NEBRASKA SOIL AND WATER
CONSERVATION COMMISSION

STATE WATER PLAN
PUBLICATION NUMBER 101B

Report on

THE FRAMEWORK STUDY

APPENDIX B

INVENTORY OF WATER RESOURCES

JUNE, 1971

J. James Exon
Governor

NEBRASKA'S
STATE WATER PLAN

REPORT ON

THE FRAMEWORK STUDY

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NEBRASKA SOIL AND WATER CONSERVATION COMMISSION

JUNE, 1971

NEBRASKA SOIL AND WATER CONSERVATION COMMISSION

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NEBRASKA'S STATE WATER PLAN

Nebraska Revised Statutes § 2-1507 (7) (Supp. 1967) directs the Nebraska Soil and Water Conservation Commission to "plan, develop, and encourage the implementing of a comprehensive program of resource development, conservation and utilization for the soil and water resources of this state in cooperation with other local, state and federal agencies and organizations."

Legislative Resolution 5, of the 1967 Legislature, (Reaffirmed by L.R. #72 -- 1969 Session) specifically directed the Nebraska Soil and Water Conservation Commission to "...prepare a comprehensive water and related land plan for the State of Nebraska, such framework plan to be completed no later than June 30, 1971, and to be known as the State Water Plan." In addition to an analysis and evaluation of the state's water and land resources, the Resolution directed that the State Water Plan include an examination of legal, social, and economic factors associated with resource development.

Nebraska's State Water Plan, as established by the Commission, will consist of the following four sections:

Section 1. The Framework Study - The framework study is based on reconnaissance type investigations and makes use of presently available planning data in formulation of the framework plan. Basic objectives of the study were to assess the present quantity, distribution, quality, and use of Nebraska's water and land resources and to provide a broad, flexible guide to the best uses of these resources to meet current and future needs.

Section 2. Basin Studies - This section will consist of studies of individual river basins. The studies will be made in the detail necessary to identify potential projects, estimate project costs and benefits, suggest the order of development, show the relationship of each project to the state's framework plan, and recommend local action to accelerate resource development.

Section 3. Status Summary - Significant water resource development projects which have been proposed for future development are described in the Status Summary of Potential Projects. It will be updated periodically to reflect new proposals and progress in resource planning. The Status Summary section of the State Water Plan will also include a report summarizing the present status of water resource development in the State.

Section 4. Special Recommendations - This section consists of recommendations for action by the Legislature, Governor, and various units of government to improve the conservation, development, management, and utilization of Nebraska's land and water resources. The recommendations will be prepared as the need for action becomes apparent and are to include a thorough study of the legal, social, and economic aspects of major problems of resource development.

THE FRAMEWORK STUDY

The Framework Study is the central feature of Nebraska's State Water Plan. Results of the study are presented in a main report and four appendices. The appendices generally present summations of basic data and miscellaneous supporting material for the main report.

Appendix A, "Land Inventory," is an inventory of the land resources of the State. Three major topics (1) existing land use, (2) land ownership, and (3) land capability are discussed. This appendix was printed in preliminary form in June, 1969.

Appendix B is an inventory of the water resources of the State. Primary objectives of this volume are to:

(1) Summarize those climatic factors related to water resource development,

(2) Inventory and determine the location, quantity, quality, and present use of the state's surface water, and

(3) Inventory and determine the location, availability, quality, and present use of the state's ground water.

Appendix B was printed in preliminary form in May, 1970.

Appendix C, "Land and Water Resources Problems and Needs," is an inventory of present and anticipated future water requirements and water related problems of the State. All of the various uses and problems concerning the water resource are considered. It was printed in preliminary form in September, 1970.

Appendix D is a summary of federal and state laws, compacts and court decrees which are important to water resource development in the State. It was printed in preliminary form in June, 1970.

The main report on the Framework Study is based on information presented in the appendices and the sources given in them. It presents a generalized statewide reconnaissance of Nebraska's water and related land resources, problems and needs, and a general framework for development. It does not provide detailed evaluations or time schedules for specific projects but a flexible guide into which properly designed projects can be fitted. The report also presents recommendations for action required to insure the optimum development of Nebraska's water resources. The report was published in May, 1971.

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INTRODUCTION

This appendix presents an inventory of Nebraska's water resources in support of the State Water Plan Framework Study Report published by the Commission in May, 1971. The main purpose of this appendix is to inventory, assess and determine the quantity, distribution, quality, and present use of Nebraska's water resources. It should also be useful to future planners as a record of the present water situation in Nebraska.

Studies and accumulation of data required for preparation of this appendix were initiated in 1967, soon after approval of Legislative Resolution 5. Only data already available were used in its preparation. However, all available sources were contacted and use was made of both published and unpublished data from federal, state and local sources. When necessary to describe certain features of the water resource, estimates were made if no specific data were available. No attempt is made in this appendix to present detailed basic data, but references are included for sources. Summaries of information and data are presented to provide the planner with readily usable materials. Information which could best be summarized and presented on maps is included in the Map Section following Chapter 3. In addition, more complete data on historical streamflow at some locations is given in the three attachments following the Map Section.

The State has been divided into 13 river basins for planning purposes. Map 1, "River Basin Delineation," shows the location of the basins.

Most of the information contained in this publication was contributed or collected by federal and state agencies and it could not have been completed without their generous assistance.

The Nebraska Soil and Water Conservation Commission gratefully acknowledges the help and advice received from governmental agencies, private organizations, and individuals during preparation and review of this publication.

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Federal Agencies

Bureau of Reclamation
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National Weather Service, State Climatologist
Geological Survey
Environmental Protection Agency

State Agencies

Department of Water Resources
Bureau of Environmental Health Services, State Dept. of Health
Game and Parks Commission
Conservation and Survey Division, University of Nebraska

Private Organizations and Individuals

Members of the Technical Advisory and Special Representatives Committees and State Water Plan work group whose names are listed near the beginning of this report.

Appendix B was printed in preliminary form in May, 1970. The main report on the Framework Study was subsequently published in May, 1971. This publication updates material presented in the preliminary appendix report and in some cases utilizes more current information than that presented in the main report. In summarizing the information from the preliminary appendix for use in the main report and in the finalization of this appendix, attempts have been made continuously to correct any previous errors or omissions. For this reason, some data and information presented in this volume may differ from corresponding figures in the main report.

SUMMARY

This appendix to the "Report on the Framework Study" is an inventory of the water resources of the State and is not intended to present detailed analyses of data or specific plans for water resource development. Data has been collected from many sources, assembled, and summarized to make information required for water resources planning more readily available. This section presents statements and conclusions drawn from summarization and general analysis of the data collected. Figure 1 shows a generalized picture of Nebraska's water resources.

Climate

Nebraska's climate is typical of the Great Plains area. Its weather, or day-to-day climate, is variable due to invasion of large masses of air with different characteristics.

Precipitation occurs in the form of rain, hail, sleet or snow, depending upon the season of the year. About 80 percent of the annual precipitation falls during the main crop growing season of April through September. Both annual and monthly precipitation is highly variable from year to year. The annual precipitation at Nebraska's seven first order Weather Bureau stations varies as much as 400 percent between high and low years. The average annual precipitation decreases from a high of 35 inches in the southeast corner of the State to less than 16 inches in the extreme west.

Air temperature extremes in Nebraska vary from summer highs around 115° F to winter lows down to -40° F. The frost-free period (air temperature above 32° F) in Nebraska is generally from May 15 to the first of October, varying with the year and the location.

Average annual total lake evaporation varies from over 50 inches in the southwestern part of the State to slightly less than 40 inches in the northeast.

Annual mean wind speeds are about 11 miles per hour, but during storms, winds of over 100 miles per hour have been experienced. General wind direction is from the north in the winter and from the south in the summer. During spring and fall the direction is more variable.

Some weather modification work has been done in Nebraska. Precipitation management and fog dispersal have met with some success. Little, if any, weather modification research is presently being done in Nebraska.

Surface Water

Most of Nebraska's streamflow originates from overland runoff of precipitation, but the base flow is supported by percolating shallow

NEBRASKA'S WATER SUPPLY

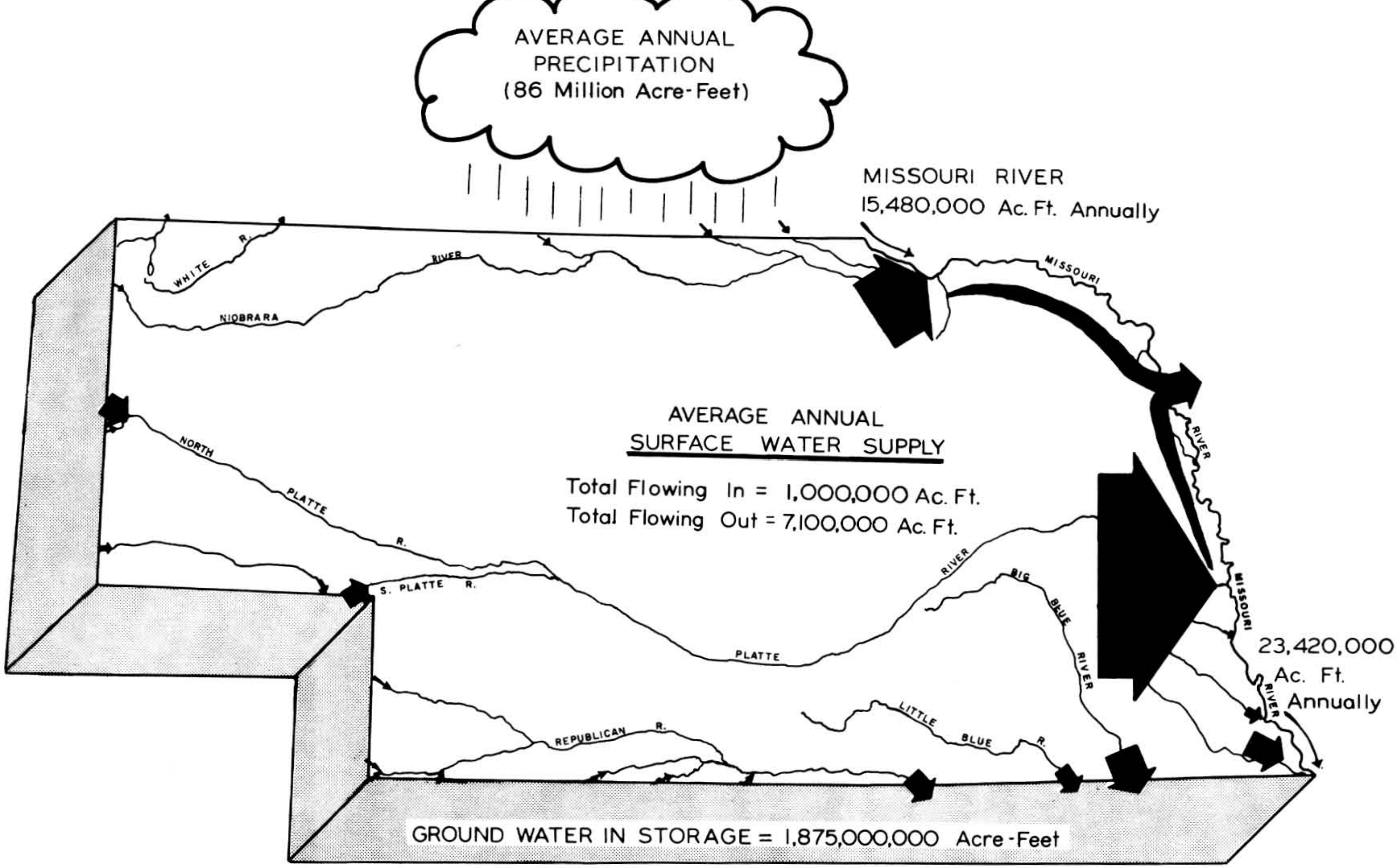


Fig. 1

ground water. Streams in the Sandhills derive almost their entire flow from ground water which flows into the surface drainage channels.

There are about 350 sites on Nebraska streams where some type of streamflow data is being recorded. Historical streamflow records presented in Attachment 1 and flow-duration curves presented in Attachment 3 show that the state's streams differ greatly in their natural flow regimens. Many, especially in the Sandhills, are perennial and flow even during long periods of little or no precipitation. Others are intermittent and flow only as a result of direct precipitation runoff. Highest peak discharge observed on an interior Nebraska stream was 280,000 cfs on the Republican River near Cambridge during the 1935 flood.

There are 33 lakes and reservoirs controlled by man-made structures that have surface areas greater than 100 acres at conservation pool level. Total surface area is about 84,440 acres. Lake McConaughy is the largest with a surface area of 35,000 acres and 1,948,000 acre-feet of storage at conservation pool level. Reservoirs with less than 100 surface acres form an aggregate total of about 4,780 acres and farm ponds total at least another 55,000 acres. Permanent natural lakes cover an area of about 95,000 acres and the remaining water surface in the State consisting of streams, intermittent lakes, gravel pits, etc., averages about 240,000 acres. The total water surface area of the State averages somewhere around 500,000 acres, or a little over one percent of the total area.

Irrigation is the biggest user of surface water. In 1966, there were 1,730,700 acres of land in the State with surface water irrigation rights. Of this amount, it is estimated that about 1.1 million acres (64%) are irrigated during an average year. About 2,400,000 acre-feet are diverted to irrigate that much land.

Floods have occurred on every major river in Nebraska during this century. Some flood control structures, especially in the Republican River Basin, have lessened the flood potential, but most river valleys have little flood protection.

Surface water quality in Nebraska is generally good. Biological and chemical characteristics are generally within accepted limits for most uses except for a few localized conditions. Suspended sediment is the greatest contributor to physical degradation.

Although the largest volume of surface water is used for irrigation, a considerable amount is also used non-consumptively for generating hydro-electric power at 20 different locations, for cooling at some steam-electric power plants and for municipal supplies at two communities in the State. Surface water is also used for recreation, by fish and wildlife, and for dilution and transportation of waste materials.

Ground Water

There is an extensive supply of ground water in storage in the State. Within the Missouri River Basin, Nebraska occupies only one-seventh of the area, but more than one-half of the basin's total ground water is stored in Nebraska. It is estimated that almost 1.9 billion acre-feet are stored in materials of Pleistocene, Pliocene and Miocene Age which range in thickness from 0 to 1,600 feet, mainly in the western three-fourths of the State. Not all of this amount is physically or economically available, but adequate supplies for domestic use and livestock are available over nearly all of the State and quantities suitable for irrigation are available in over two-thirds of Nebraska.

Under natural conditions the water table would remain relatively stable in most of the State and fluctuate only slightly depending upon precipitation. There are several areas where the water table is declining because of withdrawal for irrigation and at least two areas where the water table is rising as a result of surface water irrigation.

Ground water quality is generally good throughout the State. Near the eastern border waters contain high concentrations of iron and manganese, and hardness is excessive throughout much of the eastern and southern part of the State. Nevertheless, total dissolved solids concentration generally is less than 400 mg/l, except in localized areas or from ground water in some of the deeper-lying older rocks.

Nebraska ranks third in the nation in number of acres irrigated. About 2.2 million acres, or 70 percent of the total irrigated, is irrigated from ground water. Approximately 2.5 million acre-feet are used consumptively by irrigated agriculture in an average year.

All communities in the State, except Crawford and about two-thirds of Omaha, use ground water exclusively for municipal supply. Nearly all domestic supplies for farm and rural non-farm use also come from ground water. It is estimated that about 143,000 acre-feet are used annually for domestic purposes and about 248,000 acre-feet are used annually by industry. Approximately 48,000 acre-feet are used for cooling in steam-electric power plants and about 83,000 acre-feet are consumed by livestock. The total ground water used annually is about 3.0 million acre-feet.

CHAPTER 1. CLIMATE

Climate may be described as the course or condition of the weather over a period of years including the extremes and distribution of the various elements. Weather is generally defined as the state of the atmosphere with respect to temperature, humidity, precipitation, wind speed and direction, and cloudiness at any given time. For many planning, engineering and scheduling purposes, it is more important to have knowledge of an area's climate, or long-term weather, than what the weather happens to be on any particular day. This is especially true in water resources planning.

Nebraska's weather is noted for variability. Rapid changes in Nebraska's weather are caused by the invasion of large masses of air of different characteristics, such as warm, moist air from the Gulf of Mexico; hot, dry air from the Southwest; cool, dry air from the north Pacific Ocean; and cold, dry air from northwestern Canada.

In this chapter, Nebraska's climate, as it affects water resource development, is discussed under the headings of Precipitation, Temperature, Evaporation and Transpiration, Wind, and Weather Modification. This climatic summary is based upon weather observations obtained through the efforts of the National Weather Service and its many volunteer cooperative observers. Data have been extracted from a number of Weather Service and University of Nebraska publications.

Precipitation

In Nebraska, precipitation occurs in various forms throughout the year. In summer, precipitation occurs predominantly as rain with occasional hail, but during the remainder of the year it may occur in the form of rain, snow, sleet, drizzle or hail.

The predominant moisture supply for precipitation comes from the Gulf of Mexico. The wide variation in rainfall from year to year is a result of the distance from the supply source and the fact that moist air from the Gulf is often deflected eastward before it reaches Nebraska.

Map 2, "Nebraska Precipitation Characteristics," shows the average annual distribution of precipitation throughout the State for the period 1931 through 1960. This period appears to be representative of long-term average annual precipitation when compared to long-term averages for several stations within the State. The variation from 35 inches annually in the southeast corner to less than 16 inches in the northwest corner is fairly uniform across the State. However, because the weather pattern is conducive to very intense local thunderstorms, monthly and annual extremes of precipitation vary greatly from the average. Figure 2 shows the maximum and minimum recorded annual precipitation at the 7 first order Weather Service stations in Nebraska. Table 1, "Precipitation and

TABLE 1

PRECIPITATION AND TEMPERATURE CHARACTERISTICS FOR SELECTED STATIONS

River Basin / Station Name	Weather Bureau Index Number	County	Precipitation			Temperature						
								Years Prior to 1968		Mean Frost-Free Period c/		
			Total Years of Record Prior to 1968	Normal Mean Annual a/ (Inches)	Average Annual Snowfall (Inches) b/	Total Years of Record Prior to 1968	Normal Mean Annual (°F) a/	Record High (°F)	Record Low (°F)	Mean Date of Last 32°F in Spring	Mean Date of First 32°F in Autumn	Number of Days
White R. - Hat Cr.												
Fort Robinson	3015	Dawes	83	17.49	-- d/	80	47.8	110	-37	--	--	--
Chadron AP	1575	Dawes	53	15.27	45.9	52	48.6	111	-31	05-10	10-01	144
Niobrara												
Harrison	3615	Sioux	53	17.64	--	51	45.7	107	-35	05-22	09-21	122
Alliance	0130	Box Butte	71	15.84	38.6	64	48.0	109	-40	05-13	09-28	138
Gordon	3355	Sheridan	66	16.42	39.9	57	46.9	110	-40	05-25	09-16	114
Valentine WB	8760	Cherry	80	17.30	37.2	78	46.9	110	-38	--	--	--
Ainsworth	0050	Brown	70	20.31	44.9	59	49.3	112	-33	--	--	--
Butte	1365	Boyd	61	22.14	35.5	58	49.0	115	-36	--	--	--
Missouri Trib.												
Hartington	3630	Cedar	75	24.74	39.3	75	49.3	118	-38	05-03	10-07	158
Walthill	8935	Thurston	65	24.91	--	60	49.0	113	-45	--	--	--
Tekamah	8480	Burt	76	28.26	32.1	76	50.9	113	-37	05-02	10-13	164
Omaha WB	6255	Douglas	100	27.56	28.4	96	51.5	114	-32	04-14	10-20	189
North Platte												
Scottsbluff WB	7665	Scotts Bluff	78	14.38	34.7	76	48.7	110	-45	05-14	09-26	135
Oshkosh	6385	Garden	54	16.32	32.6	53	49.8	111	-34	05-07	10-03	150
Arthur	0365	Arthur	38	17.42	--	36	48.4	113	-31	--	--	--
South Platte												
Kimball	4440	Kimball	79	17.35	43.0	77	48.3	110	-36	05-14	09-27	135
Sidney	7830	Cheyenne	39	15.77	40.7	38	48.9	109	-30	--	--	--
Ogallala 3W	6200	Keith	50	18.24	--	44	50.5	115	-29	--	--	--
Middle Platte												
North Platte WB	6065	Lincoln	27	18.27	26.3	27	49.2	112	-35	04-30	10-07	160
Gothenburg	3365	Dawson	72	19.92	--	72	51.1	116	-33	05-09	10-02	146
Kearney	4335	Buffalo	94	22.60	--	72	50.7	114	-34	--	--	--
Grand Island WB	3395	Hall	75	21.85	27.3	75	50.1	117	-28	04-29	10-06	160
Loup												
Hyannis	4100	Grant	39	17.19	29.0	39	48.6	110	-32	05-15	09-23	131
Stapleton 5SSE	8130	Logan	45	19.79	31.5	44	49.5	114	-30	--	--	--
Brewster	1130	Blaine	54	19.70	--	--	--	--	--	--	--	--
Loup City	4985	Sherman	71	20.80	--	70	50.5	112	-39	05-08	10-01	146
Ericson 6 WNW	2770	Garfield	74	21.51	--	--	--	--	--	--	--	--
Genoa 2W	3185	Nance	91	23.37	28.2	89	51.3	116	-32	--	--	--
Elkhorn												
Ewing	2805	Holt	75	22.47	--	59	48.7	114	-38	--	--	--
Norfolk WB	5995	Madison	21	23.95	28.8	21	48.9	113	-26	05-04	10-03	152
Wakefield	8915	Dixon	72	23.85	--	69	49.5	115	-41	05-07	10-02	148
West Point	9200	Cuming	81	26.69	--	69	50.7	113	-38	05-02	10-08	159

TABLE 1 (Continued)

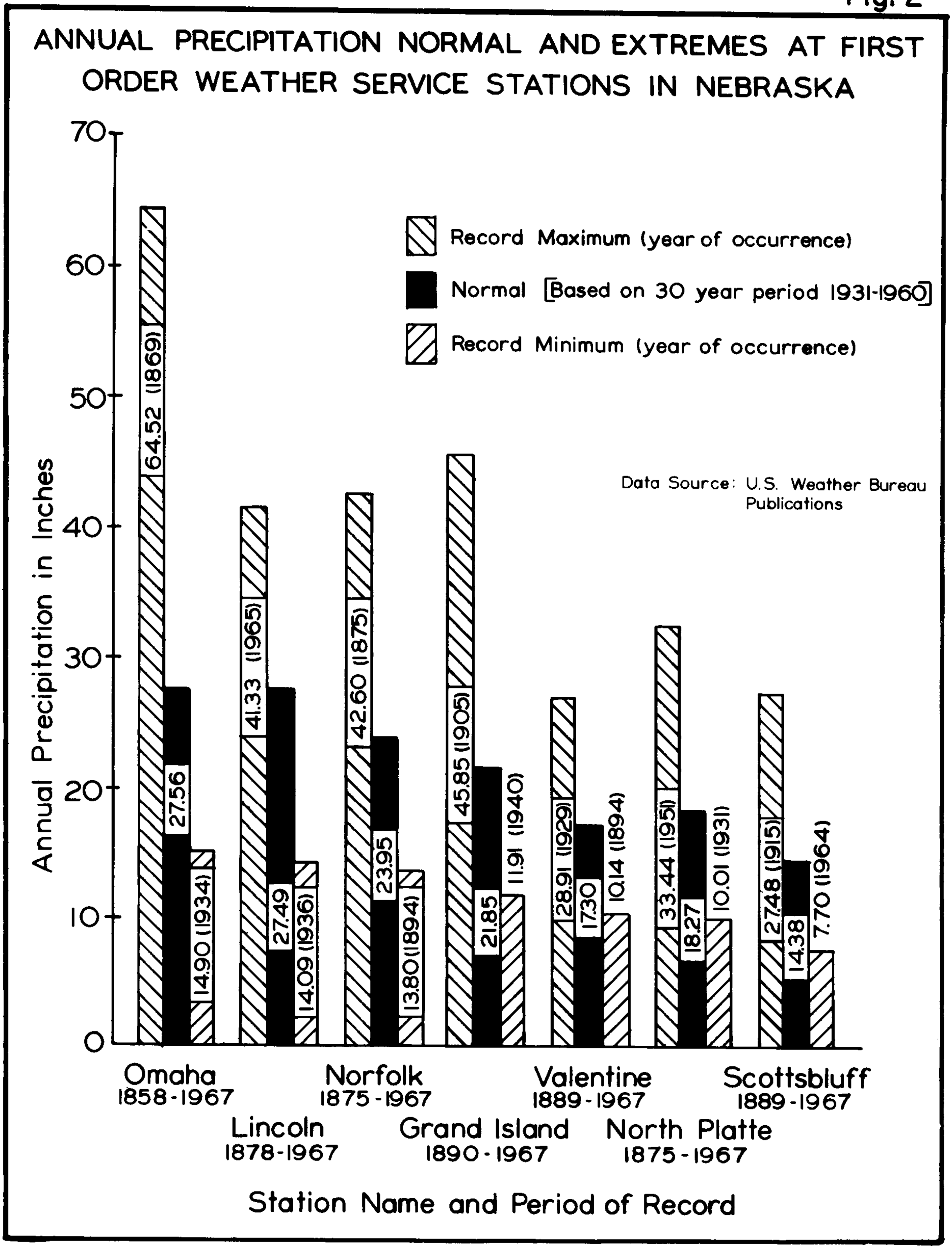
PRECIPITATION AND TEMPERATURE CHARACTERISTICS FOR SELECTED STATIONS

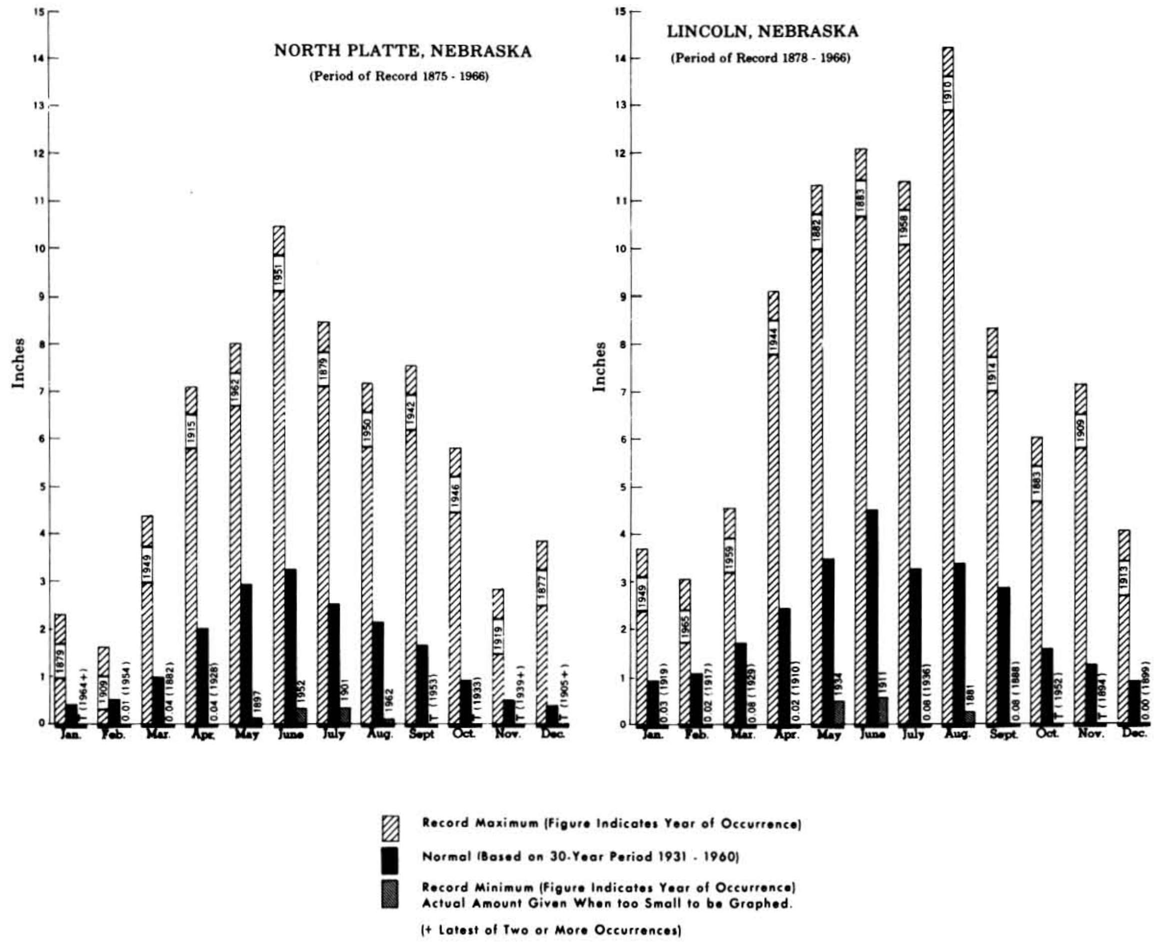
River Basin / Station Name	Weather Bureau Index Number	County	Precipitation: Total Years of Record Prior to 1968	Precipitation: Normal Mean Annual a/ (Inches)	Precipitation: Average Annual Snowfall (Inches) b/	Temperature: Total Years of Record Prior to 1968	Temperature: Normal Mean Annual (°F) a/	Years Prior to 1968: Record High (°F)	Years Prior to 1968: Record Low (°F)	Mean Frost-Free Period c/: Mean Date of Last 32°F in Spring	Mean Frost-Free Period c/: Mean Date of First 32°F in Autumn	Mean Frost-Free Period c/: Number of Days
Lower Platte												
Schuyler	7640	Colfax	73	26.67	--	--	--	--	--	--	--	--
Fremont	3050	Dodge	86	28.32	--	83	51.6	116	-31	04-30	10-10	163
Lincoln Ag. Farm	4790	Lancaster	46	27.49	--	46	53.0	117	-24	04-20	10-17	180
Wahoo	8905	Saunders	77	27.48	--	5	--	--	--	--	--	--
Republican												
Imperial	4110	Chase	76	18.76	36.0	75	51.1	113	-35	05-09	10-05	150
Benkelman	0760	Dundy	63	16.62	--	48	53.0	114	-29	--	--	--
McCook	5310	Red Willow	81	19.75	--	66	52.9	114	-38	--	--	--
Curtis	2100	Frontier	69	19.20	--	69	51.5	114	-36	--	--	--
Alma	0145	Harlan	71	20.91	--	68	53.1	117	-38	--	--	--
Red Cloud	7070	Webster	81	23.43	23.9	70	52.8	117	-28	05-01	10-04	156
Little Blue												
Minden	5565	Kearney	89	22.99	--	83	52.2	118	-33	05-04	10-09	159
Hastings	3660	Adams	76	24.02	--	73	52.4	116	-30	--	--	--
Nelson	5840	Nuckolls	49	25.09	--	32	--	116	-24	--	--	--
Fairbury 2SSE	2820	Jefferson	91	28.69	--	71	53.3	114	-38	04-25	10-15	174
Big Blue												
Aurora	0445	Hamilton	67	23.76	--	5	--	--	--	--	--	--
York	9510	York	79	26.36	27.5	74	52.0	114	-31	05-02	10-09	160
Crete	2020	Saline	87	28.26	24.2	83	52.4	114	-27	04-24	10-14	173
Geneva	3175	Fillmore	76	27.03	--	73	51.7	118	-32	04-29	10-11	165
Beatrice No. 1	0620	Gage	77	28.87	25.1	74	52.4	117	-33	04-26	10-13	170
Nemaha												
Nebraska City	5810	Otoe	91	30.46	--	83	--	115	-28	--	--	--
Syracuse	8395	Otoe	86	29.30	--	74	52.7	116	-33	--	--	--
Tecumseh	8465	Johnson	88	32.03	24.4	76	52.3	112	-30	04-30	10-08	161
Falls City	2850	Richardson	79	35.01	23.9	67	53.4	115	-30	--	--	--

a/ Average Annual for period 1931 thru 1960
b/ For period of record prior to 1960
c/ Based on period 1921-1950, or portion of that period for which data were available
d/ -- Indicates no record or data available

Source of Data: U. S. Weather Bureau Climatic Summaries

Fig. 2


ANNUAL PRECIPITATION NORMAL AND EXTREMES AT FIRST ORDER WEATHER SERVICE STATIONS IN NEBRASKA
Record Maximum (year of occurrence)
Normal [Based on 30 year period 1931-1960]
Record Minimum (year of occurrence)
Data Source: U.S. Weather Bureau Publications
Annual Precipitation in Inches
0
10
20
30
40
50
60
70
64.52 (1869)
27.56
14.90 (1934)
41.33 (1965)
27.49
14.09 (1936)
42.60 (1875)
23.95
13.80 (1894)
45.85 (1905)
21.85
11.91 (1940)
28.91 (1929)
17.30
10.14 (1894)
33.44 (1951)
18.27
10.01 (1931)
27.48 (1915)
14.38
7.70 (1964)
Omaha 1858-1967
Lincoln 1878-1967
Norfolk 1875-1967
Grand Island 1890-1967
Valentine 1889-1967
North Platte 1875-1967
Scottsbluff 1889-1967
Station Name and Period of Record



Source: Selected Climatic Maps, Missouri River Basin Comprehensive Framework Study

Fig. 3. MONTHLY DISTRIBUTION OF PRECIPITATION AT NORTH PLATTE AND LINCOLN

Temperature Characteristics for Selected Stations," shows normal 1/ annual precipitation for 55 observation stations distributed throughout the State. These stations were selected as being representative of precipitation and temperature conditions for each of the 13 river basins into which the State has been divided.

Map 2 also shows the monthly distribution of mean precipitation for the 1931 through 1960 period for one or more stations in each river basin. Figure 3 shows the recorded maximum, minimum, and mean monthly precipitation for Lincoln and North Platte.

1/ Normals for all stations are climatological standard normals used by the National Weather Service and are based on averages for the 30-year period 1931-1960.

The same average annual precipitation falling on two areas with different climatic factors may result in a marked difference in the effectiveness of the precipitation and the type of plants that will be found there or can be grown there.

Precipitation effectiveness (P-E) depends partly on evaporation rate and will be greatest with high humidity, cool temperature, and low wind movement when evaporation losses are slight. The P-E Index expresses precipitation effectiveness as a ratio of precipitation amount to estimated evaporation rate and has been shown to be closely related to the production of forage by native grasses. The index can also be used as part of a classification of climate or in an expression for the climatic basis of soil development.

In Nebraska the P-E is generally associated with total precipitation. The lines connecting points of equal P-E at 55, 44 and 31 percent in Nebraska and throughout the Great Plains States are closely associated with the soil associations and soil groups in this area.

Rainfall

The majority of Nebraska's agriculture is dependent upon rainfall which occurs during the main crop-growing season of April through September. About 80 percent of the annual precipitation falls during this period. In the non-irrigated regions, the distribution of rainfall throughout the growing season is nearly as important as the total amount which falls during the year.

To be effective for crop growth, rainfall must penetrate the soil into the plant root zone. However, during high intensity rainfalls, much of the water runs off into the stream system and flows out of the area where it fell. Rainfall of high intensity is relatively common in Nebraska. Figure 4, "Rainfall Intensity - Duration - Frequency Curves," shows possible rainfall intensities for different durations at representative locations across the State.

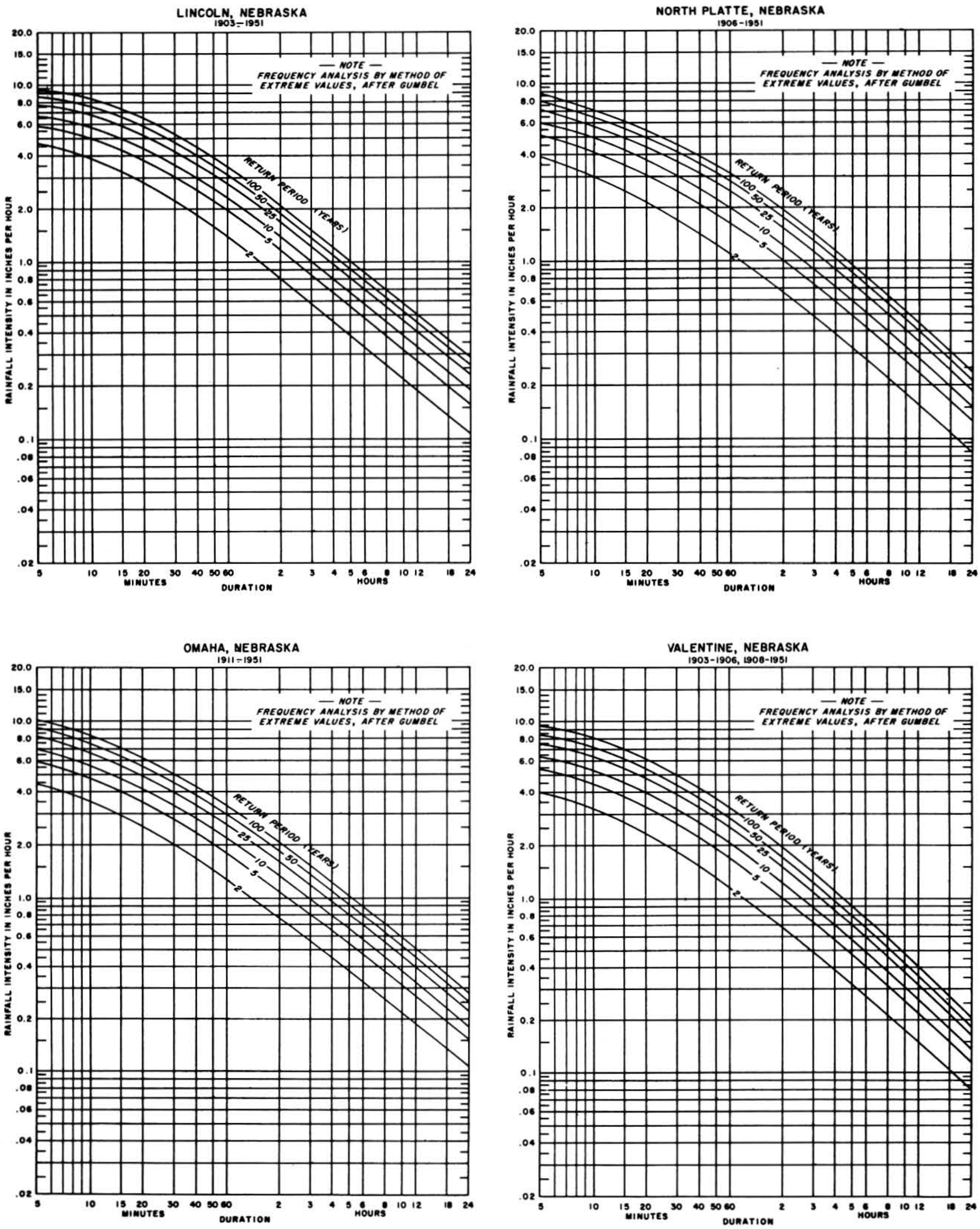
Snow, Hail and Sleet

A significant amount of Nebraska's total precipitation occurs in solid form as snow, hail or sleet.

Snow. Snowfall occurs in every part of the State. The annual amount varies between areas and varies greatly from year to year at any particular location. Table 1 shows average annual snowfall at selected stations across the State. Average annual snowfall at these

Fig. 4

RAINFALL INTENSITY– DURATION–FREQUENCY CURVES



SOURCE: <u>Rainfall Intensity - Duration-Frequency Curves</u>, U. S. Department of Commerce, Weather Bureau, Technical Paper No. 25, December 1955 stations varies from a high of 45.9 inches at Chadron to a low of 23.9 inches at Falls City and Red Cloud, with a state average of about 29 inches. Generally, snow is light and melts rapidly, but at times considerable amounts may accumulate and remain on the ground for long periods.

Heavy local snowfalls and blizzards are not uncommon. The heaviest snowfall in recent years occurred in 1960 over the southern and eastern part of the State. As much as 50 to 60 inches was recorded that year at many locations that normally receive 30 to 35 inches annually. As the snow melted, heavy runoff and damaging floods resulted.

Severe blizzards have occurred several times in this century. In 1949, snowfall during the storm of January 3rd and 4th amounted to 20 to 30 inches at several locations and northerly gales formed many drifts 20 feet or more in height. Transportation was disrupted for days, many livestock died, and some communities were completely isolated for several days. Total snowfall during January, 1949, amounted to 36 inches at Niobrara. On the other hand, the total snowfall at the same location was only 10 inches for the entire year in 1967.

Hail. Hail generally occurs during the spring and summer months in connection with well-developed thunderstorms and turbulent atmospheric conditions. Destruction of crops and property often results from hail storms but they are usually local in extent, of short duration, and create damage in an extremely variable and spotted pattern. There is no way to predict what areas will be affected and, at this time, no proven method of hail suppression.

Sleet. Sleet and freezing rain storms occur during the winter months. This type of storm commonly affects large areas of the State. Freezing rain storms have caused widespread damage and disruption to the communications and transportation systems but, in general, severe storms of this type are not frequent.

Probability of Occurrence

Satisfactory crop yields are dependent upon adequate soil moisture being available to the plant at all times. In planning for irrigated agriculture in areas which receive some natural rainfall during the growing season, it is helpful to know the probabilities that certain amounts of rainfall will occur at certain times.

Analyses of the probability of occurrence of various amounts of precipitation during any week of the year are presented in a University of Nebraska publication.2/ Analyses were completed for 11 locations

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2/ Nebraska's Precipitation, Its Patterns and Probabilities, Miscellaneous Publication 10 by the University of Nebraska, College of Agriculture and Home Economics and Agricultural Experiment Station, May, 1965.

in Nebraska and probability curves for two stations, Fairbury and Alliance, are reproduced in Figure 5, along with the explanation of their possible use.

Prolonged lack of precipitation, or drought, has been experienced several times in Nebraska's recorded history. These dry periods tend to recur randomly and severe droughts occurred over most of the State during 1887-1896, 1924-1927, 1931-1941 and 1952-1956. The most severe was during 1931-1941, with 1934 having less rainfall than any other year during the period.

Several theories have been advanced as to the cause of periods of low precipitation, but no one is capable of forecasting future droughts.

Temperature

Air temperature in Nebraska may vary widely from day to day and sometimes from hour to hour. This variation is generally caused by invasion of large air masses from the north or south. Daily air temperatures recorded by observers at about 135 locations across the State are published monthly by the National Weather Service.

Averages and Extremes

Daily air temperatures often vary widely across the State, but mean temperature on a monthly basis varies only 5 to 10 degrees between any two locations. Table 2 shows normal3/ mean monthly temperatures at six locations across the State.

Table 1 shows normal mean annual temperature for each of the selected stations in the 13 river basins. Temperature extremes (the highest and lowest temperatures recorded prior to 1968) are also shown for each station.

Length of Growing Season

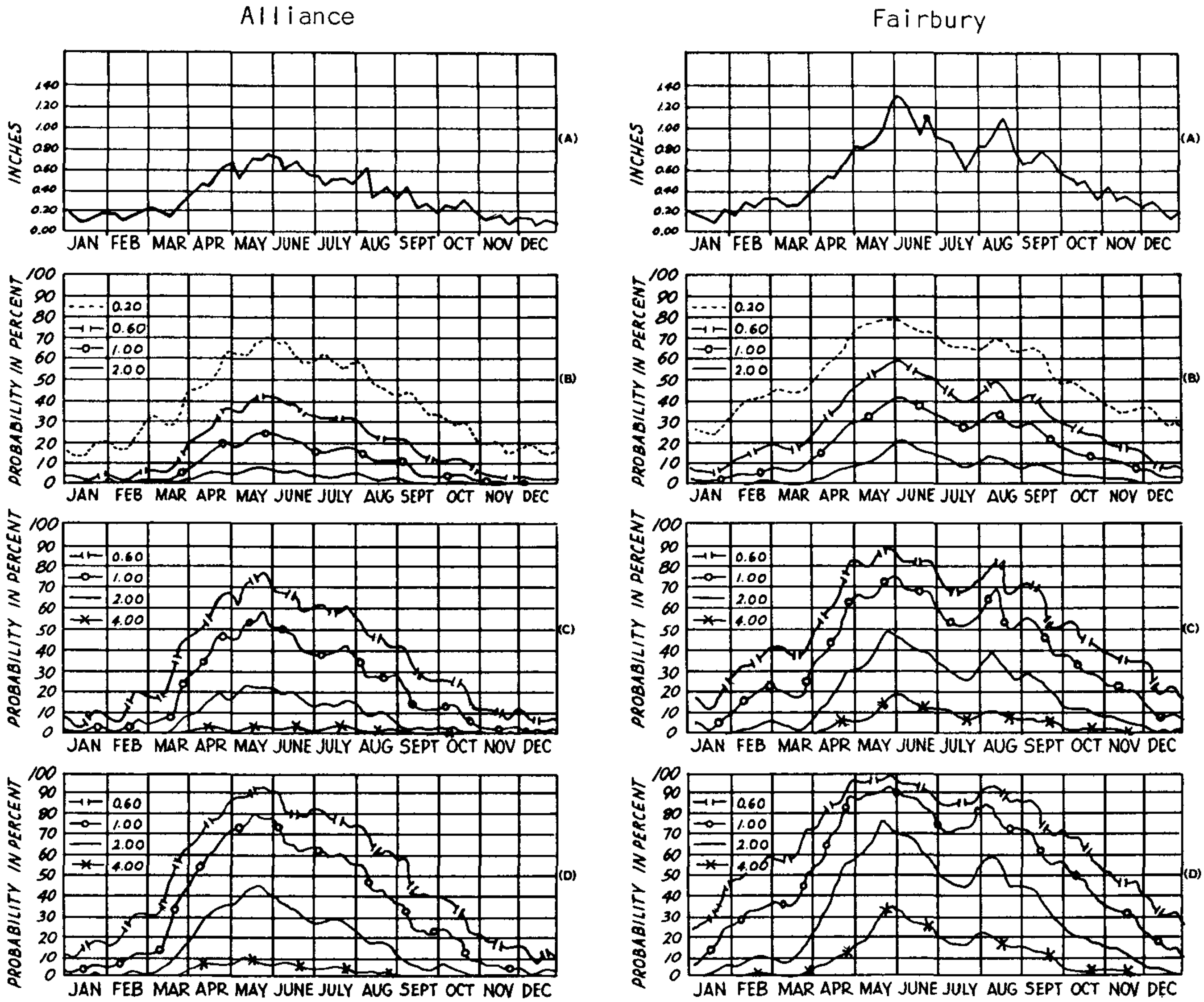
The length of the crop growing season depends upon the crop in question and the indicator selected. The growing season is defined by Rosenberg and Myers4/ as, "that period during which plants may develop without danger of destruction from low temperature injury." It is usually that period during which the air temperature does not fall below 32°F for any extensive time.

3/ Refer to Footnote Number 1.

4/ Climatic Atlas of Irrigated Regions in Nebraska, University of Nebraska Agricultural Experiment Station, July 1963.

Fig. 5

PRECIPITATION PROBABILITIES AT FAIRBURY AND ALLIANCE



Explanation of Graphs -

(A) Average weekly precipitation. (B) Probability of receiving 0.20, 0.60, 1.00 and 2.00 inches of precipitation during 1-week intervals. (C) Probability of receiving 0.60, 1.00, 2.00 and 4.00 inches of precipitation during two-week intervals beginning with each week of the year. (D) Probability of receiving 0.60, 1.00, 2.00 and 4.00 inches of precipitation during three-week intervals beginning each week of the year.

Uses for Graphs -

The graphs may be used for estimating the likelihood that irrigation will be necessary in any particular week or for indicating the probability of zero or trace rainfall occurring during periods of the year when certain operations require dry weather. They can also be used to determine the adaptability of new crops to an area when the crop requires periods of dry weather during specific stages of development.

These probability graphs are presented here only as an example. Graphs for other locations are available in the University of Nebraska's Miscellaneous Publication 10 and specific examples for their use are given.

Data Source: Miscellaneous Publication 10 by the Univ. of Nebr. College of Agric. and Home Economics, Agric. Exp. Station titled Nebraska's Precipitation, Its Patterns and Probabilities.

TABLE 2

NORMAL MEAN MONTHLY TEMPERATURE AT SELECTED STATIONS

(Based on period 1931-1960)

Station Name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
				Degrees Fahrenheit									
Scottsbluff W.B.	25.3	29.0	35.3	46.6	56.8	66.9	74.7	72.6	62.3	50.4	35.8	28.6	48.7
Valentine W.B.	20.0	23.0	31.3	45.7	57.1	67.5	75.4	72.9	61.8	49.3	33.6	25.1	46.9
North Platte W.B.	24.0	27.9	35.0	47.7	58.5	69.1	76.1	74.5	63.7	51.0	35.5	27.4	49.2
Minden	25.6	29.7	38.1	51.0	61.5	72.0	78.5	77.1	67.5	55.7	39.3	30.1	52.2
Hartington	20.0	23.4	33.7	49.2	60.9	70.6	76.9	75.1	65.6	53.8	36.5	25.8	49.3
Syracuse	24.5	28.7	38.8	52.7	63.1	73.4	78.9	77.2	68.2	56.6	40.0	29.7	52.7

Source of Data: Climatic Summary of the United States - Supplement for 1951 through 1960, U. S. Weather Bureau.

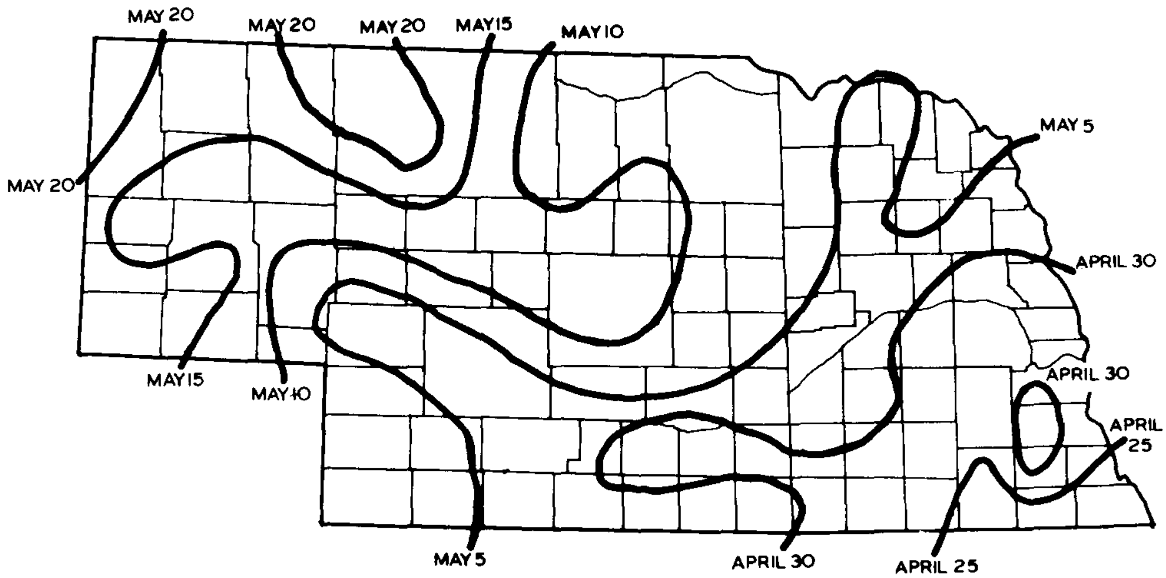
Although other methods have been used to indicate the length of growing season, that presented in Table 1 is the mean length of time between the last spring and the first fall air temperature of 32°F. For the stations presented, the frost-free period varies from a low of 114 days at Gordon to a high of 189 days at Omaha for the period 1921-1950. Figure 6 presents two maps which show lines of equal average dates of the last 32°F air temperature in the spring and similar lines for the first in the fall. These maps were prepared by the National Weather Service's Nebraska State Climatologist and are based on the period 1921 through 1965.

Evaporation and Transpiration

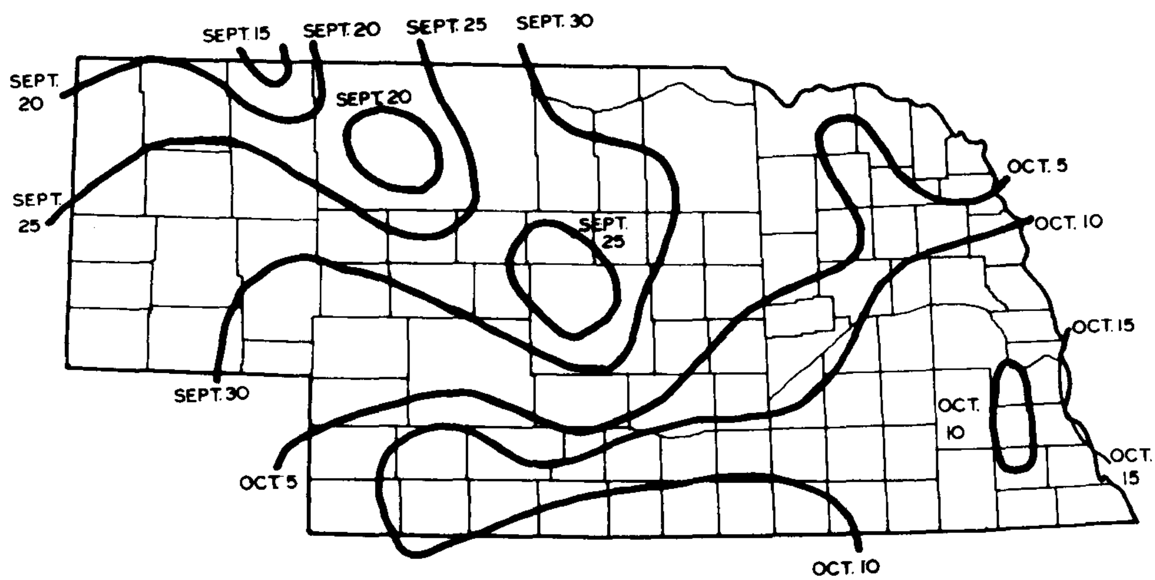
Evaporation of water from the earth's surface to the atmosphere is part of the hydrologic cycle. Evaporation occurs from free water surfaces and from the soil. Transpiration is the process by which water vapor is transferred to the atmosphere by plants. The amount of evapo-transpiration (water withdrawn from the soil by evaporation and plant transpiration) is dependent upon weather conditions, soil moisture, methods of cultivation and the type of vegetation and is often called consumptive use.

Fig. 6

AVERAGE FIRST AND LAST FROST DATES IN NEBRASKA

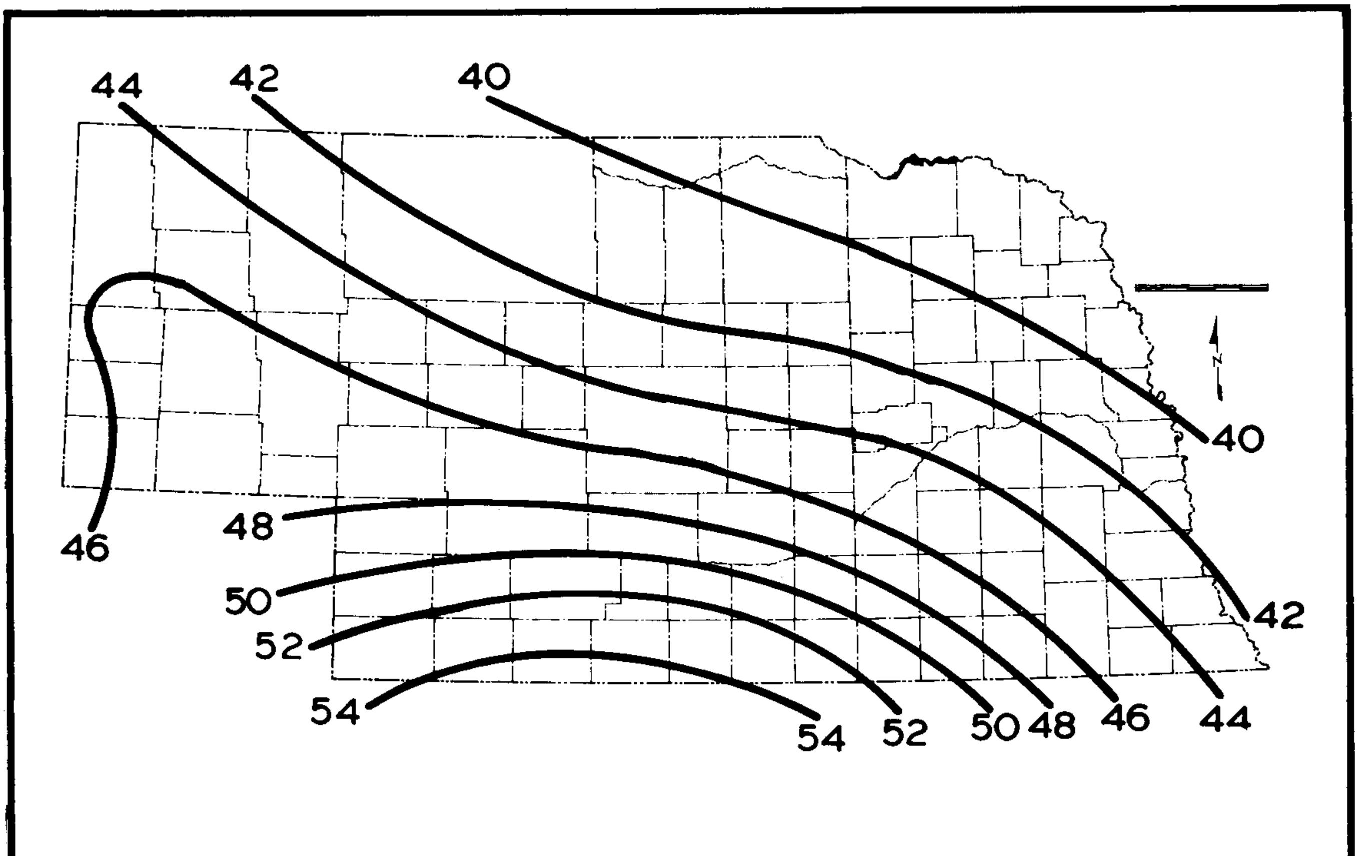


Average Date of Last 32° F. Temperature in the Spring



Average Date of First 32° F. Temperature in the Fall
Based on period 1921 through 1965

Source: State Climatologist and University of Nebraska



Source: Evaporation Estimates For The Missouri River Basin, Missouri River Basin Comprehensive Framework Study; Data From U.S.W.B. Technical Paper No. 37

Fig. 7 AVERAGE ANNUAL TOTAL LAKE EVAPORATION IN INCHES FOR PERIOD 1946-1955

Evaporation from free water surfaces in storage reservoirs and conveyance canals is an important factor in planning for water resource development. Table 3 shows the average monthly total evaporation from National Weather Service observation stations operated in Nebraska. Evaporation is measured in the standard Weather Service type pan and is corrected for precipitation so that amounts given are for total evaporation. Pan evaporation rates differ from rates experienced on large bodies of water. Figure 7 shows lines of equal annual total lake evaporation in Nebraska which, through observation and experimentation, has been determined to be about 70 percent[5/] of that from standard Weather Service pans. This relationship varies somewhat with the season.

5/ Evaporation Maps for the United States, Technical Paper No. 37 by U. S. Department of Commerce, Weather Bureau, 1959.

TABLE 3

AVERAGE MONTHLY TOTAL PAN EVAPORATION[a]

(For Period of Record prior to 1968)

		Mean Evaporation in Inches/Years of Record											
STATION	COUNTY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Kingsley Dam	Keith	--[b]	--	--	5.92 23	6.75 37	8.15 36	9.69 37	8.39 37	6.30 36	4.25 33	--	--
Medicine Creek Dam	Frontier	--	--	--	7.14 14	8.85 16	10.55 16	11.70 16	10.52 16	7.90 16	5.66 16	-- --	-- --
North Platte Exper. Farm	Lincoln	--	--	--	6.91 6	7.61 7	9.62 7	11.18 7	10.32 7	6.66 7	--	--	--
Red Willow Dam	Frontier	--	--	--	7.64 6	9.56 6	9.98 6	11.33 6	10.00 6	6.77 6	5.72 6	--	--
Trenton Dam	Hitchcock	--	--	--	7.72 7	9.33 7	10.08 7	11.48 7	10.10 7	6.96 7	5.51 7	--	--
Harlan County Dam	Harlan	--	--	--	6.94 13	7.97 16	9.85 18	11.19 17	10.12 18	7.69 19	6.01 15	--	--
Holdrege IE	Phelps	--	--	--	--	7.70 4	7.31 4	8.78 6	7.30 7	5.24 6	--	--	--
Rosemont 2s	Webster	--	--	--	7.54 17	9.16 22	10.43 23	11.35 23	10.85 23	8.27 23	6.20 23	--	--
Box Butte Exp. Sta.	Box Butte	--	--	--	--	8.33 13	9.44 13	11.83 13	10.90 13	7.82 13	--	--	--
Bridgeport	Morrill	--	--	--	5.22 32	6.60 36	7.65 36	8.93 37	7.90 37	5.60 37	3.64 35	--	--
Mitchell S. E.	Scotts Bluff	--	--	--	--	7.94 13	8.66 15	9.25 15	7.58 15	5.61 15	--	--	--
Valentine Lks. Game Refuge	Cherry	--	--	--	--	7.04 16	7.64 16	9.24 16	7.87 17	5.92 18	4.50 8	--	--
Gavins Point Dam	Cedar	--	--	--	--	8.06 6	8.06 7	9.32 7	8.12 7	5.46 7	4.94 7	--	--
Northeast Nebr. Exp. Sta.	Dixon	--	--	--	--	8.63 7	8.34 7	9.34 7	8.46 7	5.29 7	--	--	--
Grand Island WB AP	Hall	--	--	--	--	8.89 5	9.55 5	10.41 5	9.04 5	5.68 5	--	--	--
Lincoln Agronomy Farm	Lancaster	--	--	--	5.37 25	7.00 35	8.31 34	9.80 37	8.47 37	6.18 37	4.29 35	--	--
Omaha N. Omaha Airport	Douglas	--	--	--	--	8.78 7	8.66 7	8.74 7	7.75 7	4.92 7	4.94 6	--	--
Enders Dam	Chase	--	--	--	7.09 12	8.04 16	10.04 15	11.52 16	10.11 16	7.47 17	5.19 16	--	--

a/ Measurements made in standard U. S. Weather Bureau Type pans. Evaporation amounts have been corrected for rainfall and are total evaporation from water surface.

b/ -- Indicates no record

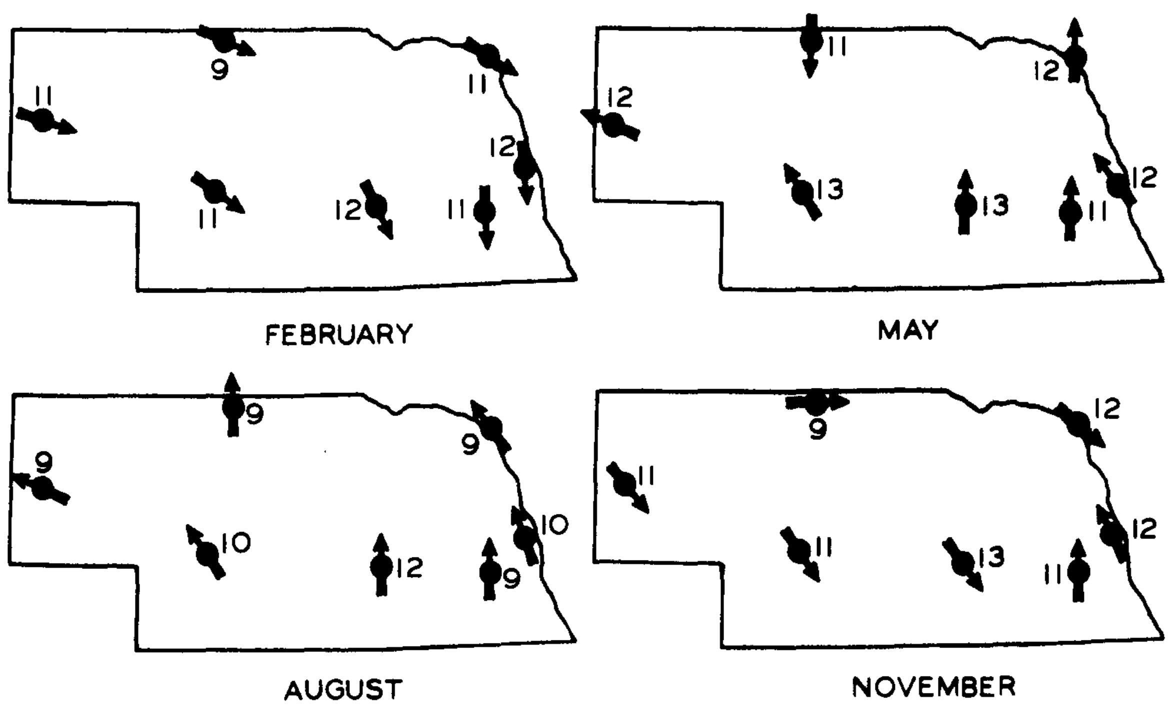
Source of Data: Climatic Summary of the United States - Supplement for 1951 through 1960, U. S. Weather Bureau

Wind

The Plains states are known for wind, and Nebraska is no exception. Wind is a natural movement of air created by a complex system of atmospheric conditions.

Direction and Velocity

As a general rule, the prevailing winds in Nebraska are from a southerly direction in the warmer seasons and from a northerly direction in the winter. There are many interruptions to this flow and in some months the time is about evenly divided between winds from opposite directions. Prevailing directions and average speeds for representative months are shown in Figure 8. March and April are the windiest months with speeds averaging about 11 to 12 miles per hour over the State as a whole. July and August have the least wind with an average of 8 to 9



Based on period of record through 1960

Source: Selected Climatic Maps, Missouri River Basin Comprehensive Framework Study.

Fig. 8. PREVAILING DIRECTION AND MEAN SPEED OF WIND (M.P.H.)

miles per hour.

Winds of high velocity that occur in the late spring and summer are generally associated with severe thunderstorms. They are very gusty and usually are of short duration. Gusts above 75 miles per hour are not uncommon and winds of approximately one minute duration have been recorded in the 60 to 80 miles per hour range at most stations. On one occasion a wind of 109 miles per hour was recorded for a half-minute. Table 4 shows the direction and speed of the fastest winds recorded at five representative stations across the State.

