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Water Resources Data
Missouri
Water Year 2004

Water-Data Report MO-04-1

U.S. Department of the Interior
U.S. Geological Survey

Calendar for Water Year 2004

2003

October

S	M	T	W	T	F	S
			1	2	3	4
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December

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2004

January

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February

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March

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April

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August

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September

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26	27	28	29	30		

Water Resources Data
Missouri
Water Year 2004

By H. S. Hauck and C. D. Nagel

Water-Data Report MO-04-1

Prepared in cooperation with the State of Missouri
and with other agencies

U.S. Department of the Interior
U.S. Geological Survey

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Gale A. Norton, Secretary

U.S. Geological Survey
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2005

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PREFACE

This hydrologic-data report for Missouri is one of a series of annual reports that document hydrologic data collected from the U.S. Geological Survey's surface- and ground-water data collection networks in each State, Puerto Rico, and the Trust Territories. These records of surface water, surface-water quality, and ground-water levels provide the hydrologic information needed by local, State, and Federal agencies and the private sector for developing and managing our Nation's land and water resources.

This report is the culmination of a concerted effort by personnel of the U.S. Geological Survey who collected, compiled, analyzed, verified, and organized the data and who typed, edited, and assembled the report. In addition to the authors, who had primary responsibility for ensuring that the information is accurate, complete, and adheres to U.S. Geological Survey policy and established guidelines, the following individuals contributed significantly to the collection, processing, and tabulation of the data:

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Sherry A. Ternes and Miya N. Barr assembled the text of the report and Gary L. Wilson and Rebecca S. Inman modified the illustrations in the report.

This report was prepared in cooperation with the State of Missouri and with other agencies under the general supervision of C. Shane Barks, Assistant Director and Michael E. Slifer, Director, Missouri Water Science Center.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 2005	Annual--Oct. 1, 2003 to Sept. 30, 2004

4. TITLE AND SUBTITLE
Water Resources Data--Missouri, Water Year 2004

5. FUNDING NUMBERS

6. AUTHOR(S)
H.S. Hauck and C.D. Nagel

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Geological Survey,
Missouri Water Science Center
1400 Independence Road, Mail Stop 100
Rolla, MO 65401

8. PERFORMING ORGANIZATION REPORT NUMBER
USGS-WDR-MO-04-1

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Geological Survey,
Missouri Water Science Center
1400 Independence Road, Mail Stop 100
Rolla, MO 65401

10. SPONSORING / MONITORING AGENCY REPORT NUMBER
USGS-WDR-MO-04-1

11. SUPPLEMENTARY NOTES
Prepared in cooperation with Federal, State, and local agencies

12a. DISTRIBUTION / AVAILABILITY STATEMENT
No restriction on distribution. This report may be purchased from National Technical Information Service, Springfield, Virginia 22161.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

The U.S. Geological Survey, Missouri Water Science Center, in cooperation with local, State, and Federal agencies and organizations, obtains a large quantity of data pertaining to the water resources of Missouri each water year (October 1 to September 30). These data, accumulated during the water years, constitute a valuable data base for developing an improved understanding of the water resources of Missouri.

Water-resources data for the 2004 water year for Missouri consist of records of stage, discharge, and water quality of streams; elevation, contents, and water quality of lakes and reservoirs. This volume contains discharge records for 174 surface-water gaging stations; elevation at 12 lakes and reservoirs; water quality at 108 sampling stations (including 2 lakes); data for 39 crest-stage stations; data for 6 water-quality partial-record stations; and water-level records for 8 ground-water monitoring wells.

14. SUBJECT TERMS
*Missouri, *Hydrologic data, *Surface water, *Quality water, Ground water, Gaging stations, Streamflow, Flow rates, Lakes, Reservoirs, Chemical analysis, Sediment, Water temperature, Water analysis, Water levels, Data collection

15. NUMBER OF PAGES
798

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified			Unclassified

CONTENTS

CONTENTS

ILLUSTRATIONS

TABLES

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER,
FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME

[Letter after station name designates type of data: (d) discharge, (c) chemical, (m) microbiological, (t) water temperature, (s) sediment, and (e) elevation and/or contents]

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER,
FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME

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SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER,
FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME

GROUND-WATER MONITORING WELLS,
FOR WHICH RECORDS ARE PUBLISHED IN THIS VOLUME

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS

The following continuous-record surface-water discharge or stage-only stations (gaging stations) in Missouri have been discontinued. Daily streamflow or stage records were collected and published for the period of record, expressed in water years, shown for each station. Discontinued project stations with less than three years of record have not been included. Information regarding these stations may be obtained from the Center Office at the address given on the back side of the title page of this report.

[Letters after station name designate type of data collected:
(d) discharge and (e) elevation (stage only)]

Station name	Type of record	Station number	Drainage area (mi^2)	Period of record
Middle Fabius River near Baring	(d)	05497500	185	1930-1961
North River at Bethel	(d)	05500500	58.0	1930-1973
Oak Dale Branch near Emden	(d)	05503000	2.64	1955-1975
North Fork Salt River near Hunnewell	(d)	05503500	626	1931-1940, 1979-1988
Youngs Creek near Mexico	(d)	05506000	67.4	1930-1982
Middle Fork Salt River at Duncan's Bridge	(d)	05506190	200	1980-1982
Elk Fork Salt River near Paris	(d)	05507000	262	1930-1954, 1980-1982
Salt River near Monroe City	(d)	05507500	2,230	1939-1981
Calumet Creek near Clarksville	(d)	05509700	15.7	1965-1972
Tarkio River at Fairfax	(d)	06813000	508	1922-1990
Mill Creek at Oregon	(d)	06816000	4.90	1950-1976
Nodaway River near Burlington Junction	(d)	06817500	1,240	1922-1983
Platte River at Ravenwood	(d)	06818900	486	1921-1923, 1924-1925, 1928-1932, 1958-1971
White Cloud Creek near Maryville	(d)	06820000	6.06	1948-1970
Jenkins Branch at Gower	(d)	06821000	2.72	1950-1976
Line Creek at Riverside	(d)	06821280	19.2	1975-1981
Brush Creek at Main Street in Kansas City	(d)	06893560	14.8	1970-1979
Rock Creek at Independence	(d)	06893600	5.20	1967-1974
Shoal Creek at Claycomo	(d)	06893670	29.8	1975-1981
L. Blue River bl Longview Dam at Kansas City	(d)	06893793	50.3	1966-1999
East Fork L. Blue River near Blue Springs	(d)	06893890	34.4	1974-1999
East Fork Fishing River at Excelsior Spring	(d)	06894500	20.0	1950-1972
Sni-A-Bar Creek near Tarsney	(d)	06894680	29.1	1970-1979
Crooked River near Richmond	(d)	06895000	159	1948-1970
Wakenda Creek at Carrollton	(d)	06896000	248	1948-1970
Thompson Branch near Albany	(d)	06896500	5.58	1955-1972
Thompson River at Mount Moriah	(d)	06898100	891	1960-1977
Weldon River near Mercer	(d)	06898500	246	1939-1959
Weldon River at Mill Grove	(d)	06899000	494	1929-1972
Shoal Creek near Braymer	(d)	06899700	391	1957-1977
Medicine Creek near Galt	(d)	06900000	225	1921-1975, 1977-1990
West Yellow Creek near Brookfield	(d)	06902200	135	1959-1977
Hamilton Branch near New Boston	(d)	06902500	2.51	1955-1972
Mussel Fork near Musselfork	(d)	06906000	267	1948-1951, 1962-1990
Thomas Hill Lake near Thomas Hill	(e)	06906350	147	1966-1974
Middle Fork Chariton River below Salisbury	(d)	06906470	201	1964-1970
Burge Branch near Arrow Rock	(d)	06906600	0.33	1959-1973
Flat Creek near Sedalia	(d)	06906700	148	1958-1967
Lamine River at Clifton City	(d)	06907000	598	1922-1971
South Fork Blackwater near Elm	(d)	06907500	16.6	1954-1979
Blackwater River at Valley City	(d)	06907700	547	1958-1973
Shiloh Branch near Marshall	(d)	06908500	2.87	1952-1965
Moniteau Creek near Fayette	(d)	06909500	81	1948-1969
Petite Saline Creek near Boonville	(d)	06910000	182	1948-1967
Hinkson Creek at Columbia	(d)	06910230	44.8	1964-1976, 1986-1991

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Type of record	Station number	Drainage area (mi^2)	Period of record
Cedar Creek near Columbia	(d)	06910410	70.2	1966-1982, 1987-1991
Chesapeake Spring at Chesapeake	(d)	06918444	--	1926,1932 1936,1954 1963-1968
Oak Grove Branch near Brighton	(d)	06918700	1.30	1956-1975
Little Sac River at Aldrich	(d)	06918800	304	1967-1968
S. Fork Dry Sac River near Springfield	(d)	06918493	13.7	1996-2002
Pomme de Terre River near Bolivar	(d)	06921000	225	1950-1969
Pomme de Terre River at Hermitage	(d)	06921500	655	1921-1965
South Grand River at Archie	(d)	06921590	356	1969-1986
South Grand River at Urich	(d)	06921600	670	1960-1969
Big Creek at Blairstown	(d)	06921720	414	1960-1974
Brushy Creek near Blairstown	(d)	06921740	1.15	1960-1975
South Grand River near Brownington	(d)	06922000	1,660	192l-1971
Osage River bl Harry S. Truman Dam at Warsaw	(d)	06922450	11,500	1978-2002
Big Buffalo Creek near Stover	(d)	06922800	24.2	1965-1977
Niangua River near Windyville	(d)	06923250	338	1991-1996
Bennett Spring at Bennett Springs	(d)	06923500	--	1916-1920, 1928-1941, 1965-1995
Niangua River near Decaturville	(d)	06924000	627	1929-1969
Starks Creek at Preston	(d)	06925200	4.18	1956-1976
Van Cleve Branch near Meta	(d)	06926200	0.75	1956-1972
Osage River near St. Thomas	(d)	06926500	14,500	1931-1996
Big Hollow near Fulton	(d)	06927200	4.05	1957-1972
Osage Fork Gasconade River at Drynob	(d)	06927800	404	1962-1981
Laquey Branch near Hazlegreen	(d)	06928200	1.58	1958-1972
Gasconade River near Waynesville	(d)	06928500	1,680	1914-1971
Beeler Branch near Cabool	(d)	06928700	7.78	1967-1976
Little Beaver Creek near Rolla	(d)	06931500	6.45	1947-1975
Loutre River at Mineola	(d)	06935500	202	1947-1967
Coldwater Creek near Hazelwood	(d)	06936200	12.1	1996-2001
Coldwater Creek near St. Louis	(d)	06936500	43.6	1959-1965
Meramec River at Cook Station	(d)	07010350	199	1965-1981
Maramec Spring near St. James	(d)	07010500	--	1903-1906, 1921-1929, 1965-1986
Green Acre Branch near Rolla	(d)	07011500	0.62	1947-1975
Bourbeuse River near St. James	(d)	07015000	21.3	1947-1981
Lanes Fork near Rolla	(d)	07015500	0.225	1952-1971
Bourbeuse River near Spring Bluff	(d)	07016000	608	1943-1981
Dry Branch near Bonne Terre	(d)	07017500	3.35	1955-1975
Sandy Creek near Pevely	(d)	07019690	32.5	1966-1968, 1969-1972
Plattin Creek at Plattin	(d)	07019790	65.8	1965-1972
Saline Creek near Minnith	(d)	07020270	82.6	1968-1981
Brewers Creek near Ironton	(d)	07033800	2.19	1964-1966
St. Francis River near Roselle	(d)	07034000	234	1983-1997
Little St. Francis River at Fredericktown	(d)	07035000	90.5	1983-1997
Barnes Creek near Fredericktown	(d)	07035500	3.35	1955-1975
St. Francis River near Saco	(d)	07036100	664	1983-1997
Clark Creek near Piedmont	(d)	07037700	4.39	1956-1976
Little River Ditch 81 near Kennett	(d)	07041000	111	1926-1979
Little River Ditch 1 near Kennett	(d)	07042000	235	1926-1979
Little River Ditch 251 near Lilbourn	(d)	07042500	235	1945-1991
Castor River at Aquilla	(d)	07043000	175	1945-1981
Little River Ditch 251 near Kennett	(d)	07044000	883	1926-1979

