U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN THE LOUP RIVER BASIN, NEBRASKA

by

F. B. Shaffer

Open-file Report 7401
Prepared in cooperation with
Nebraska Department of
Water Resources

Nebraska District
Lincoln, Nebraska
January 1974

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ABSTRACT

Nearly 80 years of streamflow records have been collected in Nebraska. Such records are of immeasurable value and are essential if water resources are to be planned wisely and managed efficiently. Their value for planning and management can be greatly enhanced if the records are analyzed statistically. This report presents statistics on the flow of streams in the Loup River basin. As major irrigation projects have been constructed in the basin since gaging of streamflow was begun, the complete record of water discharge at some gaging stations includes periods before and after streamflow was first affected by diversions to an upstream project. Streamflow records presented in this report have been computed from data that represent current conditions of development and water use.

INTRODUCTION

Purpose and scope of study

Nebraska's streams have been gaged under a variety of State, Federal, and State-Federal cooperative programs, sporadically beginning in 1894 and continuously since 1931. As the accumulated mass of data obtained under those programs grew, the need to analyze them increased. However, until electronic digital computers were developed, statistical analyses of stream-discharge records were exceedingly time consuming. Now large amounts of data can be evaluated speedily once the data are prepared in suitable form and appropriate computer programs have been written.

This report presents streamflow statistics and exceedence probability graphs of daily discharge for nine sites on the Middle Loup River and its tributaries, seven on the North Loup and its tributaries, and seven on the Loup River and its tributaries below the confluence of the North and Middle Loup Rivers. It also presents exceedence probability graphs for six canals diverting from the Middle Loup River and for three canals diverting from the North Loup River. The purpose of the report is to summarize, in a form

suitable for planning development of water supplies, those streamflow data that are representative of current hydrologic conditions.

Sources of water data

U.S. Geological Survey publications containing records of daily discharges at gaging stations in the Loup River basin during all or part of the period 1928 through 1971 are as follows:

Water year	Water-Supply Paper	Water year	Water-Supply Paper	Water year	Water-Supply Paper	Water year	Water-Supply Paper
1928	666	1939	876	1950	1176	1961	
1929	686	1940	896	1951	1210	1962	
1930	701	1941	926	1952	1240	1963	1918
1931	716	1942	956	1953	1280	1964	
1932	731	1943	976	1954	1340	1965	
1933	746	1944	1006	1955	1390	1966	
1934	761	1945	1036	1956	1440	1967	
1935	786	1946	1056	1957	1510	1968	2118
1936	806	1947	1086	1958	1560	1969	
1937	826	1948	1116	1959	1630	1970	
1938	856	1949	1146	1960	1710	1971	Annual report[1/]

[1/] Entitled "Water Resources Data for Nebraska, 1971, Part 1." Prepared in cooperation with State and other Federal agencies.

Records of monthly and annual mean discharges through September 1950 at all stream-gaging stations in the same three basins are reproduced in Water-Supply Paper 1310 and those for the period October 1950 to September 1960 are reproduced in Water-Supply Paper 1730.

Other types of information used in preparing this report and the sources from which they were derived are as follows:

Water rights and diversions--Hydrographic and Biennial Reports of Nebraska Department of Water Resources.

Irrigation well registrations--Files of Nebraska Department of Water Resources.

Irrigation well locations--Files of Conservation and Survey Division of University of Nebraska.

Description of basin

The Loup River in central Nebraska drains about 15,200 square miles, or nearly one-fifth of the State. The basin is more than 300 miles long and about 90 miles wide at its widest point. All drainage is eastward or southeastward toward a narrow band along the southeast border of the basin; drainage within that band is mostly northeastward. (See fig. 1.)

The sandhills region (fig. 1), which constitutes three-fifths of the basin, consists of grass-covered sand dunes and interdune meadows. The remainder of the basin is referred to as the dissected loess plains region. It consists of nearly level loess-mantled interstream divides that give way to moderately to steeply sloping loess-mantled hills, which in turn give way to stream terraces and bottom lands.

The sandhills region produces almost no overland runoff to streams. Precipitation, which ranges from an average 18 inches per year at the western end of the basin to 24 inches at the easternmost extent of the sandhills region (fig. 1), either returns to the atmosphere by evapotranspiration or infiltrates to the water table. Streams in this area have very uniform discharge, which is maintained by seepage of ground water. Where streams leave the sandhills region and enter the dissected loess plains region their average annual flow is equivalent to 2 to 3 inches of runoff from their drainage areas.

The Middle Loup River, North Loup River, Cedar River, and Beaver Creek are the principal streams that rise in the sandhills region and flow into the dissected loess plains region. There the Middle Loup and North Loup join near St. Paul to form the Loup River. Cedar River and Beaver Creek are tributary to the Loup. Within the dissected loess plains region stream discharge increases owing to both influent seepage and overland runoff. Because the latter occurs only after precipitation, stream discharge becomes increasingly variable with increasing distance from the sandhills boundary. Only a small part of the flow of the South Loup River, which is tributary to the Middle Loup, originates within the sandhills region, the much larger part being derived from influent seepage of ground water and overland runoff within the dissected loess plains region. Mud Creek, a tributary to the South Loup, rises within the dissected loess plains area, and the flow of this stream consists wholly of overland runoff in its upper reaches and of overland runoff and a little influent seepage in its lower reaches. Streamflow generated within the western part of the dissected loess plains area is equivalent to 0.6 to 1.6 inches of runoff and within the middle and eastern parts is equivalent to 2 to 3 inches of runoff. As average annual precipitation on the dissected loess plains region ranges from 19.5 to 26.5 inches (fig. 1), the ratios of the runoff values to average annual precipitation are somewhat less than those for the sandhills region.

The nearly uniform streamflow leaving the sandhills region provides a dependable year-round supply of water for use within the dissected loess plains region.

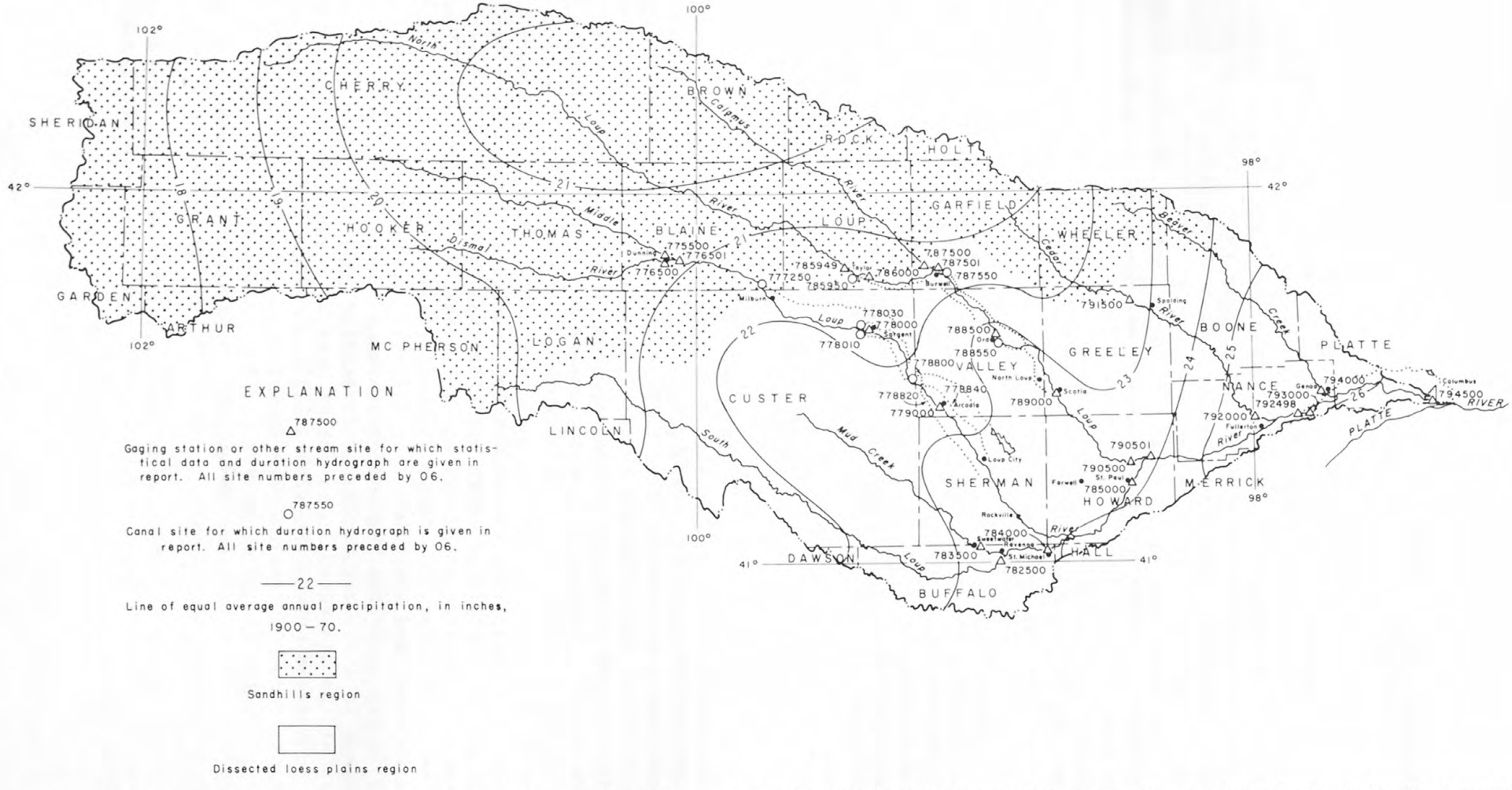

Figure 1.--Map of the Loup River drainage basin showing locations of stream and canal sites for which statistical analyses are presented, lines of equal average annual precipitation, and location of sandhills and dissected loess plains regions.

Definition of terms

Terms used in this report are defined as follows:

Climatic year is a continuous 12-month period beginning April 1 and is used in the low-flow probability analyses. It is designated by the calendar year in which it ends. (See water year.)

Cubic foot per second (cfs) is the unit of measurement used in reporting stream discharge, sometimes referred to as second-foot (sec-ft). It is a volume of 1 cubic foot passing a given point during 1 second of time and is equivalent to 7.48 gallons per second or 448.8 gallons per minute.

Duration table shows the percentage of time that specified discharges are equaled or exceeded.

Evapotranspiration is the quantity of water withdrawn from a land area by evaporation from water surfaces and moist soil and by plant transpiration.

Exceedence probability is the percent chance that the discharge will exceed that indicated in a given unit of time. (See recurrence interval.)

Net diversion is the arithmetic difference between the measured quantity of water diverted from a stream into the upper end of a canal and the measured quantity of unused water returned to that stream.

Nonexceedence probability is the percent chance that the discharge will be less than that indicated in any climatic year. (See recurrence interval.) The mean 7-day low flow having a 10-percent nonexceedence probability (10-year recurrence interval) is used in applying Nebraska water-quality criteria (Nebr. Dept. of Health, 1969, p. 18).

Exceedence probability hydrograph is a plot of selected exceedence probabilities of stream discharges for each day of the year. In this report, the selected exceedence probabilities are 20, 50, and 80 percent and were obtained from records of 9, 19, 29, or 39 years' duration. They were determined by ranking from highest to lowest, the values of mean daily discharge for each January 1, each January 2, etc., in the period of record used and then selecting those discharges for which 20, 50, and 80 percent of the values were greater. The graph shows for each day the discharge that has been exceeded the indicated percentage of days during the period of record. Daily extremes for the period of record are also shown. The dot pattern between the 20 percent and the 80 percent lines helps the reader to distinguish these lines from those representing the lowest and highest discharges.

Recurrence interval (return period) is the average interval of time that a high-flow event will be equaled or exceeded only once, or that a low-flow event will be equaled or not exceeded only once. It is equal to the reciprocal of the exceedence or nonexceedence probability multiplied by 100.

Total diversion is the measured quantity of water diverted from a stream into the upper end of a canal.

Water year is the 12-month period beginning October 1. It is used in analyzing surface-water supply and is designated by the calendar year in which it ends. (Also see climatic year.)

LIMITATIONS ON USE OF STATISTICAL DATA ON STREAMFLOW

The reliability of the statistics tabulated in this report depend on the length of record and the changes in use of water, diversions, and storage. The statistics are valid as long as water use remains the same as during the period on which the statistics are based.

WATER RESOURCES DEVELOPMENTS AFFECTING STREAMFLOW

Early irrigation development

Development of irrigation in the Loup River drainage basin began in the early 1890's, and about 145,600 acres were included in several irrigation projects by the middle part of that decade. For a variety of reasons practically all of the early projects were abandoned by 1900 or soon after.

According to a report prepared by the Nebraska State Planning Board in 1936, most of the irrigation water then being used in the Loup River drainage basin was supplied by small pumping units and short ditches diverting directly from streams. Estimates of acreages served were as follows:

Stream	Number of acres
North Loup	800
Middle Loup	2,000
South Loup	1,200
Loup	90
Total	4,090

At that time no irrigation wells had been drilled in upland areas and only a few had been drilled in those valleys where water-bearing sand and gravel is present near the surface.

Present irrigation development

The severe drought of the 1930's caused revival of interest in irrigation. Since then, the irrigated acreage has increased each year. In 1971 about 121,200 acres were irrigated with water from streams and about 235,900 acres with water from wells.

Water for about a fourth of the irrigated acreage supplied from streams is obtained by diverting directly or by pumping from the streams into short privately owned ditches. The land thus served is on either the flood plain or adjacent low terraces. About 935 rights to appropriate streamflow for irrigation were on record as of 1971, and of these at least two-thirds were for less than 1 cfs, about one-fourth for 1-2 cfs, and the remainder for rates ranging from 2-9 cfs. The amount of water thus used is not known but it varies considerably from year to year. In some recent years, regulation of junior appropriators has been necessary because demand exceeded the water supply.

The remaining three-fourths of the acreage irrigated with water from streams is within organized irrigation districts or projects built by the U.S. Bureau of Reclamation. These lands are mostly on stream terraces or uplands that would require too much lift to be served profitably by small privately owned systems. Salient features of the projects are described in the following paragraphs:

Middle Loup Public Power and Irrigation District.--Organized in 1936 according to provisions of Nebraska Senate File 310, this project originally had water rights dated December 28, 1932, and January 4, 1937, for 300 cfs and 98.48 cfs, respectively. Construction of its two diversion dams and four main canals was financed by the Public Works Administration. A dam at Sargent diverts water into Canals 1 and 2, which convey water to lands on both sides of the river in Custer County. The other dam, near the east boundary of Custer County, diverts water into Canals 3 and 4 to serve lands on both sides of the river in Valley and Sherman Counties. The irrigated land increased from 750 acres in 1938 to 17,500 acres in 1971. Figure 2 shows graphically the total and net amounts of water diverted for irrigation, the number of acres served, the amount of water diverted per acre served, and total May-September precipitation in each year of the period 1938 through 1971.

North Loup Public Power and Irrigation District.--Organized under the provisions of Nebraska Senate File 310 and funded by the Public Works Administration, this project originally had a water right dated March 28, 1933, for 238 cfs. Construction of the project began in 1937 and first

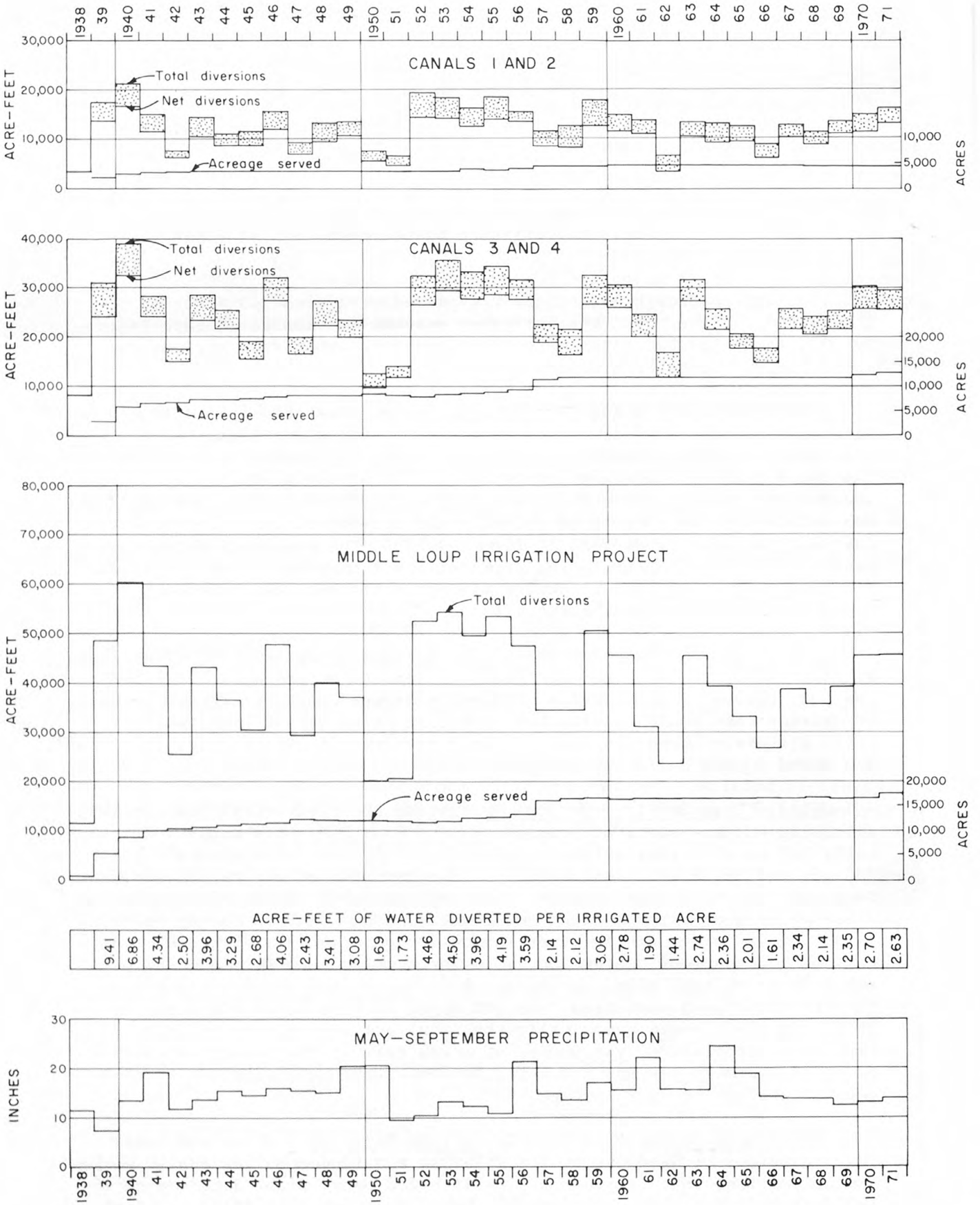

Figure 2.--Graphs of total and net amounts of water diverted for irrigation, acreage served, amount of water diverted per acre served, and total May-September precipitation, Middle Loup Public Power and Irrigation District, 1938-71.

diversions were made in the summer of 1938. Major features consist of dams at Taylor, Burwell, and Ord that divert water into the Taylor-Ord, Burwell-Sumter, and Ord-North Loup Canals, respectively. The Burwell-Sumter Canal serves valley lands northeast of the North Loup River and the others serve valley lands south and southwest of the river. The irrigated area increased from 1,371 acres in 1938 to 24,100 in 1971. The total and net amounts of water diverted for irrigation, the acreage served, the number of acre-feet of water diverted per acre served, and total May-September precipitation in each year of the period 1939 through 1971 are shown graphically in figure 3.

The Sargent Unit.--This is a U.S. Bureau of Reclamation project consisting of irrigated valley land on the north side of the Middle Loup River in northeastern Custer County. This project, which became operative in April 1957, has a water right dated July 6, 1954, for 198.20 cfs to serve 13,874 acres. Water is diverted into the Sargent Canal in southern Blaine County. The irrigated area increased from 2,567 acres in 1957 to 11,000 acres in 1971. Figure 4 shows graphically the total and net diversions for irrigation, the acreage served, and the amount of water diverted per acre served for each year in the period 1957 through 1971.

The Farwell Unit.--This is a U.S. Bureau of Reclamation project consisting of irrigated upland between the Middle and North Loup Rivers in eastern Sherman and western Howard Counties. It has a water right dated July 6, 1954, to store 68,120 acre-feet in Sherman Reservoir in northeastern Sherman County. The same dam that diverts water into Canals 3 and 4 of the Middle Loup Public Power and Irrigation District also diverts into the Farwell Feeder Canal, which conveys water to the reservoir. Water was first diverted into the reservoir on November 8, 1962, and was turned into the distribution system for a first time on May 1, 1963. Acres irrigated increased from 1,044 in 1963 to 38,000 in 1971. Total diversions for irrigation, the acreage served, and the number of acre-feet diverted per acre served in each year of the period 1963 through 1971 are shown graphically in figure 4.

Figures 5 through 10 show, for reaches upstream from selected stream-gaging sites, the acreage irrigated with water from streams during the period 1935 through 1971. Large increases shown on the graphs within a span of a few years indicate the beginning phase of operations by an irrigation district or Bureau of Reclamation project, each of which submits to the Nebraska Department of Water Resources an annual report of acreages actually irrigated. Acreages irrigated under private systems during the period 1934-65 were estimated from the acreage reports that each irrigator submits annually by April 15 to indicate to the Department of Water Resources the number of acres he intends to irrigate that year. Privately irrigated acreages during the period 1966-71 were determined from annual field surveys.

Withdrawal of ground water for irrigation depletes the flow of a stream wherever pumping from a well either induces seepage from the stream or intercepts water that otherwise would be discharged into it. If a well

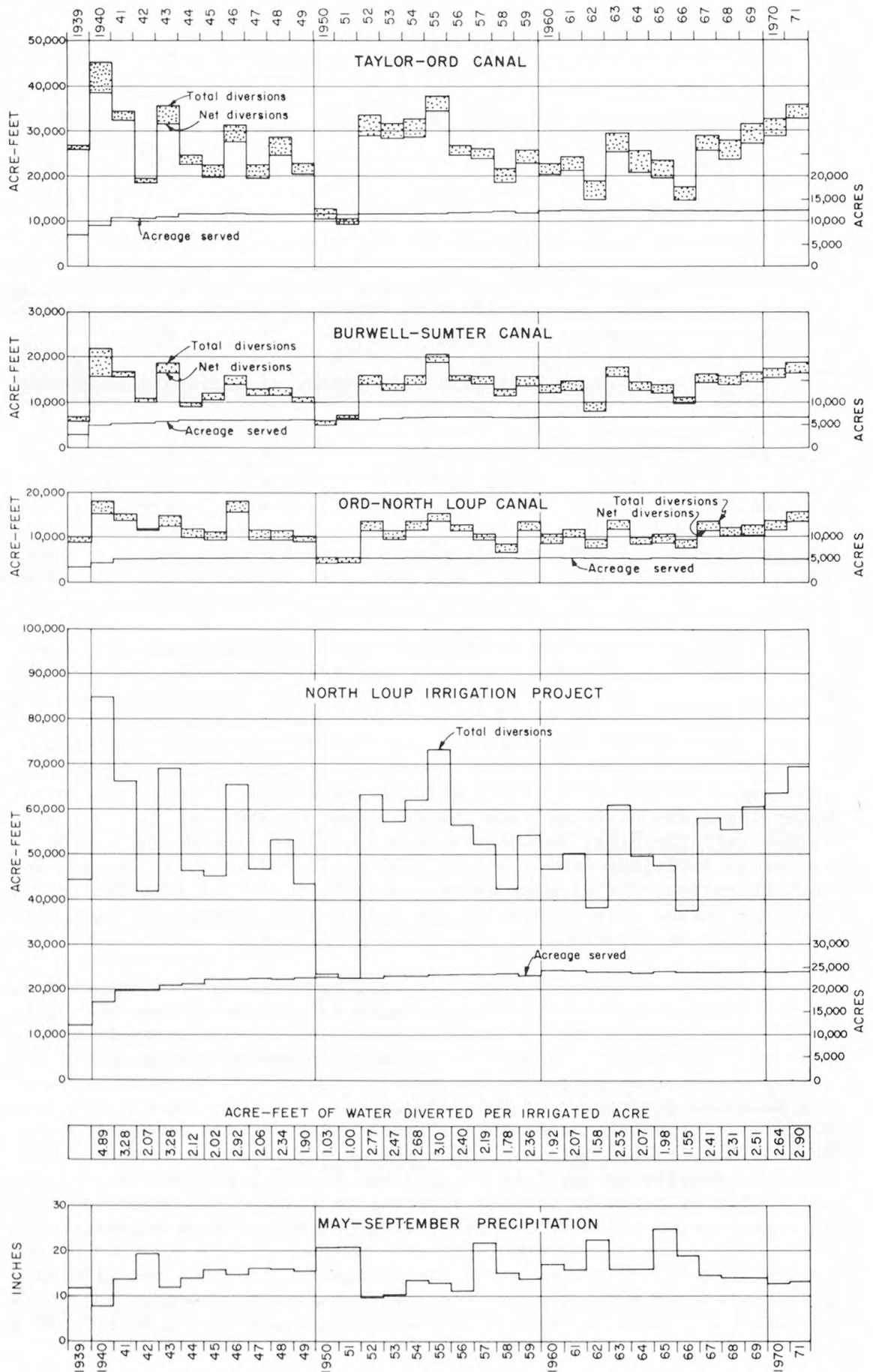

Figure 3.--Graphs of total and net amounts of water diverted for irrigation, acreage served, amount of water diverted per acre served, and total May-September precipitation, North Loup Public Power and Irrigation District, 1939-71.

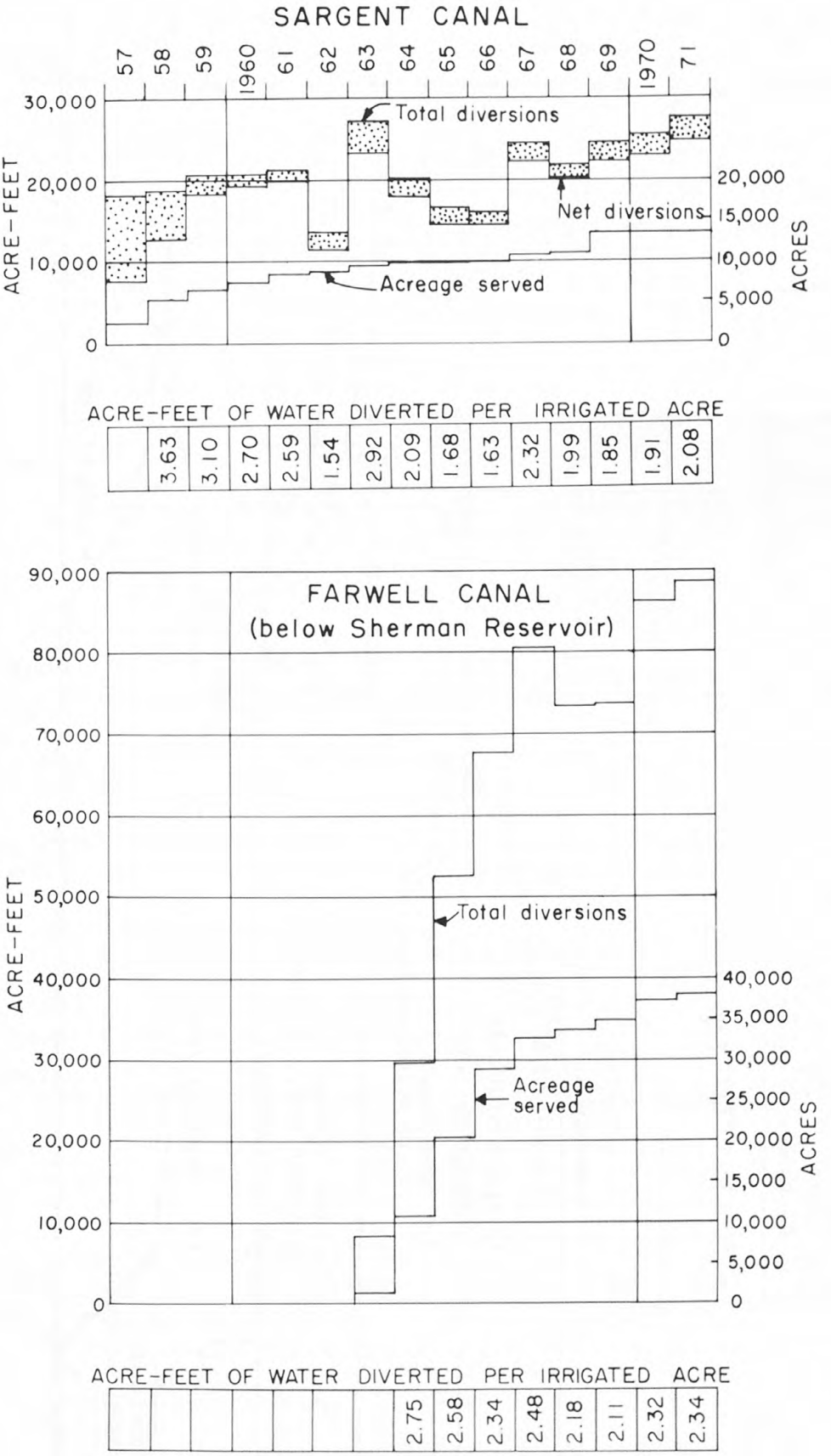

Figure 4.--Graphs showing total and net amounts of water diverted for irrigation, acreage served. amd amount of water diverted per acre served, Sargent Irrigation Project, 1957-71 and Farwell Irrigation Project, 1963-71.

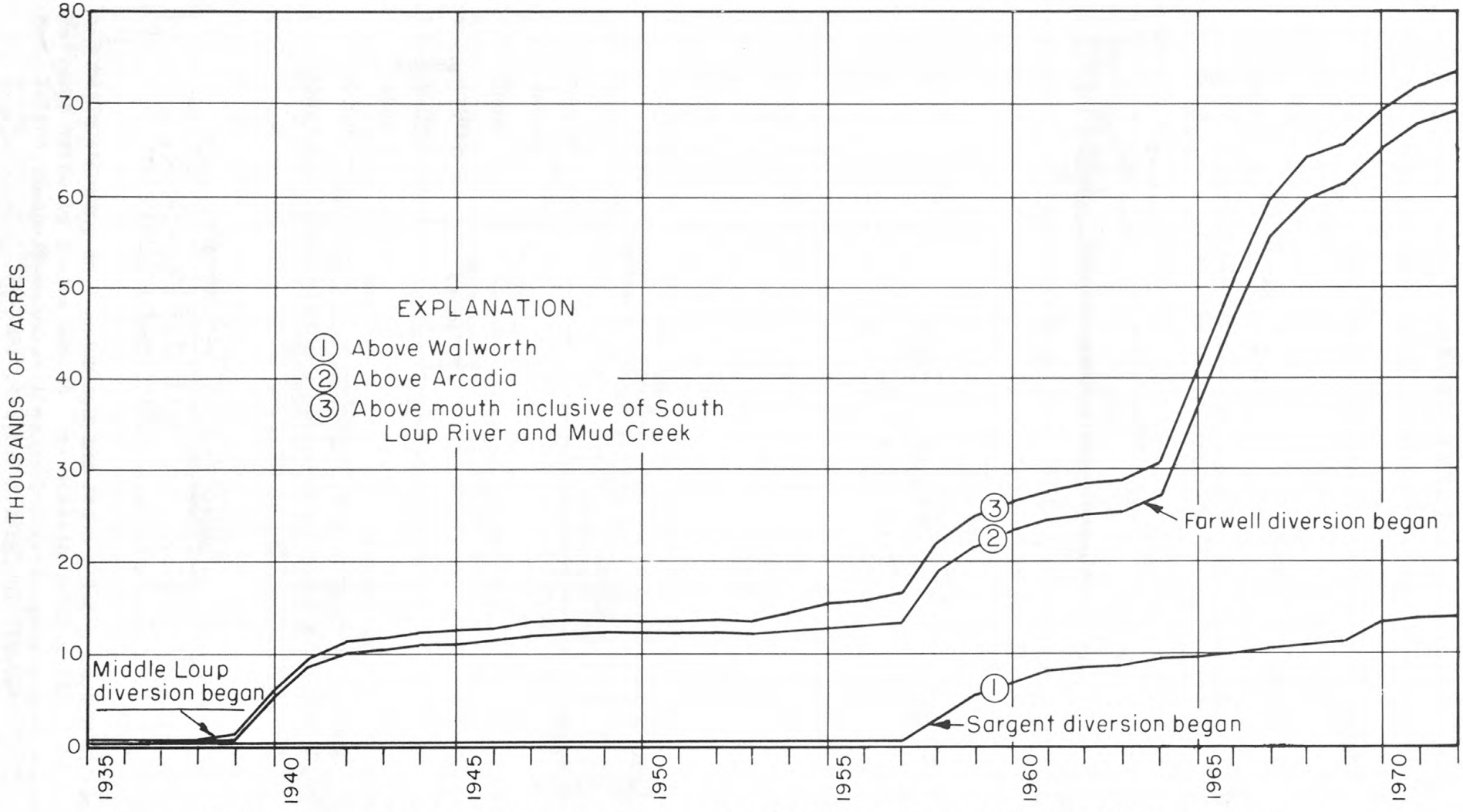

Figure 5 .--Estimated acreage irrigated with surface water in Middle Loup River basin.