Tornadoes

Nearly every resident of Nebraska is conscious of tornadoes and many have had first-hand experience with them. A tornado is a cone of rapidly rotating air extending downward from a cloud. Winds in the cone are estimated to attain velocities between 300 and 500 miles per hour, but no measuring device has ever survived a tornado's fury.

Tornadoes may occur at any time of the year in Nebraska, but are most prevalent during the spring months. They generally travel from southwest to northeast and are generally less than one-fourth mile in width.

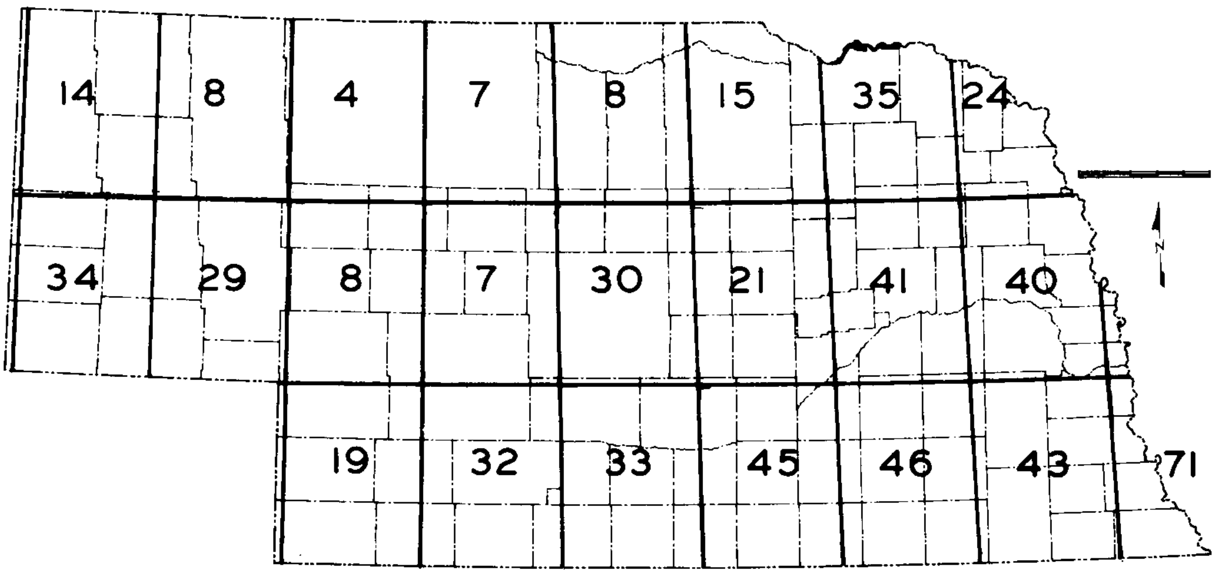
Figure 9 shows the number of tornadoes that were observed during the period 1916-1961 in areas of Nebraska bounded by one degree of latitude and longitude. It can be seen that historically tornadoes were most prevalent in the southern Panhandle and southeast portions of the State.

TABLE 4

DIRECTION AND SPEED OF FASTEST RECORDED WINDS

Station	Record Years	J	F	M	A	M	J	J	A	S	O	N	D	Year
Lincoln(Univ)	50	49 NW	56 NW	63 NW	56 NW	60 NW	66 NW	65 NW	62 NW	50 N	44 S	52 NW	54 NW	66 NW
North Platte	50	57 N	68 N	72 N	63 NW	70 S	72 N	60 NW	56 SW	53 N	72 SW	64 NW	59 NW	72 N
Omaha	89	60 NW	59 N	73 NW	65 NW	73 NW	72 N	109 N	66 N	51 N	59 SW	58 NW	52 NW	109 N
Scottsbluff	10	40 NW	60 WNW	48 W	46 NW	80 NW	80 WNW	52 WNW	41 NNW	46 NW	44 WNW	52 NW	47 NW	80 WNW
Valentine	50	45 N	56 N	49 NW	55 N	62 NW	56 W	56 SW	65 NW	57 S	49 SE	56 W	50 N	65 NW

Source of Data: Climatic Atlas of the United States, U. S. Dept. of Commerce, Weather Bureau



Source: Selected Climatic Maps, Missouri River Basin Comprehensive Framework Study

Fig. 9 TOTAL NUMBER OF OBSERVED TORNADOES BY AREAS OF ONE DEGREE LATITUDE AND LONGITUDE FOR PERIOD 1916-1961

Weather Modification

To change the weather to fit the desires of man has long been a dream of the earth's inhabitants, especially the farmers. For years, attempts at weather modification have been made, but only in the last few decades have real technological advances been recorded.

Historical

"Rainmakers" undoubtedly came to visit Nebraska farmers during the first drought after the prairie sod was broken. Since that time, technological advances have been made and weather modification has become a respectable science; yet weather modification, and rainmaking in particular, is still not fully accepted or understood by much of the population.

In 1957, a Weather Control Commission was authorized under Nebraska Statutes to license persons engaging in artificial weather modification. The Commission consists of four members appointed by the Governor; the Director of the Nebraska Department of Agriculture, the Dean of the University of Nebraska College of Agriculture, the Head of the University of Nebraska Physics Department, and the Head of the Conservation and

Survey Division of the University of Nebraska. Each year hearings are held and licenses for various weather modification activities are issued for a term of one year. Licenses have so far been issued for only rainfall modification and fog dispersal. No licenses have been issued for any other types of weather modification such as hail or tornado suppression.

Effects of rainfall modification are difficult to assess, but in the western, more arid portion of the State, operators are engaged almost every year. Under certain conditions, fog dispersal has met with much success and has been used at the Omaha airport for several years.

Future

Weather modification efforts are expected to increase in the future. The Federal Government and many other agencies are continuing research in this field, although little of this effort is taking place in Nebraska.

CHAPTER 2. SURFACE WATER

"Surface water" is that which rests upon or flows over the earth's surface. In Nebraska, most of the total volume of surface water originates from rainfall and much drains away through the stream system. Base flow of the streams, however, is supported by percolating shallow ground water and streams in the Sandhills derive almost their entire flow from ground water which flows into the surface drainage channels. Because streamflow does originate mainly from rainfall runoff, the total volume of streamflow can vary considerably from year to year in all basins except those influenced by the huge Sandhills ground water basin.

This chapter presents first a general summary of the state's historical streamflow, natural lakes and reservoirs, surface water rights, present water use, flooding problems, and present water quality situation. The second portion of the chapter is devoted to more detailed discussion of streamflow, present water use and historical flooding in each of the 13 river basins into which the State was divided for planning purposes. A discussion of the mainstem Missouri River is also included.

Summary of Nebraska's Surface Water Resource

This section presents general data and information which applies on a statewide basis or is a summary of more detailed data collected and published by other federal or state agencies.

Historical Streamflow

Earliest records of streamflow in Nebraska date back to 1894 and some Missouri River flows along the Nebraska border were recorded as much as 20 years earlier.

There are presently about 350 sites on Nebraska streams (including the Missouri River) where some type of streamflow data is being collected. The number of sites varies from time to time as some locations are discontinued and new ones are added. The streamflow data available include stage height, discharge, low flow, peak stage or discharge, flow duration and means and extremes of flow and runoff. Other supplemental data such as water quality and precipitation is available for some stations. The Office of Water Data Coordination of the Geological Survey, U. S. Department of Interior, has prepared a Catalog of Information on Water Data, Surface Water Stations which provides a compilation of information on types of surface water data being collected by federal, state and local agencies. An excerpt from the 1967 catalog was published separately and provides information for sites in Nebraska.

The U. S. Geological Survey, in cooperation with the Nebraska Department of Water Resources, currently operates the greatest number of stream discharge measurement stations in the State. Data from stations listed in Table 5 are considered to be representative of runoff in each basin. Station location and a summary of streamflow for the period of record is also shown in the table. Map 5, "Selected Water Quality and Stream Gaging Stations," shows the location of the stations listed in Table 5.

Attachment 1, "Selected Historical Streamflow Records," is a compilation of recorded streamflow at about 50 U. S. Geological Survey gaging stations across Nebraska. These records were compiled from the U.S.G.S. Water Supply Papers and Surface Water Records for Nebraska. Average annual discharge is shown for the period of record. Maximum and minimum discharge for the period of record and average discharge for the period 1953 through 1967 were determined on both monthly and annual bases.

Attachment 2, "High-Flow, Volume-Frequency Duration Curves," presents curves for 19 stations that were prepared for the Missouri River Basin Comprehensive Framework Study.6/ Curves for at least one station in each river basin are included. Volume-frequency curves for durations of 1, 3, 7, 15, 30, 50 and 365 consecutive days of the water year are shown and volumes are plotted in acre-feet. The frequency curve for the instantaneous peak during the water year (WYP) is plotted in cubic feet per second.

Natural Lakes and Reservoirs

There are hundreds of natural lakes and many reservoirs created by man-made structures in Nebraska. The natural lakes occur mainly in the Sandhills where lakes are formed by high ground water levels exposed in natural depressions. Major reservoirs are usually constructed in part for conservation of water but there are also many smaller single purpose floodwater retardation structures which hold water for only a short period after heavy rainfall.

Natural Lakes. The actual number and size of all natural lakes in Nebraska is not known. Since many are intermittent, size and number vary depending upon wetness of the year. Natural lakes (those not controlled by man-made structures) include Sandhills lakes, river oxbow lakes and ground water lakes formed by gravel pit and roadway borrow excavations. In Water Resources of Nebraska7/ it is stated that the

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6/ This study is being accomplished by the Standing Committee on the Missouri Basin Inter-Agency Committee. The objective of the study is to formulate a framework program of the best use of water and related land resources to guide future resource development. The study has been in progress six years and is completed except for final report publication.

7/ Water Resources of Nebraska, Revised February, 1941, prepared by the Nebraska State Planning Board.

combined area of intermittent lakes and marshes averages about 163 square miles. The category of intermittent lakes and marshes included about 13 square miles of man-made reservoirs which would make the average area of natural lakes and marshes approximately 150 square miles, or about 96,000 acres. A recent survey by the Nebraska Game and Parks Commission lists the area of permanent natural lakes as 94,412 acres, which agrees rather closely, assuming definitions are similar. The same survey by Game and Parks Commission shows 90,175 acres of streams considered to be productive for fish and total water surface area in the State to be 466,395 acres.

Reservoirs. An inventory of water storage reservoirs was made from the Nebraska Department of Water Resources storage permits and the results tabulated by basin in Tables 6 and 7. Table 6 lists individually those reservoirs whose conservation pool is greater than 100 surface acres. Location of each of these reservoirs is shown on Map 4. Table 7 gives, by basin, a summation of the total capacity and surface area of conservation pools for reservoirs less than 100 surface acres.

There are other structures which form floodwater retention reservoirs that are not shown in either Table 6 or 7. These reservoirs are difficult to inventory because they have no conservation capacity and require no water right for storage. Most of these structures are small and were constructed as part of the small watershed flood control program.

Farm ponds also provide a significant amount of water storage. Table 8 shows by basin the approximate number and surface area of farm ponds in the State that are still effective for their primary use of providing livestock water or erosion control. Many other farm ponds have lost their effectiveness for livestock water or erosion control but continue to provide valuable habitat for fish and wildlife. The 1964 U. S. Agricultural Census reported 55,422 farm ponds in the State with a maximum water surface area of 79,600 acres. A reasonable average area for farm ponds in Nebraska is about one acre per reservoir or a total area in the State of about 55,000 acres, of which the 27,000 acres shown in Table 8 are still effective for their primary use.

Surface Water Rights

Nebraska surface water rights are based on the doctrine of prior appropriation, but there are still a few riparian rights held from the early days of Nebraska's existence. The use of surface water is governed by statute and permits to use surface water for beneficial purposes may be obtained by application to the Nebraska Department of Water Resources. While many of the streams of the State are fully appropriated, new appropriators are not denied due to the variability of streamflow and the fact that water use varies considerably from year to year.

TABLE 5

STREAMFLOW CHARACTERISTICS AT SELECTED U.S.G.S. GAGING STATIONS

River Basin Station Name	Sta. No.a/	Approx. Drainage Area (Sq. Mi.)	Period of Record b/	Discharge (cfs) Minimum Daily	Discharge (cfs) Instantaneous Peak	Annual Discharge For Period of Record (1000 AF) Ave.	Min.	Max.
White River-Hat Creek								
White River at Crawford	4440	313	2/31-9/43					
			10/47-9/67	2.7	1,580	14.7	11.9	21.3
White River near Oglala, South Dakota	4460	2,200	5/43-9/65	.0	5,200	42.1	10.4	103.0
Niobrara								
Ponca Creek at Anoka	4535	410	3/49-9/67	No Flow	9,810	41.6	5.2	186.5
Ponca Creek at Verdel	4536	820	10/57-9/67	No Flow	15,700	66.1	10.1	248.5
Niobrara River at Nebr-Wyo State Line	4540	450	10/55-9/67	1.4	465	3.1	2.4	3.9
Niobrara River above Box Butte Reservoir	4545	1,400	10/46-9/67	1.6	4,950	23.0	17.9	28.4
Niobrara River near Gordon	4575	4,290	9/28-9/32	16.0	9,130	93.1	73.8	127.0
Snake River near Burge	4595	660	6/47-9/67	5.8	3,170	172.3	108.8	195.6
Minnechaduza Creek at Valentine	4610	390	12/47-9/67	2.6	1,100	25.9	21.4	31.6
Niobrara River near Sparks	4615	8,090	10/45-9/67	100.0	10,200	598.7	526.9	638.4
Plum Creek at Meadville	4625	600	12/47-9/67	15.0	2,070	78.9	66.5	101.2
Long Pine Creek near Riverview	4635	390	4/48-9/67	44.0	9,650	95.6	80.3	121.7
Keya Paha River at Wewela, South Dakota	4645	1,070	11/47-9/67	No Flow	5,430	54.9	17.2	126.8
Niobrara River near Spencer	4650	12,100	10/47-9/67	5.0	27,400	1,022.0	793.3	1,495.0
Missouri Tributaries								
Bazile Creek near Niobrara	4665	440	5/52-9/67	2.5	68,600	70.6	31.4	140.6
Omaha Creek at Homer	6010	170	10/45-9/67	0.1	14,400	25.5	11.3	45.3
New York Creek at Herman	6090	254	5/46-9/67	No Flow	5,500	5.1	0.6	13.3
North Platte								
North Platte River at Wyo-Neb State Line	6745	26,177	4/29-9/67	13.0	17,900	480.7	281.2	911.0
Horse Creek near Lyman	6775	1,570	2/31-9/67	0.0	5,110	43.1	13.2	71.6
Blue Creek near Lewellen	6870	1,120	10/30-9/67	No Flow	720	50.7	38.2	66.6
North Platte River at Lewellen	6875	32,600	12/40-9/67	44.0	9,140	944.4	597.6	1,244.0
Birdwood Creek near Hershey	6920	1,000	5/31-9/67	61.0	1,770	111.5	94.0	131.0
North Platte River at North Platte	6930	34,900	2/1895-9/67	20.0	29,600	1,388.9	240.4	3,890.0
South Platte								
Lodgepole Creek at Bushnell	7625	1,361	10/31-9/67	1.2	16,500	9.1	5.3	14.3
Lodgepole Creek at Ralton	7635	3,307	6/51-9/67	No Flow	1,150	8.0	1.4	14.4
South Platte River at Julesburg, Colo.	7640	23,138	4/02-9/67	No Flow	37,600	331.6	55.4	1,130.0
South Platte River at North Platte	7655	24,300	5/17-9/67	No Flow	37,100	267.5	56.4	1,055.0
Middle Platte								
Platte River near Overton	7680	61,700	10/14-9/67	No Flow	37,600	1,439.8	176.1	4,420.0
Wood River near Gibbon	7715	572	4/49-9/67	No Flow	4,050	11.5	1.9	34.9
Platte River near Duncan	7740	64,900	10/01-9/09					
			10/29-9/67	No Flow	44,100	1,356.8	102.9	5,330.0
Loup								
Middle Loup River at Dunning	7755	1,760	9/45-9/67	100.0	932	287.4	264.0	304.7
Dismal River at Dunning	7765	1,780	9/45-9/67	100.0	996	233.8	220.1	246.4
Mud Creek near Sweetwater	7835	1,020	7/46-9/67	No Flow	26,600	32.9	13.5	92.5
South Loup River at St. Michael	7840	2,560	10/43-9/67	6.6	N.A.	182.4	116.4	349.4
Middle Loup River at St. Paul	7850	7,720	8/28-9/67	100.0	72,000	895.6	642.6	1,760.0
North Loup River at Taylor	7860	2,210	11/36-9/67	45.0	2,770	335.2	257.0	402.0
Calamus River near Burwell	7875	1,260	10/40-9/67	54.0	1,790	217.9	176.0	267.3
North Loup River near St. Paul	7905	4,460	8/28-9/67	85.0	90,000	712.4	484.7	1,335.0
Cedar River near Spalding	7915	805	10/44-9/67	30.0	4,000	112.2	81.3	146.1
Cedar River near Fullerton	7920	1,220	9/31-6/32					
			10/40-9/67	33.0	64,700	179.5	124.8	270.5
Loup River Power Canal near Genoa	7925	--	12/36-9/67	No Flow	3,410	1,135.6	423.2	1,423.0
Beaver Creek at Genoa	7940	627	10/40-9/67	3.0	21,200	94.1	56.6	179.8
Loup River at Columbus	7945	15,200	10/1894-9/15					
			10/33-9/67	11.0	119,000	1,343.4	248.8	3,690.0

TABLE 5 (Continued)

STREAMFLOW CHARACTERISTICS AT SELECTED
U.S.G.S. GAGING STATIONS

River Basin / Station Name	Sta. No.a/	Approx. Drainage Area (Sq. Mi.)	Period of Record b/	Discharge (cfs) Minimum Daily	Instantaneous Peak	Annual Discharge For Period of Record (1000 AF) Ave.	Min.	Max.
Elkhorn								
Elkhorn River at Ewing	7975	1,400	8/47-9/67	9.0	7,500	142.6	39.7	373.1
Elkhorn River near Norfolk	7990	2,790	10/45-9/67	60.0	16,900	393.8	174.4	860.4
Logan Creek near Uehling	7995	1,030	3/41-9/67	14.0	19,400	133.2	48.1	289.3
Maple Creek near Nickerson	8000	450	10/51-9/67	0.1	10,800	48.8	3.8	153.2
Elkhorn River at Waterloo	8005	6,900	10/00-9/67	50.0	100,000	826.0	301.7	1,957.0
Lower Platte								
Shell Creek near Columbus	7955	270	8/47-9/67	0.4	5,970	32.0	10.1	69.1
Platte River near Ashland	8010	83,800	8/28-5/53	256.0	107,000	3,886.8	1,955.0	5,954.0
Salt Creek at Lincoln	8035	710	10/49-9/67	22.0	28,200	153.5	64.5	326.8
Salt Creek near Ashland	8050	1,640	10/47-9/67	21.0	87,000	350.4	122.1	660.2
Platte River near South Bend	8055	88,800	5/53-9/67	240.0	124,000	3,843.6	2,095.0	6,016.0
Republican								
Arikaree River at Haigler	8215	1,460	10/31-9/67	No Flow	50,000	19.8	6.8	91.7
North Fork Republican River at Colo-Nebr State Line	8230	--	10/30-9/67	No Flow	2,110	36.0	25.4	47.3
South Fork Republican River near Benkelman	8275	2,580	10/30-9/67	No Flow	19,600	43.7	7.1	87.5
Frenchman Creek below Champion	8310	519	10/34-9/56	5.0	2,850	30.6	24.0	38.8
Frenchman Creek at Culbertson	8355	3,080	10/30-9/67	7.0	15,000	86.9	55.2	124.9
Red Willow Creek near Red Willow	8380	710	9/39-9/67	0.4	30,000	26.2	6.8	45.1
Medicine Creek at Cambridge	8430	1,070	10/36-7/57	0.5	120,000	56.3	4.8	131.5
Republican River near Orleans	8445	15,400	10/47-9/67	No Flow	40,600	271.5	73.9	539.9
Beaver Creek near Beaver City	8470	2,060	10/36-9/67	No Flow	3,800	24.5	0.3	84.1
Sappa Creek near Stamford	8475	3,840	10/45-9/67	No Flow	43,400	64.8	2.3	165.9
Republican River near Bloomington	8505	20,800	4/29-9/57	6.8	260,000	462.3	53.9	1,087.0
Republican River near Hardy	8535	22,400	4/31-9/67	No Flow	225,000	505.3	82.9	1,227.0
Little Blue								
Little Blue River near Deweese	8830	979	2/53-9/67	12.0	17,100	109.3	59.3	225.3
Little Blue River near Fairbury	8840	2,350	5/08-9/67	14.0	36,800	264.2	77.8	740.0
Big Blue								
Lincoln Creek near Seward	8800	426	10/53-9/67	1.3	10,100	35.4	7.0	75.5
Big Blue River at Seward	8805	1,099	10/53-9/67	No Flow	15,300	85.4	10.3	196.1
Big Blue River near Crete	8810	2,716	3/45-9/67	13.0	27,600	261.4	83.6	494.2
Big Blue River at Barneston	8820	4,444	5/32-9/67	1.0	57,700	556.0	83.2	1,600.0
Nemaha								
Weeping Water Creek at Union	8065	238	2/50-9/67	0.1	60,300	59.9	14.4	158.0
Little Nemaha River near Syracuse	8105	218	5/51-9/67	No Flow	28,600	47.6	14.5	91.9
Little Nemaha River at Auburn	8115	801	8/49-9/67	4.2	164,000	212.8	60.4	625.0
North Fork Big Nemaha River at Humboldt	8145	531	10/52-9/67	6.2	51,000	133.2	35.8	264.3
Big Nemaha River at Falls City	8150	1,340	3/44-9/67	4.3	51,400	432.9	62.9	1,455.0

a/ The complete 8-digit number for each station, such as 06-7945.00, includes the part number "06", plus a 6 digit number. In this table the part number "06" and non-essential zeros are not shown.
b/ Data were available only up to September 1967. Most stations are continuing operation.

Source of Data: Water Resources Data for Nebraska - Part I. Surface Water Records, U. S. Geological Survey

TABLE 6

WATER STORAGE RESERVOIRS WITH
OVER 100 SURFACE ACRES AT CONSERVATION POOL LEVEL

River Basin Reservoir Name	County	Water Supply Source	Name of Owner	Storage Application No.	Conservation Pool Level		Primary[a/] Purposes
					Capacity (Acre-Feet)	Surface Area (Acres)	
White R.-Hat Cr.							
Whitney	Dawes	White River	Whitney Irrig. Dist.	1603	10,960	984[b/]	Irrig.
Niobrara							
Box Butte	Dawes	Niobrara River	U.S. Bur. of Reclamation	2709a 3456	31,060	1,600	Irrig.
Merritt	Cherry	Snake River	U.S. Bur. of Reclamation	9660	74,500	2,906	Irrig.
School House Lake	Cherry	Steer Creek	Elvin Adamson	10269	935	177.2	Storage
Antelope Cr. Watershed	Antelope	Antelope Creek	City of Gordon	10551	770	193.5	FC
Missouri Tribs							
None Existing[c/]							
North Platte							
Lake McConaughy	Keith	North Platte R.	Central Neb. PP&ID	2374	1,948,000	35,000	Irrig. Power
Lake Alice	Scotts Bluff	Interstate Canal	U.S. Bur. of Reclamation	Reg.[d/]	11,015	776	Irrig.
Lake Minatare	Scotts Bluff	Interstate Canal	U.S. Bur. of Reclamation	Reg.	62,190	2,158	Irrig.
South Platte[e/]							
Sutherland	Lincoln	Sutherland Canal	Nebraska PPD	2350 2361	80,000[f/]	3,190	Irrig. Power
Lake Maloney	Lincoln	Sutherland Canal	Nebraska PPD	2352	6,000[g/]	1,670	Power
Middle Platte							
Jeffrey	Lincoln	Tri-County Canal	Central Neb. PP&ID	Reg.	6,000	600	Power
Johnson	Dawson & Gosper	Tri-County Canal	Central Neb. PP&ID	Reg.	50,000	2,800	Power Irrig.
Loup							
Sherman	Sherman	Middle Loup R.	U.S. Bur. of Reclamation	4923a&b	66,250	2,792	Irrig.
Babcock	Platte	Loup Power Canal	Loup River PPD	Reg.	2,083	1,157[b/]	Power
Ericson	Wheeler	Cedar River	Nebraska PPD	2081	1,650	160	Power
Elkhorn							
None Existing							
Lower Platte							
Branched Oak	Lancaster	Oak Creek	U.S. Corps of Engineers	10309	26,000	1,750	FC-FW&R
Twin Lakes	Seward	Middle Creek	U.S. Corps of Engineers	10308	3,500	260	FC-FW&R
Capitol Beach	Lancaster	Oak Creek	Capitol Beach Inc.	9944	1,430	290	Resort
Holmes Lake	Lancaster	Antelope Creek	U.S. Corps of Engineers	9972	1,200	115	FC-FW&R
Conestoga Lake	Lancaster	Holmes Creek	U.S. Corps of Engineers	10121	2,700	230	FC-FW&R
Yankee Hill	Lancaster	Cardwell Branch	U.S. Corps of Engineers	10430	2,020	210	FC-FW&R
Blue Stem	Lancaster	Salt Creek Trib.	U.S. Corps of Engineers	10025	3,200	330	FC-FW&R
Wagon Train	Lancaster	Salt Creek Trib.	U.S. Corps of Engineers	10024	2,500	300	FC-FW&R
Olive Creek	Lancaster	Salt Cr. Olive Br.	U.S. Corps of Engineers	10120	1,410	175	FC-FW&R
Stagecoach	Lancaster	Salt Creek S.B.	U.S. Corps of Engineers	10119	1,900	200	FC-FW&R
Pawnee	Lancaster	Middle Cr. N.B.	U.S. Corps of Engineers	10176	8,600	720	FC-FW&R

TABLE 6 (Continued)

WATER STORAGE RESERVOIRS WITH
OVER 100 SURFACE ACRES AT CONSERVATION POOL LEVEL

River Basin Reservoir Name	County	Water Supply Source	Name of Owner	Storage Appli-cation No.	Conservation Pool Level		Primary[a/] Purposes
					Capacity (Acre-Feet)	Surface Area (Acres)	
Republican							
Hugh Butler	Frontier	Red Willow	U.S. Bur. of Reclamation	4885 9858	37,776	1,629	Irrig-FC
Harry Strunk	Frontier	Medicine Creek	U.S. Bur. of Reclamation	3900	37,141	1,850	Irrig-FC
Enders	Chase	Frenchman Creek	U.S. Bur. of Reclamation	3899	44,480	1,707	Irrig-FC
Harlan County	Harlan	Republican River	U.S. Corps of Engineers	4190	342,560	13,240	Irrig-FC
Swanson	Hitchcock	Republican River	U.S. Bur. of Reclamation	4884	120,160	4,974	Irrig-FC
Little Blue							
None Existing							
Big Blue							
Rockford Lake	Gage	Bloody Creek	Mud Creek Watershed Cons. Dist. & Neb. Game & Parks Comm.	11177	1,825	149	FC-FW&R
Nemaha							
Burchard Lake	Pawnee	Turkey Creek Trib.	Nebr. Game & Parks Comm.	9646	1,798	146.6	FW&R
TOTAL					2,991,613	84,439	

a/ FW&R - Fish, Wildlife & Recreation
FC - Flood Control
Irrig. - Irrigation
Power - Hydro Power
b/ Maximum water surface
c/ The Corps of Engineer's Lewis and Clark Reservoir on the Missouri River lies partially in Nebraska but is not included in this tabulation.
d/ "Reg." is abbreviation for regulating reservoir which has no storage right.
e/ Oliver and Bennett Reservoirs in the South Platte River Basin are silting up and may be abandoned.
f/ Approved capacity 165,000 acre-feet.
g/ Principal use of reservoir is for regulation. A storage right of 6,000 acre-feet was acquired but actual reservoir capacity is greater.

Chapter 46, Article 204 of the Revised Statutes of Nebraska, 1943, provides that, "the right to divert unappropriated waters of every natural stream for beneficial use shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purposes, but when the waters of any natural stream are not sufficient for the use of all those desiring the use of the same, those using the water for domestic purposes shall have the preference over those claiming it for any other purpose, and those using the water for agricultural purposes shall have the preference over those using the same for manufacturing purposes."

Although domestic purpose has first preference of use, only two cities in the State -- Crawford and Omaha -- use surface water for their municipal supply, and Omaha began using some ground water in 1968. Chadron used surface water for its municipal supply until 1969, and it still retains the water right on Chadron Creek. There have been water rights granted for operation of mechanical grain mills, but nearly all of these have been abandoned. Consequently, rights for irrigation and hydroelectric power production constitute the only significant surface water rights in existence today. Table 9 summarizes the irrigation and power rights to surface water use. In Table 9, irrigation rights to

TABLE 7

WATER STORAGE RESERVOIRS WITH LESS THAN
100 SURFACE ACRES AT CONSERVATION POOL LEVEL

River Basin	Surface Area[a/] (Acres)	Capacity (Acre-Feet)
White R.-Hat Cr.	383	4,739
Niobrara	195	5,062
Missouri Tributaries	3	151
North Platte	441	4,877
South Platte	58	648
Middle Platte	144	880
Loup	225	1,596
Elkhorn	95	743
Lower Platte	663	3,989
Republican	546	4,200
Little Blue	382	6,662
Big Blue	1,293	5,750
Nemaha	350	1,867
TOTAL	4,778	41,164

a/ Surface area was not available for every reservoir.

natural streamflow are those rights which permit diversion of water from normal streamflow and in some instances include supplemental water from storage. Storage-only rights permit storage of water during excess streamflow periods for use during periods of need.

Map 5 shows location and information about hydro and steam-electric plants that have surface water rights. Map 6 shows the general location of lands within the State that have surface water rights for irrigation.

Interstate compacts and agreements are in effect on several streams. The oldest of these is the compact agreement between Colorado and Nebraska on the South Platte River which was signed in 1923. The Republican River Compact between Colorado, Kansas and Nebraska was signed in 1942. A compact on the Upper Niobrara River has been approved by the States of Wyoming and Nebraska, ratified by the U. S. Congress, and was recently signed by the President of the United States. A compact on the Niobrara River tributaries and Ponca Creek has been approved by South Dakota and Nebraska and is awaiting congressional approval. Kansas and Nebraska have approved a compact covering the Big and Little Blue Rivers and it is also awaiting congressional action.

A U. S. Supreme Court decree in a case of Nebraska *vs*. Wyoming in 1945, and modified by a supplemental decree in 1953, established the division of waters of the North Platte River between Colorado, Wyoming and Nebraska.

TABLE 8

ESTIMATED NUMBER AND SURFACE AREA OF EFFECTIVE FARM PONDS IN NEBRASKA

River Basin	Estimated Number of Farm Ponds[a/]	Estimated Average Surface Area in Acres
White R.-Hat Cr.	880	1,760
Niobrara	3,210	4,820
Missouri Tributaries	2,040	1,220
North Platte	290	350
South Platte	290	350
Middle Platte	2,340	1,640
Loup	5,840	4,090
Elkhorn	1,020	610
Lower Platte	440	440
Republican	7,300	7,300
Little Blue	2,630	2,100
Big Blue	2,050	1,440
Nemaha	950	950
TOTAL	29,280	27,070

a/ Farm ponds which still serve their primary purposes of watering livestock or erosion control.

Source of Data: U. S. Soil Conservation Service

Present Water Use

Water flowing in Nebraska's rivers and streams is used for many different purposes. Generally, the main uses of surface water are for:

(1) Irrigation supplies

(2) Hydroelectric power generation

(3) Disposal of wastes

Other Uses Include:

(1) Domestic, municipal, industrial and livestock water supplies

(2) Navigation (Missouri River only)

(3) Recreation

(4) Fish and Wildlife

(5) Steam-electric power plant cooling

TABLE 9

SUMMARY OF WATER RIGHTS FOR IRRIGATION AND POWER

River Basin	Irrigation Rights[a] Natural Streamflow Diversion Permitted (cfs)	Irrigation Rights[a] Natural Streamflow Acres Permitted for Irrigation	Irrigation Rights[a] Storage Only[b] Acres Permitted for Irrigation	Active Power Rights[c] Number of Hydroelectric Plants	Active Power Rights[c] Diversion Permitted (cfs)
White R.-Hat Cr.	331.96	31,714.0	5,801.9	0	0
Niobrara	1,327.88	94,099.7	2,172.9	4	3,675.0
Missouri Tribs.	102.19	10,878.8	187.5	0	0
North Platte	7,778.69	544,469.1	1,998.0	0	2,050.0[e]
South Platte	340.90	23,862.3	12,000.0	1[f]	500.0
Middle Platte	4,071.34	369,497.6	88,115.1	5	3,013.0
Loup	2,811.67	229,276.0	583.9	5	4,965.0[d]
Elkhorn	369.17	39,075.4	228.4	1	100.0
Lower Platte	200.69	20,812.0	9.3	0	0
Republican	1,762.23	153,182.6	1,027.6	2	83.3
Little Blue	225.76	20,609.3	460.0	0	0
Big Blue	614.28	59,993.9	972.5	4	1,650.0
Nemaha	192.15	19,456.8	0	0	0
TOTAL	20,128.91	1,616,927.5	113,557.1	22	16,036.3

a/ Water rights recorded with the Nebraska Department of Water Resources on September 30, 1966, as reported in the Department's biennial report.
b/ These lands do not have a natural flow permit, and have a right to use only storage waters.
c/ Revised from the Nebraska Department of Water Resources' 1965-1966 biennial report to reflect conditions on April 1, 1970.
d/ Excludes 450 cfs for Fullerton plant which was damaged by the August, 1966 flood and will not be restored.
e/ Diversion for Nebraska Public Power District power plant located just south of North Platte in the South Platte River Basin.
f/ Main diversion for this plant is in the North Platte Basin.

Source of Data: Nebraska Department of Water Resources

Irrigation is by far the largest consumptive user of surface water in Nebraska. Table 10 shows estimates for each basin of the average annual acreage irrigated from surface water, the amount diverted, the consumptive use and the return flow. The estimates of acreage irrigated were made from interviews and information collected[8] during 1966. Estimates of water diverted, consumptive use, and return flow are intended

8/ Collected by Nebraska Department of Water Resources.

TABLE 10

ESTIMATED AVERAGE ANNUAL SURFACE WATER USE FOR IRRIGATION

River Basin	ESTIMATED AVERAGE ANNUAL			
	Area Irrigated (1000 Ac.)	Water Diverted (1000 AF)	Consumptive Use a/ (1000 AF)	Return Flow (1000 AF)
White R.-Hat Cr.	26.6 b/	25.0	18.5	6.5
Niobrara	71.8 c/	135.0	d/	d/
Missouri Tributaries	5.8	5.8	4.3	1.5
North Platte	362.6	1,212.0	d/	d/
South Platte	22.3	37.7	d/	d/
Middle Platte	296.4 b/	530.0	d/	d/
Loup	143.7 e/	230.1	d/	d/
Elkhorn	20.2	20.2	15.0	5.2
Lower Platte	9.6	9.6	7.2	0.4
Republican	106.7	182.8	160.0	82.4
Little Blue	12.8	12.8	9.6	3.2
Big Blue	25.0	25.0	19.0	6.0
Nemaha	7.8	7.8	5.8	1.9
TOTAL	1,111.3	2,433.8	-	-

a/ Includes evaporation from irrigation project reservoirs.
b/ Includes lands irrigated with storage water.
c/ Includes 14,300 acres not yet irrigated in Ainsworth Project.
d/ Not estimated.
e/ Includes 23,130 acres not yet irrigated in Farwell and Sargent Projects.

Source of Data: Nebraska Department of Water Resources

to represent average conditions of precipitation amounts and distribution, temperature, and other factors which influence the use of irrigation water. In most basins, the average acreage irrigated annually from surface water is much less than the total acreage which has permits for use of surface water. This is particularly true in eastern basins such as the Big Blue River and Elkhorn River where the amount of precipitation is often sufficient for production of some crops without supplemental irrigation. Table 11 shows the estimated average area in each basin irrigated annually with natural streamflow and with storage water only.

The U. S. Geological Survey has estimated[9/] that 2,200,000 acre-feet of surface water were withdrawn, or diverted, for irrigation in Nebraska during 1965. This agrees closely with the 2,434,000 acre-feet estimate of diversion presented in Table 10.

9/ Estimated Use of Water in the United States, 1965, U.S.G.S. Circular 556.

TABLE 11

ESTIMATED AVERAGE AREA IRRIGATED ANNUALLY WITH SURFACE WATER

River Basin	Area Irrigated by Natural Streamflow Rights[a] (Acres)	Area Irrigated by Storage Water Only[b] (Acres)	Total (Acres)
White R.-Hat Creek	20,800	5,800	26,600
Niobrara	57,500	2,200	59,700
Missouri Tributaries	5,800	200	6,000
North Platte	362,600	2,000	364,600
South Platte	22,300	12,000	34,300
Middle Platte	208,300	88,100	296,400
Loup	120,600	600	121,200
Elkhorn	20,200	200	20,400
Lower Platte	9,600	0	9,600
Republican	106,700	1,000	107,700
Little Blue	12,800	500	13,300
Big Blue	39,200[c]	1,000	40,200
Nemaha	7,800	0	7,800
TOTAL	994,200	113,600	1,107,800

a/ Water rights granted by the Nebraska Department of Water Resources.
b/ Lands without rights to natural streamflow irrigated with water stored during periods of excess streamflow.
c/ Probable maximum acreage irrigated under average conditions.

Source of Data: Nebraska Department of Water Resources

The various uses of surface water are discussed by basin in more detail later in this chapter.

Flooding Problems

Floods have occurred on every major river in Nebraska during this century. In rivers not prone to floods caused by rapid surface runoff, localized floods are sometimes caused by ice-jams during the spring ice breakup. Combinations of rapid surface runoff and ice-jams sometimes cause severe flooding on some rivers, such as the Elkhorn.

The entire State is subject to localized, intense thunderstorms during the spring and summer months which sometimes concentrate several inches of rain onto a small drainage area and cause severe local flooding in small streams. Other more general storms cover large areas of the State and cause widespread flooding of the major rivers.

A short discussion of the most severe storms and floods of record is presented in the discussions of each drainage basin which follow this summary. Curves in Attachment 2 show volume-frequency duration relationships and frequency of occurrence of instantaneous annual flood peaks for 19 stations across the State.

Present Water Quality

The quality of water in Nebraska's streams is as important as the quantity. Undesirable biological, chemical or physical characteristics of water can render it unfit for a particular use unless it is given special and often extensive treatment.

The Nebraska Water Pollution Control Council has recently adopted water quality standards for both interstate and intrastate streams. The standards for interstate streams conform to the U. S. Water Quality Act of 1965 and they have been approved by the Federal Government. Enforcement of these standards will help preserve the quality of surface waters of Nebraska at an acceptable level for the foreseeable future.

The purpose of this section is to discuss the extent of sampling being done, to indicate where records of analysis are available and to describe in a general way with available data the present quality of surface water in Nebraska. Present quality will be discussed in 3 parts, (1) biological (2) chemical, and (3) physical.

Sampling and Analysis. Nearly all sampling and chemical and physical analysis of Nebraska's surface water has been done by the U.S. Geological Survey. Analyses were published annually in parts 5 and 6 of its *Quality of Surface Waters of the United States* until 1964 and subsequent to that in *Water Resources Data for Nebraska, Part 2 - Water Quality Records*. An *Index of Water Quality Records for Nebraska* is published annually by the U. S. Geological Survey office in Lincoln. This index lists for surface water sampling locations the station name, identification number, location, and period of data collection for both chemical quality and sediment concentration.

Map 3, "Selected Water Quality and Stream Gaging Stations," shows the location of U.S.G.S. monthly sampling stations with sufficient length of record to be representative of present conditions.

The Nebraska Department of Health collects water quality information from approximately 282 different locations. Twenty-eight stations are sampled monthly, 120 are sampled quarterly, and the remainder less frequently. The period of record for most stations extends back to about 1960. Station locations and water quality information are available through Storet or the Department of Health.

In addition, some sampling and chemical analysis was done by the State Department of Health specifically for the State Water Plan basin studies in the Big Blue and Elkhorn River Basins. In the Big Blue River Basin, several samples were collected at Crete and Barneston during 1967.

In the Elkhorn River Basin, streams were sampled three times - March, June and July 1968 - at 20 different locations. Analyses of the samples are available from the State Department of Health.

Three stations in Nebraska are operated as a part of the United States irrigation water sampling network. They are Missouri River at Nebraska City, Platte River at Brady and Supply Canal (Tri-County diversion) near Maxwell. Chemical samples have been collected daily at these locations since 1951. The South Platte River at Julesburg, Colorado is also an irrigation network station.

Sampling is generally requested by an agency such as the U. S. Corps of Engineers or Bureau of Reclamation when they are investigating an area for water development. This has resulted in sampling for short periods of years in local areas throughout the State, which is not very effective in describing the regional water quality or defining the variation of water quality with time. A network of regular sampling stations has been proposed by state and federal agencies, but no action has been taken toward establishment of the network.

Biological sampling and water analysis of Nebraska's surface water has been accomplished primarily by the State Department of Health. Others carrying out regular sampling and analysis programs include the Environmental Protection Agency, the U. S. Geological Survey, the Nebraska Game and Parks Commission, the Omaha Municipal Utility District, and numerous municipal water departments. Sampling and analysis by the Department of Health are increased when problems develop. Records of samples taken and analyzed are available from the Bureau of Environmental Health Services.

Biological, Chemical and Physical Quality. The general quality of water is best described by determining the biological condition, the concentration of chemical constituents and the physical character. Its suitability for a particular use must be determined by established standards and criteria.

The best available indicators of biological degradation of surface water are the dissolved oxygen (DO) content of the water and the biochemical oxygen demand (BOD) of materials introduced into the stream or body of water.

Dissolved oxygen can vary throughout the length of a stream depending upon channel characteristics and nature of inflow. Diurnal and seasonal effects also cause variations in dissolved oxygen content. Information collected by the Nebraska Department of Health throughout the State during the past ten years indicates that the dissolved oxygen content of the state's streams is generally sufficient to maintain a diversified aquatic life. However, short term low dissolved oxygen levels have been noted following heavy runoff and localized low dissolved oxygen levels have been noted downstream of certain wastewater outfalls and feedlots. In some cases, this has caused nuisance conditions.

Dissolved chemical constituents in water can limit the beneficial use of the water. Limits of chemical concentrations for economical and physical use of water for various purposes have been established and are used to determine the suitability of water for specific purposes. These limits are generally presented as a range which describes the suitability from marginal to good.

Table 12 shows the average, maximum and minimum concentrations of various chemical indicators for 24 locations throughout the State. Map 3 shows the location of these stations. The period investigated was from 1964 through 1967, and although many locations were sampled prior to 1964, this period was considered to be representative of present conditions. There are also other locations which have been sampled irregularly during the period investigated, but generally so few samples were taken or the location was so influenced locally that data did not apply on a general, regional basis.

The chemical quality of water in all Nebraska streams can be regarded as generally good. The highest concentration of dissolved solids recorded during the period of study was 1720 ppm on the South Platte River at Julesburg, Colorado in January, 1964. Hardness, Sodium Adsorption Ratio (SAR), Specific Conductance and pH are also higher at that location than other stations shown in Table 12.

The <u>physical</u> characteristics of surface water are generally described by the suspended solids (usually referred to as sediment), temperature, color and odor. Color and odor can cause problems for some uses, but in Nebraska there has been little, if any, problem to date and consequently very little data has been collected.

The main characteristics affecting the physical quality of Nebraska surface waters are suspended sediments and temperature. Some information has been collected on both of these characteristics but generally only on a short-term basis for a specific study or project. Although sediment bed load is not actually a quality characteristic, it is important and has been analyzed for material size in several instances, but seldom for total amount since this is a very difficult and expensive determination.

Table 13 provides information on suspended sediment at U.S.G.S. stations where data was being collected in 1967. Other federal agencies, such as the Bureau of Reclamation, Corps of Engineers and Soil Conservation Service, have collected and analyzed data at other locations. No regular network of physical quality sampling stations has been established to enable conditions throughout the State to be adequately investigated.

Sediment is the greatest contributor to degradation of physical quality of the state's surface waters. The river basins in the eastern part of the State covered with loess soils are the greatest originators of suspended sediment. This area includes all or parts of the Missouri Tributaries, Elkhorn, Lower Platte, Nemaha, and Big and Little Blue River Basins. The Elkhorn River also transports a large bed load, and data is presently being collected by the U.S.G.S. so that total load determinations may be made at U. S. Bureau of Reclamation proposed structure sites. Inspection of Table 13 shows that suspended sediment concentrations as high as 20,700 parts per million have been recorded in the Elkhorn River.

TABLE 12

CHEMICAL AND WATER TEMPERATURE DATA FOR
SELECTED U.S.G.S. MONTHLY SAMPLING STATIONS

Station Number	Station Name	CHEMICAL ANALYSES: Period Of Record	Period 1964 Thru 1967 or Part of Period Available: Dissolved Solids (ppm) Ave.	Dissolved Solids (ppm) High	Dissolved Solids (ppm) Low	Hardness (Ca&Mg) (ppm) Ave.	Hardness (Ca&Mg) (ppm) High	Hardness (Ca&Mg) (ppm) Low	Sodium Adsorption Ratio Ave.	Sodium Adsorption Ratio High	Sodium Adsorption Ratio Low	Specific Conductance (micromhos) Ave.	Specific Conductance (micromhos) High	Specific Conductance (micromhos) Low	pH Ave.	pH High	pH Low	WATER TEMPERATURE[a/]: Period Of Record	Recorded High[b/] °F	Recorded High[b/] Date
4535	Ponca Creek at Anoka	12/63 - 9/64 10/66 - 9/67	579	825	282	386	554	210	.6	.8	.5	820	1130	439	7.8	8.2	7.2	-	-	-
4592	Snake River above Merritt Reservoir	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10/63 - 9/67	87	7/66
4655	Niobrara River near Verdel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6/58 - 9/65 10/66 - 9/67	101	7/64
7640	South Platte River at Julesburg, Colorado	10/45 - 9/67	1425	1720	732	693	852	378	2.8	3.5	1.2	1800	2180	758	7.7	8.2	6.8	10/45 - 9/67	93	7/7/63 7/18/63
7657	Supply Canal (Tri-County Div.) near Maxwell	3/51 - 9/67	573	948	394	263	456	186	2.1	2.6	1.1	839	1300	594	7.7	8.4	6.7	3/51 - 9/67	85	7/31/57
7660	Platte River at Brady	11/50 - 9/67	452	657	355	222	357	176	1.5	2.6	1.0	663	931	408	7.8	8.4	6.7	3/51 - 9/67	90	7/20/51
7680	Platte River near Overton	12/51 - 9/52 11/58 - 9/67	557	781	385	269	391	186	1.9	2.3	1.2	819	1120	564	7.8	8.5	6.9	11/58 - 9/67	98	6/13/59
7740	Platte River near Duncan	12/64 - 9/67	540	765	171	254	392	80	1.7	2.1	.6	776	1090	236	7.7	8.3	7.1	-	-	-
7755	Middle Loup River at Dunning	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10/49 - 9/56 10/65 - 9/67	93	6/21/56
7947	Platte River near Schuyler	10/66 - 9/67	297	484	214	157	244	114	0.9	1.7	.6	429	709	290	7.8	8.2	7.6	10/66 - 9/67	84	7/26/67
7980	South Fork Elkhorn River at Ewing	9/60 - 9/66	157	209	132	82	110	70	.4	.6	.3	193	285	167	7.5	8.4	7.0	10/64 - 9/65	93	8/3/65
7990	Elkhorn River near Norfolk	9/60 - 9/67	217	287	141	140	198	100	.3	.5	.1	316	434	226	7.7	8.4	7.1	10/64 - 9/65	86	8/17/65
7994.5	Logan Creek at Pender	1/64 - 9/67	453	529	204	333	396	136	.5	.7	.1	696	810	320	7.8	8.4	7.4	1/65 - 10/67	89	7/5/66
8005	Elkhorn River at Waterloo	10/66 - 9/67	307	389	171	210	278	109	.6	.7	.2	482	613	259	7.8	8.2	7.3	-	-	-
8040	Wahoo Creek at Ithaca	10/66 - 9/67	429	575	97	233	308	43	1.4	2.0	.2	675	910	199	7.6	8.4	6.7	-	-	-
8070	Missouri River at Nebraska City	1/51 - 9/67	445	622	203	225	310	111	1.6	2.2	1.1	686	945	332	7.6	8.2	6.8	5/51 - 9/67	85	7/25/52
8370	Republican River at McCook	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12/66 - 9/67	90	8/15/67
8530	Republican River near Guide Rock	11/61 - 9/67	318	416	208	191	274	13	.6	.8	.3	496	630	300	7.8	8.4	7.3	-	-	-
8799	Big Blue River at Surprise	10/65 - 9/67	212	411	40	121	284	12	.5	.9	.1	322	676	47	7.3	8.1	6.3	10/66 - 9/67	82	9/29/66
8800	Lincoln Creek near Seward	6/63 - 9/67	260	425	52	160	270	13	.6	.9	.1	394	603	51	7.6	8.4	6.2	10/66 - 9/67	80	9/18/67
8808	West Fork Big Blue River near Dorchester	6/63 - 9/67	270	377	68	155	227	21	1.8	1.3	.2	405	605	78	7.5	8.3	6.5	10/66 - 9/67	92	7/11/67
8812	Turkey Creek near Wilber	10/65 - 9/67	300	690	77	165	228	21	1.1	4.8	.2	482	1200	80	7.6	8.5	6.4	10/65 - 9/67	98	7/11/66
8820	Big Blue River at Barneston	10/66 - 9/67	341	468	69	184	252	28	1.3	1.7	.1	549	737	89	7.6	8.4	6.1	10/66 - 9/67	84	7/26/67
8830	Little Blue River near DeWeese	8/56 - 9/58 10/59 - 9/67	245	292	61	160	198	24	.4	.6	.1	380	450	67	7.6	8.3	6.5	8/56 - 9/61	83	8/10/59

a/ Waters at all stations listed reach the freezing point on many days during winter months, so low temperatures are not shown.

b/ When maximum temperature reaches this reading on one or more dates, latest date is shown.

Source of Data: Water Resources Data for Nebraska - Part 2. Surface Water Records, U. S. Geological Survey

TABLE 13

SUSPENDED SEDIMENT IN NEBRASKA STREAMS

River Basin[a/] Station Name	Station Number	Period of Record	Number of Samples	Maximum Concentration: Concentration (ppm)	Maximum Concentration: Discharge (cfs)	Maximum Concentration: Date of Sample	Minimum Concentration: Concentration (ppm)	Minimum Concentration: Discharge (cfs)	Minimum Concentration: Date of Sample	Usual Concentration by Record Inspection (ppm)
White R.-Hat Cr.										
White River @ Slim Butte, S.D.	4457	10/64-9/67	32	27,600	17	8-2-66	78	16	1-11-66	200-300
Niobrara										
Ponca Cr. @ Anoka	4535	10/66-9/67	12	6,280	1,740	6-19-67	4	0.8	10-25-66	40-80
Niobrara River nr. Norden	4620	11/63-9/67	63	2,270	2,230	3-14-66	318	390	9-2-64	300-1,000
Middle Platte										
Platte River nr. Overton	7680	10/64-9/67	49	16,000	8,840	6-25-65	10	543	1-4-67	25-75
Elkhorn										
S.F. Elkhorn River @ Ewing	7980	9/63-9/66	52	1,680	428	6-15-65	14	36	2-20-64	50-150
Elkhorn River @ Meadow Grove	7988	11/63-6/65	26	4,040	13,000	6-23-64	28	211	1-20-65	25-200
Logan Cr. @ Pender	7994.5	1/64-8/64 10/66-9/67	28	20,700	21,400	6-19-67	31	52	1-11-67	25-100
Lower Platte										
Platte River nr. Schuyler	7947	10/66-9/67	13	4,700	14,600	6-6-67	138	1,440	8-16-67	100-300
Republican										
Frenchman Cr. @ Palisade	8340	10/63-9/67	53	13,200	745	6-22-64	38	31	11-11-64	50-200
Little Blue										
Little Blue River nr. Deweese	8830	5/61-9/61	7	4,270	4,260	5-22-61	2,220	281	9-13-61	2,000-4,000
Big Blue										
Big Blue River @ Surprise	8799	10/65-9/67	24	4,960	384	6-5-67	8	0.2	2-3-66	50-250
Lincoln Cr. nr. Seward	8800	10/63-9/67	71	5,260	495	6-12-65	3	6.7	2-27-64	20-300
West Fork Big Blue R. nr. Dorchester	8808	10/63-9/67	73	11,400	3,210	6-8-65	13	64	2-27-64	20-150
Nemaha										
Brownell Cr. Sub-watershed No. 1A nr. Syracuse	8109	6/55-9/67	62	8,730	172	6-24-55	100	4.99	5-31-67	1,000-6,000
Brownell Cr. Sub-watershed No. 1 nr. Syracuse	8110	1/55-9/67	61	2,410	31.2	6-24-55	91	5.37	3-26-59	300-1,500

a/ No data available for 4 basins

Source of Data: U. S. Geological Survey Water Quality Records and Water Supply Papers

Sediment concentrations vary greatly depending upon the condition and composition of the surface soils and the intensity of rainfall. Therefore, under unfavorable conditions small subbasins sometimes contribute large amounts of sediment, which when recorded on a main river station downstream, will show low concentrations because of dilution.

Because of the many variables involved in sediment contribution to a river system, it is impossible to make accurate statements concerning average or normal sediment conditions.

Water temperatures are generally recorded at U. S. Geological Survey surface water quality sampling stations. The high temperature recorded, the date and the period of record are shown for Nebraska stations in Table 12. Since most streams in the State reach the freezing point on many days during winter months, low temperatures are not shown. High water temperatures generally occur in July and range from about 85° to 101°F. The water temperature is, of course, dependent upon many variables, such as air temperature, water depth and time of day.

White River - Hat Creek Basin

The White River - Hat Creek Basin covers an area of about 2,130 square miles in the northwest corner of the State. The area is drained by Hat Creek which is tributary to the Cheyenne River in South Dakota, and by the White River which crosses into South Dakota and eventually flows into the Missouri River above Fort Randall Dam.

Tributaries of both Hat Creek and the White River head in the Pine Ridge and flow toward the north and northeast. Canyons cut by these streams form an area of rough lands along the Pine Ridge. Between the canyons there are long interstream slopes and along the main streams narrow bottom lands with well defined terraces. "Badlands" area covers a significant part of the Basin. Topographically, this is one of the roughest basins in Nebraska.

Clayey soils, which prevail throughout most of the Basin, do not absorb water readily and through erosion contribute to the high sediment load of the streams. Most of the area is in native grassland which is used for pasture, with large areas of pine forests on the steeper slopes of the Pine Ridge. Less than 15 percent of the area is cultivated.

Streamflow Characteristics

The White River rises on the Pine Ridge near the town of Harrison at an elevation of about 4,560 feet above mean sea level (msl). Tributaries entering from the south and east head at Pine Ridge and are mostly spring fed during periods of low rainfall. Streams entering from the west and north drain a "badlands" area and generally flow only from direct precipitation runoff.

Hat Creek rises just north of Harrison in the same area as the White River at about 4,500 feet elevation. Some tributaries are perennial in the upper reaches where they are spring fed, but generally are dry within a short distance downstream, except during periods of overland runoff in response to rainfall.

There is one U.S.G.S. stream gaging station in the Basin which has recorded streamflow for more than ten years. This station, located on the White River at Crawford, recorded an average annual runoff of 14,700 acre-feet for the period of record, 1931-43; 1947-67. The maximum recorded was 21,350 acre-feet and the minimum 11,920 acre-feet. Maximum instantaneous peak during the period of record was 1,580 cfs on March 15, 1948. Local residents and the Nebraska Department of Roads report that floods in 1944 and 1947 exceeded the 1948 flood. There is no gaging station in Nebraska on Hat Creek or its tributaries.

Present Water Use

Surface water in this Basin is used mainly for irrigation. Some additional use is made for municipal supply, recreation, fish and wildlife and for dilution and transportation of sewage wastes.

Irrigation. In this area, where average annual precipitation is only about 16 inches, irrigation is necessary for proper growth of most crops. Irrigation in this Basin began in the early 1880's and has developed gradually during the ensuing years.

Nebraska Department of Water Resources records show that 331.96 cfs had been appropriated from natural streamflow for irrigation of 31,714 acres in 1966. In addition, about 5,800 acres had rights to use only storage water.[10/] However, it is estimated that the present average irrigated area is only about 26,600 acres. Considering the water actually available for lands being irrigated and estimated return flows, it is estimated that the present average consumptive use for irrigation in the Basin is about 18,500 acre-feet annually.

Power Generation. There are presently no hydroelectric or steam power plants in this Basin which use surface water.

Waste Water Disposal. Several communities in the Basin use the stream system to carry away partially treated sewage. Chadron, however, is the only town whose 1960 population was greater than 2,500, and it is estimated that the BOD placed upon the stream system by the population of about 5,000 averages about 130 pounds per day.

Other Uses. Crawford is the only town in Nebraska that depends entirely on surface water as a raw water source for its municipal supply. Crawford's supply is diverted from Dead Man Creek and from the White River. Until 1969, Chadron used surface water for its municipal supply and still retains the water right on Chadron Creek. Nebraska Department of Water Resources records show total combined rights for diversion of 12.07 cfs for both cities and Chadron has storage rights for 143 acre-feet.

The stream system is also used for recreation and by fish and wildlife. The present fishing use in this Basin is estimated by the Nebraska

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10/ These lands do not have a natural flow permit, and have a right to use only storage water.

Game and Parks Commission to be about 30,000 fishing occasions annually. Much of the fishing activity is due to the good trout fishery.

Historical Flooding

Flooding in this Basin generally does not cause severe damage because the flood plains are not highly developed. Short descriptions of the most severe floods that have occurred since 1942 are presented in the following paragraphs.

May 12-13, 1942. This flood resulted in above normal discharges at most stations with the discharge of White River near Chadron the second highest of record. Harrison received 3.15 inches of precipitation on the 12th and Chadron 2.15 inches. The discharge was 3,690 cfs and the gage height 18.07 feet.

June 21-22, 1947. This flood was the result of the widespread storm activity which was centered near the central part of the State. Chadron received 4.28 inches during the two-day period and Fort Robinson reported 4.75 inches. The peak discharge of White River near Chadron was observed during this storm. The discharge was 5,500 cfs and the gage height was 19.1 feet.

May 20-25, 1957. Two different storms during this period produced the peak and second highest discharge for the period of record for the White River below Cottonwood Creek near Whitney. The first, on May 20, reached a peak discharge of 4,480 cfs and a gage height of 20.09 feet. The second on May 25 was 2,450 cfs, with a gage height of 19.12 feet.

June 11, 1962. This storm produced localized flooding conditions on Chadron Creek near Chadron. Precipitation for the month totaled 6.76 inches at Harrison, 3.77 inches above normal. The discharge was 2,740 cfs and the gage height, 14.47 feet, both maximum for the period of record at this station.

Niobrara River Basin

The Niobrara River Basin covers about 11,870 square miles along the northern border of the State. The area is drained by the Niobrara River which originates in the tablelands of eastern Wyoming and by Ponca Creek, which originates in eastern South Dakota. Niobrara River tributaries originating in South Dakota enter Nebraska all along the eastern two-thirds of the state's northern boundary. There are also a few square miles of the Hay Creek drainage area included in this Basin. Hay Creek is tributary to the White River in South Dakota.

In Nebraska, the tablelands near the Nebraska-Wyoming border are devoted to grasslands and to cultivated cropland in the Box Butte Plain area. The central part of the Basin in the Sandhills is devoted almost exclusively to grassland. In the lower portion of the Basin, the walls of the valley are steep with bordering loess uplands devoted to cultivated cropland. The main river valley is usually narrow and about 300 feet below the uplands.

Streamflow Characteristics

The Niobrara River originates in eastern Wyoming near Lusk and crosses the western border of Nebraska in Sioux County at about 4,700 feet above msl. After flowing about 380 miles across the State, it joins the Missouri River at about 1,250 feet above msl.

The upper end of the valley is fairly flat and somewhat marshy adjacent to the stream. The channel becomes more deeply entrenched as it progresses eastward across the State and many of the tributaries are also deeply entrenched.

There are 17 U.S.G.S. gaging stations on the Niobrara River and its tributaries and two on Ponca Creek with more than 10 years of record. The gaging station on the Niobrara River at the Wyoming-Nebraska State Line provides a record of flows entering the State since 1955 and flows leaving the State can be estimated from either the Spencer or Verdel stations. Average flow at the State Line station for the period 1955 to 1967 was 3,130 acre-feet per year and during the ten-year period 1958-1967 at Verdel the average flow was 1,134,000 acre-feet per year. The peak discharge of 39,000 cfs at Verdel was recorded in March, 1960.

The Sandhills in the central portion of the Basin provide a relatively constant base flow to the Niobrara River. The Snake River, Long Pine Creek and Plum Creek are three Sandhills tributaries which contribute to the base flow of the main river. Because of the low overland runoff from this area, extreme flood flows are not frequent.

Stations on Minnechaduza Creek near Kilgore and on the Keya Paha River at Wewela, South Dakota provide records to estimate the flow from South Dakota into Nebraska. The Naper station on Ponca Creek is located only two and one-half miles north of the Nebraska-South Dakota State Line and the Verdel station is just 3.1 miles upstream from the mouth and may be used to estimate Ponca Creek flows entering and leaving Nebraska.

Flow-duration curves for the Niobrara River at Spencer and for Ponca Creek at Anoka are presented in Attachment 3. The constant flow of the Niobrara River is demonstrated by the curve, which shows that the flow was below 600 cfs only four percent of the time and above 5,000 cfs only one percent of the time during the 31-year period of record. Flow equaled or exceeded 1,250 cfs fifty percent of the time.

Present Water Use

The major use of surface water in the Niobrara River Basin is for irrigation. There are some communities in the lower half of the Basin which use the streamflow to transport partially treated sewage wastes.

Fishing on the Niobrara is regarded as among the best in Nebraska and the upper reaches support an excellent trout fishery.

The Upper Niobrara River Compact, which provides for division of Niobrara River water between Wyoming and Nebraska, has been drawn up by the states, approved by the U. S. Congress and was recently signed by the President of the United States. The Lower Niobrara River and Ponca Creek Compact provides for division of water on Niobrara River tributaries and Ponca Creek which are common to South Dakota and Nebraska. Agreement between the states was reached in 1961, but the compact has not yet been ratified by the U. S. Congress.

Irrigation. Irrigation from surface water in the Niobrara River Basin has been practiced during this entire century. During the period 1912-1914, water was diverted from the Niobrara River and its tributaries into 30 small canals which provided water to 7,500 acres of wild hay and alfalfa land. Many are still in use today above Box Butte Reservoir. It is estimated that 9,200 acres of meadow land are presently irrigated annually between the Nebraska-Wyoming State Line and Box Butte Reservoir by diversion from the stream. It is also estimated that the annual consumptive use of water by this meadow land is about one acre-foot per acre or 9,200 acre-feet each year.

Water is stored in Box Butte Reservoir on the Niobrara River north of Alliance for use on the Mirage Flats Project lands. During the period 1957-1966, an average of 16,320 acre-feet was diverted from the reservoir and the river to the 11,600 acres of project lands each year. This U. S. Bureau of Reclamation project began water delivery in 1946 and since that time the average annual diversion has been about 17,000 acre-feet. The amount of water supplied by the project has not been adequate and many private wells have been drilled to supplement the project supply. The Bureau of Reclamation completed a feasibility study in 1965 which proposes drilling deep wells along the supply canal and laterals within the project area to augment the present supply.

Another Bureau of Reclamation project began storing water in 1964 in Merritt Reservoir, southwest of Valentine on the Snake River, a tributary of the Niobrara River. The first project water was delivered through the Ainsworth Canal in 1965. It is estimated that with full project development 101,200 acre-feet will be diverted annually to 33,960 acres. It is estimated that consumptive use on project lands will be about 41,700 acre-feet annually, but considering canal losses and irrigation return flows the streamflow depletion due to the Ainsworth Project at the Spencer gaging station is expected to be about 55,900 acre-feet annually. An additional depletion of 18,600 acre-feet due to private development brings the total depletion to 74,700 acre-feet at the Spencer station.

Although most of the area developed for irrigation in the Niobrara River Basin is of the project type, there are still many scattered individual developments. The actual amount of land irrigated is difficult to determine as small private projects are initiated and abandoned each year. Table 11 shows that presently the total area normally being irrigated in this Basin is about 59,700 acres. Considering 9,200 acres of irrigated hay land above Box Butte Reservoir, 11,600 acres in the Mirage Flats Unit, and approximately 20,000 acres presently irrigated in the Ainsworth Unit, it appears that about 18,900 acres of individual areas are normally being irrigated below Box Butte Reservoir.

Power Generation. In the past, 45 hydroelectric plants have been installed in the Niobrara River Basin, but only three are still in operation. These plants, owned and operated by Nebraska Public Power District, are located on the Niobrara River near Valentine, on the Niobrara River near Spencer, and on Minnechaduza Creek near Valentine. There is a small amount of storage provided at the Spencer plant, but the Valentine plants on the Niobrara River and on Minnechaduza Creek are run-of-the-river plants. Another plant on Minnechaduza Creek near Valentine owned by the City of Valentine is not being used, but the water right has been retained. Map 5 shows location and general information about the plants.

There are no steam-electric power plants in the Basin which use surface water for cooling.

Waste Water Disposal. Most communities in the Niobrara River Basin use the stream system to carry away partially treated sewage wastes. Most of these communities are in the lower half of the Basin. Table 14 lists the larger communities, their population, and an estimate of the average daily BOD loading placed upon the stream at each location.

TABLE 14

ESTIMATED AVERAGE DAILY BOD OF SEWAGE
EFFLUENT FROM NIOBRARA RIVER BASIN
COMMUNITIES WITH 1960 POPULATION
OVER 2,500

Town	1960 Population	Estimated BOD (Lbs/day)
Alliance	7,845	200[a/]
Valentine	2,875	318

a/ This is a complete retention facility and has no actual discharge.