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS--Continued

Station name	Type of record	Station number	Drainage area (mi^2)	Period of record
Little River Ditch 66 near Kennett	(d)	07045000	--	1926-1979
Little River Ditch 66-A near Kennett	(d)	07045500	--	1927-1965
Little River Ditch 259 near Kennett	(d)	07046000	89.0	1926-1979
Roaring River Spring near Cassville	(d)	07050150	--	1965-1968
James River near Strafford	(d)	07050580	165	1973-1986
Wilson Creek below Springfield	(d)	07052150	47.2	1967-1972
White River near Branson	(d)	07053500	4,022	1952-2002
Hodgson Mill Spring at Sycamore	(d)	07057800	--	1965-1968
Taum Sauk Creek near Lesterville	(d)	07061280	10.1	2001-2002
East Fork L. Black River near Lesterville	(d)	07061300	94.5	1960-1990
Black River near Leeper	(d)	07062500	987	1921-1994
Fudge Hollow near Licking	(d)	07064300	1.72	1956-1976
Montauk Springs at Montauk	(d)	07064400	--	1964-1968
Big Creek near Yukon	(d)	07064500	8.36	1949-1975, 1960-1990
Round Spring at Round Spring	(d)	07065000	--	1928-1939, 1965-1979
Alley Spring at Alley	(d)	07065500	--	1928-1939, 1965-1979
Current River near Eminence	(d)	07066500	1,272	1921-1975
Middle Fork Little Black River at Grandin	(d)	07068250	6.85	1980-1984
North Prong Little Black River near Grandin	(d)	07068300	39.4	1980-1984
Little Black River near Grandin	(d)	07068380	79.5	1980-1984
Little Black River below Fairdealing	(d)	07068510	194	1980-1986
Logan Creek at Oxly	(d)	07068540	37.5	1980-1984
Little Black River at Success, AR	(d)	07068600	386	1980-1986
Fourche River near Poynor	(d)	07068863	87.2	1976-1983
Eleven Point River near Thomasville	(d)	07070500	361	1950-1976
Stahl Creek near Miller	(d)	07185500	3.86	1950-1976
Spring River at La Russell	(d)	07185700	306	1947-1981
Spring River at Carthage	(d)	07185765	425	1967-1980, 2001-2003
Center Creek near Carterville	(d)	07186400	232	1962-1991
Center Creek below Carl Junction	(d)	07186475	299	1993-1995
Turkey Creek near Joplin	(d)	07186600	41.8	1963-1972

DISCONTINUED SURFACE-WATER-QUALITY STATIONS

The following surface-water-quality stations in Missouri have been discontinued or converted to partial-record stations. Water-quality data (daily or periodic samples with collection frequency not less than quarterly) were collected and published for the period of record shown for each station. Discontinued project stations with less than three years of record are not included. Information regarding these stations may be obtained from the Center Office at the address given on the back of the title page of this report.

[Type of record: (B) biological, (C) chemical, (M) microbiological, (S) sediment, (T) temperature]

Station name	Station number	Drainage area (mi^2)	Type of record	Period of record
Mississippi River at Canton	05495150	--	C,T	1969-1975
Middle Fabius River near Monticello	05498000	393	S	1980-1986
North River at Palmyra	05501000	373	C	1972-1975
Mississippi River at Hannibal	05501600	--	C,M	1982-1989
North Fork Salt River near Shelbina	05502500	481	S	1988-1994
North Fork Salt River near Hunnewell	05503500	626	S	1980-1988
Middle Fork Salt River at Paris	05506500	356	S	1980-1997
Salt River near New London	05508000	2,480	C,M,T	1967-1975, 1977-1990
			S	1980-1997
Mississippi River at Alton, IL	05587500	171,500	S	1980-1985, 1986-1989
Mississippi River below Alton, IL	05587550	171,500	C,M	1975-1989
Nodaway River near Oregon	06817800	--	C,M	1968-1975, 1977-1989
Platte River at Platte City	06821200	--	C	1967-1975
Missouri River at Sibley	06894100	--	C,T	1972-1975
Thompson River near Chillicothe	06899620	--	C,M	1968-1975, 1983-1987
East Fork Little Chariton River near Macon	06906200	112	C	1971-1974
Middle Fork L. Chariton R. below Salisbury	06906470	201	C,M	1983-1986
Burge Branch near Arrow Rock	06906600	0.33	S	1961-1964
Lamine River near Blackwater	06908800	2,610	B,C,M,T	1979-1986
Missouri River at Boonville	06909000	505,700	T	1953-1959, 1960-1964
Hinkson Creek at Columbia	06910230	70.2	T	1987-1991
Cedar Creek near Columbia	06910410	44.8	C,M	1987-1991
Cedar Creek near Ashland	06910414	--	C,M	1983-1989
Marais Des Cygnes River near Worland	06916650	3,230	C,M	1962-1963, 1972-1975, 1977-1981
East Fork Drywood Creek at Prairie State Park	06917630	--	C,M	1994-1997
Sac River near Dadeville	06918440	257	C,M,T	1974-1978, 1980-1982, 1983-1987
Stockton Lake near Stockton	06918990	1,160	T	1974-1977
Pomme de Terre River near Hermitage	06921350	615	T	1974-1977
Pomme de Terre River at Hermitage	06921500	615	T	1970-1978
South Grand River at Urich	06921600	670	C,M	1983-1987
South Grand River near Clinton	06921760	1,270	S	1991-1999
West Fork Tebo Creek near Lewis	06922190		C,M	1983-1991
Trib. to Middle Fork Tebo Creek nr Leeton	06922075	--	C	1989-1992
Tebo Creek at Leesville	06922200	--	B,C,M,T	1978-1983
Osage River at Warsaw	06922500	11,500	T	1969-1978
Big Buffalo Creek near Stover	06922800	24.2	T	1965-1977
Big Buffalo Creek at Big Buffalo Wildlife Area	06922850	24.5	C,M	1994-1997
Dousinbury Creek near Wall Street	06923150	39.5	C,M	1993-1997
Niangua River near Windyville	06923250	338	C,M	1991-1995
Bennett Spring at Bennett Springs	06923500	--	C,M	1991-1993
Ha Ha Tonka Spring at Ha Ha Tonka State Park	06924500	--	C,M	1994-1996
Coakley Hollow Spr. Br. at Lake of the Ozarks	06925445	--	C,M	1994-1996
Gasconade River near Hooker	06928600	--	C,M	1977-1986
Missouri River near St. Louis	06935840	--	C,T	1969-1974
Paddy Creek above Slabtown Springs	06929318	338	C,M	1991-1995
Shanghai Spring near Waynesville	06930400		C,M	1994-1997

DISCONTINUED SURFACE-WATER-QUALITY STATIONS--Continued

Station name	Station number	Drainage area (mi^2)	Tye of record	Period of record
Mississippi River at East St. Louis, IL	07001000	--	C	1969-1973
Crooked Creek near Dillard	07013050	--	C	1982-1988
Coonville Creek at St. Francis State Park	07017605		C,M	1993-1997
Meramec River near Eureka	07019000	3,788	C,M	1978-1994
Pickle Creek at Hawn State Park	07020200	--	C,M	1994-1997
Mississippi River at Cape Girardeau	07020850	--	C,T	1969-1974
Headwater Diversion Channel near Allenville	07021800	--	C	1969-1975
Big Creek at Chloride	07036940	--	C	1969-1975, 1983-1990
St. Francis River at St. Francis, AR	07040100	--	C	1969-1975
Little River Ditch 1 near Morehouse	07043500	450	C,M	1996-1997
Little River Ditches near Kennett	07046001	--	C,M	1969-1970, 1972-1973, 1977-1989, 1992-1993
Roaring River at Roaring River State Park	07050152	--	C,M	1991-1993
James River near Nixa	07050750	273	T	1966-1975, 1977-1980
James River near Wilson Creek	07051600	--	C,M	1967-1982, 1983-1987
Wilson Creek near Springfield	07052100	31.4	C,T	1972-1982
Wilson Creek below Springfield	07052150	47.2	C,T	1967-1970, 1970-1972
James River west of Nixa	07052200	440	C	1962-1963, 1965-1967
Finley Creek at Riverdale	07052340	--	C	1967-1975
Double Spring near Dora	07057475	--	C,M	1994-1997
Black River at Poplar Bluff	07063000	1,245	C,M	1983-1987
Black River below Poplar Bluff	07063050	--	C	1969-1975
Main Ditch near Neelyville	07063300	--	C	1969-1975
Middle Fork Little Black River at Grandin	07068250	6.85	T	1980-1984
North Prong Little Black River near Grandin	07068300	39.4	C,M	1980-1984
Little Black River near Grandin	07068380	79.5	C,M,S,T	1980-1984
Logan Creek at Oxly	07068540	37.5	C,M,S,T	1980-1984
Little Black River near Naylor	07068550	--	C	1969-1975
Little Black River at Success, AR	07068600	386	C,M,S,T	1980-1986
Fourche River near Poynor	07068863	87.2	T	1976-1983
Fourche River near Middlebrook, AR	07068867	--	C	1969-1975
Spring River near Thayer	07069170	--	C	1969-1975
Mammoth Spring at Mammoth Spring, AR	07069200	--	C,M	1994-1996
Eleven Point River below Bardley	07071900	--	C	1969-1975
Spring River near Waco	07186000	1,164	C	1965-1975, 1977-1978, 1980-1981
Center Creek near Carterville	07186400	232	C,M	1980-1989
Shoal Creek above Joplin	07187000	427	C,M	1968-1968, 1979-1982
Shoal Creek near Galena, KS	07187560	--	C	1968-1975
Lost Creek at Seneca	07188500	42	C	1967-1975
Little Sugar Creek at Caverna	07188820	--	C	1967-1975
Buffalo Creek at Tiff City	07189100	--	C	1967-1975

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INTRODUCTION

The U.S. Geological Survey, Missouri Water Science Center, in cooperation with local, State, and Federal agencies and organizations, obtains a large quantity of data pertaining to the water resources of Missouri each water year (October 1 to September 30). These data, accumulated during many water years, constitute a valuable data base for developing an improved understanding of the water resources of Missouri. To make these data readily available to interested parties outside the U.S. Geological Survey, the data are published annually in this report series, entitled "WATER RESOURCES DATA - MISSOURI."