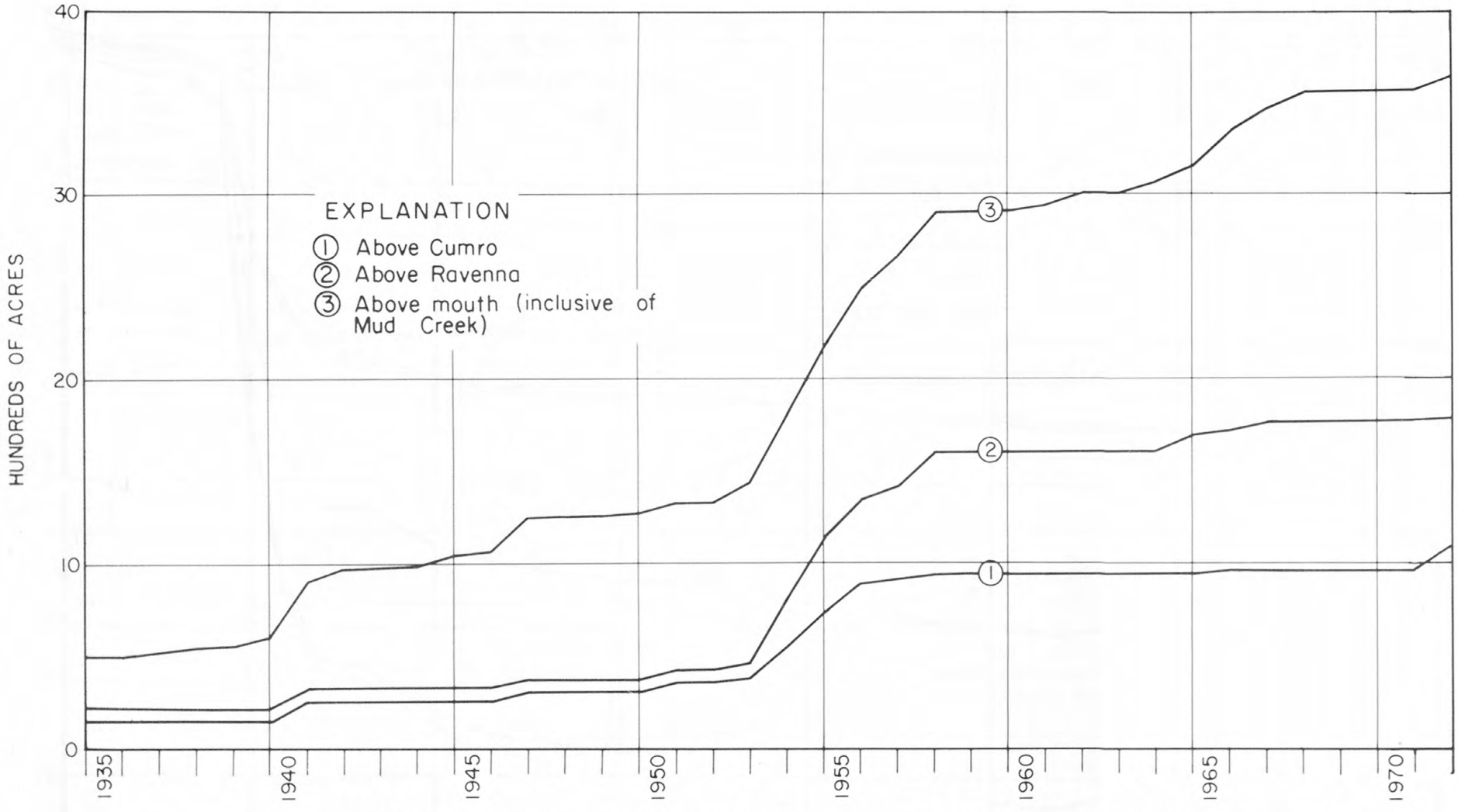

Figure 6.--Estimated acreage irrigated with surface water in South Loup River basin.

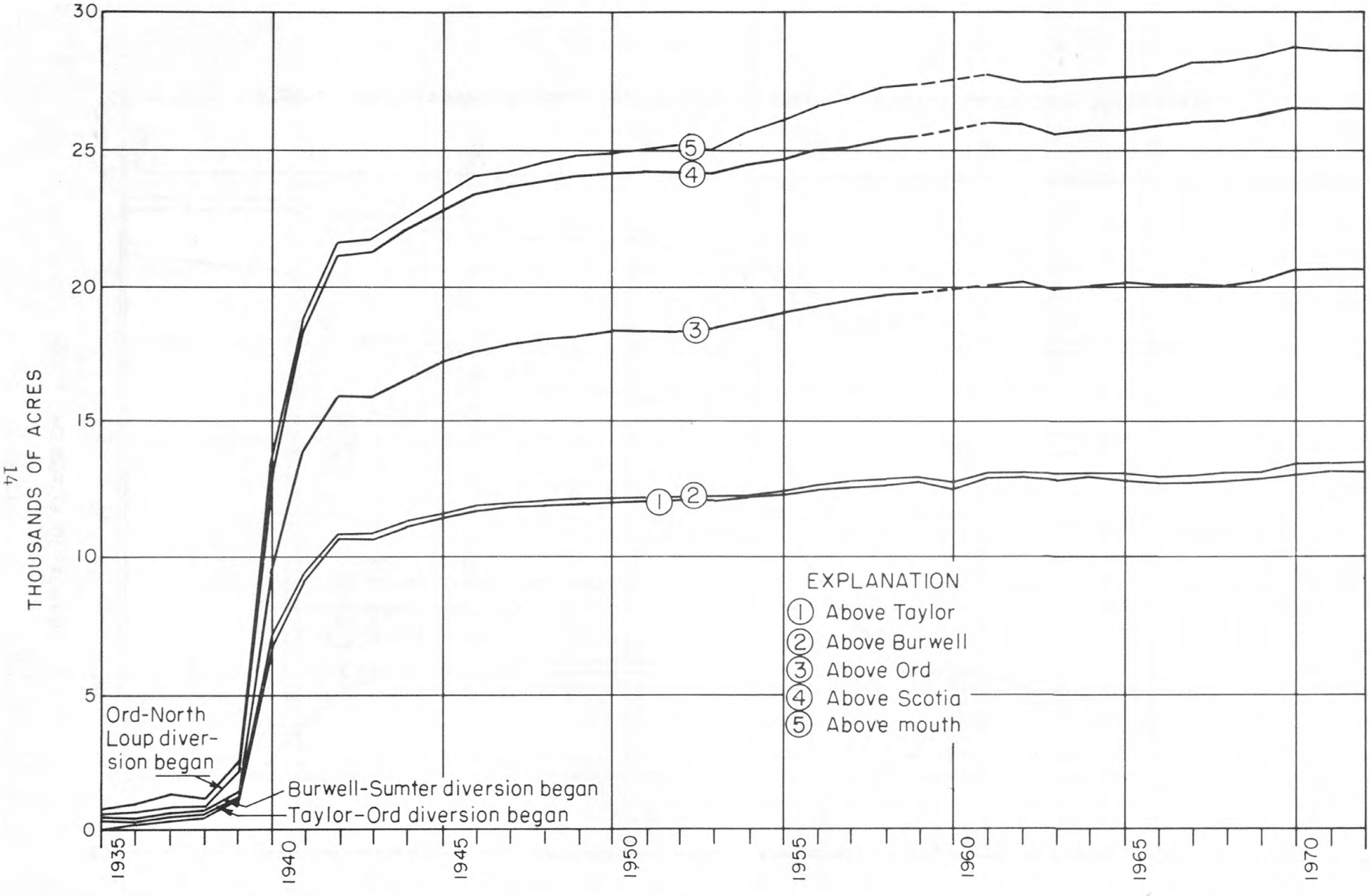

Figure 7.--Estimated acreage irrigated with surface water in North Loup River basin.

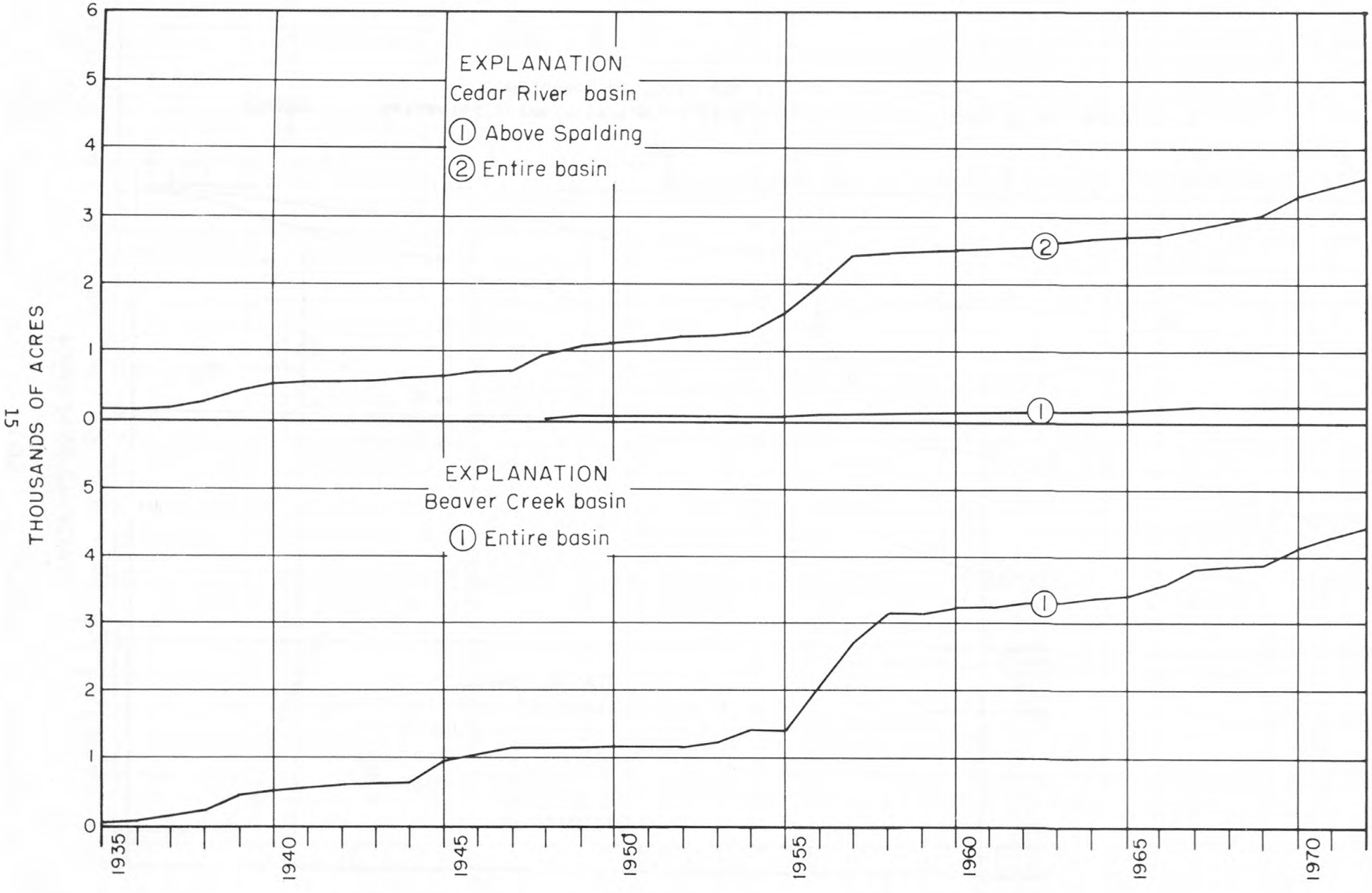

Figure 8.--Estimated acreage irrigated with surface water in Cedar River and Beaver Creek basins.

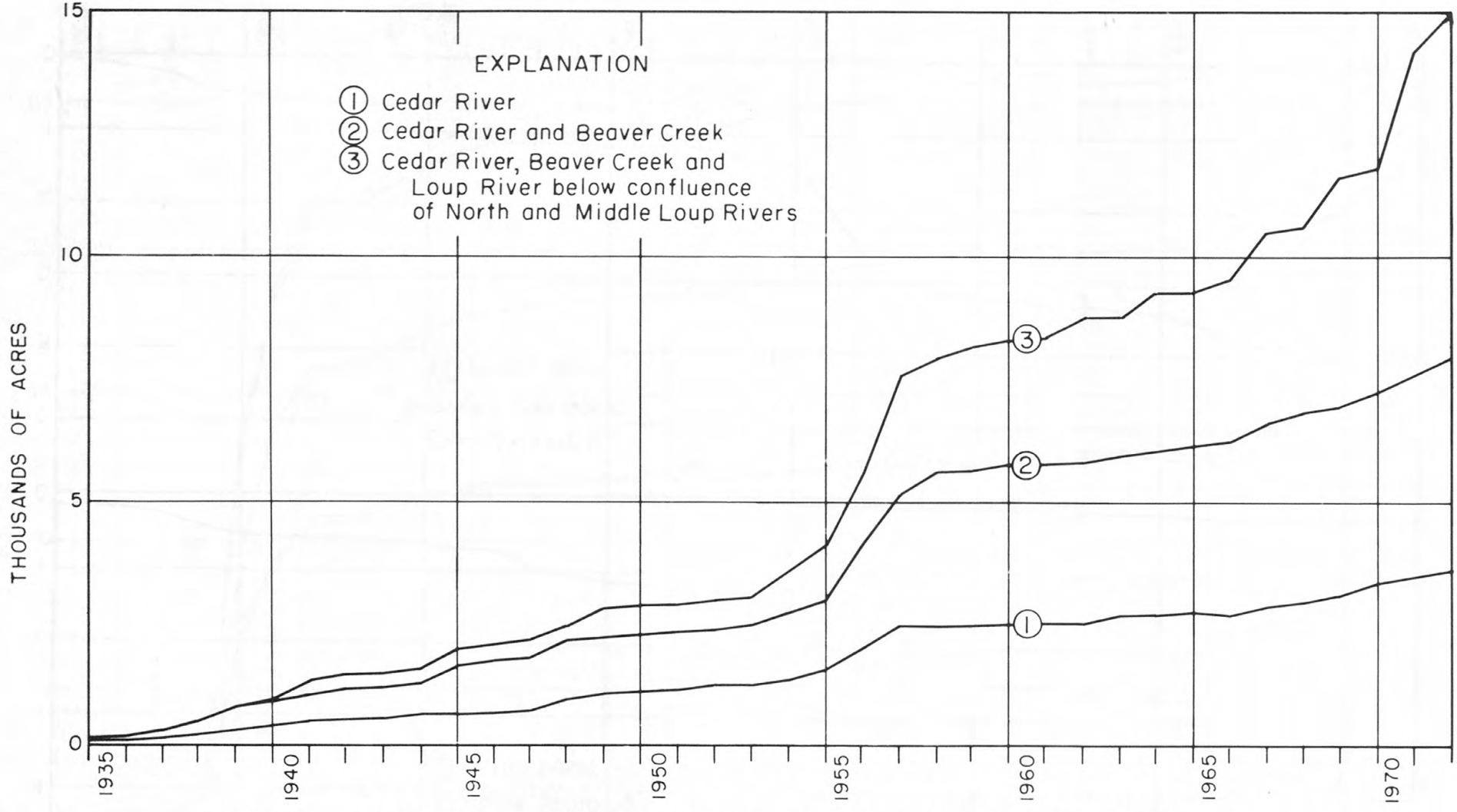

Figure 9.--Estimated acreage irrigated with surface water in Loup River basin below confluence of North and Middle Loup Rivers.

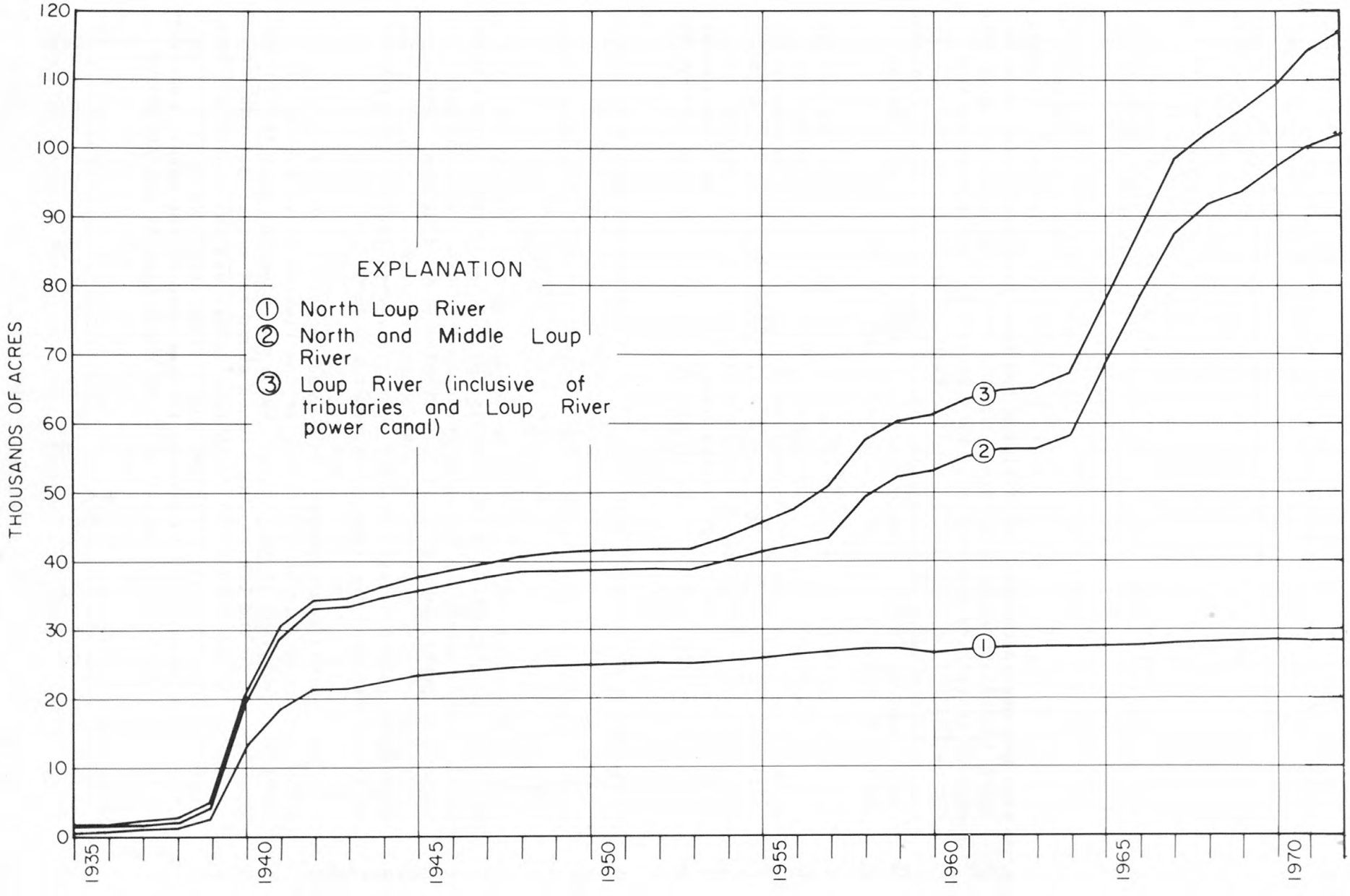

Figure 10.--Estimated acreage irrigated with surface water in Loup River basin.

is near a stream, the magnitude of its effect on streamflow may be demonstrable, but if a well is located far from a stream its effect on streamflow may be negligible. Although the combined pumping from numerous wells distant from a stream will eventually diminish natural discharge of ground water, such pumping is not likely to result in significant depletion of the streams. Instead, it is more likely to diminish the amount of ground water lost to the atmosphere through evapotranspiration in areas of shallow water table.

Installation of irrigation wells in large numbers began after World War II, when supplies for construction became more readily available and new techniques for drilling had been developed. The rate of installation increased greatly in the mid-1950's, when crop yields were reduced sharply by dry weather. Many irrigation wells were drilled during 1955, 1956, and 1957, then the rate of drilling tapered off until the dry years of the middle 1960's, when the rate again increased rather rapidly. The number of irrigation wells in the basin had increased from 806 in 1954 to 3,364 by the end of 1971.

Figures 11 to 16 show the increase, from 1934 to 1971, in acreage irrigated with ground water in areas upstream from selected stream-gaging sites. As shown by the curves for the drainage areas above the confluence of the Middle Loup and Dismal Rivers (fig. 11) and above Brewster on the North Loup (fig. 13), only a very small acreage is irrigated in the sandhills part of the basin. Development of ground-water resources of the sandhills region is increasing and eventually may result in irrigation of much more land.

Power development

During the first half of this century, water for power was developed at 37 sites in the Loup River drainage basin. Most power plants were small, either supplying the adjacent town with electrical energy or mechanical power for a grist mill. Problems caused by ice, floods, and deposition of sand resulted in abandonment of several, and most of the electrical plants became marginal operations when larger utilities established regional interconnected power systems.

The Central Power Company in Howard County had an appropriation of 1,000 cfs dated July 14, 1914, and at one time was the largest hydroelectric powerplant in the State. Water was diverted from the Middle Loup River into the Boelus Power Canal about 5.5 miles upstream from the confluence of the Middle and South Loup Rivers and was discharged into the South Loup about 2 miles upstream from its confluence with the Middle Loup. This powerplant, located at the east end of the canal, continued to operate until the summer of 1972, at which time it was abandoned.

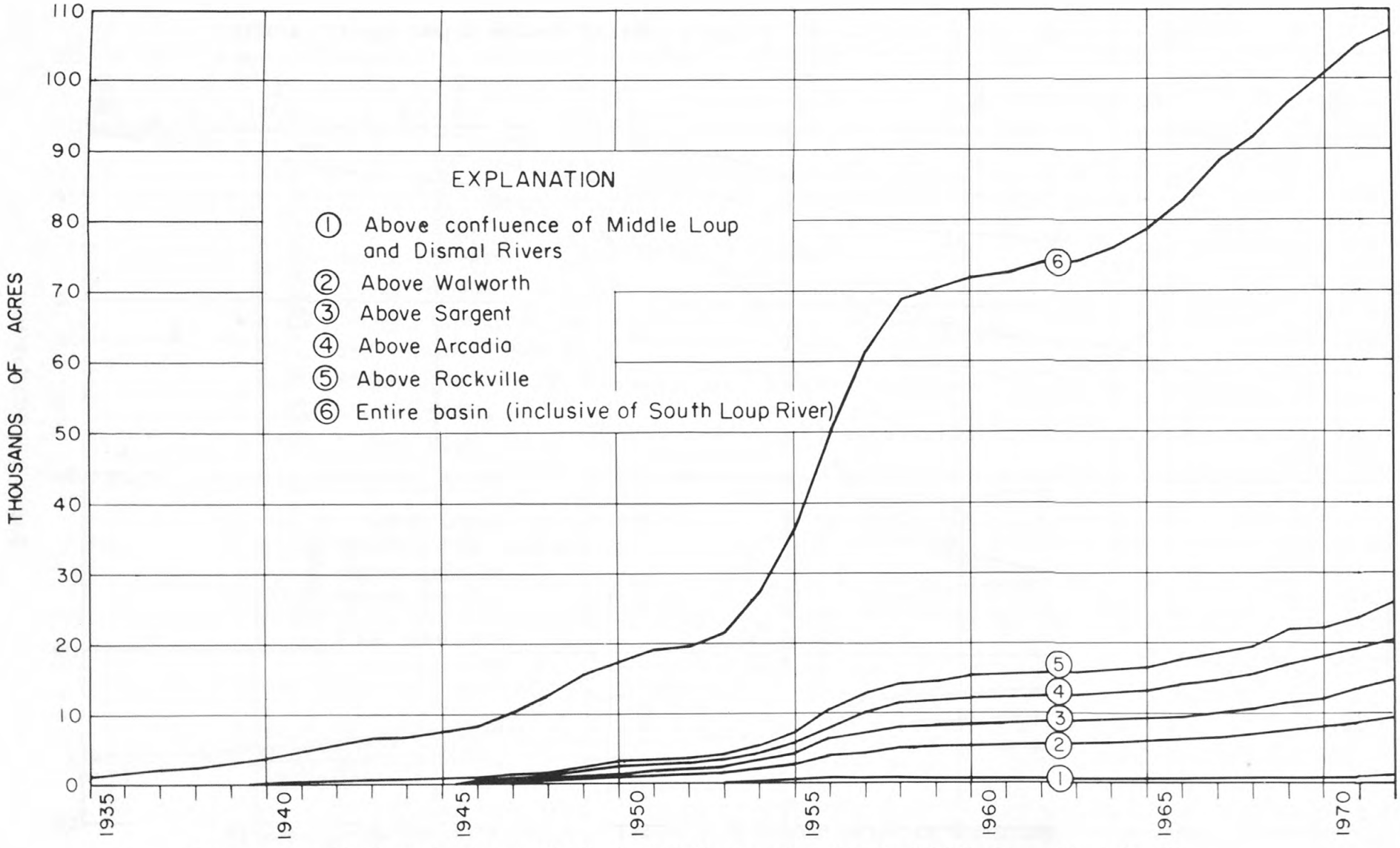

Figure 11.--Estimated acreage irrigated with ground water in Middle Loup River basin.

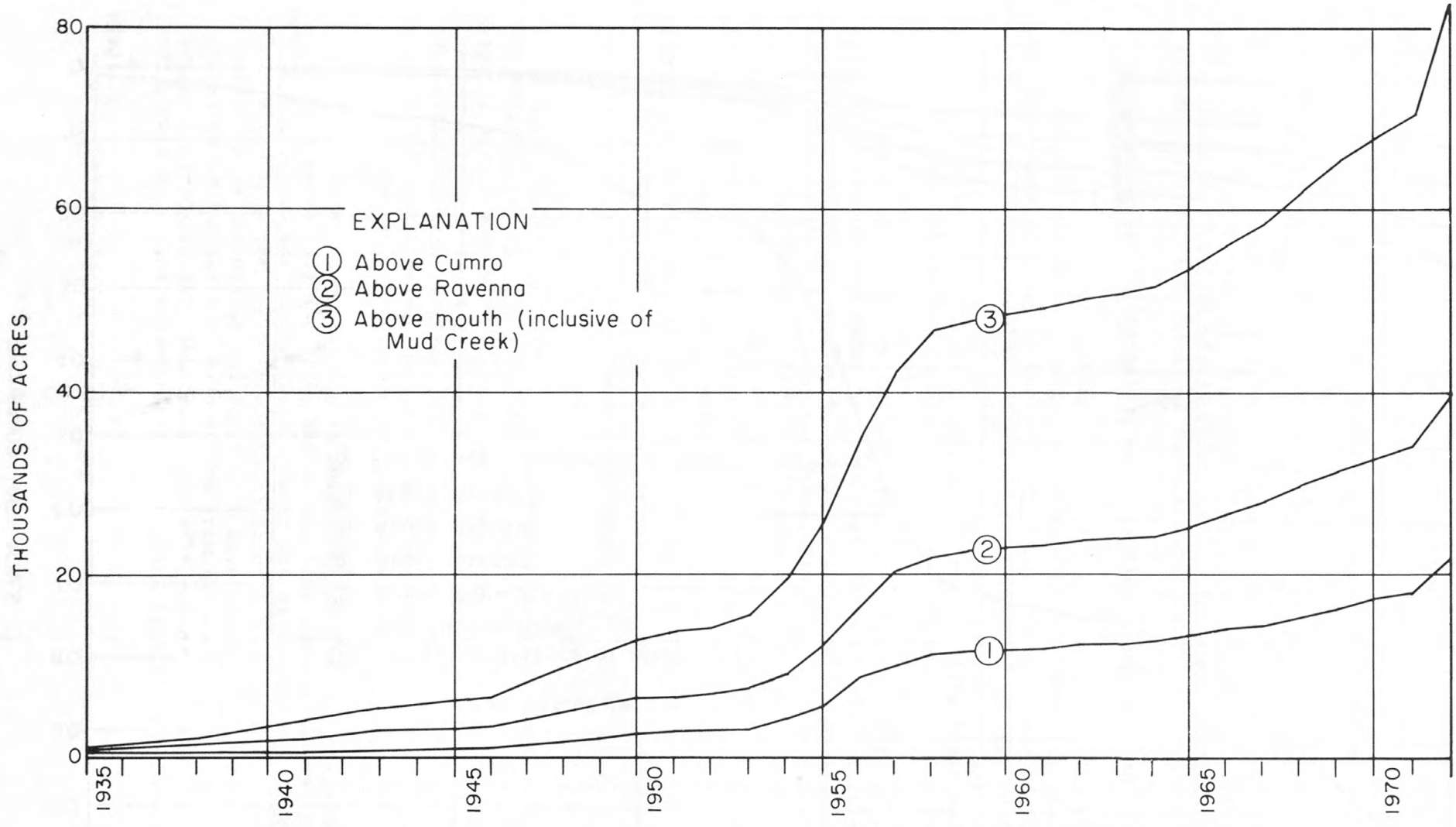

Figure 12.--Estimated acreage irrigated with ground water in South Loup River basin.