Source of Data: Nebraska Department of Health

Other Uses. Recreation activities form a major use of the Niobrara River and its tributaries. Fishing, hunting and associated activities such as picnicking, camping and small pleasure boating are carried out in this Basin. The Nebraska Game and Parks Commission estimates that the surface waters in the Basin have a present annual use of about 174,000 fishing occasions. This includes 60,500 fishing occasions annually on streams and reservoirs, 68,500 on natural lakes and the remainder on farm ponds, gravel pits, oxbow lakes, etc. This Basin has the greatest potential for stream fishing of any of Nebraska's river basins.

Historical Flooding

Flood damage in this Basin is generally not so severe as in many other Nebraska basins because of the low runoff from the Sandhills and the sparse development in much of the Basin. Short descriptions of the most recent floods are presented in the following paragraphs in their order of occurrence.

June 14, 1943. Ainsworth, in the eastern third of the Basin, received 2.64 inches of precipitation on the 14th. The flow of the Niobrara River near Spencer was 21,500 cfs, the fourth highest on record. None of the other stations in the Basin reported a high flow at this time, but very few stations were in operation in 1943.

July 28, 1951. A storm in the upper part of the Basin produced maximum discharges of record on Cottonwood Creek near Dunlap and Niobrara River near Hay Springs. Merriman received 2.50 inches of rain and Agate received 1.50 inches on July 27. No stations were located within the storm area. The flow of Cottonwood Creek was 28,100 cfs from an 82 square mile drainage area which was 255 times the mean annual flood.

July 28, 1953. A localized storm produced maximum discharges on a small tributary, Pebble Creek, near Esther. The estimated discharge was 2,000 cfs from a drainage area of 3.07 square miles, or 444 cfs per square mile. The peak on this same creek farther downstream near Dunlap was also a maximum but was only 2,740 cfs from a 23.5 square mile drainage area.

March 18-27, 1960. This flooding was caused by a combination of ice jams, snowmelt, and rainfall. Butte reported 66.0 inches of snow during the 1959-60 season. The stage and discharge of Niobrara River near Verdel were maximums of record and were 10.1 feet and 39,000 cfs, respectively. Backwater from the ice jams reached a stage of 13.34 feet on the Keya Paha River near Naper and the maximum discharge during this period was 6,890 cfs.

Minnechaduza Creek at Valentine gage recorded the maximum stage and discharge for the period of record.

The maximum discharge of Ponca Creek at Verdel was 15,700 cfs with a stage height of 15.10 feet.

June 30-July 1, 1962. A storm in the lower part of the Basin produced flood discharges on several streams. Nenzel reported 11.62 inches of rainfall in June and 6.04 inches in July. Butte recorded 14.79 inches for the two months, 8.33 inches above normal. The discharge of Niobrara River near Spencer was 27,000 cfs, just under the maximum discharge for the period of record. Keya Paha River near Naper had a discharge of 9,280 cfs during this flood. This discharge was also the maximum for the period of record. The discharge of Long Pine Creek near Riverview was 9,650 cfs, with a gage height of 15.68 feet, both maximum for the period of record. Discharges of Niobrara River near Norden and Snake River near Burge were both maximum for the period of record. The Snake River discharge was double the second highest discharge recorded to date.

Missouri Tributaries River Basin

The Missouri Tributaries River Basin covers an area of about 2,950 square miles which extends along the Missouri River from the Niobrara River Basin on the north to the Lower Platte River Basin on the south. The area is drained by many small streams which flow directly into the Missouri River.

Most of the Basin is in the loess hills area and is devoted to cultivated cropland and pasture. The hills are steep and sharply rolling all along the Missouri River bluffs. The Missouri River has created a low bottomland between the hills and the river in much of the area and this area is generally in cropland or unproductive woodland.

Streamflow Characteristics

Most streams draining the Basin are relatively short and steep when compared to other Nebraska streams. Papillion Creek in Washington, Douglas and Sarpy Counties is an exception. It is longer and more nearly parallels the Missouri River for some distance.

There are four U.S.G.S. stream gaging stations in the Basin which have recorded flows for more than 10 years. These are Bazile Creek near Niobrara, Omaha Creek at Homer, Tekamah Creek at Tekamah, and New York Creek at Herman.

Runoff from the streams in the Basin originates mainly from direct surface runoff from rainfall. Base flow is low and during dry periods many streams cease to flow. A flow-duration curve for Omaha Creek at Homer is presented in Attachment 3.

Present Water Use

At the present time, very little use is made of surface water in this Basin. Some water is used for irrigation and many small communities employ the streams to transport their partially treated sewage wastes. There is also some use for recreation and for fish and wildlife.

Irrigation. Irrigation water for crops is generally required only as a supplemental supply in years of low rainfall in this area, which has an average annual precipitation of about 24 to 28 inches. Nearly all irrigation water from surface sources is pumped from the streams.

Nebraska Department of Water Resources records show appropriations for diversion of 102.19 cfs for irrigation of 10,879 acres in this Basin in 1966. However, the Department estimates that only about 50 percent, or 5,800 acres, is actually being irrigated each year. It is also estimated that the diversion rate is approximately one acre-foot per acre and that 25 percent of the diversion would return to the stream system. Therefore, the amount consumptively used would be about 4,350 acre-feet annually.

Power Generation. There is no surface water used for hydroelectric power generation in this Basin. There are, however, three steam-electric power plants in Omaha which use Missouri River water for cooling. Location and general information about the plants is shown on Map 5.

Waste Water Disposal. Many communities in the Missouri River Tributaries Basin are using the stream system to carry away partially treated sewage. Table 15 lists the major communities, their population and an estimate of the daily average BOD loading placed upon the stream at each location.

TABLE 15

ESTIMATED AVERAGE DAILY BOD OF SEWAGE EFFLUENT FROM MISSOURI TRIBUTARIES RIVER BASIN COMMUNITIES WITH 1960 POPULATION OVER 2,500

Town[a/]	1960 Population	Estimated BOD (Lbs/Day)
South Sioux City	7,200	1,000
Omaha	301,600	108,333
Blair	4,930	493
Bellevue	8,830	883

a/ Much of the effluent from these communities goes directly into the Missouri River and does not enter tributary streams.

Source of Data: Nebraska Department of Health

Other Uses. No use is made of surface water from streams in the Basin for municipal supplies.

Some use is made of surface water for livestock by storage in farm ponds.

Watercourses in the Basin are used for recreation and by fish and wildlife. It is estimated that the present stream fishing use is about 26,000 fishing occasions annually and there are an additional 212,500 fishing occasions each year in the Basin's reservoirs, gravel pits, oxbow lakes, etc. This includes fishing occasions at Lewis and Clark Lake on the Missouri River and on the main river also.

Historical Flooding

Streamflow records for stations in this Basin are fairly recent. Short descriptions of major storms and floods that have occurred since 1950 are presented in the following paragraphs.

July 15, 1950. This flood developed as a result of heavy precipitation primarily in the east central portion of the State. The station at Spiker reported 8.03 inches for the month of July, with 3.47 inches falling on the 15th. Tekamah reported 7.42 inches for the month, with 2.86 inches occurring on the 16th. The discharge of Tekamah Creek at Tekamah was 4,400 cfs, maximum of record. New York Creek at Herman also experienced the peak discharge of record, 5,500 cfs.

June 20-21, 1954. This flooding was the result of heavy precipitation above some of the shorter tributaries discharging into the Missouri River. Thurston reported 9.99 inches for June with 4.30 inches falling on the 20th and 21st. Walthill recorded 3.70 inches on the 21st. The discharge of South Omaha Creek near Walthill was 10,100 cfs, the maximum of record. At Walthill, it was 14,000 cfs, second highest of record.

June 20, 1960. Heavy precipitation in the southern part of the Basin caused some local flooding. The North Omaha Airport received 7.47 inches during the month, of which 3.70 inches fell in a two-hour period. Spiker received 6.25 inches. The discharge of New York Creek near Spiker was 1,700 cfs; Little Papillion Creek at Irvington, 15,300 cfs; and New York Creek east of Spiker was 9,250 cfs; all maximums of record.

June 16, 1964. This storm occurred along the northern border of Nebraska and moved southeastward to Sarpy and Cass Counties. Rainfall amounting to 8.44 inches fell near Papillion, 7.50 inches in one hour. The peak discharge of Papillion Creek at Ft. Crook was 32,300 cfs, and the West Branch Papillion Creek near Papillion peaked at 40,800 cfs, both maximums of record. Seven lives were lost in this flood and extensive urban damages were inflicted.

September 6-7, 1965. Heavy rain again fell over the Papillion Creek Basin with Bennington reporting six inches in a little over two hours. The peak discharges were considerably less than those of 1964. The West Branch near Papillion peaked at 20,400 cfs, and Papillion Creek at Ft. Crook had a discharge of 15,600 cfs.

North Platte River Basin

The North Platte River Basin covers parts of Colorado, Wyoming and about 7,140 square miles in the Panhandle of Nebraska. The area is drained by the North Platte River and its tributaries. The mainstem crosses the Wyoming-Nebraska boundary near Henry and joins the South Platte River at North Platte to form the Platte River.

The uppermost part of the Basin on the eastern slope of the Rocky Mountains in northern Colorado and south-central Wyoming is mainly forest area and grassland. The drainage area in the high plains of southeastern Wyoming is devoted mainly to grassland. In Nebraska, the plains area on each side of the alluvial river valley is dry farmed and grassland, but much of the valley land and the benches and terraces parallel to the stream above Lake McConaughy are irrigated with water from the North Platte River. Topography of the Basin ranges from gently rolling to rough and soils range from clay to sand. Extensive erosion has occurred on the escarpment areas and steeper bench lands.

Streamflow Characteristics

The flow of the North Platte River is now controlled by several dams and reservoirs in Wyoming and by Kingsley Dam which forms Lake McConaughy in Nebraska. Pathfinder Dam, at the junction of Sweetwater River and the North Platte River in Wyoming, was completed in 1909. It was the first major U. S. Bureau of Reclamation project completed after formation of the Bureau. Many other projects have followed until thousands of acres of land are now being irrigated from North Platte River waters in Wyoming and Nebraska.

There are currently 22 stream gaging stations with over 10 years of record on the North Platte River, its tributaries and irrigation drains in the Nebraska portion of the Basin. The stations on the North Platte River at the Wyoming-Nebraska State Line and on Horse Creek at Lyman record the flow coming into Nebraska. The North Platte River at North Platte station records flow leaving the Basin through the natural stream channel. Water diverted at Keystone below Lake McConaughy by the Nebraska Public Power District must be included to determine the total water leaving the Basin.

The total drainage area of this station is approximately 34,900 square miles, of which only about 7,150 are in Nebraska. A large sand-hill area north of the river does not contribute directly to overland runoff, but is included in the base flow of tributary streams such as Blue and Birdwood Creeks. Because of upstream storage, diversion and use, recorded flow at this station differs greatly from natural flow.

A flow-duration curve for the North Platte River at Lewellen gaging station is presented in Attachment 3.

Present Water Use

Surface water in this Basin is used mainly for irrigation. Other uses include livestock water, recreation, fish and wildlife, and transportation of wastes. Although storage reservoirs are used for pleasure boating, there is no navigation and no surface water is used for municipal supplies.

Irrigation. Diversion of surface water for irrigation has been practiced in this Basin for about 90 years. Many private irrigators and small irrigation districts continue to divert water from the North Platte River and its tributaries throughout the Basin. Construction of Pathfinder Reservoir in Wyoming by the Bureau of Reclamation in the first decade of this century provided regulation of water for the North Platte Project. Guernsey Reservoir, farther downstream in Wyoming, also provides regulation for the project. In Nebraska, this project supplies water for the Pathfinder Irrigation District on the north side of the North Platte River through the Interstate Canal and to the Gering-Fort Laramie Irrigation District on the south side of the river through the Gering-Fort Laramie Canal. Two reservoirs, Lake Alice and Lake Minatare, regulate the water supply along the Interstate Canal. The Northport Irrigation District also uses water developed by construction of the North Platte Project. Water is conveyed through the Tri-State and Northport Canals.

A decree of the U. S. Supreme Court in 1945 apportioned the natural flow of the North Platte River and established priorities for storage of water in reservoirs on the North Platte River in Wyoming. The decree was amended in 1953 to permit construction and operation of Glendo Dam and Reservoir.[11/]

Nebraska Department of Water Resources records show that 7,778.69 cfs had been appropriated for irrigation of about 544,500 acres in this Basin in 1966. Table 10 shows that the area presently irrigated amounts to about 362,600 acres. For this acreage, approximately 1,212,000 acre-feet were diverted annually during the period 1957-1966. Some, of course, is return flow which re-enters the river below the irrigation service area and is reused several times as it moves downstream, but the total amount diverted is almost 3.5 acre-feet per acre.

Power Generation. There are no hydroelectric or steam power plants which use surface water for cooling located in this Basin. However, water is diverted at Keystone below Lake McConaughy for use in the Nebraska Public Power District plant located just south of North Platte in the South Platte River Basin. A diversion right of 2,050 cfs is registered with the Nebraska Department of Water Resources.

Waste Water Disposal. There are several communities in the North Platte River Basin which use the stream system to carry away partially treated sewage. Table 16 lists the major communities, their population and an estimate of the average daily BOD loading placed upon the stream at each location.

Other Uses. Some surface water is stored in farm ponds for livestock water supply. No communities use surface water for municipal supply.

11/ More details concerning this decree as well as other important court decisions affecting distribution of surface water in this Basin may be obtained from the Nebraska Department of Water Resources.

TABLE 16

ESTIMATED AVERAGE DAILY BOD OF SEWAGE
EFFLUENT FROM NORTH PLATTE RIVER BASIN
COMMUNITIES WITH 1960 POPULATION OVER 2,500

Towns	1960 Population	Estimated BOD (Lbs/day)
Scottsbluff	13,377	400
Gering	4,585	1,260
North Platte	17,184	1,033

Source of Data: Nebraska Department of Health

The stream system is used for recreation and for fish and wildlife. Although the resident population is relatively low, the high quality warm and cold water fishery attracts many fishermen from other basins and other states. Lake McConaughy provides the largest body of water in the State for recreation and fishing activities. It is estimated that the present annual stream fishing use in this Basin is about 39,000 fishing occasions and the use of standing waters, including Lake McConaughy, is about 290,000.

Historical Flooding

Flows on the North Platte River have been partially controlled by reservoirs in Wyoming (Pathfinder, Seminoe, Alcova, Glendo, and Guernsey) for several years. The major flooding occurs along the tributaries draining the steeper escarpment lands on either side of the mainstem. Short descriptions of especially severe storms and floods are presented in the following paragraphs.

June 3-11, 1909. Rather high flows occurred on the North Platte River during this period. Precipitation records are not too complete for this period but monthly figures show Bridgeport received 4.96 inches during June, 1909; Kimball 6.10 inches for the same month. The maximum discharge of record, 27,500 cfs, was observed for North Platte River at Mitchell on June 3, 1909. The discharge of North Platte River near Minatare during this storm was 28,000 cfs, also the maximum of record. The flow at North Platte reached a peak of 29,600 cfs, maximum of record for that station.

June 17-20, 1921. Flows during this period reached peaks which were second highest for the period of record on the North Platte River at Bridgeport and Pumpkin Creek near Bridgeport. The discharge of the North Platte River at Bridgeport was 24,000 cfs.

June 2-4, 1929. This flood produced the maximum discharge of record on the North Platte River at Oshkosh, 19,500 cfs. High discharges were also observed for North Platte River at Mitchell and North Platte River at Bridgeport.

June, September, 1951. A severe hailstorm and floodwaters caused extensive damage in Garden, Morrill, and Scotts Bluff Counties during the latter part of June. Dry Spottedtail Creek at Mitchell reached the maximum discharge of record of 2,010 cfs.

Rainfall was quite heavy during September in the eastern portion of the Panhandle with Oshkosh reporting 4.48 inches for the month with 2.58 inches occurring on the 1st. Scottsbluff reported 3.82 inches during September with 2.56 inches on the 2nd. The discharge of Pumpkin Creek near Bridgeport was 2,970 cfs on September 3rd.

June 9, 1965. Heavy precipitation throughout most of the Panhandle produced flooding on several tributaries. Bridgeport reported 9.33 inches for the month of June, 6.23 inches above normal. The discharge of Pumpkin Creek near Bridgeport was 7,880 cfs, maximum for the period of record.

South Platte River Basin

The South Platte River Basin covers about 3,150 square miles of the southern Panhandle area in Nebraska. The South Platte River drainage area (24,300 square miles) also extends over a large area of northeast Colorado and a small area in the southeast corner of Wyoming. The Nebraska part of the area is drained by the South Platte River and Lodgepole Creek.

The uppermost part of the drainage area lies along the eastern side of the Rocky Mountains where many tributaries originate high in the mountains. Many storage structures have been constructed on the tributaries as part of the Colorado - Big Thompson Project of the U. S. Bureau of Reclamation. The central part of the area is in the high plains of northeastern Colorado and southeastern Wyoming which are devoted mainly to dry farming and grassland. The portion of the area in Nebraska is in the high plains. It is devoted mainly to dry farming except where there is some irrigation with water diverted from Lodgepole Creek and the mainstem of the South Platte River. Topography ranges from gently rolling to flat and soils range from clay to sandy loam.

Streamflow Characteristics

The South Platte River originates on the eastern slope of the Rocky Mountains south of Denver, flows northward to near Greeley, then east to Fort Morgan, where it turns toward the northeast and crosses into Nebraska near Julesburg, Colorado. The largest tributary to the river in Nebraska, Lodgepole Creek, originates in Wyoming near Laramie, flows through the southern part of the Nebraska Panhandle and empties into the South Platte River just over the border in Colorado at Julesburg.

Flood control and irrigation structures on the South Platte in Colorado provide some regulation to flood flows entering Nebraska, but there is no control on Lodgepole Creek. There is considerable irrigation development along Lodgepole Creek both in Wyoming and Nebraska which alters the natural streamflow.

The U. S. Geological Survey maintains 5 stream gaging stations in the Nebraska part of the Basin which have records for more than 10 years. Stations at Bushnell on Lodgepole Creek and at Julesburg, Colorado on the South Platte River provide estimates of flow entering Nebraska and the station at North Platte records the flow just before the confluence with the North Platte River. A flow duration curve for the South Platte River at North Platte is shown in Attachment 3.

Present Water Use

The major use of surface water in this Basin is for irrigation. There is one diversion right for hydroelectric power, and recreationists and fish and wildlife make some use of the streams. Flow of the South Platte River comes under the South Platte River Compact between Colorado and Nebraska which was approved in 1923.

Irrigation. Surface water in this Basin has been developed for irrigation for many years. During these years, irrigation schemes have been developed and abandoned until at the present time the actual area irrigated is difficult to determine. Presently the Kimball Irrigation District, with rights to store Lodgepole Creek water to irrigate 12,000 acres, is experiencing difficulties in maintaining its storage and distribution facilities and the feasibility of its continuation is in doubt.

Nebraska Department of Water Resources records show that 340.9 cfs have been appropriated for irrigation of 23,862 acres in this Basin and that there are storage rights for an additional 12,000 acres. In the Lodgepole Creek drainage area, miscellaneous diversion records obtained during 1967 indicate that about 10,200 acres were being irrigated with surface water in that year. The water diverted for use on this acreage was only 9,310 acre-feet. About 12,060 acres are presently being irrigated with water diverted from the South Platte River through the Western Canal. For the period 1957-66 the average diversion was 27,812 acre-feet per year.

The estimated average annual amount of water diverted for irrigation in the South Platte River Basin is 9,310 acre-feet from Lodgepole Creek for use in that drainage area, plus 27,812 acre-feet from the South Platte River to main canals, and about 620 acre-feet to miscellaneous tracts for a total basin diversion of about 37,700 acre-feet. Some of this would return to the stream system. Use is, of course, limited by the supply and in years of adequate supply more water might be used.

Power Generation. The Nebraska Public Power District (formerly the Platte Valley Public Power and Irrigation District) has a right to divert 500 cfs from the South Platte River at the Korty Diversion

Dam into the Sutherland Canal. In addition, 2,050 cfs is diverted from the North Platte River as discussed in the North Platte River Basin section. This water is used for generation of power in the North Platte hydroelectric plant south of North Platte and the water is then returned to the South Platte River just above the North Platte Diversion Dam. Sutherland and Maloney Lakes are regulating reservoirs for this 26,000 kilowatt plant. Map 5 shows location and general information about the plant. No other use is made of water in this Basin for power generation.

Waste Water Disposal. Several communities in the South Platte River Basin use the stream system to carry away partially treated sewage. Table 17 lists the major communities, their population and an estimate of the daily average BOD loading placed upon the stream system at each location.

TABLE 17

ESTIMATED AVERAGE DAILY BOD OF SEWAGE EFFLUENT FROM SOUTH PLATTE RIVER BASIN COMMUNITIES WITH 1960 POPULATION OVER 2,500

Town	1960 Population	Estimated BOD (Lbs/day)
Kimball	4,384	112
Sidney	8,000	204
Ogallala	4,250	108

Source of Data: Nebraska Department of Health

Other Uses. Some use is made of surface water for livestock by storage in farm ponds.

No communities use surface water for municipal supply.

The stream system is used for recreation and by fish and wildlife. The Nebraska Game and Parks Commission estimates that the streams, reservoirs and natural lakes in the Basin have a present use of about 172,750 fishing occasions annually.

Historical Flooding

Flooding in this Basin results from rapid runoff from high intensity rainfall. Snowmelt or ice jams generally cause no problem in the Basin. Short descriptions of the most severe floods that have occurred since 1921 are presented in the following paragraphs.

June 13, 1921. Above normal precipitation was quite widespread throughout the Panhandle during June. Sidney received 3.34 inches of precipitation during the month, about an inch above normal. The discharge of South Platte River at North Platte reached a peak of 24,000 cfs, the second highest of record.

June 3, 1935. Heavy precipitation in eastern Colorado and southwestern Nebraska caused extensive flooding in the Republican River Basin and high flows in surrounding basins. Ogallala received 8.93 inches of precipitation during May, about six inches above normal. This, along with the heavy runoff from Colorado, caused the peak of record at South Platte River at North Platte, 37,100 cfs.

September 15, 1950. Rainfall was above normal for most of the Panhandle during the month. Sidney and Kimball both received 1.05 inches on the 15th, but rains mostly in Wyoming caused the peak discharge of record on Lodgepole Creek at Bushnell near the Nebraska-Wyoming border. The discharge was 16,500 cfs. The peak flattened considerably as it moved downstream and caused little flooding on Lodgepole Creek or the South Platte River.

June 20-22, 1965. This flooding was caused by high intensity rainfall centered near the Denver area. Flooding was quite severe around Denver, but most of the damage received in Nebraska was agricultural and road damage. Sidney received 10.07 inches of precipitation during the month, about 7.22 inches above normal, and Dalton received 8.99 inches. The peak discharge at South Platte River at Julesburg, Colorado was 37,600 cfs, maximum of record. The peak on the South Platte River at Paxton was also the maximum of record, 33,800 cfs.

August 14-16, 1968. Heavy precipitation in Deuel, Garden, and Cheyenne Counties caused localized flooding, mainly on Lodgepole Creek and its tributaries. Rainfall amounts up to seven inches were reported for the storm period. Extensive soil erosion damages were experienced along with considerable road damage. The estimated discharge of Lodgepole Creek at Ralton was 5,000 cfs, the maximum observed for the period of record.

Middle Platte River Basin

The Middle Platte River Basin planning area extends from the confluence of the North and South Platte Rivers along the Platte River to its confluence with the Loup River. All streams tributary to the Platte River in this reach are included in the Basin. Plum, Spring, and Buffalo Creeks, Wood River and Silver and Prairie Creeks are the main tributaries. The area covers about 5,130 square miles of the southcentral part of the State.

Most of the Basin is in the Platte valley lowlands which are generally alluvial soils devoted to cultivated cropland. This area is very flat, and some poorly drained areas near the Platte River are still in grass or woodland. One exception to this flat lowland is at the upper end of the Basin in the drainages of Plum, Spring and Buffalo Creeks and in the upper Wood River drainage. These areas are sharply rolling loess hills which are devoted mainly to grassland. Another exception to the flat valley land is at the northwestern tip of the Basin which is in the edge of the Sandhills. This is also devoted to grassland.

Streamflow Characteristics

The Platte River and its tributaries in this reach of the stream drain the Middle Platte River Basin. Flow in this reach of the mainstem is partially controlled by Lake McConaughy on the North Platte River above this Basin. In the upper half of the Basin, water is diverted from the Platte River for irrigation and power generation at several locations and part is returned to the river near the middle of the Basin. The slope of the Platte River channel is generally steeper than other major rivers in Nebraska, (about six feet per mile), but the slope across the valley is quite flat causing most tributaries to flow parallel to the mainstem before joining it.

There are ten U.S.G.S. gaging stations in this Basin which have recorded flows for more than 10 years. The Platte River station near Duncan is near the lower end of the Basin and provides an estimate of Platte River flow before its confluence with the Loup River. The average annual runoff for the period of record is 1,356,840 acre-feet with the minimum 102,900 and maximum 5,330,000 acre-feet. This recorded flow is considerably modified by upstream storage, diversion and return flows. A flow-duration curve for the Platte River at Overton is presented in Attachment 3.

Present Water Use

Surface water in this Basin is used mainly for irrigation and generation of electric power. It is also used for fishing, recreation, and dilution and transportation of sewage wastes.

Irrigation. Most of the surface water being used for irrigation in this Basin is stored upstream in Lake McConaughy and released during the irrigation season for diversion and use downstream. Although irrigation had been practiced in the Basin for many years by direct diversion from streams, passage of Nebraska's Public Power and Irrigation District Act in the early 1930's made irrigation development on a project scale possible.

Central Nebraska Public Power and Irrigation District constructed Kingsley Dam to form Lake McConaughy and first delivered water from this facility in 1941. Water for irrigation of approximately 130,000 acres in the tri-county area of Gosper, Phelps and Kearney Counties is stored in Lake McConaughy.

The Nebraska Public Power District (formerly the Platte Valley Public Power and Irrigation District) diverts water from the North Platte River at Keystone Diversion Dam a few miles below Lake McConaughy and conveys it across the South Platte River where it joins water diverted from the South Platte River at Korty Diversion Dam. This combined flow is used to generate electricity at the North Platte power plant and then returned to the South Platte River above the North Platte Diversion Dam, where it is diverted by the Central Nebraska Public Power and Irrigation District to Jeffrey power plant. After passing through this plant, the water can be conveyed to the Johnson plants and the Tri-County area, or it can be returned to the Platte just below Brady. This water can then be diverted from the Platte River into the Gothenburg, Cozad and Dawson County canals north of the river and into the Orchard-Alfalfa, Thirty-Mile and Six-Mile Canals south of the river, for irrigation of approximately 100,000 acres of land between North Platte and Kearney.

Nebraska Department of Water Resources records show that in 1966 there were rights to divert 4,071.34 cfs for irrigation of approximately 369,500 acres in this Basin. Table 10 shows that about 296,400 acres are presently irrigated from surface water. About 208,300 acres are irrigated from natural streamflow and 88,100 acres are irrigated from storage rights. Of the total 296,400 acres presently being irrigated, almost 80 percent, or 230,000 acres, is supplied by the two irrigation districts discussed previously and the remaining 20 percent is diverted from tributaries to the Platte River.

Diversions from the Platte River by principal canals between North Platte and Kearney during the ten-year period 1957-1966 averaged about 411,400 acre-feet per year. Of this amount, about 276,500 acre-feet per year were diverted by the Central Nebraska Public Power and Irrigation District and the remainder by other canals, principally those supplied by the former Platte Valley Public Power and Irrigation District.

Power Generation. Prior to passage of the Nebraska Public Power and Irrigation District Act in 1933, generation of hydroelectric power in this Basin was limited to a plant at Gothenburg and one at Kearney. Water was diverted from the Platte River for these two small, low-head plants. The Gothenburg and Kearney plants are now owned and operated by the Nebraska Public Power District.

Water for three hydroelectric power plants owned and operated by Central Nebraska Public Power and Irrigation District is diverted from the Platte River just below the confluence of the North and South Platte Rivers. After passing through the 18,000 kilowatt Jeffrey Power Plant, some water can be returned to the Platte River to satisfy irrigation needs, and the remainder flows 75.6 miles through the Johnson Supply Canal to the Johnson #1 and #2 power plants which each have 18,000 kilowatt capacities.

Central Nebraska Public Power and Irrigation District completed a 100,000 kilowatt, natural gas fueled, steam operated electric power plant just below the Johnson #2 hydroelectric power plant in 1958. Named Canaday, the plant uses about 80.5 mgd of surface water for the production of steam and for cooling. Cooling water is not consumed, but returned to the canal directly below the plant with a slight rise in temperature.

Map 5 shows location and general information for power plants in the Basin.

Waste Water Disposal. Several communities in this Basin use the stream system to carry away partially treated sewage wastes. Table 18 lists the major communities, their population and an estimate of the average daily BOD loading placed upon the stream system at each location.

TABLE 18

ESTIMATED AVERAGE DAILY BOD OF SEWAGE EFFLUENT
FROM MIDDLE PLATTE RIVER BASIN COMMUNITIES
WITH 1960 POPULATION OVER 2,500

Town	1960 Population	Estimated BOD (Lbs/day)
Gothenburg	3,050	78
Cozad	3,184	81
Lexington	5,572	142
Kearney	14,210	362
Grand Island	25,742	2,700

Source of Data: Nebraska Department of Health

Other Uses. Some use is made of surface water for livestock by storage in farm ponds, but most livestock water comes from wells.

No communities use surface water for municipal supply.

The stream system is used for recreation and the Platte River is especially important to wildlife. During the fall it supports a high percentage of the waterfowl hunting in the basin. During the winter it is used by wintering ducks and geese. Most of the continental population of white-fronted geese and lesser sandhill crane use it as roosting habitat during their spring migration staging.

The system of canals and reservoirs created by the Platte Valley and Central Nebraska Public Power and Irrigation Districts also provides for considerable recreation and fishing activity. Many permanent recreation facilities have been constructed at Midway and Johnson Lakes on the Central District's supply canal. The Nebraska Game and Parks Commission estimates that the present fishing use of streams in the Basin is about 43,500 fishing occasions annually and that of reservoirs, natural lakes and other standing waters is about 223,500 annually.

Historical Flooding

Flooding in this reach of the Platte River has been partially controlled through operation of Lake McConaughy since the beginning of its operation in 1941. A flood in June, 1905, produced the maximum discharge of record, 44,100 cfs, at the Platte River near Duncan station. Short descriptions of four of the largest floods since 1920 are presented in the following paragraphs.

June 14, 1921. Flooding on the mainstem of the Platte River near Lexington produced a peak discharge of 35,600 cfs, the maximum on record for this station. The discharge of the Platte River near Overton was 37,000 cfs. Most of the precipitation fell upstream of North Platte, with Ogallala reporting 2.90 inches on the 14th.

June 5-7, 1935. This flood was the result of the excessive rainfall which fell primarily in the Republican River Basin. Precipitation for the months of May and June was considerably above normal for stations such as Kearney, Lexington, Gothenburg, Elwood 10 SSW and Paxton. The peak discharge at Platte River near Overton was 37,600 cfs, which was the maximum discharge for the period of record for this station. The discharge at Platte River near Grand Island was 30,000 cfs, which was also the maximum for the period of record.

June 22-23, 1947. This flood was the result of the excessive precipitation which covered most of the State during this period. The month had been wetter and cooler than normal prior to this storm so runoff amounts were unusually heavy. Precipitation for a 24-hour period totaled 7.04 inches at Miller, 6.15 inches at Lexington, and 5.85 inches at Oconto. The center of the storm was near the Middle Platte-Loup River divide. Discharges at several stations were the maximum of record and others are second only to the June, 1967 flows. Flows on Wood River, a tributary north of the Platte in Dawson, Buffalo and Hall Counties, were the highest of record and caused extensive damage throughout the valley from Sumner to Alda. The discharge at Wood River near Riverdale was 20,000 cfs, the peak for the period of record. Flows of Buffalo Creek near Darr, Plum Creek near Farnam, and Elm Creek near Overton were the highest of record. The discharge at Platte River near Odessa was 22,700 cfs, maximum for the period of record.

June 5-20, 1967. Widespread precipitation prior to this period resulted in high amounts of runoff. Most of the precipitation received was not excessively high in intensity, but the duration and total amounts were high enough to cause considerable flooding. The City of Grand Island sustained the worst flood damages of record. Most of the flooding occurred from Prairie Creek, Silver Creek, Wood River, and the North Channel of the Platte River. Agricultural and road damages were quite extensive. Most of the agricultural damages occurred on the north side of the Platte River except for an area south of the Platte in Phelps and Kearney Counties. Precipitation amounts for the period included 10.54 inches at Wood River with 5.65 inches occurring in one 24-hour period. Grand Island received 13.77 inches with 4.08 inches the highest 24-hour amount.

The peak discharges for Wood River near Gibbon and Wood River near Alda were the maximums for the period of record, but the period did not include the June, 1947 flood. Estimated discharges during this flood were: Platte River near Grand Island, 18,000 cfs; Wood River near Gibbon, 4,050 cfs; Platte River near Duncan, 24,700 cfs.

Loup River Basin

The Loup River Basin covers an area of about 15,230 square miles in the central part of the State. The Basin, drained by the Loup River and its tributaries, is completely contained within the State.

The upper two-thirds of the Basin lies in the Sandhills and is rangeland almost entirely covered with native grasses. The lower one-third of the Basin in the loess hills and plains is devoted mainly to cultivated cropland. The topography of the Basin is generally rolling with broad expanses of flat valley land adjacent to some of the streams in the lower reaches and also between ranges of the sandhills. Stream gradients are not steep, but channels carry large quantities of sand as bedload in the upper reaches and silt and sands as suspended sediment in the lower reaches.

Streamflow Characteristics

The Loup River has several main tributaries which originate deep in the Sandhills and combine on the loess plains to form the main Loup River which empties into the Platte River at Columbus. The South Loup, Middle Loup, North Loup and Cedar Rivers and Beaver Creek are the major Loup River tributaries. Base flow in each of these streams is fed from the Sandhills ground water reservoir and provides dependable water supplies even during periods of low precipitation. Direct runoff from precipitation in the Sandhills is practically nonexistent, so flooding generally occurs only in the lower part of the Basin.

There are seventeen U.S.G.S. gaging stations in the Basin which have recorded streamflow for more than 10 years. These stations are located on all major tributaries as well as the mainstem of the Loup River.

The average flow recorded for the period of record at Columbus, located practically at the river's mouth, is 1,343,420 acre-feet annually. Maximum peak flow recorded was 119,000 cfs.

A large part of the Loup River flow is diverted into the Loup Power Canal about four miles west of Genoa. After being used for hydroelectric power generation, the water enters the Platte River just below Columbus. Since this diversion is above the Loup River at Columbus gaging station, it must be taken into account in determining total basin runoff. Average annual runoff of the Loup River at Columbus for the period 1894-1915 was 2,283,400 acre-feet. This was prior to the Loup Power Canal diversion beginning in 1937. The diversion has averaged 1,135,600 acre-feet annually since that time and 1,201,500 acre-feet annually during the period 1953 through 1967.

Flow-duration curves for the North and Middle Loup Rivers at St. Paul, Cedar River near Fullerton, and Loup River at Columbus are presented in Attachment 3.

<u>Present Water Use</u>

Surface water in the Loup River Basin is used mainly for irrigation and for hydroelectric power generation. The relatively constant flow, which is fed by ground water from the Sandhills, provides a dependable supply for both of these uses.

The stream system is also used for recreation and by fish and wildlife.

<u>Irrigation</u>. Surface water is made available for irrigation by diversion of natural streamflow by gravity systems and by pumping from the streams. Water is also stored in Sherman Reservoir during the fall and spring months for use during the irrigation season.

Two large project-type developments have been completed in the Basin by the Bureau of Reclamation. Delivery of water to the Sargent Unit was begun in 1957 and application of water to all of the proposed service area is nearing completion. The Farwell Unit, including Sherman Reservoir, began irrigation water delivery in 1963. Most of the proposed irrigable lands are now receiving water and the remainder are being prepared for application of water.

In the Missouri River Basin Comprehensive Framework Study it is estimated that the ultimate area irrigated in the Sargent Unit will be about 13,000 acres by diversion of approximately 28,000 acre-feet annually from the Middle Loup River. Of this amount, 15,000 acre-feet would be consumed and 13,000 acre-feet would be returned to the stream. About 10,000 acres are being irrigated at present.

The Missouri River Basin study also indicates that, under fully developed conditions, about 162,000 acre-feet would be diverted annually to the Farwell Unit from the Middle Loup River through Sherman Reservoir, and that return flow from reservoir seepage and irrigated project land would be about 48,000 acre-feet annually. The total amount of water lost in Sherman Reservoir Feeder Canal, evaporated from Sherman Reservoir, consumed on irrigated land and lost by distribution facilities is estimated to be about 114,000 acre-feet annually. Total area ultimately irrigated would be about 48,000 acres, of which about 33,000 is presently being irrigated.

The North Loup River and Middle Loup Public Power and Irrigation Districts divert water from the North and Middle Loup Rivers respectively for irrigation of land within their Districts. During the ten-year period 1958-1967, the average annual net diversion for the Middle Loup District has been about 29,300 acre-feet and for the North Loup District about 40,900 acre-feet. The area irrigated during that period has varied considerably. The Middle Loup District reports annual irrigated acreages ranging from about 16,000 to 26,000 and the North Loup District from about 24,500 to almost 30,000. Average annual acreage irrigated during the ten-year period was 23,250 and 28,370 for the Middle and North Loup Districts, respectively.

It is estimated that 2,900 acres irrigated with water from the Loup River Power Canal and 6,340 acres irrigated from Beaver Creek required diversion of approximately 9,200 acre-feet annually. Assuming 25 percent return flow, consumptive use is about 6,900 acre-feet each year.

Nebraska Department of Water Resources records showed that 2,811.67 cfs had been appropriated from natural streamflow for irrigation of 229,276 acres of land in 1966. In addition, 584 acres had rights to irrigate from storage water only. However, it is estimated that only 120,600 acres are being irrigated. Of this amount, approximately 97,860 acres are irrigated from stream and reservoir diversions and 22,760 are irrigated from streambank pumps. The acreage irrigated will increase by about 23,130 acres, however, when the entire service areas of the Farwell and Sargent Units are developed.

Power Generation. Over the years hydroelectric power has been generated at 37 different locations with water from the Loup River and its tributaries. Only 5 of these are still operating. Map 5 shows location and general information for these plants. Water is diverted from the Middle Loup River to the Boelus power plant, which is a run-of-the-river plant near Boelus. Ericson and Spalding power plants are located on the Cedar River and operated by the Nebraska Public Power District. There is some storage regulation at Ericson, but none at Spalding. The Loup River Public Power District operates the Monroe and Columbus power plants with water diverted from the Loup River 5.5 miles southwest of Genoa and conveyed to the power plants through 26 miles of canal.

There are no steam-electric power plants in this Basin that use surface water for cooling.

Waste Water Disposal. Since a majority of this Basin lies in the sparsely populated Sandhills, the number of communities discharging partially treated sewage into the stream system is relatively small. Only two communities in the Basin, Columbus and Broken Bow, had populations over 2,500 in 1960. It is estimated that the average BOD of sewage effluent from these two towns is about 1,250 and 100 pounds per day, respectively.

Other Uses. Some use is made of surface water for livestock by storage in farm ponds, but generally most livestock water supply comes from wells.

No communities use surface water for municipal supply.

The stream system is used for recreation and by fish and wildlife. It is estimated that present fishing use in the Basin is about 197,500 fishing occasions each year. Other associated activities such as picnicking and camping are also practiced in this Basin.

Historical Flooding

Flooding in the Loup River Basin usually occurs only in the lower part of the Basin and the Loup River mainstem since the upper part is in the Sandhills. Short descriptions of the most severe floods are presented in the following paragraphs in their order of occurrence.

June 6, 1896. The maximum discharge of record occurred on the North Loup River near St. Paul during this flood. The discharge was estimated at 90,000 cfs, nearly three times the second highest discharge during the 1947 and 1966 floods. The Loup River at Columbus discharge during this flood was 70,000 cfs.

June 22-23, 1947. Precipitation was 5 to 6 inches above normal for the month at several stations, with Arcadia reporting 6.02 inches on the 22nd. This flood was quite widespread and resulted in several peaks of record being observed on both tributaries and main streams in the Loup Basin. Peak discharges were recorded for: Mud Creek near Sweetwater, 26,600 cfs; South Loup River at St. Michael, 50,000 cfs; Middle Loup River at St. Paul, 72,000 cfs; and North Loup River at Scotia, 32,000 cfs. Other discharges which were not peaks of record but quite high were Loup River near Genoa, 90,000 cfs, and Loup River at Columbus, 85,000 cfs. The lower parts of Columbus were flooded for the first time in history during this flood.

July 8-9, 1950. The lower portion of the Basin received high precipitation during the night of the 8th as a result of the storm center which produced the flood at York. A flash flood swept a car off the highway south of Fullerton and drowned the five occupants. Fullerton reported 4.30 inches of precipitation on the 9th. The discharge of Oak Creek near Dannebrog was 1,780 cfs, with a gage height of 17.0 feet, the second highest for the period of record. The discharge of Loup River at Columbus was 42,100 cfs on July 10.

July 18-19, 1950. A localized storm produced the maximum discharge of record for Beaver Creek at Genoa. Precipitation at Albion was 2.53 inches on the 18th and Madison just outside the Basin reported 3.84 inches. The discharge of Beaver Creek at Genoa was 21,200 cfs, with a gage height of 18.7 feet. The Cedar River near Fullerton crested at 9.64 feet with a discharge of 10,100 cfs. This was the highest discharge observed at this station prior to August, 1966.

June 17, 1954. Heavy rains in the central part of the Basin resulted in some locally damaging floods. Loup City received 5.05 inches and St. Paul 4.25 inches on the 17th. The discharge of Oak Creek near Dannebrog was 1,880 cfs, the highest for the period of record. The discharge of South Loup River at Ravenna was 11,200 cfs, second only to the June, 1947 flow.

March 27-28, 1960. This flood was mostly the result of snowmelt from the above normal snowfall of 1959-60. Flooding was not extensive and occurred mostly on areas directly adjacent to the main streams and tributaries. The peak discharge of Loup River at Columbus was 52,000 cfs.

August 12-15, 1966. This flood was the greatest of record in lower reaches of the Loup River. Considerable damage was inflicted on the communities of Fullerton, Columbus, Wolbach, Cedar Rapids, and St. Edward. Agricultural and road damages were quite high. The center of the storm was near the center of the Cedar River basin, with Plum and Spring Creeks receiving comparable amounts. Precipitation amounts ranged up to 17 inches unofficially near Greeley. Rainfall for Greeley totaled 10.06 inches for about a twelve-hour period and Albion reported 10.29 inches for a 24-hour period. The discharge of the Cedar River near Fullerton, 64,700 cfs, was the maximum of record, with a recurrence interval of much more than 100 years. The peak discharge of Loup River near Genoa was 129,000 cfs, also the maximum of record. Levees along the Loup River Power Canal failed and probably added to the peak experienced near Genoa. The discharge of Loup River at Columbus was 119,000 cfs, over 30,000 cfs greater than the June, 1947 flood peak at this station.

Elkhorn River Basin

The Elkhorn River Basin covers about 7,000 square miles in the northeastern part of the State and lies entirely within Nebraska. The area is drained by the Elkhorn River and its tributaries, of which North Fork Elkhorn River and Logan Creek are the largest. The Elkhorn River begins in the eastern Sandhills in Rock County and empties into the Platte River about five miles upstream from Ashland after flowing about 320 miles southeastward.

The upper portion of the Basin in the Sandhills is composed mainly of dune sand which allows rapid infiltration of precipitation into the underlying ground water reservoir with very little direct surface runoff. This area is almost entirely native grassland. The central part of the Basin, a transition area between the Sandhills and the loess areas, has a mixture of native grassland and cultivated cropland. The lower part of the Basin is in the loess area and is devoted almost entirely to cultivated cropland with some woodland along the streams.

Streamflow Characteristics

Base flow of the Elkhorn River in the upper part of the Basin is very uniform because of the discharge from adjacent sand and gravel aquifers in the Sandhills. Lower basin flows are more variable because of precipitation runoff from the steeper hard lands drained by the lower tributaries. The stream falls about 1,265 feet in 320 miles for an average slope of about four feet per mile. The slope is less in the lower reaches and the stream tends to meander.

There are seven U.S.G.S. stream gaging stations in the Basin which have recorded flows for more than 10 years. The Waterloo station has continuous records since 1928 and some intermittent records for as far back as 1899. This station near the mouth of the river provides an estimate of the runoff from the entire Basin. The peak discharge recorded was 100,000 cfs and the average annual runoff for the period 1928-1967 was 826,000 acre-feet.

Of the 7,000 square miles in this drainage Basin, approximately 1,000 square miles in the Sandhills do not contribute directly to surface runoff. However, the ground water basin in this non-contributing area does provide a source of very constant base flow to the streams in the upper part of the Basin. Flow-duration curves for Logan Creek at Uehling, and Elkhorn River at Norfolk and Waterloo are presented in Attachment 3.

Present Water Use

Surface water used in the Elkhorn River Basin is utilized mainly for irrigation. There is only one hydroelectric power plant presently in use. Natural streamflow dilutes and transports sewage, feedlot and farm fertilizer wastes from the area. Recreationists and fish and wildlife also make use of the basin's surface waters.

Irrigation. As in most of Nebraska, the amount of water used for irrigation in this Basin varies from year to year depending upon the amount of rainfall which occurs during the crop growing season. There are no large canal diversions from streams in the Basin. Most water is lifted from the stream by small streambank pumps which are concentrated in the eastern one-third of the Basin.

Very little administration of water has ever been required in this Basin, so there are practically no records of diversions. Water rights on file with the Nebraska Department of Water Resources show that 369.17 cfs had been appropriated for irrigation of 39,075.4 acres in 1966. However, irrigation field surveys indicate that only about 20,200 acres are presently under irrigation. Assuming that this is about average for the Basin and that the average annual diversion rate is one acre-foot per acre, the average annual diversion would be about 20,200 acre-feet. Return flow is estimated to be 25 percent of the diversion, which would make the average annual consumptive use for irrigation about 15,000 acre-feet.

Power Generation. In past years, Elkhorn River Basin streams have been used for generation of power at 24 known points. Most of these developments were for mechanical milling establishments and have been abandoned. Only one plant at Norfolk is presently being operated to produce electrical energy. Location and general information about the plant is shown on Map 5. The diversion right at this plant is 100 cfs. There is no record of the amount of electricity generated or the amount of water run through the plant.

There are no steam-electric generating plants in this Basin which use surface water for cooling.

Waste Water Disposal. Approximately 36 communities in the Elkhorn River Basin use the Elkhorn River and its tributaries to carry away partially treated sewage wastes. Table 19 lists the major communities, their population and the estimate of the daily average BOD that is placed upon the receiving waters at each location.

TABLE 19

ESTIMATED AVERAGE DAILY BOD OF SEWAGE
EFFLUENT FROM ELKHORN RIVER BASIN COMMUNITIES
WITH 1960 POPULATION OVER 2,500

Town	1960 Population	Estimated BOD (Lbs/day)
Norfolk	13,640	348
O'Neill	3,181	81
Wayne	4,217	127
West Point	2,921	605
Fremont	19,698	17,550

Source of Data: Nebraska Department of Health

The Elkhorn River Basin presently supports many large cattle feed-lot operations which contribute an undetermined amount of waste materials to the surface water. Chemical fertilizers applied to farm land are also a possible source of surface water pollution, the magnitude of which is not known.

Other Uses. Recreationists use the basin watercourses for fishing and hunting. Other associated activities such as picnicking and hiking are engaged in to some extent, but swimming is not popular because of the silt-laden condition of the water in the lower reaches of the stream system.

The Elkhorn system supports a warm-water fishery. Many forms of wildlife depend on the streams and their immediate environs as a necessary part of their habitat.

The streams are not commercially navigable, but limited non-powered pleasure boating is practiced on the main river.

Historical Flooding

The Elkhorn and its major tributaries have caused severe flooding in the lower Basin several times during this century. Short descriptions of the most severe are presented in the following paragraphs in their order of occurrence.

June 4-7, 1940. This flood was the greatest on Logan and Union Creeks, two tributaries of the Elkhorn River in the eastern half of the Basin. The precipitation at Wakefield during June was 9.11 inches - 6.35 inches on the 4th. Considerable damage to agricultural and urban property occurred and five lives were lost in Dakota and Thurston Counties. The gage height for Logan Creek near Uehling was 18.6 feet and the discharge was 22,200 cfs, the highest on record for this station. The discharge of Union Creek at Madison was 16,300 cfs. The discharge at Waterloo was

22,900 cfs and was the highest recorded up to that date, but was greatly exceeded by the 1944 flood and the floods of the sixties.

May 10-13, 1944. A storm center near Norfolk produced the maximum discharge on record for the Elkhorn River near Norfolk. The discharge was estimated at 14,300 cfs, with a gage height of 11.8 feet. Meadow Grove received 3.82 inches on the 11th and Norfolk 2.91 inches on the 12th. Considerable flood damage was experienced in the Norfolk area. This storm produced only minor peaks both up and downstream.

June 11-12, 1944. This flood was centered in the lower part of the Basin and affected primarily Logan and Maple Creeks and the Lower Elkhorn River. West Point reported 7.17 inches on the 11th and Clarkson, 6.25 inches. Damages below West Point were quite severe. The discharge of Maple Creek near Nickerson was 35,000 cfs, with a gage height of 16.28 feet. This was greatly in excess of any discharge recorded at this station prior or since.

The discharge of the Elkhorn River at Waterloo was 100,000 cfs, and is the maximum recorded at this or any other station in the Basin.

June 23-26, 1947. This flood was minor in the Basin except above Norfolk. The major storm center was in southern and central Nebraska with the Elkhorn Basin on the fringe. O'Neill received 3.03 inches on the 22nd. The discharge of the Elkhorn River at Neligh was 12,000 cfs, with a gage height of 12.53 feet. This is the maximum flow recorded at this station. The discharge of the Elkhorn River near Norfolk was 12,600 cfs.

March 28-April 2, 1960. This flooding was caused by snowmelt and rainfall and resulted in high discharges in the lower part of the Basin. Norfolk received 59.1 inches of snow during the 1959-60 season. The discharge of the Elkhorn River near Norfolk was 13,500 cfs, the second highest on record. The discharge of Elkhorn River at Waterloo was 46,900 cfs, the third highest on record.

March 25-29, 1962. This flood was also caused by snowmelt, ice jams, and rainfall. The major flooding was again in the lower part of the Basin. The discharge of Logan Creek near Uehling was 19,400 cfs, the second highest on record. The discharge at Waterloo was also the second highest on record, 50,200 cfs.

Lower Platte River Basin

The Lower Platte River Basin planning area covers about 3,110 square miles in the eastern part of the State. It extends from the confluence of the Loup and Platte Rivers to the mouth of the Platte where it enters the Missouri River. The area is drained by the Platte River and the major tributaries, Shell, Wahoo and Salt Creeks. The Elkhorn River joins the Platte near the middle of this Basin and contributes significantly to flows of the lower Platte River.

The upland areas of the Basin consist of loess hills used for cultivated cropland. The hills closer to the Missouri River are sharply rolling and a greater proportion of the area is devoted to grassland and woodland. The broad alluvial lowlands along the Platte River are also used to grow cultivated crops. Drainages in the uplands are well defined, but in the lowlands the lack of well defined drainage causes some flooding problems.

Streamflow Characteristics

In this Basin, the Platte River valley is broad and flat in the upper portion, but it narrows near South Bend and remains relatively narrow and steep-walled to the confluence with the Missouri River. The Platte River channel is wide and sandy and at normal and low flows the stream is braided. Channels of tributary streams draining the loess hills bordering the valley lowlands are well defined and often deeply cut into the easily erodible loess. After entering the valley area, stream gradients flatten and channels are shallower and tend to meander.

During dry seasons, flow in the Platte River between its confluence with the Loup and the Elkhorn Rivers is mainly dependent upon Loup River inflow, since the Platte above the Loup has little flow during dry periods.

There are currently eight U.S.G.S. stream gaging stations in the Basin which have recorded flows for more than 10 years. Flows were recorded at the Platte River near Ashland station during the period 1928-1953 and have been recorded at Platte River near South Bend since 1953. This is currently the last station on the Platte River, and it provides an estimate of the flow leaving the State.

Flow-duration curves for Salt Creek near Ashland and Platte River at Ashland are presented in Attachment 3.

Present Water Use

In this Basin, surface water is used for irrigation, for waste water dilution, for fish and wildlife and for recreation.

Irrigation. Average annual precipitation in this Basin is approximately 28 inches. Therefore, surface water used for irrigation is mainly a supplemental supply in years when total rainfall is low or poorly distributed within the growing season.

Nebraska Department of Water Resources records show that 200.69 cfs have been appropriated for irrigation of 20,812 acres in the Basin. However, the best information available indicates that only about 9,600 acres were actually being irrigated in recent years. Nearly all water is taken from the streams by pumping. It is estimated that about one acre-foot per acre is pumped and that approximately 25 percent returns to the stream system. Therefore, the average annual consumptive use and losses due to irrigation in the Basin would be about 7,200 acre-feet annually.

Use of water for irrigation in this Basin has generally developed since 1950.

Power Generation. There are no hydroelectric or steam operated power plants using surface water in this Basin.

Waste Water Disposal. Most communities in the Lower Platte River Basin use the stream system to carry away partially treated sewage. Table 20 lists the major communities, their population and an estimate of the average daily BOD loading placed upon the stream at each location.

TABLE 20

ESTIMATED AVERAGE DAILY BOD OF SEWAGE EFFLUENT FROM LOWER PLATTE RIVER BASIN COMMUNITIES WITH 1960 POPULATION OVER 2,500

Town	1960 Population	Estimated BOD (Lbs/day)
Lincoln	128,521	8,245
Wahoo	3,610	92
Schuyler	3,096	79

Source of Data: Nebraska Department of Health

Other Uses. Some surface water is stored in farm ponds for livestock water supply, but it is estimated that only 10 percent of the amount consumed by livestock is obtained from this source.

No communities use surface water for municipal supply, but both the Omaha and Lincoln wellfields are dependent on the recharge of the ground water aquifers by streamflow.

The stream system is used for recreation and by fish and wildlife. It is estimated that the present stream fishing use is about 52,000 fishing occasions annually, and that the use of reservoirs, including Salt Valley Watershed reservoirs, farm ponds, gravel pits, etc., amounts to an additional 590,000 fishing occasions annually. The streams are not commercially navigable, but air boating for pleasure is practiced on the mainstem.

Historical Flooding

Past flooding in this Basin has been very damaging, especially in the Salt Creek drainage area around Lincoln. Construction of flood control structures in the Salt Valley Watershed Project during the middle 1960's has greatly reduced the flood hazard in this area.

Short descriptions of major storms and floods that have occurred in the Basin since 1950 are presented in the following paragraphs.

May 8-9, 1950. This flood was the result of heavy rain over the headwaters of Salt Creek. Amounts as high as 12 inches for the two-day period were received south of Hickman. The discharge of Salt Creek at Lincoln was 27,800 cfs, and caused considerable damage including the loss of six lives. Below Lincoln the crest was reduced by valley storage and the flow at Ashland was not unusual.

June 1-2, 1950. Heavy precipitation near the headwaters of Shell Creek resulted in flash flooding on this stream. Precipitation amounts as high as 8 inches were reported. The discharge of Shell Creek at Newman Grove was 11,600 cfs.

July 18, 1950. Shell Creek was again hit by severe thunderstorms following lesser storms which had saturated the soils of the area. The discharge of Shell Creek at Newman Grove was slightly greater than the June, 1950, flow and was estimated at 12,000 cfs.

May 31-June 2, 1951. Heavy thunderstorms following a month of above normal precipitation caused considerable flooding. Lincoln received 4.14 inches and Hickman 3.76 inches on June 1. The discharge of Salt Creek at Lincoln was 28,200 cfs, maximum for the period of record. North Fork Wahoo Creek at Weston peaked at 9,600 cfs, maximum for the period of record. The discharge of Salt Creek near Ashland was 46,200 cfs, exceeded only by the June, 1963 flood.

August 2, 1959. This flood was the result of excessive precipitation primarily in the Wahoo Creek Basin. The discharge of Wahoo Creek at Ithaca was 45,300 cfs, and the discharge of Silver Creek near Colon was 12,000 cfs.

March 27-30, 1960. High flows on the Lower Platte were caused mainly by melting and runoff of heavy snow cover on upstream tributaries. Damages were mostly confined to lowlands adjacent to the stream. Agricultural damage was minor because of the season of the year and was limited to fences and debris accumulation. The discharge of Platte River at North Bend was 112,000 cfs, the maximum of record. The peak observed at Platte River near South Bend was 124,000 cfs, also the maximum of record.

June 24-25, 1963. This storm occurred mainly in the Wahoo Creek Basin as the result of high intensity rainfall. Precipitation for the month at Wahoo was 7.98 inches, some 3.4 inches above normal. David City, just across the basin divide, received 10.98 inches, 6.09 inches above normal. In the area 15 miles south of Linwood, storm rainfall as high as 16½ inches was reported unofficially. The discharge of Wahoo Creek at Ithaca was 77,400 cfs, maximum of record. Salt Creek near Ashland had a discharge of 87,000 cfs, which was also the maximum of record. A measurement made on Skull Creek about two miles south of Linwood shows a discharge of about 74,800 cfs from a drainage area of 72 square miles, slightly over 1,000 cfs per square mile.

Republican River Basin

The Republican River Basin covers an area of about 9,650 square miles in the southcentral part of the State. The area is drained by the mainstem and tributaries of the Republican River which originates in Colorado, flows through Nebraska and into Kansas, where it empties into the Kansas River near Junction City, Kansas.

The upper Basin is in the high plains of eastern Colorado and is mostly devoted to dryland farming. That portion of the Basin in Nebraska drains the sharply dissected loess plains which are devoted mainly to grass and dry farmed cropland. A part of the Nebraska Sandhills is also included in the Basin near the Colorado border. Five major storage reservoirs have been constructed on the mainstem and tributaries in Nebraska. Water from these reservoirs is used to irrigate alluvial lands in the main river valley.

The flows of the Republican River are apportioned between Kansas, Colorado and Nebraska according to a compact approved by Congress and administered by representatives of the states.

Streamflow Characteristics

The mainstem of the Republican River enters Nebraska near the southwestern corner of the State from Colorado and the Arikaree River, a major tributary, enters from Kansas right at the corner of the State. The main river flows eastward nearly parallel to the Kansas-Nebraska border to Nuckolls County, where it re-enters Kansas. Of the 23,100 square mile drainage area above this point, 9,650 square miles are in Nebraska. Four major U. S. Bureau of Reclamation reservoirs -- Enders on Frenchman Creek, Hugh Butler on Red Willow Creek, Harry Strunk on Medicine Creek, and Swanson on the mainstem -- store water for irrigation and provide flood control. Harlan County Reservoir was constructed on the mainstem by the U. S. Corps of Engineers and serves similar purposes.

Streams originating in the Sandhills, such as Red Willow and Medicine Creeks, have relatively constant base flow, but most other tributaries experience a wide variation in flow, depending upon the amount of precipitation runoff.

There are currently 31 U.S.G.S. stream gaging stations in the Nebraska portion of the Basin which have recorded flows for 10 years or more. Stations at Arikaree River at Haigler, North Fork Republican River at Colorado-Nebraska State Line, South Fork Republican River at Benkelman and stations on Beaver, Sappa and Prairie Dog Creeks record the majority of the flow entering the Nebraska portion of the Basin. Attachment 3 presents flow duration curves for the first three stations listed.

Present Water Use

Surface water in this Basin is used mainly for irrigation. It is also used for power generation, for recreation, by fish and wildlife and for dilution and transportation of waste materials.

Irrigation. Nebraska Department of Water Resources' records show that 1,762.2 cfs had been appropriated for irrigation of 153,182 acres in this Basin, and there were storage-only rights for irrigation of an additional 1,028 acres in 1966. It is estimated that approximately 81,800 acres are presently being irrigated from diversions and canals and about 24,900 acres by pumping from the stream. Therefore, total acreage presently being irrigated with natural streamflow rights in the Basin is about 106,700 acres.

It is estimated that the average diversion from streamflow for irrigation in the Basin during the period 1959-1967 was about 183,000 acre-feet per year.

Power Generation. Two hydroelectric power plants, Imperial and Champion Mills, are located in the Republican Basin. The plants are located on Frenchman Creek near the city of Imperial and have a plant capacity of 120 kilowatts each. The Champion Mills plant is no longer being used, but the water right has been retained. Map 5 shows location and general information about the plants.

There are no steam operated power plants in the Nebraska portion of the Basin that use surface water for cooling.

Waste Water Disposal. Most communities in the Republican River Basin use the stream system to carry away partially treated sewage.

Only three towns in the Basin had populations over 2,500 in 1960. It is estimated that these towns - Holdrege, 1960 population of 5,226, McCook, 1960 population of 8,300 and Superior, 1960 population of 2,935 - place an average biochemical oxygen demand of about 523, 830 and 293 pounds per day, respectively, on the stream system.

Other Uses. Some use is made of surface water for livestock by storage in farm ponds.

No communities use surface water for municipal supply.

The stream system is used for recreation and by fish and wildlife. It is estimated that the present stream fishing use is about 32,500 fishing occasions annually in the Basin. Additional use of about 394,000 fisherman occasions annually is made of the basin's reservoirs, farm ponds, gravel pits, etc.

Historical Flooding

Major flooding in this Basin occurred frequently prior to construction of the multipurpose U. S. Bureau of Reclamation and Corps of Engineers structures which include flood control features. These structures have greatly reduced the flood hazard on several major tributaries and on the mainstem. However, high intensity rainfall and runoff still cause flooding in smaller drainage areas. Short descriptions of major storms and floods since 1935 are presented in the following paragraphs.

May 27-June 2, 1935. This was the worst flood of record in this Basin. It resulted from heavy precipitation in eastern Colorado and western Nebraska. The precipitation at Benkelman for May, 1935 was 8.39 inches; at Culbertson, 8.33 inches; Hayes Center, 12.50 inches; Imperial, 9.21 inches; and Stratton, 9.15 inches.

The flood crest traveled about ten miles per hour above Trenton and occurred at night, resulting in the loss of 40 lives. Below Trenton, the people were warned of the impending crest but did not believe that danger was imminent. As a result, 65 lives were lost below Trenton in Nebraska and Kansas. The maximum discharge, 280,000 cfs, occurred at the Republican River near Cambridge gaging station, below the mouth of Medicine Creek. Frenchman Creek at Culbertson had the maximum discharge of record of 15,000 cfs. The Arikaree River at Haigler, South Fork Republican River near Benkelman, Republican River at Culbertson, and Republican River near Hardy all had the maximum discharges of record.

June 22-24, 1947. This flood was the result of the high intensity rainfall which occurred in southern and central Nebraska during this period. Precipitation for a 24-hour period on June 22nd was 5.10 inches at Curtis; 2.34 inches at Oxford; 3.20 inches at Holdrege; and 2.75 inches at Beaver City.

The flood runoff was especially heavy on Medicine Creek and tributaries. The discharge of Medicine Creek at Cambridge was 120,000 cfs, the maximum of record. This was a flash flood which hit the town at night, resulting in the loss of 13 lives. The discharge of Dry Creek near Curtis was 25,900 cfs, and the discharge of Red Willow Creek near Red Willow was 30,000 cfs, both maximums for the period of record, which does not include 1935.

May and July, 1951. Flooding during this period was mostly confined to the eastern and southern parts of the Kansas River basin and little flooding occurred in Nebraska. Precipitation amounts for the month of May included: Alma, 8.63 inches; Imperial, 7.20 inches; and Madrid, 7.89 inches. Some localized flooding occurred along Beaver, Sappa, and Prairie Dog Creeks.

June 16-17, 1956. Intense rainfall near Enders Dam caused flooding along the lower reaches of Frenchman Creek and along Stinking Water Creek. Sixty percent of the residential sections of the town of Wauneta were inundated and 90 percent of the business district was covered by floodwaters. Enders Reservoir prevented additional damages. The discharge of Frenchman Creek near Hamlet was 7,000 cfs, and the discharge of Stinking Water Creek near Palisade was 3,030 cfs, both maximums for the period of record.

June, 1957. Heavy rainfall during the month produced high runoff in several tributaries of the Republican River. Flooding occurred along Beaver, Sappa, and Prairie Dog Creeks and along the mainstem below Harlan County Reservoir. The discharge of Republican River near Hardy on June 17 was the third highest of record.

June 23-24, 1966. Intensive rainfall near the center of the Basin caused flooding on Prairie Dog and Sappa Creeks. Rainfall at Beaver City on the 24th totaled 5.80 inches. Orleans also reported over five inches on this date. The discharge of Sappa Creek near Stamford was 43,400 cfs, the maximum of record. The discharge of Sappa Creek near Beaver City was also the maximum of record. The community of Stamford was damaged by runoff from adjacent areas which reportedly received as much as 14 inches of rain. Extensive damages also occurred to transportation facilities and agriculture.

Little Blue River Basin

The Little Blue River Basin, which encompasses an area of about 2,650 square miles in the southeastern part of the State is drained by the Little Blue River and its tributaries. The Little Blue River empties into the Big Blue River at the upper end of Tuttle Creek Reservoir in Kansas.

The upper end of the Basin along the northern basin boundary is generally comprised of loess plains which are very flat and have poorly defined drainage. This area is almost entirely devoted to cultivated cropland. The remainder of the Basin is made up of dissected tablelands and gently undulating loess hills with well-developed drainage patterns. The smoother uplands and bottom lands near streams are cultivated, whereas the rougher dissected plains are mainly in pasture. The flood plains are relatively narrow throughout the Basin.

Streamflow Characteristics

The Little Blue River originates in southeastern Kearney County at about elevation 2,200 feet and flows generally southeastward until it leaves the State near Steele City in Jefferson County. The stream gradient, which averages about five feet per mile, is slightly steeper than the neighboring Big Blue River and often the base flow is also somewhat higher because the channel sometimes intersects the adjacent sand and gravel aquifers.

