ANNUAL YIELD AND SELECTED HYDROLOGIC DATA FOR THE ARKANSAS RIVER BASIN COMPACT ARKANSAS--OKLAHOMA

1987 WATER YEAR

By M.A. Moore, T.E. Lamb, and L.D. Hauth

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CONVERSION FACTORS

For use of readers who prefer to use metric (International System) units, rather than the inch-pound units used in this report, the following conversion factors may be used:

Multiply inch-pound unit	By	To obtain metric unit
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
acre	4047	square meter (m^2)
	0.004047	square kilometer (km^2)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
acre-foot (acre-ft)	1233	cubic meter (m^3)
	1.233×10^{-6}	cubic kilometer (km^3)
cubic foot per second (ft^3/s)	28.32	liter per second (L/s)
	0.02832	cubic meter per second (m^3/s)

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ABSTRACT

The computed annual yield and deficiency of the subbasins as defined in the Arkansas River Compact, Arkansas-Oklahoma, are given in tables. Actual runoff from the subbasins and depletion caused by major reservoirs in the compact area are also given in tabular form. Monthly maximum, minimum, and mean discharges are shown for the 14 streamflow stations used in computing annual yield. Water-quality data are shown for the Arkansas River at Dam No. 13, near Van Buren, Arkansas, and Neosho River below Fort Gibson Lake near Fort Gibson, Oklahoma.

INTRODUCTION

The computed annual yields for subbasins in the Arkansas River basin as defined in the Arkansas River Basin Compact, Arkansas-Oklahoma, 1972, are presented in this report. The area included in the Compact is shown in figure 1. Water-quality data for the Arkansas River at Dam No. 13 near Van Buren, Arkansas, and Neosho River below Fort Gibson Lake near Fort Gibson, Oklahoma, are also included in the report.

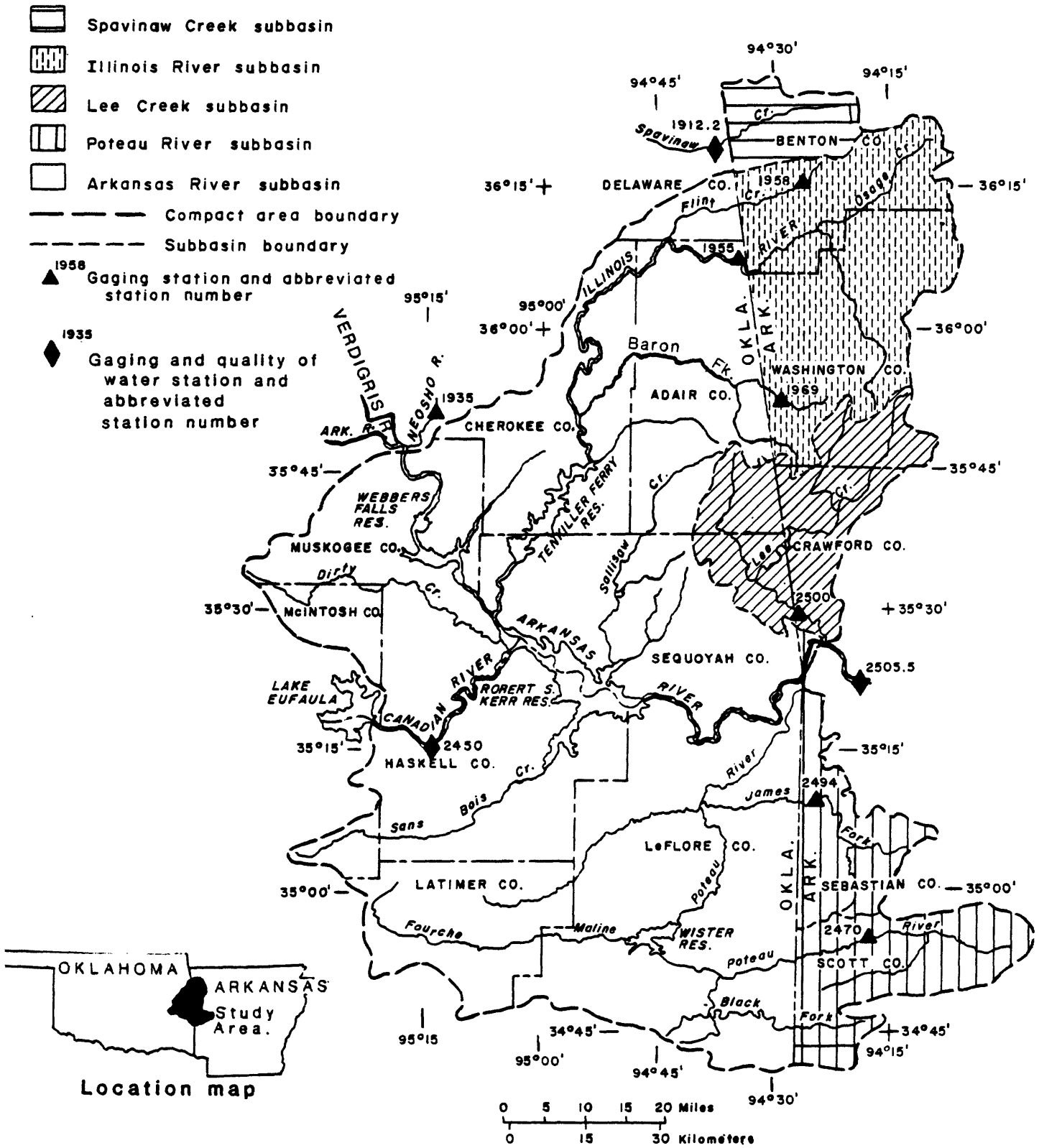

Figure 1.--Arkansas-Oklahoma Arkansas River Basin Compact area and subbasins.