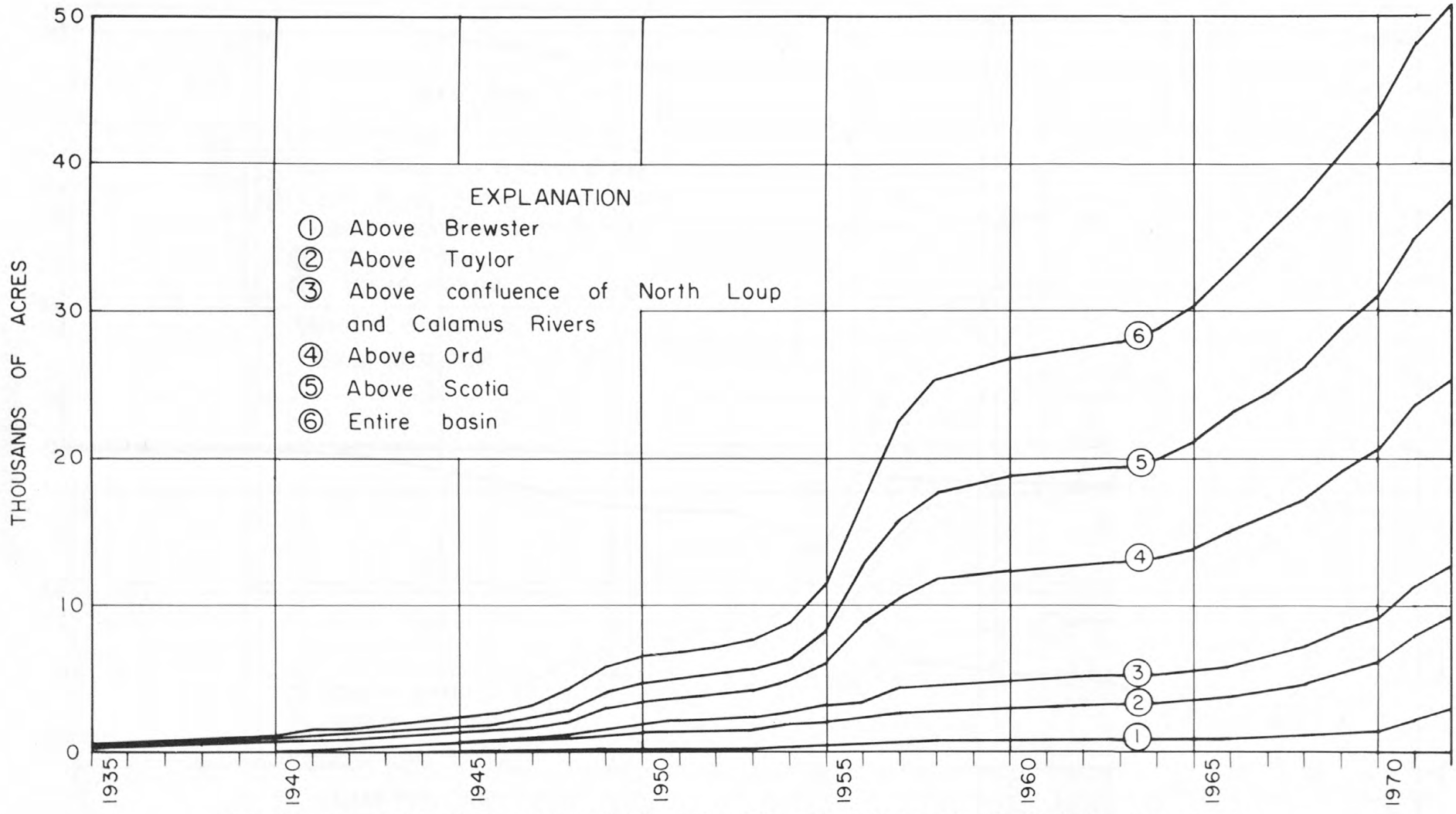

Figure 13.--Estimated acreage irrigated with ground water in North Loup River basin.

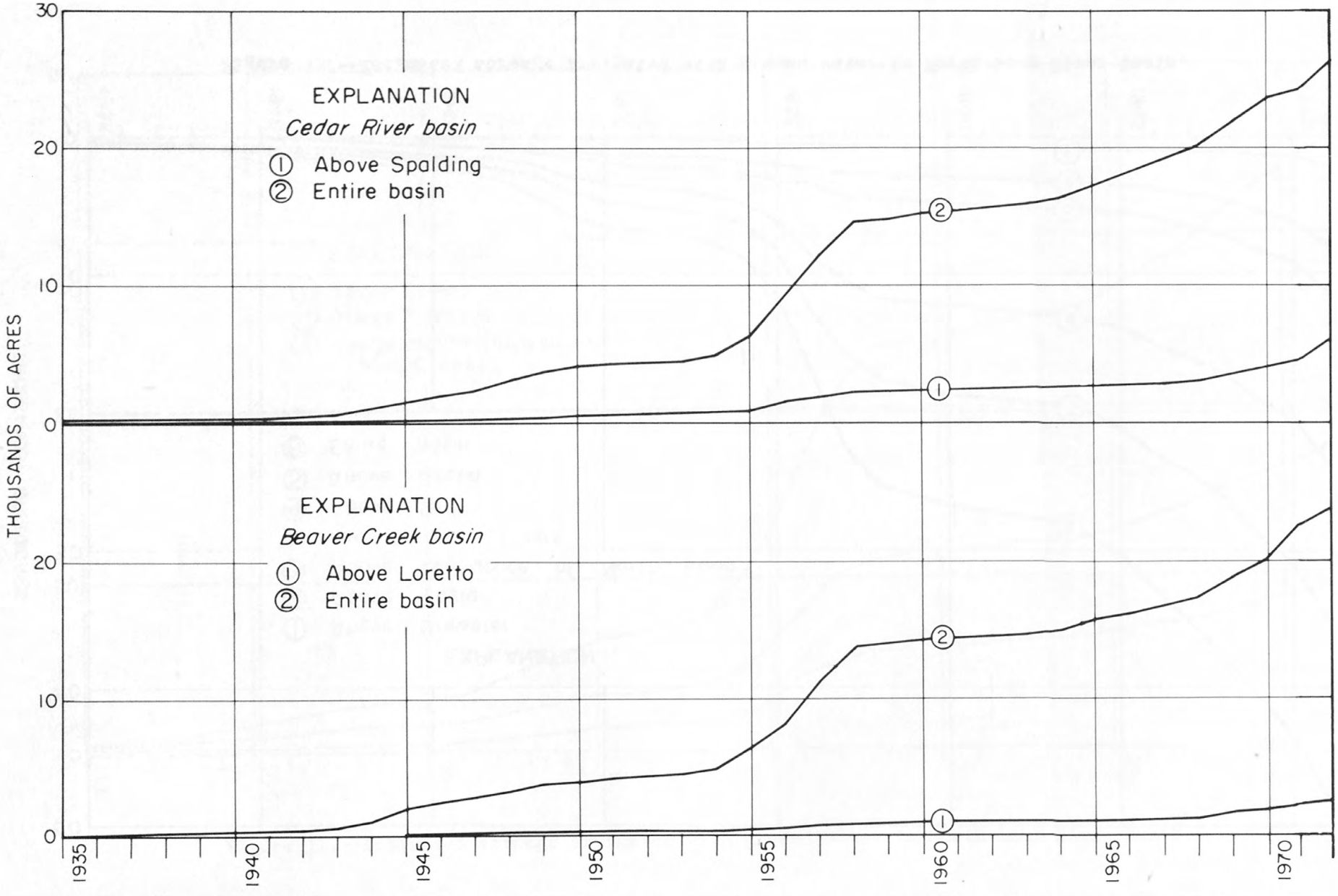

Figure 14.--Estimated acreage irrigated with ground water in Cedar River and Beaver Creek basins.

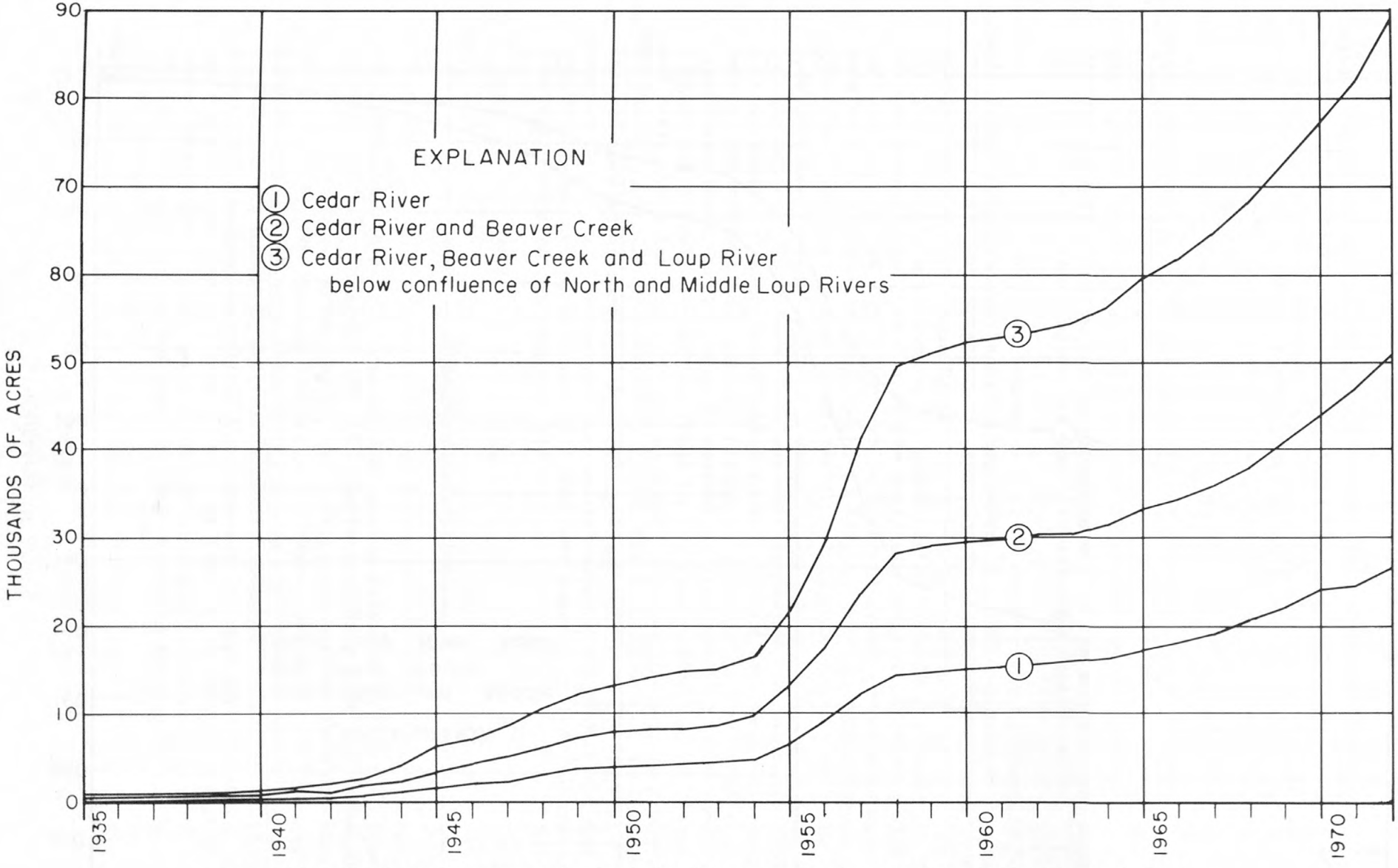

Figure 15.--Estimated acreage irrigated with ground water in Loup River basin below confluence of North and Middle Loup Rivers.

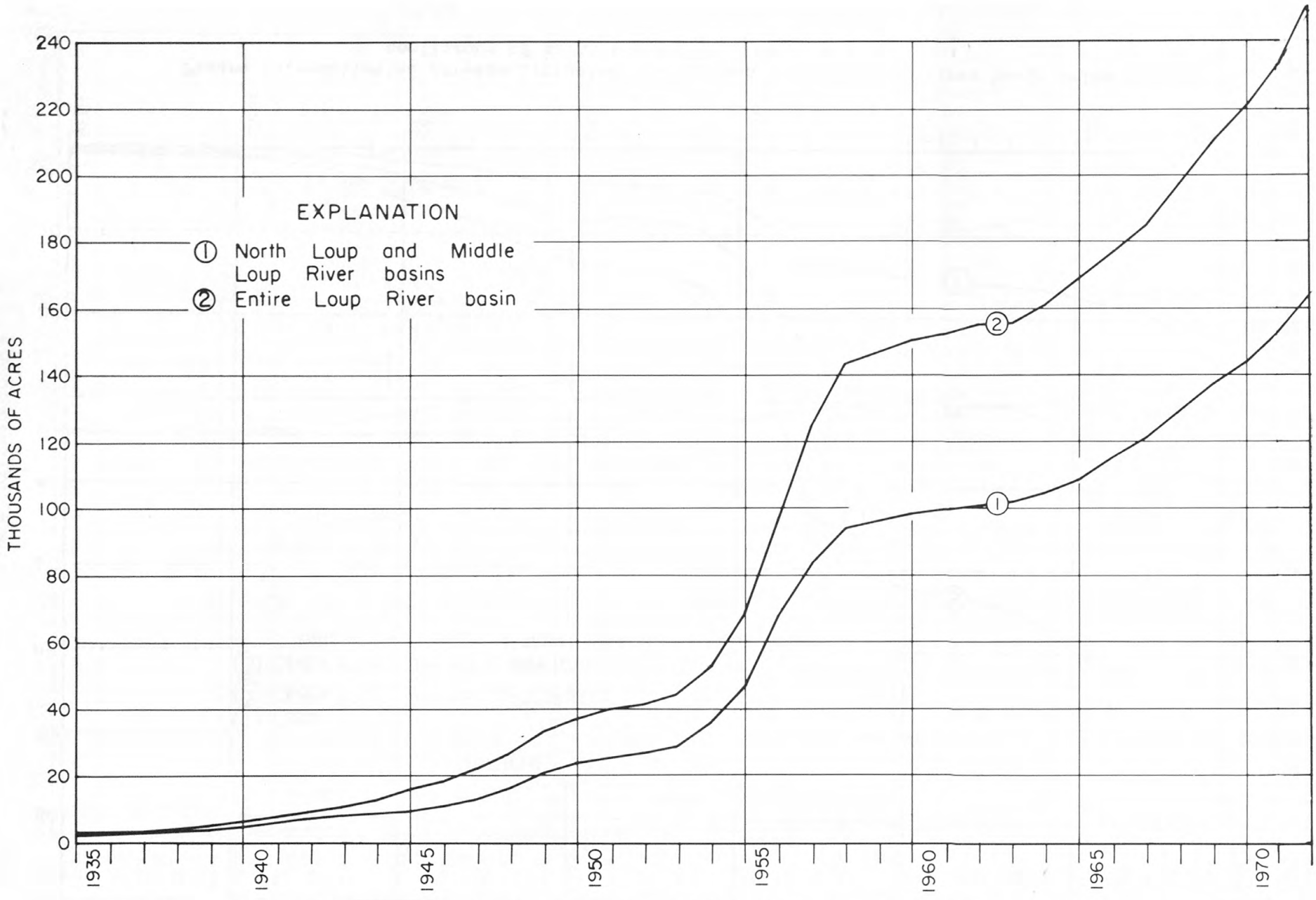

Figure 16.--Estimated acreage irrigated with ground water in Loup River basin.

Only two of the older small plants, both on the Cedar River (one at Ericson, the other at Spalding) still generate electricity.

The Loup River Public Power District, currently the principal producer of electricity in the basin, began operations in December 1936. It has two power plants on the Loup Power Canal, which divert from the Loup River in eastern Nance County. Because the water that passes through the plants via a 30-mile canal is not returned to the Loup River but discharges into the Platte River downstream from the mouth of the Loup, the discharge of the Loup at its mouth is affected considerably.

The Loup River Public Power District's water right to divert 3,500 cfs from the Loup River is dated September 15, 1932. Subsequently, rights to divert water for irrigation at upstream locations were granted to the Middle Loup and North Loup Public Power and Irrigation Districts. As irrigation rights are superior to power rights according to Nebraska law and exercise of the junior upstream irrigation rights interfered with the senior right of the Loup River Public Power District, agreements were made whereby the Middle Loup and North Loup Districts would compensate the Loup River Public Power District for their interference with the District's water right. Individuals who also had junior rights to divert for irrigation at upstream locations were requested, beginning in 1955, to compensate the Loup River Public Power District for their interference. Several farmers who had obtained rights to pump irrigation water from the Loup River Power Canal similarly compensated the District. Because the Sargent and Farwell irrigation projects also are junior to the District and their operation would result in a further reduction of water available to the District for production of power, the U.S. Bureau of Reclamation entered into an agreement with the Loup River Public Power District whereby the two irrigation projects would compensate the District for power interference by delivery of equivalent power from federal hydroelectric plants on the Missouri River.

STREAMFLOW STATISTICS

Characteristics of streamflow at gaging stations in the Loup River drainage basin are described by the statistical data that are arranged in tables or are shown graphically. All statistics derived from discharge records for a given gaging station are grouped together after the gaging-station description, and the several groups are arranged according to gaging-station number in increasing order. Because the gaging-station numbers are assigned to reflect downstream order, the first statistics are for gaging station 06775500, which is located farther upstream than any of the other gaging stations in the Loup River drainage system, and the last are for gaging station 06794500, which is located at the mouth of the system.

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06775500 Middle Loup River at Dunning, Nebr.

LOCATION.--Lat 41°49'50", long 100°06'00", in NW¼SE¼ sec.33, T.22 N., R.24 W., Blaine County, on left bank just upstream from bridge on State Highway 2 at northeast corner of Dunning, 1 mile upstream from Dismal River.

DRAINAGE AREA.--1,760 sq mi, approximately, of which about 80 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--September 1945 to September 1971.

DIVERSIONS.--Some pumping directly from stream; streamflow not appreciably affected.

Monthly and annual mean discharges, water years 1946-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October....	436	346	386	24.2	0.06	8.12
November...	430	365	392	19.0	.05	8.23
December...	432	336	394	21.8	.06	8.28
January....	490	322	387	36.2	.09	8.13
February...	492	370	415	30.7	.07	8.73
March.....	522	359	438	38.8	.09	9.20
April.....	545	334	425	42.0	.10	8.94
May.....	504	353	412	33.3	.08	8.66
June.....	504	342	394	39.9	.10	8.28
July.....	473	324	369	30.6	.08	7.77
August.....	407	341	368	19.2	.05	7.73
September..	449	330	377	26.7	.07	7.93
Annual.....	428	364	396	16.3	0.04	100

Duration of daily mean discharges, water years 1946-71

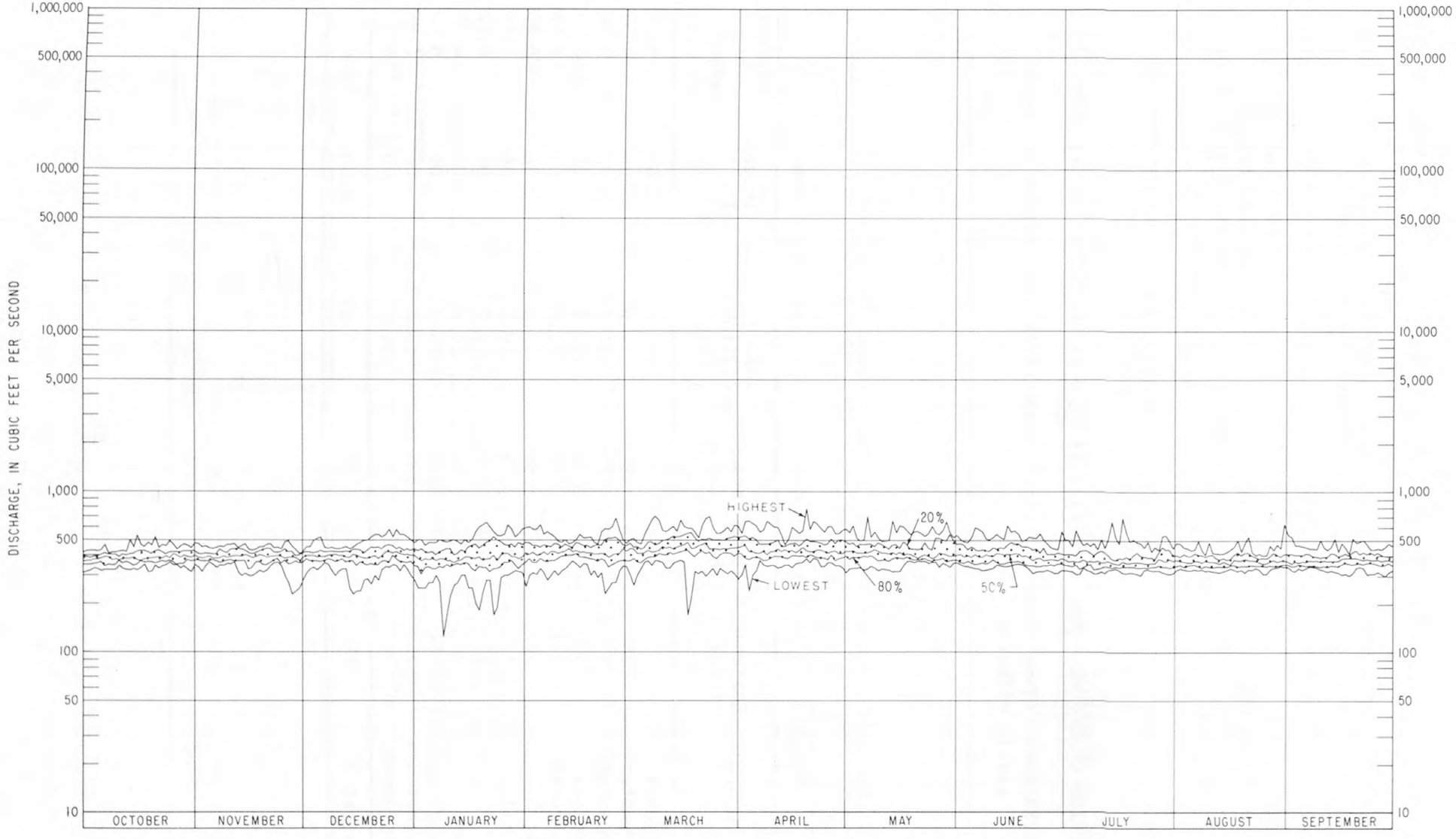
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
100	100	290	98.8	440	17.3
160	99.9	310	97.6	460	11.2
200	99.8	330	94.3	490	5.9
220	99.7	340	90.3	520	3.0
240	99.6	370	68.2	550	1.6
260	99.3	390	50.2	590	.7
270	99.2	410	34.2	620	.3

Probability of annual high flows, water years 1946-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	468	436	432	415	397	384
50	2	619	579	542	507	480	453
10	10	705	645	597	563	526	494
4	25	737	665	615	585	543	509
2	50	757	678	626	599	554	519
1	100	776	688	636	612	564	527

Probability of annual low flows, climatic years 1947-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	79	110	213	270	299	320
2	50	91	122	215	280	305	325
5	20	115	145	237	288	312	331
10	10	132	170	250	297	319	336
20	5	160	200	265	307	327	343
50	2	222	252	293	324	341	357



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP RIVER AT DUNNING, NEBR., 1953-71

06776500 Dismal River at Dunning, Nebr.

LOCATION.--Lat 41°49'23", long 100°06'05", in sec.4, T.21 N., R.24 W., Blaine County, on right bank 100 ft downstream from bridge on State Highway 2 at southeast corner of Dunning and 1 mile upstream from mouth.

DRAINAGE AREA.--2,040 sq mi, approximately, of which about 45 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--March to June 1932, September 1945 to September 1971.

DIVERSIONS.--Some pumping directly from river; streamflow not appreciably affected.

Monthly and annual mean discharges, water years 1946-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October....	358	296	319	14.4	0.04	8.24
November...	360	304	322	14.6	.04	8.32
December...	348	291	323	14.2	.04	8.34
January....	348	278	318	18.1	.06	8.21
February...	371	270	336	23.0	.07	8.68
March.....	360	305	336	15.2	.04	8.70
April.....	370	305	335	18.8	.06	8.66
May.....	363	294	326	19.0	.06	8.42
June.....	387	275	321	23.8	.07	8.30
July.....	361	269	310	20.2	.06	8.02
August.....	356	279	309	18.2	.06	7.99
September..	343	285	314	14.8	.05	8.12
Annual.....	340	305	322	9.41	0.03	100

Duration of daily mean discharges, water years 1946-71

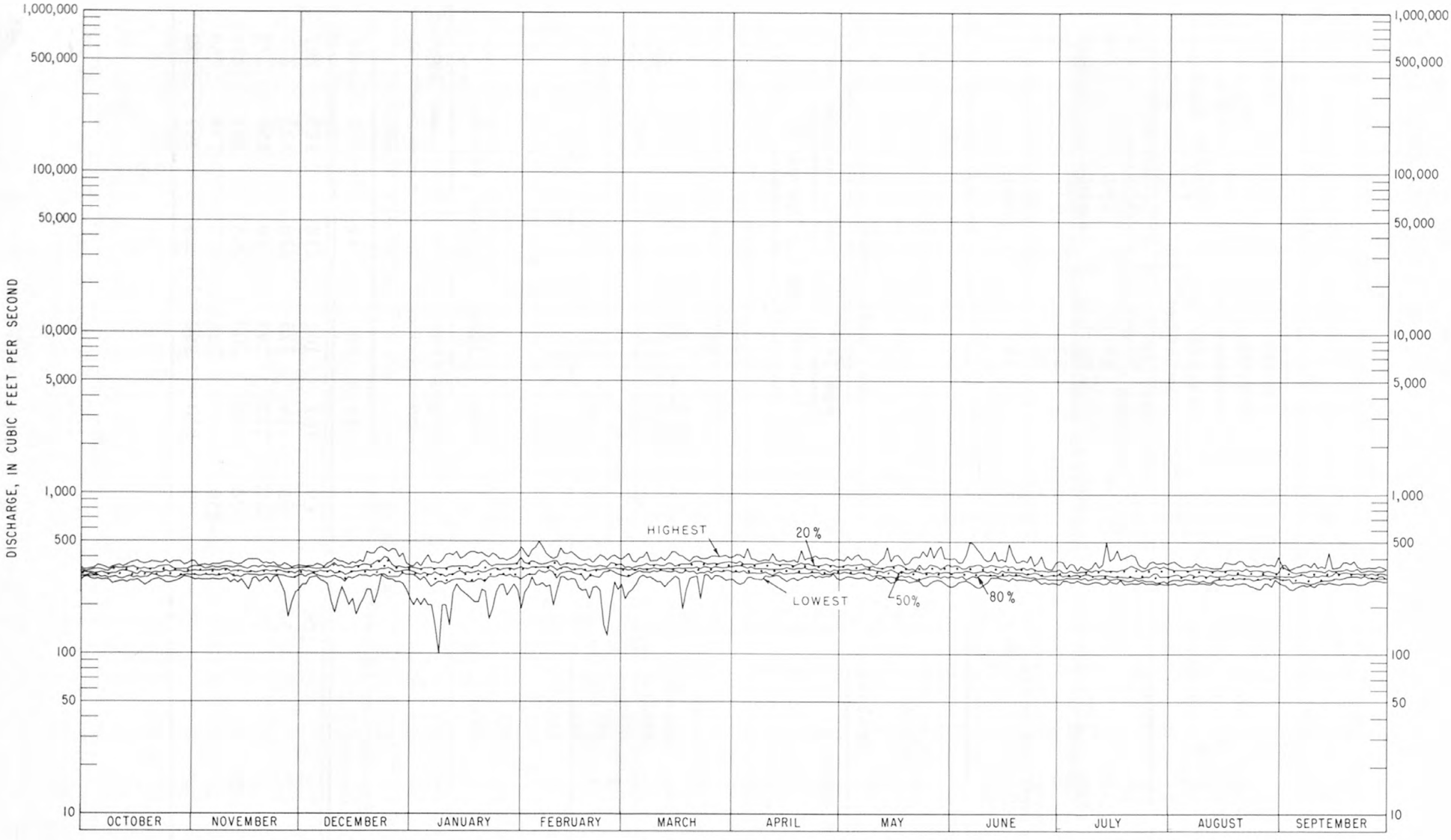
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
100	100	270	96.9	370	6.4
140	99.9	290	88.1	390	2.8
180	99.8	300	80.1	410	1.3
210	99.6	320	53.2	430	.7
230	99.4	330	40.0	450	.3
250	98.8	350	16.0	470	.1
260	98.2				

Probability of annual high flows, water years 1946-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	377	369	357	345	337	321
50	2	447	418	396	377	361	349
10	10	504	465	429	398	379	366
4	25	530	487	445	407	387	373
2	50	548	502	455	413	393	377
1	100	565	518	466	418	398	381

Probability of annual low flows, climatic years 1947-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	69	102	162	218	225	267
2	50	85	114	175	228	235	272
5	20	109	138	193	240	250	278
10	10	128	160	208	258	265	283
20	5	150	188	225	265	274	289
50	2	190	230	258	285	292	300



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, DISMAL RIVER AT DUNNING, NEBR., 1953-71

06776501 Middle Loup River below confluence of Middle Loup and Dismal Rivers near Dunning, Nebr.

LOCATION.--Lat 41°49'32", long 100°04'30", in NE¼NE¼ sec.3, T.21 N., R.24 W., Blaine County immediately below confluence of Middle Loup and Dismal Rivers and 1.4 miles east of State Highway 2.

DRAINAGE AREA.--3,800 sq mi, approximately, of which about 125 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--September 1945 to September 1971.

COMPUTATION OF RECORD.--Sum of Middle Loup River at Dunning (06775500) and Dismal River at Dunning (06776500).

DIVERSIONS.--Small amount of pumping directly from rivers; streamflow not appreciably affected.