The U. S. Geological Survey maintains two stream gaging stations in the Basin which have records for more than 10 years. These are located near Deweese and Fairbury. The Fairbury station records flows from 2,350 square miles of the drainage basin and continuous records have been kept since 1928. This station measures runoff from all major tributaries except Rose Creek and furnishes a reliable estimate of flows leaving the State. The average annual runoff for the period of record is 264,200 acre-feet per year and the recorded maximum is 723,300 acre-feet. The maximum observed instantaneous discharge was 36,800 cfs.

Most of the flood flows occur during the late spring and early summer as a result of high-intensity rainfall. Although snowmelt and ice jams do not normally cause flooding problems in this Basin, some high flows have been recorded due to these causes - notably the early spring flood in 1960.

A flow-duration curve for the Little Blue River near Fairbury included in Attachment 3 shows that the flow equals or exceeds 100 cfs about 90 percent of the time.

Present Water Use

Surface water in the Little Blue Basin is used mainly for irrigation of farm crops. There is no hydroelectric power generated in the Basin and only one steam-electric plant uses surface water for cooling. The main streams are used for transportation of sewage wastes. Recreationists and fish and wildlife also make use of the basin's surface waters. A compact for this stream and the Big Blue River which could affect the future use of water in the Basin has recently been ratified by the States of Kansas and Nebraska and is now awaiting Congressional action.

Irrigation. Water used for irrigation in the Little Blue River Basin is a supplemental supply required when precipitation is inadequate during the crop growing season. Water is generally pumped from the stream system and applied directly to the fields.

Water rights on file with the Nebraska Department of Water Resources show that 225.76 cfs had been appropriated for irrigation of 20,609 acres in 1966. However, the Department estimates that the average annual acreage irrigated is only about 12,800. It is estimated that the average annual amount of water applied in this Basin is about one acre-foot per acre, but that approximately 25 percent of this amount returns to the stream system. Therefore, the present average annual consumptive use of water for irrigation would be about 9,600 acre-feet.

It is interesting to note that in 1960 a field inventory showed that 8,826 acres were actually being irrigated and that appropriations for 16,606 acres were recorded at that time.

Power Generation. There was one hydroelectric plant in the Basin located at Fairbury which operated under an old riparian water right, but the plant is no longer in use and was recently dismantled.

Fairbury also has the only steam electric power plant in the Basin. This plant has an appropriative right for 16.7 cfs to be used for cooling purposes. After use, the water is returned to the stream.

Waste Water Disposal. Most of the communities in the Little Blue River Basin are using the stream system to dilute and carry away partially treated sewage. It is estimated that Fairbury, the only town in the Basin with a population over 2,500 adds an average of about 560 pounds per day of BOD to the stream system. No estimate was made for other towns in the Basin.

Other Uses. The basin's watercourses are used for fishing and hunting. The Nebraska Game and Parks Commission estimates that the capacity for fishing in this Basin is greater than in the Big Blue River Basin, but present use is less. The 1967 survey indicates that there were only 69,500 fishing occasions in the Little Blue River Basin during that year compared to 97,500 in the Big Blue River Basin.

The streams are not commercially navigable, but small pleasure boating, such as canoeing, is possible on the main river.

Historical Flooding

The Little Blue River and its tributaries have caused damaging floods many times in the past. Short descriptions of the most severe since 1935 are presented in the following paragraphs in the order of their occurrence.

May 20-June 1, 1935. This flood was centered in southwest Nebraska and eastern Colorado and produced three separate peaks on the Little Blue River near Fairbury. Fairbury received 10.60 inches of precipitation in May and 5.97 inches in June. Hebron received 14.65 and 8.20 inches during the same two months. The peaks at Fairbury were 20,800, 11,800, and 17,900 cfs.

June 9, 1941. Rainfall amounts were as high as 5.61 inches at Fairbury on the 9th. This flood, which was probably the greatest on record in the Big Blue Basin, produced the third highest flow at the Little Blue River near Fairbury station. The flow was 31,000 cfs, with a gage height of 16.23 feet.

May 22 and June 14, 1949. Storms in the Basin above Fairbury produced peak discharges of 24,400 and 28,500 cfs on the Little Blue River near Fairbury on May 22 and June 14, respectively. Hebron received 4.00 inches of precipitation and Bruning 3.47 inches on June 13th.

June 27, 1951. Hebron received 3.79 inches on the 26th and Fairbury received 3.00 inches. Minden in the upper part of the Basin received 4.50 inches on the 26th. The peak discharge from this flood was 36,800 cfs, with a gage height of 16.36 feet. This is the maximum discharge of record at Fairbury.

March 28, 1960. This flood was caused by snowmelt and rainfall. Hebron reported 63.8 inches of snow during the winter of 1959-60. The discharge of Little Blue River near Fairbury was 31,700 cfs, and the gage height was 15.80 feet. This is the second highest discharge on record for this station.

June 13-17, 1967. This flood was the result of heavy and prolonged rainfall which covered the eastern two-thirds of the State. The town of Kenesaw on Thirty-Two Mile Creek was severely flooded from rainfall amounts as high as 6.00 inches in a 24-hour period. Much of the town was inundated with depths of water ranging from two to five feet.

Big Blue River Basin

The Big Blue River Basin covers about 4,570 square miles in the southeast part of the State. The area is drained by the mainstem and tributaries of the Big Blue River which crosses the State Line into Kansas and eventually empties into the Kansas River near Manhattan.

The upper Basin is generally composed of loess plains with some areas so flat there is no defined drainage pattern. The plains change to dissected tablelands near the center of the Basin and into undulating loess hills with well developed drainage patterns at the lower end of the Nebraska portion of the Basin.

About 80 percent of the Basin is cultivated cropland, with most of the remainder in pasture, but there is some woodland along the streams.

Streamflow Characteristics

The Big Blue River originates in Hamilton County, flows northeastward through Polk and into Butler County and then turns southeastward and leaves the State near Barneston. Stream gradients are quite flat throughout most of the Basin and the channel meanders considerably in the lower reaches.

There are four U.S.G.S. stream gaging stations in the Basin which have recorded flows for more than 10 years. The Barneston station is located about five miles above the Nebraska-Kansas State Line and its records give a reliable estimate of the runoff leaving the State from this Basin. The average annual runoff for the June, 1932, to September, 1967 period was 556,000 acre-feet. The maximum annual runoff observed was 1,600,000 acre-feet and the minimum was 83,200 acre-feet. The instantaneous peak discharge was 57,700 cfs and the minimum observed daily discharge was 1 cfs.

Most runoff from the Basin is direct rainfall runoff. Consequently, runoff is high during heavy precipitation periods and quite low during dry periods. The base flow of the extreme upper tributaries is very low because most ground water aquifers which could contribute to base flow are below the stream channels. In recent years, however, streamflow in upper basin tributaries has increased during the summer months because of return flows from ground water irrigation.

Attachment 3 inclues a flow-duration curve for the Barneston station which shows that discharges at that point can be expected to equal or exceed 100 cfs about 90 percent of the time.

Present Water Use

The major use of surface water in the Big Blue River Basin is for irrigation of farm crops. There is also some hydroelectric power generation and the main streams are used for disposal of sewage wastes. Recreationists and fish and wildlife also make use of the basin's surface waters.

Kansas and Nebraska have recently ratified a compact for this stream and the Little Blue River which could affect the use of water in the Basin. It is now awaiting Congressional action.

Irrigation. The amount of water used for irrigation in this Basin varies from year to year depending upon the amount of rainfall which occurs during the crop-growing season. Water for irrigation is lifted from the stream by pumps, but in years when there is sufficient rainfall, little or no water is pumped.

Water rights on file with the Nebraska Department of Water Resources show that 614.28 cfs had been appropriated for irrigation of 59,993.9 acres in 1966. However, it is estimated that the average acreage irrigated annually is about 25,000 acres. The average annual water applied to this acreage is estimated to be one acre-foot per acre, but approximately 25 percent is considered to be returned to the stream through irrigation return flows. Taking return flows into account, the total average annual consumptive use for irrigation by surface water in the Basin would amount to about 19,000 acre-feet.

During dry years, irrigators pump heavily from the streams and virtually all the water in the stream is used. In fact, the stream was dry at the upper end near Seward in July, 1955, and below Milford above the mouth of the West Fork in 1966 and 1967. The major portions of the new appropriations are taking place on tributary streams like Turkey and Lincoln Creeks which are being fed partially by irrigation return flows from land irrigated from ground water supplies. There is no significant storage of surface water in this Basin for irrigation.

Power Generation. At one time, there were 15 hydroelectric power plants in the Basin. They were all low-head, run-of-the-river plants with practically no reservoir storage. All but four have been abandoned and the water rights cancelled. The four hydroelectric power plants presently operating are located at DeWitt, Holmesville, Blue Springs, and Barneston. Map 5 shows the location and general information about the plants.

These plants are comparatively small. They provide power supplies for municipal use, but they are not in use continuously and some are used only for standby power. There is no record of the quantity of power generated or the amount of water that is run through the plants.

There are no steam operated power plants in the Basin that use surface water for cooling.

Waste Water Disposal. Nearly all communities in the Big Blue River Basin are using the Big Blue River and tributaries to carry away partially treated sewage. Table 21 lists the major communities, their 1960 population and an estimate of the average daily biochemical oxygen demand (BOD) that is placed upon the receiving waters at each location.

TABLE 21

ESTIMATED AVERAGE DAILY BOD OF SEWAGE
EFFLUENT FROM BIG BLUE RIVER BASIN COMMUNITIES
WITH 1960 POPULATION OVER 2,500

Town	1960 Population	Estimated BOD (Lbs/day)
Beatrice	12,132	309
Hastings	21,412	546
York	6,173	157
Aurora	2,576	66
Crete	3,546	225
Seward	4,208	107

Source of Data: Nebraska Department of Health

Other Uses. Streams in the Basin are used by recreationists for fishing, boating and hunting. Other associated uses such as picnicking and camping are also engaged in to some extent. Swimming is not popular because of the suspended sediment content of the water.

The stream does support a warm water fishery generally composed of catfish, carp and members of the sunfish family. The Nebraska Game and Parks Commission estimates that fishing use in the Basin amounted to about 97,500 fisherman occasions in 1967. Many forms of wildlife use the streams for a drinking water supply and for some wildlife, such as muskrat and beaver, the water areas are a necessary part of their environment.

The stream is not commercially navigable, but small pleasure boating, such as canoeing, is practiced on the main river.

Historical Flooding

The Big Blue River Basin has experienced many severe floods during this century. Short descriptions of the most severe are presented in the following paragraphs in their order of occurrence.

July 23, 1911. Rainfall during July totaled 11.56 inches at Beatrice, about seven inches above normal. This flood reportedly reached a stage of 26.0 feet at Beatrice, which was the maximum stage prior to the 1951 flood. The estimated discharge for this stage was 33,000 cfs.

June 9, 1941. Beatrice received 10.49 inches of precipitation during the month, with 5.05 inches occurring on the 9th. The stage at Barneston reached 34.3 feet with an estimated discharge of 57,700 cfs. This is the highest discharge recorded at this station for records starting in 1903.

July 8-9, 1950. This storm center was located near York on tributaries of the West Fork Big Blue River. Residential and business sections of York were badly flooded by Beaver Creek. The entire business district of Beaver Crossing on the West Fork was inundated. From noon on July 8 until midnight, York reported 11.59 inches of rainfall, with 4.99 inches occurring in one hour. The discharge of a small creek near York having a drainage area of 6.9 square miles was 23,000 cfs, about 3,333 cfs per square mile. The discharge of the West Fork near Dorchester was 49,400 cfs on July 10, 1950.

June 4, 1951. Beatrice received 2.71 inches of precipitation on June 2, upstream at Crete, 3.12 inches were received and two miles south of Crete, 4.58 inches on the same day. The stage at Beatrice reached 28.3 feet, but stages on the river above and below Beatrice were not as high as those of 1941 and 1950.

June 6-16, 1967. Widespread rainfall caused flooding along most of the Big Blue mainstem. Amounts of 5 to 6 inches for a 24-hour period were reported. Precipitation at David City totaled 18 inches for a 15 day period. The peaks on some tributaries in the northern part of the Basin were the highest on record. The gage height at Seward on the Big Blue River was 22.80 feet and the discharge was estimated at 18,000 cfs. The gage height at Crete was the highest on record, but the discharge was less than that of the 1950 flood. The peak at Barneston was considerably less than the 1941 flood. This was due in part to control measures along the lower mainstem tributaries and the location and duration of the storm upstream.

Nemaha River Basin

The Nemaha River Basin covers about 2,760 square miles in the southeast corner of the State. The area is drained by the Big Nemaha and Little Nemaha Rivers and by Weeping Water Creek. Each flows into the Missouri River between the Platte River and the Kansas-Nebraska border. There are several other small streams which drain directly into the Missouri River.

Most of the Basin is made up of sharply rolling hills of glacial drift and wind deposited loess. Alluvium consisting of silt, sand, clay and some gravels is found in the bottom lands along the streams. The major drainages have cut through the overlying material to expose the limestone and shale bedrock. Most of the area is in cultivated cropland except where steeper terrain is devoted to pasture or woodland.

Streamflow Characteristics

The three major streams in the Basin, Weeping Water Creek, Little Nemaha and Big Nemaha Rivers, flow generally in a southeasterly direction to the Missouri River. Many miles of the stream channels have been straightened and, especially in the lower reaches of the Big Nemaha and Little Nemaha, channels have subsequently deepened and widened until only extreme flows go overbank in these areas.

There are seven U.S.G.S. stream gaging stations in the Basin which have recorded flow for more than 10 years. Gages located on Weeping Water Creek at Union, Little Nemaha River at Auburn and Big Nemaha River at Falls City provide records to estimate the flow leaving the State from the basin's principal streams.

Most runoff from the Basin is direct rainfall runoff which creates high streamflow during heavy precipitation periods and low flows during dry periods. Base flow, especially in the smaller, upper tributaries, is very low.

Flow-duration curves for the Little Nemaha River near Syracuse, North Fork Big Nemaha River at Humboldt and Big Nemaha River at Falls City are presented in Attachment 3.

Present Water Use

Very little use is made of streamflow in this Basin. Being in the highest rainfall area of the State, most crop moisture requirements are met from this source. Some use is made of surface water for supplemental irrigation, for stockwatering, for dilution and transportation of sewage wastes and for recreation and fish and wildlife.

Irrigation. Surface water in this Basin is generally used for irrigation as a supplement to rainfall, mainly during low rainfall years. Average annual precipitation of about 32 inches generally provides adequate amounts of moisture for growth of crops.

Nebraska Department of Water Resources' records show that 192.15 cfs had been appropriated for irrigation of 19,457 acres in 1966. However, it is estimated that there are only 7,800 acres presently being irrigated annually. In this Basin the average diversion requirement is approximately one acre-foot per acre and the return flow is about 25 percent of the amount diverted. Therefore, the average consumptive use for irrigation in the Basin is about 5,800 acre-feet annually.

Power Generation. There are presently no hydroelectric or steam power plants in this Basin which use surface water.

Waste Water Disposal. Many communities in the Nemaha River Basin use the stream system to carry away partially treated sewage. Table 22 lists the major communities, their population and an estimate of the daily average BOD loading placed upon the stream at each location.

TABLE 22

ESTIMATED AVERAGE DAILY BOD OF SEWAGE EFFLUENT FROM NEMAHA RIVER BASIN COMMUNITIES WITH 1960 POPULATION OVER 2,500

Town	1960 Population	Estimated BOD (Lbs/day)
Falls City	5,598	143
Nebraska City	7,252	3,333
Auburn	3,229	82
Plattsmouth	6,244	624

Source of Data: Nebraska Department of Health

Other Uses. Surface water stored in farm ponds and used for stockwater is a major use in this Basin. The difficulty of obtaining adequate ground water supplies for stockwater wells creates the need for storage of surface water. In the Nemaha River Basin, there are at least 950 farm ponds with a total surface area of about 950 acres, but their capacity is unknown.

The stream system is also used for recreation and for fish and wildlife habitat. The present fishing use in this Basin is estimated by the Nebraska Game and Parks Commission to be about 120,000 fisherman occasions annually.

There is no use of surface water for municipal or industrial purposes.

Historical Flooding

The rivers and streams in this Basin have caused severe damage from flooding on many occasions. Short descriptions of the most severe floods which have occurred since 1941 are presented in the following paragraphs in their order of occurrence.

June 10, 1941. This flood occurred primarily on the Big Nemaha River. Auburn recorded 4.37 inches of rainfall and Tecumseh 4.99 inches on the 9th. The Big Nemaha River at Falls City reached a stage of 27.6 feet and a discharge of 30,000 cfs.

June 1-2, 1949. A storm of hail and heavy rain, along with a tornado, struck Richardson County and six inches of rain were reported at Falls City on the 2nd. The Big Nemaha River at Falls City crested at 28.8 feet, with a discharge of 34,200 cfs. This was the third highest discharge for the period of record and the highest gage height.

May 8-9, 1950. This was the worst flood on record in the Little Nemaha River Basin. Rainfall amounts as high as 9.00 inches at Firth on the 8th were reported. Thirty-five thousand acres were flooded and 14 lives were lost. A bus was swept from the highway about a mile east of Unadilla and carried two miles to near Syracuse. The crest reached Syracuse about 1:00 a.m. on May 9 and the discharge was estimated at 225,000 cfs from a drainage area of 218 square miles. The peak of Little Nemaha River at Auburn was 164,000 cfs, with a gage height of 27.65 feet. Weeping Water Creek crested on May 9, with peaks the highest of record. The discharge of Weeping Water Creek at Union was 60,300 cfs. The Big Nemaha River was mostly outside the high precipitation area and flooding was moderate. The discharge of the Big Nemaha River at Falls City was 26,300 cfs.

June 17, 1954. This storm was centered over the lower end of Big Nemaha and Little Nemaha Basins and resulted in the peak discharge of record for Big Nemaha River at Falls City. Falls City reported 3.20 inches of rain on the 17th. Precipitation had been above normal prior to this storm. The discharge of North Fork Big Nemaha River at Humboldt was 43,300 cfs, the second highest for the period of record.

July 10, 1958. This flood produced the peak discharges for the period of record on North Fork Big Nemaha River at Humboldt and Muddy Creek at Verdon. Precipitation at Auburn for the month was 11.47 inches, 8.24 inches above normal, and at Syracuse, 13.48 inches, 10.61 inches above normal. The discharge of North Fork Big Nemaha at Humboldt was 51,000 cfs, with a gage height of 31.7 feet. Other high discharges were recorded at Big Nemaha River at Falls City, Little Nemaha River at Auburn, and Little Nemaha River near Syracuse.

March 27-28, 1960. This flood occurred early in the year and was mostly due to the melt and ensuing runoff of the abnormally large snowfall received during the winter of 1959-60. Snowfall at Weeping Water totaled 67.7 inches for the season and Tecumseh received 63.4 inches. The second highest peak of record, 46,900 cfs, was recorded for Big Nemaha River at Falls City on March 28. The discharge of Muddy Creek at Verdon was also the second highest for the period of record and was estimated at 20,000 cfs.

Missouri River Mainstem

The Missouri River forms the eastern border of Nebraska and contributes to the state's economy through water supply, navigation, and other uses such as recreation, waste water dilution, and power generation.

All of Nebraska and parts of nine other states are included in the river's drainage area. Except for the Rocky Mountains and the Black Hills, the drainage basin is characterized by rolling or gently sloping plains and prairies. Much of the area is highly erodible, which contributes to the river's sediment load and, hence the nickname "Big Muddy."

Streamflow Characteristics

The Missouri River flows 2,315 miles from Three Forks, Montana to its mouth, a few miles above St. Louis, Missouri, where it joins the Mississippi River. It drains a total area of 529,000 square miles, of which about 263,000 are above Nebraska's northern border and 420,000 are above Nebraska's southern border.

Streamflow has been altered by the construction and operation of mainstem dams such as Big Bend, Fort Randall and Gavins Point. The releases from their attendant reservoirs have firmed and enhanced low flows and sharply decreased flood flows along the Nebraska reach of the stream.

Flow of the Missouri River is being recorded at five locations in the Nebraska reach. The gages are located near Yankton, South Dakota; Sioux City, Iowa; and at Omaha, Nebraska City, and Rulo in Nebraska. All have operated for twenty years or more and the station at Sioux City was established in 1897.

Present Water Use

Probably the main uses of the Missouri River in the Nebraska reach are for navigation and hydroelectric power production. The river is also used for municipal water supply, for recreation, by fish and wildlife, and for dilution and transportation of waste material. Some water is pumped for irrigation but use is relatively minor.

Water is pumped from the river for irrigation of adjacent lands at several locations along the Nebraska border. Water rights for this pumping are not required by the Nebraska Department of Water Resources. Generally, permission is required for installation of a pump and pipeline which would be on or cross land under jurisdiction of the U. S. Army Corps of Engineers because of levee construction. Records of amounts of water used are not available, but would be very small in relation to Missouri River flow.

Hydroelectric power is generated at Gavins Point Dam and distributed in Nebraska and neighboring states. Two steam-electric power plants in Omaha use river water for cooling.

Omaha uses water from the Missouri River for a part of its municipal supply. The treatment plant located in the northern part of the city supplied the entire municipal supply until 1968 when a new plant which draws water from wells along the Platte River was installed. During the period 1965 through 1967, about 23 billion gallons were used annually.

Omaha has provided primary sewage treatment but operational difficulties have resulted in some by-passing. Two other towns along the river also discharge inadequately treated sewage effluent directly into the river and below the major communities problems with river pollution do arise. Under the Nebraska Water Quality Standards, by 1975 all wastes are to be given adequate treatment before discharge to the river.

The Missouri River is navigable for barge traffic from its mouth to Sioux City. The Corps of Engineers maintains the established channel depths by dredging and river training methods. The river provides an important transportation facility to the State of Nebraska, particularly to the communities that lie along the river.

The river and islands in the river provide habitat for fish and wildlife. Sportfishing and hunting are favored recreation activities on the river as are pleasure boating and water skiing. The river is also fished commercially by Nebraska residents. Estimates of present fishing use by sport fishermen are included in the Missouri Tributaries River Basin and Nemaha River Basin discussions earlier in this chapter.

Historical Flooding

Damaging floods were often experienced along the Nebraska side of the river prior to construction of upstream flood control structures on the mainstem and its tributaries. The flood of April, 1952 was one of the worst on record. The flood was caused by breakup of heavy ice cover on the river and rapid melting of an abnormally heavy accumulation of snow. The discharge at Sioux City was 441,000 cfs, maximum of record. The Missouri River at Omaha peaked at a stage height of 30.2 feet, with a discharge of 396,000 cfs, also the maximum of record. The peak at Nebraska City was 414,000 cfs and at Rulo, 358,000 cfs, both maximums of record.

Although there are major flood control structures upstream from Nebraska, uncontrolled inflow from the Platte River and those rivers flowing out of Iowa continue to pose flood threats to the mainstem in the lower part of the Nebraska reach.

CHAPTER 3. GROUND WATER

"Ground water" is subsurface water located in saturated materials below the water table that will enter freely into wells or feed springs.

An aquifer is a rock stratum that is capable of yielding water in sufficient quantities to supply pumping wells or springs. The aquifer storage coefficient is the volume of water released from or taken into storage per unit volume of aquifer with a unit change in head normal to the aquifer surface. For an unconfined aquifer, the storage coefficient equals the specific yield.

A ground water reservoir can be an aquifer, or, more commonly, several aquifers. Generally, a ground water reservoir is the water-bearing material in which water is stored and from which it can be extracted and used.

Occurrence and Availability

Nebraska has a ground water supply that is much greater than that of its neighboring states and may be as large or larger than any other state in the country per unit area. The Missouri River Basin Comprehensive Framework Study indicates that although Nebraska occupies only one-seventh of the Missouri River Basin, more than one-half of the basin's total ground water is stored in the State. The state's total water supply is quite well distributed except that surface water is more abundant in the eastern one-fourth and ground water is more abundant in the western three-fourths of the State.

Location

In Nebraska, ground water of varying quality is stored in rocks of different textures, compositions, and ages. Most of the water that has been pumped has come from a principal ground water reservoir composed of the Pleistocene undifferentiated deposits, the Pliocene Ogallala Formation, and the Miocene Hemingford-Arikaree Groups.

Map 7, a geologic profile across the southern part of the State, shows the relationship of the various geologic formations.

Map 8 shows the location of underground water areas in the State. This map was prepared at the request of the Legislature and published by the University of Nebraska Conservation and Survey Division in January, 1969. The State was divided into 13 regions to facilitate description of areas with similar ground water conditions. Descriptions of each region are provided on the binding side of the map.

Aquifer Characteristics

Aquifers of the Pleistocene, Pliocene, and Miocene ages constitute the largest reservoir of good quality ground water in Nebraska. The reservoir underlies the entire central part of the State in much of the Niobrara, North Platte, Middle Platte, Loup, Big Blue, Little Blue, and Elkhorn River Basins. The majority of ground water irrigation in the State utilizes this source of water. Large quantities of water are stored in rocks older than Miocene in age, but the quality of water is often undesirable and the rocks often do not readily yield water to wells.

Among these older rocks, the basal sand and gravelly sand of the Oligocene White River group, the sandstones of the Upper Cretaceous Lance and Fox Hills Formations, and the sandy zones in the upper part of the Upper Cretaceous Pierre Formation constitute a reservoir underlying the western one-third of the State.

Water from the Upper Cretaceous Niobrara Formation is being utilized for domestic and municipal supplies in the easternmost part of the State where the formation occurs. Here, the formation is directly overlain by much younger Pliocene and Pleistocene deposits and it was exposed to weathering for long periods of time. The weathering enlarged cracks and fractures and developed solution openings, all of which yield water to wells.

The sandstones of the Lower Cretaceous Dakota Group underlie most of the State. These sandstones yield fresh water to wells in the easternmost part of the area of their occurrence, but even here the water quality may vary. It is significant to note that these rocks contain considerable concentrations of oil and gas in western Nebraska. The Dakota Group sandstones can furnish larger fresh to brackish water supplies than they do now, particularly in the eastern part of the State.

Weathered limestones of the Permian and Pennsylvanian Systems are local sources of fresh water in places in the southeastern part of the State. Some sandstones of the Pennsylvanian System also constitute a potential, small-scale aquifer with water of undetermined quality, but probably is very highly mineralized.

The dolomites and sandstones of the Lower Paleozoic Systems are proven producers of fair quality water in the Omaha area. These rocks constitute a major aquifer that elsewhere contains water varying in quality from relatively fresh to very salty. These rocks also have small accumulations of oil and gas in some areas of the State. Greater utilization of this reservoir for fresh to brackish water supplies is definitely possible.

The characteristics of the water-bearing materials and their water supply capabilities are summarized in Table 23.

Ground Water in Storage

A large quantity of water is stored in the Quaternary, Pliocene and Miocene age materials which underlie Nebraska. Rock materials in the first three subdivisions listed in Table 23 (Pleistocene undifferentiated continental deposits, Pliocene Ogallala Formation and Miocene Hemingford-Arikaree Groups) constitute the principal storage reservoir for large quantities of readily exploitable, good quality water. The ground water reservoir ranges in thickness from 0 to 1600 feet. It has been estimated that nearly 1.9 billion acre-feet of water are stored in the beds of sand, sand and gravel, sandstone, and silty sandstone of Pleistocene, Pliocene, and Miocene ages. Fine-textured deposits of these ages, such as silt and clay, store additional quantities of water, but this water is only very slowly available to wells.

Map 9 shows an estimate of the statewide distribution of water in the coarser-textured sediments of the principal ground water reservoir. The map is based on records from approximately 3,000 test holes drilled in a systematic pattern, mostly in the eastern, central, and southern parts of the State, and on numerous other data from private well drillers. The coarser-textured, water-bearing materials were assumed to have a storage coefficient of 0.20. The map, at this scale, is of necessity highly generalized, so local areas having small amounts of ground water available for development may lie in areas mapped as having large amounts of ground water in storage.

The estimated volume of water in storage beneath each of the river basin planning areas is shown in Table 24. The table indicates that more than 60 percent of the water stored in the principal reservoir is beneath the Loup and Niobrara River Basins, which is approximately 35 percent of the total land area of the State. More than 85 percent of the water stored in this principal reservoir is beneath the Loup, Niobrara, North Platte, Middle Platte and Elkhorn River Basins, which occupy about 60 percent of Nebraska's total area.

Not all of this estimated 1.9 billion acre-feet of water in storage is physically available for development because of the drawdown limitations of pumping wells. Furthermore, by current economic standards, recovery of all the stored water is not economically feasible because of excessive depths of wells, thin, water-bearing strata, and various technical factors.

Larger quantities of water are stored in rocks older than Miocene in age. This water ranges from fresh water to brines, but is generally of questionable quality for current needs and generally is at excessive depths by current standards, which makes it costly to recover by current means. Although detailed knowledge of the quantity or quality of water in these older rocks is limited, data from oil tests and other drilling show that a huge reserve of substandard water is available for development in Nebraska.

Water Table Trend

In unconfined material, the water table is the surface along which the hydrostatic pressure is equal to the atmospheric pressure. This surface can be approximated by the elevation of water surfaces in wells

TABLE 23

CHARACTERISTICS OF WATER BEARING MATERIALS

SYSTEM	SERIES	SUBDIVISION	CHARACTERISTICS AND DISTRIBUTION	WATER SUPPLY
QUATERNARY	Pleistocene	Undifferentiated continental deposits	Stream-deposited silt, clay, sand, and gravel; wind-deposited silt and sand; and glacial deposits. Occurs throughout most of the state except for the panhandle.	A major source of water in Nebraska. Yields large quantities to wells in Loup, Elkhorn, Mid-Platte, Big Blue, and Little Blue Basins and in the far eastern part of the Republican Basin. Also yields large quantities to wells on floodplains and terraces of major streams in other basins. Buried, stream-laid sand and gravel deposits in eastern Nebraska furnish large yields to wells in places. Water occurring in Pleistocene deposits usually contains less than 700 ppm total dissolved solids and is of calcium bicarbonate type.
TERTIARY	Pliocene	Ogallala Formation	Mostly stream-deposited silt, clay, sand and gravel, often indurated or cemented with calcium carbonate to form siltstone, sandstone, or sandy limestone. Occurs throughout much of the state except for the eastern one-third and the northwestern part.	A major source of water in Nebraska. Yields large quantities to wells in much of the Loup Basin and in parts of the following basins: Niobrara, Elkhorn, Mid-Platte, South Platte, and Republican. Chemical characteristics of water contained in the formation are generally similar to that in overlying Pleistocene deposits. Potential for developing more supplies is great.
	Miocene	Hemingford-Arikaree Groups	Mostly sandstone, silty sandstone, sandy siltstone, and siltstone. Occurs principally between the Pine Ridge escarpment and the North Platte River valley in western Nebraska, and perhaps extends eastward as far as west-central Nebraska. Occurs in channel fills in southwestern part of panhandle.	A major source of water in northwest Nebraska. Yields large quantities to wells in Box Butte, southeastern Dawes, and west-central Sheridan Counties. Water contained in these rocks probably varies in quality, but known supplies generally contain less than 500 ppm total dissolved solids, is generally hard, and is of calcium bicarbonate type.
	Oligocene	White River Group	Basal deposits of sand and gravelly sand, in places, overlain by thick sequences of clay, claystone, silt, and siltstone. Underlies the western one-third of the state except for the extreme northwest corner.	Basal sand and gravelly sand is a source of water to some wells in the North Platte River valley and a very few wells in the South Platte and White and Hat Basins. Cracks, fractures, and "pipes" in the uppermost siltstone supplies water to irrigation and municipal wells in Lodgepole Creek valley. Pumpkin Seed Creek valley, and perhaps the North Platte River valley. Water pumped in these areas is comparable in quality to that in younger deposits. Water contained in basal sand and gravelly sand has much larger concentrations of total dissolved solids, is generally softer, and has larger concentrations of sodium, bicarbonate, sulfate, and chloride ions. Potential sodium and boron hazards exist for crop use.
CRETACEOUS	Upper Cretaceous	Lance and Fox Hills Formations	Sandstone with interbedded clay and shale. Occurs in southwestern part of panhandle.	Potential source for limited supplies in area of occurrence. Used as a source of water in places in eastern Wyoming where the water is of sodium bicarbonate type and usually contains about 1000 ppm total dissolved solids.
		Pierre Formation	Mostly black to gray shale with a few thin chalky zones and thin sandstones. Upper part is silty to sandy in southwest part of panhandle. Underlies the western two-thirds of Nebraska except for a belt extending from Western Furnas and eastern Red Willow counties, at the south, to northeastern Sheridan County, at the north.	Not considered a source of water except in the southwestern part of the panhandle. Wells in this area pump water from sandy and silty shale for secondary oil recovery. The water from one of these wells contained 1720 ppm total dissolved solids and was of the sodium chloride type.

TABLE 23 (Page 2)

SYSTEM	SERIES	SUBDIVISION	CHARACTERISTICS AND DISTRIBUTION	WATER SUPPLY
CRETACEOUS	Upper Cretaceous	Niobrara Formation	Mostly cream-colored to gray chalk, shaly limestone, and limy shale. Underlies the western three-fourths of the state.	Capable of yielding small to large quantities to wells from solution cavities, fractures, and vugs in areas where the unit has been exposed to long periods of weathering. Source of water for some municipal and domestic wells in south-central and east-central Nebraska. Can be considered a limited aquifer in areas where directly overlain by Pleistocene or Pliocene deposits. This area includes a belt from Franklin, Webster, and Nuckolls Counties, at the south, to Cedar County at the north. Quality of water in these areas would be similar to that in overlying deposits except that it may be somewhat harder.
		Carlile, Greenhorn, and Graneros Formations	Mostly black to gray shale and limy shale with prominent shaly limestone unit. Can have sandstone beds near top of sequence. Underlies state except for the eastern and southeastern parts.	Small-yield wells are developed from upper sandstone beds, where they occur, or from weathered limestone in eastern part of area of occurrence. Quality of water from such wells depends on overlying and surrounding rocks, but generally is moderately mineralized.
	Lower Cretaceous	Dakota Group	Sandstone with clay, claystone, siltstone and sandy silt. Underlies state except for southeastern part and a belt along the Missouri River north to Thurston County.	An important local source of water in parts of eastern Nebraska and an oil and gas producing sequence in the panhandle. Can yield small to large quantities of water to wells and is used for domestic and municipal supplies in eastern part of the state. Chemical quality of water varies from less than 700 ppm total dissolved solids, in places, to more than 30,000 ppm in others. Potential for development not determined, but known areas of good quality water in eastern Nebraska not fully utilized.
Jurassic-Triassic Systems			Shale and silty shale, with some fine-grained sandstones and thin limestones. Underlies much of the western half of the state.	Possible potential for developing limited supplies from sandstones. Quality of water undetermined, but probably has large total dissolved solids concentration.
Permian System			Shale with interbedded limestone and some sandstone. Underlies most of the state except for the northeastern one-third and parts of the east and south-east.	Fractured and weathered limestones yield water to some domestic and municipal wells in the southeastern part of the state. Quality of water depends on relations to overlying and surrounding rocks, but generally is highly mineralized.
Pennsylvanian System			Interbedded shale and limestone with some sandstone. Underlies all but the northeastern part of the state.	Fractured and weathered limestones may yield some water to domestic wells in the southeastern part of the state. Sandstones may furnish water to wells in places and are potential but limited aquifers. Quality of water similar to Permian rocks, or more mineralized.
Lower Paleozoic Systems			Thick dolomites with some limestone, shale and sandstone. Underlies most of the eastern half of the state, the southwestern part of the state, and the northwest corner of the panhandle.	Large potential for developing additional quantities of lower quality water. Some sections of dolomite and the lower sandstones yield water to wells in the Omaha area, and the entire unit forms a major water-producing unit in states immediately east and northeast Total dissolved solids content may range from less than 1000 ppm to more than 20,000 ppm.
Precambrian System			Igneous, metamorphic, and sedimentary rocks. Underlies the entire state.	May have a limited potential for yielding water to wells in small areas.

Source: Conservation and Survey Division, University of Nebraska

TABLE 24

ESTIMATED VOLUME OF GROUND WATER IN STORAGE

River Basin	Estimated Volume of Ground Water in Storage in Acre-Feet
White River-Hat Creek	1,400,000
Niobrara	500,000,000
Missouri Tributaries	13,000,000
North Platte	160,000,000
South Platte	20,000,000
Middle Platte	140,000,000
Loup	670,000,000
Elkhorn	150,000,000
Lower Platte	26,000,000
Republican	110,000,000
Little Blue	28,000,000
Big Blue	49,000,000
Nemaha	7,600,000
TOTAL	1,875,000,000

Source of Data: Conservation and Survey Division, University of Nebraska

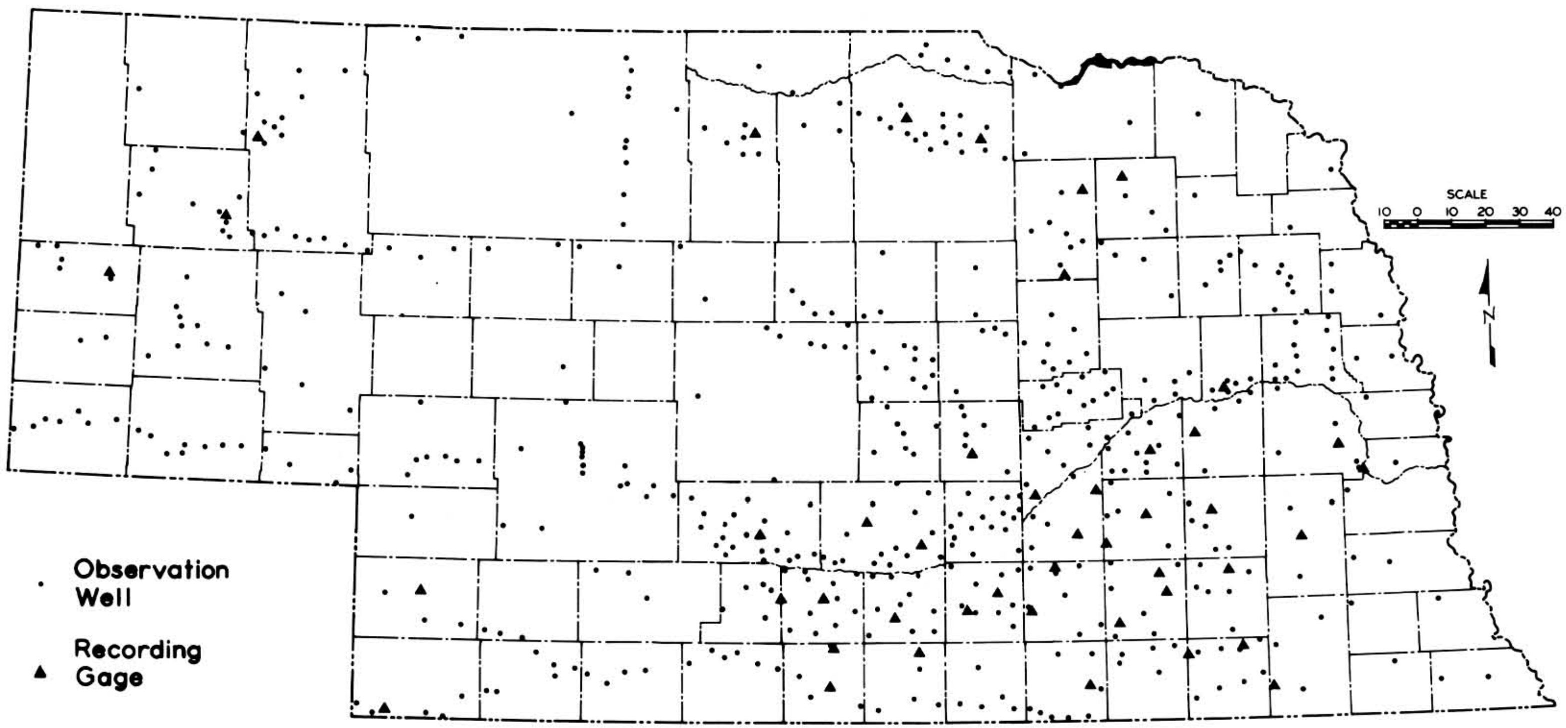
which penetrate a short distance into the saturated zone of water-bearing materials. Elevation of the water table in much of Nebraska is being observed and recorded by the U. S. Geological Survey in cooperation with the Conservation and Survey Division, University of Nebraska. Observations are made through a system of wells, of which many have been measured for more than 20 years and some since 1934. Figure 10 shows the location of observation wells in use as of January, 1970.

Throughout most of Nebraska the water table remains at a relatively constant level and fluctuates mostly in response to precipitation. There are some areas, however, where the water table has either consistently risen or declined over a period of years. Areas where the rise or decline has been five feet or more during the period of observation are shown on Figure 11.

Four areas in the State are experiencing a decline in the ground water table. Recent observations indicate a fifth area, in Chase County, is also starting to decline. Generally, in each area, little or no natural discharge can be salvaged by pumping wells and the amount of recharge from precipitation is small, so water must be withdrawn from storage.

The largest of the four areas is located in the Big and Little Blue River Basins and extends through parts of Adams, Clay, Fillmore, Thayer, Saline, Hamilton, York, Seward, Polk, and Butler Counties. The amount of

LOCATION OF OBSERVATION WELLS

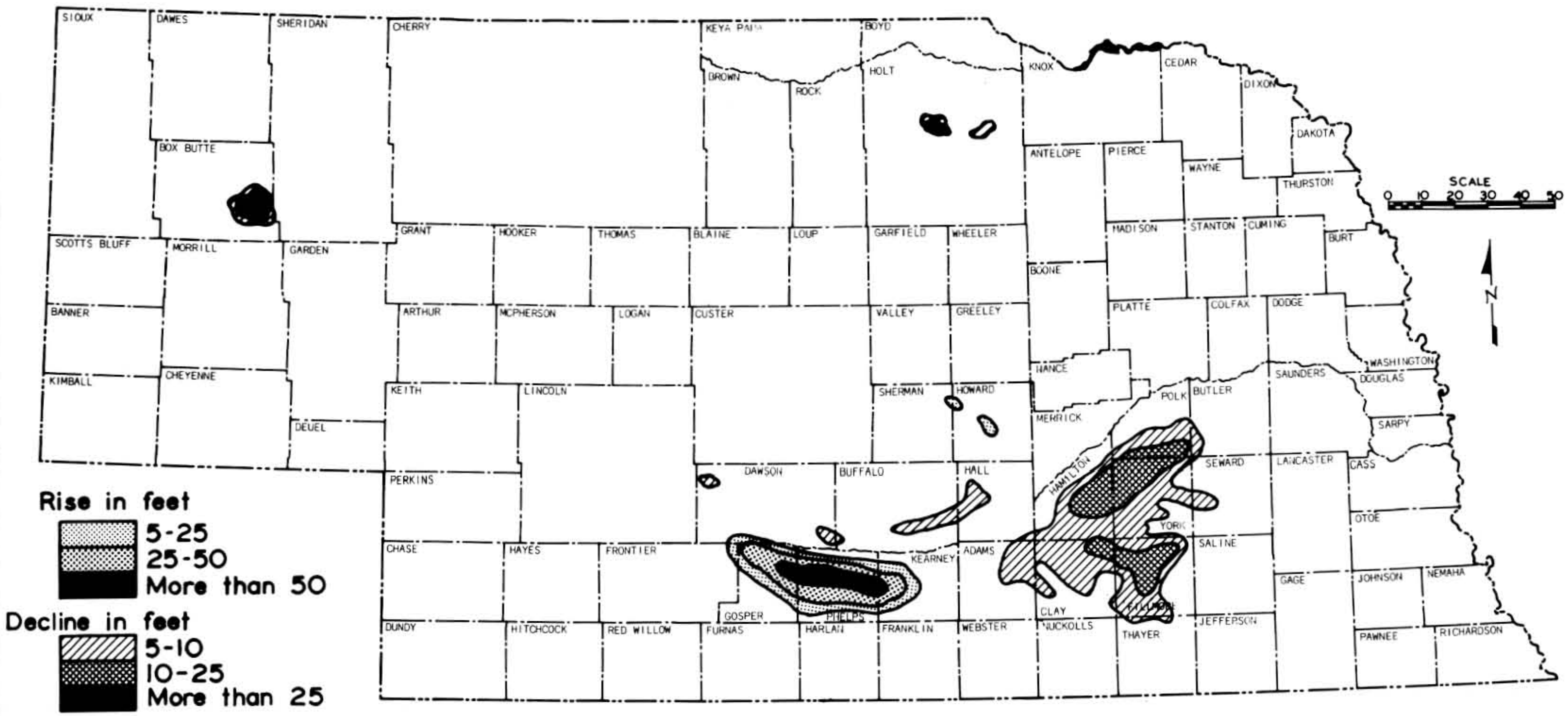


Source: Conservation & Survey Division, University of Nebraska

Fig. 10

AREAS WHERE GROUND WATER LEVELS HAVE RISEN OR DECLINED FIVE FEET OR MORE

During period of record ending in 1969



Source: Conservation & Survey Division, University of Nebraska

Fig. 11

recharge through precipitation in this area is relatively small, and because of the geologic and hydrologic conditions, much of the irrigation water pumped is being taken from storage. Hydrographs showing the water table trend for two wells in the area are shown on Figures 12 and 13.

Another area where ground water levels have declined more than five feet occurs along the northern edge of the Platte Valley in Dawson, Buffalo, and Hall Counties. Here many irrigation wells are concentrated on the flood plain and associated terraces and large quantities of water have been pumped for irrigation. The depth to water, however, is usually less than 30 feet and is often less than 15 feet. Large withdrawals of water by wells have salvaged water that would ordinarily escape from the reservoir by natural means. This circumstance has limited the decline of water levels, and the greatest declines have occurred on terraces to the north of the river where the depth to water is greater and the water-bearing materials are thin. Figure 14 is a hydrograph showing the water table decline in the area.

An area around Alliance in southeastern Box Butte County has experienced the greatest water table decline. In some places, the water table has lowered 40 feet since observations were begun in 1946. There is very little recharge to ground water in this area, so essentially all water pumped comes from storage. The decline for one well in the area is shown on Figure 15.

A small area in Holt County has also experienced a decline of 10 to 15 feet in recent years. Conditions causing the decline here are similar to that in Box Butte County.

Two areas in the State are experiencing a rise in the water table. These areas are shown on Figure 11. The largest covers parts of Dawson, Frontier, Gosper, Phelps, and Kearney Counties. The rise in the water table began in this area after introduction of surface irrigation water by the Central Nebraska Public Power and Irrigation District in 1941. Part of the water used for irrigation enters the ground water reservoir by deep percolation and, because of the slow lateral movement out of the area, reservoir storage has increased. Water table fluctuations are shown for one well in the area on Figure 15.

In some areas of Phelps and Gosper Counties, the water table has risen as much as 70 feet since 1945. There are reports of a 90 foot rise since the beginning of project operation. Many low areas are becoming water-logged and the water table is now at or near the ground surface during wet periods.

The second area, located in Sherman and Howard Counties, is within the area irrigated by the Bureau of Reclamation's Farwell Unit. A rise in the water table of 10 to 15 feet has been recorded in several places, but the area affected remained very small until about two years ago.

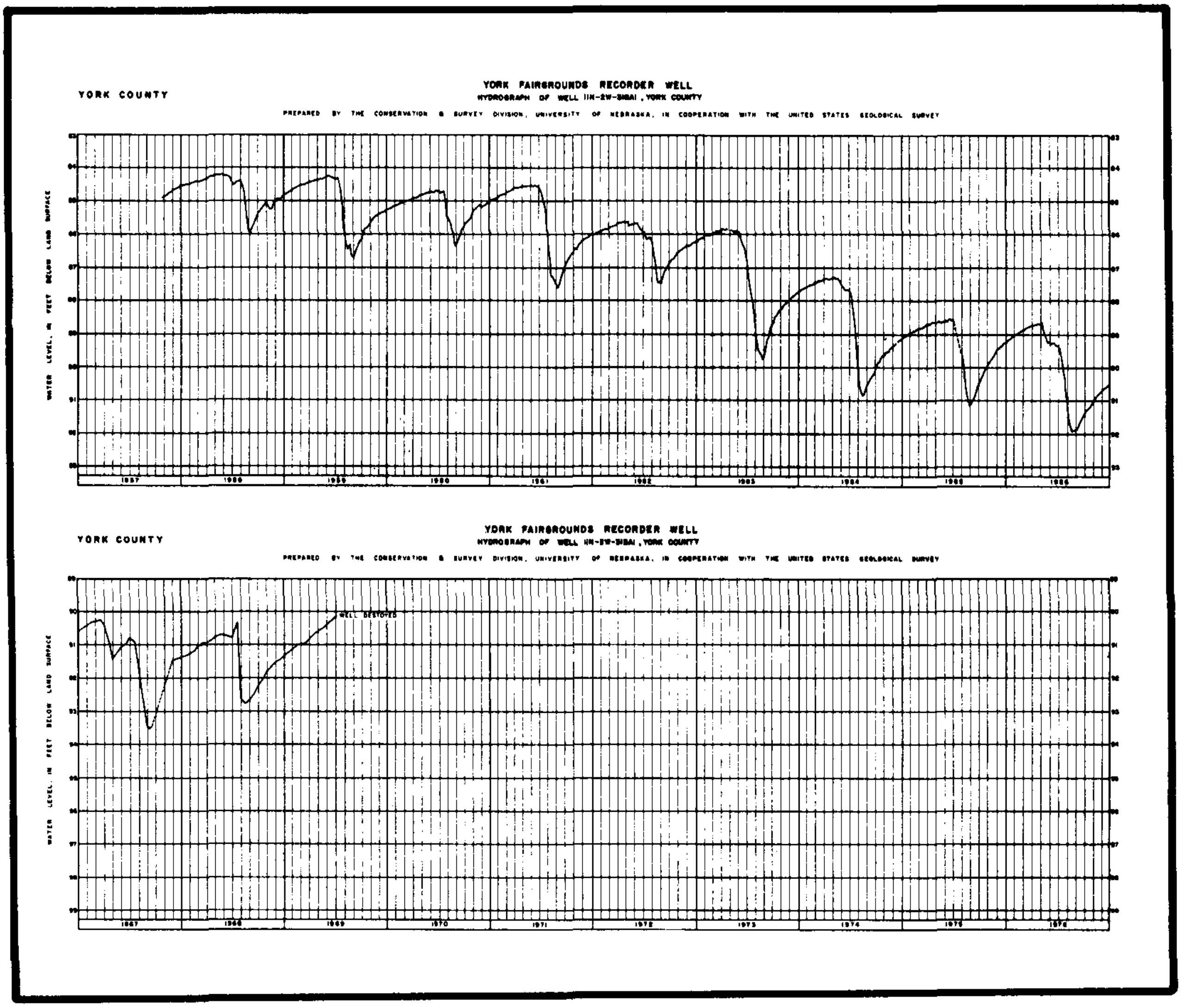


Fig. 12. HYDROGRAPH OF WELL 11N-2W-31BA1

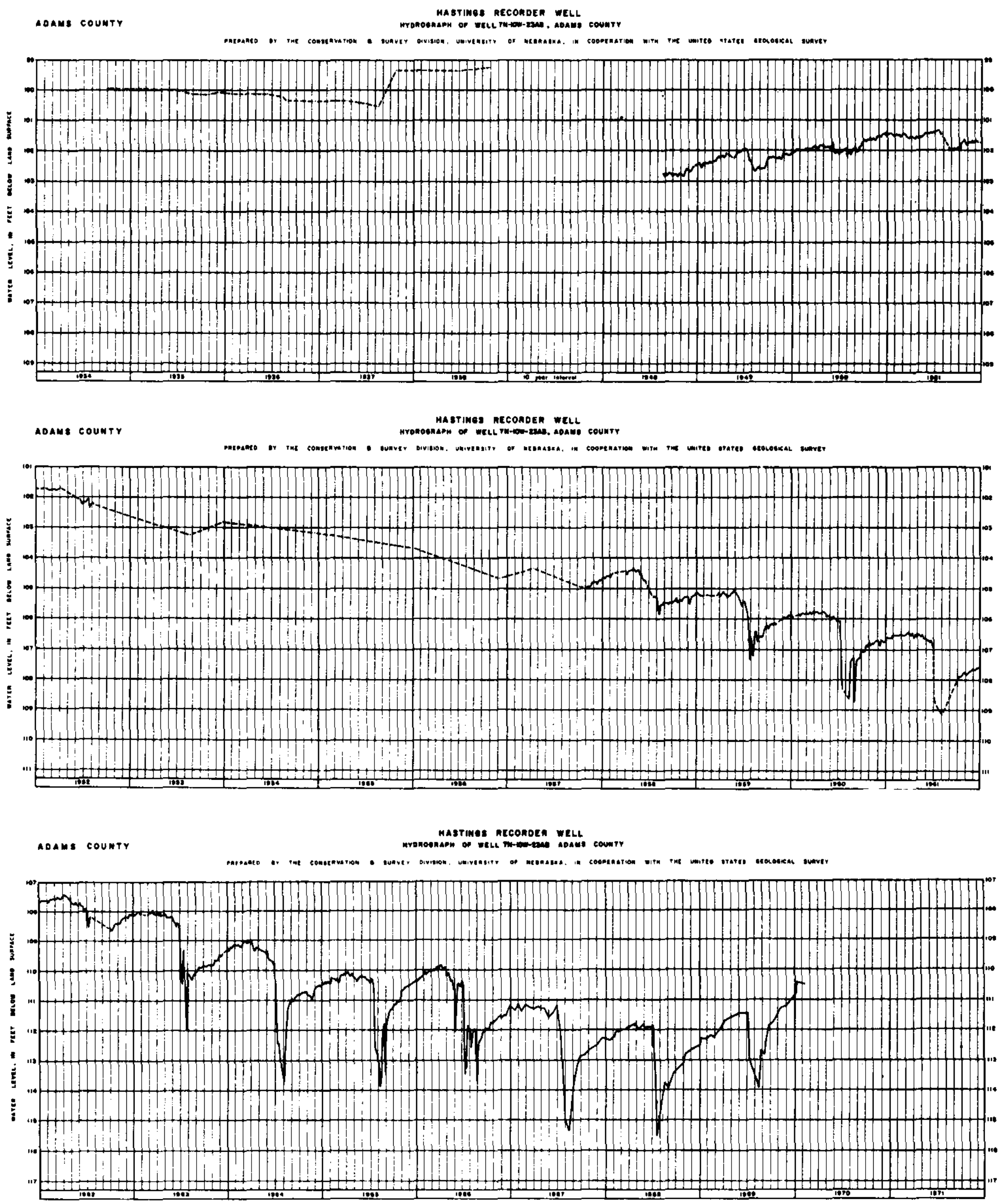
Ground Water Quality

Ground water which occurs at comparatively shallow depths in Nebraska is of good quality for the most part, and averages about 400 mg/l (milligrams per liter) of total dissolved solids, but is moderately hard. Chemical quality of the ground water is related to the amount and quality of recharge water and the nature of the materials through which it moves and is stored.

Areas of poor quality ground water occur in some valleys of western Nebraska because of poor quality surface water carried in the North and South Platte Rivers as a result of irrigation return flows and because of the concentration of salts by evapotranspiration in shallow water table areas. Generally poor quality ground water occurs in the shale and clay land of the extreme northwest part of the State. Wells in the

Fig. 13

HYDROGRAPH OF WELL 7N-10W-23AB



NOTE: Hydrograph reflects pumpage of City of Hastings wells

Fig. 14

HYDROGRAPH OF WELL 9N-14W-1DC

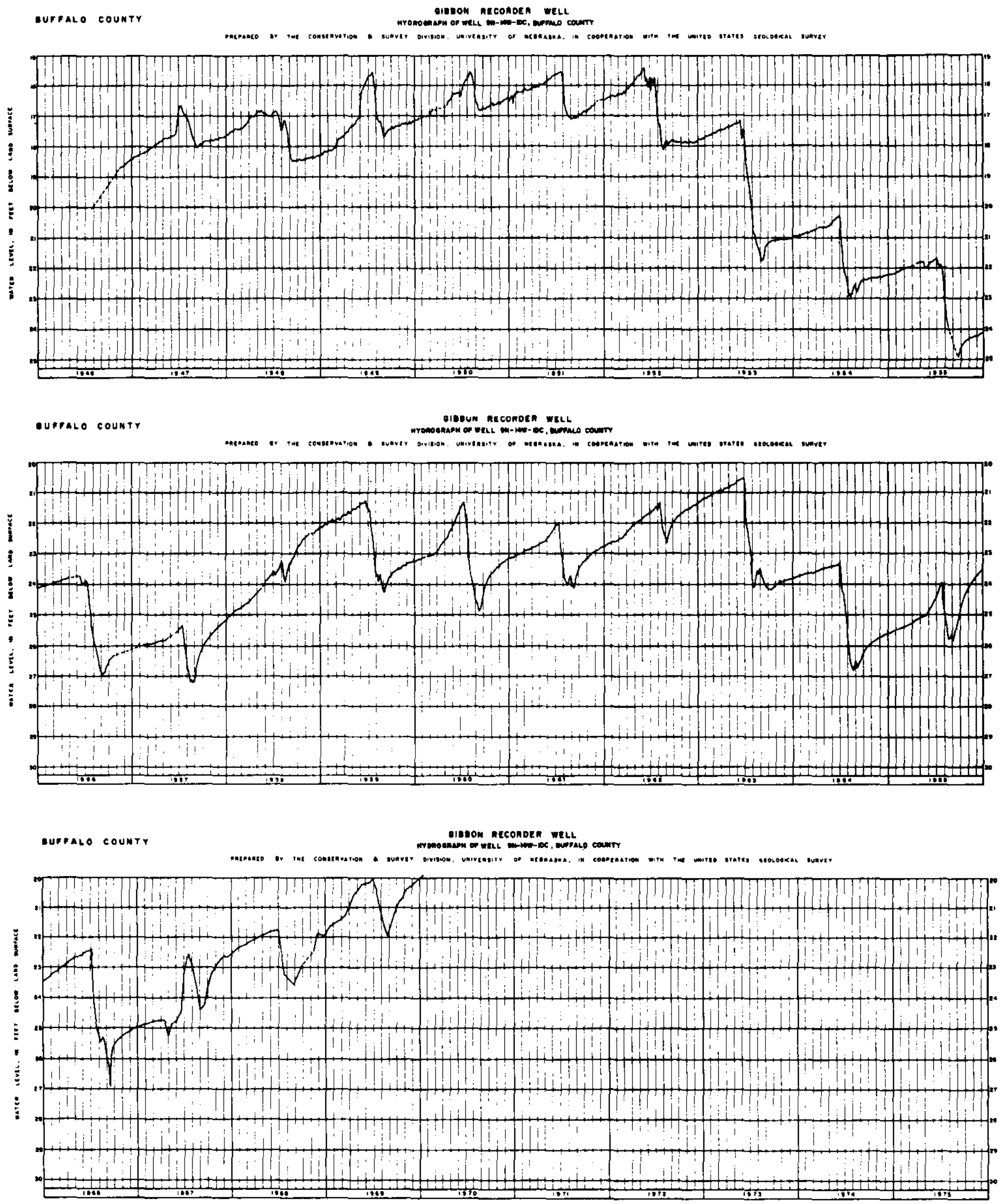
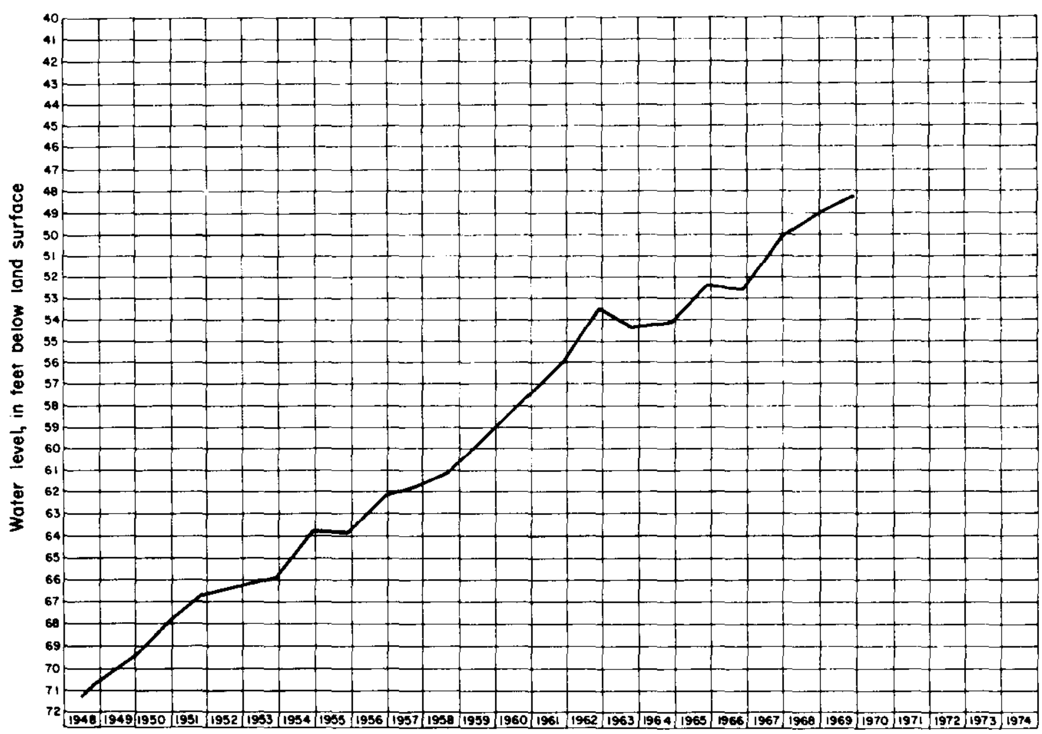


Fig.15

HYDROGRAPHS OF WELLS 25N-48W-4DDD1 AND 6N-15W-1CB

Hydrograph of water-level fluctuations in well 25N-48W-4DDD1, Box Butte County, Nebr.



Hydrograph of water-level fluctuations in well 6N-15W-1CB, Kearney County, Nebr.

eastern part of the State which are developed in materials of low permeability or in sandstones of the Dakota Group generally have the largest concentration of total dissolved solids. The eastern part of the State has some high concentrations of iron and manganese due to the geologic environment.

Ground water has been contaminated in isolated locations by infiltration of surface water containing raw sewage or chemical wastes. In some areas contaminated surface water is discharged into wells as a means of drainage. Household detergents are becoming a problem in Nebraska as they are in many other states. Brines from oil fields and other industrial wastes are discharged into streams and have contaminated or may contaminate the adjacent ground water, as well as render the surface water less readily usable for ordinary purposes. Chemical fertilizers, though not "wastes," contribute to mineralization of ground water in some areas. The problems are not yet critical in Nebraska, but with the growth of population and industry in some areas, they are bound to increase.

Biological

The ground water in Nebraska, for the most part, is free of biological contamination. Where problems have occurred, it was generally found that the cause was not the aquifer but rather other factors such as improper waste disposal, poor design and/or construction of sewer and water systems, and others. It is noteworthy that where biological contamination has occurred, it is a local situation and does not involve an extensive area.

Because the majority of the population and industry is in the eastern third of the State and because of the characteristics of the aquifers, this area is and will become even more susceptible to biological contamination.

Chemical

The chemical characteristics of ground water in the aquifers will vary from area to area. The major constituents of water in the principal reservoir are calcium and bicarbonate ions. The concentration of total dissolved solids is generally less than 700 mg/l in nearly all of the State. Map 10 shows the approximate chemical quality of the ground water, as indicated by specific conductance measurements converted to milligrams per liter total dissolved solids, from wells generally less than 400 feet in depth. Ground water in deeper parts of the reservoir probably contains more total dissolved solids than the map indicates, but little information is available on the actual composition of the water.

In all parts of the State except the eastern one-quarter and the extreme northwest corner, the map shows mineral concentrations of water in at least the upper part of the principal reservoir. In the eastern one-third of the State, samples were taken from shallow to moderately deep wells which draw water from Pleistocene sand and gravel deposits that form one part of the principal reservoir, and from a variety of other rock subdivisions. In this area, the map reflects the quality of water associated with complex geologic and reservoir conditions, and no simple chemical-quality patterns are evident. As the principal reservoir does not occur in the extreme northwest corner of the State, the map shows the quality of water from rock subdivisions other than those constituting the principal reservoir.

Areas of larger than usual concentration of total dissolved solids occur in alluvial deposits of the principal reservoir in the North Platte, South Platte, and Republican River valleys. These areas generally correlate with areas where stream water is diverted and used for irrigation in states to the west, and this water usually contains larger concentrations of total dissolved solids, chlorides, and sulfates than occur locally. Thus, because part of the applied water infiltrates to the ground water reservoir, water pumped from wells reflects the increased concentration of dissolved minerals.

The concentration of total dissolved solids in rocks of Miocene (Tertiary) Age and older ranges from about 700 mg/l to 30,000 mg/l. Water in the basal sand and gravelly sand of the Oligocene White River Group, the sandstones of the Upper Cretaceous Lance and Fox Hills Formations, and the silty and sandy portions of the upper part of the Upper Cretaceous Pierre Formation in western Nebraska generally ranges from 1000 to 2000 mg/l total dissolved solids. Sodium and bicarbonate ions are the most common constituents of water from these rocks, and chloride, sulfate, and boron concentrations generally exceed those in water from Pleistocene, Pliocene, and Miocene deposits. The sodium and boron concentrations would constitute hazards to crops if the water were used for irrigation, and in places the quality of water is often undesirable for domestic uses.