Water resources data reported for the 2004 water year for Missouri consists of records of discharge and water quality (physical measurements and chemical concentrations) of streams, lakes, and ground-water levels. Data from selected sites in Nebraska and Kansas, also are included. This volume contains records for water discharge at 174 gaging stations; elevation at 12 lakes and reservoirs; water quality at 108 sampling stations (including 2 lakes); data for 39 crest-stage stations; data for 6 water-quality partial-record stations; and water-level records for 8 ground-water monitoring wells.

Records of discharge and stage of streams, and contents or stage of lakes and reservoirs were first published in a series of U.S. Geological Survey Water-Supply Papers entitled, "Surface Water Supply of the United States." These Water-Supply Papers were in an annual series through September 30, 1960, and then in a 5-year series for 1961-65 and 1966-70. Records of chemical quality, water temperature, and suspended sediment were published from 1941 to 1970 in an annual series of Water-Supply Papers entitled, "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of Water-Supply Papers entitled, "Ground-Water Levels in the United States." Water-Supply Papers are in the libraries of the principal cities in the United States or may be purchased from the U.S. Geological Survey, Information Services, Federal Center, Box 25286, Denver, CO 80225.

For water years 1961 through 1974, streamflow data were released by the U.S. Geological Survey in annual reports on a State-boundary basis. Water-quality records for water years 1964 through 1974 similarly were released either in separate reports or in conjunction with streamflow records.

Beginning with water year 1975, water data for streamflow, water quality, and ground water are published in Survey reports on a State-boundary basis. These reports carry an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report MO-04-1."

For archiving and general distribution, the reports for water years 1971-74 also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the Center Office at the address given on back of the title page or by telephone (573) 308-3667.

COOPERATION

The U.S. Geological Survey and State and local agencies and organizations in Missouri have had cooperative agreements for the systematic collection of streamflow records since 1921, and for water-quality records since 1964. Organizations that assisted in collecting data published in this report through cooperative agreements are:

City of Columbia
City of Perryville
City Utilities of Springfield
Greenway Network
Holt County
Kansas City Water Service Department
Metropolitan St. Louis Sewer Disttrict
Missouri Department of Conservation
Missouri Department of Natural Resources
  Geological Survey and Resource Assessment Division
  Water Protection and Soil Conservation Division
  Water Pollution Control Program
Missouri Department of Transportation

The following Federal agencies and organizations assisted in the collection of data published in this report by providing funds or services:

Ameren UE Company of Missouri
Sho-Me Power Electric Cooperative
U.S. Department of Agriculture
  U.S. Forest Service
U.S. Department of Commerce
  National Oceanic and
    Atmospheric Administration
  National Weather Service
U.S. Department of Defense
  U.S. Army
  U.S. Army Corps of Engineers
U.S. Department of the Interior
  National Park Service
U.S. Fish and Wildlife Service

WATER USE--2000

Listed below are general water-use facts for the state of Missouri. The major water uses and percentage of surface water and ground water for the 2000 calendar year are shown in figure 1.

MISSOURI WATER USE FACT SHEET

1. Total water use in Missouri was 8,240 million gallons per day (Mgal/d).

2. Total population was 5.60 million, an increase of 5.3 percent from 1995.

3. Per capita water use for all uses was 1,470 gallons per person per day.

4. Surface-water withdrawals totalled 6,450 Mgal/d, about 78.3 percent of the total use. The largest use was in the St. Louis and Kansas City metropolitan areas.

5. Ground-water withdrawals totalled 1,790 Mgal/d, about 21.7 percent of total use. The largest ground-water use was for irrigation in southeastern Missouri.

6. The largest overall use of water was for thermoelectric power generation, about 5,640 Mgal/d to produce 76,700 gigawatt-hours of electricity.

7. Surface water accounts for 5,620 Mgal/d (99.8 percent) of the thermoelectric power generation use. About 5,200 Mgal/d of surface water was used by plants with once-through cooling water systems; the remainder was used by plants with recirculating cooling water systems.

8. The largest use of ground water was 1,380 Mgal/d for irrigation. Total irrigation water use was 1,430 Mgal/d.

9. Water withdrawals by public suppliers was 872 Mgal/d; 68.1 percent surface water and 31.9 percent ground water.

10. Domestic water use was 491 Mgal/d; 11 percent self-supplied and 89 percent public-supplied. Per capita domestic water use was 87.8 gallons per person per day.

11. Commercial water use was 87.0 Mgal/d; 14 percent self-supplied and 86 percent public-supplied.

12. Industrial and mining water use was 200 Mgal/d; 40 percent self-supplied and 60 percent public-supplied.

13. Public use and losses were 238 Mgal/d, calculated from the total water withdrawals for public supply minus deliveries to domestic, commercial, industrial, and thermoelectric uses.

14. Non-irrigation agriculture water use was 156 Mgal/d for livestock and aquaculture use. About 83.3 Mgal/d is used for fish farms and in-stream fish hatcheries.

15. Water use for in-stream and off-stream hydroelectric power generation was 10,900 Mgal/d to produce 408 gigawatt-hours of electricity. These values are not included in the withdrawal totals, as the water was left in or returned to the stream with no appreciable losses.

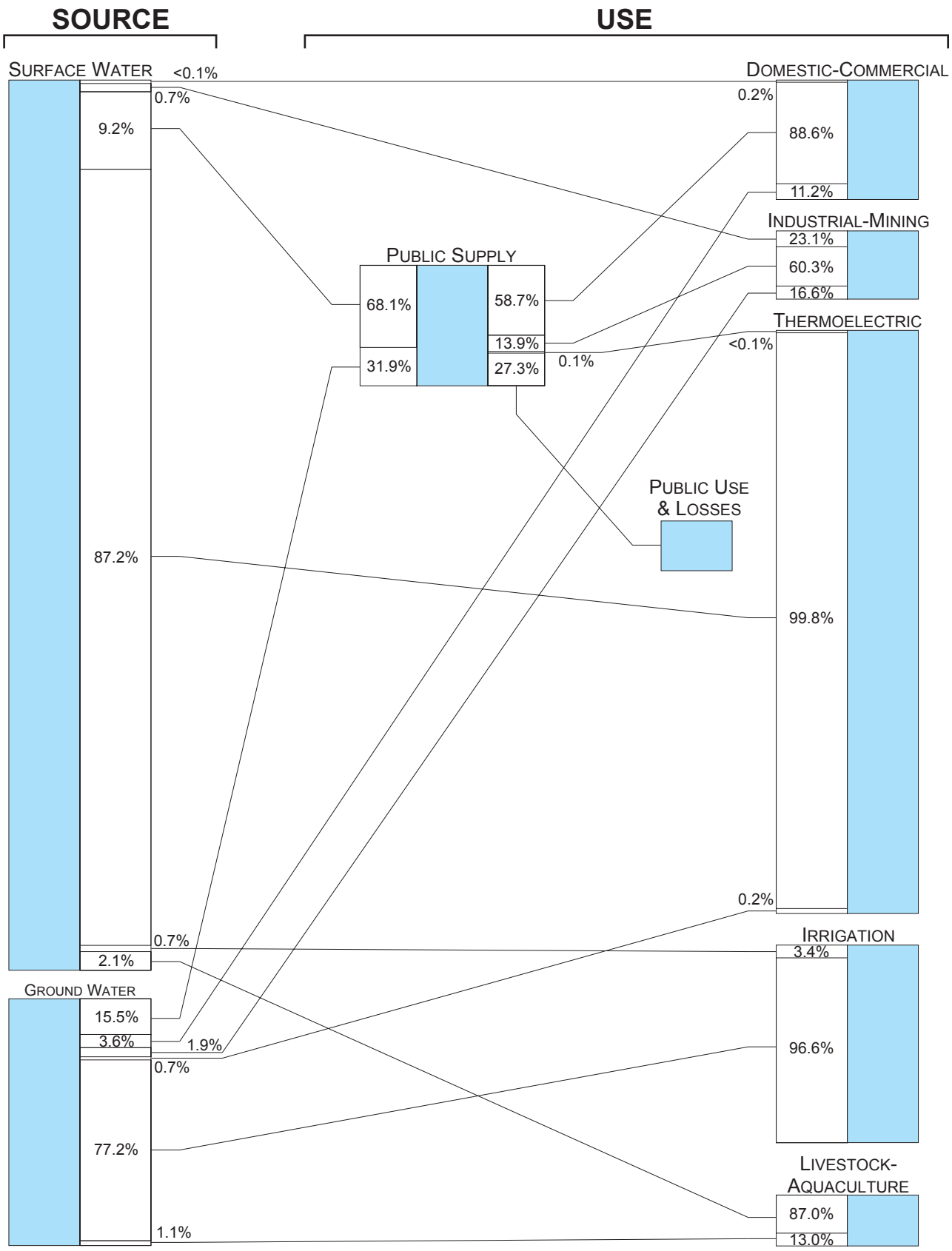


Figure 1. Source and use values and percentages for major offstream water-use categories in Missouri during the 2000 calendar year.

PHYSIOGRAPHY

Missouri has three distinct physiographic areas--the Central Lowland in the north and west, the Mississippi Alluvial Plain in the southeast, and between them the Ozark Plateaus (Figure 2).

The Central Lowland includes most of the area north of the Missouri River and a large area south of the river in the western part of the State. Elevations range from about 450 to 1,000 feet above North American Vertical Datum of 1988. The area has numerous wide, flat valleys incised by rivers.

The Ozark Plateaus in the southern part of the State is wooded, rugged, and has deep, narrow valleys with sharp ridges separating the valleys. Elevations range from about 1,000 to 1,600 feet above North American Vertical Datum of 1988.

The Mississippi Alluvial Plain (Bootheel) is a relatively flat area of about 3,000 square miles in the extreme southeast part of the State. Elevations range from about 200 to 300 feet above North American Vertical Datum of 1988. The area is well drained and contains excellent farmland.

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water--Streamflow

Streamflow varies seasonally in Missouri and often reflects precipitation patterns unless the stream is regulated. Precipitation was was above normal throughout most of the state during November, December, January, March, May, July, and August. Missouri received below normal precipitation during October, February, April, June, and September. September was notably dry with all regions (figure 3) receiving at least 2 inches less than normal rainfall. However, all regions except the West Ozarks and the Bootheel had greater than normal precipitation for the year.

Generally, the 2004 water year mean discharges were greater than long-term mean discharges in south central, southwest, and northwest Missouri and less than long-term mean discharges in eastern Missouri (figure 2). Monthly discharges during the 2004 water year and median of long-term monthly mean discharges at six representative stations are shown in Figure 3.

Peak discharges for the 2004 water year are compared to the peak discharges for the period of record at 14 selected gaging stations in Table 1. The 7-day low flow for the 2004 water year is compared to the 7-day, 2-year low flow and minimum flow for selected stations in Table 2. The 7-day, 2-year low flow is the 7-day minimum flow with a recurrence interval of 2 years.