Monthly and annual mean discharges, water years 1946-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	766	653	705	33.9	0.05	8.17
November....	772	673	713	29.3	.04	8.27
December....	757	635	716	29.7	.04	8.31
January.....	809	626	704	45.9	.06	8.17
February....	859	644	751	44.7	.06	8.71
March.....	862	683	774	45.7	.06	8.97
April.....	915	639	760	56.8	.08	8.81
May.....	861	666	738	49.0	.07	8.56
June.....	890	619	715	61.2	.09	8.29
July.....	835	595	680	48.3	.07	7.88
August.....	763	626	677	33.2	.05	7.85
September...	779	636	691	36.8	.05	8.01
Annual.....	761	672	718	25.0	0.04	100

Duration of daily mean discharges, water years 1946-71

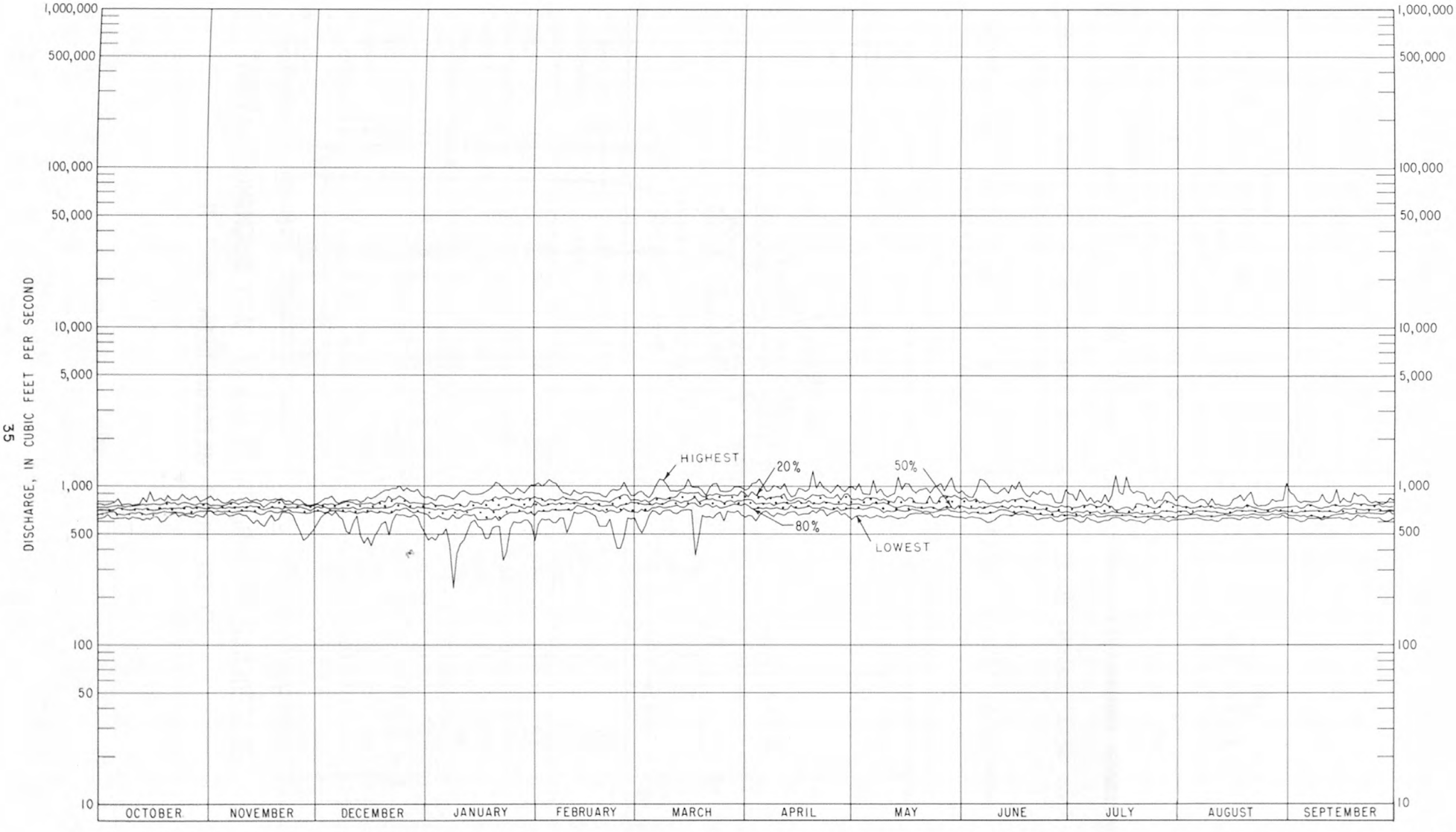
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
220	100	560	98.7	820	9.3
310	99.9	590	97.8	870	4.5
410	99.8	630	91.7	910	2.2
450	99.7	660	79.9	970	.7
480	99.5	700	56.6	1,000	.5
500	99.3	740	34.2	1,100	.1
530	99.1	780	17.8		

Probability of annual high flows, water years 1946-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	838	782	758	745	722	699
50	2	1,020	970	919	874	832	797
10	10	1,140	1,050	984	932	889	852
4	25	1,180	1,070	1,000	951	909	872
2	50	1,210	1,080	1,010	963	921	886
1	100	1,230	1,090	1,020	973	932	897

Probability of annual low flows, climatic years 1947-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	144	260	415	500	581	604
2	50	170	285	435	520	590	612
5	20	225	325	475	540	600	620
10	10	280	365	495	555	609	628
20	5	345	400	522	570	621	639
50	2	450	492	566	614	642	661



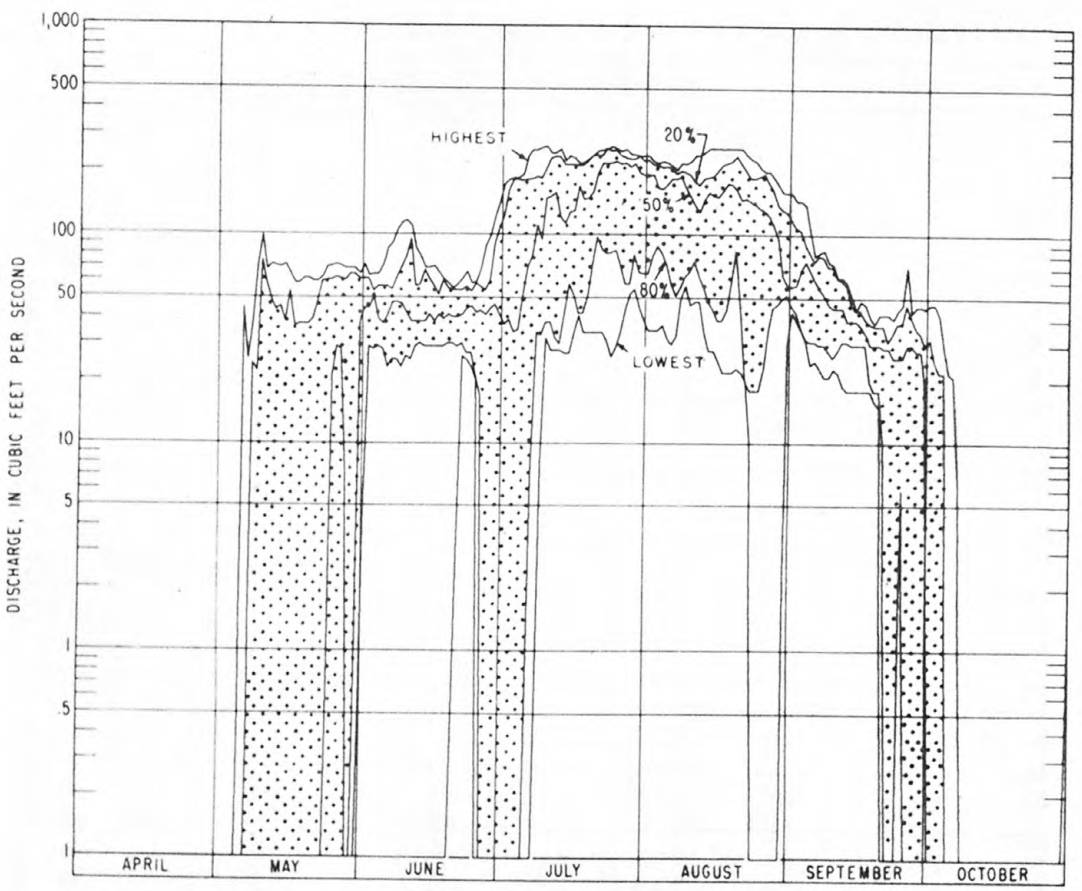
EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP RIVER BELOW CONFLUENCE OF MIDDLE LOUP AND DISMAL RIVERS NEAR DUNNING, NEBR., 1953-71

06777250 Sargent Canal near Milburn, Nebr.

POINT OF DIVERSION.--Lat 41°45'8", long 99°46'39", SW¼NE¼ sec.32, T.21 N., R.21 W., Blaine County, on left bank of Middle Loup River 0.7 mile upstream from Blaine-Custer County Line.

PERIOD OF RECORD.--April 1, 1957 to September 1971.

AVERAGE ANNUAL DIVERSIONS.--1958-71, 21,300 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, SARGENT CANAL NEAR MILBURN, NEBR., 1963-71

06778000 Middle Loup River at Sargent, Nebr.

LOCATION.--Center of diversion dam: Lat 41°37'36", long 99°22'15", in SE¼ sec.10, T.19 N., R.18 W., Custer County, above Middle Loup Canals No. 1 and No. 2, 280 ft downstream from county highway bridge, 0.7 mile south of Sargent, and 1.2 miles downstream from Sand Creek.

DRAINAGE AREA.--4,480 sq mi, approximately, of which about 475 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--December 1936 to December 1938; October 1952 to January 1970 (discontinued).

DIVERSIONS.--Sargent Canal diversion began April 1, 1957; also some pumping directly from river.

Monthly and annual mean discharges, water years 1957-69

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	886	757	825	36.3	0.04	8.34
November....	877	755	830	38.3	.05	8.38
December....	939	722	795	57.8	.07	8.04
January.....	967	671	787	88.2	.11	7.95
February....	1,120	713	935	98.1	.10	9.45
March.....	1,170	867	982	87.4	.09	9.91
April.....	1,020	800	913	69.0	.08	9.22
May.....	1,030	730	863	77.7	.09	8.72
June.....	1,200	675	844	128	.15	8.52
July.....	956	572	703	101	.14	7.10
August.....	739	506	659	80.7	.12	6.65
September...	845	688	764	50.1	.07	7.72
Annual.....	882	773	824	30.4	0.04	100

Duration of daily mean discharges, water years 1957-69

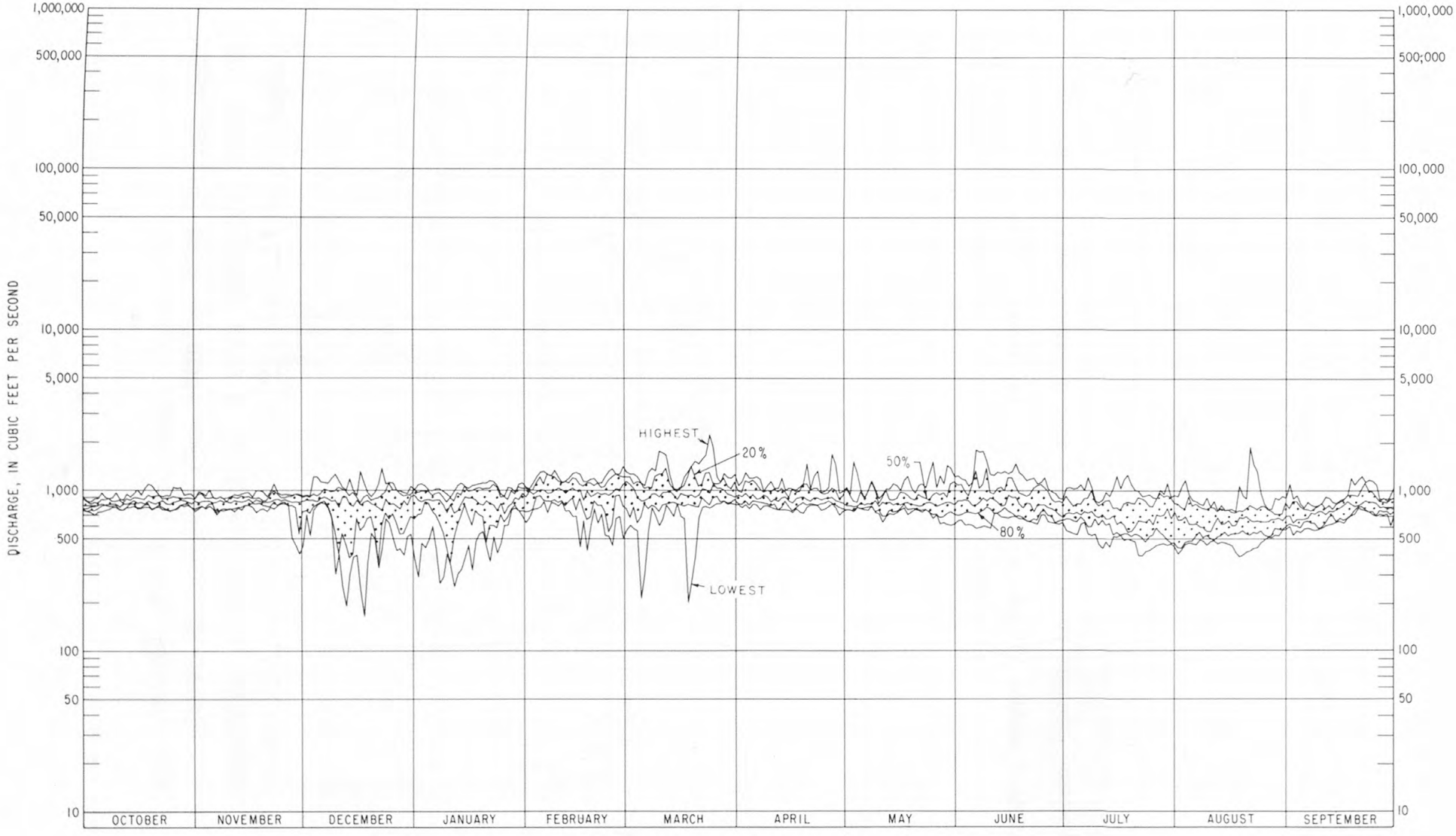
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
160	100	480	97.5	1,000	12.8
210	99.9	530	95.5	1,100	6.0
270	99.8	590	92.2	1,200	3.1
300	99.7	640	87.7	1,400	.7
330	99.6	710	78.3	1,500	.4
360	99.4	780	62.9	1,700	.2
400	99.2	850	40.5	1,800	.1
440	98.5	940	19.7		

Probability of annual high flows, water years 1957-69

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
100	1	1,180	1,110	1,080	1,000	929	867
50	2	1,500	1,370	1,240	1,130	1,060	1,000
10	10	2,170	1,840	1,580	1,350	1,210	1,090
4	25	2,620	2,140	1,800	1,480	1,280	1,130

Probability of annual low flows, climatic years 1958-69

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
5	20	159	237	360	443	509	571
10	10	181	262	385	463	529	587
20	5	213	295	413	487	554	607
50	2	288	365	464	529	603	648



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP RIVER AT SARGENT, NEBR., 1961-69

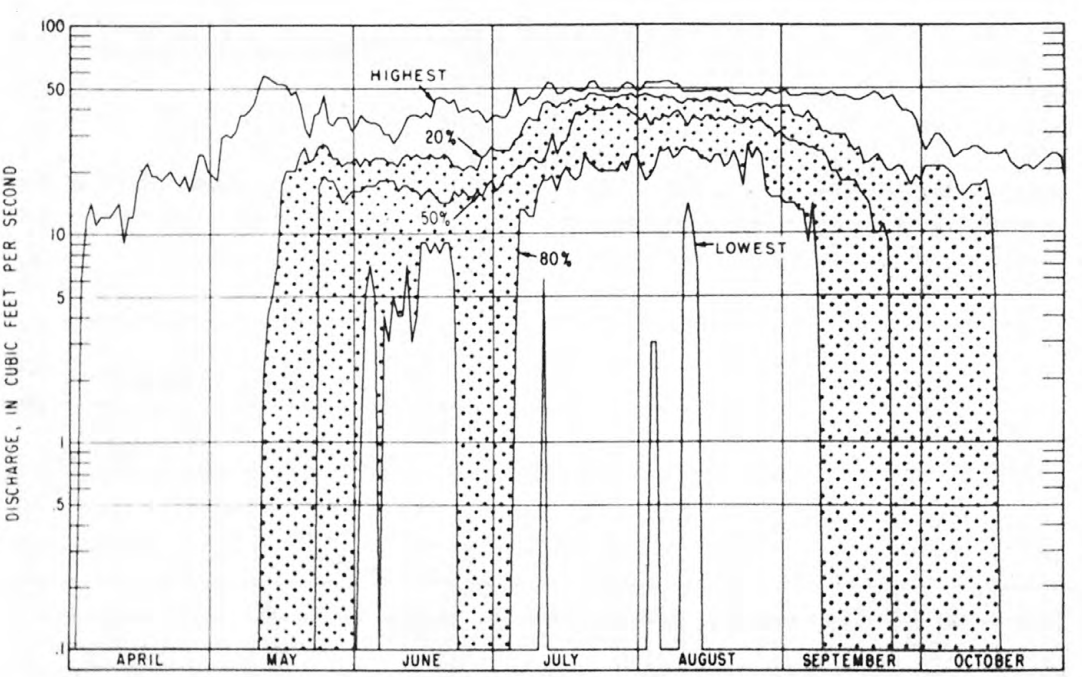
06778010 Middle Loup Canal No. 1 (Middle Loup Project)
near Sargent, Nebr.

POINT OF DIVERSION.--Lat 41°37'47", long 99°22'17", NW¼SE¼ sec.10, T.19 N., R.18 W., Custer County, on right bank of Middle Loup River 1.0 mile south of Sargent.

PERIOD OF RECORD.--July 18, 1938 to September 1943; October 1947 to September 1971.

REMARKS.--Canals No. 1 and No. 2 have a common diversion dam.

AVERAGE ANNUAL DIVERSIONS.--1939-71, 6,320 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP CANAL NO. 1 (MIDDLE LOUP PROJECT) NEAR SARGENT, NEBR., 1940-43, 1947-71

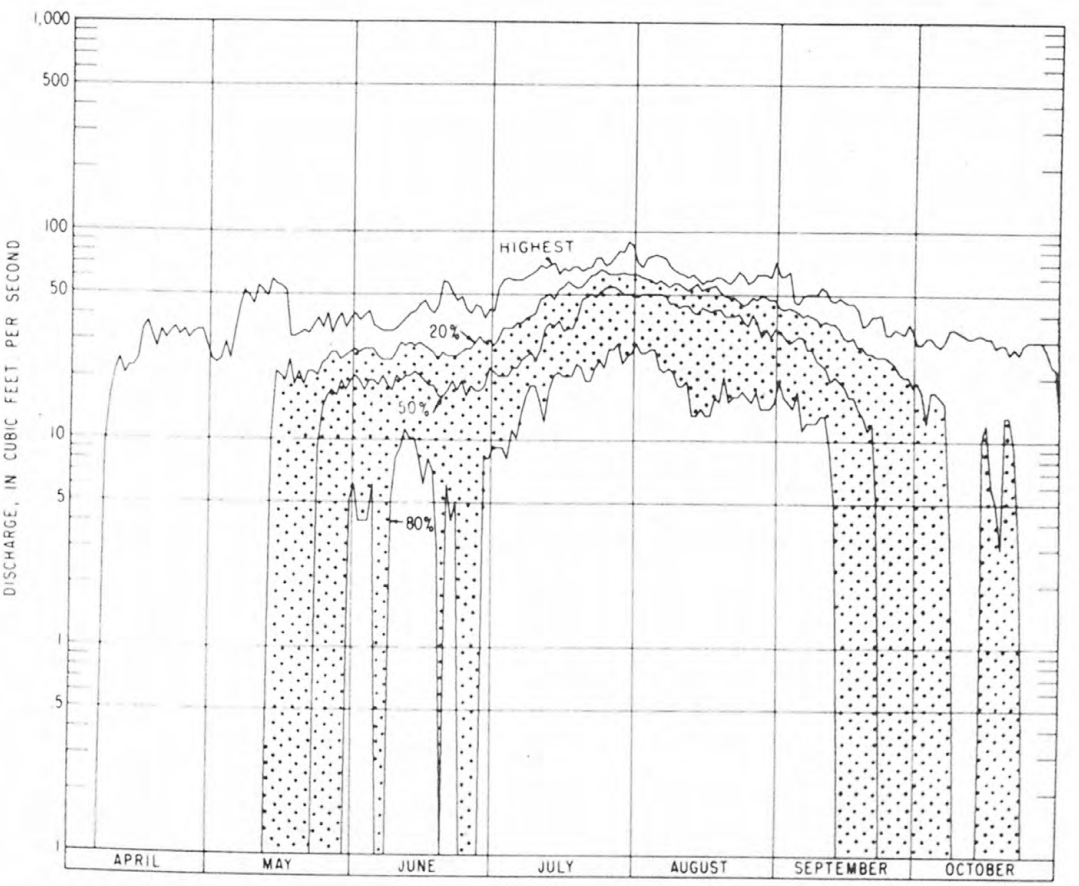
06778030 Middle Loup Canal No. 2 (Middle Loup Project)
near Sargent, Nebr.

POINT OF DIVERSION.--Lat 41°37'47", long 99°22'17", NW¼SE¼ sec.10, T.19 N., R18 W., Custer County, on left bank of Middle Loup River 0.9 mile south of Sargent.

PERIOD OF RECORD.--August 10, 1938, to September 1943; October 1947 to September 1971.

REMARKS.--Canals No. 1 and No. 2 have a common diversion dam.

AVERAGE ANNUAL DIVERSIONS.--1939-71, 7,350 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP CANAL NO. 2 (MIDDLE LOUP PROJECT) NEAR SARGENT, NEBR., 1940-43, 1947-71

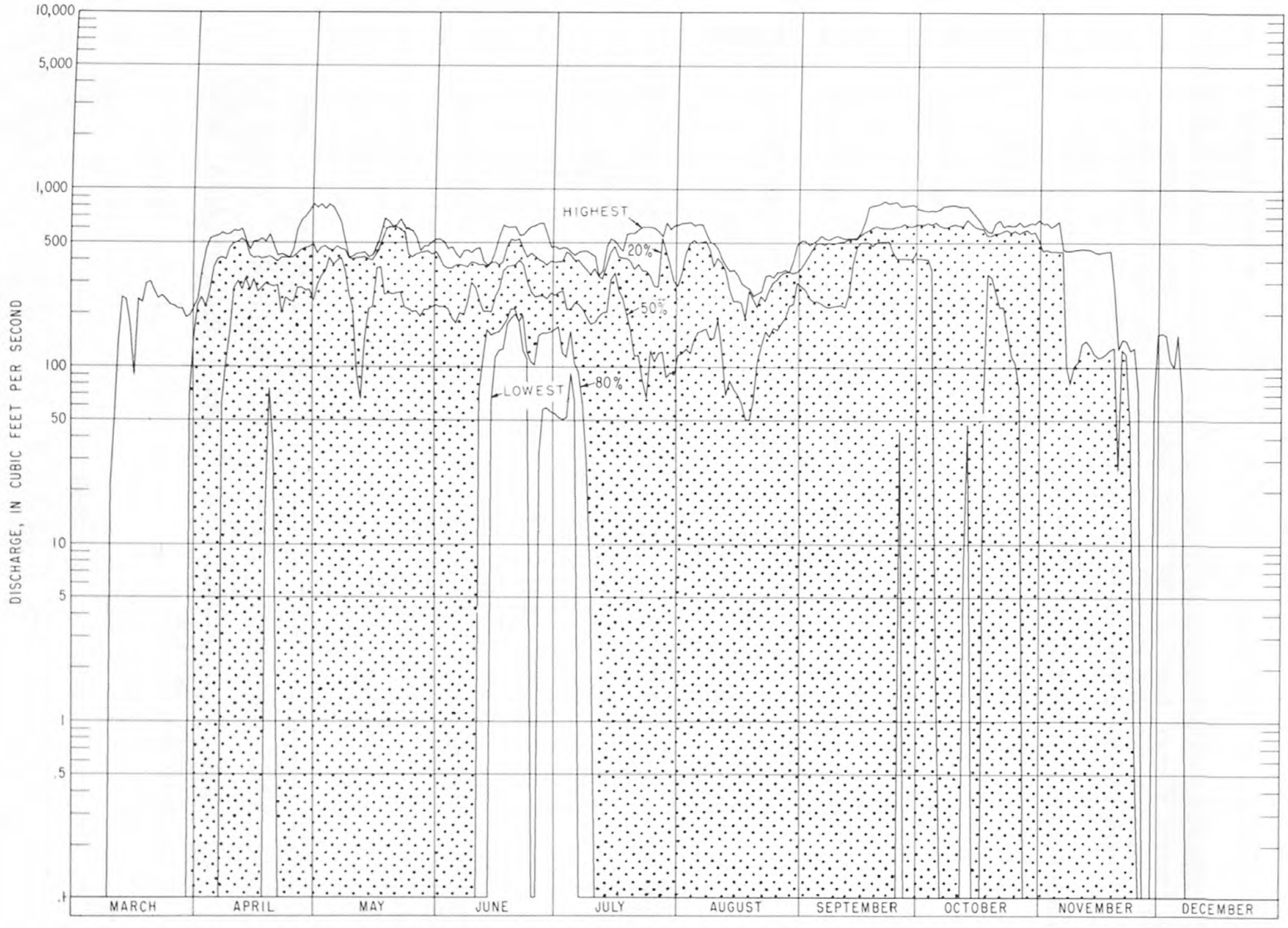
06778800 Farwell Canal near Arcadia, Nebr.

POINT OF DIVERSION.--Lat 41°29'26", long 99°14'48", in SW¼NE¼ sec.35, T.18 N., R.17 W., Custer County, on left bank of Middle Loup River 1.5 miles upstream from Custer-Valley County line.

PERIOD OF RECORD.--November 8, 1962 to September 1971.

REMARKS.--Records are for diversions from Middle Loup River into the Farwell Canal (Sherman Reservoir feeder canal). Water from the Sherman Reservoir on Oak Creek is released as needed into the irrigation canal system which serves lands under the Farwell project between Loup City and St. Paul.

AVERAGE ANNUAL DIVERSIONS.--1963-71, 104,000 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, FARWELL CANAL NEAR ARCADIA, NEBR., 1963-71

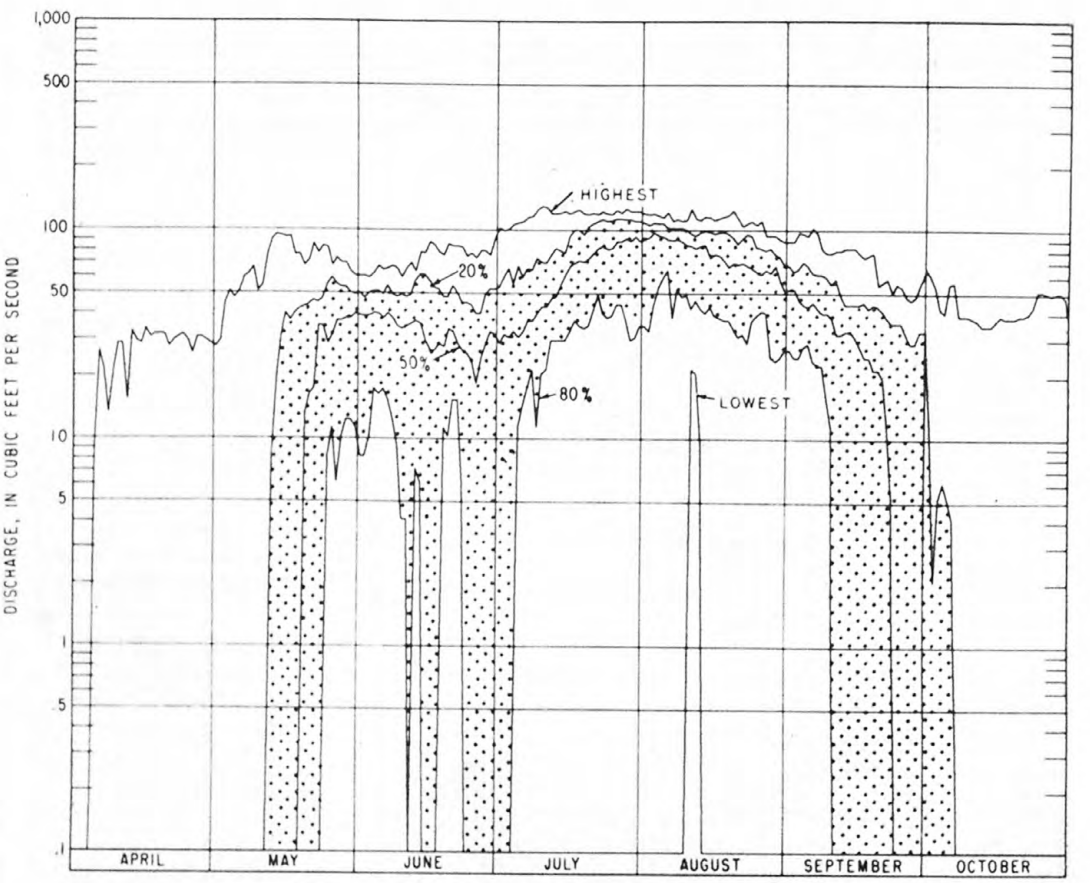
06778820 Middle Loup Canal No. 3 (Middle Loup Project)
near Arcadia, Nebr.

POINT OF DIVERSION.--Lat 41°29'26", long 99°14'48", SW¼NE¼ sec.35, T.18 N., R.17 W., Custer County, on right bank of Middle Loup River 1.5 miles upstream from Custer-Valley County Line.

PERIOD OF RECORD.--August 2, 1938, to September 1943; October 1947 to September 1971.

REMARKS.--Canals No. 3 and No. 4 and Farwell Canal have a common diversion dam. Water for all three carriers is diverted on the left bank, siphoned under the Middle Loup to Canal No. 3 which serves land on the right bank of the stream whereas Canals No. 4 and Farwell serve lands on the left bank as separate carriers for their respective projects.

AVERAGE ANNUAL DIVERSIONS.--1939-71, 12,600 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP CANAL NO. 3 (MIDDLE LOUP PROJECT) NEAR ARCADIA, NEBR., 1940-43, 1947-71

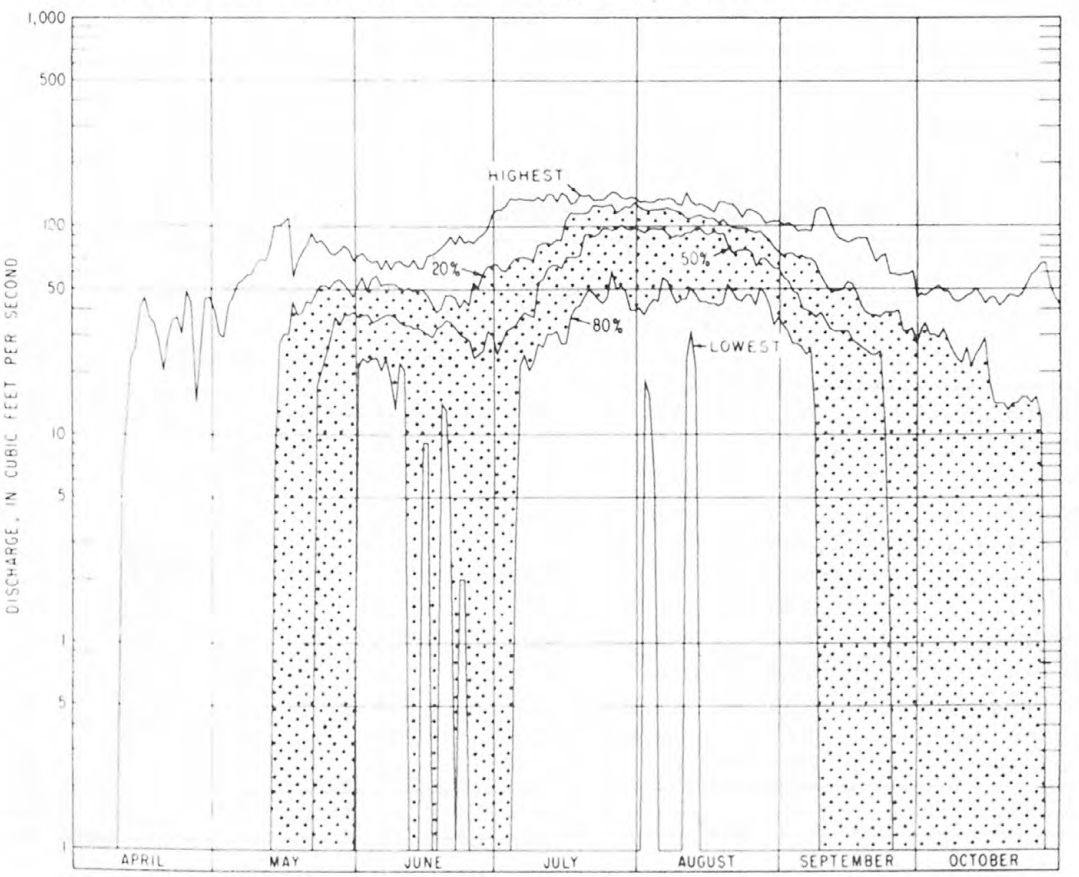
06778840 Middle Loup Canal No. 4 (Middle Loup Project)
near Arcadia, Nebr.

POINT OF DIVERSION.--Lat 41°29'26", long 99°14'48", SW¼NE¼ sec.35, T.18 N., R.17 W., Custer County, on left bank of Middle Loup River 1.5 miles upstream from Custer-Valley County Line.

PERIOD OF RECORD.--July 29, 1938, to September 1943; October 1947 to September 1971.

REMARKS.--Canals No. 3 and No. 4 and Farwell Canal have a common diversion dam. Water for all three carriers is diverted on the left bank, siphoned under the Middle Loup to Canal No. 3 which serves land on the right bank of the stream whereas Canals No. 4 and Farwell serve lands on the left bank as separate carriers for their respective projects.

AVERAGE ANNUAL DIVERSIONS.--1939-71, 13,600 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP CANAL NO. 4 (MIDDLE LOUP PROJECT) NEAR ARCADIA, NEBR., 1940-43, 1947,-71

06779000 Middle Loup River at Arcadia, Nebr.

LOCATION.--Lat 41°25'20", long 99°08'10", in sec.26, T.17 N., R.16 W., Valley County, on left bank 80 ft downstream from bridge on State Highway 70 at southwest edge of Arcadia.

DRAINAGE AREA.--4,730 sq mi, approximately, of which about 820 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--July 1937 to September 30, 1972.

DIVERSIONS.--Middle Loup Canal diversion No. 1 began July 18, 1938; Middle Loup Canal No. 2, August 10, 1938; Middle Loup Canal No. 3, August 2, 1938; Loup River Canal No. 4, July 29, 1938; Sargent Canal, April 1, 1957; and Farwell Canal, November 8, 1962; also pumping directly from river.