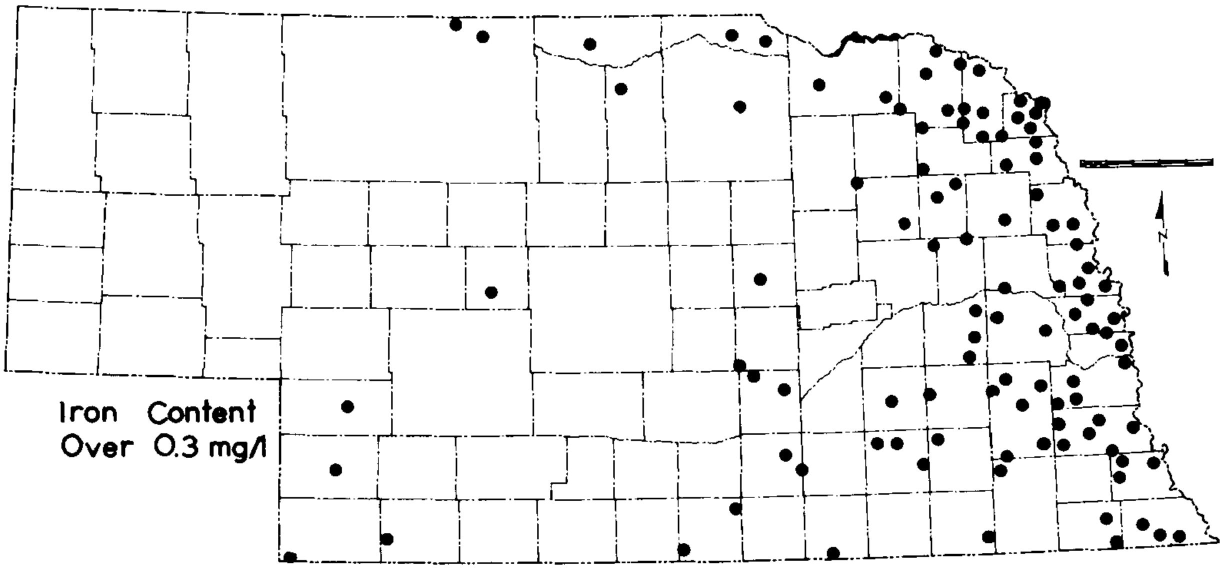
The Upper Cretaceous Niobrara Formation, where water is pumped from it, produces water similar in quality to that in the principal reservoir of younger rocks. In areas where the formation is deeper and not directly overlain by the younger rocks, the quality of water would be generally undesirable for most purposes. Water in the sandstones of the Dakota Group ranges from about 700 mg/l to 30,000 mg/l of total dissolved solids, with fresh water occurring within short distances of saline water, especially in the eastern part of the State. Sandstones and weathered limestones of the Permian and Pennsylvanian Systems contain water that ranges greatly in total dissolved solids, but on a statewide basis it is highly mineralized. Total dissolved solids concentration of water in rocks of the Lower Paleozoic Systems similarly varies greatly, but probably ranges from about 1000 mg/l to 20,000 mg/l.

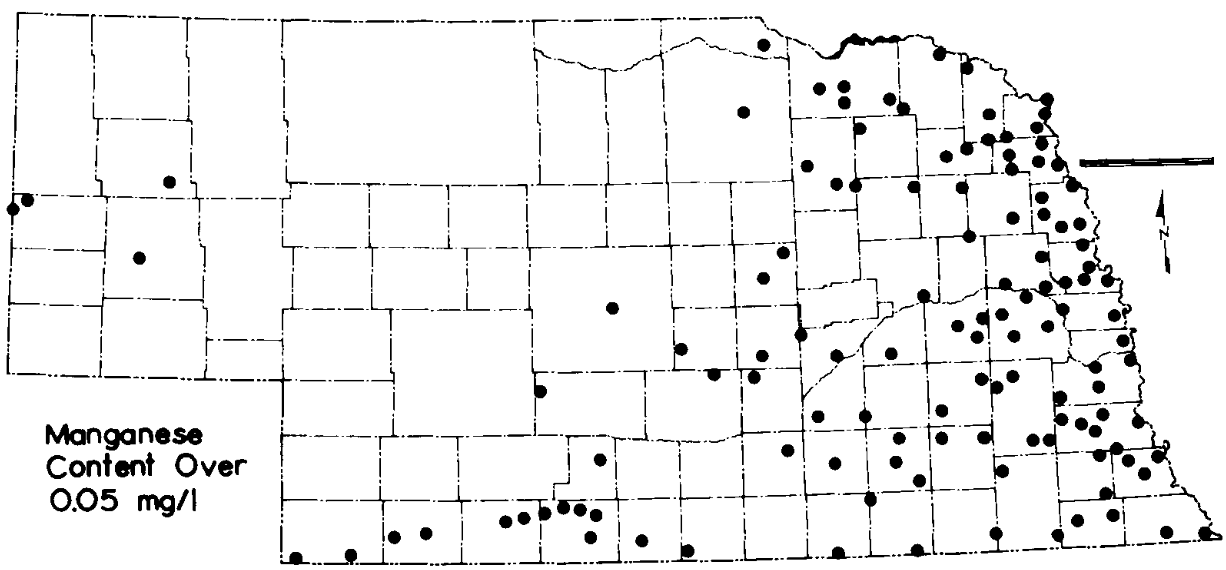
For domestic supplies, iron and manganese are high in many parts of the State. Figure 16 shows areas where iron in excess of 0.3 mg/l and manganese in excess of 0.05 mg/l have been found in municipal well water. The figure shows that concentrations of these minerals are highest in the eastern part of the State and in the Republican River Basin.

Hardness also affects the suitability of water for domestic use.

Fig. 16

LOCATION OF MUNICIPAL WELLS WITH HIGH IRON OR MANGANESE CONTENT





Source of Data: Chemical Analyses of Nebraska Municipal Water Supplies, Nebr. Dept. of Health, Jan. 1969

Hardness of ground water in Nebraska is highest in an area 50 to 70 miles wide along the eastern border of the State. In this area, hardness ranges from about 100 to 800 mg/l with an average of about 400 mg/l. In the Big and Little Blue River drainage basins, hardness ranges from about 100 to 500 mg/l with an average of about 250 mg/l. In the main Republican River drainage area along the Kansas border, hardness ranges from 250 to 500 mg/l and averages about 350 mg/l. Ground water hardness in the Sandhills ranges from about 70 to 160 mg/l and averages about 100 mg/l. In the fringe area surrounding the Sandhills which makes up the remainder of the State, hardness ranges from about 140 to 500 mg/l with an average of about 280 mg/l.

Physical

Ground water in Nebraska generally contains no sediment and is quite clear. It is common, however, that ground water, under specific circumstances, will precipitate minerals. In cases where ground water has a color or tint, this is usually caused by precipitation of minerals or bacteria.

The major sources of odors in ground water are caused by decomposition of iron bacteria, sulfides derived from organic sources, organic solutions, and the decomposition of sulfate-reducing bacteria.

The temperature of ground water remains fairly constant in its natural environment as it is not subject directly to the atmosphere. The average temperature of ground water in Nebraska is about 55 degrees Fahrenheit.

Nearly all of Nebraska's ground water has low turbidity (cloudiness). There is no turbulence in ground water because its movement is extremely slow, generally only a few feet per day. Any solid sediments that are contained in ground water when pumped from wells are usually caused by mechanical problems, such as an underdeveloped or poorly developed well or a well not properly constructed to fit the geologic conditions.

Utilization

In Nebraska, ground water is used mainly for irrigation, for cooling in steam-electric power plants, and for municipal and domestic supplies. Some ground water is also used for industry and manufacturing and for stockwater.

In this section, each use of ground water is discussed on a statewide basis, followed by short discussions of uses within each of the 13 river basin planning areas.

Irrigation

Around thirty-five years ago, the ground water resources of Nebraska were used almost wholly for municipal, domestic, and livestock supplies. At the present time, however, irrigation is by far the largest user of ground water and the development of ground water for irrigation has doubled in the past fifteen years.

The rate of installation of wells in the past has generally followed precipitation patterns. In dry periods the installation of wells is accelerated and during wet periods the number of wells installed decreases. This is illustrated by Figure 17 which shows the number of wells installed each year since 1940. Only wells registered with the Nebraska Department of Water Resources are included. Wells installed but not registered are not included and in some areas it is estimated that up to 20 percent of the operating wells are not registered. The dry period in the middle 1950's is easily recognized by the large number of wells installed and registered and the wet period in the early 1960's is characterized by a low rate of installation.

Irrigation well registrations with the Nebraska Department of Water Resources totaled 32,430 on January 1, 1969. The distribution of these wells by county is shown on Figure 18. The number of wells installed and registered during 1968 is also shown.

Map 11 shows the density of registered irrigation wells throughout the State. The total number of wells registered in each of the river basin planning areas is also shown on the map. The highest density of wells occurs in the Middle Platte River Basin north of the Platte River, where there are 9 to more than 12 wells per square mile over much of the area. There are 5 to 8 wells per square mile in part of the Upper Big Blue River Basin and generally less than 4 wells per square mile over the other areas of the State that are irrigated from ground water.

Map 12 shows areas of the State with potential irrigation well yields of less than and greater than 500 gallons per minute. The areas shown on the map are general and should not be interpreted to mean that it is impossible to develop wells with greater or lesser yields than indicated for a specific area.

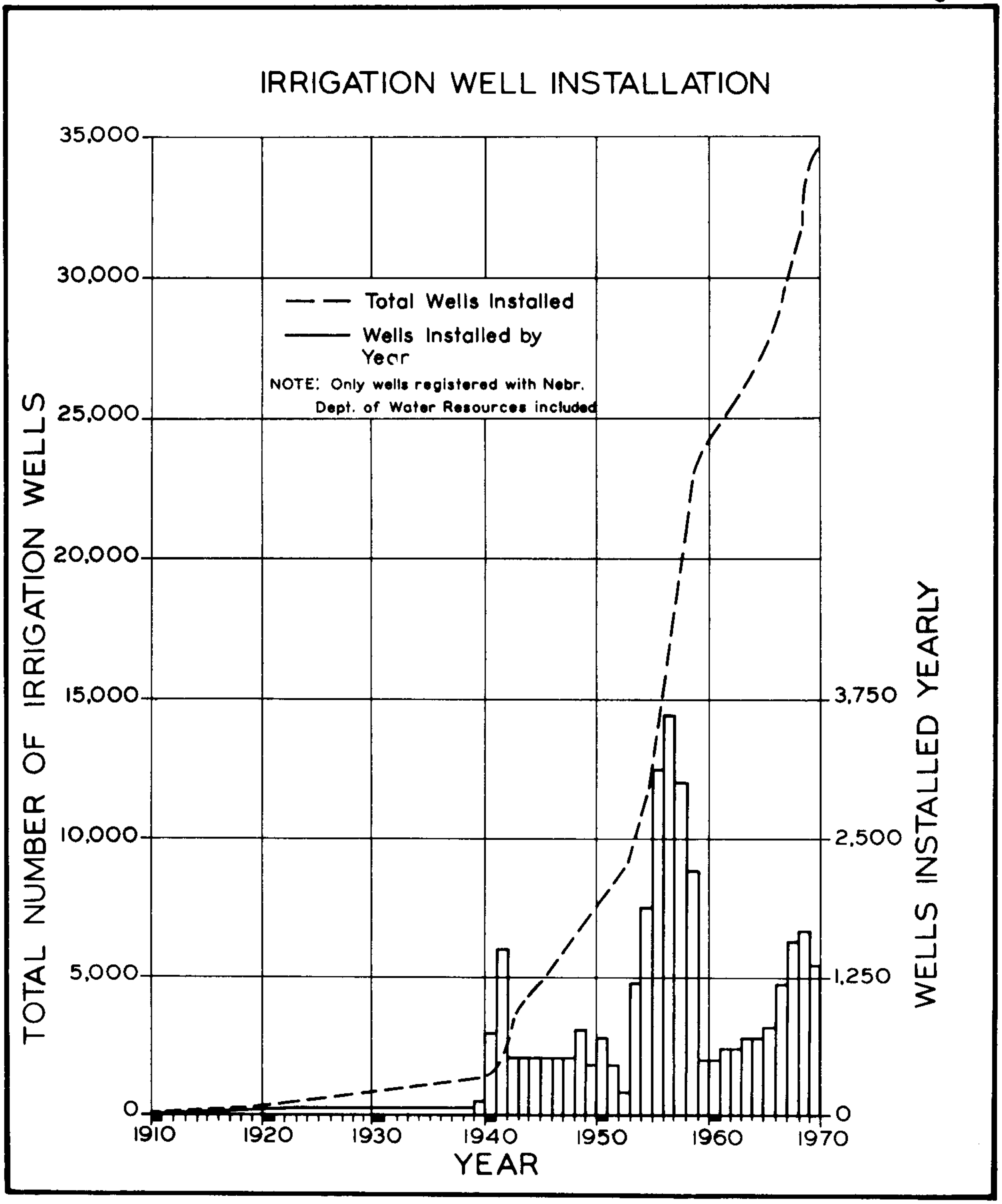
The amount of ground water consumptively used in each year is highly variable. During years of high precipitation there is little or no consumptive use of ground water in many areas and during dry years consumption of twice the average annual use may be experienced. In order to estimate the present average annual consumptive use of ground water for irrigation, the following assumptions were required:

(1) Irrigation wells in most of the river basins are capable of supplying and are supplying an adequate water supply for an average of 100 acres, except in the Lower, Middle, North and South Platte River Basins, where 60 acres were assumed, 80 acres in the Missouri River Tributaries Basin, and 60 to 100 acres in the Nemaha River Basin.

(2) Fifty percent of the long-term average annual precipitation in each county was considered effective for crop production.

(3) The difference between effective precipitation and 24-inch

Fig. 17



IRRIGATION WELL INSTALLATION
Total Wells Installed
Wells Installed by Year
NOTE: Only wells registered with Nebr. Dept. of Water Resources included
TOTAL NUMBER OF IRRIGATION WELLS
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
WELLS INSTALLED YEARLY
3,750
2,500
1,250
0
1910
1920
1930
1940
1950
1960
1970
YEAR

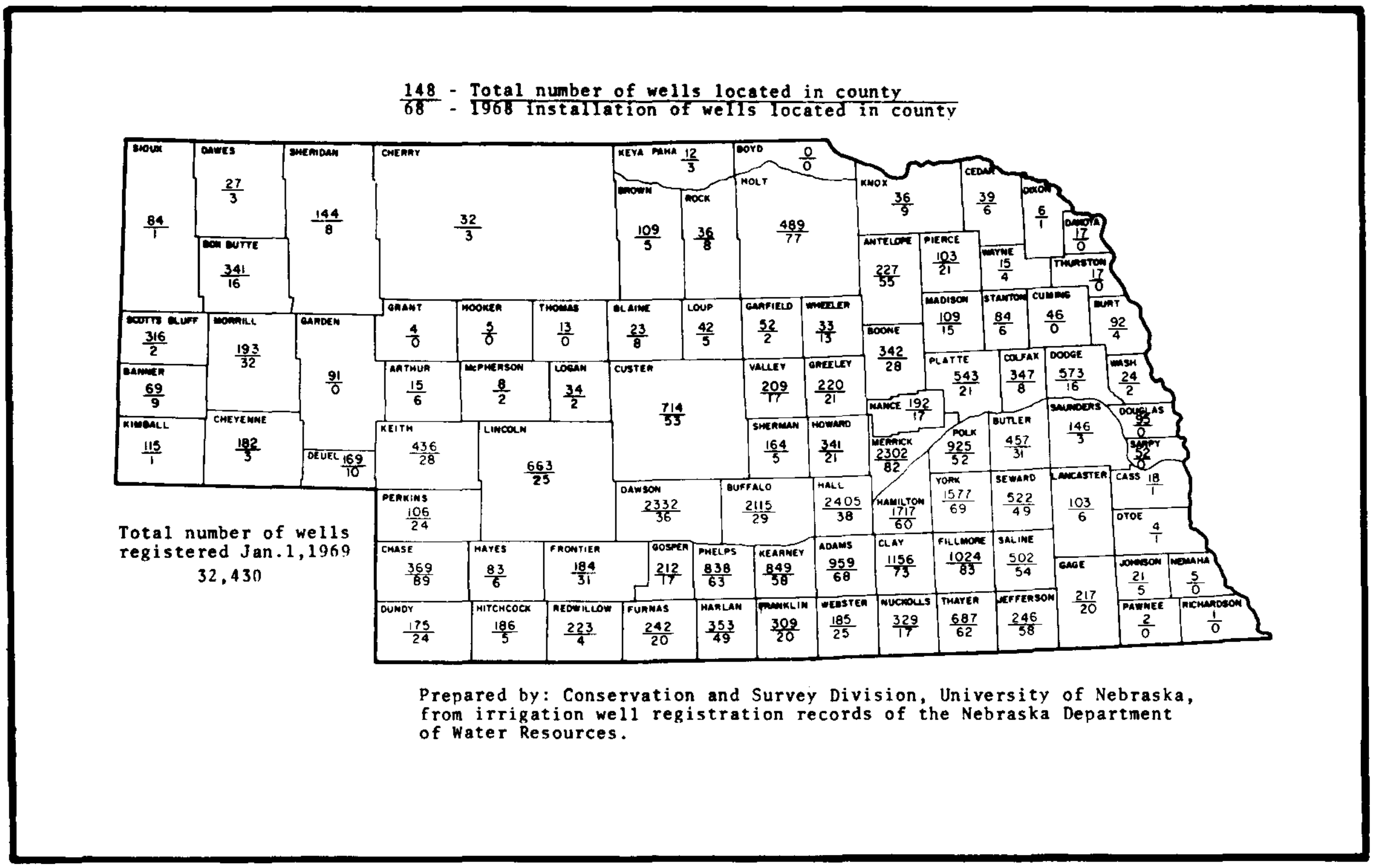


Fig.18 NUMBER OF IRRIGATION WELLS BY COUNTY

requirement for adequate crop production was assumed to be pumped from ground water in areas irrigated from ground water.

The acreage irrigated from ground water was computed for each county using the number of wells registered on January 1, 1968, and the assumed acreage irrigated from each well. Consumptive use of ground water was then computed by using the difference between effective precipitation and crop requirement and applying it to the area irrigated. Table 25 shows the estimated consumptive use of ground water in each basin based on 1968 level of development.

Domestic

Nearly all domestic water used in Nebraska comes from ground water. Only two towns - Craford and Omaha - get part or all of their municipal and domestic supplies from surface water. Most rural users also have wells for their supply.

To estimate domestic use of ground water, the users were divided into three groups:

TABLE 25

ESTIMATED ANNUAL CONSUMPTIVE USE OF GROUND WATER FOR IRRIGATION

(January 1968)

River Basin	Estimated Average Area Irrigated Annually (Acres)	Estimated Annual Consumptive Use (Acre-Feet)
White River-Hat Creek	1,000	1,300
Niobrara	83,200	114,500
Missouri Tributaries	12,100	11,000
North Platte	23,800	66,100
South Platte	44,600	66,600
Middle Platte	562,900	661,000
Loup	232,400	258,600
Elkhorn	86,400	84,100
Lower Platte	86,300	78,100
Republican	211,100	287,200
Little Blue	270,000	258,700
Big Blue	629,500	607,400
Nemaha	3,400	2,600
STATE TOTAL	2,246,700	2,497,200

Source of Data: Conservation and Survey Division, University of Nebraska

(1) Urban -- those people living in communities with a population over 2,500.

(2) Rural -- Non-farm -- people living in communities with a population less than 2,500 and those living in rural areas but not engaged in farming.

(3) Farm -- those living on farms and engaged in farming as an occupation.

Population estimates from the 1960 census were used to estimate present use by applying 150 gallons per capita per day to urban users, 100 gallons to rural - non-farm, and 75 gallons to the farm population. The total amount of ground water used for domestic purposes in Nebraska is estimated to be about 142,600 acre-feet per year. Much of this water, of course, is discharged to the stream system after use and part returns to ground water. Estimates of annual use by basin are shown in Table 26.

Industrial

Much of the water used by industry is supplied from ground water by either municipal systems or private wells. The water requirement per

TABLE 26

ESTIMATED PRESENT ANNUAL GROSS GROUND WATER WITHDRAWAL
(Acre-Feet)

River Basin	Irrigation (Thru 1967) a/	Domestic (1960 Census) Urban b/	Rural Non-Farm b/	Farm	Indus-trial (1968)	Power (For Cooling) (1968)	Live-Stock (1966)	Total
White R.-Hat Cr.	1,300	900	100	400	---c/	---	400	3,100
Niobrara	114,500	1,800	1,700	1,700	200	14,600	6,700	141,200
Missouri Tribs.	11,000	8,000	6,000	2,200	85,200	---	6,500	118,900
No. Platte	66,100	5,900	2,100	1,500	20,900	18,600	3,700	118,800
So. Platte	66,600	2,800	1,200	600	6,300	---	1,300	78,800
Middle Platte	661,000	8,700	2,300	2,000	16,200	2,000	8,600	700,800
Loup	258,600	2,700	3,600	3,200	800	---	15,300	284,200
Elkhorn	84,100	7,300	5,400	4,000	19,800	---	13,000	133,600
Lower Platte	78,100	24,000	3,600	2,300	26,400	4,000	5,300	143,700
Republican	287,200	2,800	3,300	2,300	18,000	---	7,000	320,600
Little Blue	258,700	900	2,300	1,300	1,000	---	4,100	268,300
Big Blue	607,400	8,400	4,400	2,800	53,000	8,700	7,600	692,300
Nemaha	2,600	3,800	2,500	1,800	100	---	3,800	14,600
STATE TOTAL	2,497,200	78,000	38,500	26,100	247,900	47,900	83,300	3,018,900

a/ Consumptive use and not gross withdrawal
b/ Includes some minor industry
c/ --- Indicates 0 or less than 10 acre-feet

user varies considerably due to the product involved, manufacturing techniques and total production.

As the demands on municipal systems are increasing, industry is seeking and obtaining its own water supply as a supplement or as a completely independent source. In many cases, industrial plants use a combination of municipal water and their own supply, depending upon the quantity and quality of water needed, and/or available.

Industrial use of ground water is generally considered nonconsumptive, but such use may add chemicals and pollutants to the water or change its temperature to the extent that it is less desirable for other uses.

Present use of ground water developed and supplied for industry independent of municipal systems amounts to about 248,000 acre-feet annually in Nebraska. This use was estimated from records of the State Health Department, U. S. Department of the Interior, Missouri River Basin Studies, and others, and is shown for each basin in Table 26.

Power

At the present time, essentially all of the electric power which is produced by thermal energy requires cooling water. About three-fourths of the electric generating stations within the State are thermal plants. Map 5 shows the location of steam-electric plants with generating capacity of 10 MW and over.

There are also several steam-electric power plants in the State which produce less than 10 MW. Generally, the cooling water is ground water supplied by municipal systems. In cases where they do have their own supply of ground water, the quantity required for steam-electric plants is so small that it is not considered in this report. An estimate of ground water used for cooling in steam-electric power plants is shown in Table 26.

Livestock

Ground water is the most important source of water for livestock. Approximately 80 percent of the total requirement for livestock comes from ground water, and the remainder comes from surface water sources such as lakes, streams and farm ponds.

The quantity of water consumed by livestock varies widely by river basin because of several factors: the type, purpose, and age of the animal; climatic conditions; environment, which includes type of feed; area of the State; and others. Although the basins within the State have an adequate supply of ground water, there are localized areas within the basins where the availability of ground water is poor. In circumstances such as these, farm ponds and other such structures have been constructed to store water for livestock supply.

In determining the consumptive use of ground water by livestock for each basin shown in Table 26, the number and type of livestock was obtained from the 1966 Nebraska Agricultural Statistics Annual Report and the quantity of water required for each type of livestock was obtained from the U. S. Department of Health, Education and Welfare Manual of Individual Water Supply Systems.

Summary of Present Ground Water Use

In Nebraska, the largest volume of ground water is used for irrigation.

Table 26 presents a summary of estimated present annual ground water use for each purpose in each river basin.

Ground Water Use By River Basin

A short discussion of ground water use in each river basin is presented in this section.

White River-Hat Creek Basin. This area has the lowest population and the least amount of ground water in storage of any of the river basins. The major industry of the area is agriculture, with approximately 14 percent of the land under cultivation and 65 percent in rangeland. There is very little ground water irrigation because of insufficient amounts of water-bearing material. Due to these facts, the Basin uses the least amount of ground water of any of the basins within the State. The largest use of ground water in the Basin is for domestic purposes, which accounts for 45 percent of the total of 3,100 acre-feet used annually.

Niobrara River Basin. This Basin has the second largest estimated amount of ground water stored within the State. Agriculture is the major industry, with ground water irrigation and livestock wells supplying much of the required water. Because of the small population of the Basin, the amount of water required for domestic use is extremely low in relation to the basin area. Some ground water is used for cooling in the generation of steam-electric power, but 81 percent of the 141,200 acre-feet pumped annually is used for irrigation.

Missouri Tributaries River Basin. The majority of Nebraska's manufacturing is located in this Basin and the highest basin population is also located here. The Basin ranks ninth in total use of ground water, seventh in consumptive use of livestock, and eleventh in number of irrigation wells. Industrial use in the Basin averages 85,200 acre-feet annually or 72 percent of the total. Domestic use is second highest among all the basins and accounts for 14 percent of the basin's total.

North Platte River Basin. This Basin ranks ninth in population and in use of ground water for domestic purposes. A wide variety of agriculture and the majority of manufacturing industries of the western part of the State are located within this Basin. Considerable amounts of ground water are utilized by agriculture. Irrigation uses 55 percent of the annual total of 118,800 acre-feet. Manufacturing industries and cooling water for electric power generation utilize 39,500 acre-feet annually or 33 percent of the total.

South Platte River Basin. The total population of the South Platte Basin ranks twelfth among the thirteen basins of the State. The major industry of the Basin is agriculture, which utilizes about 85 percent of the total ground water pumped annually for irrigation. Petroleum production is the second largest industry within the Basin and ground water used for oil recovery accounts for a large consumptive use of ground water.

Middle Platte River Basin. This Basin is fifth in population and it has the largest concentration of irrigation wells of any basin in the State. The major industry of the Basin is agriculture and the consumptive use of ground water through irrigation is the largest of all basins, accounting for 661,000 acre-feet or 94 percent of the total ground water use in the Basin. Another major industry of the Basin is the manufacturing of agricultural products.

Loup River Basin. Of all of the basins of the State, the Loup has the largest estimated amount of ground water in storage. It ranks sixth in basin population and has the fifth largest number of irrigation wells. Agriculture is the largest industry of the Basin, with range cattle being the predominant part. Irrigation, the largest user of ground water, uses an average of 258,600 acre-feet annually, or 91 percent of the basin total. It is estimated that more water is used for livestock in this Basin than any other basin in the State. The use is estimated to be 15,300 acre-feet annually, but amounts to only 5 percent of the ground water used in the Basin.

Elkhorn River Basin. This Basin has the third highest population of all basins within the State and is ninth in total number of irrigation wells. Agriculture is the chief industry. The Basin ranks second of all basins in consumptive use of ground water for livestock because of the intensive livestock production and feeding. Considerable amounts of ground water are used in product manufacturing and the use of ground water for industry is sixth of all basins within the State. Irrigation accounts for the use of 84,100 acre-feet annually or about 63 percent of the total.

Lower Platte River Basin. This Basin is the second largest in population of all the basins within the State. Agriculture is the largest industry of the Basin, but manufacturing of other products is considerably higher than most basins in the western part of the State. Approximately 4,000 acre-feet per year are used for cooling in the generation of electric power in the Basin. This is about 3 percent of the total estimated use in the Basin. About 78,000 acre-feet or 53 percent of the total annual ground water usage in the Basin is for irrigation.

Republican River Basin. The Republican River Basin ranks seventh in population and third of all basins in total consumptive use of ground water. The chief industry of the Basin is agriculture and, compared to other basins, it ranks fifth of thirteen in the use of ground water for livestock. Ground water irrigation accounts for the use of 287,200 acre-feet annually or about 90 percent of the total annual use. Industrial use is second and makes up 5 percent of the annual total.

Little Blue River Basin. This Basin ranks tenth in population and in consumptive use of ground water for domestic supplies. Agriculture is the basin's major industry. It is third in total number of irrigation wells and fourth in consumptive use of ground water for irrigation. About 258,700 acre-feet annually, or 96 percent of the basin total is used for irrigation.

Big Blue River Basin. The Big Blue River Basin is second in total consumptive use of ground water of all basins in the State and ranks fourth in population. Agriculture is the basin's major industry. It ranks second in total number of irrigation wells and in ground water used for irrigation. The use of ground water for irrigation accounts for 88 percent of the total basin use. Although agriculture is the major industry in the Basin, the amount of ground water used by industry is the second highest of all basins in the State. However, industrial use makes up only 8 percent of the total annual use in the Basin.

Nemaha River Basin. This Basin ranks eighth of all basins in population and domestic use of ground water. Only a small amount of irrigation is practiced in the Basin. It ranks twelfth of the thirteen basins in the number of irrigation wells and use of ground water by irrigation. Agriculture is the major industry and some ground water is used in processing agricultural products. Use of ground water by livestock in the Basin accounts for 3,800 acre-feet annually, or 26 percent of the total basin use. Domestic use makes up 55 percent of the annual total.

MAP SECTION

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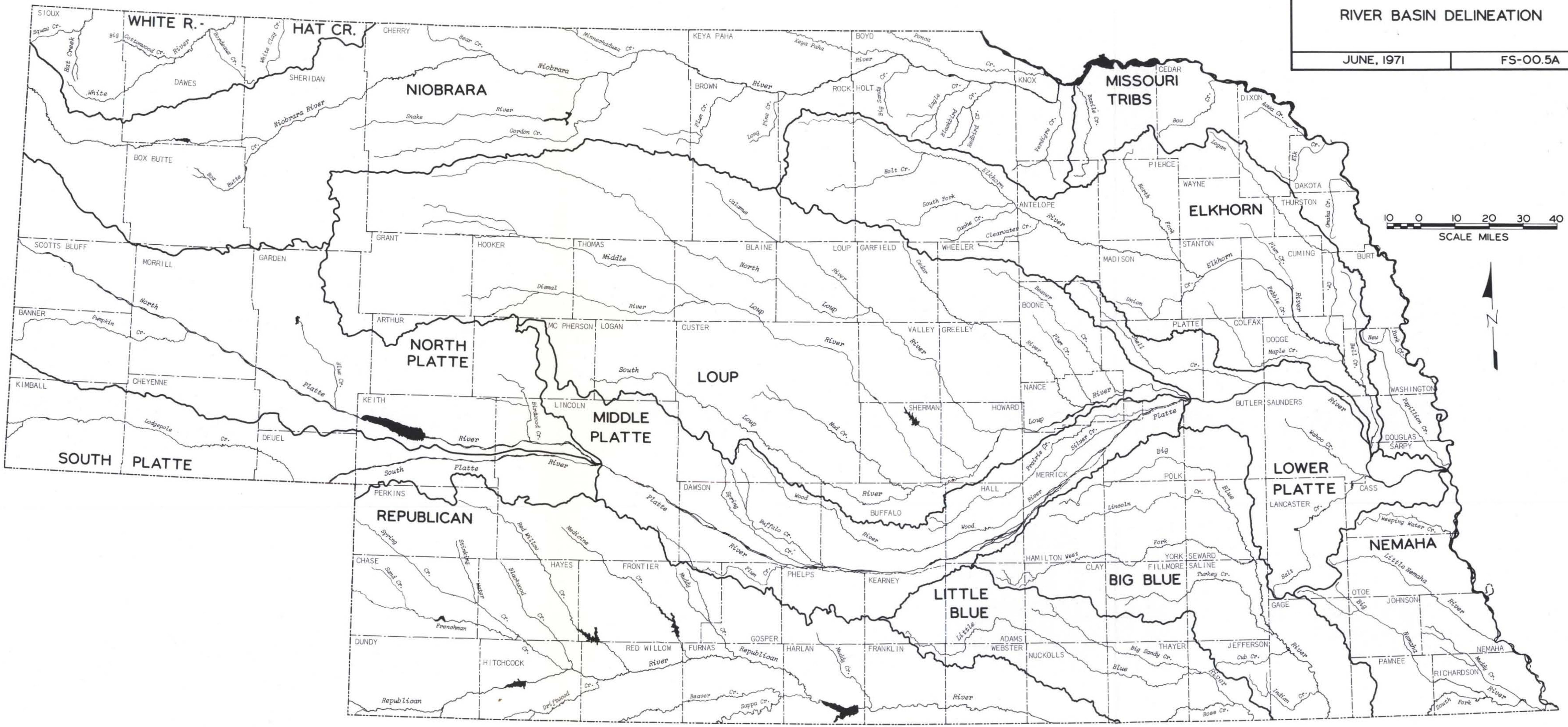
MAP 1

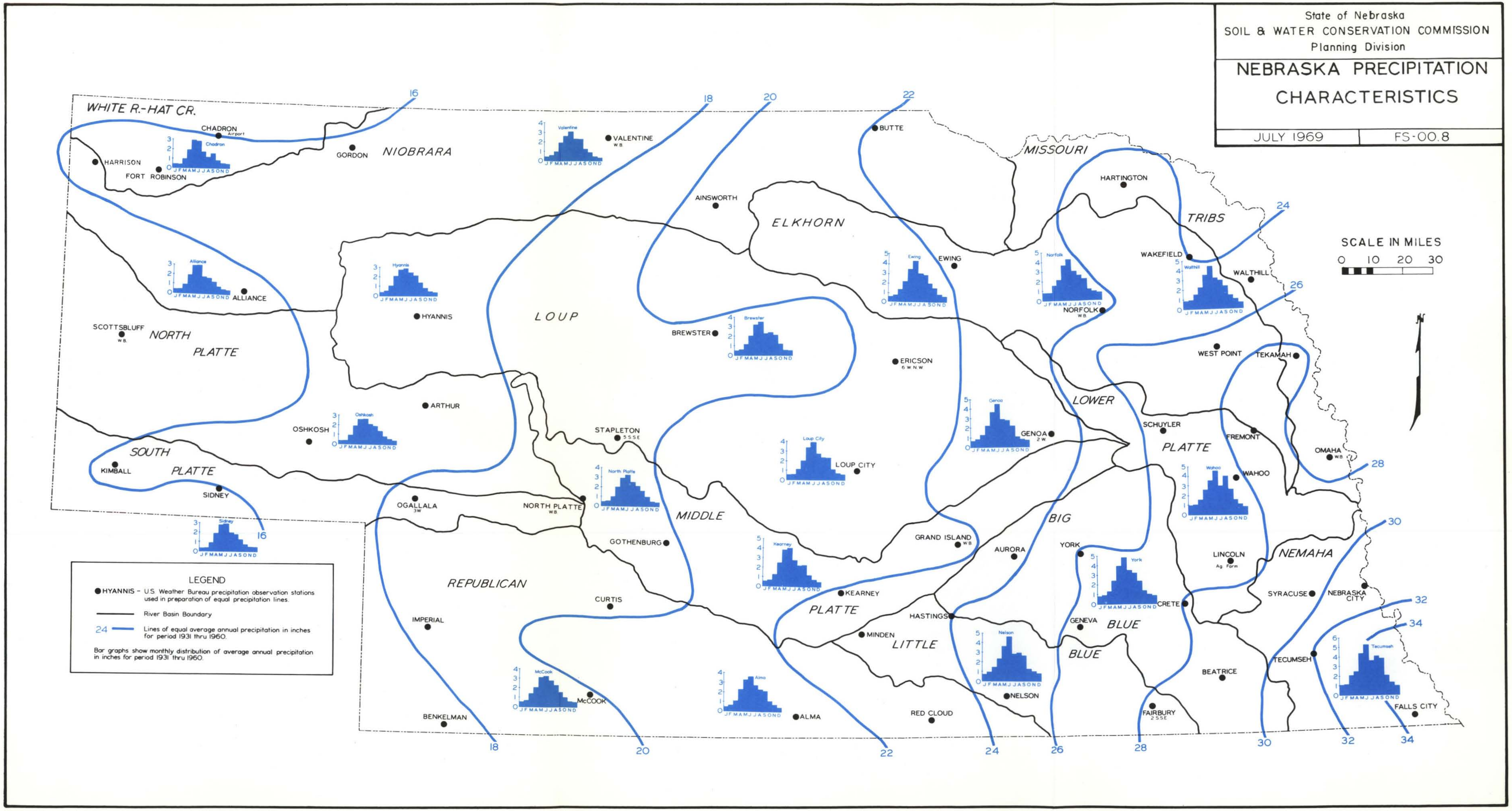
State of Nebraska
SOIL AND WATER CONSERVATION COMMISSION
Planning Division

RIVER BASIN DELINEATION

JUNE, 1971	FS-00.5A



MAP 2

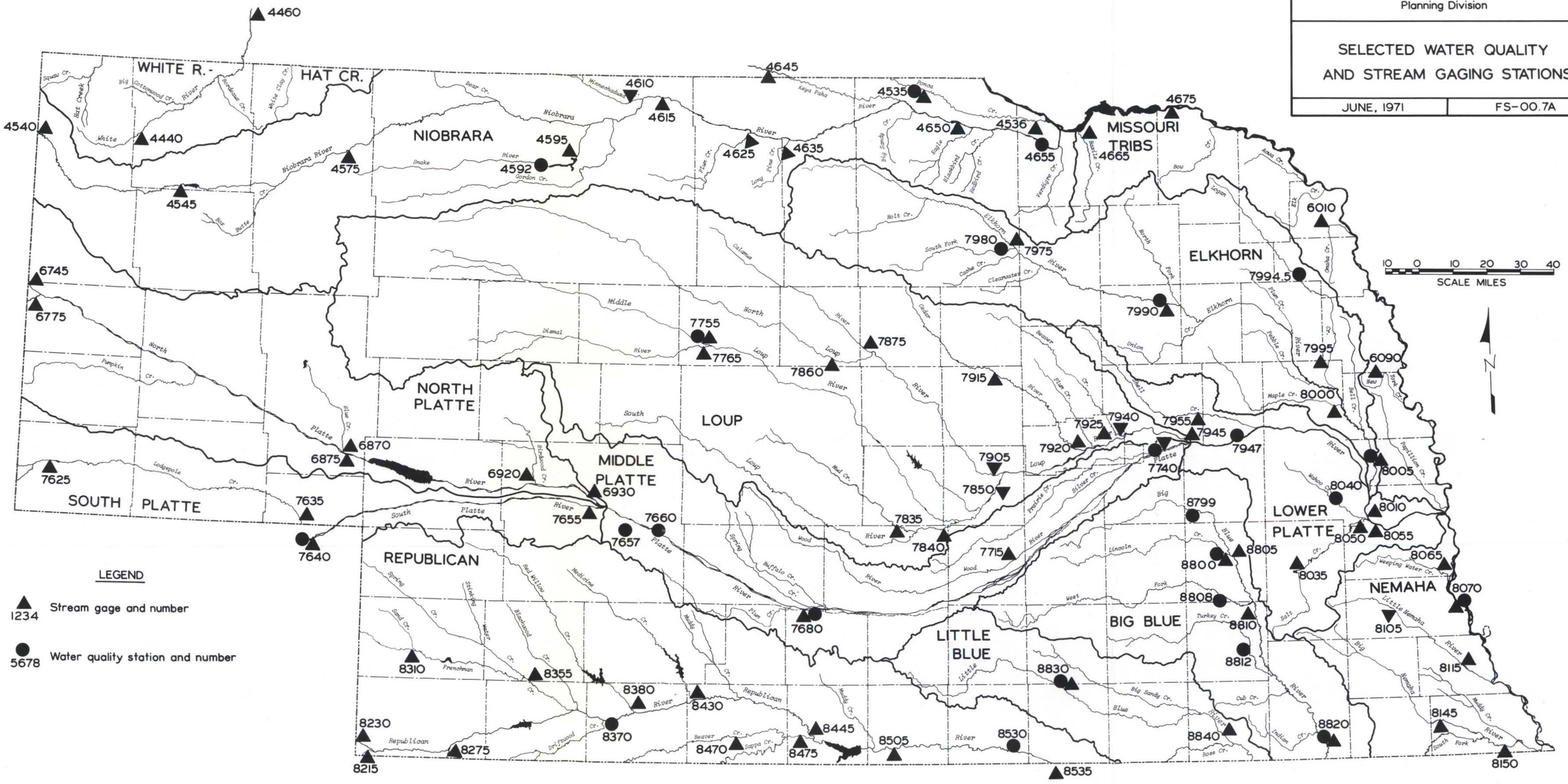

State of Nebraska
SOIL & WATER CONSERVATION COMMISSION
Planning Division
NEBRASKA PRECIPITATION CHARACTERISTICS
JULY 1969
FS-00.8
SCALE IN MILES
0 10 20 30
LEGEND
● HYANNIS - U.S. Weather Bureau precipitation observation stations used in preparation of equal precipitation lines.
River Basin Boundary
24 Lines of equal average annual precipitation in inches for period 1931 thru 1960.
Bar graphs show monthly distribution of average annual precipitation in inches for period 1931 thru 1960.
WHITE R.-HAT CR.
NIOBRARA
MISSOURI
TRIBS
ELKHORN
LOUP
NORTH
PLATTE
SOUTH
PLATTE
MIDDLE
PLATTE
LOWER
PLATTE
REPUBLICAN
LITTLE
BLUE
BIG
BLUE
NEMAHA
CHADRON
Airport
HARRISON
FORT ROBINSON
GORDON
VALENTINE
W.B.
BUTTE
AINSWORTH
HARTINGTON
WAKEFIELD
WALTHILL
EWING
NORFOLK
W.B.
ALLIANCE
HYANNIS
SCOTTSBLUFF
W.B.
BREWSTER
ERICSON
6 W N W
WEST POINT
TEKAMAH
ARTHUR
OSHKOSH
STAPLETON
5 S S E
SCHUYLER
FREMONT
OMAHA
W.B.
GENOA
2 W
LOUP CITY
WAHOO
KIMBALL
SIDNEY
OGALLALA
3 W
NORTH PLATTE
W.B.
GOTHENBURG
GRAND ISLAND
W.B.
AURORA
YORK
LINCOLN
Ag. Farm
KEARNEY
SYRACUSE
NEBRASKA CITY
CURTIS
IMPERIAL
HASTINGS
MINDEN
GENEVA
CRETE
TECUMSEH
BEATRICE
McCOOK
NELSON
BENKELMAN
ALMA
RED CLOUD
FAIRBURY
2 S S E
FALLS CITY
Chadron
Valentine
Alliance
Hyannis
Brewster
Ewing
Norfolk
Walthill
Oshkosh
Genoa
Loup City
North Platte
Wahoo
Sidney
Kearney
York
McCook
Alma
Nelson
Tecumseh
J F M A M J J A S O N D
16
18
20
22
24
26
28
30
32
34

MAP 3

State of Nebraska
SOIL AND WATER CONSERVATION COMMISSION
Planning Division

SELECTED WATER QUALITY AND STREAM GAGING STATIONS

JUNE, 1971 | FS-00.7A

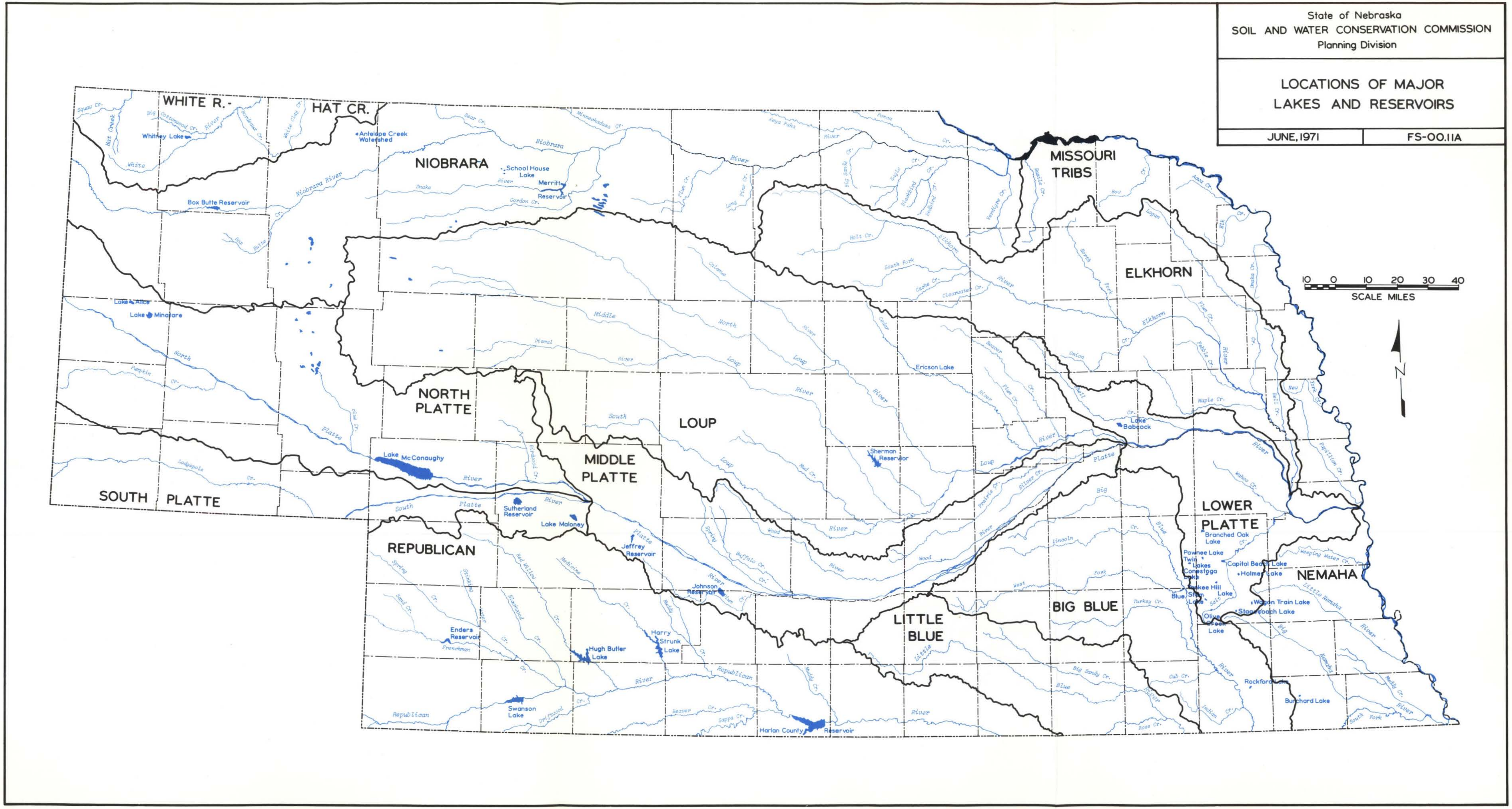


LEGEND

▲ 1234 Stream gage and number

● 5678 Water quality station and number

NOTE: Stations shown are operated by the U.S. Geological Survey and records are published annually.


State of Nebraska
SOIL AND WATER CONSERVATION COMMISSION
Planning Division
LOCATIONS OF MAJOR LAKES AND RESERVOIRS
JUNE, 1971
FS-00.11A
10 0 10 20 30 40
SCALE MILES
N
WHITE R.-HAT CR.
NIOBRARA
MISSOURI TRIBS
ELKHORN
NORTH PLATTE
MIDDLE PLATTE
LOUP
SOUTH PLATTE
LOWER PLATTE
REPUBLICAN
LITTLE BLUE
BIG BLUE
NEMAHA
Whitney Lake
Antelope Creek Watershed
School House Lake
Merritt Reservoir
Box Butte Reservoir
Lake Alice
Lake Minatare
Ericson Lake
Lake Babcock
Sherman Reservoir
Lake McConaughy
Sutherland Reservoir
Lake Maloney
Jeffrey Reservoir
Johnson Reservoir
Enders Reservoir
Hugh Butler Lake
Harry Strunk Lake
Swanson Lake
Harlan County Reservoir
Branched Oak Lake
Pawnee Lake
Twin Lakes
Conestoga Lake
Capitol Beach Lake
Holmes Lake
Wagon Train Lake
Stagecoach Lake
Olive Creek Lake
Rockford Lake
Burchard Lake

HYDROELECTRIC POWER PLANTS

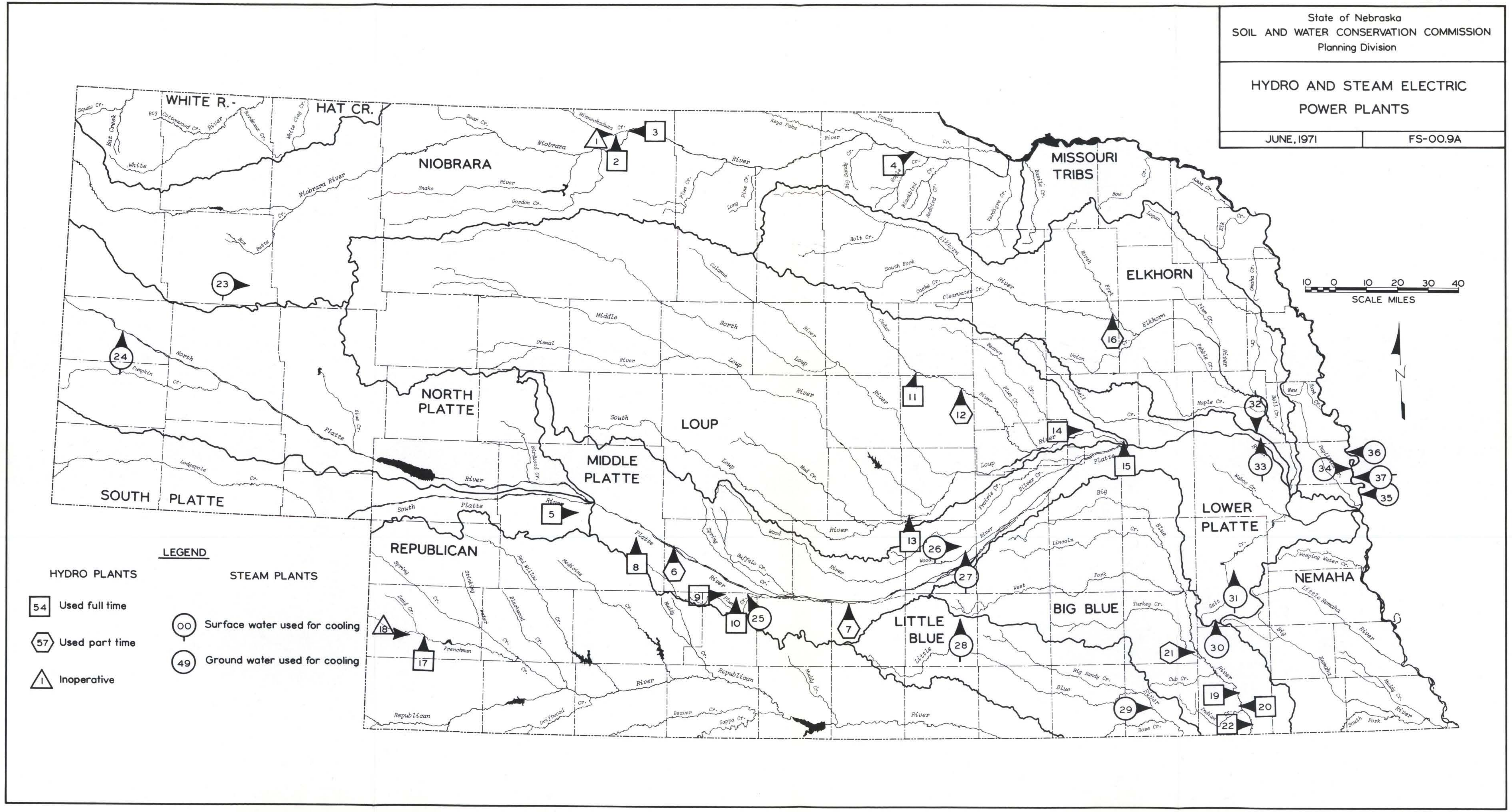
Map Index No.	Name of Plant	Name of Owner	Capacity in Megawatts	Surface Water Right in cfs	Water Source
1.	Valentine #1	City of Valentine	Not Used	40.0	Minnechaduza Creek
2.	Valentine #2	Nebraska P.P.D.	0.25	35.0	Minnechaduza Creek
3.	Valentine #3	Nebraska P.P.D.	1.85	2,150.0	Niobrara River
4.	Spencer	Nebraska P.P.D.	3.9	1,450.0	Niobrara River
5.	North Platte	Nebraska P.P.D.	26.0	2,550.0	North & South Platte R.
6.	Gothenburg	Nebraska P.P.D.	0.5	188.0	Platte River
7.	Kearney	Nebraska P.P.D.	1.88	625.0	Platte River
8.	Jeffrey	Central Neb. P.P.&I.D.	18.0	2,200.0	North & South Platte R.
9.	Johnson #1	Central Neb. P.P.&I.D.	18.0	2,200.0	North & South Platte R.
10.	Johnson #2	Central Neb. P.P.&I.D.	18.0	2,200.0	North & South Platte R.
11.	Ericson	Nebraska P.P.D.	0.44	175.0	Cedar River
12.	Spalding	Village of Spalding	0.15	290.0	Cedar River
13.	Boelus	Nebraska P.P.D.	2.5	1,000.0	Middle Loup River
14.	Monroe	Loup River P.P.D.	24.8	3,500.0	Loup River
15.	Columbus	Loup River P.P.D.	39.9	3,500.0	Loup River
16.	Norfolk	Norfolk Feed Mills Co.	0.08	100.0	N.F. Elkhorn River
17.	Imperial	City of Imperial	0.14	55.0	Frenchman Creek
18.	Champion Mills	Carl Hill	Not Used	28.3	Frenchman Creek
19.	Holmesville	Nebraska P.P.D.	0.35	500.0	Big Blue River
20.	Blue Springs	Nebraska P.P.D.	0.42	450.0	Big Blue River
21.	DeWitt	Fred Zwonecheck Estate	0.24	200.0	Big Blue River
22.	Barneston	Norris P.P.D.	0.72	500.0	Big Blue River

STEAM ELECTRIC POWER PLANTS 10 MW AND OVER

Map Index No.	Name of Plant	Name of Owner	Capacity in Megawatts	Source of Cooling Water
23.	Alliance	Alliance	16.5	Ground Water
24.	Scottsbluff	Nebraska P.P.D.	42.2	Ground Water
25.	Canaday	Central Neb. P.P.&I.D.	108.8	Central Neb. P.P.&I.D. Supply Canal
26.	Burdick C.W.	Grand Island	39.5	Ground Water
27.	Pine Street	Grand Island	17.5	Ground Water
28.	Hastings	Hastings	32.0	Ground Water
29.	Fairbury	Fairbury	21.2	Little Blue River[a/]
30.	Sheldon	Nebraska P.P.D.	225.0	Ground Water
31.	Lincoln K St.	Nebraska P.P.D.	31.7	Ground Water
32.	Fremont No. 1	Fremont	44.0	Ground Water
33.	Fremont No. 2	Fremont	21.0	Ground Water
34.	Jones Street	Omaha P.P.D.	173.5	Missouri River
35.	Kramer	Nebraska P.P.D.	112.5	Missouri River
36.	North Omaha	Omaha P.P.D.	427.1	Missouri River
37.	South Omaha	Omaha P.P.D.	20.0	Ground Water

a/ Partially from ground water

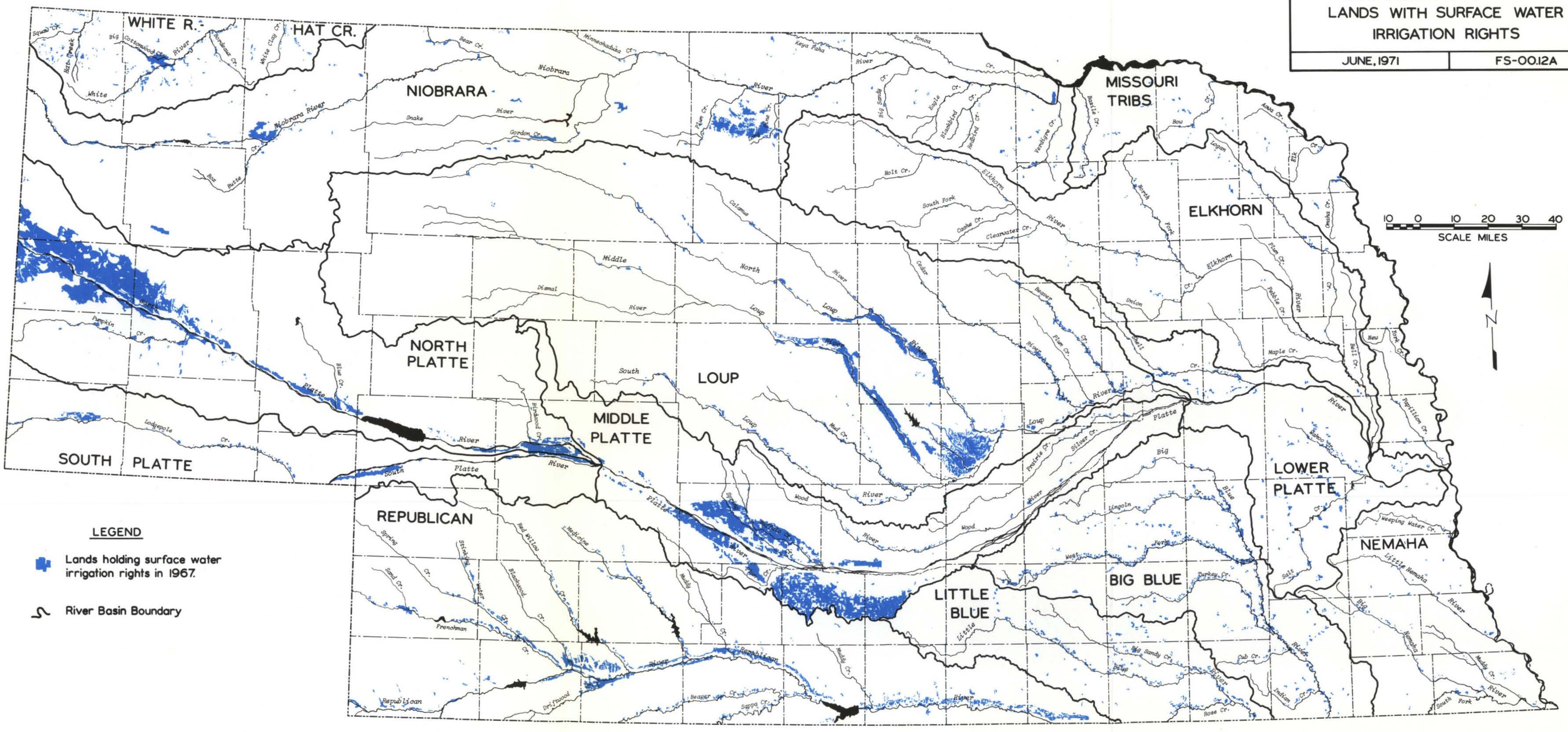
MAP 5



State of Nebraska
SOIL AND WATER CONSERVATION COMMISSION
Planning Division

GENERALIZED LOCATION OF LANDS WITH SURFACE WATER IRRIGATION RIGHTS

JUNE, 1971	FS-00.12A



MAP 7

State of Nebraska
SOIL & WATER CONSERVATION COMMISSION
Planning Division

GEOLOGIC PROFILE ACROSS SOUTH CENTRAL NEBRASKA

AUG. 1969	FS-00.16

NOTE: This geologic profile is shown in "NEBRASKA GEOLOGICAL SURVEY BULLETIN 15A" APRIL 1947.

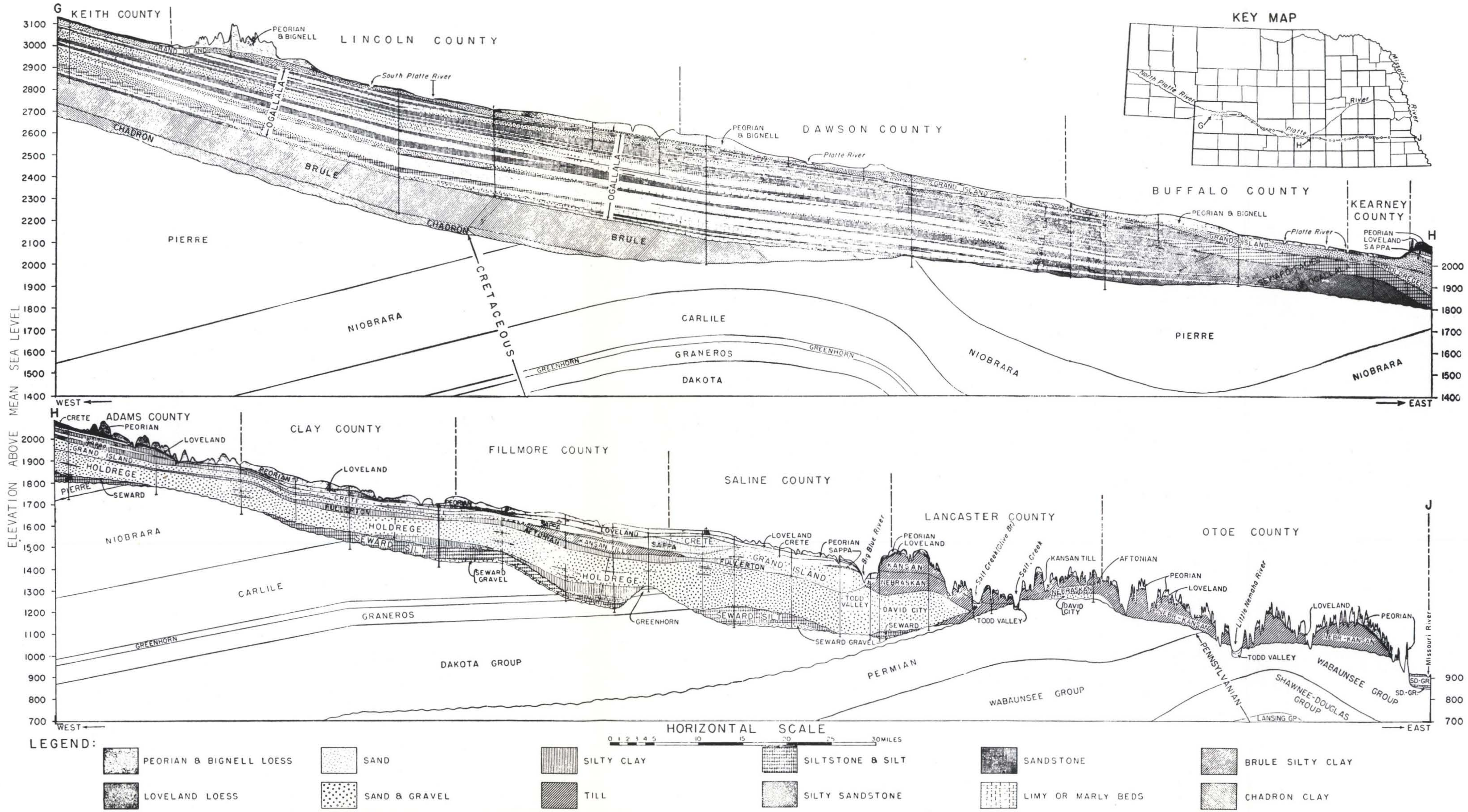


Figure 8.—Profile Section G-H-J from Keith County Eastward Across South Central Nebraska to Missouri River, Showing Relations of Pleistocene Formations to Tertiary and Older Bedrock.

Note the facial change in the late Tertiary from typical Ogallala sediments in the western part to a fine-textured equivalent (Seward formation) in the eastern part.

DESCRIPTION OF UNDERGROUND WATER AREAS OF NEBRASKA

SANDHILLS REGION. Grass-covered sand dunes, relatively flat interdune meadows, many small lakes, and large areas having no surface drainage characterize the main sandhills area of north-central Nebraska. In places, the eastern edge of the sandhills area is bordered by extensive sand plains. As the sandy soils readily absorb precipitation and transmit it downward to the zone of saturation, overland runoff rarely occurs. Most of the infiltrating precipitation is eventually returned to the atmosphere by the transpiration of wild hay growing in areas of shallow ground water and by evaporation from lakes that are hydraulically continuous with the zone of saturation; the remainder is discharged as streamflow. Streams heading in the sandhills area are noted for the constancy of their flow.

Much of this region is underlain by a great aggregate thickness of permeable water-bearing rock of Tertiary and Quaternary age. The Ogallala Formation of Tertiary age underlies the entire area but is thinner toward the east. Fluvial deposits of Pleistocene sand and gravel fill channels eroded into the surface of the Ogallala. In places, large-yield wells could be obtained from wells of moderate depth tapping the Pleistocene sand and gravel; elsewhere, large yields generally could be obtained from deeper wells tapping most or all of the permeable beds in the Ogallala. Despite the tremendous potential for large-yield wells, only a small amount of ground water is being withdrawn at the present time. Large total withdrawals could be made without reducing storage or streamflow appreciably because pumping from wells would salvage ground water now lost by evapotranspiration.

Most of the ground water is low in dissolved solids. Water in those lakes hydraulically continuous with the zone of saturation is similarly dilute, but that in lakes having poor or restricted connections with ground water tends to be highly mineralized. Several lakes east of Alliance are high in dissolved solids and were developed as sources of potash during World War I.

PLATTE RIVER VALLEY REGION. This region comprises the flood plains and bordering terracelands along the North and South Platte Rivers and along the Loup River below Boelus. The entire area is underlain by water-bearing deposits of Pleistocene sand and gravel, and part (the South Platte River Valley and the Platte River Valley between North Platte and Grand Island) is also underlain by the Ogallala Formation. Throughout the area, the depth to water ranges from less than 5 feet to about 40 feet.

Most of the area is irrigable, and a large part of the land is currently irrigated either by diverted river water or water pumped from wells. In those parts where irrigation supplies are obtained from both sources, the ideal situation of conjunctive use is the result. In such situations, water levels remain relatively stable because recharge from applied water is returned to the surface by pumping from wells. Extension of conjunctive use would help to insure ample water supplies indefinitely. Lowering of water levels beneath the flood plain also creates space for storage of river seepage, thereby augmenting the ground water supply and at the same time reducing the threat of floods.

Large quantities of water for municipal and industrial use are obtained from wells in the 30-mile stretch above the mouth of the Platte River. As each of these developments induces seepage from the river and also salvages water that would be lost through evapotranspiration, the quantity of ground water in storage remains nearly the same. The location of this part of the region so near to the principal metropolitan areas insures even greater development of the supply in the future. Consideration of proposals for large-scale construction in the lower part of the Platte River Valley should take into account whether the construction would result in impairment of the area's water-supply potential.

The quality of the ground water in this region is generally good. Some deterioration of the supply has occurred in the North Platte River Valley where surface water of poorer quality from Wyoming is used for irrigation. Similarly, use of poorer quality of water from Colorado for irrigation in the South Platte River Valley has resulted in increased mineralization of the ground water supplies there. In Dawson and Buffalo Counties, recharge from Platte River water that is diverted for irrigation of land on the north side of the river also has caused some impairment of ground water quality.