This report was prepared by the U.S. Geological Survey in cooperation with the Arkansas-Oklahoma Arkansas River Compact Commission. Streamflow data were furnished by the Arkansas and Oklahoma Districts, U.S. Geological Survey and the U.S. Army Corps of Engineers, Tulsa District. The Tulsa District also provided data from the Webbers Falls, Tenkiller Ferry, Robert S. Kerr and Wister Reservoirs. Water-quality data were provided by the U.S. Geological Survey.

DEFINITION OF TERMS

The following terms used in this report are taken from Article II of the Arkansas River Basin Compact, Arkansas-Oklahoma, 1972.

The term "Arkansas River Basin" means all of the drainage basin of the the Arkansas River and its tributaries from a point immediately downstream from the confluence of the Neosho River with the Arkansas River (fig. 1) to a point immediately downstream from the confluence of Lee Creek with the Arkansas River, together with the drainage basin of Spavinaw Creek in Arkansas (top of fig. 1), but excludes that part of the drainage basin of the Canadian River upstream from Lake Eufaula Dam.

The term "Spavinaw Creek Subbasin" means the drainage area of Spavinaw Creek in the State of Arkansas.

The term "Illinois River Subbasin" means the drainage area of Illinois River in the State of Arkansas.

The term "Lee Creek Subbasin" means the drainage area of Lee Creek in the State of Arkansas and in the State of Oklahoma.

The term "Poteau River Subbasin" means the drainage area of Poteau River in the State of Arkansas.

The term "Arkansas River Subbasin" means all areas of the Arkansas River Basin except the four subbasins described previously.

The term "water year" means a 12-month period beginning on October 1 and ending September 30.

The term "annual yield" means the computed annual gross runoff from any specified subbasin. The runoff would have passed any certain point on a stream and would have originated within any specified area under natural conditions, without any manmade depletion or accretion during the water year.

Other hydrologic terms used in this report are defined as follows:

Acre-foot is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet.

Bacteria are microscopic unicellular organisms, typically spherical, rod-like, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Fecal coliform bacteria are present in the intestines or feces of warm-blooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory, they are defined as all the organisms that produce blue colonies within 24 hours when incubated at 44.5°C $\pm$ 0.2°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 milliliters (mL) of sample.

Fecal streptoccocal bacteria also are present in intestines of warm-blooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, coccoid bacteria that are capable of growth in brain-heart infusion broth. These bacteria are also defined as all the organisms that produce red or pink colonies within 48 hours at 35°C ± 0.5°C on KF-streptococcus agar (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Code numbers have been assigned for agencies collecting and analyzing samples, and are listed in water-quality tables of this report as follows:

80513 Arkansas District, WRD, U.S. Geological Survey

80020 National Water Quality Laboratory, WRD, U.S. Geological Survey

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Cubic foot per second is the rate of discharge representing a volume of 1 cubic foot passing a specified point during 1 second.

Discharge is the volume of water that passes a given point within a given period of time.

Instantaneous discharge is the discharge at a particular instant of time.

Mean discharge is the arithmetic average of individual daily mean discharges during a specific period.

Dissolved refers to the material in a representative water sample that passes through a 0.45-micrometer membrane filter. This is a convenient operational definition used by Federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

Dissolved oxygen content of water in equilibrium with air is a function of atmospheric pressure and temperature and the dissolved-solids concentration of the water. The ability of water to retain oxygen decreases with increasing temperature or dissolved solids, with small temperature changes having the more significant effect. Photosynthesis and respiration may cause diurnal variations in dissolved-oxygen concentration in water of some streams.

Drainage area of a stream at a specified point on the stream is that area enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the stream upstream from the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas within the area, unless otherwise noted.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained.

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate ($CaCO_3$).

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from, water; it includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 feet above the bed), expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

Suspended-sediment discharge (tons/day) is the rate at which dry weight of sediment passes a section of a stream or is the quantity of sediment, as measured by dry weight or volume, that passes a section in a given time. It is computed by multiplying discharge by milligrams per liter by 0.0027.

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Sodium-absorption-ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions with soil and is an index of sodium or alkali hazard to the soil. Water varies, in respect to sodium hazard, from that which can be used for irrigation on almost all soils to that which generally is unsatisfactory for irrigation.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in microsiemens per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids concentration of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in microsiemens). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height and the amount of water flowing past the gage in a channel.

Total is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total." (Note that the word "total" does double duty here, indicating that the sample consists of a water-suspended-sediment mixture and that the analytical method determines all of the constituent in the sample.)

COMPUTATION OF ANNUAL YIELD

The annual yield and deficiency (table 1) for each subbasin were computed as described in Appendix I to the Arkansas River Basin Compact Arkansas-Oklahoma, 1972, supplement No. 1. Actual runoff for the subbasins (table 2) was computed as described in the Compact except for the stations Arkansas River at Muskogee, which has been discontinued, and Arkansas River at Van Buren, which has been moved 7.9 miles downstream.