Monthly and annual mean discharges, water years 1963-72

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	995	217	619	257	0.42	7.82
November....	1,000	587	871	118	.14	11.01
December....	986	570	791	120	.15	9.99
January.....	1,020	663	831	123	.15	10.50
February....	1,180	835	1,010	102	.10	12.73
March.....	1,340	790	1,000	157	.16	12.64
April.....	1,170	538	787	178	.23	9.94
May.....	892	390	596	165	.28	7.53
June.....	745	243	457	166	.36	5.78
July.....	484	75.2	251	144	.58	3.17
August.....	577	56.9	281	221	.79	3.55
September...	798	116	423	269	.64	5.34
Annual.....	751	562	657	68.4	0.10	100

Duration of daily mean discharges, water years 1963-72

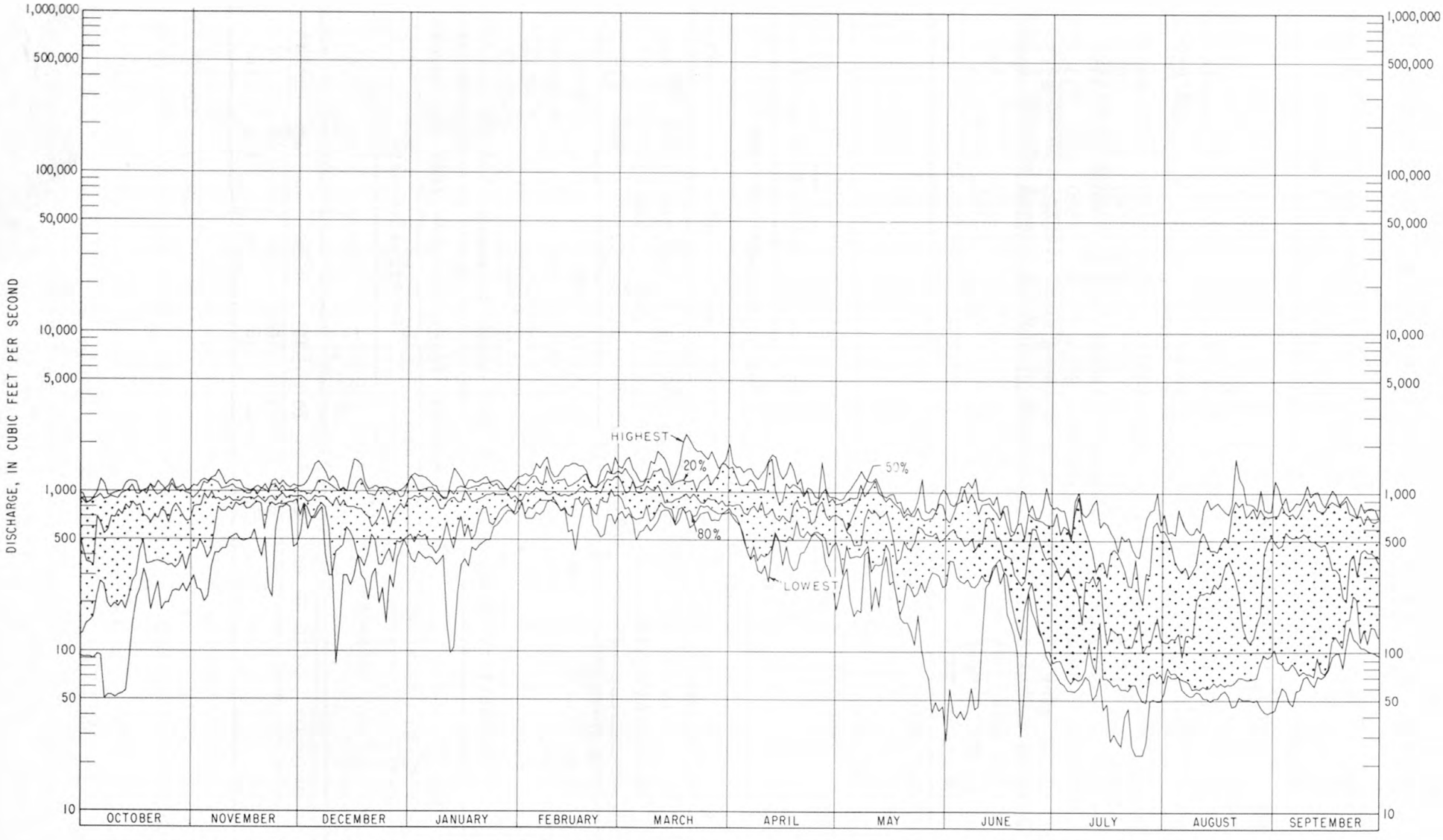
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
23	100	120	89.4	490	66.1
27	99.9	140	87.5	580	60.1
32	99.7	160	86.6	680	53.4
44	99.4	190	85.1	800	41.7
52	98.7	220	83.6	940	23.5
61	97.3	260	81.1	1,100	9.2
71	95.4	300	78.4	1,300	2.8
84	93.5	360	74.5	1,500	1.1
98	91.7	420	70.2	1,800	.2

Probability of annual high flows, water years 1963-72

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
50	2	1,630	1,530	1,330	1,210	1,130	1,050
10	10	2,020	1,890	1,680	1,530	1,320	1,170
4	25	2,210	2,050	1,880	1,720	1,400	1,210

Probability of annual low flows, climatic years 1964-72

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
10	10	22	26	29	34	45	59
20	5	28	34	38	44	58	77
50	2	50	62	68	79	105	160



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP RIVER AT ARCADIA, NEBR., 1963-71

06782500 South Loup River at Ravenna, Nebr.

LOCATION.--Lat 41°00'42", long 98°54'44", in SW¼NW¼ sec.16, T.12 N., R.14 W., Buffalo County, 16 ft downstream and 38 ft left of left downstream corner of county highway bridge, 0.5 mile south of Ravenna city limits, and 1.4 miles upstream from Mud Creek.

DRAINAGE AREA.--1,660 sq mi, approximately, of which about 890 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1940 to September 1958; October 1967 to September 1971.

DIVERSIONS.--Considerable pumping directly from river.

Monthly and annual mean discharges, water years 1941-58; 1968-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	462	89.9	153	73.4	0.48	6.55
November....	235	104	158	26.4	.17	6.77
December....	268	113	153	33.3	.22	6.56
January.....	237	108	154	24.8	.16	6.57
February....	300	139	206	39.4	.19	8.82
March.....	450	148	248	84.4	.34	10.60
April.....	341	165	224	45.7	.20	9.56
May.....	494	138	231	87.7	.38	9.86
June.....	1,580	140	383	325	.85	16.35
July.....	576	61.9	178	113	.64	7.61
August.....	236	27.8	111	47.0	.42	4.73
September...	440	58.0	141	86.6	.62	6.02
Annual.....	336	133	195	42.8	0.22	100

Duration of daily mean discharges, water years 1941-58; 1968-71

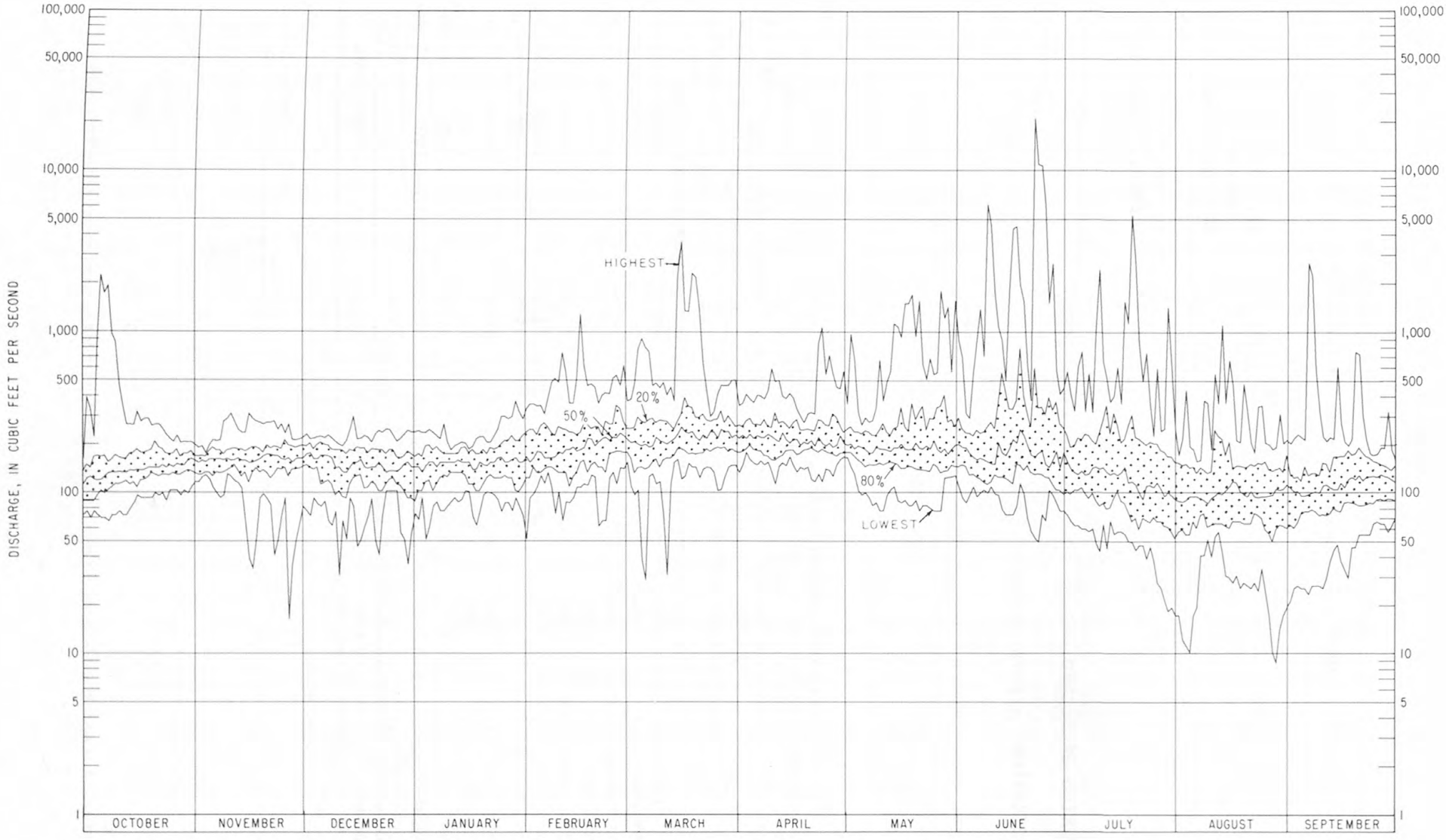
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
8.6	100	92	88.3	640	1.6
13	99.9	110	80.9	790	1.2
20	99.8	140	62.3	980	1.0
25	99.7	180	35.9	1,200	.7
31	99.4	220	19.5	1,500	.5
39	99.1	270	9.7	1,900	.4
48	98.5	330	5.8	2,300	.2
60	97.1	420	3.5	2,900	.1
74	94.6	510	2.4		

Probability of annual high flows, water years 1941-58; 1968-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	270	210	199	185	183	180
50	2	2,230	1,430	843	550	406	317
10	10	8,350	5,000	2,490	1,370	845	548
4	25	13,900	8,190	3,920	2,050	1,180	703
2	50	19,600	11,400	5,330	2,700	1,500	838

Probability of annual low flows, climatic years 1942-58; 1968-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	3.1	4.5	7.5	11	14	16
2	50	6.0	8.0	12	15	20	23
5	20	14	18	21	27	33	38
10	10	23	29	35	38	48	55
20	5	34	41	48	54	63	76
50	2	56	65	74	80	91	108



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, SOUTH LOUP RIVER AT RAVENNA, NEBR., 1944-58, 1968-71

06783500 Mud Creek near Sweetwater, Nebr.

LOCATION.--Lat 41°02'15", long 98°59'35", in NE¼SE¼ sec.3, T.12 N., R.15 W., Buffalo County, on right bank 12 ft downstream from bridge on State Highway 2, 0.9 mile southeast of Sweetwater and 11.6 miles upstream from mouth.

DRAINAGE AREA.--1,020 sq mi, of which 655 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--July 1946 to September 1971.

DIVERSIONS.--Pumping directly from creek.

Monthly and annual mean discharges, water years 1947-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	154	7.36	26.4	28.9	1.09	5.06
November....	34.6	9.75	22.0	6.30	.29	4.21
December....	32.7	11.1	21.8	5.15	.24	4.16
January.....	44.4	10.2	23.0	7.76	.34	4.39
February....	131	13.8	42.1	27.9	.66	8.06
March.....	308	21.5	67.7	71.7	1.06	12.96
April.....	54.9	19.1	34.4	9.50	.28	6.58
May.....	130	16.5	50.1	32.2	.64	9.59
June.....	1,000	26.4	128	199	1.6	24.41
July.....	191	4.33	54.7	51.0	.93	10.46
August.....	146	.49	31.1	39.0	1.2	5.96
September...	58.5	3.11	21.7	15.8	.73	4.16
Annual.....	128	18.7	43.5	24.2	0.56	100

Duration of daily mean discharges, water years 1947-71

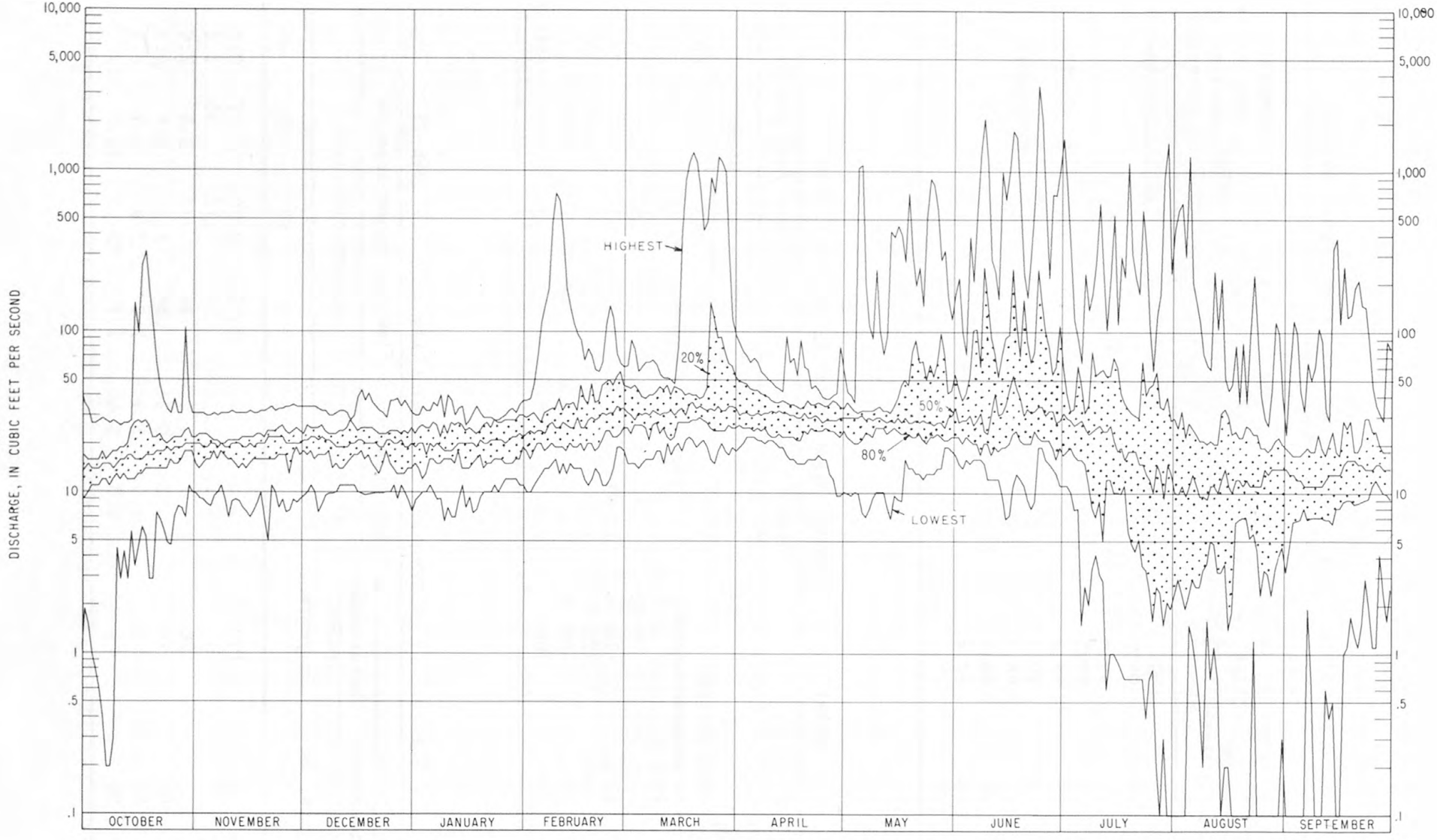
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
0.0	100	5.5	96.3	110	4.2
.1	99.7	7.7	94.7	160	3.0
.2	99.6	11	91.2	220	2.2
.4	99.5	15	83.3	310	1.5
.7	99.4	21	62.7	430	1.1
1.0	99.1	30	34.5	600	.8
1.5	98.7	41	15.8	840	.4
2.0	98.3	58	8.7	1,200	.2
2.8	97.8	81	5.7	1,600	.1
4.0	97.1				

Probability of annual high flows, water years 1947-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	94	65	46	37	29	26
50	2	760	504	290	187	124	87
10	10	3,080	2,100	1,130	636	376	232
4	25	5,380	3,750	1,970	1,060	598	352
2	50	7,830	5,530	2,890	1,510	820	470
1	100	11,100	7,940	4,120	2,090	1,100	620

Probability of annual low flows, climatic years 1948-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	.....	....	0.02	0.04	0.17	0.6
2	50	.....	....	.06	.11	.38	1.1
5	20	.....	....	.24	.41	1.1	2.5
10	10	0.2	0.31	.68	1.1	2.4	4.5
20	5	1.0	1.4	1.9	2.9	5.1	8.1
50	2	4.0	5.4	7.7	10	14	17



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MUD CREEK NEAR SWEETWATER, NEBR., 1953-71

06784000 South Loup River at St. Michael, Nebr.

LOCATION.--Lat 41°01'53", long 98°44'25", in NE¼NE¼ sec.11, T.12 N., R.13 W., Buffalo County, 15 ft upstream and 65 ft right from right upstream corner of county highway bridge, 0.6 mile northeast of St. Michael, and 3.4 miles upstream from Sweet Creek.

DRAINAGE AREA.--2,560 sq mi, approximately, of which about 1,650 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1943 to September 30, 1971.

DIVERSIONS.--Flow affected by irrigation development.

Monthly and annual mean discharges, water years 1944-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	619	87.5	183	96.4	0.53	6.17
November....	272	136	190	27.5	.14	6.40
December....	225	116	176	26.6	.15	5.93
January.....	214	121	177	21.4	.12	5.95
February....	543	162	270	80.8	.30	9.10
March.....	782	205	338	162	.48	11.38
April.....	443	178	266	59.7	.22	8.97
May.....	562	186	311	125	.40	10.47
June.....	2,740	164	525	524	1.00	17.68
July.....	706	62.6	230	143	.62	7.74
August.....	482	21.3	150	98.5	.66	5.05
September...	370	51.0	153	70.7	.46	5.16
Annual.....	483	161	247	65.7	0.27	100

Duration of daily mean discharges, water years 1944-71

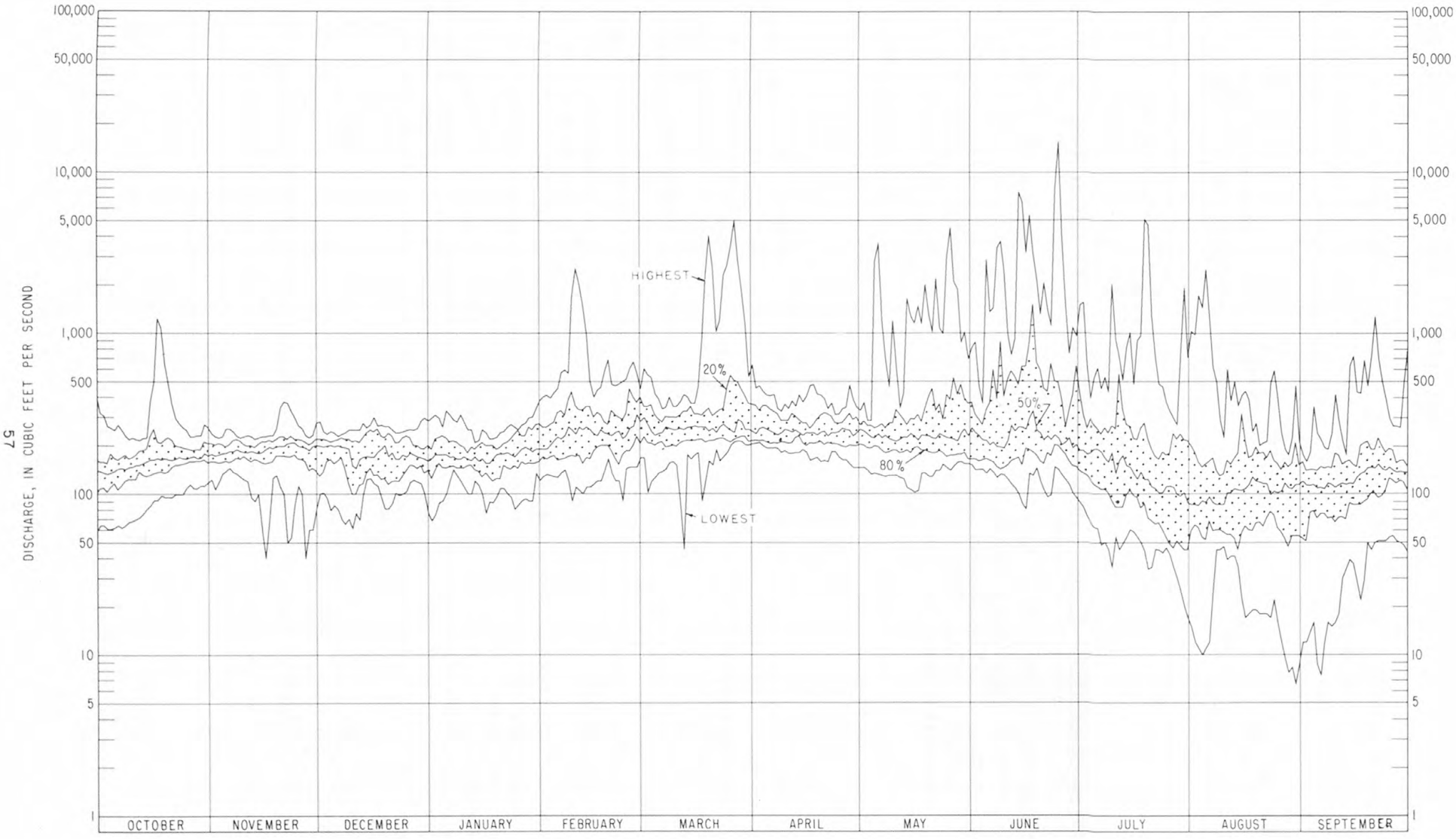
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
7	100	94	93.1	820	2.0
11	99.9	120	86.5	1,000	1.6
14	99.8	150	74.2	1,300	1.1
22	99.7	190	53.0	1,700	.8
28	99.6	250	25.1	2,200	.5
36	99.3	310	12.8	2,800	.3
46	98.8	400	7.0	3,500	.2
58	97.9	510	4.3	4,500	.1
74	96.2	650	2.9		

Probability of annual high flows, water years 1944-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	293	282	275	270	251	215
50	2	2,610	1,860	1,150	770	560	431
10	10	9,610	6,490	3,430	1,970	1,210	801
4	25	15,800	10,700	5,440	2,970	1,730	1,050
2	50	21,900	14,900	7,460	3,960	2,210	1,280
1	100	29,400	20,300	10,000	5,200	2,800	1,530

Probability of annual low flows, climatic years 1945-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	7	8	10	11	16	24
2	50	10	12	15	17	22	32
5	20	18	20	24	27	35	48
10	10	27	30	34	40	49	64
20	5	40	45	50	58	70	87
50	2	67	74	84	95	111	129



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, SOUTH LOUP RIVER AT ST. MICHAEL, NEBR., 1953-71

06785000 Middle Loup River at St. Paul, Nebr.

LOCATION.--Lat 41°11'55", long 98°26'50", in sec.10, T.14 N., R.10 W., Howard County, on left bank at St. Paul, 450 ft upstream from bridge on U.S. Highway 281 and 6 miles upstream from confluence with North Loup River.

DRAINAGE AREA.--7,720 sq mi, approximately, of which about 3,200 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1894 to September 1915, August 1928 to 1972.

DIVERSIONS.--Middle Loup Canal No. 1 began diverting July 18, 1938; Middle Loup Canal No. 2, August 10, 1938; Middle Loup Canal No. 3, August 2, 1938; Middle Loup Canal No. 4, July 29, 1938; Sargent Canal, April 1, 1957; and Farwell Canal, November 8, 1962. Considerable pumping directly from river and tributaries.

Monthly and annual mean discharges, water years 1963-72

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	1,230	404	845	255	0.30	7.20
November....	1,320	771	1,100	145	.13	9.43
December....	1,170	686	948	166	.18	8.08
January.....	1,200	770	996	156	.16	8.49
February....	1,570	1,170	1,330	132	.10	11.32
March.....	2,530	1,180	1,560	396	.25	13.28
April.....	1,470	866	1,120	225	.20	9.57
May.....	1,530	706	954	248	.26	8.13
June.....	3,250	395	1,170	835	.71	10.01
July.....	927	178	578	255	.44	4.93
August.....	823	202	472	230	.49	4.02
September...	1,370	277	649	358	.55	5.54
Annual.....	1,120	831	974	92.2	0.09	100

Duration of daily mean discharges, water years 1963-72

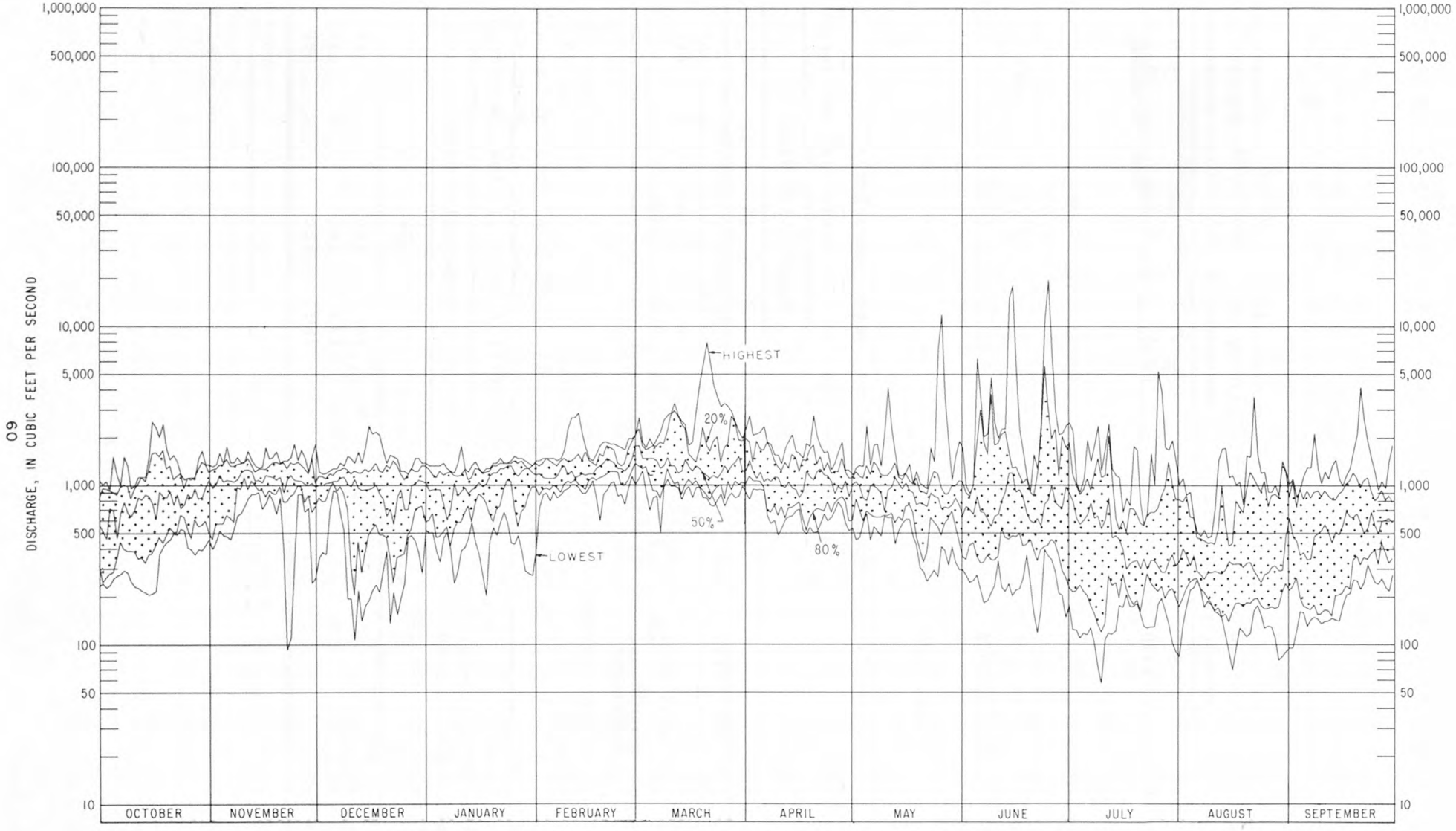
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
59	100	360	85.9	1,800	5.7
85	99.9	430	82.1	2,200	2.7
100	99.6	520	76.9	2,700	1.3
120	99.4	620	71.5	3,200	.7
150	98.2	750	62.9	3,800	.6
180	97.1	900	53.3	4,600	.4
210	95.6	1,100	36.9	5,500	.3
250	92.5	1,300	20.8	6,600	.2
300	88.9	1,500	10.7	7,900	.1

Probability of annual high flows, water years 1963-72

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
50	2	5,690	4,160	3,010	2,300	1,860	1,540
10	10	17,100	11,400	6,250	3,980	2,740	1,950
4	25	26,700	17,400	8,480	5,040	3,270	2,170

Probability of annual low flows, climatic years 1964-72

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
10	10	65	82	100	116	130	164
20	5	85	104	123	148	170	225
50	2	130	152	180	220	272	390



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, MIDDLE LOUP RIVER AT ST. PAUL, NEBR., 1964-72

06785949 North Loup River above Taylor-Ord Diversion
(Computed record)

LOCATION.--Lat 41°47'41", long 99°27'35", SW¼NE¼ sec.13, T.21 N., R.19 W., immediately upstream from Taylor diversion dam and 4.5 miles northwest of Taylor.

DRAINAGE AREA.--2,180 sq mi, approximately, of which about 170 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--April 1939 to September 1971.

COMPUTATION OF RECORD.--Sum of Taylor-Ord diversion (06785950) and North Loup River at Taylor (06786000).

DIVERSIONS.--Some pumping directly from river, although streamflow not appreciably affected.

