importance of each gage and identified gaging stations that may be considered for discontinuation.

Data-Use Classes

Data uses identified by the survey were categorized into nine classes, defined in the following sections. The sources of funding for each gage and the frequency that data are provided to the users also were compiled and are defined in the "Funding" section of this report. Data-use and ancillary information are presented for each continuous-record streamflow-gaging stations in table 2. The following definitions were used to categorize each known use of streamflow data for each continuous-record streamflow-gaging station:

Regional Hydrology

For data to be useful in defining regional hydrology, a streamflow gage needs to be largely unaffected by manmade storage or diversion. In this class of use, the effects of man on streamflow are not necessarily small, but the effects are limited to those primarily caused by land-use and climate changes. Large quantities of manmade storage may exist in the basin providing the outflow is uncontrolled. These stations are useful in developing regionally transferable information about the relationship between basin characteristics and streamflow.

Table 2.--Uses, funding, and availability of surface-water data, from 100 continuous-record streamflow-gaging stations, 1983 water year

[A, Published on an annual basis; O, Local observer;
T, Data transmitted by telemetry; P, Provisional data provided on a monthly basis]

United States Geological Survey station number	Data use						Funding				Frequency of data availability
	Regional hydrology	Hydrologic systems	Planning and design	Project operation	Hydrologic forecasts	Water-quality monitoring	Federal program	Other Federal agency program	Co-op program	Other non-Federal	
05495000	1	1			2,3			3			A
05496000	Ø	Ø			3	4		3			A
05497000	Ø	Ø			2,3			3			A
05498000	Ø	Ø			2,3	5		3			AO
05500000	Ø	Ø			2,3	4		3			A
05501000	Ø	Ø			2,3			3			A
05502000		Ø		6	3		7	3			A
05502300	Ø	Ø	8	6		8		6			AT
05503500	Ø	Ø	8	6		4,5,8		6			AOT
05503800	Ø	Ø	8	6		8		6			AT
05505000	Ø	Ø	8	6		8		6			AOT
05506500		Ø	8	6		4,5,8		6			AOT
05506800	Ø	Ø	8	6		8		6			AOT
05507600	Ø	Ø	8	6		8		6			AT
05507800	Ø	Ø	8	6	2	8		6			AT
05508000		Ø	8	6	2	4,5,8,9		6			AOT
05508805	Ø	Ø	8	6	6	8		6			AT
05514500	Ø	Ø			2			6			A
05587500		Ø			2	5		6			AO
06813000	1	1	8		2	8			10		AO

See list at end of table for explanation of numerical designation in "Data use" and Funding" columns.

Table 2. Uses, funding, and availability of surface-water data, from 100 continuous-record streamflow-gaging stations, 1983 water year--Continued

United States Geological Survey station number	Data use						Funding				Frequency of data availability
	Regional hydrology	Hydrologic systems	Planning and design	Project operation	Hydrologic forecasts	Water-quality monitoring	Federal program	Other Federal agency program	Co-op program	Other non-Federal	
06817500	Ø	Ø	8	11	2,11	8		11			A
06818000		Ø		11	2,11	4,9	7	11			AT
06819500	1	1	8	11	2,11	8			10		AO
06820500	1	1	8	11	2,11	8		11			AT
06821150		Ø		11	2,11			11			AT
06821190		Ø		11	11	4,9		11			AT
06893000		Ø		11	2,11		7	11			AT
06893500		Ø		11	2			11			A
06893793		Ø	11	11				11			A
06893890		Ø	11	11				11			A
06894000	Ø	Ø		11	2,11			11			A
06895500		Ø		11	2,11		7	11			AOT
06897500	Ø	Ø	8	11	2,11	8		11			AOTP
06899500	Ø	Ø		11	2,11	8		11			AOT
06900000	1	1	8	11		8			10		AO
06902000	1	1		11	2,11	4,8,9	7	11			AOT
06904050		Ø		11	11			11			AT
06904500		Ø		11	2,11			11			AT
06905500		Ø		11	2,11	4,9		11			AOT
06906000	Ø	Ø						11			

Table 2. Uses, funding, and availability of surface-water data, from 100 continuous-record streamflow-gaging stations, 1983 water year--Continued