Annual depletion caused by major reservoirs (table 3) was computed for the four major reservoirs in the basin as described in Appendix I to the Compact. Depletion caused by small reservoirs and minor diversion for municipal and agricultural use are considered insignificant at this time and data are not included in tables 1 and 3.

A compilation of the areas and capacities of lakes and ponds in Arkansas, updated in 1981, conducted by the Arkansas Soil and Water Conservation Commission was used to evaluate depletions caused by small reservoirs in the Poteau River, Lee Creek, Spavinaw Creek, and Illinois River subbasins. Analysis shows that their impact on the depletions in any subbasin, except Illinois River, is probably insignificant and further consideration is not necessary at this time. Total storage capacity in the Illinois River subbasin is 27,700 acre-feet of which 18,300 acre-feet is in one lake. There is not enough information presently collected to evaluate the magnitude of depletions in the Illinois River subbasin.

Streamflow data used in the computations are given in hydrologic station records (p. 15 to 33). The station description under "Remarks" states the degree of accuracy of the records. "Excellent" means that about 95 percent of the daily discharges are within 5 percent of the actual discharge, "good" means within 10 percent, and "fair" means within 15 percent. "Poor" means that daily discharges have less than "fair" accuracy.

Table 1.--Annual yield and deficiency for the subbasins as defined in the Arkansas-Oklahoma Arkansas River Basin Compact

[Average annual flow in cubic feet per second for 1987 water year]

Subbasin	Actual runoff from the subbasins	Total depletions (+) or accretions (-)	Annual yield	Percent depletion allowed	Minimum required flow	Deficiency
Spavinaw Creek	132	0	132	50	66	0
Illinois River	955	0	955	60	382	0
Lee Creek	770	0	770	100	0	0
Poteau River	348	0	348	60	139	0
Arkansas River	777	+868	1,640	60	656	0

Table 2.--Actual runoff from the subbasins

[Mean discharge in cubic feet per second for the 1987 water year; D.A. = drainage area]

Month	Spavinaw Creek D.A.=135 square miles[a]	Illinois River D.A.=744 square miles[b]	Lee Creek D.A.=464 square miles[c]	Poteau River D.A.=536 square miles[d]	Arkansas River D.A.=4,553 square miles[e]
October	387	3,110	1,520	84	1,086
November	99	785	780	194	981
December	74	396	339	332	-478[f]
January	142	1,030	1,010	468	4,062
February	162	1,300	1,010	723	-2,353[f]
March	325	2,060	2,130	1,460	3,040
April	132	1,110	1,440	206	2,559
May	104	550	770	411	3,140
June	76	436	181	241	3,252
July	43	264	37	24	-2,842[f]
August	24	184	5	7	-1,480[f]
September	23	225	14	7	-1,890[f]
1987 water year	132	955	770	348	777
1987 water year (acre-feet)	95,560	691,400	557,500	251,900	562,500

[a] Includes 31 square miles ungaged.
[b] Includes 63 square miles ungaged.
[c] Includes 38 square miles ungaged.
[d] Includes 125 square miles ungaged.
[e] Computed by subtracting drainage area at Arkansas River at Muskogee, Canadian River near Whitefield, Illinois River Subbasin, Lee Creek Subbasin, and Poteau River Subbasin from drainage area at Arkansas River at Dam No. 13, near Van Buren, Ark.
[f] Negative discharge caused by storage in reservoirs, seepage into ground water, and evaporation from reservoirs.

Table 3.--Annual depletion caused by major reservoirs

[1987 water year]

Reservoir	Year-end contents (acre-feet)	Change in contents in water year (acre-feet)	Precipitation on reservoir surface (inch)[a]	Evaporation from reservoir (inch)[b]	Depletion (acre-feet)	Depletion (Average annual cubic feet per second)
Webbers Falls-----	168,700	-6,900	47.76	71.83	+28,850	+39.8
Tenkiller Ferry---	908,700	+192,200	49.25	53.22	+219,000	+302
Robert S. Kerr----	511,500	-27,700	34.81	65.85	+104,100	+144
Wister----------	311,400	+253,100	43.31	52.07	+276,600	+382

[a] From U.S. Corps of Engineers, Tulsa District.
[b] Adjusted for pan coefficient of 0.70 (from Wisler and Brater, 1949).

SELECTED REFERENCES

Arkansas River Compact Committee, 1972, Arkansas River Basin Compact Arkansas-Oklahoma, 1972, with Supplemental Interpretive Comments, Supplement No. 1: Austin, Tex., 31 p.

Arkansas Soil and Water Conservation Commission, 1981, Arkansas State Water Plan - Lakes of Arkansas, 157 p.

Wisler, C.D., and Brater, E.F., 1949, Hydrology: New York, N.Y., John Wiley & Sons, Inc., 150 p.

HYDROLOGIC STATION RECORDS

07165570 Arkansas River near Haskell, Oklahoma

LOCATION.--Lat 35°49'23", long 95°38'39", in NE 1/4 sec.31, T.16 N., R.16 E., Muskogee County, near right bank on downstream side of bridge on State Highway 104, 2.0 mi east of Haskell, 23.5 mi upstream from Verdigris River, and at mile 483.7.

DRAINAGE AREA.--75,473 mi^2, of which 12,541 mi^2 probably is noncontributing.

AVERAGE DISCHARGE.--15 years, 9,997 ft^3/s.

EXTREMES.--June 1972 to current year: Maximum discharge, 259,000 ft^3/s Oct. 6, 1986; minimum daily, 139 ft^3/s Nov. 18, 1982.