Monthly and annual mean discharges, water years 1939-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	576	372	470	49.1	0.10	7.86
November....	580	416	486	43.8	.09	8.13
December....	605	384	459	46.4	.10	7.69
January.....	738	371	473	69.0	.15	7.92
February....	679	402	532	67.0	.13	8.91
March.....	816	472	608	87.6	.14	10.18
April.....	747	446	584	77.8	.13	9.79
May.....	789	392	548	99.5	.18	9.17
June.....	902	362	529	121	.23	8.85
July.....	779	278	431	90.3	.21	7.22
August.....	593	304	417	64.9	.16	6.98
September...	665	327	436	67.0	.15	7.30
Annual.....	573	416	498	37.9	0.08	100

Duration of daily mean discharges, water years 1939-71

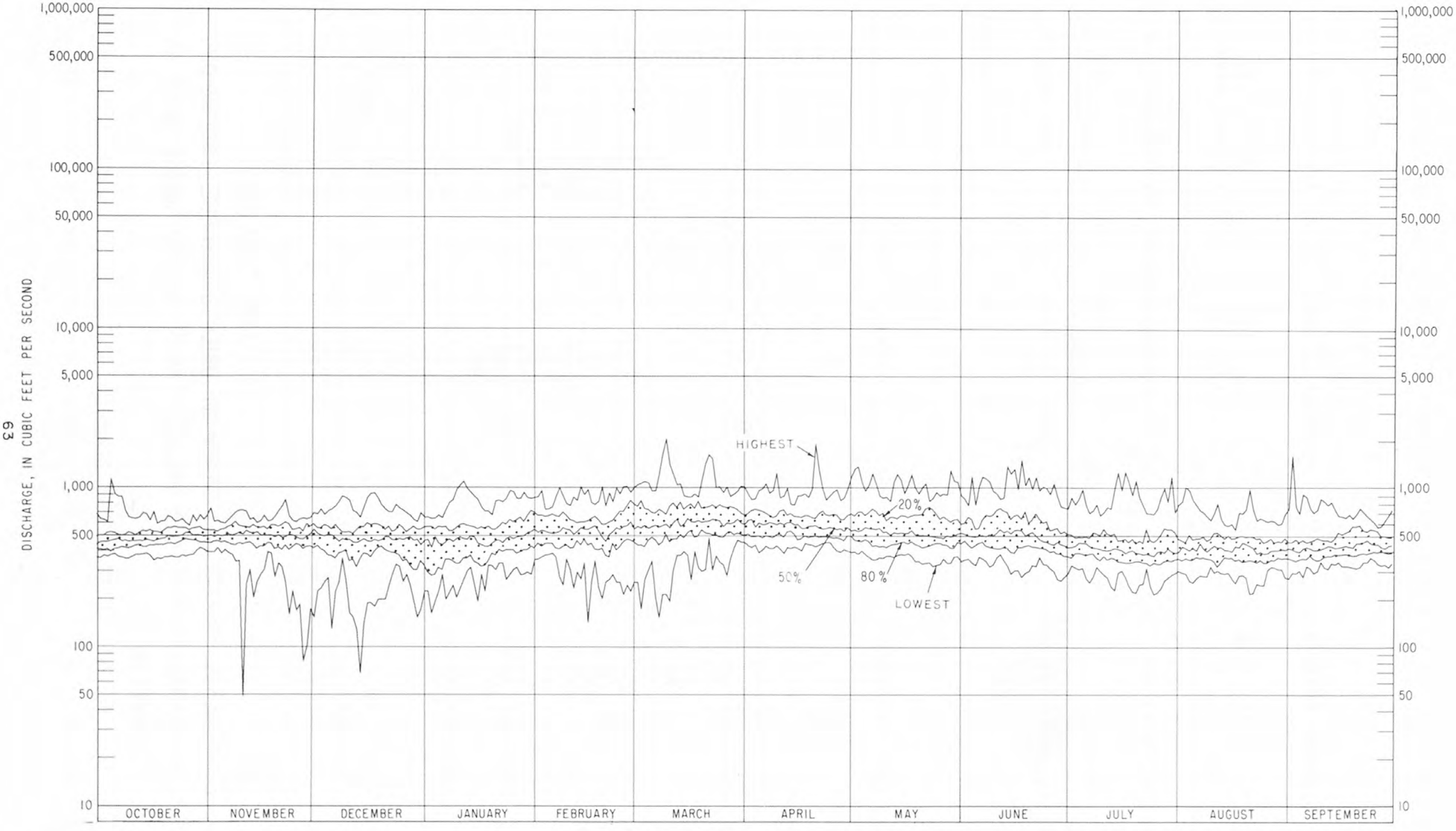
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
45	100	340	92.9	750	5.2
140	99.9	380	84.5	840	2.5
190	99.8	430	68.2	950	1.0
220	99.5	480	49.2	1,100	.3
240	99.2	540	30.1	1,200	.2
270	98.5	600	17.3	1,300	.1
310	96.4	670	9.6		

Probability of annual high flows, water years 1939-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	769	750	638	574	503	492
50	2	1,080	955	879	792	717	649
10	10	1,510	1,250	1,070	936	831	746
4	25	1,770	1,410	1,150	993	870	783
2	50	1,980	1,550	1,210	1,030	894	808
1	100	2,200	1,690	1,270	1,070	915	830

Probability of annual low flows, climatic years 1940-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	26	71	125	180	255	270
2	50	39	90	145	205	270	285
5	20	70	122	185	230	290	310
10	10	105	152	220	267	313	340
20	5	146	193	253	290	331	358
50	2	207	244	297	332	368	399



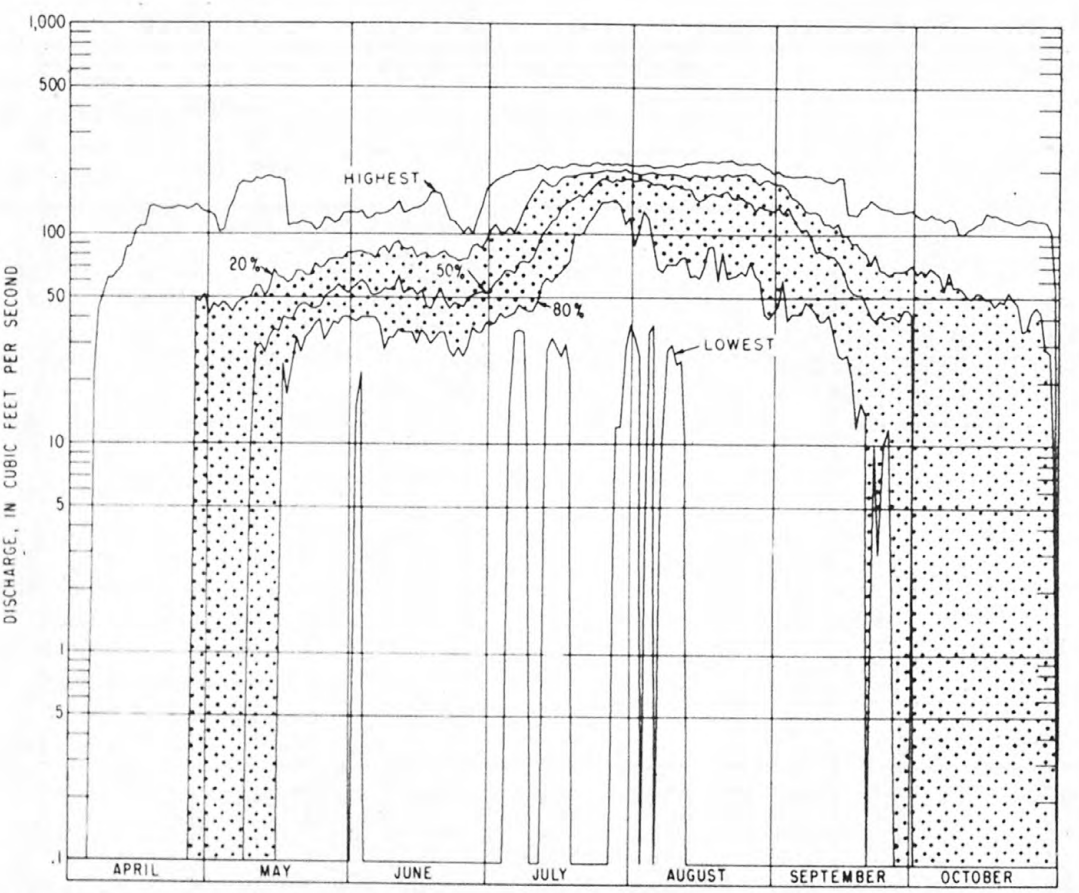
EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, NORTH LOUP RIVER ABOVE TAYLOR-ORD DIVERSION 1940-43, 1947-71

06785950 Taylor-Ord Canal (North Loup Project) near Taylor, Nebr.

POINT OF DIVERSION.--Lat 41°47'38", long 99°27'40", NE¼SW¼ sec.13, T.21 N., R.19 W., Loup County, on right bank of North Loup River, 4 miles upstream from Taylor.

PERIOD OF RECORD.--April 18, 1939 to September 1943; October 1947 to September 1971.

AVERAGE ANNUAL DIVERSIONS.--1939-71, 27,100 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, TAYLOR-ORD CANAL (NORTH LOUP PROJECT) NEAR TAYLOR, NEBR. 1940-43, 1947-71

06786000 North Loup River at Taylor, Nebr.

LOCATION.--Lat 41°46'37", long 99°22'45", in NE¼SE¼ sec.22, T.21 N., R.18 W. Loup County, on left bank 64 ft downstream from bridge on U.S. Highway 183 and 0.4 mile north of Taylor.

DRAINAGE AREA.--2,210 sq mi, approximately, of which about 180 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--November 1936 to September 1971.

DIVERSIONS.--Taylor-Ord Canal diversion began April 18, 1939; also some pumping directly from river.

Monthly and annual mean discharges, water years 1939-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	576	295	446	70.6	0.16	8.07
November....	580	416	486	43.8	.09	8.78
December....	605	384	459	46.4	.10	8.31
January.....	738	371	473	69.0	.15	8.55
February....	679	402	532	67.0	.13	9.63
March.....	816	472	608	87.6	.14	10.99
April.....	747	405	579	85.8	.15	10.46
May.....	782	300	510	117	.23	9.22
June.....	861	285	476	136	.29	8.60
July.....	716	147	314	115	.37	5.68
August.....	523	143	281	95.0	.34	5.07
September...	665	200	367	91.5	.25	6.64
Annual.....	555	354	460	43.9	0.10	100

Duration of daily mean discharges, water years 1939-71

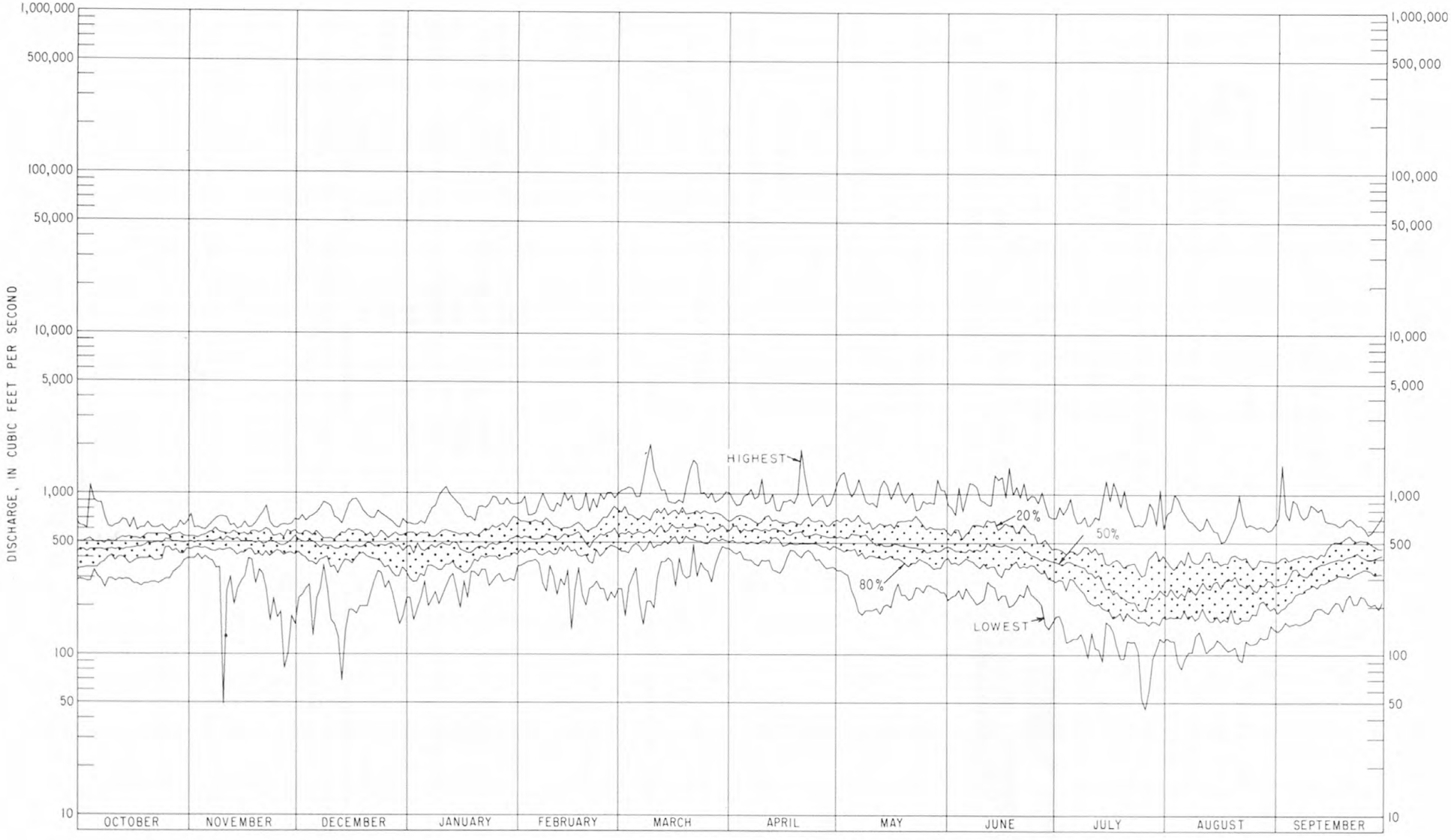
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
45	100	220	92.7	540	27.7
89	99.9	240	90.9	600	16.2
110	99.8	270	87.7	670	8.9
120	99.6	310	82.6	750	4.9
140	98.8	340	77.9	840	2.3
160	97.6	380	70.4	950	.9
170	96.8	430	58.5	1,100	.2
190	95.3	480	43.6	1,300	.1

Probability of annual high flows, water years 1939-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	778	745	640	573	501	485
50	2	1,070	951	875	786	712	646
10	10	1,500	1,240	1,060	925	818	733
4	25	1,750	1,410	1,150	980	853	763
2	50	1,960	1,540	1,210	1,020	875	783
1	100	2,180	1,680	1,270	1,050	893	800

Probability of annual low flows, climatic years 1940-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	40	57	77	87	102	127
2	50	50	69	87	97	114	141
5	20	66	83	102	113	133	165
10	10	82	98	118	131	152	188
20	5	103	118	133	148	171	209
50	2	144	157	169	188	215	260



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, NORTH LOUP RIVER AT TAYLOR, NEBR., 1940-43, 1947-71

06787500 Calamus River near Burwell, Nebr.

LOCATION.--Lat 41°48'35", long 99°10'57", in NW¼NW¼ sec.9, T.21 N., R.16 W., Garfield County, on left bank 130 ft downstream from highway bridge, 1.5 miles upstream from mouth, and 3 miles northwest of Burwell.

DRAINAGE AREA.--1,260 sq mi, approximately, of which about 110 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1940 to September 1971.

DIVERSIONS.--Some pumping directly from river, although streamflow not appreciably affected.

Monthly and annual mean discharges, water years 1941-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	365	241	290	28.1	0.10	8.06
November....	354	250	295	25.7	.09	8.18
December....	382	233	284	35.2	.12	7.88
January.....	383	232	288	35.9	.12	7.99
February....	392	231	309	38.7	.12	8.58
March.....	407	257	334	39.8	.12	9.26
April.....	422	244	329	42.0	.13	9.13
May.....	430	244	321	54.3	.17	8.90
June.....	638	226	319	70.8	.22	8.85
July.....	454	217	277	45.4	.16	7.70
August.....	372	206	274	38.5	.14	7.62
September...	393	235	283	36.4	.13	7.85
Annual.....	369	243	300	30.6	0.10	100

Duration of daily mean discharges, water years 1941-71

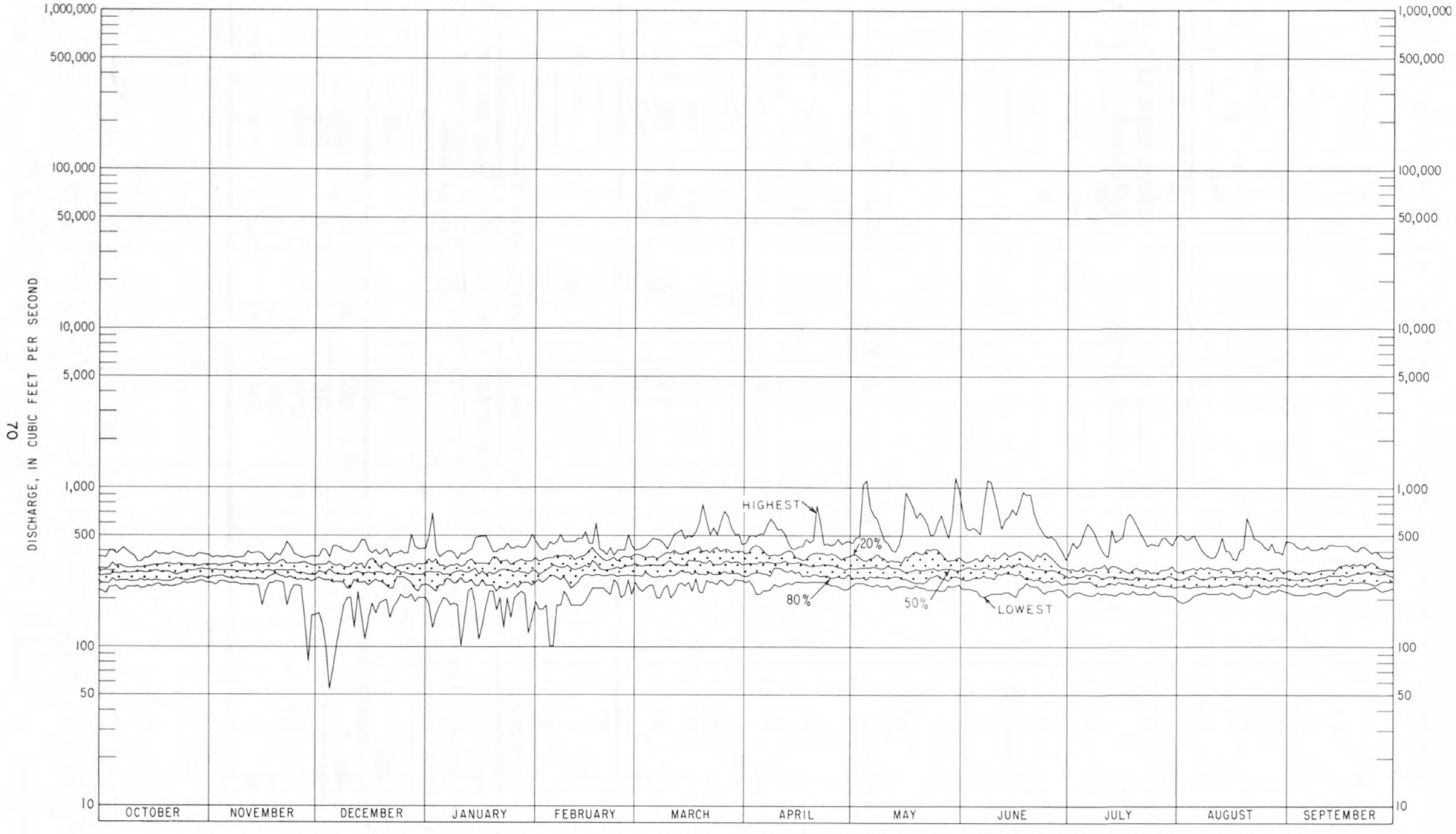
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
54	100	260	76.8	440	2.5
110	99.9	280	61.0	480	1.4
150	99.8	310	35.4	530	.7
180	99.5	340	19.2	580	.4
190	99.2	370	10.4	640	.2
210	98.1	400	5.6	760	.1
230	93.8				

Probability of annual high flows, water years 1941-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	357	336	310	309	285	268
50	2	539	494	445	394	364	347
10	10	816	726	598	527	475	434
4	25	988	866	678	607	538	479
2	50	1,130	980	740	672	588	513
1	100	1,290	1,110	804	742	641	547

Probability of annual low flows, climatic years 1942-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
2	50	44	80	93	158	200	210
5	20	74	108	130	178	210	219
10	10	96	130	158	192	219	229
20	5	124	160	182	210	231	241
50	2	170	200	220	240	252	264



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, CALAMUS RIVER NEAR BURWELL, NEBR., 1943-71

06787501 North Loup River below confluence of Calamus River near Burwell, Nebr. (Computed record)

LOCATION.--Lat 41°48'17", long 99°09'07", in NW¼SE¼ sec.10, T.21 N., R.16 W., Garfield County, immediately below confluence of North Loup and Calamus Rivers and 1.5 miles northwest of Burwell.

DRAINAGE AREA.--3,775 sq mi, approximately, of which about 515 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1940 to September 1971.

COMPUTATION OF RECORD.--Sum of North Loup River at Taylor (06786000) and Calamus River near Burwell (06787500).

DIVERSIONS.--Taylor-Ord Canal diversions began April 18, 1939; also some pumping directly from river.

Monthly and annual mean discharges, water years 1941-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	901	537	742	92.3	0.12	8.07
November....	895	667	783	62.7	.08	8.52
December....	944	641	744	73.8	.10	8.09
January.....	982	606	763	85.4	.11	8.29
February....	1,070	712	844	91.2	.11	9.18
March.....	1,200	738	945	120	.13	10.28
April.....	1,170	670	917	112	.12	9.98
May.....	1,100	599	841	157	.19	9.15
June.....	1,390	519	801	192	.24	8.71
July.....	1,170	438	598	152	.26	6.51
August.....	893	390	558	128	.23	6.07
September...	1,060	490	657	120	.18	7.15
Annual.....	916	638	765	66.6	0.09	100

Duration of daily mean discharges, water years 1941-71

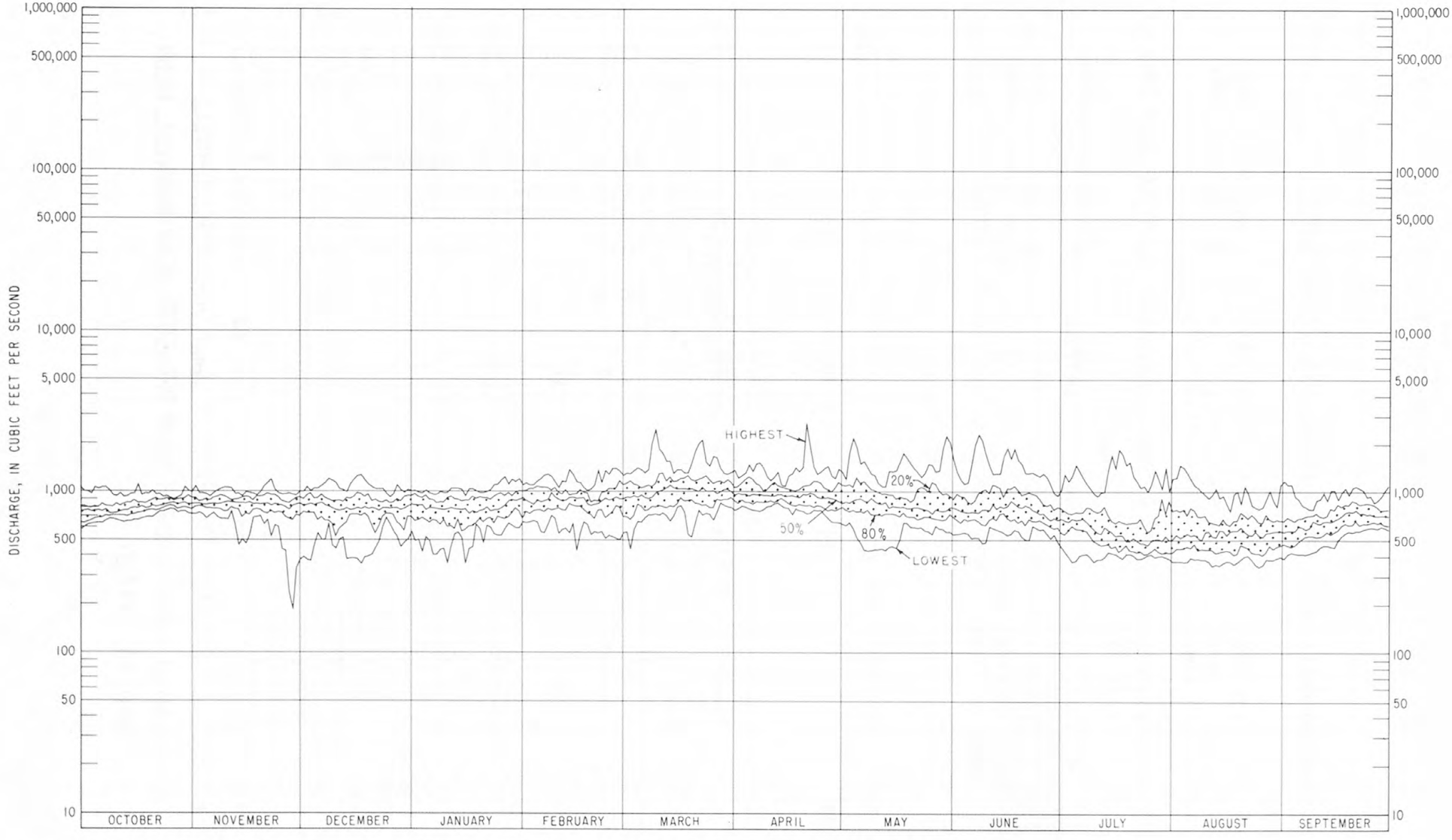
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
135	100	540	87.0	1,000	11.3
260	99.9	600	79.6	1,100	6.2
340	99.7	660	69.8	1,300	1.8
380	98.5	720	58.2	1,400	1.0
410	97.0	790	41.8	1,500	.5
450	94.7	870	26.0	1,700	.2
500	90.7	950	15.3	1,800	.1

Probability of annual high flows, water years 1941-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	1,130	1,090	995	900	810	790
50	2	1,540	1,410	1,300	1,180	1,080	990
10	10	2,080	1,800	1,560	1,380	1,260	1,160
4	25	2,390	2,010	1,670	1,470	1,330	1,230
2	50	2,630	2,170	1,754	1,530	1,370	1,280
1	100	2,880	2,340	1,830	1,590	1,420	1,330

Probability of annual low flows, climatic years 1942-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	140	198	250	285	320	365
2	50	168	223	270	305	340	385
5	20	210	255	305	335	370	415
10	10	258	285	335	364	388	433
20	5	300	320	365	390	417	462
50	2	365	390	420	447	482	530



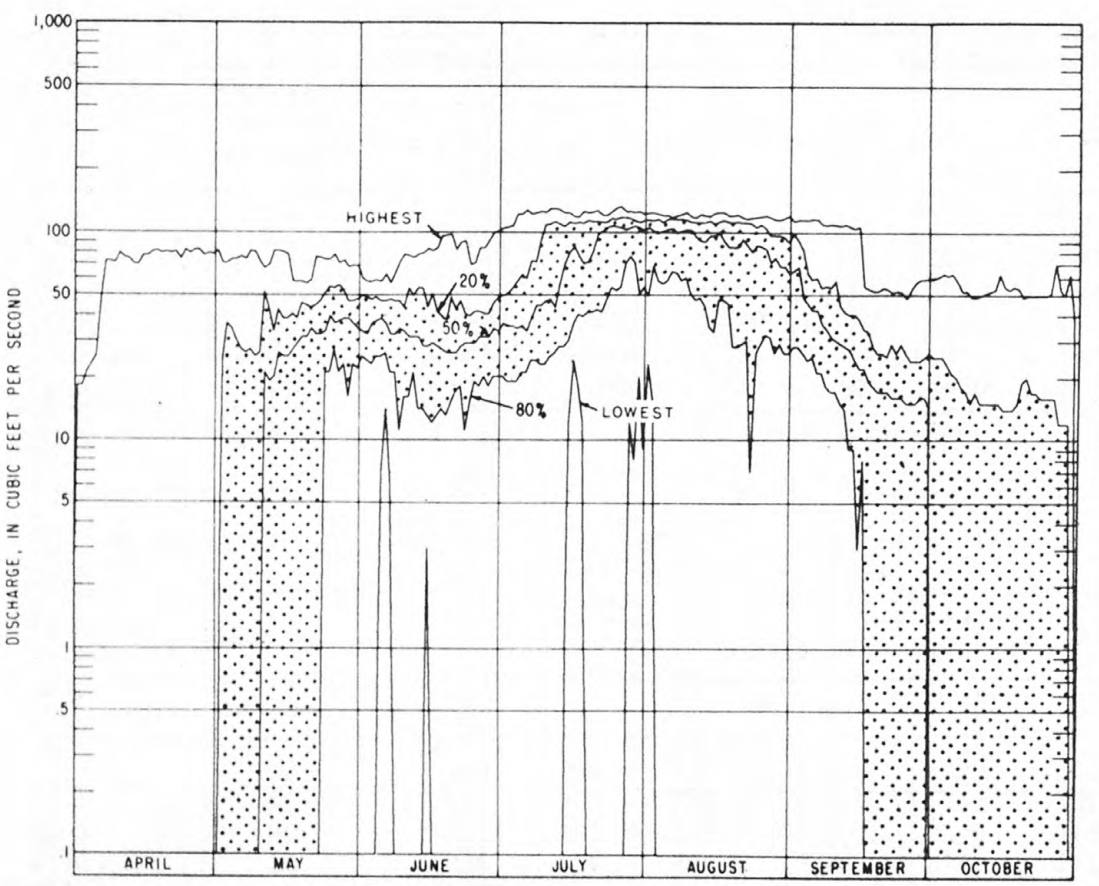
EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, NORTH LOUP RIVER BELOW CONFLUENCE OF CALAMUS RIVER NEAR BURWELL, NEBR., 1953-71

06787550 Burwell-Sumter Canal (North Loup Project) near Burwell, Nebr.

POINT OF DIVERSION.--Lat 41°47'49", long 99°7'52", NW¼SE¼ sec.14, T.21 N., R.16 W., Garfield County, on left bank of North Loup River 0.5 mile north of Burwell.

PERIOD OF RECORD.--April 24, 1939, to September 1943; October 1947 to September 1971.

AVERAGE ANNUAL DIVERSIONS.--14,100 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, BURWELL-SUMTER CANAL (NORTH LOUP PROJECT) NEAR BURWELL, NEBR., 1940-43, 1947-71

06788500 North Loup River at Ord, Nebr.

LOCATION.--Lat 41°36'27", long 98°55'17", in SW¼NW¼ sec.22, T.19 N., R.14 W., Valley County, on right bank 150 ft downstream from bridge on State Highway 70 at Ord.

DRAINAGE AREA.--3,960 sq mi, approximately, of which about 770 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--November 1936 to September 1938; June 1952 to September 1971.

DIVERSIONS.--Taylor-Ord Canal diversions began April 18 and Burwell-Sumter April 24, 1939; also pumping directly from river.