Table 1: Comparisons of peak discharge for the 2004 water year with those for period of record for selected stations

Station identification		Peak discharge during 2004 water year		Peak discharge for period of record	
		Cubic feet per second	Date	Cubic feet per second	Date
05495000	Fox River at Wayland (1922-2004)	10,900	Aug. 28	26,400	Apr. 22, 1973
05587450	Mississippi River at Grafton, Ill. (1928-2004)	307,000	Jun 5, 6	598,000	Aug. 1, 1993
06893000	Missouri River at Kansas City (1898-2004)	119,000	May 31	573,000	July 14, 1951
06894000	Little Blue River near Lake City (1948-2004)	9,840	May 19	42,300	Aug. 13, 1982
06897500	Grand River near Gallatin (1921-2004)	35,800	Jun 14	89,800	July 7, 1993
06905500	Chariton River near Prairie Hill (1929-2004)	22,700	Aug. 29	37,100	May 13, 2002
06933500	Gasconade River at Jerome (1923-2004)	27,300	April 26	136,000	Dec. 5, 1982
06934500	Missouri River at Hermann (1898-2004)	214,000	Mar. 7	750,000	July 31, 1993
07010000	Mississippi River at St. Louis (1861-2004)	463,000	May 29	1,080,000	Aug. 1, 1993
07019000	Meramec River near Eureka (1922-2004)	25,800	Mar. 7	145,000	Dec. 6, 1982
07022000	Mississippi River at Thebes, Ill. (1933-2004)	504,000	May 31	996,000	Aug. 7, 1993
07057500	North Fork River near Tecumseh (1945-2004)	27,800	April 24	133,000	Nov. 19, 1985
07068000	Current River at Doniphan (1919-2004)	33,000	Nov. 20	122,000	Dec. 3, 1982
07186000	Spring River near Waco (1924-2004)	18,200	Mar. 5	151,000	Sept. 26, 1993

Table 2.--Comparisons of 2004 7-day low flows to 7-day, 2-year low flows and minimum flows for the period of record for selected stations

[Flows in cubic feet per second]

Station identification and period of record used (water years)	7-day low flows		Minimum flows for period of record used	
	2004	2-year[1]	Discharge	Years of occurrence
05495000 Fox River at Wayland (1922-97)	7.7	1.3	0	Several years
06820500 Platte River near Agency (1933-97)	8.5	17	0	Several years
06921070 Pomme de Terre River near Polk (1969-97)	3.4	3.0	0.3	1980
07016500 Bourbeuse River at Union (1921-97)	29	32	11	1957
07067000 Current River at Van Buren (1912-97)	674	700	473	1957
07187000 Shoal Creek above Joplin (1942-97)	62	92	12	1954

[1] Skelton, John, 1976, Missouri stream and springflow characteristics--Low-flow frequency and flow duration: Rolla, Missouri Division of Geology and Land Survey Water Resources Report 32, 76 p.

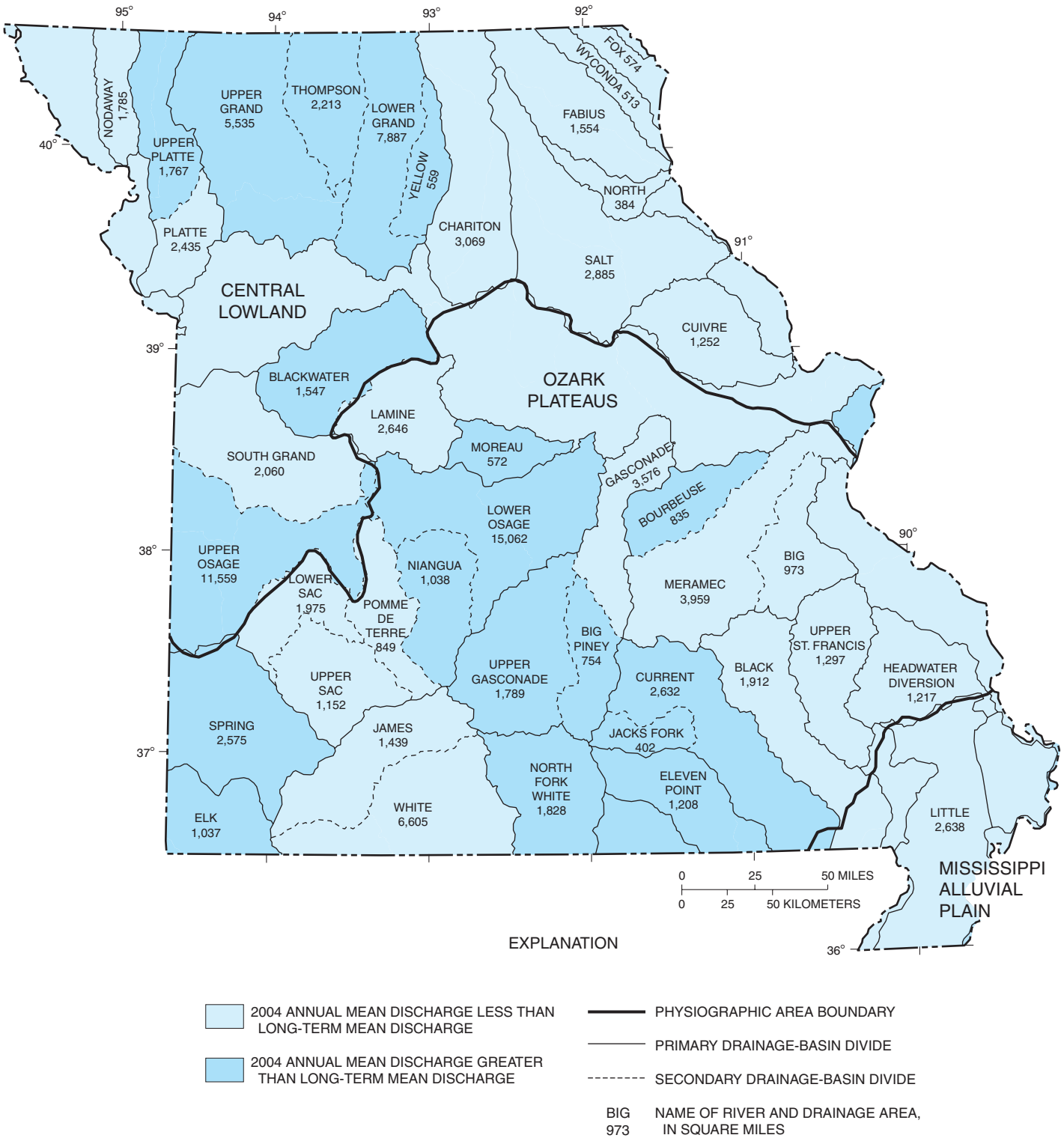
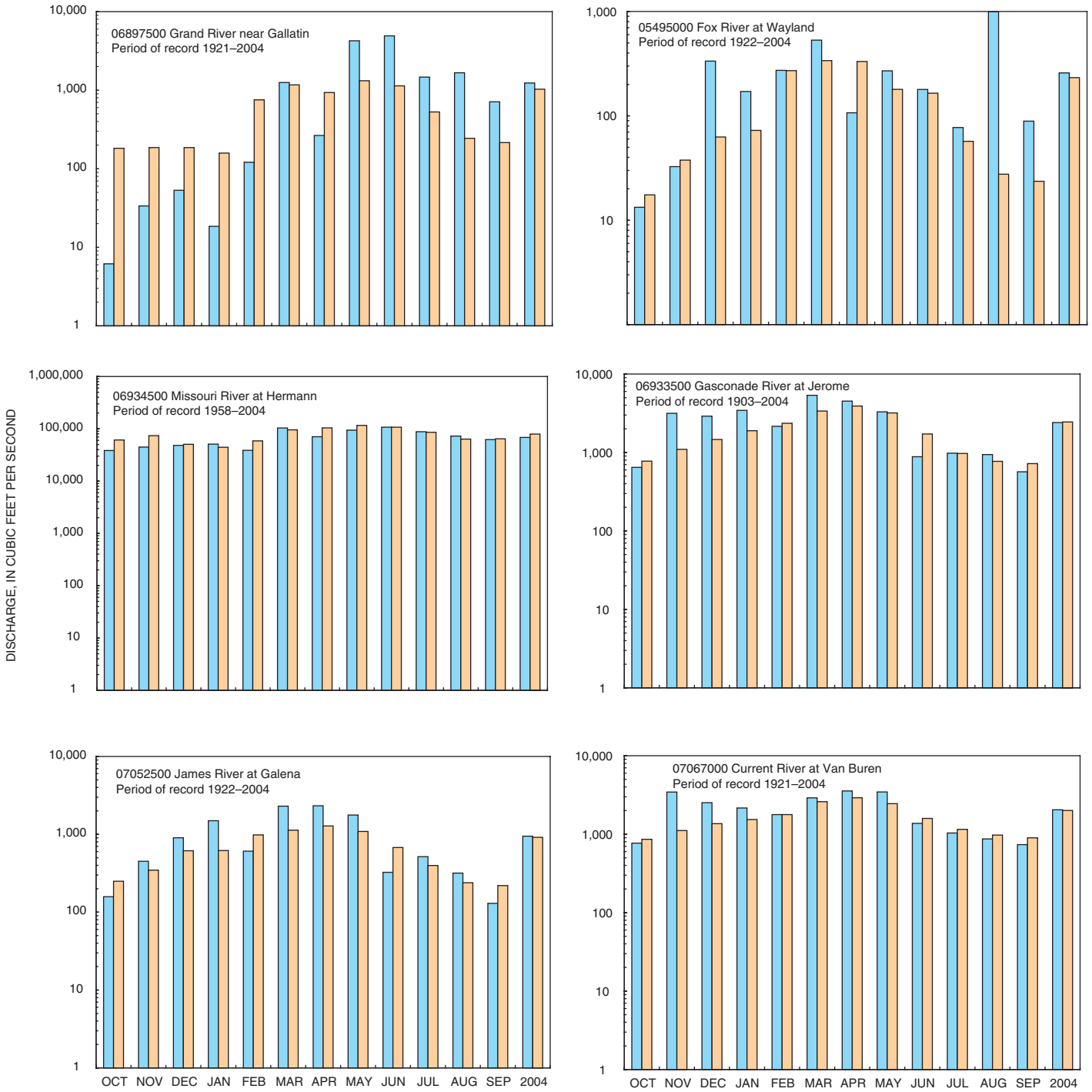


Figure 2. Major drainage basins, physiographic areas, and areas of mean discharge during the 2004 water year.



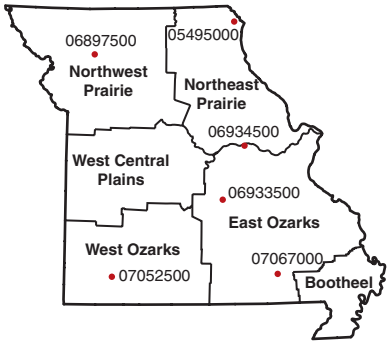


Figure 3. Comparison of 2004 water-year mean discharge to period of record median discharge at six representative gaging stations.

Surface-Water-Quality

Samples for determining the chemical quality of streamflow were collected at 108 stations in Missouri. Data collected at these stations, in addition to streamflow data, include some or all of the following properties or constituents: water temperature, specific conductance, dissolved oxygen, pH, carbonate, bicarbonate, alkalinity, major ions, nutrients, trace elements, indicator bacteria, sediment, and pesticides.