MISSOURI RIVER LOWLAND REGION. Underlying the flood plain and bordering terraceland along the Missouri River is a sufficient thickness of saturated Pleistocene and sand and gravel that large yields can be obtained from wells in many places. As pumping from wells near the Missouri River induces seepage from it, large quantities of ground water could be withdrawn without causing a progressive decline of water levels. Furthermore, a general lowering of ground water levels in the valley would provide storage space for part of the flood flows now allowed to pass through the area. Because this area is near the more populated part of the State, much greater development of its water-supply potential for municipal and industrial supply is anticipated. The ground water in this area is generally more mineralized than that in the Platte River Valley Region. In particular, its higher iron content requires that the water be treated to render it satisfactory for many uses.

SOUTH-CENTRAL PLAINS REGION. The deep soils, topography, and abundant supply of ground water for irrigation have combined fortuitously to make the south-central plains the prime agricultural area in the State. The source of irrigation supplies in the western part is, in part, water diverted from the Platte River below Brady in eastern Lincoln County; in the central part is water from wells tapping Pleistocene sand and gravel and the underlying Ogallala Formation; and in the eastern part is water from wells tapping only Pleistocene sand and gravel. In the last few years, problems relating to water use have become increasingly apparent. Seepage from the surface-water distribution systems in the western part of the area has raised ground water levels near enough to the surface to cause problems of drainage, and pumping in the central and eastern parts has caused water levels to decline progressively.

Management of the water supply by conjunctive use methods would extend the productive life of the area -- in the western part, water levels need to be lowered through pumping; and in the central and eastern parts water levels need to be raised, or at least stabilized, through use of imported water for part of the irrigation supply. The quality of the ground water in the area currently is ideal, or nearly so, for irrigation use. With time, however, the ground water will become more mineralized.

Some concern has been expressed that the intensive use of ground water in the upper part of the Big and Little Blue River Basins eventually will reduce the base flow of the Big and Little Blue Rivers across the state line into Kansas. However, an electric analog model of this area indicates that the predicted maximum ground water withdrawals to the year 2022 will not deplete the base flow at the state line by more than 5 percent.

SOUTHWESTERN TABLELAND REGION. Mostly smooth and gently sloping eastward, the upland plain that constitutes this region has been modified through formation of several sandhill areas and by the headward erosion of tributaries of the Republican River. The Ogallala Formation, which underlies the entire area, is the principal source of ground water supplies. To obtain yields sufficient for irrigation, wells must be moderately deep because the static ground water level is about 200 feet below the land surface and pumping from the Ogallala generally results in a relatively large drawdown of the water level. Despite the greater lift and consequent greater cost of pumping, use of ground water for irrigation is increasing.

NORTHERN PANHANDLE TABLELAND REGION. The upland surface constituting this region is gently rolling in its western half and nearl smooth in its eastern half; its slope is generally eastward. Several hundred feet of moderately permeable sediments of Tertiary age, mostly older than the Ogallala Formation, underlie the area. Except near the northern and southern margins of the region, the zone of saturation in these sediments is sufficiently thick that medium to large yields can be obtained from properly constructed deep wells. Lifts ordinarily are great because the depth to water in a large part of the area exceeds 200 feet and large yields are accompanied by large water level drawdowns. Development of the ground water supply for irrigation in the vicinity of Alliance is causing a local progressive decline of the ground water level because withdrawals exceed recharge to the zone of saturation.

Although a tremendous quantity of ground water is stored beneath this area, withdrawals at the same or greater rate will cause further decline of ground water levels and increase pumping costs.

SOUTHERN PANHANDLE TABLELAND REGION. This area comprises the tablelands and the dissected tablelands between the North Platte and South Platte River Valleys. The tablelands have a gentle eastward slope. Although the tablelands are underlain by relatively thick and moderately permeable sediments of Tertiary age, the zone of saturation in them is thick enough to support medium to large yields only locally in the tableland areas. Irrigation wells are located in both Pumpkin Creek and Lodgepole Creek Valleys which traverse the area. Those in the former derive water from Pleistocene sand and gravel underlying the valley floor, whereas those in the latter derive water from the Brule Formation of Tertiary age. Ordinarily the Brule is not an important source of water supply, but in some places it is reworked or contains large openings--probably fractures--that are filled with water. The Brule is exposed extensively on the slopes separating the floor of Pumpkin Creek Valley from Wildcat Ridge to the north and the broad tableland to the south, but, in those places, is not a source of large water supplies.

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EAST CENTRAL DISSECTED PLAINS REGION. This area consists of the following: remnants of a formerly smooth, eastward-sloping plain; valley lands along the South Loup River, Mud Creek, Middle and North Loup Rivers, Cedar River, and Beaver and Shell Creeks; and much rolling to rough land between the valley lands and the upland remnants. The western two-thirds of the area is underlain by the eastward-thinning Ogallala Formation. Overlying the Ogallala in the middle third and extending eastward to the boundary of the area are deposits of Pleistocene sand and gravel overlain by wind-deposited silt (loess). Where the deposits of sand and gravel fill east-trending buried valleys, they are much thicker than where they overlie the intervening buried divides. The flood plain and bordering terrain in each of the present-day southeastward-trending valleys are underlain by a fill of late Pleistocene sand and gravel. Medium to large yields can be obtained from wells in those places underlain by a thick zone of saturation in the Ogallala, in Pleistocene sand and gravel, or a combination of both. Most such places can be located only through exploratory test drilling. Almost nowhere in the area is it a problem to obtain sufficient water for livestock or for domestic use. Present development of the ground water resources in this area has not resulted in appreciable decline of water levels.

REPUBLICAN RIVER VALLEY AND DISSECTED PLAINS REGION. Moderately thick deposits of Pleistocene sand and gravel underlie the flood plain and bordering terraces within the valleys of the Republican River and its principal tributaries. These deposits partly fill a trench incised into virtually impermeable shale and chalk bedrock of Cretaceous age. In the western half of the area the Cretaceous bedrock on both sides of the valley is overlain by the eastwardly thinning Ogallala Formation.

In the eastern half of the area, the bedrock south of the valley is either exposed or thinly mantled by Pleistocene loess, whereas, north of the valley it is mantled by thin to very thick Pleistocene sediments. The thickest deposits, which consist in large part of sand and gravel, occupy east-trending buried valleys, and the thinner deposits, which generally are fine textured, overlie buried bedrock ridges and hills.

Where the zone of saturation in the Pleistocene sand and gravel underlying the valley floor is thick enough, medium to moderately large yields can be obtained from wells. As sources of recharge consist of infiltrating precipitation, seepage from the river and, in places, infiltration of river water diverted for irrigation, large annual withdrawals can be made in many places without causing a progressive water level decline.

The zone of saturation in the Ogallala Formation is generally thin in this area; hence, it is a source of only small to medium supplies. Moderately large yields can be obtained from the thicker deposits of Pleistocene sand and gravel that fill bedrock channels north of the Republican River Valley in the eastern part of the area. However, because precipitation is the only source of recharge, large annual withdrawals eventually will result in declining water levels.

Where the Cretaceous bedrock is at or close below the land surface, good quality ground water sufficient for domestic or livestock supplies is difficult if not impossible to locate. In the western half of the area this condition exists in a narrow band bordering both sides of the Republican River Valley and the valleys of the principal tributaries; in the eastern half it is the case throughout that part south of the valley and throughout most of Nuckolls County, northeast Webster County, and southern Adams County north of the valley.

NORTHEAST NEBRASKA GLACIAL DRIFT REGION. Deposits of glacial till, in places more than 200 feet thick, underlie most of this region. Where no glacial deposits are present, bedrock generally is at or near the surface. Exceptions to this are those places where deposits of Pleistocene sand and gravel underlie the principal stream valleys. In some locations the glacial till is underlain by deposits of Pleistocene sand and gravel in buried bedrock valleys, but throughout much of the area glacial till rests directly on bedrock. The Dakota Sandstone, a bedrock formation of Cretaceous age, underlies all but the southeastern part of the area, where rocks of Pennsylvanian age are at or close below the surface. The Dakota is exposed in many places along the east boundary of the area for a distance of 50 miles south from the town of Ponca, but westward from a north-south line through Ponca it is progressively more deeply buried.

The glacial till is a poor source of water; yields to wells are small to negligible and the water commonly is highly mineralized. Where thick deposits of Pleistocene sand and gravel occur, they are sources of medium to moderately large supplies of good quality water to wells. However, in areas where they are thin or absent, even small supplies are difficult or impossible to obtain except by drilling into the deeper lying Dakota Sandstone. The Dakota is tapped by many domestic and stock wells in the part of the area where it may be reached at shallow to moderate depth. The Dakota contains beds of gravel at its base locally where moderately large yields can be obtained from it. The other bedrock formations in this region are generally poor sources of water. In the vicinity of Omaha some deep wells have been drilled into bedrock below the Pennsylvanian, but the relatively high mineralization of the ground water has resulted in limited use of this deeper supply.

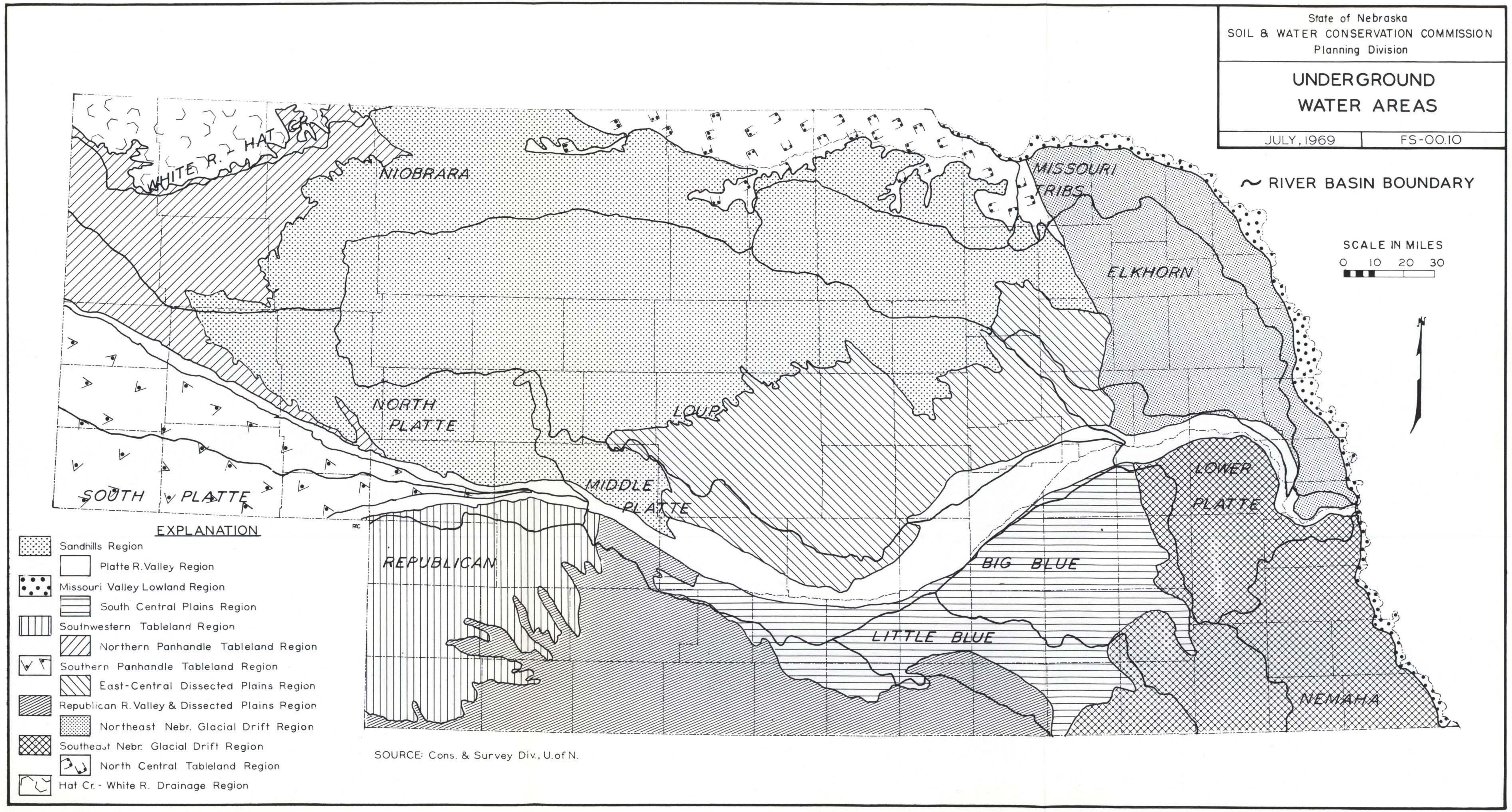
SOUTHEAST NEBRASKA GLACIAL DRIFT REGION. The features of this area are similar to those in the northeast Nebraska Glacial Drift Region. The principal stream valleys are underlain by thin to moderately thick deposits of Pleistocene sand and gravel, and bedrock valleys beneath the glacial till are filled either with Pleistocene sand and gravel or finer grained fluvial sediments. Bedrock of Cretaceous, Permian, and Pennsylvanian age is exposed in many places, especially in ravines and along valley sides. The Dakota Sandstone of Cretaceous age is the uppermost bedrock throughout a broad band in the northwestern and western part of the region and is available as a bedrock source of water when permeable zones are saturated. Pennsylvanian and Permian limestones and shales form the uppermost bedrock in the remainder of the region and do not provide a satisfactory source of ground water because of low permeability or high mineralization.

NORTH-CENTRAL TABLELAND REGION. Included in this region are smooth to gently rolling uplands bordered by steep escarpments, extensive lower lying rough rolling lands, and the flood plain and adjacent terraces in the valleys of the Niobrara River and its principal tributaries. Underlying the upland surface is the eastwardly thinning Ogallala Formation, which is a source of medium to moderately large supplies of good-quality water where the zone of saturation is thick. The lower lying rough rolling terrain was developed on shales of Cretaceous age, and throughout this part of the area supplies of ground water are virtually unavailable except by drilling several hundred feet to tap the Dakota Sandstone. Medium to moderately large supplies of good quality water can be obtained from the thicker deposits of Pleistocene sand and gravel underlying the flood plain and terrace lands. In topographically low places in the eastern part of this area, wells tapping the Dakota flow at the land surface. However, most water from the Dakota is highly mineralized and thus of limited usefulness.

HAT CREEK - WHITE RIVER DRAINAGE BASIN. This area is mostly rough to steeply sloping in its topographically higher southern part and gently rolling in its lower part. The underlying rocks are mostly fine textured, consisting of clay of early Tertiary age in the higher part and of shale of Cretaceous age in the lower part. As neither the clay nor the shale yield water freely, more than meager supplies of ground water are virtually impossible to find except in the valleys underlain by stream alluvium, and even in those valleys well yields are small. Larger supplies can be obtained by drilling to the deep-lying Dakota Sandstone, but the water generally is highly mineralized.

Descriptions taken from "Underground Water Areas" map compiled by E. C. Reed and published by Conservation and Survey Division, University of Nebraska, in cooperation with Department of Water Resources and Soil and Water Conservation Commission - January 1, 1969.

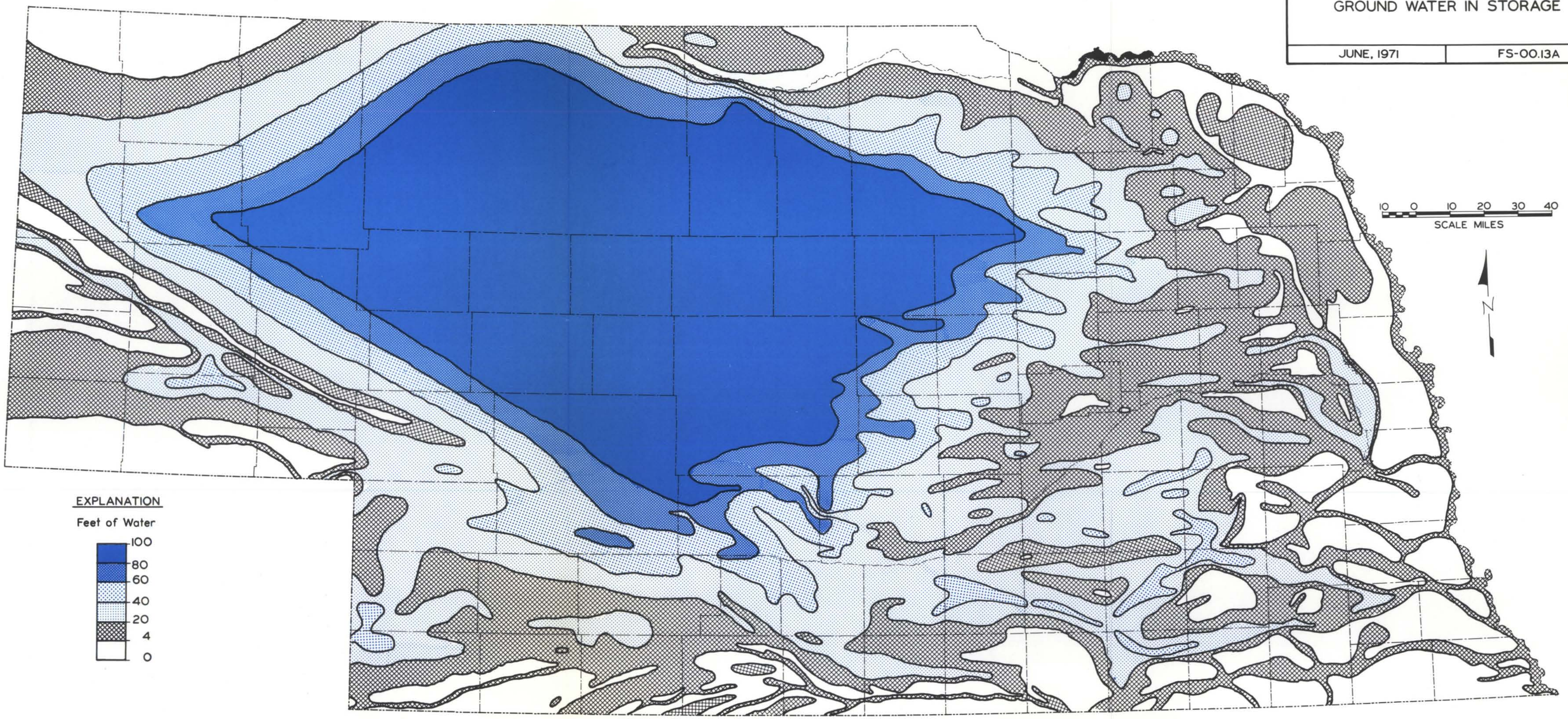
MAP 8



State of Nebraska
SOIL AND WATER CONSERVATION COMMISSION
Planning Division

GROUND WATER IN STORAGE

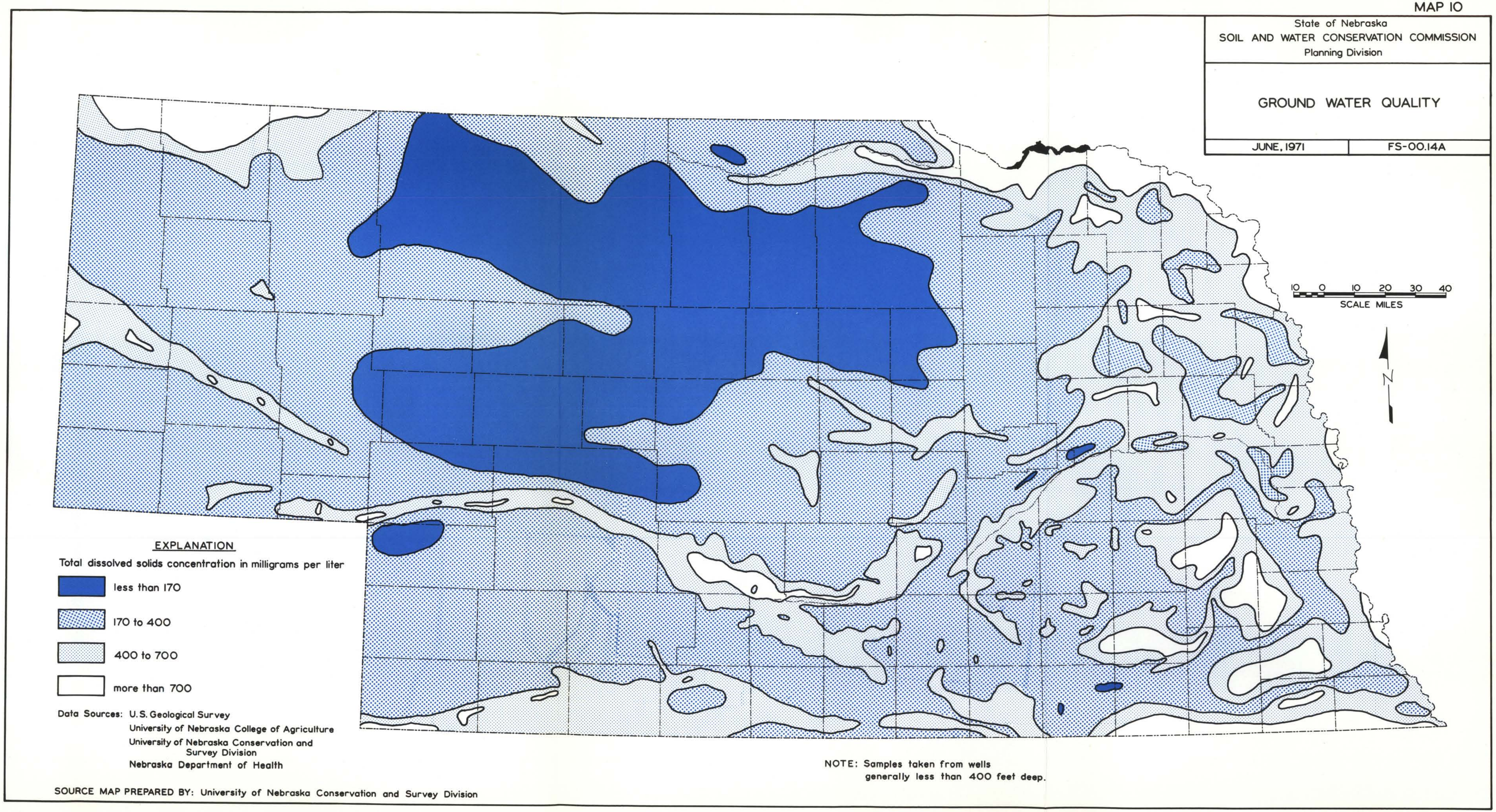
JUNE, 1971	FS-00.13A



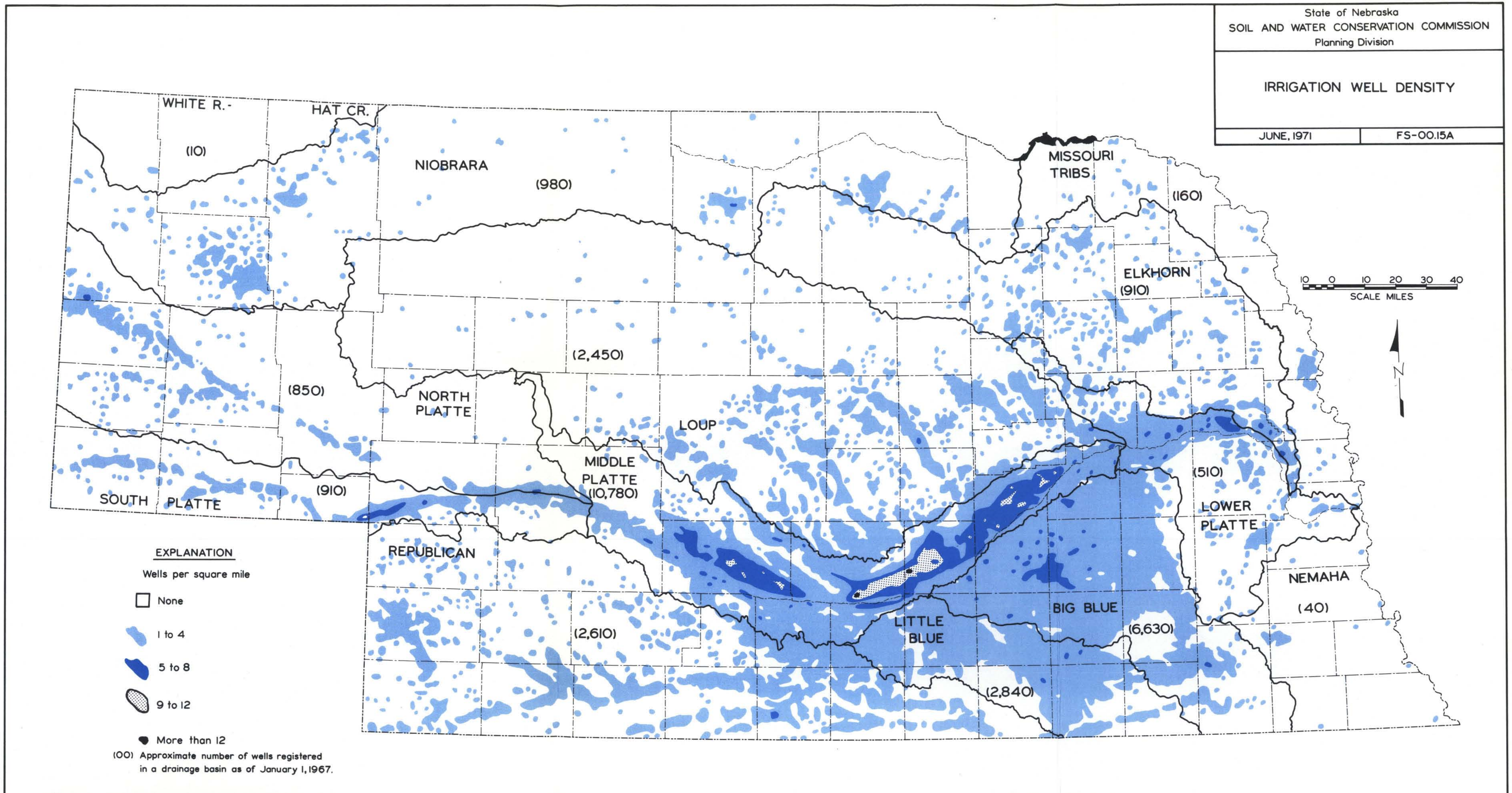
NOTE: A storage coefficient of 0.20 was assumed for volume estimates, that is, each foot of water represents 5 feet of permeable, water-bearing material composed of Pleistocene, Pliocene, and Miocene deposits of the principal reservoir.

SOURCE: CONSERVATION AND SURVEY DIVISION, UNIVERSITY OF NEBRASKA

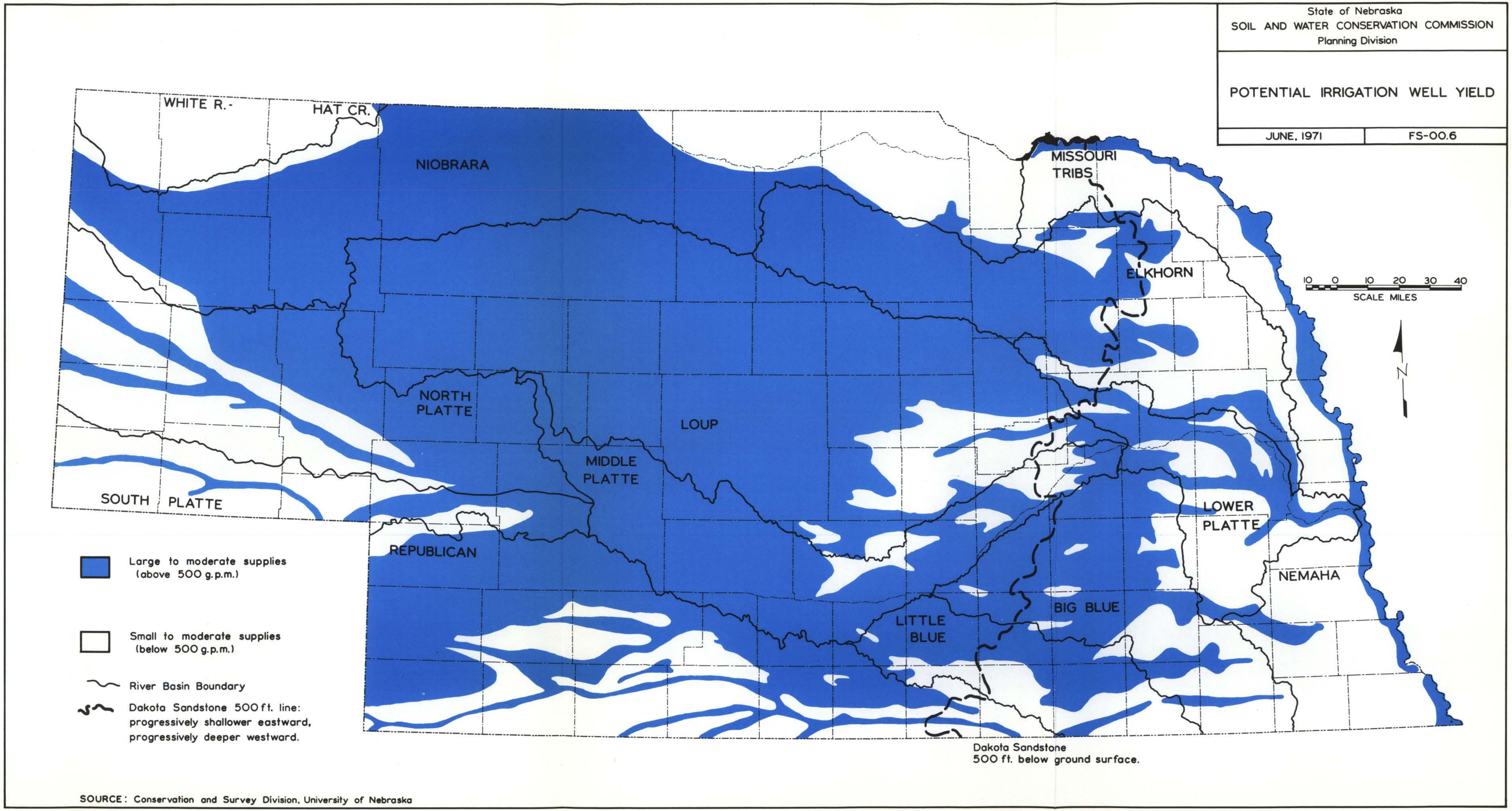
MAP 10


State of Nebraska
SOIL AND WATER CONSERVATION COMMISSION
Planning Division
GROUND WATER QUALITY
JUNE, 1971
FS-00.14A
10 0 10 20 30 40
SCALE MILES
N
EXPLANATION
Total dissolved solids concentration in milligrams per liter
less than 170
170 to 400
400 to 700
more than 700
Data Sources: U.S. Geological Survey
University of Nebraska College of Agriculture
University of Nebraska Conservation and Survey Division
Nebraska Department of Health
NOTE: Samples taken from wells generally less than 400 feet deep.
SOURCE MAP PREPARED BY: University of Nebraska Conservation and Survey Division

MAP 11



SOURCE: Department of Water Resources—prepared by Conservation and Survey Division, University of Nebraska


State of Nebraska
SOIL AND WATER CONSERVATION COMMISSION
Planning Division
POTENTIAL IRRIGATION WELL YIELD
JUNE, 1971
FS-00.6
WHITE R.-
HAT CR.
NIOBRARA
MISSOURI
TRIBS
ELKHORN
NORTH
PLATTE
LOUP
MIDDLE
PLATTE
SOUTH
PLATTE
REPUBLICAN
LOWER
PLATTE
NEMAHA
LITTLE
BLUE
BIG BLUE
10 0 10 20 30 40
SCALE MILES
N
Large to moderate supplies
(above 500 g.p.m.)
Small to moderate supplies
(below 500 g.p.m.)
River Basin Boundary
Dakota Sandstone 500 ft. line:
progressively shallower eastward,
progressively deeper westward.
Dakota Sandstone
500 ft. below ground surface.
SOURCE: Conservation and Survey Division, University of Nebraska

ATTACHMENT SECTION

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ATTACHMENT 1

SELECTED HISTORICAL STREAMFLOW RECORDS

River Basin	Station Name	Station Number	Page
White R.-Hat Cr.	White River at Crawford	06-4440	A1-3
Niobrara	Niobrara River at Wyoming-Nebraska State Line	06-4540	A1-4
	Minnechaduza Creek at Valentine	06-4610	A1-5
	Niobrara River near Sparks	06-4615	A1-6
	Plum Creek at Meadville	06-4625	A1-7
	Long Pine Creek near Riverview	06-4635	A1-8
	Keya Paha River at Wewela, South Dakota	06-4645	A1-9
	Niobrara River near Spencer	06-4650	A1-10,11
	Ponca Creek at Verdel	06-4536	A1-12
Missouri Tribs.	Omaha Creek at Homer	06-6010	A1-13
	New York Creek at Herman	06-6090	A1-14
North Platte	North Platte River at Wyoming - Nebraska State Line	06-6745	A1-15,16
	Horse Creek near Lyman	06-6775	A1-17
	North Platte River at Lewellen	06-6875	A1-18
	North Platte River at North Platte	06-6930	A1-19,20
South Platte	Lodgepole Creek at Bushnell	06-7625	A1-21
	South Platte River at Julesburg, Colo.	06-7640	A1-22,23
	South Platte River at North Platte	06-7655	A1-24,25
Middle Platte	Platte River near Overton	06-7680	A1-26,27
	Platte River Near Duncan	06-7740	A1-28,29
Loup	South Loup River at St. Michael	06-7840	A1-30
	North Loup River near St. Paul	06-7905	A1-31,32
	Middle Loup River at St. Paul	06-7850	A1-33,34
	Cedar River near Fullerton	06-7920	A1-35
	Loup River Power Canal near Genoa	06-7925	A1-36
	Loup River at Columbus	06-7945	A1-37,38
Elkhorn	Elkhorn River at Ewing	06-7975	A1-39
	Logan Creek near Uehling	06-7995	A1-40
	Maple Creek near Nickerson	06-8000	A1-41
	Elkhorn River at Waterloo	06-8005	A1-42,43
Lower Platte	Shell Creek near Columbus	06-7955	A1-44
	Salt Creek near Ashland	06-8050	A1-45
	Platte River near South Bend	06-8055	A1-46

River Basin	Station Name	Station Number	Page
Republican	Arikaree River at Haigler	06-8215	A1-47
	North Fork Republican River at Colorado-Nebraska State Line	06-8230	A1-48
	Frenchman Creek at Culbertson	06-8355	A1-49
	Republican River near Orleans	06-8445	A1-50
	Republican River near Hardy	06-8535	A1-51,52
Little Blue	Little Blue River near Deweese	06-8830	A1-53
	Little Blue River near Fairbury	06-8840	A1-54,55
Big Blue	Big Blue River at Seward	06-8805	A1-56
	Big Blue River near Crete	06-8810	A1-57
	Big Blue River at Barneston	06-8820	A1-58
Nemaha	Weeping Water Creek at Union	06-8065	A1-59
	Little Nemaha River at Auburn	06-8115	A1-60
	Nemaha River at Falls City	06-8150	A1-61
Missouri River Mainstem	Missouri River at Yankton, South Dakota	06-4675	A1-62

Note: Recorded flows were taken directly from U.S.G.S. water supply papers. Maximum, minimum and average flows were determined for this report.

STREAMFLOW DATA

Station Number and Name: 6-4440 White River at Crawford

Location: Lat. 42° 41' Long. 103° 25', in W½, Sec. 3, T.31N., R.52W., on right bank 15 feet downstream from bridge in city park at Crawford.

Drainage Area in Sq. Mi.: 313 **Datum of Gage:** 3,659.85' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1931	—	—	—	—	—	19.0	17.6	18.1	14.4	9.1	11.9	6.7	—
1932	9.7	11.9	12.3	12.3	17.3	15.4	25.1	21.8	16.5	10.2	11.6	8.6	173.0
1933	13.1	14.7	14.2	16.0	16.7	16.2	21.8	22.9	14.7	10.6	20.5	12.2	194.0
1934	11.8	12.5	16.6	14.8	15.7	17.9	15.4	10.6	8.8	6.3	5.7	7.6	143.7
1935	11.9	13.6	15.5	16.9	13.9	19.3	21.3	19.1	32.7	14.6	5.7	8.7	193.2
1936	12.0	14.3	13.7	13.3	13.9	16.7	15.1	14.4	11.4	5.7	6.2	22.1	158.8
1937	9.6	11.8	13.6	14.6	15.0	16.6	14.2	13.2	12.2	7.4	5.3	7.3	140.8
1938	10.6	10.9	12.6	13.7	13.1	13.4	16.5	14.2	12.8	9.0	7.2	8.7	142.6
1939	10.9	11.6	11.4	12.7	10.5	16.3	13.6	12.1	8.6	7.0	7.1	6.5	128.4
1940	9.3	9.9	11.2	11.3	11.5	13.4	14.7	11.6	8.0	5.1	9.3	6.0	121.3
1941	8.6	10.5	11.1	11.8	11.4	13.3	15.1	11.2	10.5	6.3	5.9	6.6	122.3
1942	9.3	9.7	10.3	11.3	10.3	13.6	15.2	65.2	26.4	18.3	12.5	11.4	213.5
1943	14.2	16.0	13.5	14.7	17.0	37.0	27.8	19.0	20.6	10.3	7.6	9.6	207.3
1948	11.0	13.7	14.2	13.3	16.7	29.4	15.0	16.0	16.3	11.8	10.0	7.4	174.8
1949	11.3	15.5	15.8	11.3	17.1	20.6	16.3	17.9	13.1	9.7	6.8	8.1	163.6
1950	11.8	12.5	12.6	9.0	11.8	14.4	13.3	14.3	11.2	8.0	6.8	8.8	134.5
1951	11.0	12.5	13.6	12.6	12.0	12.5	12.8	12.9	11.8	12.7	8.3	12.0	144.7
1952	10.5	12.3	15.1	14.6	13.4	17.8	14.6	14.0	10.7	6.9	5.7	5.8	141.3
1953	8.8	10.4	11.0	12.5	10.8	14.0	13.6	13.6	12.4	8.7	11.8	6.5	134.2
1954	9.1	10.3	12.0	12.2	10.6	13.1	11.9	13.0	10.5	5.9	5.4	5.1	119.2
1955	9.4	10.2	11.2	11.6	12.0	15.8	13.5	12.3	14.0	8.2	7.0	10.6	135.8
1956	9.3	10.3	12.4	12.3	12.1	13.8	12.7	12.5	8.3	10.4	6.5	5.8	126.5
1957	9.1	11.5	11.8	11.6	12.2	13.5	14.7	18.1	15.5	10.7	7.7	8.6	145.0
1958	11.3	12.2	13.1	15.7	12.6	14.0	14.8	12.7	12.1	19.2	9.2	8.5	155.4
1959	10.5	10.2	12.4	13.4	13.5	14.6	12.9	13.5	12.3	10.4	4.7	5.6	134.0
1960	8.8	10.2	11.0	13.6	12.6	34.7	13.2	14.9	8.3	5.2	7.4	4.9	144.8
1961	8.0	9.7	12.3	12.6	11.9	13.5	12.7	13.5	8.9	7.3	3.9	5.7	119.9
1962	9.0	10.2	11.0	11.1	10.5	12.8	12.2	14.6	17.3	15.1	8.2	8.2	140.2
1963	10.3	11.8	13.5	12.8	15.5	16.6	14.2	12.5	13.3	6.8	4.9	6.8	139.1
1964	9.1	10.5	12.0	12.9	14.0	17.3	13.2	12.1	11.4	6.9	5.0	5.4	129.8
1965	8.3	9.8	12.1	12.2	12.6	12.0	11.4	14.0	12.9	9.7	6.2	7.8	128.9
1966	9.6	11.1	11.7	11.8	12.4	16.7	13.6	12.7	8.6	7.9	5.9	6.0	127.9
1967	9.5	9.6	9.6	11.6	9.9	12.0	11.9	12.8	21.8	11.9	7.7	7.5	135.9
Max.	14.2	16.0	16.6	16.9	17.3	37.0	27.8	65.2	32.7	19.2	20.5	22.1	213.5
Min.	8.0	9.6	9.6	9.0	9.9	12.0	11.4	10.6	8.0	5.1	3.9	4.9	119.2
Average for Period of Record													147.3
Average for													
53-67	9.3	10.5	11.8	12.5	12.2	15.6	13.1	13.5	12.5	9.6	6.8	6.9	134.3

STREAMFLOW DATA

Station Number and Name: 6-4540 Niobrara River at Wyoming-Nebraska State Line

Location: Lat. 42° 39', Long. 104° 04', in SW¼, Sec. 15, T.31N., R.60W., on left bank one quarter of a mile downstream from Van Tassel Creek, 0.3 miles upstream from Wyoming-Nebraska State Line, and 3 miles east of Van Tassel, Wyoming.

Drainage Area in Sq. Mi.: 450 approximately **Datum of Gage:** 4,687.70' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1956	2.1	2.6	2.5	2.7	2.5	2.6	3.2	3.0	1.9	1.6	1.6	1.5	27.8
1957	1.9	2.2	2.2	2.1	2.5	3.7	5.3	6.3	3.7	3.3	2.0	2.0	37.2
1958	2.3	2.9	2.9	2.9	2.4	4.0	5.9	3.4	2.3	2.4	2.0	2.0	35.4
1959	2.0	2.1	2.3	2.2	2.0	2.8	4.1	3.8	2.6	2.5	1.4	1.1	28.9
1960	1.8	2.2	2.3	2.1	2.2	11.9	4.0	3.0	1.8	1.5	1.3	1.4	35.5
1961	1.6	1.6	1.6	1.9	2.1	2.6	3.2	2.9	1.9	1.3	1.3	1.5	23.5
1962	1.7	1.8	1.8	1.8	7.4	3.5	2.4	2.8	7.5	2.8	1.7	1.9	37.1
1963	2.2	2.3	2.3	2.3	10.0	5.4	4.5	2.6	2.4	1.9	1.6	1.7	39.2
1964	1.8	2.2	2.2	2.2	2.1	2.9	3.8	2.9	2.6	1.7	1.5	1.6	27.5
1965	1.8	1.8	2.1	1.6	1.8	2.0	2.7	4.9	3.0	6.0	2.7	2.2	32.6
1966	2.5	2.1	2.4	2.2	1.7	3.0	2.5	2.0	1.6	1.4	1.5	1.3	24.2
1967	2.0	2.0	1.9	1.9	1.8	2.2	2.1	3.9	3.7	3.6	1.4	1.1	27.6
Max.	2.5	2.9	2.9	2.9	10.0	11.9	5.9	6.3	7.5	6.0	2.7	2.2	39.2
Min.	1.6	1.6	1.6	1.6	1.7	2.0	2.1	2.0	1.6	1.3	1.3	1.1	23.5
Average for Period of Record													31.4

STREAMFLOW DATA

Station Number and Name: 6-4610 Minnechaduza Creek at Valentine

Location: Lat. 42° 53' 10", Long. 100° 33' 10", in SW¼ Sec. 30, T.34 N., R.27 W., on right bank 500 ft. downstream from power plant in city park at north edge of Valentine and 4 miles upstream from mouth.

Drainage Area in Sq. Mi.: 390 approximately; 200 contributes directly **Altitude of Gage:** 2,470' **m.s.l.**

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1948				15.5	17.8	26.3	23.3	19.8	25.7	16.7	11.8	10.1	———
1949	13.1	18.0	15.6	9.3	16.3	40.3	26.5	31.6	33.1	17.6	10.2	10.9	242.5
1950	20.8	17.2	15.7	12.9	18.4	34.9	33.0	38.8	16.6	15.2	21.0	17.6	262.1
1951	19.3	17.8	18.6	17.2	19.1	25.2	24.2	27.8	28.7	35.5	18.4	17.9	269.7
1952	18.8	19.4	15.9	14.0	33.4	63.4	43.8	37.6	17.5	9.9	12.4	9.6	295.7
1953	11.5	15.6	16.1	19.6	20.0	46.8	34.6	44.0	20.9	15.6	13.7	9.1	267.5
1954	17.5	19.1	20.4	16.0	21.6	36.1	23.0	22.2	23.6	11.0	15.9	14.2	240.6
1955	17.7	20.5	24.2	18.6	15.1	63.7	28.5	23.4	27.0	10.0	9.7	10.7	269.1
1956	15.4	16.7	18.2	20.2	19.6	45.8	24.9	27.1	12.5	9.2	21.9	10.8	242.2
1957	15.1	23.1	20.0	15.4	18.8	29.6	47.3	40.6	27.7	18.1	16.8	13.7	286.2
1958	19.7	22.0	22.2	20.3	20.1	32.7	46.7	25.2	26.1	16.9	13.4	10.6	275.9
1959	13.7	18.7	19.9	18.5	17.2	31.8	27.5	23.5	14.0	9.4	9.7	10.1	214.0
1960	15.0	18.9	18.6	14.6	17.3	65.4	37.8	57.7	19.5	12.4	13.3	11.5	302.0
1961	14.5	16.4	18.7	18.7	20.9	25.5	19.4	29.4	14.8	10.4	10.1	12.1	210.9
1962	14.5	17.1	14.7	14.1	18.6	30.5	28.6	41.5	69.9	37.4	14.9	13.9	315.7
1963	18.9	18.6	19.0	16.0	23.9	34.9	29.7	22.7	21.5	16.3	16.2	21.2	258.9
1964	17.5	19.0	17.2	20.0	20.9	26.9	39.7	29.2	22.2	14.7	10.3	11.6	249.2
1965	14.6	16.6	17.3	18.2	18.1	21.0	27.6	25.5	21.6	15.3	9.6	13.7	219.1
1966	18.8	17.8	19.5	16.5	16.2	42.2	29.9	18.9	14.8	10.6	15.0	26.0	246.2
1967	19.9	19.3	19.9	19.5	21.0	25.0	19.3	19.2	41.6	15.1	10.8	12.0	242.7
Max.	20.8	23.1	24.2	20.3	33.4	65.4	47.3	57.7	69.9	37.4	21.9	26.0	315.7
Min.	11.5	15.6	14.7	9.3	15.1	21.0	19.3	18.9	12.5	9.2	9.6	9.1	210.9
Average for Period of Record													258.4
Average for 53-67	16.3	18.6	19.1	17.7	19.3	37.2	30.9	30.0	25.2	14.8	13.4	13.4	255.9

STREAMFLOW DATA

Station Number and Name: 6-4615 Niobrara River near Sparks

Location: Lat. 42° 54'10", Long. 100° 21'40" in SE¼ Sec. 22 T.34N., R.26W., on left bank 18 feet downstream from highway bridge, 2¼ miles downstream from Big Beaver Creek, 5½ miles downstream from Minnechaduza Creek, and 6½ miles southwest of Sparks.

Drainage Area in Sq. Mi.: 8,090 approximately **Datum of Gage:** 2,287.57' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1946	479.6	476.0	423.0	537.5	560.1	638.5	491.2	503.5	470.0	405.3	378.4	507.9	5871.0
1947	520.0	480.1	433.2	495.1	491.1	564.9	566.7	495.6	731.8	505.3	387.5	396.4	6068.0
1948	451.2	491.3	483.4	447.0	471.6	612.9	511.5	487.8	549.8	482.9	460.2	416.7	5866.0
1949	484.1	502.0	483.9	378.8	444.3	900.3	592.1	650.8	509.9	451.3	416.4	423.3	6237.0
1950	519.2	477.9	394.7	514.7	510.0	576.1	554.7	615.4	437.5	456.2	504.1	500.3	6061.0
1951	505.9	465.3	494.8	417.5	562.7	557.9	515.7	558.2	582.2	566.5	527.8	590.9	6345.0
1952	511.5	493.6	481.3	528.6	617.3	758.1	675.2	638.1	481.3	410.8	409.3	371.3	6376.0
1953	464.4	457.3	461.6	550.4	498.5	678.0	601.7	676.9	476.7	444.1	440.1	390.6	6140.0
1954	474.9	468.9	474.4	420.5	542.9	628.7	531.3	560.9	501.8	415.2	415.8	412.9	5848.0
1955	471.9	476.0	497.7	426.5	377.7	806.0	535.8	532.8	542.8	397.2	396.0	407.9	5868.0
1956	492.1	460.0	583.2	520.6	511.9	676.9	521.8	562.9	432.1	425.6	442.8	412.9	6043.0
1957	462.1	504.4	485.0	453.3	503.5	537.1	669.7	775.4	592.9	470.8	477.7	451.7	6384.0
1958	517.0	516.5	510.8	480.1	461.0	558.4	722.5	568.0	547.7	547.6	482.6	420.7	6333.0
1959	475.3	481.6	499.5	475.8	470.1	643.9	552.8	562.8	440.2	428.9	415.1	436.2	5882.0
1960	458.9	451.9	479.2	413.5	461.4	768.5	571.6	637.0	473.8	417.3	441.4	409.0	5984.0
1961	490.3	488.3	520.7	434.1	550.7	581.3	479.7	588.8	451.3	419.1	393.0	416.7	5814.0
1962	463.4	483.9	430.9	473.7	478.4	672.3	493.1	694.0	772.1	690.0	509.3	436.5	6597.6
1963	489.4	521.9	514.3	544.5	501.8	680.4	557.5	515.0	501.1	426.8	426.8	475.5	6155.0
1964	466.7	489.5	478.8	529.7	463.8	557.1	636.3	454.2	358.4	381.5	298.6	298.7	5413.0
1965	322.7	398.0	478.9	498.2	466.9	401.0	425.5	419.3	503.7	496.4	350.8	507.8	5269.2
1966	540.6	467.4	506.3	394.4	473.3	753.5	543.5	465.9	428.7	357.6	431.9	377.7	5741.0
1967	410.7	493.9	454.7	459.6	473.5	488.5	366.1	415.3	874.5	434.0	311.2	326.3	5508.0
Max.	540.6	521.9	583.2	550.4	617.3	900.3	722.5	775.4	874.5	690.0	527.8	590.9	6597.6
Min.	322.7	398.0	394.7	378.8	377.7	401.0	366.1	415.3	358.4	357.6	298.6	298.7	5269.2
Average for Period of Record													5991.1
Average for 53-67	466.7	477.3	491.7	471.7	482.4	628.8	547.3	561.9	526.5	450.1	415.5	412.1	5932.0

STREAMFLOW DATA

Station Number and Name: 6-4625 Plum Creek at Meadville

Location: Lat. 42° 45' 05", Long. 99° 52' 05", in NE¼ NW¼, Sec. 14, T.32N., R.22W., on left bank 0.4 miles upstream from county bridge, 1 mile upstream from mouth, 1 mile southwest of Meadville, and 17 miles north of Ainsworth.

Drainage Area in Sq. Mi.: 600 approximately; 340 contributes directly **Altitude of Gage:** 2,035' **m.s.l.**

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1948				50.5	49.9	50.8	54.4	51.5	54.6	49.1	50.5	45.7	———
1949	49.9	47.5	48.3	46.6	49.2	78.1	97.9	63.7	86.9	48.1	48.3	46.0	710.5
1950	48.5	47.9	50.0	45.1	44.4	61.8	76.8	106.5	64.6	50.7	52.0	54.5	702.8
1951	55.8	52.2	54.1	52.7	51.0	55.7	74.1	88.1	164.3	85.9	78.5	85.5	897.9
1952	72.2	73.2	65.9	67.7	84.2	133.0	116.4	163.7	73.2	56.2	56.4	50.1	1012.0
1953	55.0	52.0	56.6	53.1	48.7	86.4	71.0	115.2	103.1	56.4	61.6	51.5	810.6
1954	71.1	55.4	58.4	56.4	55.8	81.2	67.9	92.7	88.4	61.9	51.4	55.1	795.7
1955	56.3	58.4	59.7	57.9	52.0	85.2	62.8	61.9	80.3	50.7	50.8	54.0	730.0
1956	56.1	52.4	57.3	53.6	50.0	68.4	59.6	64.0	51.8	50.4	54.3	46.9	664.8
1957	55.7	56.6	55.8	50.9	53.9	58.0	72.2	102.3	87.2	62.0	55.3	51.7	761.6
1958	57.8	59.6	57.6	58.5	51.0	72.3	161.7	77.0	64.7	68.7	67.0	53.4	849.3
1959	60.2	57.8	60.5	61.0	52.2	73.7	69.9	63.6	56.5	50.4	51.1	50.6	707.5
1960	54.7	56.8	55.0	56.9	54.1	73.8	89.0	101.5	68.4	67.7	52.2	51.8	781.9
1961	57.9	56.1	60.7	54.4	54.1	64.0	55.7	67.6	53.8	55.6	59.6	49.7	689.2
1962	55.5	54.1	56.8	56.4	55.1	72.7	59.3	101.0	107.6	239.5	78.6	73.6	1010.0
1963	62.3	61.3	65.7	65.0	78.8	97.8	74.8	76.3	103.9	68.3	61.6	66.9	882.7
1964	60.5	57.9	66.0	62.5	59.3	74.1	89.5	90.0	58.9	58.9	55.2	59.3	792.1
1965	52.3	55.2	57.5	61.8	53.5	56.4	62.1	63.9	80.6	55.6	54.6	52.1	705.6
1966	58.8	54.4	53.1	53.7	54.7	78.0	71.1	63.8	60.8	54.0	67.9	61.6	731.9
1967	58.0	55.3	58.2	59.9	51.9	62.6	54.7	64.0	114.7	69.2	58.3	81.6	788.3
Max.	72.2	73.2	66.0	67.7	84.2	133.0	161.7	163.7	164.3	239.5	78.6	85.5	1012.0
Min.	48.5	47.5	48.3	45.1	44.4	50.8	54.4	51.5	51.8	48.1	48.3	45.7	664.8
Average for Period of Record													790.8
Average for 53-67	58.1	56.2	58.6	57.5	55.0	73.6	74.8	80.3	78.7	71.3	58.6	57.3	780.0

STREAMFLOW DATA

Station Number and Name: 6-4635 Long Pine Creek near Riverview

Location: Lat. 42° 41' 20", Long 99° 41' 20", in N½ Sec. 5, T.31N., R.20W., on right bank 7 feet downstream from county road bridge, 1 mile downstream from Bone Creek, and 5½ miles southwest of Riverview.

Drainage Area in Sq. Mi.: 390 approximately

Datum of Gage: 1,983.34' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1948								63.3	62.7	61.9	57.1	52.4	——
1949	61.6	60.3	66.9	64.4	65.0	80.4	85.9	71.3	70.9	60.9	58.0	57.0	802.6
1950	67.8	59.8	63.6	64.3	65.7	91.7	68.1	75.7	69.7	64.9	80.1	77.2	848.6
1951	72.9	69.5	67.9	65.5	53.6	64.9	81.8	131.9	235.4	124.3	144.9	104.2	1217.0
1952	91.3	81.6	95.4	73.9	91.2	128.4	101.8	151.1	77.4	70.4	88.4	66.3	1117.0
1953	73.3	75.7	76.5	72.9	65.0	107.0	81.6	118.6	124.4	78.2	72.8	67.4	1013.0
1954	77.3	75.9	88.9	——	——	——	——	——	——	——	——	——	——
1955	76.4	75.7	77.5	78.3	69.4	88.2	78.7	75.0	82.2	65.2	63.4	73.1	903.1
1956	77.0	76.7	82.1	77.9	73.7	84.5	80.1	79.8	71.2	65.4	69.8	64.3	902.5
1957	74.4	74.3	71.8	63.4	69.5	83.4	92.3	122.0	84.5	82.1	72.9	68.9	959.5
1958	74.1	75.5	75.4	76.5	68.9	93.1	118.3	92.1	88.7	91.5	71.8	69.3	995.2
1959	72.3	72.9	77.7	71.0	67.3	84.0	72.6	72.2	65.7	73.3	65.4	64.9	859.3
1960	66.4	71.5	71.2	70.7	73.5	91.9	87.6	91.2	93.5	71.6	69.7	67.0	925.8
1961	73.7	74.2	74.4	69.3	66.6	78.1	72.0	74.0	75.1	70.8	69.8	66.8	864.8
1962	70.8	68.9	68.4	75.6	71.6	92.6	76.9	95.2	105.2	226.0	117.8	111.6	1181.0
1963	74.0	76.9	82.0	72.7	68.9	112.4	77.3	77.4	109.0	71.6	73.9	76.0	972.1
1964	69.0	74.4	78.3	75.1	71.0	91.5	91.6	81.3	65.6	68.8	63.9	67.1	897.6
1965	71.5	73.5	73.2	83.1	72.7	69.4	79.2	87.3	82.2	65.7	64.1	71.4	893.3
1966	70.7	72.3	75.6	71.1	68.2	95.2	75.7	77.6	82.8	74.9	88.0	85.5	937.6
1967	73.3	65.5	68.9	69.5	65.5	75.2	72.0	80.5	115.5	74.3	84.3	106.2	950.8
Max.	91.3	81.6	95.4	83.1	91.2	128.4	118.3	151.1	235.4	226.0	144.9	111.6	1217.0
Min.	61.6	59.8	63.6	63.4	53.6	64.9	68.1	63.3	62.7	60.9	57.1	52.4	802.6
Average for Period of Record													957.8

STREAMFLOW DATA

Station Number and Name: 6-4645 Keya Paha River at Wewela, South Dakota

Location: Lat. 43° 01' 40", Long. 99° 46' 45", in SE¼ Sec. 24, T. 95N., R. 76W., on left bank 13 feet downstream from bridge on U.S. Highway 183, three quarters of a mile north of Wewela, 4½ miles upstream from Holt Creek, and 11½ miles downstream from Lost Creek.

Drainage Area in Sq. Mi.: 1,070 approximately **Datum of Gage:** 2,049.78' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1938	——		7.0	8.9	34.3	63.3	55.5	64.9	31.7	20.1	7.1	9.7	——
1939	8.4	10.6	14.5	17.5	4.2	81.4	35.9	25.0	45.7	17.4	5.2	3.9	269.7
1940	10.6	10.4	10.6	4.2	4.6	41.3	46.6	24.0	12.3	2.2	2.7	2.6	172.0
1948	14.6	18.5	20.3	20.6	30.7	54.3	40.9	26.7	36.8	17.3	11.7	9.8	302.2
1949	14.6	22.3	12.3	1.0	16.9	126.2	72.9	45.3	22.6	16.3	12.2	15.4	378.0
1950	21.7	15.2	8.1	2.7	12.3	209.5	189.3	156.9	39.9	46.0	38.2	35.7	775.5
1951	42.0	38.1	20.7	18.7	14.8	46.1	55.6	69.7	83.9	69.9	42.5	39.0	541.0
1952	40.9	44.4	26.7	15.5	46.5	304.1	359.8	170.8	60.6	28.2	29.8	17.2	1144.0
1953	22.4	22.3	23.9	28.6	46.9	246.7	143.6	189.5	67.7	34.8	28.8	14.4	869.6
1954	21.0	28.8	34.5	23.4	53.4	89.2	60.8	63.0	85.7	22.0	19.2	24.9	525.9
1955	26.1	29.7	32.3	24.5	20.9	223.0	76.7	44.2	51.4	30.1	13.2	12.3	584.4
1956	18.9	8.7	5.4	12.4	18.9	144.4	75.2	63.6	26.0	12.9	21.5	12.0	419.9
1957	16.7	32.1	25.5	13.9	19.0	53.5	112.9	93.0	69.0	35.7	16.6	15.1	503.0
1958	23.5	36.0	29.9	19.6	29.7	54.6	135.9	54.6	43.9	62.2	45.8	17.6	553.3
1959	25.2	23.5	24.2	16.9	19.0	66.3	50.3	54.1	26.3	14.9	10.7	11.8	343.2
1960	17.3	13.8	21.9	17.8	30.8	367.7	155.1	126.6	45.7	23.1	15.1	14.9	849.8
1961	18.1	18.9	12.9	20.9	36.0	67.5	35.0	55.4	26.5	14.9	21.3	13.0	340.4
1962	15.3	20.1	11.4	9.5	15.4	64.8	110.0	220.1	304.5	373.0	87.9	36.0	1268.0
1963	40.2	41.2	38.3	23.9	40.7	90.6	75.7	52.0	52.9	22.2	14.3	25.7	517.7
1964	21.6	24.0	18.6	25.5	29.7	46.2	91.0	78.2	40.3	22.2	13.6	13.6	424.5
1965	15.7	19.4	14.7	12.9	17.8	33.3	65.1	58.2	47.5	31.2	11.3	17.6	344.7
1966	24.0	20.1	18.2	16.8	14.7	240.9	83.9	40.4	27.2	21.4	19.5	17.3	544.3
1967	21.9	24.2	23.6	15.5	25.6	56.0	31.6	25.8	109.0	36.2	14.0	19.5	403.0
Max.	42.0	44.0	38.3	28.6	53.4	367.7	359.8	220.1	304.5	373.0	87.9	39.0	1268.0
Min.	8.4	8.7	5.4	1.0	4.2	33.3	31.6	24.0	12.3	2.2	2.7	2.6	172.0
Average for Period of Record													548.8
Average for 53-67	21.9	24.1	22.4	18.8	27.9	123.0	86.9	81.2	68.2	50.4	23.5	17.7	566.0

STREAMFLOW DATA

Station Number and Name: 6-4650 Niobrara River near Spencer

Location: Lat. 42° 48' 33", Long. 98° 30' 19" in SE¼ NW¼ Sec. 30, T.33N., R. 11W., at Spencer power plant dam 5 miles southeast of Spencer.

Drainage Area in Sq. Mi.: 12,100 approximately **Datum of Gage:** 1,473.67' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1913	—	—	—	—	—	—	—	—	—	—	744.0	791.0	—
1914	812.0	845.0	627.0	726.0	816.0	1090.0	1350.0	1400.0	976.0	646.0	552.0	607.0	10400.0
1927	—	—	—	—	—	—	—	—	—	—	627.0	518.0	—
1928	713.0	546.0	370.0	719.0	822.0	1260.0	922.0	769.0	774.0	738.0	553.0	613.0	8800.0
1919	762.0	803.0	726.0	397.0	489.0	1290.0	803.0	830.0	1040.0	664.0	502.0	708.0	9010.0
1930	781.0	851.0	555.0	547.0	1140.0	1010.0	1200.0	1450.0	893.0	501.0	601.0	666.0	10200.0
1931	818.0	738.0	787.0	806.0	1010.0	922.0	940.0	769.0	587.0	476.0	521.0	502.0	8880.0
1932	627.0	568.0	762.0	586.0	984.0	978.0	833.0	1050.0	1070.0	528.0	517.0	512.0	9020.0
1933	676.0	655.0	474.0	756.0	616.0	1100.0	768.0	965.0	494.0	538.0	676.0	545.0	8260.0
1934	649.7	714.2	590.3	796.6	717.1	909.6	701.4	623.4	592.7	396.1	492.8	749.4	7933.0
1935	690.5	702.0	564.4	512.3	969.4	914.4	1070.0	880.3	977.5	557.7	469.0	516.7	8824.0
1936	614.0	709.7	574.6	582.7	578.2	1556.0	889.4	944.1	551.8	337.4	422.6	473.6	8234.0
1940	—	—	—	—	—	—	—	—	—	355.4	455.3	458.5	—
1941	575.6	606.0	818.3	556.5	691.0	964.2	863.6	626.7	659.8	603.3	486.0	536.2	7987.0
1942	719.0	668.1	608.1	626.7	671.5	1053.0	948.7	2492.0	1089.0	621.1	572.3	621.6	10690.0
1943	685.1	668.0	645.0	499.5	867.2	1011.0	864.6	725.3	1013.0	538.7	470.1	482.1	8470.0
1944	620.6	684.8	549.5	665.1	647.6	1300.0	1343.0	1061.0	1613.0	1017.0	760.7	575.2	10840.0
1945	750.1	791.3	639.0	842.2	974.0	1571.0	1020.0	848.7	1257.0	657.9	823.7	591.2	10770.0
1946	725.2	710.4	473.7	788.0	896.1	1212.0	742.4	814.5	657.7	574.0	535.7	851.9	8981.0
1947	1147.0	856.5	690.6	731.3	803.2	1267.0	1159.0	848.3	1595.0	762.4	488.4	591.3	10940.0
1948	659.0	802.1	740.8	543.8	741.5	1192.0	810.8	738.1	859.1	649.2	654.1	513.9	8905.0
1949	693.7	750.6	552.3	585.7	651.6	2099.0	1219.0	1083.0	824.5	572.1	555.7	625.5	10210.0
1950	991.3	735.9	453.2	473.1	466.1	2423.0	1621.0	1214.0	759.5	877.9	1045.0	887.6	11950.0
1951	923.3	733.1	764.2	672.4	964.8	1234.0	1072.0	1297.0	1829.0	1189.0	1332.0	1275.0	13290.0
1952	997.7	1012.0	837.2	828.8	1384.0	1737.0	1663.0	1612.0	896.3	779.8	850.9	616.1	13210.0
1953	740.0	697.2	766.2	889.7	842.0	2212.0	1388.0	1804.0	1027.0	733.9	808.5	581.2	12490.0
1954	833.1	858.8	790.6	1001.0	1279.0	1327.0	1109.0	1152.0	1221.0	673.3	837.8	747.0	11830.0
1955	808.1	842.8	856.6	685.7	548.4	1846.0	924.5	739.2	884.0	509.6	542.1	590.6	9778.0
1956	712.4	599.8	661.5	768.5	693.5	1280.0	961.4	869.2	603.9	594.1	680.5	546.4	8971.0
1957	670.2	813.9	760.4	547.6	790.5	1186.0	1227.0	1749.0	1082.0	881.2	708.1	703.1	11120.0
1958	850.1	897.7	847.8	796.7	867.3	1213.0	1568.0	967.9	878.5	911.8	720.2	645.9	11160.0
1959	736.7	739.2	753.7	677.4	728.7	1453.0	984.8	995.5	713.1	661.6	573.3	633.9	9651.0
1960	786.6	706.3	780.9	624.2	845.6	2347.0	1348.0	1470.0	895.7	650.9	639.7	653.0	11750.0

STREAMFLOW DATA

Station Number and Name: 6-4650 Niobrara River near Spencer

Location: Lat. 42° 48' 33", Long. 98° 30' 19" in SE¼ NW¼ Sec. 30, T.33N., R.11W., at Spencer power plant dam 5 miles southeast of Spencer.