Monthly and annual mean discharges, water years 1953-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	1,070	756	873	91.1	0.10	8.31
November....	1,040	819	901	64.6	.07	8.58
December....	988	673	824	80.4	.10	7.85
January.....	1,030	635	833	88.8	.11	7.93
February....	1,380	826	988	113	.11	9.41
March.....	1,410	922	1,150	124	.11	10.92
April.....	1,390	895	1,060	128	.12	10.14
May.....	1,370	679	978	195	.20	9.31
June.....	1,840	696	926	253	.27	8.82
July.....	1,270	433	628	195	.31	5.98
August.....	1,080	341	589	184	.31	5.61
September...	1,060	565	750	144	.19	7.14
Annual.....	1,054	771	874	69.5	0.08	100

Duration of daily mean discharges, water years 1953-71

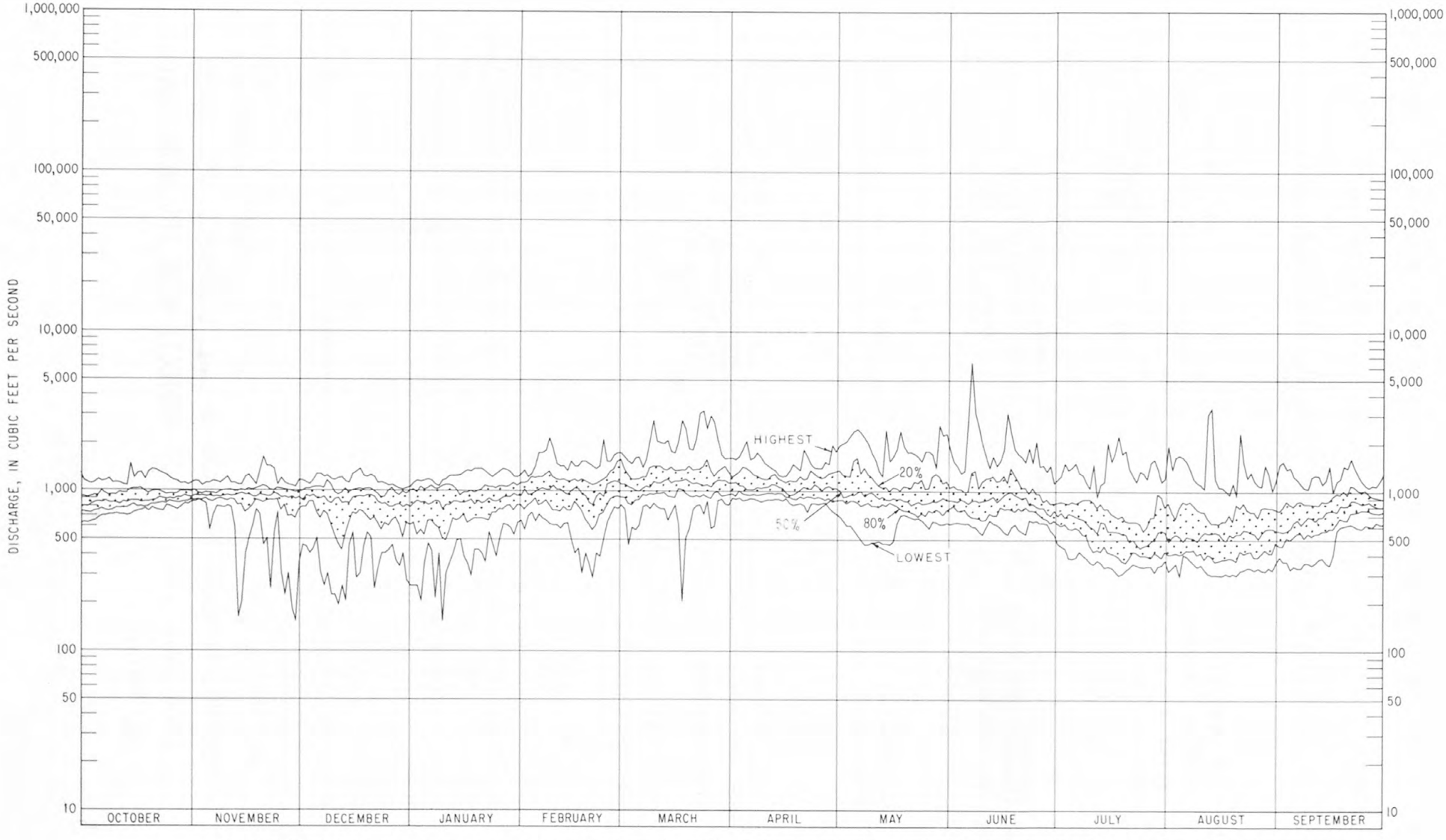
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
150	100	500	90.6	1,200	9.8
200	99.9	550	87.6	1,300	6.1
220	99.8	610	83.4	1,400	4.0
260	99.7	670	78.3	1,500	2.7
290	99.6	730	73.2	1,700	1.4
320	98.9	800	63.6	1,900	.7
350	98.1	880	48.5	2,000	.6
380	96.9	970	30.8	2,200	.3
420	94.8	1,100	16.7	2,500	.1
460	92.6				

Probability of annual high flows, water years 1953-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	1,450	1,290	1,220	1,160	1,100	982
50	2	2,030	1,760	1,580	1,410	1,250	1,150
10	10	3,480	2,660	2,140	1,810	1,540	1,390
4	25	4,600	3,280	2,480	2,060	1,730	1,530
2	50	5,660	3,810	2,750	2,260	1,880	1,630

Probability of annual low flows, climatic years 1954-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
2	50	130	210	285	300	330	380
5	20	146	227	301	318	351	402
10	10	160	243	318	340	374	431
20	5	179	264	340	368	405	468
50	2	227	307	385	428	472	549



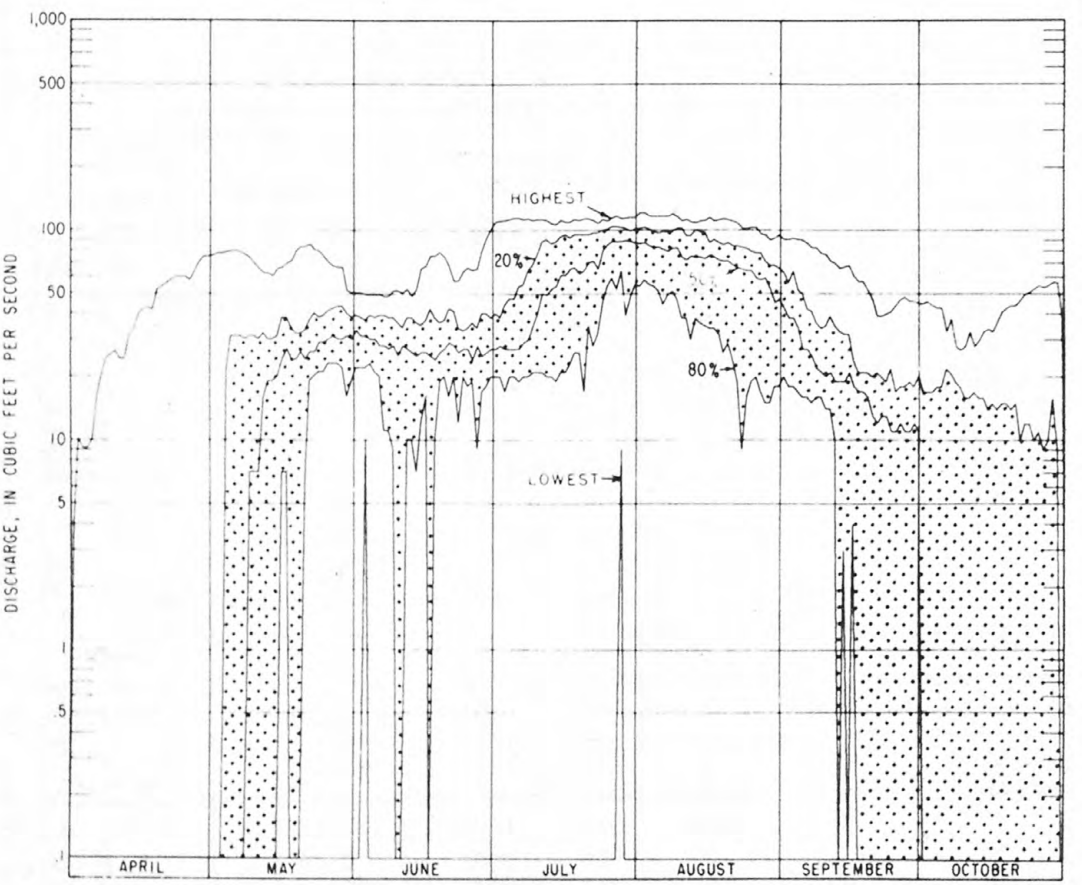
EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, NORTH LOUP RIVER AT ORD, NEBR., 1953-71

06788550 Ord-North Loup Canal (North Loup Project)
near Ord, Nebr.

POINT OF DIVERSION.--Lat 41°35'50", long 98°55'11", SE¼SE¼ sec.22, T.19 N., R.14 W., Valley County, on right bank of North Loup River 0.5 mile east of Ord.

PERIOD OF RECORD.--April 12, 1939, to September 1943; October 1947 to September 1971.

AVERAGE ANNUAL DIVERSIONS.--12,200 acre-feet.



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, ORD-NORTH LOUP CANAL (NORTH LOUP PROJECT) NEAR ORD, NEBR., 1940-43, 1947-71

06789000 North Loup River at Scotia, Nebr.

LOCATION.--Lat 41°27'30", long 98°42'40", in SW¼ sec.8, T.17 N., R.12 W., Greeley County, on right bank 30 ft downstream from trestle on Union Pacific Railroad spur, 0.5 mile upstream from Wallace Creek, and 0.9 mile southwest of Scotia.

DRAINAGE AREA.--4,100 sq mi, approximately of which about 910 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1936 to January 1970 (d).

DIVERSIONS.--Taylor-Ord Canal diversion began April 18, Burwell-Sumter April 24, and Ord-North Loup April 12, 1939; also pumping directly from river.

Monthly and annual mean discharges, water years 1939-69

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	1,120	552	845	142	0.17	8.25
November....	1,100	690	887	97.4	.11	8.66
December....	1,020	546	819	101	.12	7.99
January.....	1,070	566	823	112	.14	8.03
February....	1,410	520	967	189	.20	9.44
March.....	1,540	749	1,120	288	.26	10.89
April.....	1,560	698	1,010	260	.26	9.90
May.....	1,440	617	950	303	.32	9.27
June.....	2,230	629	979	402	.41	9.55
July.....	1,560	300	597	290	.49	5.82
August.....	1,780	234	544	316	.58	5.31
September...	1,240	344	706	232	.33	6.89
Annual.....	1,123	651	853	146	0.17	100

Duration of daily mean discharges, water years 1939-69

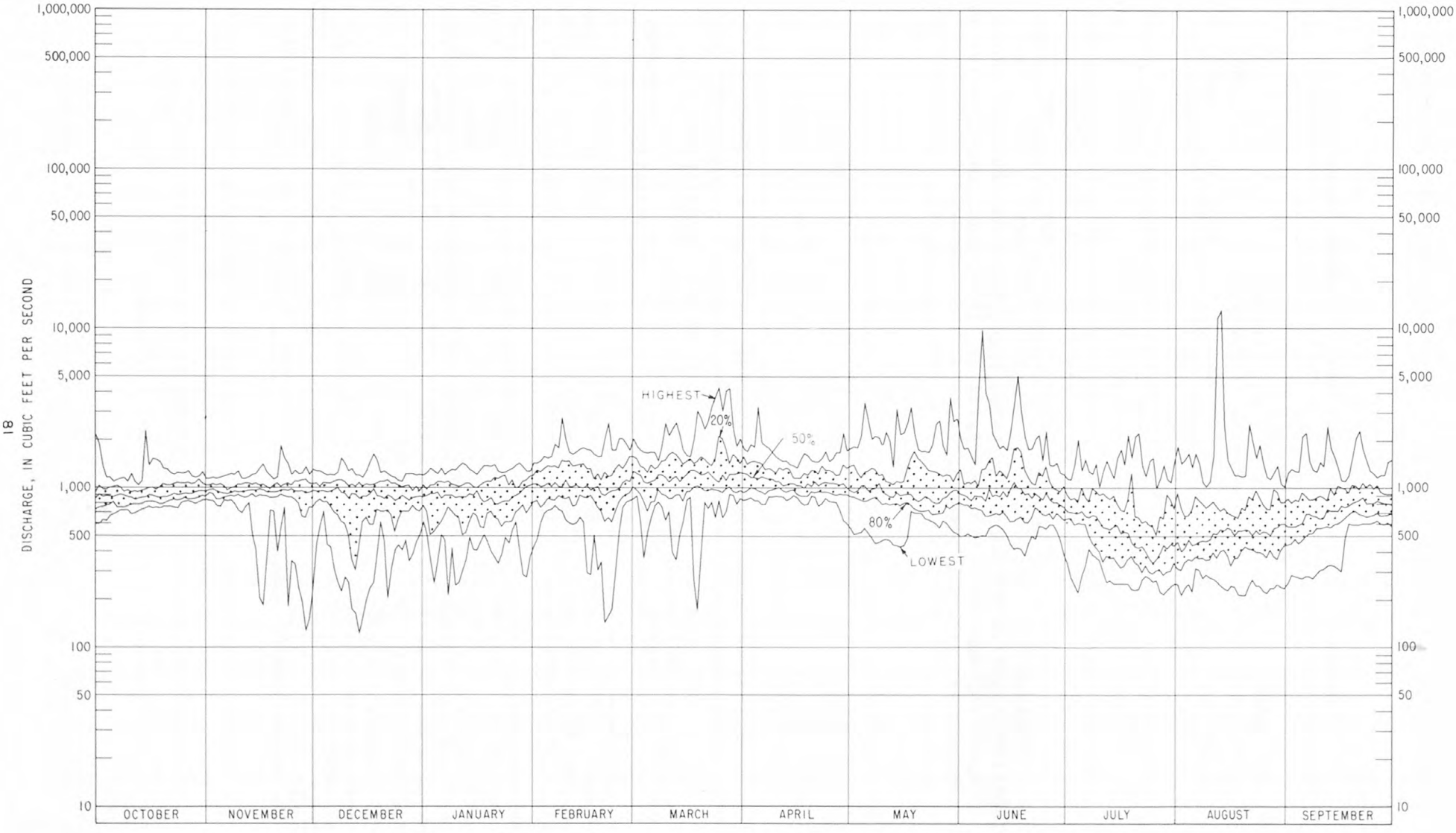
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
105	100	450	90.1	1,500	4.4
140	99.9	520	85.6	1,700	2.5
160	99.8	610	78.2	2,000	1.4
190	99.4	700	70.2	2,300	.8
220	99.0	810	55.9	2,600	.5
250	98.1	940	34.1	3,000	.4
290	96.9	1,100	18.2	3,500	.2
340	94.9	1,300	8.7	4,100	.1
390	92.8				

Probability of annual high flows, water years 1939-69

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	1,540	1,360	1,230	1,060	966	867
50	2	2,990	2,240	1,820	1,570	1,360	1,220
10	10	7,730	4,610	3,010	2,310	1,810	1,500
4	25	12,500	6,650	3,850	2,750	2,040	1,630
2	50	17,800	8,690	4,610	3,110	2,220	1,720
1	100	25,100	11,300	5,490	3,500	2,400	1,390

Probability of annual low flows, climatic years 1940-69

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	81	90	100	114	150	221
2	50	90	101	118	129	168	250
5	20	108	122	140	160	200	290
10	10	123	149	170	190	240	333
20	5	142	174	218	240	289	378
50	2	188	228	289	325	387	484



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, NORTH LOUP RIVER AT SCOTIA, NEBR., 1951-69

06790500 North Loup River near St. Paul, Nebr.

LOCATION.--Lat 41°15'35", long 98°26'50", in sec.22, T.15 N., R.10 W., Howard County, on right bank 310 ft downstream from bridge on U.S. Highway 281, 3 miles north of St. Paul, and 4 miles upstream from confluence with Middle Loup River.

DRAINAGE AREA.--4,460 sq mi, approximately, of which about 1,270 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1894 to September 1915, August 1928 to September 1972.

DIVERSIONS.--Taylor-Ord Canal diversion began April 18, Burwell-Sumter April 24, and Ord-North Loup April 12, 1939; also pumping directly from North Loup and tributaries.

Monthly and annual mean discharges, water years 1939-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	1,170	568	858	155	0.18	7.91
November....	1,130	684	914	101	.11	8.43
December....	1,010	607	832	107	.13	7.67
January.....	1,040	517	829	133	.16	7.65
February....	1,460	603	1,050	185	.18	9.70
March.....	1,830	901	1,240	256	.20	11.49
April.....	1,500	702	1,070	172	.16	9.91
May.....	1,490	576	1,010	265	.26	9.35
June.....	2,520	677	1,070	412	.38	9.85
July.....	1,680	252	650	330	.51	5.99
August.....	1,810	221	567	342	.60	5.23
September...	1,380	326	739	231	.31	6.82
Annual.....	1,180	668	902	119	0.13	100

Duration of daily mean discharges, water years 1939-71

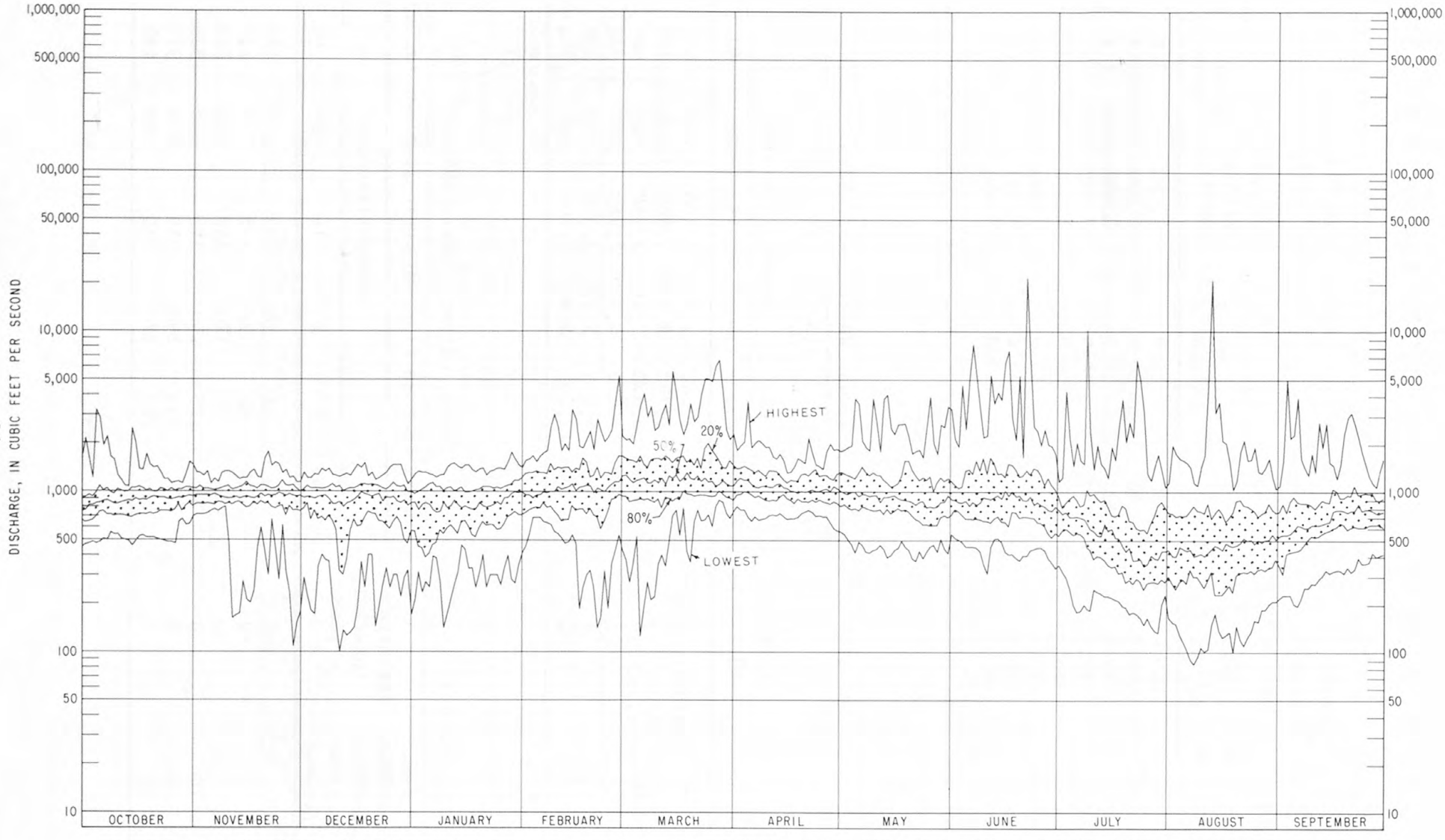
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
85	100	450	88.9	1,700	3.6
120	99.9	530	84.5	2,000	1.9
140	99.7	620	77.7	2,400	1.2
170	99.5	740	66.3	2,800	.7
200	98.9	870	49.9	3,300	.5
230	98.1	1,000	31.3	3,900	.3
270	96.9	1,200	15.1	4,600	.2
320	94.9	1,400	7.8	5,400	.1
380	92.5				

Probability of annual high flows, water years 1939-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	1,570	1,440	1,270	1,120	1,010	910
50	2	3,600	2,700	2,130	1,750	1,480	1,300
10	10	9,240	5,470	3,490	2,540	1,980	1,600
4	25	14,500	7,640	4,370	2,980	2,220	1,730
2	50	20,000	9,700	5,110	3,330	2,410	1,820
1	100	27,300	12,200	5,940	3,700	2,600	1,910

Probability of annual low flows, climatic years 1940-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	70	74	76	82	135	188
2	50	80	84	92	105	155	215
5	20	94	105	120	140	200	260
10	10	108	125	150	175	236	320
20	5	128	153	190	215	279	371
50	2	176	208	270	310	380	482



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, NORTH LOUP RIVER NEAR ST. PAUL, NEBR., 1940-43, 1947-71

06790501 Loup River below confluence of North and Middle Loup Rivers near St. Paul, Nebr. (Computed record)

LOCATION.--Lat 41°16'16", long 98°24'00", in SW¼NW¼ sec.18, T.15 N., R.9 W., Howard County, immediately below confluence of North and Middle Loup Rivers 2.5 miles below North Loup River bridge on Highway 281.

DRAINAGE AREA.--12,250 sq mi, approximately, of which about 4,540 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1894 to September 1915, August 1928 to September 1972.

COMPUTATION OF RECORD.--Sum of North Loup River near St. Paul (06790500) and Middle Loup River at St. Paul (06785000).

DIVERSIONS.--Sargent Canal (06777250) diversion began April 1, 1957; Middle Loup Canal No. 1 (06778010) diversion began July 18, 1938; Middle Loup Canal No. 2 (06778030) diversion began August 10, 1938; Farwell Canal (06778800) diversion began November 8, 1962; Middle Loup Canal No. 3 (06778820) diversion began August 2, 1938; Middle Loup Canal No. 4 (06778840) diversion began July 29, 1938; Taylor-Ord Canal (06785950) diversion began April 18, 1939; Burwell-Sumter Canal (06787550) diversion began April 24, 1939; Ord-North Loup Canal (06788550) diversion began April 12, 1939.

Monthly and annual mean discharges, water years 1963-72

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	2,250	1,320	1,790	303	0.17	7.89
November....	2,450	1,690	2,070	204	.10	9.13
December....	2,090	1,350	1,780	255	.14	7.84
January.....	2,210	1,540	1,870	244	.13	8.25
February....	3,020	2,230	2,470	267	.11	10.91
March.....	4,160	2,160	2,740	586	.21	12.12
April.....	2,750	1,800	2,220	323	.15	9.81
May.....	2,670	1,520	1,890	350	.18	8.36
June.....	4,820	1,120	2,110	1,060	.50	9.32
July.....	1,560	525	1,120	365	.33	4.94
August.....	2,600	446	1,090	628	.58	4.80
September...	2,760	918	1,500	601	.40	6.63
Annual.....	2,130	1,640	1,880	165	0.09	100

Duration of daily mean discharges, water years 1963-72

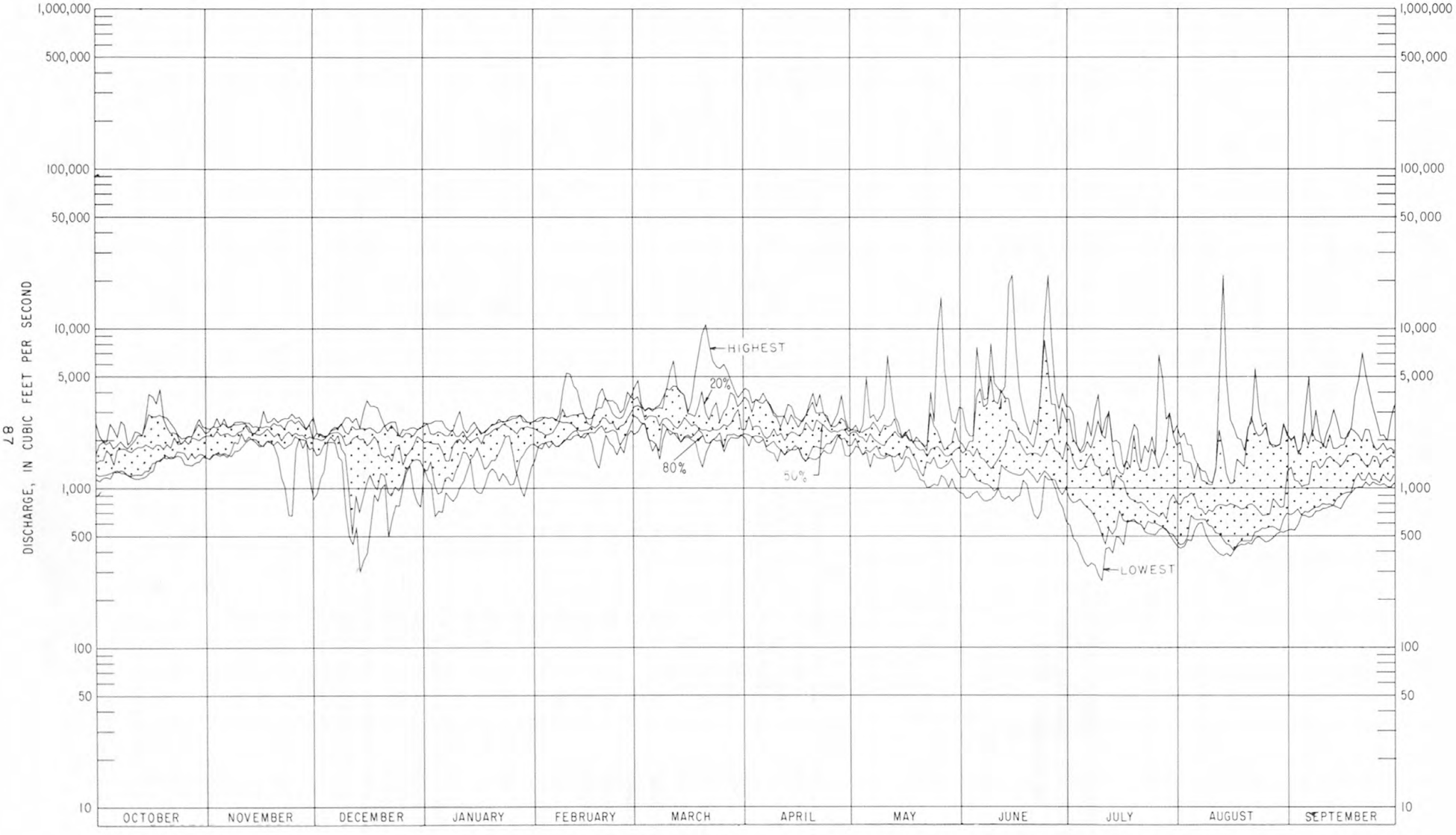
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
231	100	990	84.7	3,600	3.4
270	99.9	1,200	78.9	4,200	1.6
320	99.8	1,400	72.3	5,000	1.0
380	99.5	1,600	63.1	5,900	.6
440	98.5	1,900	47.6	6,900	.5
520	96.8	2,200	28.3	8,100	.3
610	94.4	2,600	12.7	9,500	.2
720	91.4	3,100	6.1	13,000	.1
840	88.3				

Probability of annual high flows, water years 1963-72

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
50	2	9,670	6,970	5,010	3,810	3,170	2,780
10	10	24,000	15,000	8,510	5,740	4,320	3,290
4	25	33,400	20,100	10,500	6,860	4,970	3,510

Probability of annual low flows, climatic years 1964-72

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
10	10	240	270	300	385	430	530
20	5	280	310	355	440	500	640
50	2	375	415	475	580	670	890



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, LOUP RIVER BELOW CONFLUENCE OF NORTH AND MIDDLE LOUP RIVERS NEAR ST. PAUL, NEBR., 1964-72

06791500 Cedar River near Spalding, Nebr.

LOCATION.--Lat 41°42'41", long 98°26'48", in NE¼NE¼ sec.15, T.20 N., R.10 W., Greeley County, on left bank 15 ft downstream from county highway bridge, 0.4 mile upstream from small tributary, and 4.7 miles northwest of Spalding.

DRAINAGE AREA.--805 sq mi, of which about 50 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1944 to September 1953; October 1957 to September 1971.

Monthly and annual mean discharges, water years 1958-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	173	105	138	16.8	0.12	7.47
November....	156	111	140	13.5	.10	7.62
December....	161	102	137	15.5	.11	7.45
January.....	180	107	148	22.7	.15	8.02
February....	191	112	152	22.6	.15	8.24
March.....	255	150	181	29.1	.16	9.79
April.....	269	149	185	37.0	.20	10.01
May.....	318	121	162	48.2	.30	8.76
June.....	530	110	189	108	.57	10.23
July.....	193	111	137	24.2	.18	7.45
August.....	279	99.6	141	44.5	.32	7.63
September...	180	103	135	22.4	.17	7.33
Annual.....	196	120	154	17.0	0.11	100

Duration of daily mean discharges, water years 1958-71

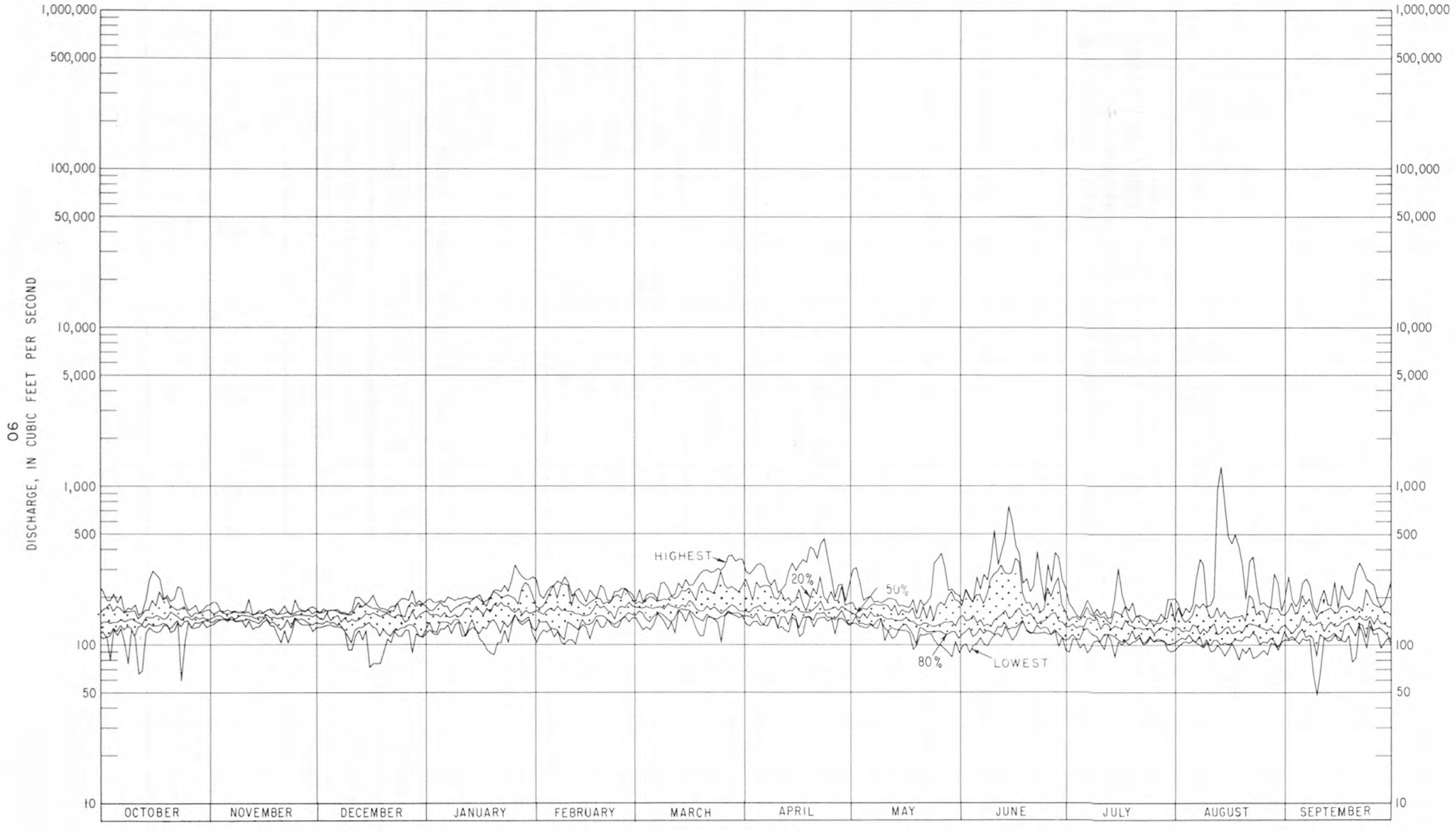
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
47	100	150	40.4	340	1.8
62	99.9	170	20.7	380	1.3
68	99.8	180	16.0	410	1.0
81	99.5	200	10.3	450	.8
89	98.8	220	7.2	490	.5
97	97.1	240	5.3	540	.4
110	89.3	260	4.1	590	.3
120	79.3	290	3.0	710	.2
130	67.7	310	2.4	780	.1
140	54.4				

Probability of annual high flows, water years 1958-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	193	156	146	153	161	154
50	2	421	368	321	266	222	195
10	10	907	770	604	478	358	282
4	25	1,290	1,060	792	628	456	343
2	50	1,650	1,330	954	763	545	395

Probability of annual low flows, climatic years 1959-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
2	50	34	43	70	88	90	95
5	20	45	58	79	92	97	100
10	10	57	70	88	96	102	106
20	5	64	77	92	100	107	111
50	2	77	90	99	108	116	122



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, CEDAR RIVER NEAR SPALDING, NEBR., 1963-71

06792000 Cedar River near Fullerton, Nebr.

LOCATION.--Lat 41°23'45", long 98°00'15", in NE¼NE¼ sec.4, T.16 N., R.6 W., Nance County, near left bank on downstream side of pier of highway bridge, 3 miles northwest of Fullerton and 5.8 miles upstream from mouth.