REMARKS.--Records fair. Flow regulated by Keystone Lake, 55.1 mi upstream.

COOPERATION.--Gage-height record and discharge measurements furnished by Corps of Engineers; records computed by Geological Survey.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	2,340,600	243,000	18,700	75,500	4,643,000
November	840,600	44,100	14,900	28,020	1,667,000
December	391,910	27,300	3,270	12,640	777,400
January	340,990	16,400	5,350	11,000	676,400
February	677,700	39,200	12,600	24,200	1,344,000
March	1,580,800	59,600	38,200	50,990	3,136,000
April	678,510	43,700	9,310	22,620	1,346,000
May	358,790	40,000	2,740	11,570	711,700
June	940,500	60,500	17,400	31,350	1,865,000
July	680,890	28,100	9,690	21,960	1,351,000
August	224,820	12,800	1,100	7,252	445,900
September	230,100	16,500	1,530	7,670	456,400
Water Year 1987	9,286,210	243,000	1,100	25,440	18,420,000

07176000 Verdigris River near Claremore, Oklahoma

LOCATION.--Lat 36°18'26", long 95°41'52", in SE 1/4 SW 1/4 sec.10, T.21 N., R.15 E., Rogers County, near left bank on downstream side of bridge on State Highway 20, 2.3 mi downstream from Caney River, 4.5 mi west of Claremore, 12.4 mi upstream from Bird Creek, and at mile 76.0.

DRAINAGE AREA.--6,534 mi^2.

AVERAGE DISCHARGE.--27 years (water years 1936-62), 3,723 ft^3/s; 23 years (water years 1965-87), 4,431 ft^3/s.

EXTREMES.--October 1935 to current year: Maximum discharge, 182,000 ft^3/s May 21, 1943; no flow at times in 1936, 1939-40, 1956.

REMARKS.--Records good. Flow regulated since May 1963 by Oologah Lake 14.3 mi upstream; some regulation by dams in Kansas since 1949 and by Hulah Lake since 1950.

COOPERATION.--Gage-height record and discharge measurements furnished by Corps of Engineers; records computed by Geological Survey.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	1,474,800	77,700	21,800	47,570	2,925,000
November	427,250	30,500	6,750	14,240	847,500
December	321,670	17,100	7,220	10,380	638,000
January	165,810	11,100	1,970	5,349	328,900
February	297,430	21,100	4,060	10,620	590,000
March	567,200	22,800	10,600	18,300	1,125,000
April	203,020	14,500	1,180	6,767	402,700
May	135,252	14,700	308	4,363	268,300
June	254,630	14,200	2,780	8,488	505,100
July	94,278	10,300	291	3,041	187,000
August	10,997	1,120	128	355	21,810
September	13,462	4,710	121	449	26,700
Water Year 1987	3,965,800	77,700	121	10,870	7,866,000

07177500 Bird Creek near Sperry, Oklahoma

LOCATION.--Lat 36°16'42", long 95°57'14", in NW 1/4 NW 1/4 sec.29, T.21 N., R.13 E., Tulsa County, on downstream side of county road bridge, 1.5 mi upstream from Delaware Creek, 2.4 mi downstream from Hominy Creek, 2.5 mi southeast of Sperry, and at mile 25.0

DRAINAGE AREA.--905 mi^2.

AVERAGE DISCHARGE.--49 years, 523 ft^3/s.

EXTREMES.--October 1938 to current year: Maximum discharge, 90,000 ft^3/s Oct. 3, 1959; no flow at times in 1939, 1954-57, 1964-66, 1970.

REMARKS.--Records good.

COOPERATION.--Gage-height record and discharge measurements furnished by Corps of Engineers; records computed by Geological Survey.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	159,500	26,600	1,870	5,145	316,400
November	78,071	7,000	211	2,602	154,900
December	35,018	4,510	177	1,130	69,460
January	16,062	3,080	98	518	31,860
February	51,117	7,090	258	1,826	101,400
March	82,728	10,700	828	2,669	164,100
April	8,407	1,050	121	280	16,680
May	15,826	6,320	33	511	31,390
June	12,817	1,940	29	427	25,420
July	10,900	1,710	19	352	21,620
August	1,348	222	15	43.5	2,670
September	11,260	5,610	19	375	22,330
Water Year 1987	483,054	26,600	15	1,323	958,100

07191220 Spavinaw Creek near Sycamore, Oklahoma

LOCATION.--Lat 36°20'07", long 94°38'24", in NE 1/4 NW 1/4 sec.4, T.21 N., R.25 E., Delaware County, on right bank 1.8 mi upstream from Cherokee Creek, 4.8 mi northeast of Row, 6.5 mi southeast of Sycamore, and at mile 35.0.

DRAINAGE AREA.--133 mi^2.

AVERAGE DISCHARGE.--26 years, 109 ft^3/s.

EXTREMES.--October 1961 to current year: Maximum discharge, 39,800 ft^3/s July 27, 1975; minimum, 1.2 ft^3/s Aug. 9, 1964.