Missouri streams generally are not contaminated by industrial wastes. Localized contamination may occur near urban areas, industrialized centers, agricultural-chemical-use areas, and waste-dump sites.

Table 3.--Comparison of range of dissolved-solids concentrations in selected streams for the 2004 water year with those for period of record.

Station identification and Period of Record	Dissolved-solids concentration (milligrams per liter)			
	2004 Water Year		Period of Record	
	Minimum	Maximum	Minimum	Maximum
05514500 Cuivre River near Troy (1983-2004)	207	230	77	276
06818000 Missouri River at St. Joseph (1970-2004)	460	483	217	592
06902000 Grand River near Sumner (1967-2004)	147	286	72	456
06926510 Osage River below St. Thomas (1975-2004)	150	194	113	274
06930800 Gasconade River above Jerome (1978-2004)	138	181	82	222
06934500 Missouri River at Hermann (1969-2004)	218	433	154	636
07019280 Meramec River at Paulina Hills (1963-75, 1981-2004)	116	323	85	323

Daily suspended-sediment samples and data on the particle size of suspended sediment were collected at four stations in Missouri. At three Missouri River stations, point suspended-sediment samples and particle-size data were collected periodically.

The following table lists two selected stations on the Mississippi River at Grafton and Thebes, Ill. and their minimum and maximum daily mean suspended-sediment concentrations during water year.

Table 4.--Comparison of minimum and maximum daily mean suspended-sediment concentrations at two selected stations for the 2004 water year with those for period of record.

Station identification and Period of Record	Daily mean suspended-sediment concentration (milligrams per liter)			
	2004 Water Year		Period of Record	
	Minimum	Maximum	Minimum	Maximum
05587455 Mississippi River below Grafton, IL (1989-2004)	54	790	1	1,910
07022000 Mississippi River at Thebes, IL (1981-2004)	69	1,300	13	3,890

SPECIAL NETWORKS AND PROGRAMS

Hydrologic Benchmark Network is a network of 61 sites in small drainage basins in 39 States that was established in 1963 to provide consistent streamflow data representative of undeveloped watersheds nationwide, and from which data could be analyzed on a continuing basis for use in comparison and contrast with conditions observed in basins more obviously affected by human activities. At selected sites, water-quality information is being gathered on major ions and nutrients, primarily to assess the effects of acid deposition on stream chemistry. Additional information on the Hydrologic Benchmark Program may be accessed from *http://water.usgs.gov/hbn*.

National Stream-Quality Accounting Network (NASQAN) is a network of sites used to monitor the water quality of large rivers within the Nation's largest river basins. From 1995 through 1999, a network of approximately 40 stations was operated in the Mississippi, Columbia, Colorado, and Rio Grande River basins. For the period 2000 through 2004, sampling was reduced to a few index stations in each main river basin. Samples are collected with sufficient frequency that the flux of a wide range of constituents can be estimated. The objective of NASQAN is to characterize the water quality of these large rivers by measuring concentration and mass transport of a wide range of dissolved and suspended constituents, including nutrients, major ions, dissolved and sediment-bound trace elements, common pesticides, and inorganic and organic forms of carbon. This information will be used (1) to describe the long-term trends and changes in concentration and transport of these constituents; (2) to test findings of the National Water-Quality Assessment (NAWQA) Program; (3) to characterize processes unique to large-river systems such as storage and re-mobilization of sediments and associated contaminants; and (4) to refine existing estimates of off-continent transport of water, sediment, and chemicals for assessing human effects on the world's oceans and for determining global cycles of carbon, nutrients, and other chemicals. Additional information about the NASQAN Program may be accessed from *http://water.usgs.gov/nasqan/*

The Ambient Water-Quality Network (AWQN) is a statewide data-collection network designed by both the U.S. Geological Survey and the Missouri Department of Natural Resources to meet many of the information needs of State agencies and other groups involved in Statewide water-quality planning and management. There are currently 66 member stations within this network. Each station has been assigned a U.S. Geological Survey downstream order number under which all data are stored in NWIS (the U.S. Geological Survey national water-quality data base). The objectives of AWQN are (1) to obtain information on the quality and quantity of water moving within the State; (2) provide for a historical data base of water-quality information that can be used by State planning and management agencies to make informed decisions about cultural impacts on the State's surface waters; and (3) provide for consistent methodology in data collection, laboratory analysis, and data reporting.

Additional information about the AWQN Program may be accessed from *http://mo.water.usgs.gov*

The Jacks Fork Water-Quality Monitoring Network is a data-collection network designed by both the U.S. Geological Survey and the National Park Service to better understand the extent and sources of microbiological contamination within the Jacks Fork. This contamination has resulted in the inclusion of an 8-mile reach of the Jacks Fork on Missouri's list of impaired waters as required by Section 303(d) of the Federal Clean Water Act. These data will provide the National Park Service and the State of Missouri with the information needed to craft a solution of abatement, regulation, prevention, and mitigation for the Jacks Fork.

The Metropolitan St. Louis Sewer District Network (MSD) is a data-collection network designed by both the U.S. Geological Survey and the Metropolitan St. Louis Sewer District to develop a baseline of stream stage, discharge, and water-quality data for several subbasins within the MSD jurisdictional area. These data will be used by MSD engineers to develop stormwater management strategies that will address concerns resulting from the U.S. Environmental Protection Agency's issuance of the Phase II stormwater regulations. There are currently 33 member stations within this network.

The National Atmospheric Deposition Program/National Trends Network (NADP/NTN) is a network of monitoring sites that provide continuous measurement and assessment of the chemical constituents in precipitation throughout the United States. As the lead Federal agency, the USGS works together with over 100 organizations to provide a long-term, spatial and temporal record of atmospheric deposition generated from this network of 250 precipitation-chemistry monitoring sites. The USGS supports 74 of these 250 sites. This long-term, nationally consistent monitoring program, coupled with ecosystem research, provides critical information toward a national scorecard to evaluate the effectiveness of ongoing and future regulations intended to reduce atmospheric emissions and subsequent impacts to the Nation's land and water resources. Reports and other information on the NADP/NTN Program, as well as data from the individual sites, may be accessed from *http://bqs.usgs.gov/acidrain/*

The National Water-Quality Assessment (NAWQA) Program is a long-term program with goals to describe the status and trends of water-quality conditions for a large, representative part of the Nation's ground- and surface-water resources; to provide an improved understanding of the primary natural and human factors affecting these observed conditions and trends; and to provide information that supports development and evaluation of management, regulatory, and monitoring decisions by other agencies.

Assessment activities are being conducted in 42 study units (major watersheds and aquifer systems) that represent a wide range of environmental settings nationwide and that account for a large percentage of the Nation's water use. A wide array of chemical constituents is measured in ground water, surface water, streambed sediments, and fish tissues. The coordinated application of comparative hydrologic studies at a wide range of spatial and temporal scales will provide information for water-resources managers to use in making decisions and a foundation for aggregation and comparison of findings to address water-quality issues of regional and national interest.

Communication and coordination between USGS personnel and other local, State, and Federal interests are critical components of the NAWQA Program. Each study unit has a local liaison committee consisting of representatives from key Federal, State, and local water-resources agencies, Indian nations, and universities in the study unit. Liaison committees typically meet semiannually to discuss their information needs, monitoring plans and progress, desired information products, and opportunities to collaborate efforts among the agencies. Additional information about the NAWQA Program may be accessed from *http://water.usgs.gov/nawqa/*.

The USGS National Streamflow Information Program (NSIP) is a long-term program with goals to provide framework streamflow data across the Nation. Included in the program are creation of a permanent Federally funded streamflow network, research on the nature of streamflow, regional assessments of streamflow data and databases, and upgrades in the streamflow information delivery systems. Additional information about NSIP may be accessed from *http://water.usgs.gov/nsip/*.

Radiochemical Programs is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

EXPLANATION OF THE RECORDS

The surface- and ground-water records published in this report are for the water year that began October 1, 2003, and ended September 30, 2004. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, and water-quality data for the surface water. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

Station Identification Numbers

Each data station, whether stream site or well, in this report is assigned a unique identification number. This number is unique in that it applies specifically to a given station and to no other. The number usually is assigned when a station is first established and is retained for that station indefinitely. The system used by the U.S. Geological Survey to assign identification numbers for surface-water stations and for ground-water sites will differ, but both are based on geographic location. The "downstream order" system is used for regular surface-water stations and the "latitude-longitude" system is used for wells and, in Missouri, for surface-water stations where only miscellaneous measurements are made.

Downstream Order and Station Number

Since October 1, 1950, hydrologic-station records in USGS reports have been listed in order of downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary entering between two main-stream stations is listed between those stations. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is located with respect to the stream to which it is immediately tributary is indicated by an indention in that list of stations in the front of this report. Each indentation represents one rank. This downstream order and system of indentation indicates which stations are on tributaries between any two stations and the rank of the tributary on which each station is located.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These station numbers are in the same downstream order used in this report. In assigning a station number, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list composed of both types of stations. Gaps are consecutive. The complete 8-digit (or 10-digit) number for each station such as 09004100, which appears just to the left of the station name, includes a 2-digit part number "09" plus the 6-digit (or 8-digit) downstream order number "004100." In areas of high station density, an additional two

digits may be added to the station identification number to yield a 10-digit number. The stations are numbered in downstream order as described above between stations of consecutive 8-digit numbers.

Numbering System for Wells and Miscellaneous Sites

The USGS well and miscellaneous site-numbering system is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, and the next 7 digits denote degrees, minutes, and seconds of longitude; the last 2 digits are a sequential number for wells within a 1-second grid. In the event that the latitude-longitude coordinates for a well and miscellaneous site are the same, a sequential number such as "01," "02," and so forth, would be assigned as one would for wells (see fig. 4). The 8-digit, downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

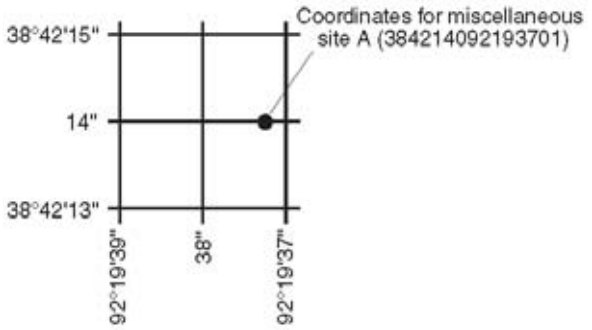


Figure 4. System for numbering miscellaneous sites (latitude and longitude).

EXPLANATION OF STAGE- AND WATER-DISCHARGE RECORDS

Data Collection and Computation

The base data collected at gaging stations (fig. 6) consist of records of stage and measurements of discharge of streams or canals, and stage, surface area, and volume of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Records of stage are obtained from a water-stage recorder that is either downloaded electronically in the field to a laptop computer or similar device or is transmitted using telemetry such as GOES satellite, land-line or cellular-phone modems, or by radio transmission. Measurements of discharge are made with a current meter or acoustic doppler current profiler, using the general methods adopted by the USGS. These methods are described in standard textbooks, USGS Water-Supply Paper 2175, and the Techniques of Water-Resources Investigations of the United States Geological Survey (TWRIs), Book 3, Chapters A1 through A19 and Book 8, Chapters A2 and B2. The methods are consistent with the American Society for Testing and Materials (ASTM) standards and generally follow the standards of the International Organization for Standards (ISO).