DRAINAGE AREA.--1,220 sq mi, approximately, of which about 480 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--September 1931 to June 1932; October 1940 to September 1971.

REMARKS.--Flow affected by irrigation and regulation.

Monthly and annual mean discharges, water years 1941-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	297	144	195	38.6	0.20	6.60
November....	272	162	204	26.4	.13	6.92
December....	235	130	186	27.9	.15	6.29
January.....	248	137	183	27.1	.15	6.21
February....	666	150	257	103	.40	8.71
March.....	560	174	295	82.8	.28	9.99
April.....	441	176	272	68.8	.25	9.23
May.....	507	175	305	99.8	.33	10.33
June.....	1,440	176	396	249	.63	13.41
July.....	1,380	62.4	241	228	.95	8.18
August.....	1,690	69.3	225	282	1.25	7.63
September...	419	123	192	64.3	.34	6.50
Annual.....	374	172	246	49.9	0.20	100

Duration of daily mean discharges, water years 1941-71

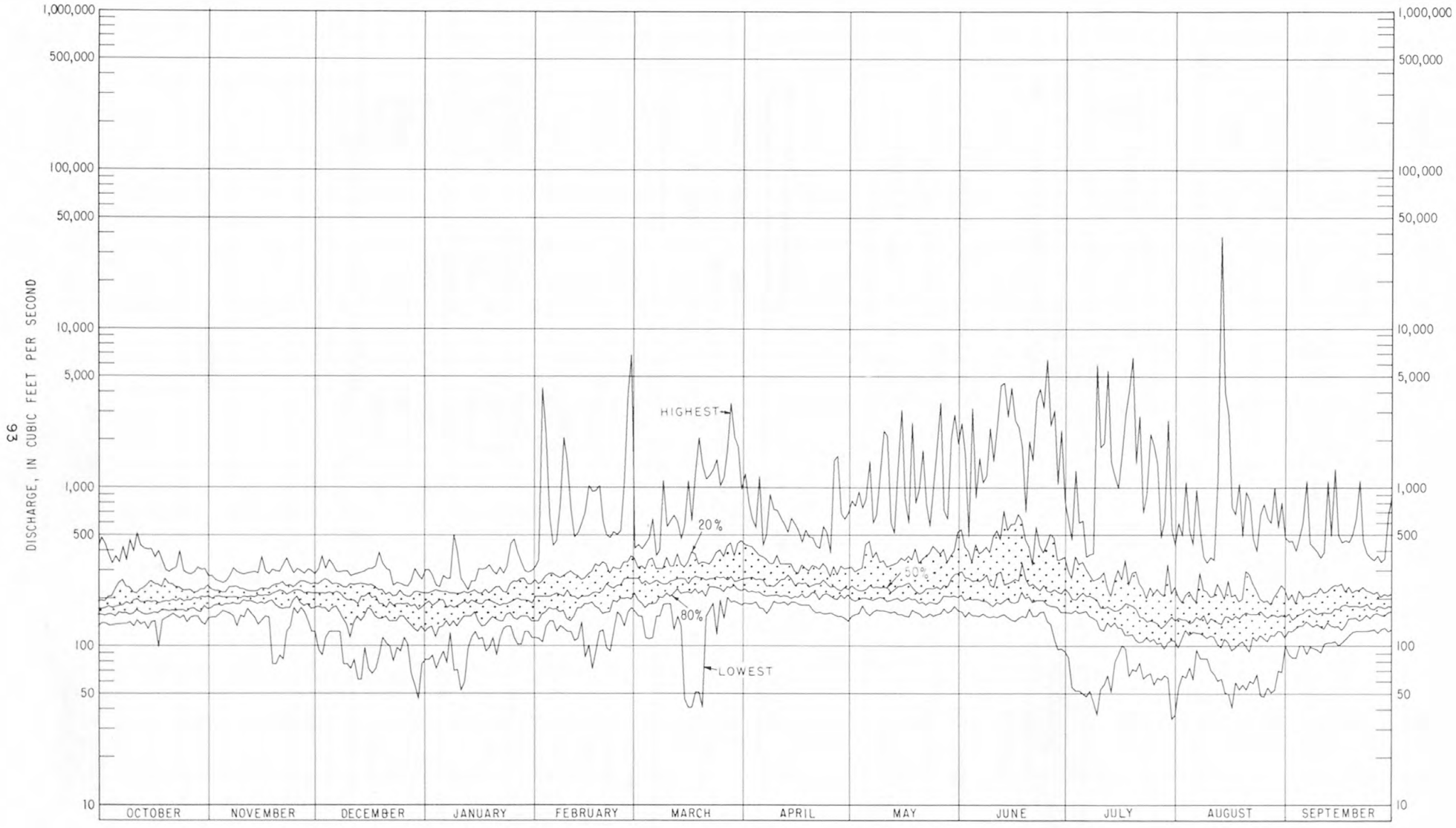
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
33	100	190	58.5	820	1.6
46	99.9	230	32.3	970	1.3
53	99.7	270	19.8	1,100	1.0
63	99.5	310	12.6	1,300	.8
74	99.1	370	8.0	1,600	.6
87	98.3	430	5.4	1,800	.5
100	96.9	510	3.6	2,200	.3
120	93.5	600	2.7	2,500	.2
140	87.9	700	2.0	3,000	.1
160	78.1				

Probability of annual high flows, water years 1941-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	460	318	273	250	227	203
50	2	1,940	1,240	799	599	477	386
10	10	6,700	3,750	2,240	1,470	988	673
4	25	10,700	5,700	3,570	2,220	1,380	858
2	50	15,000	8,000	4,960	2,980	1,740	1,020
1	100	20,000	10,900	6,780	3,960	2,180	1,190

Probability of annual low flows, climatic years 1942-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	23	28	30	35	47	52
2	50	28	35	39	45	58	67
5	20	36	44	54	62	74	88
10	10	46	54	67	80	90	109
20	5	54	63	78	92	108	125
50	2	73	84	100	114	134	152



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, CEDAR RIVER NEAR FULLERTON, NEBR., 1943-71

06792498 Loup River above Loup River Power Canal near Genoa, Nebr.
(Computed record)

LOCATION.--Lat 41°23'31", long 97°49'27", in NE¼NW¼ sec.6, T.16 N., R.4 W., Nance County, just upstream from Loup River Power Canal and 4.5 miles upstream from Genoa.

DRAINAGE AREA.--14,370 sq mi, approximately, of which about 6,000 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--Loup River near Genoa, August 1928 to June 1932, October 1943 to September 1972. Loup River Power Canal, December 1936 to September 1972.

COMPUTATION OF RECORD.--Sum of the Loup River near Genoa (06793000) and Loup River Power Canal (06792500).

DIVERSIONS.--Several diversions for irrigation (see 06790501).

Monthly and annual mean discharges, water years 1963-72

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	2,410	1,370	1,930	365	0.19	7.69
November....	2,380	1,660	2,170	211	.10	8.66
December....	2,350	1,480	1,800	272	.15	7.17
January.....	2,130	1,470	1,850	215	.12	7.35
February....	3,420	2,130	2,490	360	.14	9.92
March.....	5,630	2,260	3,240	956	.30	12.90
April.....	3,400	1,900	2,510	449	.18	9.99
May.....	3,060	1,680	2,180	485	.22	8.69
June.....	6,810	1,450	2,620	1,580	.60	10.44
July.....	1,700	521	1,240	443	.36	4.96
August.....	4,900	420	1,390	1,280	.92	5.52
September...	3,130	986	1,680	678	.40	6.71
Annual.....	2,340	1,830	2,090	176	0.08	100

Duration of daily mean discharges, water years 1963-72

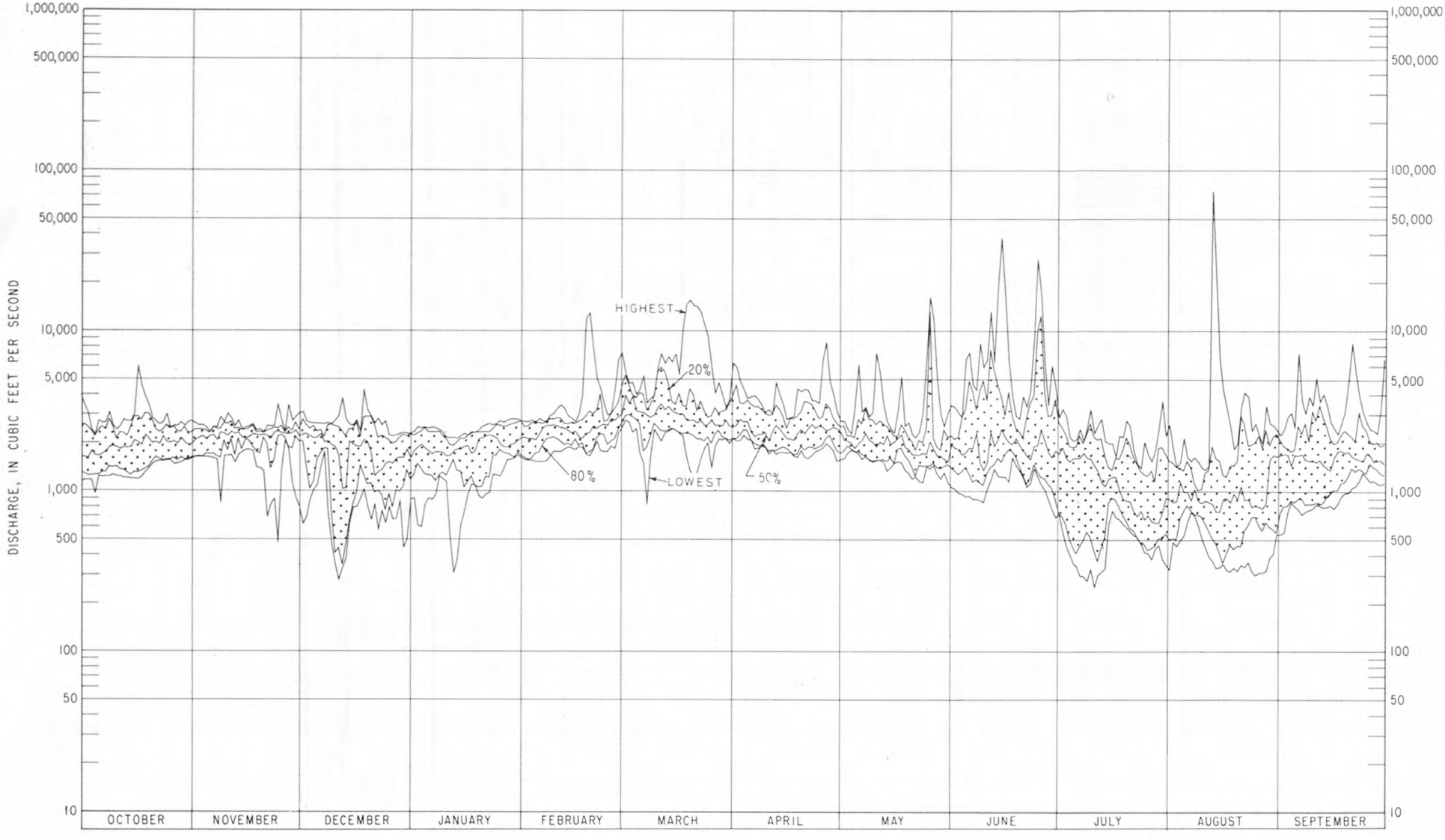
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
230	100	1,200	82.8	6,100	1.4
310	99.7	1,600	68.1	7,900	.8
400	98.9	2,000	47.6	10,000	.5
530	97.0	2,700	14.9	14,000	.3
690	94.4	3,500	5.2	18,000	.1
910	88.8	4,600	2.4		

Probability of annual high flows, water years 1963-72

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	2,630	1,960	1,860	2,150	2,140	2,150
50	2	14,400	10,200	6,830	5,000	3,940	3,210
10	10	46,400	26,800	15,300	9,010	6,160	4,230

Probability of annual low flows, climatic years 1964-72

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
10	10	245	270	295	330	410	520
20	5	265	295	325	385	490	640
50	2	345	380	430	540	700	920



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, LOUP RIVER ABOVE LOUP RIVER POWER CANAL NEAR GENOA, NEBR., 1963-71

06793000 Loup River near Genoa, Nebr.

LOCATION.--Lat 41°25'05", long 97°43'25", in SW¼NE¼ sec.25, T.17 N., R.4W., Nance County, on right bank on downstream side of bridge on State Highway 39, 2 miles south of Genoa, 3 miles upstream from Beaver Creek, and 6 miles downstream from diversion dam of Loup River Public Power District.

DRAINAGE AREA.--14,400 sq mi, approximately, of which about 6,000 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--August 1928 to June 1932, October 1943 to September 1972.

DIVERSIONS.--Flow appreciably affected by diversions for irrigation and power. The most recent diversion began November 8, 1962 (see 06790501).

Monthly and annual mean discharges, water years 1963-72

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October....	264	36.1	101	70	0.70	1.65
November...	513	59.0	280	157	.56	4.61
December...	1,510	185	879	490	.56	14.45
January....	1,340	122	523	432	.83	8.59
February...	2,350	402	815	622	.76	13.40
March.....	4,050	241	1,320	1,150	.87	21.77
April.....	915	35.0	339	311	.92	5.57
May.....	1,150	8.18	292	377	1.29	4.80
June.....	4,330	9.70	843	1,330	1.57	13.86
July.....	319	.17	69	91	1.33	1.13
August.....	4,250	1.15	449	1,340	2.98	7.37
September..	710	42.3	170	207	1.21	2.80
Annual.....	957	182	506	213	0.42	100

Duration of daily mean discharges, water years 1963-72

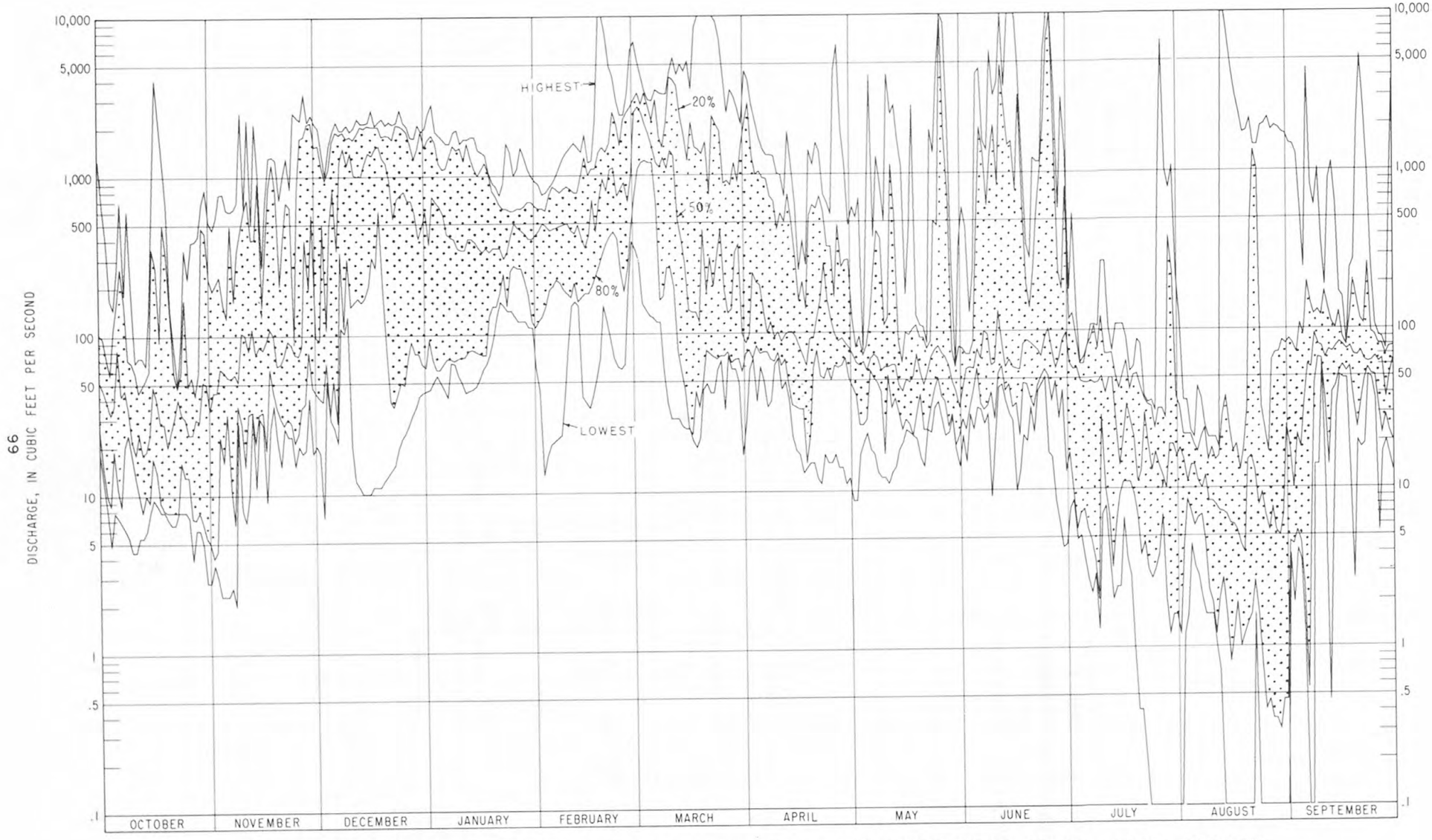
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
0.0	100	8.70	89.3	510	22.3
.10	98.0	13.0	86.2	760	17.1
.30	97.9	20.0	81.0	1,100	12.9
.50	97.7	29.0	76.1	1,700	7.4
.80	97.5	44.0	68.2	2,600	3.0
1.10	97.4	66.0	55.3	3,900	1.6
1.70	96.8	99.0	42.2	5,800	.8
2.60	96.2	150	36.6	8,700	.5
3.90	95.0	220	33.2	13,000	.3
5.80	92.7	340	28.8	20,000	.1

Probability of annual high flows, water years 1963-72

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	1,090	865	817	641	524	403
50	2	12,800	8,220	4,980	3,330	2,250	1,450
10	10	47,400	26,900	14,500	8,230	4,850	2,580

Probability of annual low flows, climatic years 1964-72

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
10	10	0	0	0	0	0	1.4
20	5	0	0	0	0.15	1.0	5.4
50	2	1.3	2.0	2.5	4.5	9.0	25



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, LOUP RIVER NEAR GENOA, NEBR., 1964-72

06794000 Beaver Creek at Genoa, Nebr.

LOCATION.--Lat 41°26'32", long 97°44'11", in NE¼SE¼ sec.14, T.17 N., R.4 W., Nance County, on left bank in city park at southwest corner of Genoa, 0.2 mile downstream from Union Pacific Railroad bridge, 0.2 mile upstream from bridge on State Highway 39, and 2.5 miles upstream from mouth.

DRAINAGE AREA.--627 sq mi, of which about 410 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1940 to September 1971.

REMARKS.--Flow slightly affected by irrigation and regulation.

Monthly and annual mean discharges, water years 1941-71

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	140	44.0	77.5	23.5	0.30	5.02
November....	114	47.6	80.7	14.0	.17	5.23
December....	101	55.8	77.3	11.0	.14	5.00
January.....	138	48.0	75.6	16.1	.21	4.89
February....	537	59.3	135	101	.75	8.73
March.....	397	88.6	184	90.8	.49	11.90
April.....	359	80.1	152	61.8	.41	9.82
May.....	405	86.3	170	91.8	.54	11.03
June.....	808	72.8	269	180	.67	17.43
July.....	1,250	21.0	137	212	1.54	8.90
August.....	601	24.8	104	111	1.07	6.71
September...	215	35.0	82.4	42.9	.52	5.34
Annual.....	248	71.6	128	38.5	0.30	100

Duration of daily mean discharges, water years 1941-71

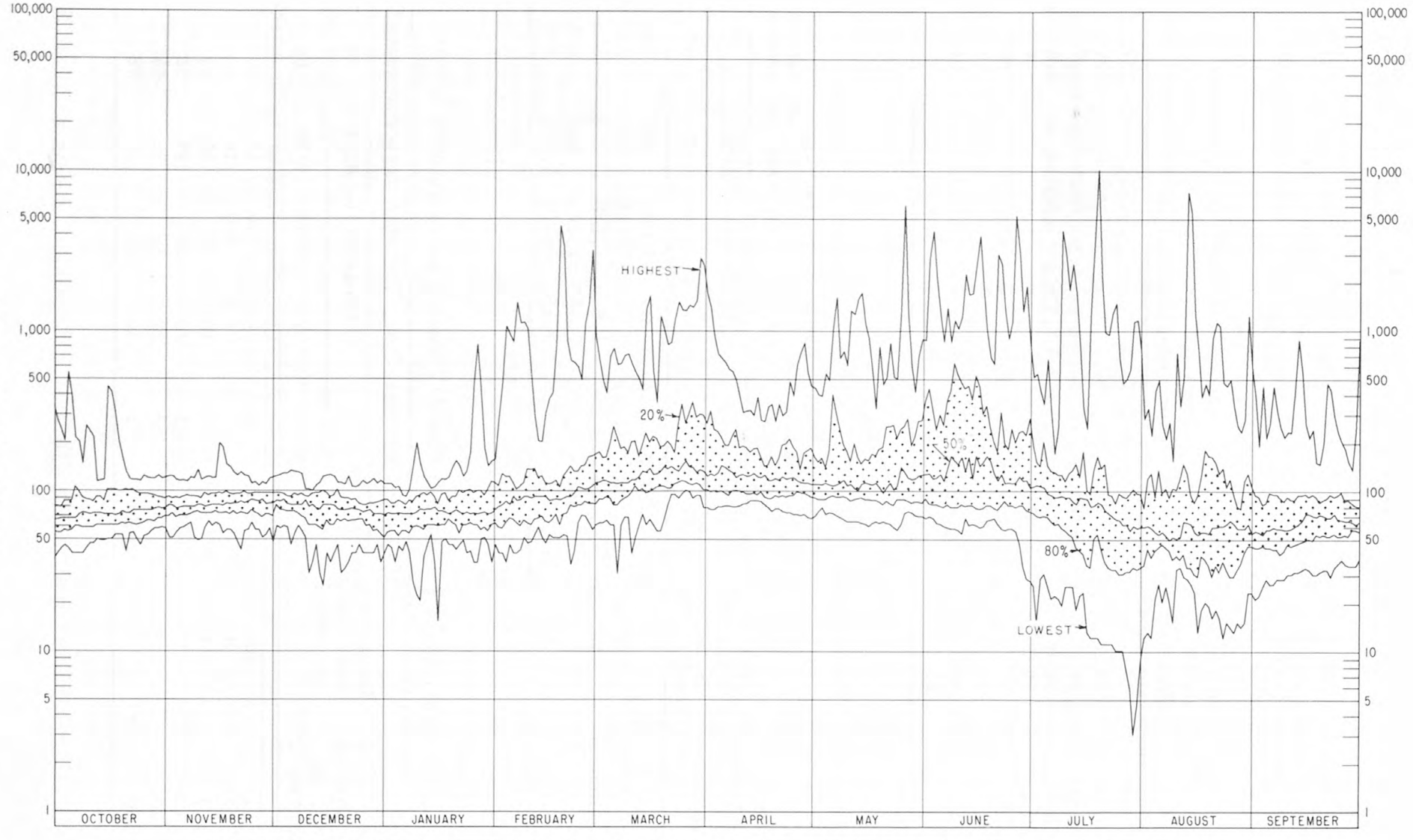
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
3.00	100	64	78.4	430	3.2
9.80	99.9	82	54.1	540	2.4
12.0	99.8	100	35.0	680	1.7
16	99.6	130	19.4	860	1.1
20	99.5	170	12.2	1,100	.8
25	99.0	210	8.9	1,400	.4
32	97.6	270	6.2	1,800	.2
40	95.6	340	4.6	2,800	.1
51	89.9				

Probability of annual high flows, water years 1941-71

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	257	154	115	97	93	90
50	2	1,620	1,140	721	477	344	250
10	10	5,060	3,180	1,840	1,170	728	476
4	25	7,860	4,570	2,560	1,620	963	605
2	50	10,500	5,750	3,150	2,010	1,150	709

Probability of annual low flows, climatic years 1942-71

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
1	100	1.2	2.2	2.7	5.0	12	20
2	50	2.5	4.0	5.0	8.2	16	24
5	20	6.4	8.8	10	14	22	30
10	10	11	13	16	20	29	36
20	5	17	19	22	26	35	44
50	2	30	33	36	41	49	58



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, BEAVER CREEK AT GENOA, NEBR., 1943-71

06794500 Loup River at Columbus, Nebr.

LOCATION.--Lat 41°25'05", long 97°21'45", in SE¼NW¼ sec.30, T.17 N., R.1 E., Nance County, on left bank 1,250 ft downstream from bridge on U.S. Highway 30 at Columbus, 3.5 miles upstream from mouth, and 14 miles downstream from Looking Glass Creek.

DRAINAGE AREA.--15,200 sq mi, approximately, of which about 6,530 sq mi contributes directly to surface runoff.

PERIOD OF RECORD.--October 1894 to September 1915, March to September 1931, October 1933 to September 1972.

DIVERSIONS.--Flow appreciably affected by irrigation (see 06790501) and power development. The Loup River Power Canal (06792500) bypasses the gaging station and water from the Columbus Power Plant is returned to the Platte River 4.5 miles below the station.

Monthly and annual mean discharges, water years 1963-72

Month	Maximum (cfs)	Minimum (cfs)	Mean (cfs)	Standard deviation (cfs)	Coefficient of variation	Percent of annual runoff
October.....	514	145	272	137	0.50	3.01
November....	697	152	431	192	.45	4.78
December....	1,750	209	1,040	532	.51	11.50
January.....	1,590	311	697	442	.63	7.73
February....	2,690	495	1,090	663	.61	12.13
March.....	5,030	377	1,780	1,400	.78	19.69
April.....	1,220	214	591	372	.63	6.55
May.....	2,030	193	622	625	1.00	6.89
June.....	6,310	165	1,320	1,830	1.39	14.61
July.....	551	39.5	234	142	.60	2.59
August.....	5,120	48.5	626	1,580	2.5	6.94
September...	756	95.4	322	241	.75	3.58
Annual.....	1,255	420	750	252	0.34	100

Duration of daily mean discharges, water years 1963-72

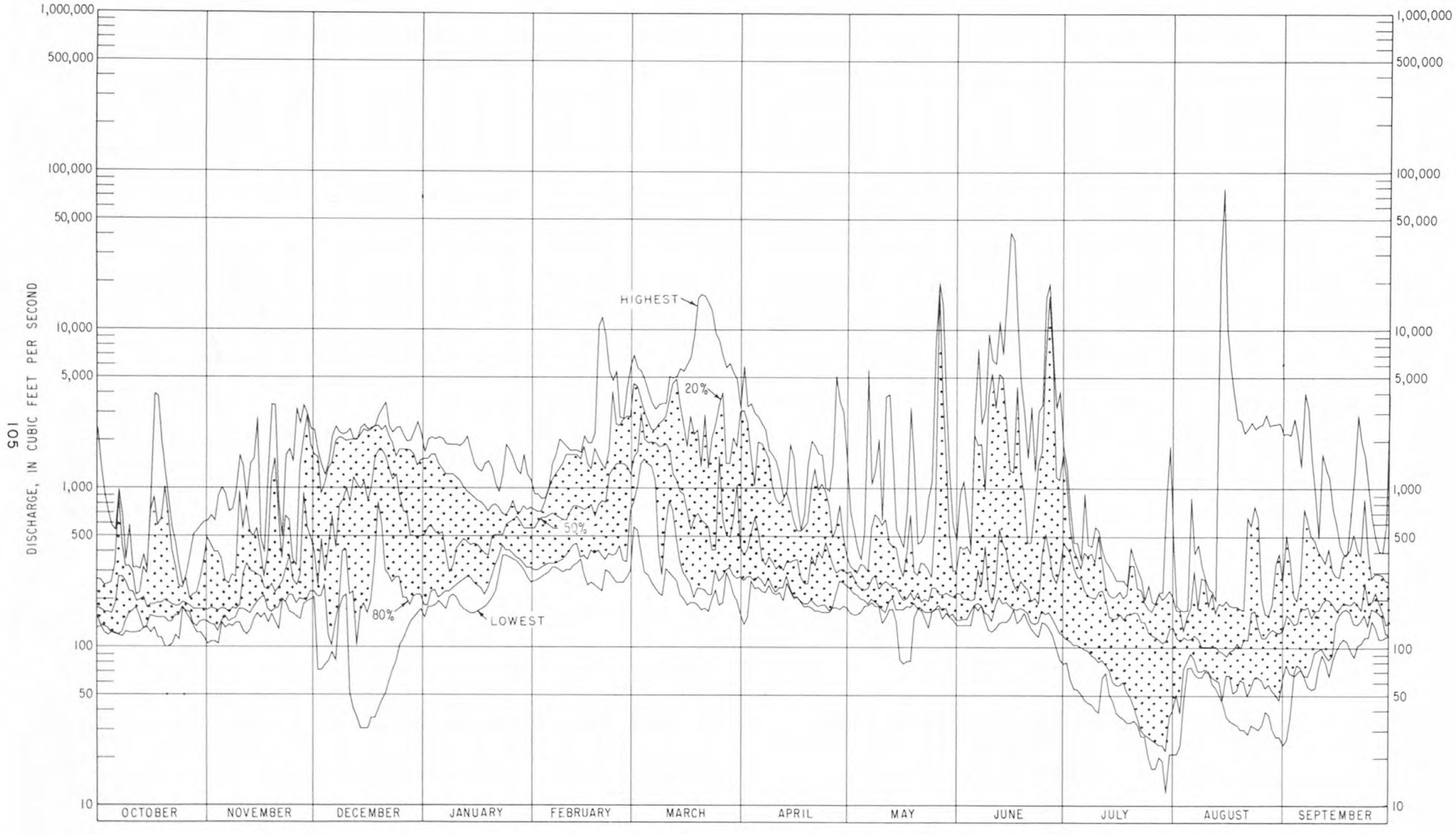
Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded	Mean daily discharge (cfs)	Percent days discharge was equaled or exceeded
14	100	180	71.6	2,300	6.0
18	99.9	240	55.0	3,000	3.7
24	99.7	300	45.3	3,900	2.2
31	99.1	390	37.1	5,000	1.6
39	98.5	510	30.5	6,500	1.0
51	97.8	650	26.0	8,400	.7
66	96.5	840	21.0	11,000	.5
85	94.0	1,100	17.5	14,000	.4
110	90.8	1,400	14.0	18,000	.1
140	84.5	1,800	9.6		

Probability of annual high flows, water years 1963-72

Exceedence probability, in percent	Recurrence interval, in years	Highest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	15	30	60
99	1	1,380	1,020	1,090	1,010	922	761
50	2	14,500	10,100	6,200	4,010	2,820	1,900
10	10	50,500	31,900	17,400	10,200	6,120	3,340

Probability of annual low flows, climatic years 1964-72

Non-exceedence probability, in percent	Recurrence interval, in years	Lowest average flow, in cubic feet per second					
		1 day	Consecutive days				
			3	7	14	30	60
10	10	12	15	19	25	33	41
20	5	24	30	37	47	59	73
50	2	61	74	88	102	122	150



EXCEEDENCE PROBABILITY GRAPH OF DAILY DISCHARGE, LOUP RIVER AT COLUMBUS, NEBR., 1963-71