REMARKS.--Records good.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	11,838	5,920	82	382	23,480
November	2,897	131	74	96.6	5,750
December	2,285	83	68	73.7	4,530
January	4,326	249	68	140	8,580
February	4,460	437	106	159	8,850
March	9,920	1,330	132	320	19,680
April	3,940	173	99	131	7,810
May	3,172	237	73	102	6,290
June	2,240	139	59	74.7	4,440
July	1,311	62	31	42.3	2,600
August	761	33	19	24.5	1,510
September	673	32	17	22.4	1,330
Water Year 1987	47,823	5,920	17	131	94,860

07193500 Neosho River below Fort Gibson Lake, near Fort Gibson, Oklahoma

LOCATION.--Lat 35°51'15", long 95°13'45", in SE 1/4 NW 1/4 sec.19, T.16 N., R.19 E., Cherokee County, on left bank 1.1 mi downstream from Fort Gibson Dam, 4.5 mi north of Fort Gibson, and at mile 6.6.

DRAINAGE AREA.--12,495 mi^2.

AVERAGE DISCHARGE.--37 years (1950-87), 8,370 ft^3/s.

EXTREMES.--May 1950 to current year: Maximum discharge, 223,000 ft^3/s May 26, 1957; minimum, 12 ft^3/s Oct. 10, 1957, Aug. 23, 1964.

REMARKS.--Records fair. Flow completely regulated by Fort Gibson Lake.

COOPERATION.--Gage-height record and discharge measurements furnished by Corps of Engineers; records computed by Geological Survey.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	2,174,240	142,000	536	70,140	4,313,000
November	587,010	31,100	4,980	19,570	1,164,000
December	355,340	15,000	6,820	11,460	704,800
January	292,220	14,800	2,450	9,426	579,600
February	477,340	27,500	8,680	17,050	946,800
March	1,040,000	44,200	11,800	33,550	2,063,000
April	436,000	27,600	10,900	14,530	864,800
May	218,685	11,700	15	7,054	433,800
June	319,220	19,400	2,250	10,640	633,200
July	175,685	12,200	15	5,667	348,500
August	58,298	8,120	15	1,881	115,600
September	92,793	10,800	15	3,093	184,100
Water Year 1987	6,226,827	142,000	15	17,060	12,350,000

WATER-QUALITY RECORDS

PERIOD OF RECORD.—Water years 1952 to current year.

PERIOD OF DAILY RECORD.—
SPECIFIC CONDUCTANCE: October 1951 to September 1963, October 1973 to January 1982.
WATER TEMPERATURE: October 1951 to September 1963, October 1973 to January 1982.

REMARKS: Samples were collected bimonthly and specific conductance, pH, water temperature, dissolved oxygen and alkalinity were determined in the field.

EXTREMES FOR PERIOD OF DAILY RECORD.—
SPECIFIC CONDUCTANCE: Maximum daily, 496 microsiemens September 7, 1975; minimum daily 188 microsiemens October 18, 1974.
WATER TEMPERATURE: Maximum daily, 31.5°C July 31, August 1, 1955; minimum daily, 0.0°C January 23-25, 1962.

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1987

[Five-digit numbers in parenthesis are STORET parameter codes used for computer storage of data; UM-MF = micrometer membrane filter; MG/L = milligrams per liter; K = plate count outside ideal range; IT-FLD = incremental titration-field; UG/L = micrograms per liter; T/DAY = tons per day]

DATE	TIME	AGENCY ANALYZING SAMPLE (CODE NUMBER) (00028)	BAROMETRIC PRESSURE (MILLIMETERS OF MERCURY) (00025)	SPECIFIC CONDUCTANCE (MICROSIEMENS) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NEPHELOMETRIC UNITS) (00076)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	COLIFORM, FECAL, 0.7 UM-MF (COLONIES PER 100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLONIES PER 100 ML) (31673)
DEC 1986											
09...	1345	80020	770	230	7.10	7.0	29	13.8	113	49	K12
JAN 1987											
13...	1100	80020	760	262	7.70	10.5	11	11.8	106	K11	31
FEB											
25...	1130	80020	770	267	7.20	10.5	15	10.8	96	180	120
APR											
09...	1230	80020	760	258	8.30	16.5	18	—	—	K5	K2
JUN											
03...	1145	80020	750	286	7.80	23.5	5.1	8.1	97	K6	K39
SEP											
01...	1030	80020	750	279	7.90	25.0	—	8.1	100	K5	K18

DATE	HARDNESS (MG/L AS CACO3) (00900)	HARDNESS, NONCARBONATE (MG/L CACO3) (95902)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	PERCENT SODIUM (00932)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	CARBONATE IT-FLD (MG/L AS CO3) (99445)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	ALKALINITY, CARBONATE IT-FLD (MG/L - CACO3) (99430)
DEC 1986											
09...	96	26	30	5.0	5.6	11	0.3	3.6	0	85	70
JAN 1987											
13...	120	28	37	6.1	6.9	11	.3	3.8	0	110	90
FEB											
25...	130	30	40	6.4	8.0	12	.3	3.6	0	120	96
APR											
09...	120	19	37	6.0	7.7	12	.3	2.7	0	120	98
JUN											
03...	120	23	37	6.0	8.1	13	3	3.1	0	120	94
SEP											
01...	—	—	—	—	—	—	—	—	0	120	94

DATE	CARBON DIOXIDE DISSOLVED (MG/L AS CO2) (00405)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L) (70301)	SOLIDS, DISSOLVED (TONS PER ACRE-FOOT) (70303)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)
DEC 1986									
09...	11	27	6.0	0.10	9.9	155	130	0.21	0.69
JAN 1987									
13...	3.5	33	7.3	.10	10	170	160	.23	—
FEB									
25...	12	41	8.7	.10	8.1	180	180	.24	3.50
APR									
09...	1	34	6.6	.20	6.0	165	160	.22	.86
JUN									
03...	2.9	35	12	.20	2.3	167	160	.23	.39
SEP									
01...	2.3	—	—	—	—	—	—	—	.12