Drainage Area in Sq. Mi.: 12,100 approximately **Datum of Gage:** 1,473.67' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1961	792.1	767.0	606.7	759.2	1004.0	1211.0	804.3	1075.0	718.8	590.6	626.5	718.2	9673.0
1962	785.9	800.3	580.4	692.4	878.5	1613.0	1139.0	1592.0	2363.0	2555.0	1105.0	850.3	14950.0
1963	881.7	895.7	827.9	722.0	1052.0	1708.0	1194.0	943.9	978.8	849.0	711.3	791.3	11560.0
1964	764.0	789.0	562.7	840.0	891.4	1069.0	1276.0	1043.0	751.6	600.7	529.1	539.6	9656.0
1965	615.9	659.2	646.5	809.7	745.0	928.2	1063.0	920.7	1123.0	769.6	554.0	857.3	9692.0
1966	944.7	797.7	743.8	604.2	777.3	1973.0	1201.0	901.7	799.1	456.2	731.3	660.8	10590.0
1967	701.6	801.7	660.7	790.8	802.7	1141.0	743.2	739.5	1544.0	675.0	547.0	715.8	9863.0
Max.	1147.0	1012.0	856.6	1001.0	1384.0	2423.0	1663.0	2492.0	2363.0	2555.0	1332.0	1275.0	14950.0
Min.	575.6	546.0	370.0	397.0	466.1	909.6	701.4	623.4	494.0	337.4	422.6	458.5	7933.0
Average for Period of Record													10230.8
Average for 53-67	774.9	777.8	723.1	747.3	849.7	1500.5	1128.7	1130.8	1038.9	807.5	687.6	682.2	10849.0

STREAMFLOW DATA

Station Number and Name: 6-4536 Ponca Creek at Verdel

Location: Lat. 42° 48' 40", Long. 98° 10' 35", in NE¼ NE¼, Sec. 30, T.33N., R.7W., near left bank at left downstream end of bridge on State Highway 12, 0.6 miles east of Verdel and 3.1 miles upstream from mouth.

Drainage Area in Sq. Mi.: 820 approximately **Datum of Gage:** 1,232.9' m.s.l.

	Discharge in 100 Acre-Feet												
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1958	3.4	6.6	6.4	1.5	6.6	66.2	124.0	32.3	16.9	34.2	13.3	0	311.4
1959	.0	.5	.3	0	.1	33.2	13.4	36.9	9.9	5.6	1.5	.3	101.1
1960	.2	1.5	2.5	.4	8.8	819.8	301.1	205.9	73.4	31.4	14.8	12.8	1473.0
1961	7.0	8.5	5.5	5.6	25.3	59.4	22.6	27.8	61.2	10.8	44.0	7.0	284.6
1962	7.9	7.7	5.5	2.5	11.3	351.1	300.6	345.6	736.1	448.2	200.8	68.0	2485.0
1963	42.3	30.1	27.4	17.7	41.3	88.9	56.5	41.8	27.7	111.8	11.7	7.0	504.2
1964	6.0	10.0	5.0	5.0	13.1	20.6	81.2	141.6	175.4	33.8	4.5	2.8	499.0
1965	2.2	4.0	1.3	1.2	1.6	4.0	40.4	25.8	79.2	18.0	1.0	1.8	180.4
1966	3.0	3.5	2.4	1.6	20.4	286.6	25.8	12.8	11.8	0	9.3	.1	377.3
1967	.4	1.5	.7	.2	.3	22.1	14.9	5.3	276.0	13.2	35.6	34.1	404.1
Max.	42.3	30.1	27.4	17.7	41.3	819.8	301.1	345.6	736.1	448.2	200.8	68.0	2485.0
Min.	.0	.5	.3	.0	.1	4.0	13.4	5.3	.9	0	1.0	.0	101.1
Average for Period of Record													662.0

STREAMFLOW DATA

Station Number and Name: 6-6010 Omaha Creek at Homer

Location: Lat. 42° 19' 29", Long. 96° 29' 43", in SW¼ SE¼ Sec. 11, T.27N., R.8E., on left bank 80 feet downstream from bridge on main street of Homer. Prior to November 4, 1966, at site 80 feet upstream.

Drainage Area in Sq. Mi.: 170 approximately **Datum of Gage:** 1,082.45' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1946	7.3	5.9	4.0	5.1	49.3	25.8	7.8	25.1	39.7	7.5	3.5	6.7	187.7
1947	9.0	13.3	8.1	5.6	8.3	24.9	29.9	14.4	44.0	16.4	4.8	4.3	183.0
1948	3.7	4.7	2.7	2.7	41.9	22.9	13.4	7.3	5.6	8.1	14.8	.5	128.3
1949	1.9	1.6	2.6	2.1	1.7	53.1	19.9	25.2	33.4	68.5	19.2	7.8	237.0
1950	8.8	5.8	4.3	2.5	3.5	145.7	8.3	15.7	47.4	26.1	48.7	5.3	322.1
1951	5.3	5.6	4.1	2.5	12.1	71.0	22.8	30.5	38.1	31.4	58.7	45.9	328.0
1952	36.4	16.4	12.1	13.7	27.4	60.1	37.3	89.4	50.6	50.5	30.6	13.2	437.7
1953	11.8	11.5	10.9	11.8	15.4	30.5	29.7	33.3	83.4	15.5	12.0	5.7	271.5
1954	5.4	9.7	6.2	5.1	24.5	18.0	14.6	17.8	153.7	16.3	12.6	7.7	291.6
1955	17.9	10.8	9.8	7.9	4.6	17.0	15.2	8.5	9.8	6.9	3.7	.6	112.7
1956	1.0	1.4	1.9	1.3	.8	3.9	2.5	15.9	72.5	41.6	7.3	.7	150.8
1957	.7	1.6	1.5	1.2	2.0	4.4	2.7	8.2	198.9	84.9	10.5	34.1	350.7
1958	5.6	15.3	6.5	5.0	39.1	12.9	23.0	11.7	7.0	104.8	8.0	4.5	243.4
1959	4.6	4.8	4.2	2.5	2.1	19.7	11.5	102.5	23.6	9.8	20.8	5.9	212.0
1960	7.3	7.6	7.2	5.5	7.2	28.2	94.9	48.7	24.8	22.3	54.0	18.5	326.2
1961	12.5	11.7	11.9	7.4	10.1	65.8	15.8	15.5	31.5	12.5	9.5	7.2	211.4
1962	7.4	6.4	4.8	4.9	13.0	121.2	38.3	90.8	83.8	40.6	26.8	14.7	452.7
1963	11.8	13.0	8.1	10.1	18.2	47.3	11.8	12.4	34.1	8.1	6.4	6.9	188.2
1964	4.1	4.5	3.3	5.3	6.3	8.3	12.5	26.9	9.8	7.8	7.4	6.1	102.3
1965	4.0	2.7	1.9	3.1	3.3	47.2	31.9	23.1	43.2	7.1	4.8	44.6	216.9
1966	15.4	10.0	9.0	6.9	73.5	17.3	12.2	8.4	32.4	67.5	45.2	44.8	342.6
1967	10.1	8.8	5.5	6.4	7.2	13.4	8.3	6.6	211.6	25.8	8.0	5.8	317.5
Max.	36.4	16.4	12.1	13.7	73.5	145.7	94.9	102.5	211.6	104.8	58.7	45.9	452.7
Min.	.7	1.4	1.5	1.2	.8	3.9	2.5	6.6	5.6	6.9	3.5	.5	102.3
Average for Period of Record													255.2
Average for 53-67	8.0	8.0	6.2	5.6	15.2	30.3	21.7	28.7	68.0	31.4	15.8	13.9	252.8

STREAMFLOW DATA

Station Number and Name: 6-6090 New York Creek at Herman

Location: Lat. 41° 39' 40", Long. 96° 12' 10", in NW¼, Sec. 32, T.20N., R.11E., on left bank about 350 feet downstream from bridge on U.S. Highway 73 and half a mile southeast of Herman.

Drainage Area in Sq. Mi.: 25.4 Datum of Gage: 1,021.67' m.s.l.

Discharge In 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1946	—	—							3.4	.4	1.4	.4	—
1947	1.3	1.1	.9	.6	1.7	2.1	2.3	3.3	29.0	2.3	.6	.5	45.7
1948	.7	1.0	1.3	.8	8.1	12.2	1.1	.8	2.9	2.0	1.1	7.9	39.9
1949	.7	.9	.8	1.8	1.5	28.5	1.8	2.9	4.0	7.3	1.2	7.0	58.4
1950	1.8	.8	.5	.2	18.3	2.6	.7	2.8	1.9	27.7	13.2	.8	71.3
1951	1.3	.6	.6	.5	17.7	17.7	9.9	23.4	13.5	22.5	22.1	3.7	133.5
1952	3.0	1.8	1.9	1.3	4.0	8.8	7.4	6.0	18.6	5.0	7.0	2.3	66.8
1953	2.0	2.1	1.5	1.7	2.8	4.7	3.8	4.0	2.4	1.3	1.0	.6	27.9
1954	.7	1.2	1.0	.5	2.3	2.0	2.3	3.6	3.0	.6	.7	.3	18.2
1955	1.1	1.0	.8	.5	.7	1.7	.9	.4	.8	2.5	1.0	.5	11.9
1956	.2	.2	.1	.1	.2	.7	.7	1.2	.2	.4	.2	2.0	6.2
1957	.1	.3	.2	.1	.2	.7	.3	.3	32.7	5.5	1.2	3.5	45.1
1958	1.4	1.3	.7	.5	2.7	2.3	7.2	1.9	1.0	9.9	4.4	.7	34.0
1959	.4	.6	.4	.3	1.1	2.4	3.4	11.8	12.2	3.6	2.1	1.1	39.4
1960	1.5	1.3	1.7	1.3	1.4	6.1	12.2	9.7	20.9	4.6	4.1	2.1	66.9
1961	2.0	2.0	2.2	2.3	2.4	4.3	3.0	10.9	8.3	3.9	1.7	1.7	44.7
1962	3.7	2.0	.8	1.0	4.7	36.3	5.7	10.0	18.6	4.7	3.3	2.1	92.9
1963	2.1	1.9	1.0	1.4	4.4	17.6	3.3	2.0	15.5	.9	1.4	1.6	53.1
1964	.9	.9	.4	.9	1.1	1.3	3.5	21.9	7.4	9.4	13.5	17.9	79.1
1965	2.5	2.2	1.5	1.0	1.2	2.5	7.7	4.9	5.2	3.4	1.9	10.8	44.8
1966	5.3	3.9	3.2	1.7	6.4	4.2	3.3	5.2	4.5	2.8	4.2	4.0	48.7
1967	1.7	1.9	1.4	1.5	1.4	1.8	1.2	1.3	26.1	2.3	1.2	1.6	43.4
Max.	5.3	3.9	3.2	2.3	18.3	36.3	12.2	23.4	32.7	27.7	22.1	17.9	133.5
Min.	.1	.2	.1	.1	.2	.7	.3	.3	.2	.4	.2	.3	6.2
Average for Period of Record													51.1
Average for 53-67	1.7	1.5	1.1	1.0	2.2	5.9	3.9	5.9	10.6	3.7	2.8	3.4	43.7

STREAMFLOW DATA

Station Number and Name: 6-6745 North Platte River at Wyoming-Nebraska State Line

Location: Lat. 41° 59' 14", Long. 104° 03' 25", in SW¼SE¼, Sec. 3, T.23N., R.60W., on left bank 0.3 miles upstream from Wyoming-Nebraska State Line and 1.0 mile southwest of Henry, Nebraska

Drainage Area in Sq. Mi.: 26,177 approximately; 5,888 noncontributing **Datum of Gage:** 4,024.77' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1929	—	—	—	—	—	—	—	2580.0	6190.0	2150.0	1310.0	1450.0	—
1930	892.0	572.0	550.0	462.0	561.0	546.0	570.0	670.0	928.0	1130.0	1250.0	976.0	9110.0
1931	885.0	607.0	481.0	358.0	342.0	368.0	352.0	410.0	1050.0	842.0	744.0	378.0	6820.0
1932	295.0	226.0	263.0	271.0	251.0	251.0	246.0	513.0	1110.0	1320.0	953.0	643.0	6340.0
1933	305.0	370.0	309.0	298.0	243.0	312.0	258.0	1630.0	1270.0	1210.0	941.0	696.0	7840.0
1934	399.7	348.7	354.1	302.6	255.2	330.6	181.2	305.4	518.1	375.5	94.8	137.1	3603.0
1935	151.6	103.6	193.9	174.2	165.3	178.1	127.0	280.1	961.6	852.3	651.2	419.2	4258.0
1936	281.8	184.3	238.6	235.3	211.0	253.0	233.5	656.4	825.8	855.5	592.6	395.2	4963.0
1937	282.6	326.0	263.9	194.3	183.3	244.6	214.8	556.5	839.1	1250.0	752.7	414.6	5522.0
1938	337.3	285.9	311.2	302.0	281.4	293.7	410.1	497.7	682.5	758.4	792.6	491.2	5444.0
1939	340.2	343.6	321.3	294.5	316.3	328.9	274.2	688.9	621.9	669.3	613.1	390.8	5203.0
1940	280.6	225.4	213.9	210.6	207.7	209.3	179.7	382.4	669.3	508.2	312.3	256.5	3656.0
1941	201.4	172.7	190.6	171.3	164.8	165.1	110.8	646.8	646.1	670.6	785.1	559.0	4484.0
1942	236.8	231.0	301.0	273.4	198.4	162.2	283.6	2278.0	670.0	846.3	737.7	530.1	6748.0
1943	312.4	373.5	410.2	384.6	289.7	348.1	550.3	533.8	569.9	815.0	744.8	468.5	5801.0
1944	252.4	307.8	275.0	247.5	195.8	192.1	224.4	691.5	629.3	783.5	725.4	480.6	5005.0
1945	242.7	266.8	244.4	251.4	225.2	274.2	216.5	994.8	944.2	739.9	689.2	651.2	5740.0
1946	351.8	330.9	326.0	335.1	293.1	322.2	180.0	407.9	588.9	668.8	674.8	430.2	4910.0
1947	311.0	296.4	325.8	304.8	261.9	281.7	235.6	388.3	1229.0	747.6	667.6	451.4	5501.0
1948	303.0	312.0	350.9	346.5	328.8	569.1	329.5	440.2	612.1	770.9	819.0	584.2	5766.0
1949	387.1	413.2	367.1	317.2	337.3	283.4	267.2	329.9	725.8	716.7	700.4	426.6	5272.0
1950	347.4	284.6	313.0	325.8	311.2	313.8	156.8	327.1	573.9	682.4	571.9	498.6	4706.0
1951	334.1	292.2	342.5	294.2	277.7	228.0	190.5	316.7	364.9	564.5	613.4	399.1	4218.0
1952	479.3	383.2	261.4	242.5	235.9	285.2	490.6	1122.0	1890.0	693.1	696.8	527.3	7307.0
1953	379.8	319.6	338.2	321.2	277.3	294.2	195.2	277.2	410.6	659.0	515.8	420.4	4408.0
1954	266.6	227.0	207.7	175.3	142.5	152.5	111.0	111.8	227.6	503.9	483.6	323.3	2933.0
1955	93.6	159.2	134.6	132.4	108.8	134.5	146.3	225.0	376.9	538.8	439.4	322.0	2812.0
1956	151.4	172.2	170.0	149.1	123.3	132.4	117.6	226.7	285.1	533.0	649.5	356.7	3067.0
1957	92.4	175.9	166.7	126.5	115.9	121.8	125.3	575.5	305.0	697.5	674.6	386.0	3563.0
1958	269.6	224.2	207.2	181.6	157.4	165.1	201.2	334.1	253.8	622.7	721.8	420.8	3760.0
1959	287.0	230.5	230.8	194.2	157.5	172.4	172.6	226.5	282.6	631.0	676.8	480.6	3742.0
1960	292.0	211.8	186.7	160.1	156.8	179.0	147.7	84.2	321.1	733.9	647.9	354.4	3476.0
1961	166.4	169.8	170.6	155.2	119.7	130.6	136.9	120.7	123.4	758.5	482.2	347.1	2881.0
1962	192.6	182.9	170.0	111.4	140.9	158.2	173.3	429.5	425.3	592.5	688.7	406.4	3672.0
1963	309.3	208.0	188.0	141.6	160.8	193.5	156.1	416.1	224.9	785.7	674.8	411.6	3870.0
1964	258.1	195.7	162.4	147.7	139.3	149.7	170.9	323.0	419.6	760.1	714.6	370.1	3811.0
1965	256.5	199.5	173.9	162.8	140.5	140.5	119.3	669.3	1129.0	600.2	671.6	412.2	4675.0

STREAMFLOW DATA

Station Number and Name: 6-6745 North Platte River at Wyoming-Nebraska State Line

Location: Lat. 41° 59' 14", Long. 104° 03' 25", in SW¼SE¼, Sec. 3, T.23N., R.60W., on left bank 0.3 miles upstream from Wyoming-Nebraska State Line and 1.0 mile southwest of Henry, Nebraska.

Drainage Area in Sq. Mi.: 26,177 approximately **Datum of Gage:** 4,024.77' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1966	328.0	229.6	206.1	173.5	136.0	171.5	303.6	390.7	405.0	753.3	589.2	397.1	4084.0
1967	250.6	196.3	171.4	144.8	113.6	117.9	103.9	219.2	778.8	681.5	695.6	439.5	3913.0
Max.	892.0	607.0	550.0	462.0	561.0	569.1	570.0	2580.0	6190.0	2150.0	1310.0	1450.0	9110.0
Min.	92.4	103.6	134.6	111.4	108.8	117.9	103.9	84.2	123.4	375.5	94.8	137.1	2812.0
Average for Period of Record													4812.7
Average for													
53-67	239.6	206.8	192.3	165.2	146.0	160.9	158.8	308.6	397.9	656.8	621.7	389.9	3644.5

STREAMFLOW DATA

Station Number and Name: 6-6775 Horse Creek near Lyman

Location: Lat. 41° 56' 14", Long. 103° 59' 00", in NE¼, Sec. 25, T.23N., R.58W., on right bank 135 feet upstream from county highway bridge, three-quarters of a mile upstream from mouth, 1 mile downstream from Kiowa Creek, and 3¼ miles northeast of Lyman

Drainage Area in Sq. Mi.: 1,570 approximately; 40 non-contributing **Altitude of Gage:** 4,010' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1931	—	—	—	—	—	40.2	39.2	65.8	78.6	60.8	52.8	37.4	—
1932	25.3	25.6	24.0	16.8	38.5	19.1	15.1	32.8	102.0	66.4	77.5	85.1	528.0
1933	52.1	21.6	13.2	15.4	9.9	18.6	20.9	105.0	77.4	59.5	82.4	143.0	619.0
1934	54.8	18.3	15.5	14.1	10.8	12.0	10.9	5.1	11.1	10.0	10.3	7.7	180.6
1935	7.8	6.3	7.3	5.8	5.6	4.7	14.4	21.9	100.8	26.8	20.7	24.8	246.9
1936	17.9	13.6	9.3	6.7	4.5	7.9	8.5	9.5	59.5	16.8	23.8	18.8	196.8
1937	18.6	11.2	8.4	5.0	5.1	8.6	6.2	11.0	40.2	58.5	35.4	59.1	267.3
1938	49.6	21.9	17.8	12.3	9.3	12.2	14.2	71.9	47.2	56.5	44.3	99.9	457.1
1939	35.7	21.4	14.2	12.9	8.6	17.8	10.1	17.5	43.4	26.0	26.7	23.4	257.7
1940	22.3	16.7	13.2	10.0	12.9	11.0	11.3	5.6	6.2	7.7	3.6	11.1	131.6
1941	15.5	7.8	9.6	9.0	7.3	5.1	5.6	8.7	48.3	34.9	28.7	35.6	216.1
1942	32.3	15.6	10.7	9.4	12.3	13.4	17.9	58.1	79.4	41.5	50.3	79.6	420.5
1943	43.1	28.9	19.9	16.4	17.4	20.4	28.1	77.6	57.6	36.7	38.9	53.8	438.8
1944	50.8	27.2	18.0	13.1	17.8	17.4	18.3	45.0	47.4	51.7	42.0	60.4	409.1
1945	42.9	25.4	19.6	16.3	11.6	15.2	18.4	47.5	147.0	45.8	167.6	82.9	640.2
1946	65.8	35.0	32.9	30.2	40.0	50.6	27.7	80.2	80.0	51.1	40.1	105.2	638.8
1947	49.9	31.2	21.0	17.9	14.7	27.9	33.1	76.5	106.3	112.7	45.6	71.9	608.8
1948	58.7	37.0	21.2	16.5	40.2	66.5	22.7	28.0	104.3	69.0	65.5	92.3	621.9
1949	48.1	29.0	21.7	2.6	30.9	35.2	14.8	19.1	92.2	38.6	42.7	74.3	449.2
1950	46.2	27.9	20.0	14.7	14.9	13.8	10.9	24.7	53.1	69.9	51.6	150.9	498.6
1951	46.9	27.7	22.6	15.8	16.7	13.1	11.3	52.8	112.7	79.6	65.8	193.5	658.5
1952	54.7	31.5	20.7	18.1	24.3	66.4	39.9	97.3	115.7	83.2	70.2	94.5	716.5
1953	72.1	33.6	24.6	23.8	17.2	18.5	13.4	37.2	112.4	58.1	85.9	78.0	574.8
1954	46.0	22.8	18.3	14.1	10.7	14.1	9.1	55.4	19.0	24.1	33.2	42.1	308.9
1955	24.9	17.0	12.9	9.1	9.4	17.6	20.9	21.8	30.5	22.7	38.8	71.0	296.6
1956	34.6	20.1	17.2	13.5	10.6	10.9	6.5	23.2	39.3	54.1	29.2	40.2	299.4
1957	22.8	21.0	16.0	9.3	10.0	10.5	12.1	33.3	61.2	122.5	105.7	110.3	534.7
1958	40.8	22.3	16.0	13.0	18.5	41.9	63.8	48.5	116.9	100.3	46.2	86.2	614.4
1959	48.6	26.5	21.8	15.7	11.6	12.7	17.5	17.2	68.4	41.8	42.5	83.2	407.5
1960	46.3	22.9	16.9	12.8	12.5	12.0	8.6	12.5	30.8	21.1	22.2	38.1	256.7
1961	24.8	15.9	13.7	12.2	11.0	11.6	8.6	25.5	7.9	35.7	41.5	39.6	248.0
1962	22.5	16.3	10.6	7.4	9.5	8.5	14.8	67.1	64.5	93.8	55.4	69.3	439.7
1963	41.3	21.1	17.1	10.6	22.8	12.5	9.1	64.9	54.2	27.2	33.6	90.7	405.1
1964	35.5	20.2	15.4	13.2	10.2	9.6	13.1	32.2	99.0	25.2	29.6	49.8	353.0
1965	34.9	21.3	17.4	14.4	12.9	12.3	8.6	65.1	42.3	73.2	48.0	133.6	484.0
1966	42.2	22.8	18.2	11.4	10.1	13.2	8.3	50.9	108.0	49.4	79.5	95.7	509.7
1967	40.9	23.7	17.6	15.5	11.5	10.2	13.9	36.1	147.3	82.9	50.4	122.3	572.3
Max.	72.1	37.0	32.9	30.2	40.2	66.5	63.8	105.0	147.3	122.5	167.6	193.5	716.5
Min.	7.8	6.3	7.3	2.6	4.5	4.7	5.6	5.1	6.2	7.7	3.6	7.7	131.6
Average for Period of Record													430.7
Average for 53-67	38.6	21.9	16.9	13.1	12.6	14.4	15.2	39.4	66.8	55.5	49.5	76.7	420.4

STREAMFLOW DATA

Station Number and Name: 6-6875 North Platte River at Lewellen

Location: Lat. 41° 19', Long. 102° 08', in Sec. 34, T.16N., R.42W., near left bank on downstream side of bridge over left channel and near left bank on downstream side of bridge over right channel on U.S. Highway 26, one half mile upstream from high-water line of Lake McConaughy and 1 mile southeast of Lewellen.

Drainage Area in Sq. Mi.: 32,600 approximately **Datum of Gage:** 3,284.6' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1931										261.0	309.0	413.0	——
1941	——	——	589.3	653.7	645.9	705.3	669.2	565.3	760.4	279.0	231.8	454.8	——
1942	1008.0	873.1	741.9	791.5	877.8	885.0	841.5	3400.0	1159.0	460.7	403.5	722.0	12160.0
1943	1219.0	1144.0	1162.0	1169.0	1014.0	1025.0	1277.0	774.6	678.4	314.6	239.9	506.3	10520.0
1944	904.7	1071.0	935.4	925.1	899.3	1014.0	887.6	1038.0	811.0	723.9	444.0	647.3	10300.0
1945	1059.0	1096.0	942.9	883.6	899.3	950.3	915.8	1253.0	1827.0	558.3	919.5	875.4	12180.0
1946	1382.0	1116.0	921.5	1025.0	911.6	1026.0	763.8	810.8	573.8	341.0	211.7	871.2	9954.0
1947	1264.0	1184.0	983.0	944.7	873.1	940.8	809.1	565.1	2165.0	1590.0	388.6	732.0	12440.0
1948	1238.0	1206.0	1209.0	927.2	1078.0	1287.0	944.7	565.2	950.5	778.9	582.3	825.5	11590.0
1949	1268.0	1198.0	964.4	702.5	1102.0	1230.0	914.8	876.5	1185.0	437.5	477.2	905.3	11260.0
1950	1267.0	1123.0	1064.0	949.5	1028.0	1002.0	717.7	566.3	338.5	584.3	683.2	1198.0	10520.0
1951	1315.0	1130.0	1157.0	927.6	923.5	845.0	738.0	636.8	1034.0	860.9	527.2	1615.0	11710.0
1952	1467.0	1272.0	888.2	892.5	914.2	1143.0	1141.0	1323.0	1803.0	477.0	385.6	729.3	12440.0
1953	1287.0	1078.0	1199.0	1049.0	917.0	1019.0	836.0	563.9	591.0	310.1	834.2	488.6	10170.0
1954	958.8	975.9	874.1	791.5	742.2	793.9	633.4	505.3	265.5	103.8	194.1	222.5	7061.0
1955	535.2	730.1	723.4	605.1	602.5	782.3	661.7	475.2	530.9	337.1	127.3	299.2	6410.0
1956	700.8	747.6	747.2	728.3	626.7	672.1	496.0	315.3	149.8	522.1	114.9	155.7	5976.0
1957	484.4	797.6	696.8	522.5	670.6	664.1	687.0	1133.0	901.9	384.7	453.9	697.2	8094.0
1958	906.0	879.9	830.7	693.3	670.0	814.7	901.7	659.3	1011.0	923.5	303.6	593.0	9187.0
1959	1005.0	897.5	872.5	793.1	736.1	811.0	788.4	700.5	341.4	196.9	120.5	451.6	7714.0
1960	1137.0	871.1	818.2	669.6	704.1	932.2	652.0	479.3	175.7	70.9	121.0	220.7	6852.0
1961	652.5	723.0	653.0	654.0	645.0	731.3	631.5	705.2	272.3	109.7	193.1	284.8	6255.0
1962	790.4	769.8	700.0	585.5	578.8	737.5	578.9	626.8	1324.0	1052.0	384.2	584.6	8712.0
1963	1086.0	878.1	744.6	637.3	891.6	950.7	760.3	353.7	736.1	90.1	176.0	719.1	8024.0
1964	1125.0	934.4	763.4	725.8	722.6	735.5	760.7	461.1	443.1	92.4	96.6	309.0	7170.0
1965	976.5	821.2	707.3	776.5	655.9	581.4	597.5	617.2	2038.0	1068.0	464.4	981.0	10285.0
1966	1254.0	909.2	945.7	739.2	732.9	880.3	846.5	374.7	546.8	296.4	537.1	998.1	9061.0
1967	1110.0	973.5	765.4	727.5	642.0	685.1	511.4	571.2	1670.0	832.9	284.8	733.2	9507.0
Max.	1467.0	1272.0	1209.0	1169.0	1102.0	1287.0	1277.0	3400.0	2165.0	1590.0	919.5	1615.0	12440.0
Min.	484.4	723.0	589.3	522.5	578.8	581.4	496.0	315.3	149.8	70.9	96.6	155.7	5976.0
Average for Period of Record													9444.1
Average for													
53-67	933.9	865.8	802.8	713.2	702.5	786.1	689.5	569.4	733.1	426.0	293.7	515.9	8031.9

STREAMFLOW DATA

Station Number and Name: 6-6930 North Platte River at North Platte

Location: Lat. 41° 09', Long. 100° 46', in Sec. 28, T.14N., R.30W., near right bank on downstream side of pier of bridge on U.S. Highway 83 one-half mile north of city of North Platte and 4½ miles upstream from confluence with South Platte River.

Drainage Area in Sq. Mi.: 34,900 (revised), approximately **Datum of Gage:** 2,794.9' **m.s.l.**

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1895	—	—	—	—	1790.0	1847.7	2064.8	4324.4	6444.0	1928.9	302.5	143.4	—
1896	498.1	807.5	835.0	792.0	1040.0	1530.0	1670.0	2802.6	3769.0	697.3	565.1	510.0	15500.0
1897	707.1	1288.9	1390.0	1720.0	1930.0	2410.9	3041.3	8596.6	8283.0	2267.7	1768.4	362.4	33800.0
1898	696.0	1280.5	1380.0	1700.0	1210.0	1368.7	1511.4	3244.1	4092.7	1135.1	217.1	209.5	18000.0
1899	289.6	647.4	695.0	2240.0	3390.0	4189.8	3873.1	5654.4	8238.4	6605.7	2377.7	683.1	38900.0
1900	592.7	1078.8	1170.0	1450.0	1430.0	1900.0	2440.0	5820.0	5480.0	1390.0	357.0	66.0	23200.0
1901	328.0	665.0	744.0	945.0	1000.0	2004.3	1432.8	4722.9	5791.1	927.1	212.8	635.5	19400.0
1902	689.2	937.7	1010.0	1250.0	894.0	1100.0	1453.6	3350.7	3057.9	1370.4	62.7	286.2	15500.0
1903	636.4	656.9	775.0	1310.0	1780.0	3740.0	1917.8	2992.0	4061.7	2058.6	437.2	324.3	20700.0
1904	668.4	785.0	847.0	1050.0	775.0	842.0	1153.0	3470.0	6105.0	2263.0	245.3	94.6	18300.0
1905	717.6	902.7	970.0	1200.0	1210.0	1680.0	2227.0	6315.0	8747.0	3679.0	1145.0	348.1	29100.0
1906	378.8	422.0	528.0	1140.0	2320.0	3390.0	3630.0	4630.0	6310.0	2550.0	695.0	875.0	26900.0
1907	978.0	1280.0	1390.0	1330.0	1620.0	1920.0	2870.0	3510.0	7440.0	4130.0	1240.0	898.0	28600.0
1908	892.0	738.0	675.0	645.0	706.0	1030.0	916.0	3880.0	5490.0	941.0	324.0	113.0	16400.0
1909	494.0	1100.0	860.0	816.0	1000.0	1050.0	1400.0	4080.0	8030.0	3580.0	2210.0	708.0	25300.0
1910	1690.0	875.0	1700.0	1200.0	1020.0	1570.0	2180.0	857.0	110.0	61.5	49.2	29.8	11300.0
1911	1070.0	1000.0	1600.0	1510.0	1390.0	1030.0	220.0	604.0	374.0	378.0	501.0	190.0	9870.0
1912	959.0	1000.0	1470.0	1390.0	1500.0	1990.0	4430.0	1580.0	340.0	2270.0	5560.0	3840.0	26300.0
1913	3640.0	3290.0	1810.0	1720.0	1750.0	2100.0	2070.0	1680.0	786.0	664.0	512.0	797.0	20800.0
1914	1190.0	934.0	920.0	871.0	910.0	1080.0	1190.0	2950.0	946.0	563.0	1080.0	1910.0	14500.0
1915	1610.0	1130.0	1040.0	989.0	1010.0	1380.0	2640.0	2450.0	2360.0	1410.0	2450.0	1840.0	20400.0
1916	1610.0	1310.0	1290.0	1570.0	1270.0	1260.0	1200.0	1320.0	1620.0	618.0	1330.0	665.0	15100.0
1917	1610.0	1310.0	1290.0	1600.0	1320.0	2170.0	2100.0	4090.0	10300.0	6960.0	1420.0	1920.0	36100.0
1918	1990.0	1850.0	1910.0	1820.0	1840.0	1970.0	1710.0	3760.0	2730.0	2510.0	1330.0	1130.0	24600.0
1919	2050.0	1650.0	1930.0	1840.0	1340.0	1330.0	1310.0	1260.0	1450.0	703.0	534.0	1020.0	16400.0
1920	1460.0	1380.0	1410.0	1350.0	1980.0	2650.0	2910.0	4200.0	5320.0	2120.0	1280.0	1550.0	27600.0
1921	1630.0	1730.0	1540.0	1460.0	1340.0	1450.0	1350.0	2070.0	9340.0	2030.0	1730.0	1220.0	26900.0
1922	1640.0	1370.0	1410.0	1340.0	1870.0	2330.0	1590.0	3460.0	2010.0	1180.0	931.0	513.0	19600.0
1923	1140.0	1430.0	1110.0	1380.0	1100.0	1220.0	1280.0	2300.0	2250.0	1520.0	2360.0	1070.0	18200.0
1924	3180.0	1920.0	1740.0	922.0	1510.0	2050.0	5090.0	5770.0	3440.0	1330.0	1220.0	2020.0	30200.0
1925	2490.0	1850.0	1660.0	1600.0	2340.0	1560.0	1280.0	1060.0	1320.0	595.0	2020.0	1260.0	19000.0
1926	1980.0	1790.0	1740.0	2540.0	2350.0	1500.0	1970.0	1800.0	3650.0	2690.0	1780.0	1940.0	25700.0
1927	2170.0	1950.0	2030.0	1260.0	1220.0	1940.0	2680.0	3080.0	2390.0	1530.0	3210.0	1330.0	24800.0
1928	2620.0	2110.0	1720.0	1540.0	1490.0	1700.0	1550.0	2320.0	6470.0	2440.0	1350.0	1030.0	26300.0
1929	1610.0	1690.0	1520.0	901.0	1400.0	2150.0	2590.0	3090.0	6660.0	1550.0	835.0	2110.0	26100.0
1930	2380.0	1760.0	1920.0	1350.0	1860.0	1870.0	1450.0	2100.0	1080.0	349.0	1500.0	1590.0	19200.0

STREAMFLOW DATA

Station Number and Name: 6-6930 North Platte River at North Platte

Location: Lat. 41° 09', Long. 100° 46', in Sec. 28, T.14N., R.30W., near right bank on downstream side of pier of bridge on U.S. Highway 83 one-half mile north of city of North Platte and 4½ miles upstream from confluence with South Platte River.

Drainage Area in Sq. Mi.: 34,900 (revised), approximately **Datum of Gage:** 2,794.9' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1931	2420.0	1850.0	1870.0	1560.0	1560.0	1450.0	1450.0	887.0	403.0	149.0	190.0	361.0	14100.0
1932	965.0	1030.0	1170.0	1130.0	1300.0	1460.0	1070.0	713.0	797.0	518.0	578.0	702.0	11400.0
1933	1530.0	1530.0	1260.0	1640.0	1090.0	1420.0	1400.0	2740.0	702.0	494.0	781.0	1650.0	16200.0
1934	1626.0	1498.0	1433.0	1516.0	1176.0	1290.0	865.1	321.3	219.7	67.5	66.0	173.0	10250.0
1935	292.4	459.4	855.0	1061.0	986.8	939.8	790.1	1467.0	2085.0	176.3	77.3	147.7	9338.0
1936	496.2	841.8	612.2	924.3	876.3	821.1	467.1	280.4	165.8	35.1	72.9	87.3	5680.0
1937	626.7	671.4	372.1	184.9	995.2	1346.0	921.5	260.9	636.0	309.5	103.0	409.9	6837.0
1938	1064.0	1204.0	1267.0	1171.0	1251.0	1130.0	811.4	899.8	607.5	676.2	395.7	1220.0	11700.0
1939	1033.0	1122.0	897.3	811.7	510.8	1118.0	922.1	289.8	244.4	164.1	53.2	98.7	7265.0
1940	733.9	943.0	402.7	366.9	643.2	445.1	306.2	161.8	233.7	73.3	26.1	57.7	4394.0
1941	229.9	240.2	190.9	232.2	234.7	211.5	233.2	180.9	135.4	260.7	81.0	173.5	2404.0
1942	203.6	186.4	187.9	269.0	186.6	255.5	371.6	307.1	196.1	140.4	519.4	460.8	3284.0
1943	188.6	210.4	429.0	238.4	220.5	233.9	714.6	324.7	262.7	371.2	808.5	253.1	4256.0
1944	237.2	219.3	182.2	202.3	220.1	291.1	297.5	261.9	216.8	288.3	984.1	221.8	3623.0
1945	291.2	796.7	886.8	287.8	214.0	213.7	228.0	222.6	319.3	425.0	929.0	545.2	5359.0
1946	324.7	232.5	208.5	219.4	209.0	276.8	203.3	422.2	557.3	881.9	925.1	366.8	4828.0
1947	330.3	289.6	248.9	206.1	223.9	252.3	229.7	205.3	254.5	260.1	1044.0	793.9	4339.0
1948	262.7	272.8	247.1	219.8	431.6	253.9	529.8	529.2	349.4	791.1	594.7	418.3	4900.0
1949	288.9	314.1	237.1	284.0	435.6	401.2	359.3	336.0	252.0	729.5	803.0	250.6	4691.0
1950	515.8	326.1	241.4	177.9	225.1	260.8	441.3	794.8	284.8	397.1	501.1	301.8	4468.0
1951	182.3	262.5	244.3	213.3	232.5	247.0	553.9	694.0	458.3	408.4	639.0	314.3	4450.0
1952	289.2	249.7	227.5	362.9	1100.0	1287.0	593.7	873.8	1078.0	1315.0	720.9	654.1	8752.0
1953	236.2	231.1	232.7	239.3	231.5	281.5	224.3	273.1	243.9	1068.0	680.7	319.8	4262.0
1954	212.0	270.0	259.7	204.1	219.8	249.0	194.4	198.8	191.9	1026.0	528.6	211.7	3766.0
1955	419.6	244.5	226.4	212.0	179.2	280.8	205.2	350.5	197.8	772.5	685.1	177.3	3951.0
1956	195.9	213.2	220.8	211.0	220.1	233.5	201.7	157.3	281.5	872.2	677.0	275.6	3760.0
1957	750.8	262.0	237.8	185.3	223.0	238.0	294.2	359.5	185.7	514.9	781.6	211.7	4244.0
1958	244.3	233.2	230.5	231.6	196.5	290.5	307.9	305.4	200.8	349.1	765.5	237.6	3593.0
1959	189.1	215.4	197.9	187.5	211.2	266.0	230.7	231.3	274.5	631.4	675.9	385.8	3697.0
1960	617.7	280.8	231.4	214.2	239.6	371.3	275.8	250.0	178.0	444.1	804.9	147.3	4055.0
1961	310.1	236.8	230.5	211.5	196.5	277.0	266.0	286.0	149.7	801.0	534.9	175.2	3675.2
1962	199.6	220.2	222.8	210.5	219.1	277.8	236.4	756.6	397.3	352.7	342.6	233.0	3669.0
1963	223.9	220.1	218.0	208.3	265.9	258.8	245.2	233.3	181.0	1110.0	785.8	327.6	4278.0
1964	359.4	220.3	222.5	212.0	188.9	267.0	294.8	242.0	195.3	777.9	671.6	193.2	3844.9
1965	446.1	227.2	228.3	234.9	224.7	233.4	219.7	266.3	359.1	364.6	419.1	323.6	3547.0
1966	260.1	269.7	278.3	220.3	215.8	323.6	237.8	371.2	573.5	1015.0	380.8	247.3	4393.0
1967	574.9	232.9	228.9	227.9	200.8	226.4	195.8	199.6	501.9	694.6	623.9	282.7	4190.0
Max.	3640.0	3290.0	2030.0	2540.0	3390.0	4189.8	5090.0	8596.6	10300.0	6960.0	5560.0	3840.0	38900.0
Min.	182.3	186.4	182.2	177.9	179.2	211.5	194.4	157.3	110.0	35.1	26.1	29.8	2404.0
Average for Period of Record													13889.1
Average for													
53-67	349.3	238.5	231.1	214.0	215.5	271.6	242.0	298.7	274.1	719.6	623.9	250.0	3928.3

STREAMFLOW DATA

Station Number and Name: 6-7625 Lodgepole Creek at Bushnell

Location: Lat. 41° 14', Long. 103° 51', in Sec. 33, T.15N., R.57W., on right bank 1½ miles east of Bushnell and 1½ miles upstream from Oliver Reservoir.

Drainage Area in Sq. Mi.: 1,361 **Datum of Gage:** 4,812.3' m.s.l.

	Discharge in 100 Acre-Feet												
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1932	8.5	11.1	10.8	10.0	12.1	16.4	14.3	12.7	10.4	7.2	6.1	6.7	126.3
1933	8.3	8.1	8.5	16.6	9.8	12.7	11.3	11.4	5.6	5.0	33.2	10.9	142.0
1934	10.8	11.4	12.3	10.5	8.8	9.5	8.1	6.0	4.6	4.0	5.6	5.4	97.0
1935	6.5	8.0	8.6	8.1	7.4	8.3	10.6	12.4	41.6	7.6	5.3	6.6	131.0
1936	9.2	11.0	8.3	9.9	9.8	11.1	10.3	8.3	6.0	2.6	3.7	3.8	94.0
1937	5.8	7.9	8.1	5.2	6.2	9.7	8.6	6.7	7.1	12.2	7.9	4.8	90.2
1938	5.3	6.0	6.4	6.8	5.9	8.7	8.3	8.2	8.0	11.6	8.0	27.4	110.8
1939	9.3	9.3	9.5	8.3	7.0	11.8	12.8	8.2	5.3	3.2	3.9	3.7	92.3
1940	5.5	6.5	7.9	6.9	7.6	11.1	9.2	7.4	4.4	3.3	3.0	5.1	77.9
1941	6.1	6.3	6.6	6.9	7.0	8.2	8.0	6.7	22.9	5.4	4.6	4.8	93.5
1942	6.3	6.4	6.5	6.0	6.6	9.8	9.6	12.3	8.4	7.9	6.3	6.5	92.6
1943	7.1	7.7	8.4	8.1	8.5	8.4	9.5	10.9	7.8	6.1	4.9	4.6	92.0
1944	6.5	7.7	7.8	7.4	8.7	10.2	10.5	8.3	8.2	8.8	5.2	5.5	94.8
1945	6.4	6.5	6.9	7.8	7.9	7.7	10.4	9.2	12.3	7.0	9.3	7.6	99.0
1946	9.1	8.7	8.6	8.6	8.4	10.0	8.3	12.7	7.0	5.3	5.0	4.8	96.6
1947	5.7	6.6	7.5	7.7	7.4	8.3	8.3	7.1	7.0	6.1	5.6	5.1	82.4
1948	6.2	7.4	7.9	6.6	7.2	9.2	7.2	5.9	4.1	15.9	9.1	4.8	91.5
1949	5.7	5.4	5.4	1.8	4.5	13.0	9.0	10.6	8.2	6.2	5.7	6.1	81.6
1950	6.5	6.2	5.0	5.0	5.8	6.8	6.2	5.6	4.4	3.7	3.8	29.3	88.3
1951	5.9	5.5	5.8	6.1	5.6	6.0	6.0	5.6	10.2	7.6	4.9	35.0	104.2
1952	8.0	7.1	6.3	6.7	7.9	9.0	7.6	6.9	4.0	3.4	3.7	3.4	74.0
1953	4.6	4.8	4.1	5.0	4.8	7.8	6.7	6.0	4.1	13.9	11.4	5.1	78.3
1954	5.4	5.6	5.1	6.7	5.8	6.7	6.5	6.4	3.8	4.2	3.0	3.9	63.1
1955	4.1	4.5	3.7	4.0	2.8	7.3	7.4	13.6	12.0	4.9	8.2	15.6	88.1
1956	6.4	5.8	5.8	6.1	6.4	8.1	7.1	6.7	5.4	3.8	3.8	3.5	68.9
1957	3.9	5.3	6.5	6.0	6.6	7.8	7.4	13.8	9.0	13.4	7.3	6.9	93.9
1958	8.0	8.1	7.8	7.8	7.8	9.4	9.4	8.2	7.3	12.6	7.9	7.0	101.3
1959	7.7	8.6	9.1	9.2	8.0	10.9	11.8	10.1	7.3	5.1	4.3	4.9	97.0
1960	7.3	6.0	7.6	6.1	7.7	8.8	7.9	9.7	7.1	9.7	4.5	4.8	87.2
1961	6.3	6.4	5.5	6.5	7.7	9.9	8.8	9.7	19.4	7.7	6.8	6.4	101.1
1962	7.3	7.6	7.1	6.6	9.0	9.9	7.8	7.2	8.5	11.8	7.1	6.5	96.4
1963	8.0	7.3	7.4	5.7	9.0	9.0	7.7	5.9	5.6	5.0	5.6	6.8	83.0
1964	6.3	5.7	3.9	4.3	4.4	4.9	5.3	4.5	4.2	3.7	2.7	2.8	52.7
1965	3.7	4.1	4.3	5.0	4.5	6.0	5.7	5.3	13.7	6.7	4.5	4.3	67.8
1966	5.3	5.6	6.0	5.4	5.3	6.9	6.3	4.9	3.9	3.3	10.5	13.1	76.5
1967	5.6	4.7	4.7	4.9	4.8	5.3	5.4	6.2	15.2	8.5	5.7	5.0	76.0
Max.	10.8	11.4	12.3	16.6	12.1	16.4	14.3	13.8	41.6	15.9	33.2	35.0	142.0
Min.	3.7	4.1	3.7	1.8	2.8	5.3	5.3	4.5	3.8	2.6	2.7	2.8	52.7
Average for Period of Record													91.2
Average for 53-67	6.0	6.0	5.9	6.0	6.3	7.9	7.4	7.9	8.4	7.6	6.2	6.4	82.0

STREAMFLOW DATA

Station Number and Name: 6-7640 South Platte River at Julesburg, Colorado

Location: Lat. 40° 58' 46", Long. 102° 15' 15", in NW¼NE¼ and SE¼NE¼, (two channels) Sec. 33, T.12N., R.44W., on left bank of channel No. 4 (left channel) 215 ft. downstream from bridge, and on right bank of channel No. 2 (second channel from right) 800 ft. downstream from bridge, on U.S. Highway 385, 0.9 miles southeast of Julesburg, 3 miles upstream from Colorado-Nebraska State Line, and 8 miles downstream from Lodgepole Creek.

Drainage Area in Sq. Mi.: 23,138 **Datum of Gage:** 3,446.76' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1902	—	—	—	—	—	—	27.4	22.8	16.7	12.9	1.5	91.0	—
1903	79.3	22.0	61.5	92.0	139.0	172.0	215.0	21.3	8.2	1.3	58.3	3.3	873.0
1904	3.6	29.2	209.0	172.0	150.0	35.0	10.3	58.8	990.0	112.0	30.4	14.1	1814.0*
1905	47.2	64.9	172.0	184.0	178.0	357.0	1130.0	3640.0	2860.0	122.0	427.0	24.9	9210.0
1906	42.3	184.0	135.0	154.0	194.0	400.0	378.0	186.0	25.3	23.9	13.0	18.1	1750.0
1907	418.0	922.0	350.0	289.0	250.0	319.0	200.0	799.0	851.0	251.0	280.0	150.0	5080.0
1908	230.0	239.0	300.0	250.0	180.0	200.0	50.0	83.6	34.3	37.9	32.4	23.5	1660.0
1909	36.8	91.6	111.0	148.0	167.0	400.0	637.0	259.0	1680.0	836.0	95.3	1020.0	5480.0
1910	719.0	797.0	492.0	523.0	555.0	738.0	171.0	27.9	5.0	3.5	11.8	10.3	4050.0
1911	14.0	13.7	92.8	372.0	257.0	94.2	15.4	14.8	9.9	6.7	33.6	6.9	931.0
1912	12.5	15.8	11.2	61.5	187.0	111.0	171.0	70.1	18.8	37.1	380.0	350.0	1430.0
1913	253.0	205.0	246.0	200.0	166.0	215.0	232.0	79.8	20.8	17.2	18.4	14.9	1670.0
1914	24.6	41.6	123.0	92.1	222.0	491.0	980.0	3630.0	2660.0	117.0	144.0	265.0	8790.0
1915	207.0	466.0	461.0	368.0	333.0	461.0	738.0	1890.0	1410.0	70.7	152.0	88.1	6640.0
1916	480.0	584.0	602.0	552.0	517.0	248.0	36.3	45.8	29.8	16.1	17.8	21.4	3150.0
1917	68.2	118.0	154.0	183.0	367.0	317.0	257.0	1090.0	2810.0	320.0	20.8	44.9	5750.0
1918	333.0	234.0	299.0	338.0	333.0	246.0	85.1	68.9	77.4	217.0	176.0	125.0	2530.0
1919	296.0	264.0	311.0	276.0	305.0	321.0	307.0	189.0	28.4	13.7	12.4	88.1	2410.0
1920	319.0	214.0	184.0	168.0	143.0	210.0	420.0	892.0	191.0	55.6	41.7	216.0	3050.0
1921	213.0	171.0	180.0	134.0	101.0	122.0	152.0	174.0	6310.0	216.0	32.7	70.2	7880.0
1922	320.0	314.0	299.0	309.0	395.0	423.0	139.0	144.0	26.8	15.4	12.3	14.9	2410.0
1923	27.7	92.2	117.0	209.0	192.0	178.0	158.0	224.0	3670.0	283.0	231.0	196.0	5580.0
1924	738.0	1400.0	1010.0	849.0	978.0	898.0	1250.0	922.0	3080.0	30.7	18.4	110.0	11300.0
1925	172.0	226.0	202.0	209.0	322.0	236.0	67.8	21.2	27.0	14.6	15.1	20.1	1530.0
1926	71.9	200.0	240.0	307.0	265.0	166.0	249.0	769.0	1140.0	411.0	68.2	62.5	3950.0
1927	246.0	234.0	224.0	259.0	253.0	426.0	780.0	215.0	98.8	18.9	134.0	44.5	2930.0
1928	220.0	217.0	211.0	237.0	244.0	255.0	38.9	149.0	904.0	504.0	166.0	16.7	3160.0
1929	136.0	257.0	242.0	357.0	472.0	535.0	531.0	463.0	19.9	20.2	12.1	165.0	3210.0
1930	77.5	272.0	346.0	205.0	1030.0	398.0	106.0	241.0	39.7	27.0	259.0	60.7	3060.0
1931	247.0	240.0	333.0	237.0	246.0	349.0	393.0	42.9	26.2	22.3	15.2	16.4	2170.0
1932	37.9	61.3	167.0	285.0	259.0	152.0	63.1	57.1	22.1	15.7	21.2	12.7	1150.0
1933	23.4	61.9	75.0	152.0	200.0	161.0	31.7	189.0	30.2	34.6	60.1	148.0	1170.0
1934	95.3	111.0	186.0	192.0	116.0	149.0	45.3	56.5	168.0	22.1	12.5	17.7	1171.0
1935	28.1	27.9	79.8	98.1	43.8	69.4	34.5	472.9	1928.0	36.8	15.5	27.5	2862.0
1936	50.1	57.6	148.5	165.7	188.7	86.2	41.7	29.8	33.4	12.3	43.8	21.0	878.8
1937	39.1	49.0	69.3	88.8	191.7	127.4	54.2	23.5	33.8	16.4	16.6	16.8	726.6
1938	27.8	51.4	80.7	100.7	164.2	50.3	51.4	135.3	112.2	39.6	27.4	811.5	1652.0
1939	184.1	190.8	355.9	682.3	481.7	1353.0	944.6	77.4	43.1	21.9	17.4	17.0	4380.0
1940	30.1	31.6	40.7	68.3	154.7	164.6	39.3	25.5	26.9	13.6	11.3	11.3	617.9

STREAMFLOW DATA

Station Number and Name: 6-7640 South Platte River at Julesburg, Colorado

Location: Lat. 40° 58' 46", Long. 102° 15' 15", in NW¼NE¼, (two channels) Sec. 33, T.12N., R.44W., on left bank of channel No. 4 (left channel) 215 ft. downstream from bridge, and on right bank of channel No. 2 (second channel from right) 800 ft. downstream from bridge, on U.S. Highway 385, 0.9 miles southeast of Julesburg, 3 miles upstream from Colorado-Nebraska State Line, and 8 miles downstream from Lodgepole Creek.

Drainage Area in Sq. Mi.: 23,138 **Datum of Gage:** 3,466.76' **m.s.l.**

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1941	20.2	44.6	49.7	63.9	108.4	66.0	61.1	27.6	95.2	40.4	40.8	30.1	648.0
1942	84.8	148.9	162.6	175.1	171.7	854.0	1452.0	5054.0	2322.0	375.6	28.1	92.1	10920.0
1943	264.9	249.1	447.4	647.0	453.4	569.5	283.2	309.1	516.7	36.1	13.0	13.7	3803.0
1944	52.9	61.8	130.3	169.1	206.6	191.6	276.7	1079.0	56.1	124.2	28.2	22.3	2399.0
1945	49.3	123.9	212.7	219.4	196.2	170.8	124.1	62.4	332.5	66.3	448.6	62.4	2069.0
1946	285.7	240.9	356.1	606.0	431.9	341.7	158.7	46.9	33.6	13.2	13.6	59.3	2588.0
1947	71.8	175.3	198.0	192.8	204.7	291.9	211.8	104.0	2496.0	1434.0	64.5	84.7	5530.0
1948	191.9	320.3	339.9	336.0	720.4	1086.0	511.3	177.3	235.1	119.0	24.6	24.4	4086.0
1949	77.5	194.1	204.6	265.6	474.9	282.8	215.8	148.9	3976.0	410.3	65.0	170.2	6486.0
1950	231.3	241.0	205.2	215.9	263.6	360.8	177.7	44.0	25.1	35.1	77.1	81.0	1958.0
1951	92.4	185.6	204.8	188.7	178.4	132.5	84.5	101.1	181.4	101.8	230.3	254.2	1936.0
1952	216.1	225.1	214.7	279.1	325.9	477.6	390.0	642.5	508.5	34.2	27.7	35.8	3377.0
1953	69.3	126.0	189.4	234.6	177.8	201.0	245.0	117.8	29.9	27.8	39.5	22.9	1481.0
1954	59.1	125.0	191.6	178.6	143.0	152.6	66.8	42.3	17.0	10.0	10.0	14.0	1010.0
1955	22.7	35.1	62.4	65.3	120.5	144.4	52.4	58.0	126.4	18.6	12.8	12.2	730.8
1956	29.5	59.4	69.8	79.7	112.4	85.2	29.2	18.1	28.4	13.5	19.0	9.5	554.0
1957	20.1	110.0	66.1	55.6	73.2	42.3	119.2	1624.0	1315.0	206.5	76.0	90.6	3799.0
1958	159.4	223.5	292.9	566.5	430.8	486.0	596.4	2525.0	943.4	268.7	33.0	49.8	6575.0
1959	124.3	189.1	201.2	172.1	172.2	268.6	619.1	548.5	152.9	18.4	12.6	12.9	2492.0
1960	91.6	114.2	172.7	164.7	231.9	477.7	371.5	193.8	162.3	25.8	10.2	9.6	2026.0
1961	43.4	56.2	126.6	145.7	130.6	138.9	159.1	429.0	1791.0	81.3	51.0	118.5	3271.0
1962	758.4	842.6	787.9	763.0	833.9	774.5	346.8	139.2	467.0	166.7	211.3	55.0	6146.0
1963	209.7	205.9	190.1	174.9	341.2	458.1	81.7	32.0	30.3	19.8	16.2	71.0	1831.0
1964	122.7	125.7	133.4	153.9	145.3	119.2	116.6	37.4	29.6	27.0	8.6	5.6	1025.0
1965	14.8	29.3	46.4	55.3	87.3	71.9	35.0	28.2	2629.0	618.3	527.2	239.3	4382.0
1966	713.5	583.4	578.3	472.1	572.4	383.1	169.3	41.7	67.3	47.4	29.7	90.6	3749.0
1967	85.6	112.5	140.7	145.4	127.3	81.4	24.6	51.0	907.9	862.2	29.9	23.7	2592.0
Max.	758.4	1400.0	1010.0	849.0	1030.0	1353.0	1452.0	5054.0	6310.0	1434.0	527.2	1020.0	11300.0
Min.	3.6	13.7	11.2	55.3	43.8	35.0	10.3	14.8	5.0	1.3	1.5	3.3	554.0
Average for Period of Record													3315.7
Average for													
53-67	168.3	195.9	216.6	228.5	246.7	259.0	202.2	392.4	579.8	160.8	72.5	55.0	2777.7

*Added 4.0 to make total correct

STREAMFLOW DATA

Station Number and Name: 6-7655 South Platte River at North Platte

Location: Lat. 41° 07', Long. 100° 46' in Sec. 9, T.13N., R.30W., near left bank on downstream side of bridge on U.S. Highway 83, three-quarters of a mile south of city of North Platte and 4 miles upstream from confluence with North Platte River.

Drainage Area in Sq. Mi.: 24,300 approximately **Datum of Gage:** 2,787.73' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1897	—	—	—	—	—	—	—	—	1129.9	8.0	656.8	0	—
1898	0	0	—	—	—	—	—	—	—	—	—	—	—
1914	—	—	—	—	—	—	—	—	3630.0	163.0	0	—	—
1915	—	—	—	—	—	—	—	2880.0	1720.0	157.0	271.0	175.0	—
1917	—	—	—	—	—	—	—	764.0	3480.0	279.0	0	4.7	—
1918	334.0	89.1	79.8	116.0	166.0	325.0	223.0	111.0	40.4	62.6	119.0	69.0	1730.0
1919	159.0	148.0	135.0	202.0	277.0	552.0	374.0	251.0	170.0	41.6	16.9	23.8	2350.0
1920	58.2	148.0	141.0	209.0	292.0	563.0	552.0	683.0	188.0	36.4	9.2	121.0	3000.0
1921	122.0	86.1	82.9	123.0	172.0	331.0	209.0	221.0	5560.0	1040.0	79.3	35.1	8060.0
1922	280.0	357.0	331.0	497.0	443.0	550.0	157.0	238.0	29.8	6.8	3.1	0	2890.0
1923	0	41.4	16.0	182.0	244.0	203.0	118.0	268.0	2180.0	569.0	361.0	134.0	4330.0
1924	582.0	1190.0	993.0	752.0	649.0	847.0	1000.0	733.0	2660.0	53.4	0	26.1	9490.0
1925	146.0	192.0	221.0	290.0	463.0	167.0	72.6	14.0	23.6	0	0	0	1590.0
1926	1.4	155.0	207.0	206.0	278.0	240.0	107.0	883.0	1100.0	348.0	37.3	13.7	3580.0
1927	183.0	241.0	228.0	492.0	555.0	771.0	1010.0	413.0	91.6	.7	80.7	0	4070.0
1928	119.0	173.0	154.0	261.0	270.0	347.0	56.8	136.0	1040.0	622.0	261.0	1.7	3440.0
1929	60.7	299.0	278.0	154.0	198.0	411.0	540.0	492.0	20.3	0	4.1	109.0	2570.0
1930	42.0	317.0	215.0	369.0	811.0	620.0	63.2	477.0	130.0	2.3	146.0	65.8	3260.0
1931	480.0	278.0	620.0	410.0	326.0	283.0	385.0	40.2	12.8	0	0	.2	2840.0
1932	1.4	0	49.4	288.0	247.0	204.0	131.0	51.3	18.1	1.4	.2	2.0	994.0
1933	0	0	0	115.0	123.0	198.0	83.8	201.0	18.1	0	12.4	139.0	890.0
1934	50.3	85.6	168.6	246.2	85.3	138.8	17.1	15.4	82.7	1.7	0	.8	892.5
1935	0	0	44.4	114.1	67.9	64.9	32.6	396.1	2055.0	80.9	.1	.1	2856.0
1936	.4	24.1	48.1	117.5	115.0	143.7	53.6	34.4	26.8	0	0	0	563.6
1937	0	6.2	52.4	28.0	151.2	205.3	96.8	43.9	45.7	6.0	2.8	9.9	648.2
1938	17.4	26.4	79.0	101.7	125.4	96.9	70.3	140.1	184.3	66.8	15.6	539.9	1464.0
1939	191.7	210.6	282.7	556.7	415.5	1197.0	1005.0	257.4	105.0	36.2	22.6	26.7	4307.0
1940	33.9	32.7	43.9	102.1	195.7	217.8	114.2	77.6	86.3	25.2	15.6	19.1	964.1
1941	32.4	44.5	71.3	114.3	118.7	147.7	140.8	98.0	119.2	93.8	39.0	44.1	1064.0
1942	116.6	158.5	197.6	269.7	206.4	732.5	933.3	5047.0	2000.0	657.2	85.6	146.9	10550.0
1943	267.4	297.2	423.2	465.0	525.9	489.0	418.0	244.9	630.8	123.4	51.2	45.0	3981.0
1944	55.2	99.2	149.4	203.3	315.5	331.7	352.3	1042.0	185.7	206.6	75.5	59.2	3076.0
1945	80.3	133.9	238.9	245.6	244.8	235.8	208.2	152.8	426.9	129.0	362.3	141.7	2600.0

STREAMFLOW DATA

Station Number and Name: 6-7655 South Platte River at North Platte

Location: Lat. 41° 07', Long. 100° 6', in Sec. 9, T.13N., R.30W., near left bank on downstream side of bridge on U.S. Highway 83, three-quarters of a mile south of city of North Platte and 4 miles upstream from confluence with North Platte River.

Drainage Area in Sq. Mi.: 24,300 approximately **Datum of Gage:** 2,787.73' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1946	337.1	299.2	270.1	622.2	514.3	481.0	322.8	164.2	132.8	61.7	53.5	129.2	3388.0
1947	179.0	192.7	94.3	84.8	92.9	83.0	90.0	74.8	1319.0	1349.0	94.3	116.3	3770.0
1948	110.3	79.6	81.6	87.1	535.9	629.1	303.5	79.0	81.0	70.2	93.0	69.9	2220.0
1949	76.0	122.7	80.6	55.6	270.4	170.8	152.5	141.2	3787.0	472.4	96.4	208.2	5634.0
1950	184.0	81.0	84.9	66.2	88.1	97.3	210.9	162.7	86.5	108.3	119.4	109.4	1399.0
1951	98.3	91.0	88.3	87.8	85.5	88.4	84.3	238.3	194.6	129.2	135.8	243.9	1565.0
1952	103.9	95.9	80.3	107.8	101.7	162.1	256.8	297.2	406.3	75.6	82.4	72.1	1842.0
1953	83.5	73.8	88.9	91.0	86.4	94.3	85.2	93.5	80.5	66.4	69.5	67.7	980.7
1954	83.8	89.4	98.4	87.7	83.1	90.9	81.4	103.6	81.4	55.4	65.5	71.1	991.7
1955	84.9	75.8	80.2	88.4	68.8	96.8	81.4	90.5	96.0	73.4	58.1	53.5	947.8
1956	78.0	73.9	74.5	83.0	79.2	86.8	84.0	81.3	99.5	80.9	74.3	66.2	961.6
1957	76.6	76.1	77.4	61.8	69.7	82.1	101.3	1308.0	645.1	121.4	91.1	110.4	2821.0
1958	95.1	87.1	85.6	91.7	83.5	114.8	137.3	1440.0	983.6	162.6	114.1	114.1	3510.0
1959	86.9	90.1	89.2	88.2	82.0	94.3	102.2	114.9	119.7	84.4	71.0	73.9	1097.0
1960	79.0	83.3	83.3	88.8	98.9	214.7	129.4	111.4	95.0	73.5	60.6	61.9	1180.0
1961	75.4	71.8	78.9	80.9	73.5	99.6	98.4	143.8	1155.0	97.3	75.4	94.0	2144.0
1962	177.1	145.0	154.4	254.0	481.7	240.9	104.0	128.5	169.7	149.6	100.3	107.1	2212.0
1963	153.9	96.1	93.4	87.3	153.1	116.9	95.7	102.5	92.0	52.4	69.7	94.4	1207.0
1964	115.5	81.6	81.4	84.1	76.5	92.6	106.2	92.1	92.3	81.0	63.3	75.2	1042.0
1965	83.2	78.8	81.7	82.7	80.9	82.8	80.2	93.7	1724.0	456.0	268.9	307.7	3421.0
1966	248.7	104.6	103.9	91.0	144.9	208.1	110.9	118.9	106.1	91.4	118.8	139.9	1587.0
1967	126.9	83.1	86.5	88.6	79.1	90.6	92.1	121.6	255.9	535.5	105.2	102.7	1768.0
Max.	582.0	1190.0	993.0	752.0	811.0	1197.0	1010.0	5047.0	5560.0	1349.0	656.8	539.9	1055.0
Min.	0	0	0	28.0	67.9	64.9	17.1	14.0	12.8	0	0	0	563.6
Average for Period of Record													2674.8
Average for 53-67	109.9	87.4	90.5	96.6	116.1	120.4	99.3	276.3	386.4	145.4	93.7	102.7	1724.7

STREAMFLOW DATA

Station Number and Name: 6-7680 Platte River near Overton

Location: Lat. 40° 41', Long. 99° 32', in Sec. 12, T.8N., R.20W, on right bank just downstream from highway bridge, 4 miles south of Overton and 4 miles downstream from Plum Creek.