United States Geological Survey station number	Data use						Funding				Frequency of data availability
	Regional hydrology	Hydrologic systems	Planning and design	Project operation	Hydrologic forecasts	Water-quality monitoring	Federal program	Other Federal agency program	Co-op program	Other non-Federal	
06906200		Ø	8	11				11			
06906300		Ø	8	11	11			11			AT
06908000	Ø	Ø			2			11			AT
06909000		Ø		11	2,11		7	11			AT
06918440	Ø	Ø		11	2	4		11			AT
06918460	Ø	Ø		11	2			11			AOT
06918740	Ø	Ø		11				11			AT
06919000		Ø		11	2,11			11			A
06919020		Ø		11	11			11			AT
06919500	Ø	Ø		11	2			11			AT
06919900		Ø		11	2,11			11			AT
06921070	Ø	Ø		11	2			11	10		AT
06921200	Ø	Ø		11	2			11			AOT
06921350		Ø		11	2,11			11			A
06921590	Ø	Ø			2			11			AOT
06922450		Ø		11	2,11	11		11			A
06926000		Ø		11	2,11					12	A
06926500		Ø		11	11					12	AT
06932000	1	1							10		A
06933500	1	1			2			11	10		ATP

Table 2. Uses, funding, and availability of surface-water data, from 100 continuous-record streamflow-gaging stations, 1983 water year--Continued

United States Geological Survey station number	Data use						Funding				Frequency of data availability
	Regional hydrology	Hydrologic systems	Planning and design	Project operation	Hydrologic forecasts	Water-quality monitoring	Federal program	Other Federal agency program	Co-op program	Other non-Federal	
06934500		Ø		6,11	2,11	9	7	11			AOTP
07010000		Ø			2,6	5	7	6			A
07013000	1	1			2,6			6			A
07014500	Ø	Ø			2,6	4		6			A
07015720	Ø	Ø			2			6			A
07016500	Ø	Ø			2,6			6			A
07017200	Ø	Ø			2		7	6			A
07018000	Ø	Ø			2		7	6			A
07018500	Ø	Ø			2,6		7	6			A
07019000	Ø	Ø			2,6	4,5,6,9		6			A
07020500		Ø			2,6	5	7	6			AO
07021000	1								10		AO
07022000		Ø		6	2	4	7	6			AO
07037500	1	1		6	2	5,6,9		6	10		A
07039500		Ø			2	6		6			AO
07042500	Ø	Ø							10		A
07043500	Ø	Ø							10		A
07050580	Ø	Ø					7	13			A
07050700	Ø	Ø							14		AO
07052500	1	1	13	13	2			13			AT

Ø. Used by U.S. Geological Survey for hydrologic studies
1. Long-term index-gaging station
2. Flood forecasting - U.S. Weather Service
3. U.S. Army, Corps of Engineers - Rock Island District
4. Department of Natural Resources - Division of Environmental Quality
5. Daily suspended-sediment station
6. U.S. Army, Corps of Engineers - St. Louis District
7. Collection of basic records program
8. U.S. Soil Conservation Service
9. National Stream-Quality Accounting Network station
10. Department of Natural Resources - Division of Geology and Land Survey
11. U.S. Army, Corps of Engineers - Kansas City District
12. Union Electric
13. U.S. Army, Corps of Engineers - Little Rock District
14. Springfield City Utilities
15. U.S. Army, Corps of Engineers - Tulsa District

Fifty-nine stations in the Missouri network are classified in the regional hydrology data-use category. Three of the stations, 06817500, 06933500, and 06934500, are index stations and are used to prepare a national monthly summary of water conditions.

Hydrologic Systems

Streamflow-gaging stations that can be used for accounting, that is, to define current hydrologic conditions and the sources and fluxes of water through hydrologic systems, including regulated systems, are designated as hydrologic systems stations. They include diversions and return flows and stations that are useful for defining the interaction of water systems.

Ninety-one stations in the Missouri network are classified in the hydrologic systems category. They are used to account for the current and long-term conditions of the hydrologic systems that they monitor.

Legal Obligations

Some streamflow-gaging stations provide records of flows for the verification or enforcement of existing treaties, compacts, and decrees. This category contains those stations that the Geological Survey is required to operate to fulfill a legal responsibility. No stations in the Missouri network are classified in the legal obligations category.

Planning and Design

Streamflow-gaging stations in this category of data use are used for the planning and design of a specific project (for example, a dam, levee, floodwall, navigation system, water-supply diversion, hydropower plant, or waste-treatment facility), or group of structures. The planning and design category is limited

to those stations that were instituted for such purposes and where these purposes are still valid. Thirty stations in the Missouri network supply cooperating agencies information that is used for planning and design.

Project Operation

Streamflow-gaging stations in this category are used to assist water managers in making operational decisions, such as reservoir releases, hydropower operations, or diversions. The project operation use generally implies that data are routinely available to the operators on a rapid-report basis. For projects on large streams, data may only be needed every few days.