07193500 NEOSHO RIVER BELOW FORT GIBSON LAKE NEAR FORT GIBSON, OKLAHOMA—CONTINUED

WATER QUALITY DATA, WATER YEAR OCTOBER 1986 TO SEPTEMBER 1987

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA DISSOLVED (MG/L AS NH4) (71846)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, TOTAL (MG/L AS PO4) (71886)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	PHOSPHATE, ORTHO, DISSOLVED (MG/L AS PO4) (00660)	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)
DEC 1986										
09...	0.06	0.08	0.60	0.09	0.18	0.08	0.06	0.18	40	1
JAN 1987										
13...	—	—	.60	.09	—	—	—	—	20	<1
FEB										
25...	.02	.03	.90	.11	.12	.05	.04	.12	—	—
APR										
09...	.18	.23	.90	.08	.09	.04	.03	.09	40	<1
JUN										
03...	.03	.04	.50	.05	—	.01	<.01	—	—	—
SEP										
01...	.06	.08	.50	.06	—	.03	<.01	—	—	—

DATE	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01055)
DEC 1986										
09...	49	<0.5	<1	<1	<3	3	53	<5	5	11
JAN 1987										
13...	56	< .5	1	<1	<3	2	26	<5	7	7
FEB										
25...	—	—	—	—	—	—	—	—	—	—
APR										
09...	52	<.5	2	<1	<3	3	28	<5	5	5
JUN										
03...	—	—	—	—	—	—	—	—	—	—
SEP										
01...	—	—	—	—	—	—	—	—	—	—

DATE	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT DISCHARGE SUSPENDED (T/DAY) (80155)	SEDIMENT SUSPENDED SIEVE DIAMETER PERCENT FINE THAN 0.062 MILLIMETER (70331)
DEC 1986											
09...	<0.1	<10	1	<1	<1	150	<6	8	21	652	84
JAN 1987											
13...	<.1	<10	4	<1	<1	190	<6	6	14	427	87
FEB											
25...	—	—	—	—	—	—	—	—	16	1,130	90
APR											
09...	<.1	<10	5	<1	<1	180	<6	13	17	610	86
JUN											
03...	—	—	—	—	—	—	—	—	11	481	66
SEP											
01...	—	—	—	—	—	—	—	—	2	61	76

STREAMFLOW

07194500 Arkansas River near Muskogee, Oklahoma

LOCATION.--Lat 35°46'10", long 95°17'55", in NW 1/4 sec.21, T.15 N., R.19 E., Muskogee County, at bridge on U.S. Highway 62, 1.7 mi downstream from Neosho River, 3.5 mi northeast of Muskogee.

DRAINAGE AREA.--96,674 mi^2 of which 12,541 mi^2 probably is noncontributing.

REMARKS.--Gaging station discontinued Sept. 30, 1970, due to backwater conditions. Streamflow computed by combining flow at station 07165570 Arkansas River near Haskell, station 07176000 Verdigris River near Claremore, station 07177500 Bird Creek near Sperry, station 07193500 Neosho River below Fort Gibson Lake near Fort Gibson, and adjusting the total for the ungaged intervening drainage area.

Monthly and yearly discharge

Month	Mean (ft^3/s)	Runoff in acre-feet
October	205,600	12,640,000
November	68,080	4,051,000
December	37,190	2,287,000
January	27,020	1,661,000
February	56,260	3,125,000
March	109,200	6,715,000
April	44,590	2,653,000
May	24,210	1,489,000
June	51,500	3,065,000
July	31,510	1,938,000
August	9,595	590,000
September	12,110	720,600
Water Year 1987	56,540	40,930,000

07195500 Illinois River near Watts, Oklahoma

LOCATION.--Lat 36°07'48", long 94°34'12", in NE 1/4 sec.18, T.19 N., R.26 E., Adair County, near right bank on downstream side of bridge on U.S. Highway 59, 1.5 mi north of Watts, 4.5 mi downstream from Cincinnati Creek, and at mile 106.2.

DRAINAGE AREA.--635 mi^2.

AVERAGE DISCHARGE.--32 years, 585 ft^3/s.

EXTREMES.--August 1955 to current year: Maximum discharge, 68,000 ft^3/s July 25, 1960; minimum, 8.6 ft^3/s Oct. 26, 1955, Sept. 19, Oct. 14, 1956.

REMARKS.--Records good. Some regulation at low flow by Lake Frances Dam, 0.8 mi above station. Since July 2, 1957, small diversion above station for municipal water supply for city of Siloam Springs, Ark.

COOPERATION.--Gage-height record and discharge measurements furnished by Corps of Engineers; records computed by Geological Survey.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	84,751	34,500	535	2,734	168,100
November	19,279	2,010	377	643	38,240
December	10,732	480	284	346	21,290
January	27,178	2,740	278	877	53,910
February	29,314	3,570	562	1,047	58,140
March	54,771	8,810	635	1,767	108,600
April	28,680	6,940	488	956	56,890
May	13,067	1,070	283	422	25,920
June	10,719	1,580	207	357	21,260
July	7,375	329	188	238	14,630
August	5,086	250	138	164	10,090
September	6,142	494	135	205	12,180
Water Year 1987	297,094	34,500	135	814	589,300

STREAMFLOW

07195800 Flint Creek at Springtown, Arkansas

LOCATION.--Lat 36°15'20", long 94°25'50", in NW 1/4 sec. 7, T.18 N., R.32 W., Benton County, Hydrologic Unit 11110103, on right bank 20 ft downstream from State Highway 12, 0.8 mi southwest of Springtown.