For stream-gaging stations, discharge-rating tables for any stage are prepared from stage-discharge curves. If extensions to the rating curves are necessary to express discharge greater than measured, the extensions are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, or computation of flow over dams and weirs), step-backwater techniques, velocity-area studies, and logarithmic plotting. The daily mean discharge is computed from gage heights and rating tables, then the monthly and yearly mean discharges are computed from the daily values. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features of the stream channel, the daily mean discharge is computed by the shifting-control method in which correction factors based on individual discharge measurements and notes by engineers and observers are used when applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the controlling section, the daily mean discharge is computed by the shifting-control method.

The stage-discharge relation at some stream-gaging stations is affected by backwater from reservoirs, tributary streams, or other sources. Such an occurrence necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage at some distance from the base gage.

An index velocity is measured using ultrasonic or acoustic instruments at some stream-gaging stations and this index velocity is used to calculate an average velocity for the flow in the stream. This average velocity along with a stage-area relation is then used to calculate average discharge.

At some stations, the stage-discharge relation is affected by changing stage. At these stations, the rate of change in stage is used as a factor in computing discharge.

At some stream-gaging stations in the northern United States, the stage-discharge relation is affected by ice in the winter; therefore, computation of the discharge in the usual manner is impossible. Discharge for periods of ice effect is computed on the basis of gage-height record and occasional winter-discharge measurements. Consideration is given to the available information on temperature and precipitation, notes by gage observers and hydrologists, and comparable records of discharge from other stations in the same or nearby basins.

For a lake or reservoir station, capacity tables giving the volume or contents for any stage are prepared from stage-area relation curves defined by surveys. The application of the stage to the capacity table gives the contents, from which the daily, monthly, or yearly changes are computed.

If the stage-capacity curve is subject to changes because of deposition of sediment in the reservoir, periodic resurveys of the reservoir are necessary to define new stage-capacity curves. During the period between reservoir surveys, the computed contents may be increasingly in error due to the gradual accumulation of sediment.

For some stream-gaging stations, periods of time occur when no gage-height record is obtained or the recorded gage height is faulty and cannot be used to compute daily discharge or contents. Such a situation can happen when the recorder stops or otherwise fails to operate properly, the intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are

estimated on the basis of recorded range in stage, prior and subsequent records, discharge measurements, weather records, and comparison with records from other stations in the same or nearby basins. Likewise, lake or reservoir volumes may be estimated on the basis of operator's log, prior and subsequent records, inflow-outflow studies, and other information.

Data Presentation

The records published for each continuous-record surface-water discharge station (stream-gaging station) consist of five parts: (1) the station manuscript or description; (2) the data table of daily mean values of discharge for the current water year with summary data; (3) a tabular statistical summary of monthly mean flow data for a designated period, by water year; (4) a summary statistics table that includes statistical data of annual, daily, and instantaneous flows as well as data pertaining to annual runoff, 7-day low-flow minimums, and flow duration; and (5) a hydrograph of discharge.

Station manuscript

The manuscript provides, under various headings, descriptive information, such as station location; period of record; historical extremes outside the period of record; record accuracy; and other remarks pertinent to station operation and regulation. The following information, as appropriate, is provided with each continuous record of discharge or lake content. Comments follow that clarify information presented under the various headings of the station description.

LOCATION.—Location information is obtained from the most accurate maps available. The location of the gaging station with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA.—Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD.—This term indicates the time period for which records have been published for the station or for an equivalent station. An equivalent station is one that was in operation at a time that the present station was not and whose location was such that its flow reasonably can be considered equivalent to flow at the present station.

REVISED RECORDS.—If a critical error in published records is discovered, a revision is included in the first report published following discovery of the error.

GAGE.—The type of gage in current use, the datum of the current gage referred to a standard datum, and a condensed history of the types, locations, and datums of previous gages are given under this heading.

REMARKS.—All periods of estimated daily discharge either will be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily discharge table. (See section titled Identifying Estimated Daily Discharge.) Information is presented relative to the accuracy of the records, to special methods of computation, and to conditions that affect natural flow at the station. In addition, information may be presented pertaining to average discharge data for the period of record; to extremes data for the period of record and the current year; and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, the outlet works and spillway, and the purpose and use of the reservoir.

COOPERATION.—Records provided by a cooperating organization or obtained for the USGS by a cooperating organization are identified here.

EXTREMES OUTSIDE PERIOD OF RECORD.—Information here documents major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the USGS.

REVISIONS.—Records are revised if errors in published records are discovered. Appropriate updates are made in the USGS distributed data system, NWIS, and subsequently to its Web-based National data system, NWISWeb (*http://water.usgs.gov/nwis/nwis*). Users are encouraged to obtain all required data from NWIS or NWISWeb to ensure that they have the most recent data updates. Updates to NWISWeb are made on an annual basis.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because no current or, possibly, future station manuscript would be published for these stations to document the revision in a REVISED RECORDS entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the Center office (address given on the back of the title page of this report) to determine if the published records were revised after the station was discontinued. If, however, the data for a discontinued station were obtained by computer retrieval, the data would be current. Any published revision of data is always accompanied by revision of the corresponding data in computer storage.

Manuscript information for lake or reservoir stations differs from that for stream stations in the nature of the REMARKS and in the inclusion of a stage-capacity table when daily volumes are given.

Data table of daily mean values

The daily table of discharge records for stream-gaging stations gives mean discharge for each day of the water year. In the monthly summary for the table, the line headed TOTAL gives the sum of the daily figures for each month; the line headed MEAN gives the arithmetic average flow in cubic feet per second for the month; and the lines headed MAX and MIN give the maximum and minimum daily mean discharges, respectively, for each month. Discharge for the month is expressed in inches (line headed IN) Values for runoff in inches may be omitted if extensive regulation or diversion is in effect or if the drainage area includes large noncontributing areas. At some stations, monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversion data or reservoir volumes are given. These values are identified by a symbol and a corresponding footnote.

Statistics of monthly mean data

A tabular summary of the mean (line headed "MEAN"), maximum (line headed "MAX"), and minimum (line headed "MIN") of monthly mean flows for each month for a designated period is provided below the mean values table. The water years of the first occurrence of the maximum and minimum monthly flows are provided immediately below those figures. The designated period will be expressed as "FOR PERIOD OF RECORD, BY WATER YEAR (WY)," and will list the

first and last water years of the range of years selected from the "PERIOD OF RECORD" paragraph in the station manuscript. It will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript.

Summary statistics

A table titled SUMMARY STATISTICS follows the statistics of monthly mean data tabulation. This table consists of four columns with the first column containing the line headings of the statistics being reported. The table provides a statistical summary of yearly, daily, and instantaneous flows, not only for the current water year but also for the previous calendar year and for a designated period, as appropriate. The designated period selected, WATER YEARS __-__, will consist of all of the station records within the specified water years, including complete months of record for partial water years, and may coincide with the period of record for the station. The water years for which the statistics are computed are consecutive, unless a break in the station record is indicated in the manuscript. All of the calculations for the statistical characteristics designated ANNUAL (see line headings below), except for the ANNUAL 7-DAY MINIMUM statistic, are calculated for the designated period using complete water years. The other statistical characteristics may be calculated using partial water years.

The date or water year, as appropriate, of the first occurrence of each statistic reporting extreme values of discharge is provided adjacent to the statistic. Repeated occurrences may be noted in the REMARKS paragraph of the manuscript or in footnotes. Because the designated period may not be the same as the station period of record published in the manuscript, occasionally the dates of occurrence listed for the daily and instantaneous extremes in the designated-period column may not be within the selected water years listed in the heading. When the dates of occurrence do not fall within the selected water years listed in the heading, it will be noted in the REMARKS paragraph or in footnotes. Selected streamflow duration-curve statistics and runoff data also are given. Runoff data may be omitted if extensive regulation or diversion of flow is in effect in the drainage basin.

The following summary statistics data are provided with each continuous record of discharge. Comments that follow clarify information presented under the various line headings of the SUMMARY STATISTICS table.

ANNUAL TOTAL.—The sum of the daily mean values of discharge for the year.

ANNUAL MEAN.—The arithmetic mean for the individual daily mean discharges for the year noted or for the designated period.

HIGHEST ANNUAL MEAN.—The maximum annual mean discharge occurring for the designated period.

LOWEST ANNUAL MEAN.—The minimum annual mean discharge occurring for the designated period.

HIGHEST DAILY MEAN.—The maximum daily mean discharge for the year or for the designated period.

LOWEST DAILY MEAN.—The minimum daily mean discharge for the year or for the designated period.

ANNUAL 7-DAY MINIMUM.—The lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date of the 7-day period. This value should not be confused with the 7-day 10-year low-flow statistic.

MAXIMUM PEAK FLOW.—The maximum instantaneous peak discharge occurring for the water year or designated period. Occasionally the maximum flow for a year may occur at midnight at the beginning or end of the year, on a recession from or rise toward a higher peak in the adjoining year. In this case, the maximum peak flow is given in the table and the maximum flow may be reported in a footnote or in the REMARKS paragraph in the manuscript.

MAXIMUM PEAK STAGE.—The maximum instantaneous peak stage occurring for the water year or designated period. Occasionally the maximum stage for a year may occur at midnight at the beginning or end of the year, on a recession from or rise toward a higher peak in the adjoining year. In this case, the maximum peak stage is given in the table and the maximum stage may be reported in the REMARKS paragraph in the manuscript or in a footnote. If the dates of occurrence of the maximum peak stage and maximum peak flow are different, the REMARKS paragraph in the manuscript or a footnote may be used to provide further information.

INSTANTANEOUS LOW FLOW.—The minimum instantaneous discharge occurring for the water year or for the designated period.

ANNUAL RUNOFF.—Indicates the total quantity of water in runoff for a drainage area for the year. Data reports may use any of the following units of measurement in presenting annual runoff data:

Inches (INCHES) indicate the depth to which the drainage area would be covered if all of the runoff for a given time period were uniformly distributed on it.

10 PERCENT EXCEEDS.—The discharge that has been exceeded 10 percent of the time for the designated period.

50 PERCENT EXCEEDS.—The discharge that has been exceeded 50 percent of the time for the designated period.

90 PERCENT EXCEEDS.—The discharge that has been exceeded 90 percent of the time for the designated period.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first table lists annual maximum stage and discharge at crest-stage stations, and the second table lists discharge measurements at low-flow partial-record stations. The tables

of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are often made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for a special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified. This identification is shown either by flagging individual daily values with the letter "e" and noting in a table footnote, "e–Estimated," or by listing the dates of the estimated record in the REMARKS paragraph of the station description

Accuracy of Data and Computed Results

The accuracy of streamflow data depends primarily on (1) the stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretations of records.

The degree of accuracy of the records is stated in the REMARKS in the station description. "Excellent" indicates that about 95 percent of the daily discharges are within 5 percent of the true value; "good" within 10 percent; and "fair," within 15 percent. "Poor" indicates that daily discharges have less than "fair" accuracy. Different accuracies may be attributed to different parts of a given record.