There are 65 stations in the Missouri stream-gaging program that are used for project operation. These stations are used to aid operators in the management of reservoirs and control structures that are part of multipurpose projects of flood control, recreation, navigation and low-flow augmentation.

Hydrologic Forecasts

Streamflow-gaging stations in this category are regularly used to provide information for hydrologic forecasting, such as flood forecasts for a specific river reach, or periodic (daily, weekly, monthly, or seasonal) flow-volume forecasts for a specific site or region. The hydrologic forecast use generally implies that data are routinely available to forecasters on a rapid-reporting basis. On large streams, data may only be needed every few days.

Streamflow-gaging stations in the Missouri stream-gaging program included in this category are those that have been designated by the National Weather Service as needed for flood forecasting. In addition to the National Weather Service, other agencies may use the information from the stations during floods, particularly, Missouri State Civil Defense Agency; U.S. Army, Corps of Engineers; and Missouri Department of Natural Resources, Division of Geology and Land Survey. Seventy stations are in this category.

Water-Quality Monitoring

Streamflow-gaging stations where regular water-quality or sediment-transport monitoring is conducted and where availability of streamflow data contributes to the utility or is essential to the interpretation of water-quality or sediment data are designated as water-quality-monitoring sites. Stations operated as part of the National Stream-Quality Accounting Network (NASQAN) are included in this category. NASQAN stations are operated to define both areal availability and trends in stream quality.

Forty-six stations in the Missouri streamflow-information program are used for water-quality monitoring. Eight stations are NASQAN stations and nine are daily sediment stations. NASQAN stations are part of a nationwide network designed to assess water-quality trends of significant streams.

Research

Streamflow-gaging stations in this category are operated for a particular research or water-investigations study. Typically, these stations are only operated for a few years. Stations of this type are not in operation in Missouri at present.

Funding

The four sources of funding for the streamflow-data program are:

1. Federal program.--Funds that have been directly allocated to the Geological Survey.

2. Other Federal agency (OFA) program.--Funds that have been transferred to the Geological Survey by other Federal agencies.

3. Federal-State cooperative program.--Joint funding from the Geological Survey cooperative-designated funding and from a non-Federal cooperating agency. Cooperating agency funds may be in the form of cash or direct services.

4. Other non-Federal.--Funds that are provided entirely by a non-Federal agency and are not matched by Geological Survey cooperative funds.

In all four categories, the identified sources of funding pertain only to the collection of streamflow data. Sources of funding for other activities that might be carried out at a site, particularly collection of water-quality samples, may not be the same as those identified herein.

Frequency of Data Availability

Frequency of data availability refers to the times when streamflow data may be furnished to the users. In this category, four possibilities exist. Data can be furnished by the annual water resources data report (A) published by the Geological Survey for Missouri (for example, U.S. Geological Survey, 1983); by telephone calls (O), usually daily, made by local observers or Geological Survey personnel directly to the National Weather Service during floods; direct-access telemetry equipment (T) for immediate use (includes both telephone-accessed equipment and satellite-data-collection platforms); or by periodic release of provisional data (P). These four categories are designated in table 2. In the current Missouri stream-gaging program, data for all 100 continuous-record streamflow-gaging stations are made available through the annual water resources data report; 60 stations are, or will be, on a near real-time basis; data from many stations are relayed directly to the National Weather Service; and some data are released on a provisional basis at many stations.

SUMMARY

Many of the 100 continuous-record streamflow-gaging stations (table 2) are used to provide data for accounting, project operation, and forecasting. The first phase of this analysis indicates that data collection needs to be continued at all these stations. Although these stations may have been established for only one specific purpose, the data are available for other uses, such as definition of regional hydrology and hydrologic systems. Ninety-one stations now provide data for the definition of regional hydrology or hydrologic systems in addition to providing data for the original purpose or purposes of the stations. If funding for the original purpose or purposes either is decreased or discontinued, additional funds need to be sought to maintain these 91 stations to continue collection of data for definition of regional hydrology and hydrologic systems.

Sixty continuous-record streamflow-gaging stations in Missouri are used to provide data to the National Weather Service for hydrologic forecasting (table 2). Telemetry equipment has been installed and is maintained at 28 of these stations. The Geological Survey maintains the basic station equipment and collects, processes, and transmits data needed by the National Weather Service for forecasts. The Geological Survey is presently increasing the numbers of stations that provide near real-time data through a satellite-relay system.

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