DRAINAGE AREA.--14.2 mi^2.

AVERAGE DISCHARGE.--26 years, 14.1 ft^3/s

EXTREMES.--June 1961 to current year: Maximum discharge, 14,600 ft^3/s June 8, 1974; no flow for part of July 9, 29, 30, Aug. 7, 1964, Sept. 16, 1980.

REMARKS.--Records good.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	1,605	418	14	51.8	3,180
November	516	27	11	17.2	1,020
December	339.4	14	9.3	10.9	673
January	607.0	32	9.0	19.6	1,200
February	499	52	10	17.8	990
March	1,045	82	13	33.7	2,070
April	469	21	11	15.6	930
May	393.9	23	8.9	12.7	781
June	276.8	13	7.1	9.23	549
July	213.1	8.7	5.7	6.87	423
August	189.5	14	5.0	6.11	376
September	219.4	13	5.9	7.31	435
Water Year 1987	6,373.1	418	5.0	17.5	12,640

07196900 Baron Fork at Dutch Mills, Arkansas

LOCATION.--Lat 35°52'48", long 94°29'11", on line between secs.21 and 22, T.14 N., R.33 W., Washington County, near right bank on downstream side of bridge on State Highway 59 at Dutch Mills, 2.2 mi downstream from Fly Creek, and 2.9 mi upstream from Arkansas-Oklahoma State line.

DRAINAGE AREA.--46.0 mi^2.

AVERAGE DISCHARGE.--29 years, 40.3 ft^3/s.

EXTREMES.--April 1958 to current year: Maximum discharge, 20,900 ft^3/s November 18, 1985; no flow at times.

REMARKS.--Records good.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	5,397	3,090	28	174	10,700
November	1,661	245	23	55.4	3,290
December	563	36	11	18.2	1,120
January	1,985	365	10	64.0	3,940
February	3,162	998	28	113	6,270
March	4,170	1,190	35	135	8,270
April	2,179	717	21	72.6	4,320
May	1,504	259	14	48.5	2,980
June	938.9	349	5.7	31.3	1,860
July	316.6	55	2.6	10.2	628
August	140.7	15	1.3	4.54	279
September	160.3	32	2.4	5.34	318
Water Year 1987	22,177.4	3,090	1.3	3,090	43,990

STREAMFLOW

07245000 Canadian River near Whitefield, Oklahoma

LOCATION.--Lat 35°15'45", long 95°14'19", in SE 1/4 SE 1/4 sec.12, T.9 N., R.19 E., Haskell County, near right bank on downstream side of bridge on State Highway 2, 0.8 mi north of Whitefield, 5.5 mi upstream from Taleka (Snake) Creek, 8.2 mi downstream from Eufaula Dam, and at mile 18.8.

DRAINAGE AREA.--47,576 mi^2, of which 9,700 mi^2 is probably noncontributing.

AVERAGE DISCHARGE.--25 years (water years 1939-63), 6,005 ft^3/s; 20 years (water years 1968-87), 5,793 ft^3/s.

EXTREMES.--July 1938 to current year: Maximum discharge, 281,000 ft^3/s May 10, 1943; minimum daily, 0.4 ft^3/s Oct. 8, 1956.

REMARKS.--Records good. Prior to February 1964, occasional slight regulation by Conchas Lake in New Mexico and except for 54 mi^2 of intervening area, completely regulated thereafter by Eufaula Lake.

COOPERATION.--Gage-height record and discharge measurements furnished by Corps of Engineers; records computed by Geological Survey.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	405,996	32,600	44	13,100	805,300
November	501,260	32,700	6,970	16,710	994,200
December	304,760	15,400	4,630	9,831	604,500
January	341,507	18,900	337	11,020	677,400
February	381,250	22,200	6,140	13,620	756,200
March	908,500	42,700	16,900	29,310	1,802,000
April	253,940	18,100	3,520	8,465	503,700
May	163,019	23,800	228	5,259	323,300
June	611,550	37,000	6,510	20,380	1,213,000
July	258,750	15,500	4,450	8,347	513,200
August	69,717	7,830	64	2,249	138,300
September	53,814	6,030	50	1,794	106,700
Water Year 1987	4,254,060	42,700	44	11,650	8,438,000

STREAMFLOW

07247000 Poteau River at Cauthron, Arkansas

LOCATION.--Lat 34°55'08", long 94°17'55", in NW 1/4 SW 1/4 sec.16, T.3 N., R.31 W., Scott County, on right bank at downstream side of highway bridge at Cauthron, 2.9 mi downstream from Cross Creek, 7.8 mi downstream from Jones Creek, and at mile 109.0.

DRAINAGE AREA.--203 mi^2.

AVERAGE DISCHARGE.--48 years, 218 ft^3/s.

EXTREMES.--February 1939 to current year: Maximum discharge, 32,200 ft^3/s May 20, 1960; no flow at times in most years.