Values of daily mean discharge in this report are shown to the nearest hundredth of a cubic foot per second for discharges of less than 1 ft^3/s; to the nearest tenths between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1,000 ft^3/s; and to 3 significant figures above 1,000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharge values listed for partial-record stations.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, values of cubic feet per second per square mile and of runoff in inches are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

Other Data Records Available

Information of a more detailed nature than that published for most of the stream-gaging stations such as discharge measurements, gage-height records, and rating tables is available from the Center office. Also, most stream-gaging station records are available in computer-usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the Center office (see address that is shown on the back of the title page of this report

EXPLANATION OF SURFACE-WATER-QUALITY RECORDS

Collection and Examination of Data

Surface-water samples for analysis usually are collected at or near stream-gaging stations. The quality-of-water records are given immediately following the discharge records at these stations.

The descriptive heading for water-quality records gives the period of record for all water-quality data; the period of daily record for parameters that are measured on a daily basis (specific conductance, water temperature, sediment discharge, and so forth); extremes for the current year; and general remarks.

For ground-water records, no descriptive statements are given; however, the well number, depth of well, sampling date, or other pertinent data are given in the table containing the chemical analyses of the ground water.

Water Analysis

Most of the methods used for collecting and analyzing water samples are described in the TWRIs which may be accessed from *http://water.usgs.gov/pubs/twri/.*

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross-section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled at several verticals to obtain a representative sample needed for an accurate mean concentration and for use in calculating load.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily mean, maximum, and minimum values for each constituent measured, and are based on 15-minute or 1-hour intervals of recorded data beginning at 0000 hours and ending at 2400 hours for the day of record.

Records of Surface-Water Quality

Records of surface-water quality ordinarily are obtained at or near stream-gaging stations because discharge data is useful in the interpretation of surface-water quality. Records of surface-water quality in this report involve a variety of types of data and measurement frequencies.

Classification of Records

Water-quality data for surface-water sites are grouped into one of three classifications. A *continuous-record station* is a site where data are collected on a regularly scheduled basis. Frequency may be one or

more times daily, weekly, monthly, or quarterly. A *partial-record station* is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A *miscellaneous sampling site* is a location other than a continuous- or partial-record station, where samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between *continuous records* as used in this report and *continuous recordings* that refer to a continuous graph or a series of discrete values recorded at short intervals. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report are shown in figure 7.

Accuracy of the Records

One of four accuracy classifications is applied for measured physical properties at continuous-record stations on a scale ranging from poor to excellent. The accuracy rating is based on data values recorded before any shifts or corrections are made. Additional consideration also is given to the amount of publishable record and to the amount of data that have been corrected or shifted.

Table 5.--Rating classifications for continuous water-quality records

[≤, less than or equal to; ±, plus or minus value shown; °C, degree Celsius; >, greater than; %, percent; mg/L, milligram per liter; pH unit, standard pH unit]

Measured physical property	Rating			
	Excellent	Good	Fair	Poor
Water temperature	≤ ±0.2 °C	> ±0.2 to 0.5 °C	> ±0.5 to 0.8 °C	> ±0.8 °C
Specific conductance	≤ ±3%	> ±3 to 10%	> ±10 to 15%	> ±15%
Dissolved oxygen	≤ ±0.3 mg/L	> ±0.3 to 0.5 mg/L	> ±0.5 to 0.8 mg/L	> ±0.8 mg/L
pH	≤ ±0.2 unit	> ±0.2 to 0.5 unit	> ±0.5 to 0.8 unit	> ±0.8 unit
Turbidity	≤ ±5%	> ±5 to 10%	> ±10 to 15%	> ±15%

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the table of discharge measurements at miscellaneous sites.

On-site Measurements and Sample Collection

In obtaining water-quality data, a major concern is assuring that the data obtained represent the naturally occurring quality of the water. To ensure this, certain measurements, such as water temperature, pH, and dissolved oxygen, must be made on site when the samples are taken. To assure that measurements made in the laboratory also represent the naturally occurring water, carefully prescribed procedures must be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for on-site measurements and for collecting, treating, and shipping samples are given in TWRIs Book 1, Chapter D1 and D2; and Book 9, Chapters A1-A9. Most of the methods used for collecting and analyzing water samples are described in the TWRIs, which may be accessed from *http://water.usgs.gov/pubs/twri/*. Also, detailed information on collecting, treating, and shipping samples can be obtained from the USGS Missouri Water Science Center office (see address that is shown on the back of title page in this report).

Water Temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at the time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, mean, maximum, and minimum temperatures for each day are published. Water temperatures measured at the time of water-discharge measurements are on file in the Missouri Water Science Center office.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross section.

During periods of rapidly changing flow or rapidly changing concentration, samples may be collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily discharges of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples are collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observation, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of suspended-sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

Laboratory Measurements

Samples for biochemical oxygen demand (BOD) and indicator bacteria are analyzed locally. All other samples are analyzed in the USGS laboratory in Lakewood, Colorado, unless otherwise noted. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chapter C1. Methods used by the USGS laboratories are given in the TWRIs, Book 1, Chapter D2; Book 3, Chapter C2; and Book 5, Chapters A1, A3, and A4. The TWRI publications may be accessed from *http://water.usgs.gov/pubs/twri/*. These methods are consistent with ASTM standards and generally follow ISO standards.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved oxygen, and suspended sediment then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. The following information is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.—See Data Presentation information in the EXPLANATION OF STAGE- AND WATER-DISCHARGE RECORDS section of this report (same comments apply).

DRAINAGE AREA.—See Data Presentation information in the EXPLANATION OF STAGE- AND WATER-DISCHARGE RECORDS section of this report (same comments apply).

PERIOD OF RECORD.—This indicates the time periods for which published water-quality records for the station are available. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.—Information on instrumentation is given only if a water-quality monitor temperature record, sediment pumping sampler, or other sampling device is in operation at a station.

REMARKS.—Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.—Records provided by a cooperating organization or obtained for the USGS by a cooperating organization are identified here.

EXTREMES.—Maximums and minimums are given only for parameters measured daily or more frequently. For parameters measured weekly or less frequently, true maximums or minimums may not have been obtained. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.—Records are revised if errors in published water-quality records are discovered. Appropriate updates are made in the USGS distributed data system, NWIS, and subsequently to its Web-based National data system, NWISWeb (*http://waterdata.usgs.gov/nwis*). Users of USGS water-quality data are encouraged to obtain all required data from NWIS or NWISWeb to ensure that they have the most recent updates. Updates to the NWISWeb are made on an annual basis.

The surface-water-quality records for partial-record stations and miscellaneous sampling sites are published in separate tables following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following codes may appear with the water-quality data in this report:

PRINTED OUTPUT	REMARK CODE
>	Greater than
<	Less than
e	Estimated discharge
E	Estimated value
M	Presence verified, not quantified
S	Most probable value
U	Analyzed for, not detected

VALUE QUALIFIER CODE	
a	Value was extrapolated above
b	Value was extrapolated below
d	Diluted sample: method hi range exceeded
f	Sample field preparation problem
i	Result may be affected by interference
k	Counts outside acceptable range
n	Below the LRL and above the LT-MDL
@	Holding time exceeded

NULL VALUE QUALIFIER CODE	
b	Sample broken in shipment
c	Sample lost in lab
e	Required equipment not functional/available
r	Sample ruined in preparation
u	Unable to determine-matrix interference

Water Quality-Control Data

The USGS National Water Quality Laboratory (NWQL) collects quality-control data on a continuing basis to evaluate selected analytical methods to determine long-term method detection levels (LT-MDLs) and laboratory reporting levels (LRLs). These values are re-evaluated each year on the basis of the most recent quality-control data and, consequently, may change from year to year.

This reporting procedure limits the occurrence of false positive error. Falsely reporting a concentration greater than the LT-MDL for a sample in which the analyte is not present is 1 percent or less. Application of the LRL limits the occurrence of false negative error. The chance of falsely reporting a non-detection for a sample in which the analyte is present at a concentration equal to or greater than the LRL is 1 percent or less.

Accordingly, concentrations are reported as less than LRL for samples in which the analyte was either not detected or did not pass identification. Analytes detected at concentrations between the LT-MDL and the LRL and that pass identification criteria are estimated. Estimated concentrations will be noted with a remark code of "E." These data should be used with the understanding that their uncertainty is greater than that of data reported without the E remark code.

Data generated from quality-control (QC) samples are a requisite for evaluating the quality of the sampling and processing techniques as well as data from the actual samples themselves. Without QC data, environmental sample data cannot be adequately interpreted because the errors associated with the sample data are unknown. The various types of QC samples collected by this Missouri Water Science Center are described in the following section. Procedures have been established for the storage of water-quality-control data within the USGS. These procedures allow for storage of all derived QC data and are identified so that they can be related to corresponding environmental samples.

Blank Samples

Blank samples are collected and analyzed to ensure that environmental samples have not been contaminated in the overall data-collection process. The blank solution used to develop specific types of blank samples is a solution that is free of the analytes of interest. Any measured value signal in a blank sample for an analyte (a specific component measured in a chemical analysis) that was absent in the blank solution is believed to be due to contamination. Many types of blank samples are possible; each is designed to segregate a different part of the overall data-collection process. The types of blank samples collected in Missouri are:

Field blank—A blank solution that is subjected to all aspects of sample collection, field processing, preservation, transportation, and laboratory handling as an environmental sample.

Trip blank—A blank solution that is put in the same type of bottle used for an environmental sample and kept with the set of sample bottles before and after sample collection.

Equipment blank—A blank solution that is processed through all equipment used for collecting and processing an environmental sample (similar to a field blank but normally done in the more controlled conditions of the office).

Sampler blank—A blank solution that is poured or pumped through the same field sampler used for collecting an environmental sample.

Filter blank—A blank solution that is filtered in the same manner and through the same filter apparatus used for an environmental sample.

Splitter blank—A blank solution that is mixed and separated using a field splitter in the same manner and through the same apparatus used for an environmental sample.

Preservation blank—A blank solution that is treated with the same preservatives used for an environmental sample.

Reference Samples

Reference material is a solution or material prepared by a laboratory. The reference material composition is certified for one or more properties so that it can be used to assess a measurement method. Samples of reference material are submitted for analysis to ensure that an analytical method is accurate for the known properties of the reference material. Generally, the selected reference material properties are similar to the environmental sample properties.