REMARKS.--Records good. As of September 1974, flow from 92.2 mi^2 above this station is controlled by 16 floodwater-detention reservoirs with a total combined capacity of 39,082 acre-ft below the flood spillway crests, of which 33,524 acre-ft is flood-detention capacity, 2,100 acre-ft is water-supply storage, and 3,458 acre-ft is sediment-storage capacity.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	1,341.0	296	3.6	43.3	2,660
November	2,679.8	328	1.6	89.3	5,320
December	5,028	1,150	33	162	9,970
January	6,142	654	34	198	12,180
February	7,748	1,490	60	277	15,370
March	17,729	3,720	86	572	35,170
April	1,956	170	19	65.2	3,880
May	6,227	1,520	12	201	12,350
June	3,361	506	10	112	6,670
July	199.9	26	1.7	6.45	397
August	143.21	27	.54	4.62	284
September	102.50	7.1	.72	3.42	203
Water Year 1987	52,657.17	3,720	.54	144	104,400

07249400 James Fork near Hackett, Arkansas

LOCATION.--Lat 35°09'45", long 94°24'25", in NW 1/4 NW 1/4 sec.34, T.6 N., R.32 W., Sebastian County, near left bank on downstream side of bridge on State Highway 45, 1.7 mi south of Hackett, 2.0 mi downstream from Elder Branch, 2.0 mi upstream from small tributary, and 3.6 mi upstream from Arkansas-Oklahoma State line.

DRAINAGE AREA.--147 mi^2.

AVERAGE DISCHARGE.--29 years, 133 ft^3/s.

EXTREMES.--April 1958 to current year: Maximum discharge, 30,000 ft^3/s May 14, 1968; no flow at times.

REMARKS.--Records good.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	293.42	31	0.82	9.47	582
November	984	128	10	32.8	1,950
December	1,385	229	11	44.7	2,750
January	3,300	523	14	106	6,550
February	5,476	1,090	26	196	10,860
March	11,702	3,140	55	377	23,210
April	2,184	267	20	72.8	4,330
May	1,688	430	16	54.5	3,350
June	1,197.6	242	8.0	39.9	2,380
July	308.1	23	3.7	9.94	611
August	132.6	11	2.8	4.28	263
September	87.1	7.4	1.5	2.90	173
Water Year 1987	28,737.67	3,140	.82	78.7	57,000

07250000 Lee Creek near Van Buren, Arkansas

LOCATION.--Lat 35°29'40", long 94°26'58", in SE 1/4 sec.21, T.12 N., R.27 E., Indian Meridian, Sequoyah County, Okla., on right bank 300 ft west of Arkansas-Oklahoma State line, 3.2 mi downstream from Webbers Creek, 6.8 mi northwest of Van Buren, and at mile 7.8.

DRAINAGE AREA.--426 mi^2.

AVERAGE DISCHARGE.--43 years (1930-36, 1950-87), 506 ft^3/s.

EXTREMES.--September 1930 to June 1937, October 1950 to current year: Maximum discharge, 80,600 ft^3/s (2,280 m^3/s) May 6, 1960; no flow at times.

REMARKS.--Records good.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	43,239	17,200	229	1,395	85,760
November	21,411	3,860	256	714	42,470
December	9,578	700	151	309	19,000
January	28,761	3,360	141	928	57,050
February	25,969	4,780	295	927	51,510
March	60,691	12,700	351	1,958	120,400
April	39,608	9,540	264	1,320	78,560
May	21,951	3,430	140	708	43,540
June	5,034	822	36	168	9,980
July	1,070.8	95	6.1	34.5	2,120
August	119.6	6.9	2.0	3.86	237
September	425.6	75	1.8	14.2	844
Water Year 1987	257,857.3	17,200	1.8	706	511,500

07250550 Arkansas River at Dam No. 13, near Van Buren, Arkansas

LOCATION.--Lat 35°20'56", long 94°17'54", in sec.28, T.8 N., R.31 W., Sebastian County, in Dam No. 13 control house on right bank, and at mile 308.9.

DRAINAGE AREA.--150,547 mi^2, of which 22,241 mi^2 is probably noncontributing.

AVERAGE DISCHARGE.--60 years, 32,200 ft^3/s.

EXTREMES.--October 1927 to current year: Maximum discharge, 850,000 ft^3/s (24,100 m^3/s) May 12, 1943; no flow Nov. 2, 1975, Feb. 1, 1981.

REMARKS.--Records fair. Prior to October 1969, published as 07250500 Arkansas River at Van Buren. Beginning Apr. 26, 1970, daily discharge computed from relation between discharge, head, and gate openings. Flow regulated by many locks, dams, and reservoirs upstream.

Monthly and yearly discharge

Month	Total (ft^3/s)	Maximum daily (ft^3/s)	Minimum daily (ft^3/s)	Mean (ft^3/s)	Runoff in acre-feet
October	6,958,000	350,000	127,000	224,500	13,800,000
November	2,625,900	145,000	39,000	87,530	5,208,000
December	1,475,800	72,600	24,100	47,610	2,927,000
January	1,382,900	72,500	20,300	44,610	2,743,000
February	1,975,600	130,000	46,800	70,560	3,919,000
March	4,562,000	166,000	128,000	147,200	9,049,000
April	1,751,200	114,000	31,300	58,370	3,474,000
May	1,064,600	130,000	12,000	34,340	2,112,000
June	2,279,600	127,000	30,900	75,990	4,522,000
July	1,157,600	52,000	11,600	37,340	2,296,000
August	327,452	22,800	612	10,560	649,500
September	367,838	31,500	254	12,260	729,600
Water Year 1987	25,928,490	350,000	254	71,040	51,430,000