Replicate Samples

Replicate samples are a set of environmental samples collected in a manner such that the samples are thought to be essentially identical in composition. Replicate is the general case for which a duplicate is the special case consisting of two samples. Replicate samples are collected and analyzed to establish the amount of variability in the data contributed by some part of the collection and analytical process. Many types of replicate samples are possible, each of which may yield slightly different results in a dynamic hydrologic setting, such as a flowing stream. The types of replicate samples collected in Missouri are:

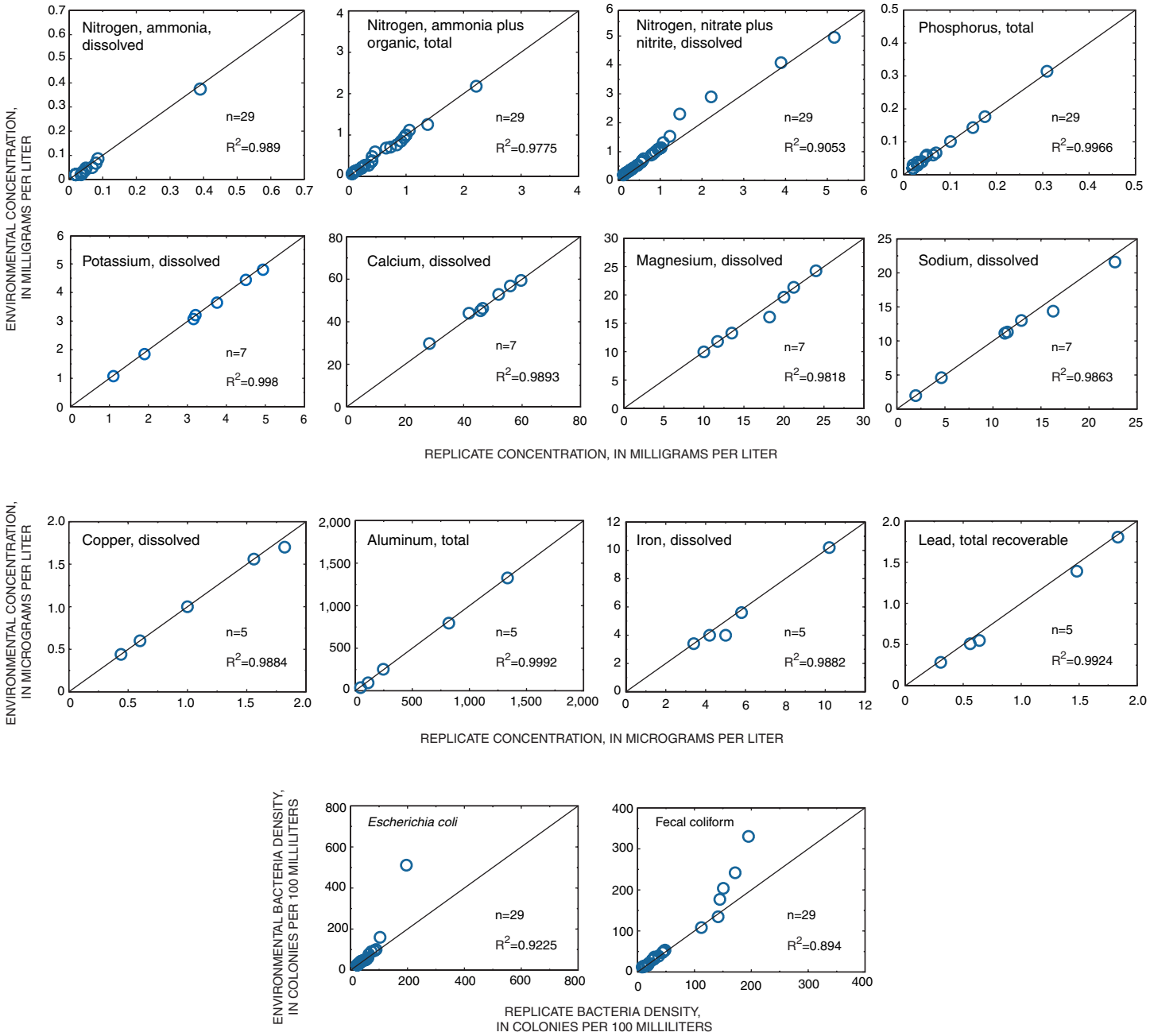
Concurrent samples—A type of replicate sample in which the samples are collected simultaneously with two or more samplers or by using one sampler and alternating the collection of samples into two or more compositing containers.

Sequential samples—A type of replicate sample in which the samples are collected one after the other, typically over a short time.

Split sample—A type of replicate sample in which a sample is split into subsamples, each subsample contemporaneous in time and space.

Spike Samples

Spike samples are samples to which known quantities of a solution with one or more well-established analyte concentrations have been added. These samples are analyzed to determine the extent of matrix interference or degradation on the analyte concentration during sample processing and analysis.



Replicate data are collected to assure the environmental data are accurate by detecting variability in analyses. The data graphed above are replicate data that were collected during the 2004 water year for the Ambient Water-Quality Network. The value of "n" above is the number of sample sets used in each analysis. The line shown has a slope of one. The smaller the difference in concentrations of the environmental data with its replicate data, the closer the data plots to the line. This causes the resultant coefficient of determination (R^2) to be close to a value of one, proving the data are normally distributed with low variance.

Figure 5. Statistical interpretation of Ambient Water-Quality Network replicate data.

EXPLANATION OF GROUND-WATER-LEVEL RECORDS

Generally, only ground-water-level data from selected wells with continuous recorders from a basic network of observation wells are published in this report. This basic network contains observation wells located so that the most significant data are obtained from the fewest wells in the most important aquifers.

Site Identification Numbers

Each well is identified by means of (1) a 15-digit number that is based on latitude and longitude and (2) a local number that is produced for local needs.

Data Collection and Computation

Measurements are made in many types of wells, under varying conditions of access and at different temperatures; hence, neither the method of measurement nor the equipment can be standardized. At each observation well, however, the equipment and techniques used are those that will ensure that measurements at each well are consistent.

Most methods for collecting and analyzing water samples are described in the TWRIs referred to in the On-site Measurements and Sample Collection and the Laboratory Measurements sections in this report. In addition, TWRI Book 1, Chapter D2, describes guidelines for the collection and field analysis of ground-water samples for selected unstable constituents. Procedures for on-site measurements and for collecting, treating, and shipping samples are given in TWRIs Book 1, Chapter D2; Book 3, Chapters A1, A3, and A4; and Book 9, Chapters A1 through A9. The TWRI publications may be accessed from *http://water.usgs.gov/pubs/twri/*. The values in this report represent water-quality conditions at the time of sampling, as much as possible, and that are consistent with available sampling techniques and methods of analysis. These methods are consistent with ASTM standards and generally follow ISO standards. Trained personnel collected all samples. The wells sampled were pumped long enough to ensure that the water collected came directly from the aquifer and had not stood for a long time in the well casing where it would have been exposed to the atmosphere and to the material, possibly metal, comprising the casings.

Water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum above sea level is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (EOM).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth of water of several hundred feet, the error in determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given only to a tenth of a foot or a larger unit.

Data Presentation

Water-level data are presented in alphabetical order by county. The primary identification number for a given well is the 15-digit site identification number that appears in the upper left corner of the table. The secondary identification number is the local or county well number. Well locations are shown in figures 16*;* each well is identified on the map by its local well or county well number.

Each well record consists of three parts: the well description, the data table of water levels observed during the water year, and, for most wells, a hydrograph following the data table. Well descriptions are presented in the headings preceding the tabular data.

The following comments clarify information presented in these various headings.

LOCATION.—This paragraph follows the well-identification number and reports the hydrologic-unit number and a geographic point of reference. Latitudes and longitudes used in this report are reported as North American Datum of 1927 unless otherwise specified.

AQUIFER.—This entry designates by name and geologic age the aquifer that the well taps.

WELL CHARACTERISTICS.—This entry describes the well in terms of depth, casing diameter and depth or screened interval, method of construction, use, and changes since construction.

INSTRUMENTATION.—This paragraph provides information on both the frequency of measurement and the collection method used, allowing the user to better evaluate the reported water-level extremes by knowing whether they are based on continuous, monthly, or some other frequency of measurement.

DATUM.—This entry describes both the measuring point and the land-surface elevation at the well. The altitude of the land-surface datum is described in feet above the altitude datum; it is reported with a precision depending on the method of determination. The measuring point is described physically (such as top of casing, top of instrument shelf, and so forth), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above National Geodetic Vertical Datum of 1929 (NGVD 29); it is reported with a precision depending on the method of determination.

REMARKS.—This entry describes factors that may influence the water level in a well or the measurement of the water level, when various methods of measurement were begun, and the network (climatic, terrane, local, or areal effects) or the special project to which the well belongs.

PERIOD OF RECORD.—This entry indicates the time period for which records are published for the well, the month and year at the start of publication of water-level records by the USGS, and the words “to current year” if the records are to be continued into the following year. Time periods for which water-level records are available, but are not published by the USGS, may be noted.

EXTREMES FOR PERIOD OF RECORD.—This entry contains the highest and lowest instantaneously recorded or measured water levels of the period of published record, with respect to land-surface datum or sea level, and the dates of occurrence.

Water-Level Tables

A table of water levels follows the well description for each well. Water-level measurements in this report are given in feet with reference to either sea level or land-surface datum (lsd). Missing records are indicated by dashes in place of the water-level value.

For wells not equipped with recorders, water-level measurements were obtained periodically by steel or electric tape. Tables of periodic water-level measurements in these wells show the date of measurement and the measured water-level value.

Hydrographs

Hydrographs are a graphic display of water-level fluctuations over a period of time. In this report, current water year and, when appropriate, period-of-record hydrographs are shown. Hydrographs that display periodic water-level measurements show points that may be connected with a dashed line from one measurement to the next. Hydrographs that display recorder data show a solid line representing the mean water level recorded for each day. Missing data are indicated by a blank space or break in a hydrograph. Missing data may occur as a result of recorder malfunctions, battery failures, or mechanical problems related to the response of the recorder's float mechanism to water-level fluctuations in a well.

ACCESS TO USGS WATER DATA

The USGS provides near real-time stage and discharge data for many of the gaging stations equipped with the necessary telemetry and historic daily-mean and peak-flow discharge data for most current or discontinued gaging stations through the World Wide Web (WWW). These data may be accessed from *http://water.usgs.gov*.

Water-quality data and ground-water data also are available through the WWW. In addition, data can be provided in various machine-readable formats on various media. Information about the availability of specific types of data or products, and user charges, can be obtained locally from each Water Science Center Office (See address that is shown on the back of the title page of this report.)

DEFINITION OF TERMS

Specialized technical terms related to streamflow, water-quality, and other hydrologic data, as used in this report, may be accessed from *http://water.usgs.gov/ADR_Defs_2004.pdf*. Terms such as algae, water level, and precipitation are used in their common everyday meanings, definitions of which are given in standard dictionaries. Not all terms defined in this alphabetical list apply to every State. See also table for converting English units to International System (SI) Units. Other glossaries that also define water-related terms are accessible from *http://water.usgs.gov/glossaries.html*.

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

The USGS publishes a series of manuals, the Techniques of Water-Resources Investigations, describing procedures for planning and conducting specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, section A of book 3 (Applications of Hydraulics) pertains to surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises.

Reports in the Techniques of Water-Resources Investigations series are online at *http://water.usgs.gov/pubs/twri/*. Printed copies are for sale by the USGS, Information Services, Box 25286, Federal Center, Denver, Colorado 80225 (authorized agent of the Superintendent of Documents, Government Printing Office), telephone 1-888-ASK-USGS. Please telephone 1-888-ASK-USGS for current prices, and refer to the title, book number, chapter number, and mention the "U.S. Geological Survey Techniques of Water-Resources Investigations." Products can then be ordered by telephone, or online at http://www.usgs.gov/sales.html, or by FAX to (303)236-469 of an order form available online at *http://mac.usgs.gov/isb/pubs/forms/*. Prepayment by major credit card or by a check or money order payable to the "U.S. Geological Survey" is required.