Drainage Area in Sq. Mi.: 61,700 approximately **Datum of Gage:** 2,299.83' **m.s.l.**

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1915	1000.0	1400.0	1200.0	100.0	1250.0	2300.0	2000.0	4880.0	5360.0	2620.0	3950.0	1740.0	30400.0
1916	1800.0	1400.0	1200.0	1000.0	900.0	1000.0	1100.0	930.0	1650.0	192.0	1050.0	510.0	12700.0
1917	1000.0	1100.0	1000.0	900.0	1300.0	2500.0	3100.0	8310.0	14340.0	7280.0	890.0	2470.0	44200.0
1918	2980.0	1900.0	1500.0	1300.0	1200.0	1800.0	2200.0	3150.0	2400.0	2010.0	1210.0	935.0	22580.0
1919	2330.0	1680.0	2150.0	1690.0	1670.0	1400.0	1860.0	1290.0	1650.0	488.0	102.0	581.0	16890.0
1920	1430.0	1670.0	1550.0	1840.0	2330.0	3550.0	3860.0	7220.0	6400.0	3240.0	1130.0	1460.0	35680.0
1921	1300.0	1560.0	1600.0	1700.0	1200.0	1400.0	1420.0	1990.0	11050.0	1040.0	1670.0	1460.0	27390.0
1922	2020.0	2080.0	1670.0	1810.0	1500.0	2600.0	1840.0	3320.0	1890.0	745.0	659.0	100.0	20230.0
1923	863.0	1070.0	1230.0	1950.0	2310.0	1620.0	1380.0	2800.0	5490.0	1790.0	3130.0	1340.0	24970.0
1924	3720.0	3450.0	2960.0	1600.0	3170.0	3430.0	5420.0	6720.0	6810.0	1260.0	739.0	1460.0	40740.0
1925	2780.0	2120.0	1850.0	2110.0	3110.0	1860.0	1680.0	1080.0	968.0	8.2	1290.0	904.0	19760.0
1926	1800.0	2100.0	1890.0	3440.0	2410.0	1740.0	2120.0	2590.0	4260.0	2720.0	1680.0	1640.0	28390.0
1927	2500.0	2190.0	2030.0	2150.0	1940.0	3200.0	3920.0	3890.0	2500.0	1050.0	3100.0	1020.0	29540.0
1928	2700.0	2200.0	1840.0	3070.0	2880.0	2580.0	1880.0	2130.0	6990.0	2770.0	1220.0	488.0	30750.0
1929	1510.0	2620.0	1720.0	992.0	1750.0	3000.0	3630.0	4100.0	6400.0	1340.0	1.9	1920.0	28980.0
1930	2220.0	2270.0	2340.0	1840.0	1670.0	2180.0	2430.0	3730.0	2190.0	42.6	1040.0	1620.0	23570.0
1931	2940.0	1860.0	2360.0	2150.0	2350.0	2610.0	2140.0	1080.0	192.0	0	0	0	17700.0
1932	437.0	994.0	1400.0	1210.0	1350.0	1600.0	1120.0	713.0	684.0	87.9	58.1	80.3	9730.0
1933	1220.0	1420.0	1390.0	1670.0	1140.0	1760.0	1560.0	2850.0	666.0	0	35.7	1460.0	15200.0
1934	1260.0	1376.0	1464.0	1660.0	1147.0	1276.0	772.0	327.0	0	0	0	0	8990.0
1935	0	0	682.3	940.8	1237.0	952.3	479.6	2355.0	5413.0	209.7	3.2	51.7	12320.0
1936	136.3	798.1	695.0	819.0	883.2	1501.0	460.6	458.8	175.1	0	0	0	5927.0
1937	0	280.5	547.5	204.2	1255.0	1968.0	709.7	647.0	590.3	0	0	31.4	5651.0
1938	356.9	877.1	1192.0	1405.0	1439.0	1409.0	602.5	1272.0	588.9	313.3	144.8	1767.0	11370.0
1939	622.0	1289.0	1009.0	1546.0	959.6	2424.0	2212.0	404.8	288.2	92.0	10.4	0	10860.0
1940	121.1	209.7	451.5	552.9	1045.0	1397.0	334.1	1374.0	400.0	0.3	0.1	0.5	4650.0
1941	0	286.1	231.9	200.5	181.1	209.1	224.5	188.5	104.4	76.5	33.2	24.9	1761.0
1942	46.2	100.5	96.2	206.5	263.0	655.5	661.2	5541.0	2503.0	977.3	118.4	675.0	11840.0
1943	390.5	484.5	1031.0	1049.0	1022.0	987.1	1300.0	843.4	739.8	113.4	146.3	234.7	8342.0
1944	348.7	650.9	705.8	810.6	689.5	820.4	782.2	1397.0	315.0	174.0	294.6	289.4	7278.0
1945	513.6	738.9	1176.0	841.3	874.3	838.7	594.1	584.1	1223.0	389.7	408.5	416.2	8598.0
1946	669.2	653.9	616.1	926.8	808.0	996.8	520.3	595.7	388.7	241.0	237.8	455.6	7110.0
1947	1141.0	716.0	907.1	773.0	730.1	956.6	910.1	515.8	1897.0	2005.0	487.0	609.6	11650.0
1948	734.3	685.8	941.0	1025.0	1110.1	1600.0	1009.0	540.6	503.0	330.9	542.9	265.3	9288.0
1949	547.7	946.8	804.1	617.9	964.4	1665.0	1422.0	1218.0	3515.0	1122.0	342.5	527.8	13690.0
1950	884.5	1031.0	1080.0	874.9	1024.0	1215.0	1045.0	775.5	396.7	229.2	167.4	421.1	9144.0

STREAMFLOW DATA

Station Number and Name: 6-7680 Platte River near Overton

Location: Lat. 40° 41', Long. 99° 32', in Sec. 12, T.8N., R.20W, on right bank just downstream from highway bridge 4 miles south of Overton and 4 miles downstream from Plum Creek.

Drainage Area in Sq. Mi.: 61,700 approximately **Datum of Gage:** 2,299.83' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1951	758.2	951.7	1016.0	1010.0	1036.0	1156.0	985.2	1254.0	1389.0	942.6	532.4	1128.0	12160.0
1952	1142.0	1269.0	1079.0	1471.0	2232.0	2623.0	1637.0	1231.0	909.3	439.3	275.3	259.5	14570.0
1953	543.1	629.6	693.5	959.1	862.4	1067.0	797.0	713.0	324.0	135.9	98.0	97.0	6920.0
1954	387.7	685.7	766.8	696.4	770.8	744.4	536.0	534.3	144.7	109.9	287.6	77.5	5742.0
1955	390.8	547.1	557.0	593.2	699.6	842.7	518.6	196.7	304.2	136.3	102.0	83.4	4972.0
1956	370.6	509.0	533.1	567.6	530.3	606.9	484.8	105.1	159.6	97.5	51.5	32.6	4049.0
1957	248.6	381.5	352.3	373.4	401.7	409.1	477.4	1524.0	973.4	208.4	96.7	357.5	5804.0
1958	612.2	623.1	715.6	761.6	806.3	1129.0	1324.0	1567.0	1074.0	458.6	243.7	191.0	9506.0
1959	474.1	626.7	668.7	676.4	775.1	1043.0	1053.0	499.8	138.2	136.4	103.3	292.5	6487.0
1960	733.6	752.3	730.4	740.2	881.1	1441.0	967.3	621.6	485.2	228.0	79.1	134.0	7794.0
1961	508.4	525.0	580.4	618.1	545.9	699.3	600.2	546.8	849.6	114.5	277.3	202.8	6068.3
1962	804.6	1029.0	893.8	825.1	1205.0	1339.0	696.2	505.0	1159.0	531.3	213.6	431.6	9633.0
1963	658.4	883.5	801.3	772.2	953.7	972.5	722.5	269.6	334.7	133.4	120.0	586.1	7208.0
1964	589.5	571.3	680.1	740.6	660.7	772.2	706.2	306.5	316.4	156.9	271.7	268.7	6041.0
1965	543.2	551.6	612.0	667.7	708.9	712.9	607.5	551.0	1856.0	900.9	323.5	960.6	8996.0
1966	1372.0	1217.0	1326.0	1218.0	1127.0	1483.0	1285.0	380.8	352.5	190.0	216.7	368.5	10540.0
1967	688.4	646.7	642.0	698.7	665.6	640.5	308.7	320.4	1466.0	1830.0	258.6	567.6	8733.0
Max.	3720.0	3450.0	2960.0	3440.0	3170.0	3550.0	5420.0	8310.0	14340.0	7280.0	3950.0	2470.0	44200.0
Min.	0	0	96.2	200.5	181.1	224.5	209.1	105.1	0	0	0	0	1761.0
Average for Period of Record													14398.0
Average for													
53-67	595.0	678.6	703.5	727.2	772.9	926.8	739.0	576.1	662.5	357.9	182.9	3101.1	7232.6

STREAMFLOW DATA

Station Number and Name: 6-7740 Platte River near Duncan

Location: Lat. 41° 22' 04", Long. 97° 29' 40", in SE¼SW¼, Sec. 12, T.16N., R.2W., on left bank 25 feet downstream from highway bridge, 1½ miles south of Duncan, and 12 miles upstream from Loup River. (Revised)

Drainage Area in Sq. Mi.: 64,900 approximately (Revised) **Datum of Gage:** 1,478.55' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1895	—	—	—	—	—	—	—	—	8347.0	2266.0	444.0	—	—
1896	—	—	—	—	—	—	—	—	4469.0	1002.0	260.0	0	—
1897	399.0	—	—	—	—	—	—	6849.8	8885.0	1704.1	—	—	—
1898	—	—	—	—	—	—	—	3597.7	6710.9	—	—	—	—
1899	—	—	—	—	—	—	4888.0	5973.0	7718.0	8763.0	3086.0	—	—
1900	—	—	—	—	—	—	2839.0	11377.0	8744.7	1772.7	—	—	—
1901	219.0	211.0	350.0	443.0	499.0	1260.0	4840.0	3258.8	5571.4	527.0	11.0	26.8	17200.0
1902	18.4	400.0	430.0	534.0	516.0	1730.0	640.2	3358.5	3823.5	3238.1	248.4	200.5	15100.0
1903	1105.5	473.7	769.0	1210.0	1940.0	6010.0	2581.9	5558.8	5173.3	3595.2	2156.4	699.2	31300.0
1904	376.9	1146.1	1010.0	1110.0	863.0	935.0	807.0	2200.3	7664.0	3281.7	228.7	2.5	19600.0
1905	637.6	893.0	552.0	835.0	997.0	3010.0	4641.0	12960.0	18400.0	6622.0	1978.0	1772.0	53300.0
1906	578.0	631.0	861.0	1170.0	2220.0	3070.0	3890.0	5030.0	5490.0	2140.0	972.0	503.0	26600.0
1907	1010.0	2430.0	2390.0	2050.0	2210.0	2220.0	2240.0	2740.0	8330.0	6150.0	1540.0	450.0	33800.0
1908	1220.0	1210.0	1310.0	1290.0	1090.0	1190.0	590.0	1440.0	7020.0	2610.0	546.0	44.5	19600.0
1909	242.0	833.0	1340.0	2020.0	1660.0	3020.0	2190.0	3460.0	9100.0	6520.0	2800.0	1840.0	35000.0
1910	2790.0	1800.0	1870.0	—	—	—	—	—	—	—	—	—	—
1912	—	—	—	—	—	—	1810.0	1710.0	678.0	515.0	3750.0	2850.0	—
1913	3990.0	3070.0	1080.0	1630.0	1330.0	2190.0	2740.0	1960.0	302.0	5.0	0	0	18300.0
1914	210.0	359.0	307.0	461.0	380.0	1230.0	940.0	5030.0	4870.0	526.0	38.3	982.0	15300.0
1915	1380.0	982.0	675.0	1010.0	830.0	1200.0	3620.0	4770.0	7380.0	2900.0	4900.0	2060.0	31800.0
1928	—	—	—	—	—	—	—	—	7690.0	2950.0	1450.0	34.7	—
1929	688.0	2170.0	1660.0	1010.0	1780.0	3630.0	2990.0	3330.0	5740.0	1190.0	9.2	952.0	25100.0
1930	2200.0	1940.0	389.0	615.0	2770.0	2130.0	1890.0	4260.0	2670.0	70.7	485.0	1360.0	20800.0
1931	2690.0	1980.0	2160.0	1920.0	2370.0	2000.0	2310.0	1140.0	137.0	4.5	.9	4.5	16700.0
1932	12.6	458.0	928.0	627.0	2800.0	2470.0	1050.0	756.0	1320.0	183.0	64.6	20.1	10700.0
1933	428.0	803.0	492.0	1310.0	1260.0	2250.0	1320.0	2380.0	649.0	8.6	3.1	432.0	11300.0
1934	682.9	1138.0	1291.0	1230.0	1277.0	1884.0	816.6	35.0	4.6	0	0	0	8359.0
1935	0	0.5	14.3	396.6	878.9	876.6	122.0	1951.0	5671.0	404.4	.7	76.1	10390.0
1936	1.2	556.7	746.6	359.7	613.4	2194.0	332.9	485.0	115.9	0.6	0	0	5406.0
1937	0.1	1.2	3.3	0.1	342.0	1963.0	689.0	232.4	405.2	70.4	3.8	0	3710.0
1938	0.1	245.2	921.3	1541.0	1200.0	2067.0	539.4	1281.0	652.8	183.7	1.5	988.0	9621.0
1939	268.2	571.9	921.6	1489.0	536.2	3031.0	2046.0	411.6	234.1	37.1	.5	0	9547.0
1940	0	0.2	2.9	6.7	829.7	1721.0	361.3	100.7	162.7	1.8	2.5	0	3190.0

STREAMFLOW DATA

Station Number and Name: 6-7740 Platte River near Duncan

Location: Lat. 41° 22' 04", Long. 97° 29' 40", in SE¼SW¼, Sec. 12, T.16N., R.2W., on left bank 25 feet downstream from highway bridge, 1½ miles south of Duncan, and 12 miles upstream from Loup River. (Revised)

Drainage Area in Sq. Mi.: 64,900 approximately (Revised) **Datum of Gage:** 1,478.55' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1941	0	0	1.5	25.8	164.4	188.9	271.8	145.0	217.3	9.4	0	4.9	1029.0
1942	1.9	7.7	9.6	27.4	149.5	468.7	521.2	5500.0	2506.0	998.4	30.5	983.6	11300.0
1943	242.5	374.2	545.1	741.2	1343.0	754.1	1111.0	815.5	887.3	434.4	1.4	.1	7250.0
1944	9.2	429.3	365.4	820.4	887.4	1233.0	1745.0	2217.0	594.1	191.2	23.4	141.2	8657.0
1945	339.7	598.3	757.7	943.2	829.5	942.4	740.4	688.2	1837.0	525.8	110.8	331.7	8635.0
1946	704.8	680.6	521.7	966.3	992.5	1312.0	504.6	457.0	461.1	47.3	3.1	426.2	7077.0
1947	1856.0	1172.0	942.1	734.9	915.0	1424.0	1379.0	550.5	3049.0	2299.0	182.1	163.7	14670.0
1948	435.0	610.0	795.6	716.8	925.1	2455.0	1004.0	504.1	439.2	341.3	561.3	29.7	8817.0
1949	228.9	714.8	777.7	401.7	596.6	2845.0	2033.0	1819.0	3617.0	1741.0	160.3	409.0	15340.0
1950	659.7	1057.0	703.7	534.1	1089.0	1517.0	1153.0	1159.0	519.5	614.6	296.2	297.9	9601.0
1951	767.9	818.9	967.3	901.7	1285.0	1750.0	1278.0	1494.0	2213.0	1173.0	456.5	1195.0	14300.3
1952	1201.0	1362.0	866.5	1250.0	3248.0	3468.0	2432.0	1641.0	883.1	560.4	83.6	36.2	17030.0
1953	309.8	558.3	552.5	842.3	1169.0	1338.0	1014.0	893.0	374.1	11.5	7.7	.7	7071.0
1954	.7	563.7	681.9	496.6	1198.0	888.8	641.3	689.5	260.8	3.8	35.9	2.4	5463.0
1955	104.0	563.6	469.7	428.5	364.4	1222.0	626.7	91.9	444.6	28.4	.1	.1	4344.0
1956	6.3	273.3	386.4	529.0	687.9	1001.0	520.5	177.0	6.7	0	0	0	3588.0
1957	0	0	78.8	94.9	324.4	504.5	582.8	1410.0	1460.0	251.7	2.2	162.3	4872.0
1958	483.9	624.1	660.5	682.5	794.6	1397.0	1739.0	1455.0	1158.0	945.2	131.7	37.8	10110.0
1959	187.3	509.3	454.7	371.7	620.4	1454.0	1318.0	994.6	156.9	209.6	43.0	11.1	6331.0
1960	561.7	701.4	708.2	546.3	905.7	2445.0	1944.0	1380.0	1301.0	317.2	41.8	6.0	10860.0
1961	215.3	450.1	576.5	605.6	780.4	858.3	737.7	1126.0	1045.0	80.2	63.3	22.0	6560.0
1962	537.1	930.6	473.4	622.0	1232.0	2134.0	981.5	498.7	1438.0	950.7	362.1	210.2	10370.0
1963	692.3	924.5	861.0	656.8	1300.0	1439.0	919.1	385.9	355.5	10.2	2.2	333.4	7880.0
1964	527.4	561.8	491.1	651.4	669.0	980.0	1029.0	492.0	246.1	134.1	33.6	67.3	5883.0
1965	344.4	463.3	417.3	604.4	777.9	1147.0	843.5	952.9	1521.0	1731.0	90.8	1148.0	10040.0
1966	1845.0	1273.0	1436.0	1062.0	1218.0	1758.0	1529.0	573.1	260.1	41.2	57.8	44.5	11060.0
1967	606.2	694.1	615.7	682.7	851.7	859.3	341.4	337.8	4681.0	1924.0	295.2	242.9	12130.0
Max.	3990.0	3070.0	2390.0	2050.0	3248.0	3630.0	4888.0	12960.0	18400.0	8763.0	4900.0	2850.0	53300.0
Min.	0	0	1.5	0.1	149.5	188.9	122.0	35.0	4.6	0	0	0	1029.0
Average for Period of Record													13568.5
Average for													
53-67	428.1	606.1	590.9	591.8	859.6	1295.1	984.5	763.8	980.6	442.6	77.8	152.6	7773.5

STREAMFLOW DATA

Station Number and Name: 6-7840 South Loup River at St. Michael

Location: Lat. 41° 01' 52", Long. 98° 44' 28", in NE¼ NE¼, Sec. 11, T.12N., R.13W., on right bank 100 feet upstream from county highway bridge, 0.6 miles northeast of St. Michael and 3.4 miles upstream from Sweet Creek.

Drainage Area in Sq. Mi.: 2,560 approximately; 1,650 contributes directly Datum of Gage: 1,921.28' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1944	88.0	104.4	99.0	101.2	125.1	150.6	263.7	323.8	178.5	123.0	74.4	78.3	1710.0
1945	92.2	113.5	89.4	104.5	146.0	125.9	133.4	204.9	662.7	170.1	115.7	80.0	2038.0
1946	98.1	104.3	83.7	115.4	118.0	156.0	106.1	121.1	161.6	90.9	48.8	115.6	1320.0
1947	380.7	161.6	124.2	120.0	182.2	180.5	173.1	123.4	1631.0	240.9	90.8	85.2	3494.0
1948	89.4	117.2	120.9	118.4	218.2	469.1	131.0	114.8	258.7	231.6	236.7	70.4	2176.0
1949	85.8	109.5	106.1	89.1	150.7	290.0	232.4	203.8	315.7	98.9	76.5	220.4	1979.0
1950	114.6	114.2	106.2	96.5	171.6	190.2	151.5	207.8	159.0	257.6	163.6	123.8	1857.0
1951	141.0	122.3	107.0	106.2	129.7	143.3	178.8	345.7	262.4	251.9	160.7	135.9	2085.0
1952	129.5	127.5	115.0	122.4	179.7	264.6	182.9	162.5	97.5	85.3	64.6	62.8	1594.0
1953	86.3	112.4	105.0	127.8	144.5	169.0	129.0	263.6	133.1	76.4	51.5	53.8	1452.0
1954	76.8	110.6	137.8	112.9	169.2	128.8	119.1	148.8	267.3	47.2	76.0	58.9	1453.0
1955	86.3	98.4	104.5	101.4	91.6	177.1	116.9	150.7	129.8	61.8	13.1	32.4	1164.0
1956	66.4	80.8	71.2	87.6	93.1	132.2	116.0	114.1	251.3	73.2	55.2	30.3	1171.0
1957	53.8	76.9	88.3	74.7	102.4	126.3	144.2	310.1	370.8	99.8	55.0	123.3	1626.0
1958	112.2	115.1	128.4	116.3	116.5	197.8	188.5	191.0	149.8	434.1	125.9	91.7	1967.0
1959	100.2	117.8	107.1	97.0	122.1	207.2	164.5	162.0	136.0	125.1	77.9	92.7	1510.0
1960	101.3	128.6	129.9	96.4	140.2	481.1	214.3	329.4	301.6	176.6	78.5	64.8	2243.0
1961	89.2	101.1	113.6	110.7	133.8	180.8	167.2	243.2	231.3	86.7	89.1	80.8	1628.0
1962	107.2	125.9	104.1	110.1	179.8	345.3	153.5	249.9	565.0	232.0	296.1	119.2	2588.0
1963	121.9	125.7	122.2	126.9	225.0	188.9	136.1	145.1	131.5	50.0	55.2	120.7	1549.0
1964	105.4	114.5	94.9	131.7	138.3	165.7	176.3	134.5	145.0	198.0	60.4	86.0	1551.0
1965	99.8	105.9	98.6	105.6	110.8	155.7	165.1	336.2	287.4	162.8	105.5	191.1	1924.0
1966	206.2	133.5	138.2	122.5	301.8	186.1	157.0	122.0	142.4	57.9	98.3	80.3	1746.0
1967	97.9	108.8	105.7	115.0	145.5	138.2	130.8	130.5	704.3	128.4	76.1	75.7	1957.0
Max.	380.7	161.6	138.2	131.7	301.8	481.1	263.7	345.7	1631.0	434.1	296.1	220.4	3494.0
Min.	53.8	76.9	71.2	74.7	91.6	125.9	106.1	114.1	97.5	47.2	13.1	30.3	1164.0
Average for Period of Record													1824.3
Average for 53-67	100.7	110.4	110.0	109.1	147.6	198.7	151.9	202.1	263.1	134.0	87.6	86.8	1701.9

STREAMFLOW DATA

Station Number and Name: 6-7905 North Loup River near St. Paul

Location: Lat. 41° 15' 35", Long. 98° 26' 50", in Sec. 22, T.15N., R.10W., on right bank 310 feet 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 in Sq. Mi.: 4,460 approximately; 1,270 contributes directly **Datum of Gage:** 1,759.39' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1895	536.0	567.0	505.0	676.0	750.0	830.0	624.0	731.0	911.0	531.0	605.0	651.0	7920.0
1896	705.0	604.0	737.0	633.0	725.0	840.0	776.0	639.0	1640.0	678.0	556.0	543.0	9080.0
1897	589.0	642.0	572.0	614.9	555.4	614.9	790.8	590.9	703.9	586.6	447.6	468.9	7180.0
1898	622.9	595.0	614.9	680.0	573.0	620.0	592.0	768.0	852.0	426.0	581.0	424.0	7350.0
1899	577.0	538.0	475.0	583.0	555.0	730.0	742.0	701.6	912.2	635.8	645.0	528.4	7620.0
1900	557.7	424.0	377.0	463.0	459.0	580.0	710.0	813.0	740.0	646.0	676.0	595.0	7040.0
1901	491.0	495.0	473.0	577.0	551.0	666.0	689.0	513.0	734.0	342.0	302.0	604.0	6440.0
1902	523.0	495.0	502.0	612.0	587.0	730.0	510.0	706.0	688.0	1241.0	1043.0	682.0	8320.0
1903	700.0	565.0	502.0	614.0	665.0	995.0	910.0	829.0	648.0	830.0	912.0	496.9	8670.0
1904	613.0	783.0	678.0	773.0	748.0	744.0	708.0	651.0	925.0	934.0	514.0	503.0	8570.0
1905	769.0	446.0	367.0	452.0	691.0	1097.0	1250.0	1860.0	1720.0	1985.0	1521.0	1194.0	13350.0
1906	719.0	929.0	826.0	1007.0	968.0	1146.0	1182.0	1004.0	612.0	609.0	684.0	552.0	10240.0
1907	716.0	655.0	580.0	513.0	452.0	666.0	580.0	720.0	993.0	819.0	512.0	520.0	7730.0
1908	495.0	538.0	545.0	513.0	491.0	744.0	669.0	1093.0	1363.0	545.0	595.0	559.0	8150.0
1909	541.0	527.0	513.0	666.0	591.0	666.0	512.0	698.0	1061.0	1136.0	673.0	534.0	8220.0
1910	538.0	516.0	545.0	491.0	463.0	644.0	516.0	612.0	434.0	459.0	644.0	601.0	6460.0
1911	492.0	491.0	506.0	523.0	484.0	595.0	563.0	577.0	449.0	367.0	506.0	566.0	6120.0
1912	538.0	573.0	505.0	533.0	581.0	718.0	2008.0	1136.0	805.0	441.0	488.0	587.0	8910.0
1913	475.0	555.0	513.0	623.0	595.0	765.0	922.0	951.0	595.0	484.0	431.0	431.0	7340.0
1914	475.0	555.0	491.0	580.0	495.0	523.0	538.0	684.0	1488.0	438.0	527.0	477.0	7270.0
1915	484.0	459.0	406.0	495.0	473.0	612.0	1203.0	755.0	1331.0	1203.0	1036.0	951.0	9410.0
1928	—	—	—	—	—	—	—	—	—	—	—	469.0	—
1929	574.0	655.0	430.0	430.0	416.0	1040.0	750.0	793.0	702.0	579.0	426.0	467.0	7260.0
1930	557.0	406.0	266.0	406.0	855.0	608.0	889.0	843.0	803.0	430.0	673.0	524.0	7260.0
1931	664.0	619.0	574.0	670.0	800.0	707.0	619.0	560.0	455.0	432.0	432.0	433.0	6960.0
1932	515.0	524.0	744.0	417.0	817.0	588.0	579.0	689.0	1190.0	487.0	465.0	439.0	7450.0
1933	545.0	464.0	395.0	527.0	384.0	646.0	613.0	756.0	394.0	538.0	514.0	477.0	6250.0
1934	457.0	530.4	506.4	461.2	427.6	484.1	472.1	432.4	360.8	302.6	386.6	483.5	5305.0
1935	488.8	479.4	339.1	392.3	699.8	550.4	937.2	896.9	953.9	507.5	406.5	417.6	7069.0
1936	476.0	497.7	494.7	374.0	423.1	1592.0	527.0	591.6	391.6	288.1	332.4	363.3	6352.0
1937	425.0	449.2	423.9	326.3	418.7	788.3	485.8	521.1	435.4	409.6	362.9	411.7	5458.0
1938	431.0	384.8	351.5	451.7	458.1	718.0	512.9	633.2	466.5	499.8	275.9	392.6	5576.0
1939	416.5	464.5	539.0	633.6	360.9	576.4	518.9	436.6	472.6	239.6	248.4	290.6	5198.0
1940	349.5	485.4	466.4	318.1	580.3	679.0	468.5	398.0	575.0	154.9	177.8	194.2	4847.0

STREAMFLOW DATA

Station Number and Name: 6-7905 North Loup River near St. Paul

Location: Lat. 41° 15' 35", Long. 98° 26' 50", in Sec. 22, T.15N., R.10W., on right bank 310 feet 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 in Sq. Mi.: 4,460 approximately; 1,270 contributes directly **Datum of Gage:** 1,759.39' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1941	350.2	406.8	469.7	458.8	603.1	679.5	604.0	500.4	504.0	254.2	136.0	421.5	5389.0
1942	469.2	484.0	505.2	492.2	335.0	659.8	553.9	916.0	777.4	288.1	302.9	591.1	6375.0
1943	453.5	488.3	435.8	356.2	511.3	554.2	495.1	354.5	570.5	415.9	146.8	397.2	5179.0
1944	371.0	468.1	473.8	532.0	561.3	620.9	743.4	862.1	717.6	406.5	236.6	387.2	6380.0
1945	483.0	485.5	391.3	511.3	570.2	637.3	546.7	718.0	770.8	573.1	331.7	329.8	6349.0
1946	474.4	502.0	373.5	546.4	506.1	602.6	417.4	477.2	406.4	252.8	146.1	455.4	5160.0
1947	717.4	590.8	518.5	466.4	568.3	653.6	646.6	460.0	1497.0	444.6	176.6	346.2	7086.0
1948	438.7	537.3	610.7	450.6	703.3	855.3	505.4	391.5	723.6	397.6	701.7	277.3	6593.0
1949	408.3	507.8	441.1	397.9	443.5	1046.0	794.9	641.6	493.1	367.0	326.6	442.1	6510.0
1950	524.6	500.2	461.7	407.0	556.0	876.9	637.5	752.3	446.2	1030.0	554.5	483.0	7230.0
1951	614.0	567.5	549.1	478.0	576.0	656.8	654.4	853.0	836.0	751.8	849.7	786.1	8172.0
1952	650.6	603.9	535.7	607.5	781.5	869.1	736.9	761.7	402.7	271.2	357.5	352.5	6931.0
1953	488.6	523.2	577.5	635.1	560.0	862.1	657.7	775.5	567.0	478.3	335.3	318.3	6779.0
1954	477.0	598.3	580.1	517.3	740.6	668.3	612.7	649.0	519.3	223.6	406.2	364.5	6357.0
1955	518.6	533.5	576.1	490.1	480.9	826.3	580.4	388.4	607.9	290.3	141.2	313.0	5747.0
1956	473.0	489.4	583.3	636.8	540.2	819.8	589.0	571.8	463.2	235.5	255.4	341.1	5998.0
1957	496.9	532.4	550.3	381.0	540.1	608.5	731.1	875.6	809.6	350.7	327.3	561.3	6765.0
1958	673.5	661.3	619.0	494.1	514.9	810.6	895.3	624.9	543.3	882.3	342.8	423.1	7485.0
1959	540.6	586.9	517.3	529.7	567.9	1024.0	676.8	652.1	439.0	415.3	276.5	429.0	6655.0
1960	618.6	648.8	575.8	491.4	642.5	1099.0	786.0	910.6	571.9	410.8	355.0	396.8	7507.0
1961	550.2	545.2	522.6	597.7	703.2	756.7	597.5	708.7	563.6	284.6	358.4	479.4	6668.0
1962	570.6	561.3	456.1	500.8	673.0	1126.0	643.8	748.3	1347.0	832.5	559.0	507.1	8526.0
1963	643.9	612.3	536.8	507.6	809.9	817.8	642.7	497.8	478.5	244.5	383.0	655.0	6830.0
1964	562.7	611.3	479.3	621.0	589.5	755.9	762.6	668.9	533.6	387.5	374.2	626.1	6973.0
1965	551.0	546.4	526.4	576.0	583.9	713.9	745.7	701.3	724.7	393.7	415.0	823.3	7301.0
1966	709.1	669.6	610.2	481.6	682.7	813.2	686.0	525.7	604.0	346.1	1114.0	509.0	7751.0
1967	567.6	575.8	526.7	598.2	566.1	652.3	555.0	544.4	933.5	376.5	243.9	384.5	6524.0
Max.	769.0	929.0	826.0	1007.0	968.0	1592.0	2008.0	1860.0	1720.0	1985.0	1521.0	1194.0	13350.0
Min.	349.5	384.8	266.0	318.1	335.0	484.1	417.4	354.5	360.8	154.9	136.0	194.2	4847.0
Average for Period of Record													7126.6
Average for													
53-67	562.8	597.7	549.2	537.2	613.0	823.6	677.5	656.2	647.1	410.1	392.5	475.4	6924.4

STREAMFLOW DATA

Station Number and Name: 6-7850 Middle Loup River at St. Paul

Location: Lat. 41° 11' 55", Long. 98° 26' 50", in Sec. 10, T.14N., R.10W., on left bank at St. Paul, 450 feet upstream from bridge on U.S. Highway 281 and 6 miles upstream from confluence with North Loup River.

Drainage Area in Sq. Mi.: 7,720 approximately; 3,200 contributes directly   Datum of Gage: 1,776.61' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1895	716.0	659.0	587.0	799.0	861.0	953.0	693.0	721.0	831.0	529.0	598.0	522.0	8470.0
1896	516.0	730.0	192.0	682.0	781.0	908.0	811.0	710.0	1230.0	782.0	599.0	591.0	9130.0
1897	640.0	694.0	615.0	922.3	833.1	983.8	1190.1	783.4	617.1	531.9	413.8	401.7	8630.0
1898	718.8	654.5	676.4	911.0	768.0	830.0	793.0	1029.0	1141.0	571.0	779.0	569.0	9440.0
1899	620.0	579.0	512.0	626.0	598.0	785.0	796.0	637.0	859.2	619.2	742.2	606.4	7980.0
1900	681.9	568.0	506.0	620.0	615.0	778.0	952.0	1090.0	893.0	830.0	861.0	774.0	9170.0
1901	658.0	663.0	634.0	773.0	740.0	892.0	923.0	688.0	984.0	458.0	404.0	810.0	8630.0
1902	707.0	664.0	673.0	820.0	787.0	978.0	684.0	946.0	922.0	1662.0	1398.0	913.0	11150.0
1903	760.0	605.0	541.0	664.0	715.0	1070.0	980.0	1586.4	1257.0	1027.2	1336.3	791.4	11300.0
1904	758.7	774.0	921.0	1035.0	1001.0	997.0	949.0	873.0	1239.0	1251.0	688.0	674.0	11160.0
1905	892.0	565.0	491.0	606.0	925.0	1469.0	1559.0	2494.0	2304.0	2660.0	2039.0	1600.0	17600.0
1906	964.0	1245.0	1107.0	1350.0	1298.0	1536.0	1584.0	1345.0	820.0	816.0	922.0	740.0	13730.0
1907	959.0	878.0	778.0	687.0	606.0	892.0	778.0	964.0	1331.0	1097.0	687.0	696.0	10350.0
1908	663.0	720.0	730.0	687.0	658.0	997.0	897.0	1464.0	1827.0	730.0	797.0	749.0	10920.0
1909	725.0	706.0	687.0	892.0	792.0	892.0	820.0	935.0	1421.0	1522.0	902.0	715.0	11010.0
1910	720.0	692.0	730.0	658.0	620.0	863.0	692.0	820.0	582.0	615.0	863.0	806.0	8660.0
1911	676.0	658.0	677.0	701.0	649.0	797.0	754.0	773.0	601.0	491.0	677.0	758.0	8210.0
1912	720.0	760.0	677.0	715.0	779.0	962.0	2690.0	1522.0	1078.0	591.0	653.0	787.0	11930.0
1913	639.0	744.0	687.0	835.0	797.0	1026.0	1235.0	1274.0	797.0	649.0	577.0	577.0	9840.0
1914	639.0	744.0	658.0	778.0	663.0	701.0	720.0	916.0	1790.0	587.0	706.0	640.0	9540.0
1915	649.0	615.0	544.0	663.0	711.0	820.0	1612.0	1011.0	1784.0	1612.0	1380.0	1274.0	12680.0
1928	—	—	—	—	—	—	—	—	—	—	—	563.0	
1929	701.0	809.0	299.0	338.0	413.0	1280.0	910.0	1270.0	1020.0	769.0	539.0	607.0	8960.0
1930	615.0	444.0	299.0	439.0	1340.0	830.0	1070.0	1240.0	1550.0	451.0	861.0	774.0	9910.0
1931	1030.0	780.0	750.0	904.0	894.0	892.0	726.0	701.0	534.0	471.0	472.0	463.0	8620.0
1932	713.0	607.0	978.0	580.0	828.0	947.0	660.0	904.0	1790.0	787.0	812.0	601.0	10200.0
1933	689.0	506.0	454.0	682.0	506.0	1000.0	750.0	892.0	480.0	695.0	787.0	631.0	8070.0
1934	628.0	689.7	787.0	645.6	610.9	664.1	691.3	574.7	523.7	445.4	528.9	592.9	7382.0
1935	780.3	807.3	435.3	466.0	845.8	725.5	945.3	1310.0	1630.0	894.0	920.3	820.8	10580.0
1936	846.7	833.7	621.8	423.7	488.0	1827.0	690.5	646.5	545.8	357.7	411.5	484.8	8178.0
1937	508.8	484.6	495.6	181.4	572.3	1446.0	664.0	718.8	819.6	523.1	456.4	719.5	7590.0
1938	685.6	416.6	471.1	541.9	587.7	903.9	655.5	1344.0	846.2	1095.0	381.1	504.8	8433.0
1939	549.3	572.2	921.6	744.0	419.7	803.5	644.7	620.2	748.8	413.9	345.0	313.1	7096.0
1940	504.1	628.8	628.1	355.4	654.1	958.1	546.0	504.6	957.4	234.0	289.5	390.1	6650.0

STREAMFLOW DATA

Station Number and Name: 6-7850 Middle Loup River at St. Paul

Location: Lat. 41° 11' 55", Long. 98° 26' 50", in Sec. 10, T.14N., R.10W., on left bank at St. Paul, 450 feet upstream from bridge on U.S. Highway 281 and 6 miles upstream from confluence with North Loup River.

Drainage Area in Sq. Mi.: 7,720 approximately; 3,200 contributes directly Datum of Gage: 1,776.61' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1941	610.2	544.6	487.1	635.1	789.2	912.4	702.9	831.2	760.5	418.7	271.4	539.0	7592.0
1942	545.7	448.5	557.4	532.1	510.3	930.8	644.3	867.2	1187.0	376.2	533.9	949.0	8082.0
1943	656.1	768.9	418.8	392.3	585.5	741.6	694.4	521.9	1112.0	818.0	357.1	553.1	7620.0
1944	578.8	614.0	536.3	619.8	856.1	950.7	1156.0	1035.0	836.3	564.3	371.6	523.5	8642.0
1945	635.1	616.9	486.1	637.9	605.2	648.1	749.8	927.9	1345.0	574.2	521.4	470.8	8218.0
1946	583.6	538.4	405.8	741.2	719.2	772.4	552.8	565.4	700.9	431.1	300.4	584.8	6896.0
1947	1099.0	675.2	582.0	609.9	653.6	833.5	840.0	596.3	2923.0	728.7	359.0	473.8	10370.0
1948	546.6	678.8	654.7	625.8	920.7	1513.0	614.5	513.6	961.4	693.8	828.1	393.9	8945.0
1949	517.1	619.8	526.6	481.6	599.4	1252.0	946.0	795.2	1189.0	454.6	426.9	704.2	8512.0
1950	666.3	598.8	497.2	428.6	665.1	889.4	758.5	922.9	569.5	1099.0	773.0	588.7	8457.0
1951	735.7	588.1	560.2	565.6	767.4	772.8	824.1	1221.0	982.8	839.7	697.1	772.3	9327.0
1952	726.0	720.3	436.1	687.2	864.2	971.9	768.9	813.7	403.4	395.5	361.6	394.5	7543.0
1953	582.5	619.2	514.0	601.1	765.6	856.5	654.1	939.0	573.3	366.2	293.8	368.2	7134.0
1954	527.3	634.2	593.9	471.0	862.3	713.0	634.2	702.8	901.6	300.7	562.4	417.8	7321.0
1955	562.2	570.2	652.5	575.8	477.4	1050.0	623.7	522.5	703.3	362.6	203.0	347.4	6651.0
1956	547.1	499.3	502.1	552.1	547.3	825.1	636.3	661.1	657.2	368.4	318.0	311.5	6426.0
1957	525.2	561.5	553.0	386.1	605.4	723.5	724.5	1237.0	1164.0	452.7	380.3	710.9	8024.0
1958	801.4	697.4	713.9	630.1	666.4	904.9	999.1	753.0	647.0	1212.0	513.7	519.8	9059.0
1959	620.1	620.3	497.9	470.8	606.6	1108.0	732.1	755.0	513.7	467.6	351.3	487.2	7231.0
1960	658.2	721.0	686.3	455.9	671.2	1542.0	864.0	1085.0	747.4	632.1	297.1	430.6	8791.0
1961	589.3	598.2	571.0	566.2	767.7	903.3	788.4	1068.0	792.5	398.5	378.6	510.4	7932.0
1962	656.4	655.7	583.3	573.6	699.2	1460.0	638.4	956.8	1610.0	1037.0	875.1	571.3	10320.0
1963	740.7	703.3	603.7	540.4	869.8	952.2	537.3	434.4	410.7	162.7	360.4	482.5	6798.0
1964	248.4	698.1	471.3	740.2	718.6	1061.0	874.6	473.4	588.4	569.7	346.5	559.9	7350.0
1965	448.6	458.7	564.9	726.9	675.4	895.9	830.2	942.2	789.9	471.4	505.9	817.7	8127.0
1966	538.3	786.3	673.1	552.4	845.2	956.7	640.2	572.5	614.8	194.3	486.9	531.6	7392.0
1967	429.6	655.6	716.2	687.7	736.7	757.0	515.3	551.1	1935.0	414.7	180.5	168.0	7748.0
Max.	1099.0	1245.0	1107.0	1350.0	1340.0	1827.0	2690.0	2494.0	2923.0	2660.0	2039.0	1600.0	17600.0
Min.	248.4	416.6	192.0	181.4	413.0	648.1	515.3	434.4	403.4	162.7	180.5	311.5	6650.0
Average for Period of Record													8961.8
Average for													
53-67	565.0	631.9	593.1	568.7	701.0	980.6	712.8	776.9	843.3	494.0	403.6	482.3	7753.2

STREAMFLOW DATA

Station Number and Name: 6-7920 Cedar River near Fullerton

Location: Lat. 41° 23' 45", Long. 98° 00' 15", on line between SE¼ SE¼, Sec. 33, T.17N., R.6W., and NE¼ NE¼, Sec. 4, T.16N., R.6W., near left bank on downstream side of pier on highway bridge, 3 miles northwest of Fullerton and 5 3/4 miles upstream from mouth.

Drainage Area in Sq. Mi.: 1,220 approximately; 480 contributes directly **Datum of Gage:** 1,640.40' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1932	95.3	115.0	148.0	953.0	121.0	185.0	130.0	122.0	251.0	—	—	—	—
1941	101.3	96.5	104.6	113.1	133.3	165.4	155.3	151.6	233.1	90.3	66.6	120.6	1532.0
1942	113.4	102.4	80.1	101.7	83.0	142.7	106.4	123.0	134.1	79.2	79.0	102.7	1248.0
1943	88.6	96.9	93.7	86.9	232.1	106.9	119.4	161.3	401.4	128.6	71.6	87.3	1675.0
1944	92.9	100.7	92.3	110.7	137.5	123.3	185.3	218.1	188.0	121.0	96.5	98.1	1564.0
1945	105.3	110.6	108.4	121.8	107.3	148.5	130.7	155.2	192.3	127.1	89.0	80.3	1476.0
1946	100.6	101.6	80.7	119.2	131.5	138.8	104.8	186.0	188.9	108.8	87.6	129.5	1478.0
1947	182.4	157.6	101.4	106.4	143.8	152.9	172.1	206.6	854.7	183.7	90.6	92.2	2444.0
1948	104.4	122.7	123.0	118.4	383.1	183.0	116.9	112.7	217.0	160.8	201.8	87.7	1932.0
1949	99.5	113.5	112.1	84.3	89.3	203.4	262.6	176.0	202.4	110.7	102.9	113.7	1670.0
1950	117.6	113.2	90.3	87.8	113.7	212.9	169.2	205.4	189.4	848.3	207.0	145.2	2500.0
1951	168.2	138.3	122.1	118.9	115.6	199.1	220.4	303.0	252.8	204.1	246.6	249.0	2338.0
1952	175.0	162.0	130.4	152.7	264.9	263.0	197.0	197.3	129.2	113.7	120.0	102.7	2008.0
1953	117.5	123.4	130.5	134.6	130.2	198.8	151.1	312.0	186.2	129.6	92.6	91.1	1798.0
1954	106.6	127.7	114.1	98.5	171.6	157.3	137.7	187.7	122.4	75.3	102.1	85.6	1487.0
1955	111.6	126.7	144.5	111.5	104.7	156.1	127.9	107.8	129.9	88.9	52.1	73.2	1335.0
1956	97.1	111.1	88.3	106.6	120.2	184.6	128.1	157.3	131.2	75.9	109.3	76.4	1386.0
1957	93.2	106.9	109.2	79.5	102.0	126.0	137.7	257.8	235.8	127.1	75.4	144.2	1595.0
1958	139.3	120.1	113.6	89.7	102.8	222.3	214.4	145.3	121.0	311.8	147.9	97.7	1826.0
1959	103.9	116.4	128.1	104.2	102.2	171.3	159.6	230.5	138.6	116.8	67.4	83.5	1522.0
1960	113.3	132.0	117.7	109.3	115.2	296.3	253.2	308.0	248.5	142.2	92.2	92.8	2021.0
1961	109.4	118.1	126.6	115.0	138.4	168.0	145.2	202.2	201.2	82.4	113.7	104.0	1624.0
1962	119.3	123.8	109.5	112.2	129.3	245.0	172.8	176.0	415.0	184.0	137.9	111.7	2036.0
1963	128.8	130.6	131.0	112.9	164.9	176.1	139.8	142.4	107.3	63.6	115.6	135.4	1548.0
1964	113.5	121.3	110.0	126.5	134.1	181.4	226.5	266.9	271.9	88.4	122.7	155.6	1919.0
1965	114.4	109.7	104.5	119.1	123.1	161.9	147.6	304.3	289.4	123.7	111.0	213.5	1922.0
1966	158.9	143.6	136.5	109.5	211.6	157.3	144.5	123.2	222.1	114.5	1041.0	142.7	2705.0
1967	124.1	129.6	143.6	133.7	137.5	152.8	124.9	133.2	499.3	129.2	145.6	104.7	1958.0
Max.	182.4	162.0	148.0	953.0	383.1	296.3	262.6	312.0	854.7	848.3	1041.0	249.0	2750.0
Min.	88.6	96.5	80.1	79.5	83.0	106.9	104.8	107.8	107.3	63.6	52.1	73.2	1248.0
Average for Period of Record													1798.0
Average for 53-67	116.7	122.7	120.5	110.9	132.5	183.7	160.7	203.6	221.3	123.5	168.4	114.1	1778.7

STREAMFLOW DATA

Station Number and Name: 6-7925 Loup River Power Canal near Genoa

Location: Lat. 41° 25' 03", Long. 97° 47' 37", in NE¼ NE¼, Sec. 32, T.17N., R.4W., at skimming weir on downstream end of settling basin on left bank, 2 miles downstream from point of diversion and 3½ miles southwest of Genoa.

Drainage Area in Sq. Mi.: ——— **Datum of Gage:** 1,566.26' **m.s.l.**

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1937	——	——	58.0	73.4	46.1	67.9	75.2	83.3	116.6	235.7	226.2	210.0	——
1938	334.4	328.3	270.3	296.3	316.0	385.7	374.3	394.6	317.7	399.0	422.6	392.7	4232.0
1939	352.5	302.2	293.8	361.7	256.7	310.9	310.4	488.0	462.7	440.0	531.4	291.6	4711.0
1940	651.8	815.8	523.2	499.5	510.0	571.3	820.1	923.1	797.0	421.0	520.5	550.0	7603.0
1941	913.2	851.6	772.3	777.8	921.8	1085.0	1387.0	1114.0	1206.0	548.7	428.4	1047.0	11050.0
1942	1224.0	1068.0	798.6	619.3	526.8	1002.0	1165.0	1151.0	1310.0	711.8	714.7	1059.0	11350.0
1943	1084.0	1062.0	890.4	810.3	975.1	687.4	989.0	962.1	1055.0	923.5	489.4	839.2	10770.0
1944	951.7	1106.0	771.6	833.1	748.9	945.1	1564.0	1257.0	1308.0	941.0	578.5	879.3	11880.0
1945	1091.0	1028.0	386.4	810.2	603.2	1105.0	1305.0	1175.0	1374.0	1073.0	831.2	769.0	11550.0
1946	1074.0	1013.0	625.7	1060.0	857.5	1409.0	1034.0	1048.0	946.9	750.7	486.8	1088.0	11390.0
1947	1499.0	1381.0	847.3	852.4	870.2	1075.0	1343.0	1197.0	1269.0	1239.0	551.2	848.1	12970.0
1948	1052.0	1174.0	722.9	320.2	399.5	883.2	1170.0	973.5	1184.0	1040.0	1300.0	716.2	10940.0
1949	1015.0	984.9	783.9	791.1	855.1	1212.0	1607.0	1603.0	1547.0	932.4	804.1	1146.0	13280.0
1950	1266.0	1251.0	466.5	715.4	1032.0	920.3	1457.0	1594.0	1124.0	1225.0	1232.0	1178.0	13460.0
1951	1326.0	840.4	764.0	935.6	798.5	712.4	1364.0	1520.0	1536.0	1416.0	1367.0	1571.0	14150.0
1952	1563.0	736.4	649.6	979.0	759.6	705.3	1167.0	1436.0	872.8	718.3	752.8	764.6	11100.0
1953	1126.0	1074.0	414.9	489.4	805.3	1237.0	1394.0	1383.0	1103.0	813.3	636.7	675.3	11150.0
1954	1036.0	1238.0	518.8	360.9	699.0	986.8	1172.0	1394.0	1141.0	472.5	981.5	826.5	10830.0
1955	1239.0	1214.0	389.3	452.4	875.9	945.3	1223.0	977.2	1344.0	695.9	308.7	620.4	10290.0
1956	1100.0	608.7	786.2	1067.0	1053.0	1065.0	1318.0	1179.0	1135.0	653.1	631.0	665.5	11260.0
1957	987.4	964.4	987.7	502.8	853.2	1412.0	1573.0	1701.0	1342.0	946.9	742.3	1171.0	13180.0
1958	1391.0	1186.0	999.7	504.9	243.4	867.0	1036.0	1359.0	1221.0	1572.0	941.4	907.6	12230.0
1959	1132.0	1077.0	824.1	721.0	862.6	1441.0	1511.0	1512.0	949.9	924.4	567.1	853.8	12380.0
1960	1229.0	771.2	821.1	461.3	1133.0	1226.0	1524.0	1665.0	1442.0	994.7	655.7	778.2	12700.0
1961	1139.0	1096.0	356.1	819.7	971.1	1394.0	1329.0	1545.0	1391.0	717.5	756.1	977.1	12490.0
1962	1214.0	1249.0	854.9	988.0	819.3	675.5	1341.0	1398.0	1752.0	1664.0	1160.0	1110.0	14230.0
1963	1417.0	1343.0	690.5	804.2	1039.0	1408.0	1253.0	1032.0	939.3	392.3	801.7	1258.0	12380.0
1964	823.3	1260.0	789.5	1209.0	1041.0	1280.0	1481.0	1038.0	1090.0	921.2	781.5	1131.0	12850.0
1965	998.7	732.2	882.7	1173.0	958.2	1020.0	1338.0	1179.0	1414.0	972.1	859.4	1442.0	12970.0
1966	1276.0	1185.0	749.2	116.0	558.0	898.4	1243.0	1087.0	1035.0	511.0	395.6	965.9	10020.0
1967	1088.0	1010.0	310.8	1016.0	1043.0	1111.0	1111.0	1103.0	1474.0	908.9	529.6	576.6	11280.0
Max.	1563.0	1381.0	999.7	1209.0	1133.0	1441.0	1607.0	1701.0	1752.0	1664.0	1367.0	1571.0	14230.0
Min.	334.4	302.2	58.0	73.4	46.1	67.9	75.2	83.3	116.6	235.7	226.2	210.0	4232.0
Average for Period of Record													11355.6
Average for													
53-67	1146.4	1067.2	691.7	712.4	863.7	1131.1	1323.1	1303.5	1251.5	877.3	716.6	930.6	12015.1

STREAMFLOW DATA

Station Number and Name: 6-7945 Loup River at Columbus

Location: Lat. 41° 25' 05", Long. 97° 21' 45", in SE¼NW¼, Sec. 30, T.17N., R.1E., on left bank 1,250 feet downstream from bridge on U.S. Highway 30 at Columbus, 3½ miles upstream from mouth, and 14 miles downstream from Lookingglass Creek.

Drainage Area in Sq. Mi.: 15,200 approximately; 6,530 contributes directly **Datum of Gage:** 1,428.29' **m.s.l.**

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1895	1506.0	1593.0	1419.2	1700.0	1800.0	2000.0	1639.0	1824.0	2468.0	1305.0	1407.0	1444.0	20110.0
1896	1506.0	1791.0	1940.0	1670.0	1910.0	2210.0	2429.0	1836.0	2861.0	1668.0	1617.0	1464.0	22900.0
1897	1680.0	1690.0	1500.0	1840.0	1750.0	2150.0	2198.7	1534.7	1486.4	2145.9	1154.0	1093.1	20200.0
1898	1949.0	1990.0	1840.0	1910.0	1610.0	1740.0	1662.5	2157.6	2393.3	1196.6	1632.5	1191.9	22100.0
1899	1523.1	1410.0	1250.0	1540.0	1460.0	1920.0	1951.7	1866.2	2316.5	1325.1	1449.3	1274.6	19300.0
1900	1176.9	1190.0	1060.0	1300.0	1290.0	1630.0	1994.6	2066.0	1762.9	1647.5	1707.6	1542.0	18370.0
1901	1604.7	1590.0	1330.0	1620.0	1550.0	1870.0	1936.3	1442.5	2063.0	989.3	846.7	1697.7	18500.0
1902	1379.2	1389.4	1410.0	1720.0	1650.0	2050.0	1433.9	1983.3	1933.8	3485.3	2931.2	1914.9	23300.0
1903	1851.2	1490.5	1320.0	1620.0	1740.0	2610.0	2396.2	2511.8	1897.0	2424.0	3303.7	1644.1	24800.0
1904	1719.2	2181.0	1930.0	2170.0	2100.0	2090.0	1989.0	1864.0	2597.0	2623.0	1463.0	1423.0	24100.0
1905	1808.0	1167.0	1030.0	1270.0	1940.0	3080.0	3268.0	5328.0	4830.0	5575.0	4273.0	3354.0	36900.0
1906	2510.0	2612.0	2320.0	2830.0	2720.0	3220.0	3320.0	2820.0	1720.0	1710.0	1920.0	1550.0	29300.0
1907	2020.0	1840.0	1630.0	1440.0	1270.0	1870.0	1630.0	2020.0	2790.0	2300.0	1440.0	1460.0	21700.0
1908	1390.0	1510.0	1530.0	1440.0	1380.0	2090.0	1880.0	3070.0	3830.0	1530.0	1670.0	1570.0	22900.0
1909	1520.0	1480.0	1440.0	1870.0	1660.0	1870.0	1720.0	1960.0	2980.0	3190.0	1890.0	1500.0	23100.0
1910	1510.0	1450.0	1530.0	1380.0	1300.0	1810.0	1450.0	1720.0	1220.0	1290.0	1810.0	1690.0	18200.0
1911	1320.0	1380.0	1420.0	1470.0	1360.0	1670.0	1580.0	1620.0	1260.0	1030.0	1420.0	1590.0	17100.0
1912	1608.0	1900.0	1419.0	1498.0	1633.0	2016.0	5640.0	3190.0	2260.0	1240.0	1370.0	1650.0	25400.0
1913	1510.0	1610.0	1440.0	1750.0	1670.0	2150.0	2590.0	2670.0	1670.0	1360.0	1210.0	1210.0	20800.0
1914	1340.0	1560.0	1380.0	1630.0	1390.0	1470.0	1510.0	1920.0	3950.0	1230.0	1480.0	1340.0	20200.0
1915	1360.0	1290.0	1140.0	1390.0	1330.0	1720.0	3380.0	2120.0	4140.0	3380.0	3380.0	2980.0	27600.0
1931	—	—	—	—	—	1070.0	1620.0	1540.0	1320.0	1110.0	953.0	940.0	—
1934	1383.0	1508.0	1768.0	1168.0	1225.0	1481.0	1634.0	1118.0	1121.0	760.0	976.8	1390.0	15530.0
1935	1543.0	1432.0	931.2	916.7	1807.0	1506.0	2661.0	2921.0	4505.0	1729.0	1461.0	1532.0	22940.0
1936	1232.0	1510.0	1312.0	832.2	878.1	4197.0	1439.0	1843.0	1149.0	662.9	851.7	996.5	16900.0
1937	1206.0	1288.0	1505.0	500.4	1097.0	1694.0	1307.0	1603.0	1887.0	1346.0	789.4	1365.0	15590.0
1938	1066.0	980.2	797.6	733.7	752.5	1923.0	1220.0	1907.0	1503.0	1399.0	445.5	1076.0	13800.0
1939	858.6	939.4	1244.0	1192.0	627.0	1922.0	1194.0	1450.0	1140.0	538.8	296.1	106.6	11510.0
1940	254.6	319.0	548.9	342.9	746.8	1973.0	536.1	236.4	1171.0	51.2	69.5	45.1	6294.0

STREAMFLOW DATA

Station Number and Name: 6-7945 Loup River at Columbus

Location: Lat. 41° 25' 05", Long. 97° 21' 45", in SE¼NW¼, Sec. 30, T.17N., R.1E., on left bank 1,250 feet downstream from bridge on U.S. Highway 30 at Columbus, 3½ miles upstream from mouth, and 14 miles downstream from Lookingglass Creek.

Drainage Area in Sq. Mi.: 15,200 approximately; 6,530 contributes directly **Datum of Gage:** 1,428.29' m.s.l.

Discharge in 100 Acre-feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1941	137.9	320.3	336.1	595.2	1174.0	941.3	343.0	473.2	692.3	343.5	49.9	156.4	5563.0
1942	152.2	170.4	303.3	560.4	614.1	1203.0	237.5	788.3	1379.0	181.7	168.7	791.8	6550.0
1943	115.3	135.0	176.2	91.0	686.4	663.2	531.8	183.5	1765.0	602.9	61.7	75.1	5087.0
1944	66.3	120.6	298.9	539.1	1071.0	723.7	829.9	1389.0	591.5	317.5	198.5	133.6	6280.0
1945	99.8	257.5	522.4	528.2	778.5	570.2	273.8	629.3	1409.0	593.5	142.5	110.4	5915.0
1946	96.2	234.1	297.9	238.2	597.5	296.9	134.9	373.1	772.3	93.6	67.9	229.3	3432.0
1947	835.9	317.0	439.8	256.0	594.2	782.0	506.8	297.1	4882.7	426.3	129.3	104.6	9572.0
1948	101.4	254.0	549.0	820.2	1891.0	2332.0	183.3	148.1	824.2	382.0	680.0	102.1	8267.0
1949	91.3	274.4	389.4	156.5	275.1	2055.0	882.7	378.2	1027.0	140.7	131.3	232.2	6034.0
1950	114.6	118.6	542.9	235.8	250.5	1399.0	196.2	557.1	469.2	3437.0	613.9	147.8	8083.0
1951	261.3	499.0	509.0	234.6	771.6	1389.0	626.7	1042.0	981.0	506.5	628.1	406.1	7855.0
1952	167.7	798.2	446.9	381.7	1348.0	1637.0	944.1	604.9	146.5	151.9	198.3	89.3	6914.0
1953	74.3	94.2	791.5	926.3	871.4	826.9	324.2	1159.0	540.0	218.0	106.3	69.0	6001.0
1954	71.0	157.9	547.2	529.7	1098.0	696.2	374.5	405.7	562.4	86.2	90.4	80.8	4700.0
1955	103.3	119.2	1155.0	689.3	96.1	1400.0	240.0	123.3	229.7	104.6	21.4	26.6	4308.0
1956	54.8	610.9	223.5	118.4	167.1	691.9	148.0	203.9	134.1	53.7	61.8	19.4	2488.0
1957	47.5	304.6	185.6	213.4	418.2	233.9	134.8	741.0	1192.0	162.7	53.6	181.4	3869.0
1958	113.2	219.9	383.6	769.7	1428.0	1493.0	1413.0	208.4	102.4	1249.0	123.9	86.9	7591.0
1959	80.2	236.4	470.7	216.3	265.6	855.3	251.9	308.7	170.4	149.9	64.6	59.2	3129.0
1960	85.1	536.8	522.7	600.4	299.2	2392.0	979.0	1229.0	443.4	167.4	80.2	86.4	7422.0
1961	95.7	163.2	952.1	519.3	827.7	407.0	195.6	319.7	421.1	41.6	76.8	52.7	4072.0
1962	86.8	136.2	161.0	132.7	564.0	2279.0	372.1	578.6	1738.0	604.9	441.8	92.9	7188.0
1963	122.3	116.7	450.8	239.5	809.5	676.7	149.4	123.2	102.3	36.6	62.1	153.8	3043.0
1964	89.2	90.2	128.6	191.1	469.0	966.3	727.7	774.7	419.3	135.0	93.9	319.0	4404.0
1965	139.0	365.9	198.3	194.0	425.8	1635.0	519.0	1247.0	664.3	148.9	99.0	449.7	6086.0
1966	316.2	276.5	729.1	979.6	865.2	1333.0	276.7	130.7	504.4	121.0	3151.0	403.3	9087.0
1967	145.9	223.0	732.9	234.2	274.7	474.3	127.6	118.7	3754.0	181.7	123.6	109.1	6500.0
Max.	2510.0	2612.0	2320.0	2830.0	2720.0	4197.0	5640.0	5328.0	4882.7	5575.0	4273.0	3354.0	36900.0
Min.	47.5	90.2	128.6	91.0	96.1	233.9	127.6	118.7	102.3	36.6	21.4	19.4	2488.0
Average for Period of Record													13434.3
Average for 53-67	108.3	243.4	508.8	436.9	592.0	1090.7	415.6	511.4	731.9	230.7	310.0	146.0	5325.7

STREAMFLOW DATA

Station Number and Name: 6-7975 Elkhorn River at Ewing

Location: Lat. 42° 16' 03", Long. 98° 20' 11", in NW¼ SW¼ Sec. 35, T.27N., R.9W., on right bank 350 feet downstream from bridge on St. Highway 420, 3/4 of a mile north of Ewing, and 1½ miles upstream from South Fork Elkhorn River.

Drainage Area in Sq. Mi.: 1,400 approximately; 740 contributes directly **Altitude of Gage:** 1,835' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1947	——	——	——	——	——	——	——	——	——	——	29.0	20.5	——
1948	25.5	39.5	34.2	31.7	39.6	65.2	60.7	48.1	52.6	45.2	47.3	22.9	512.5
1949	31.4	30.8	38.5	28.1	29.8	736.9	1206.0	178.4	166.7	44.7	32.7	43.3	2567.0
1950	36.8	41.0	35.8	23.4	30.1	191.0	406.6	301.0	200.8	226.9	158.8	104.5	1758.0
1951	168.1	57.6	51.4	47.5	53.8	264.1	439.5	934.1	756.4	428.7	247.2	281.5	3731.0
1952	412.3	222.4	154.0	84.6	674.2	651.5	510.3	365.5	115.6	32.0	30.8	23.7	3277.0
1953	26.2	33.1	38.1	43.3	48.8	241.5	224.3	607.4	147.5	40.0	36.0	22.7	1509.0
1954	28.2	39.6	48.7	33.8	68.6	107.3	89.1	207.1	125.1	35.9	30.7	28.6	842.7
1955	34.2	39.0	43.5	38.8	27.7	94.9	61.4	42.4	66.9	31.3	16.9	12.3	509.3
1956	25.7	21.0	16.8	23.3	27.9	74.1	83.1	56.5	28.1	17.5	14.2	8.4	396.6
1957	15.3	26.1	27.2	14.4	22.4	55.8	96.0	273.9	186.4	47.2	27.3	23.6	815.6
1958	41.3	45.4	46.1	36.2	37.0	108.0	365.0	112.7	54.7	117.2	69.6	29.4	1063.0
1959	26.2	35.6	39.8	29.9	24.0	124.2	111.1	80.5	53.0	27.2	19.5	18.7	589.7
1960	30.8	73.7	63.9	36.5	51.4	344.9	774.3	935.6	287.6	194.0	43.9	43.4	2888.0
1961	38.0	41.8	44.7	48.6	64.0	161.3	89.8	92.8	81.5	33.5	26.9	27.5	750.4
1962	41.1	33.7	30.8	36.0	59.4	285.0	244.6	346.9	1601.0	497.7	101.8	47.8	3326.0
1963	52.9	45.9	46.3	39.9	77.5	165.4	97.8	60.1	63.3	43.8	26.2	42.8	761.9
1964	38.1	42.3	33.1	38.8	43.7	82.4	140.8	200.8	68.6	67.6	35.8	37.8	829.8
1965	33.1	33.4	32.2	34.7	44.7	45.3	78.3	88.2	332.8	59.9	33.1	57.0	872.7
1966	78.3	56.1	48.2	49.7	45.3	170.1	142.1	70.4	86.5	19.6	39.0	30.0	835.3
1967	33.3	34.1	36.0	31.0	52.3	75.2	57.1	44.1	268.6	80.9	24.7	17.9	755.1
Max.	412.3	222.4	154.0	84.6	674.2	736.9	1206.0	935.6	1601.0	497.7	247.2	281.5	3731.0
Min.	15.3	21.0	16.8	14.4	22.4	45.3	57.1	42.4	28.1	17.5	14.2	8.4	396.6
Average for Period of Record													1429.5
Average for 53-67	36.2	40.1	39.7	35.7	46.3	142.4	177.0	214.6	230.1	87.6	36.3	29.9	1115.9

STREAMFLOW DATA

Station Number and Name: 6-7995 Logan Creek near Uehling

Location: Lat. 41° 42' 50", Long. 96° 31' 15", on south line of SE¼ SE¼ Sec. 9, T.20N., R.8E., near right bank on downstream side of bridge on county road, 2 miles southwest of Uehling and 8 miles upstream from mouth.

Drainage Area in Sq. Mi.: 1,030 approximately   Datum of Gage: 1,208.73' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1941	—	—	—	—	—	—	113.5	49.6	59.6	36.6	25.2	207.4	—
1942	64.2	29.5	24.5	27.8	22.8	171.4	66.0	48.6	115.1	51.9	36.3	70.8	728.9
1943	26.7	23.6	24.0	24.0	79.3	35.3	27.3	24.5	113.6	55.2	28.4	18.8	480.7
1944	20.2	24.1	19.6	29.6	70.1	43.2	73.1	340.6	742.1	255.6	153.0	47.2	1818.0
1945	34.9	40.2	27.1	30.7	63.9	145.6	64.0	104.5	561.2	276.7	67.6	41.7	1458.0
1946	37.1	31.2	23.0	27.9	173.2	112.0	37.0	93.9	84.5	44.3	33.5	31.0	728.6
1947	47.5	69.3	32.6	36.4	85.3	114.9	102.4	60.2	287.5	72.9	35.5	33.4	977.9
1948	35.5	32.0	26.2	30.5	237.6	171.5	42.2	33.9	50.8	62.2	64.3	29.3	816.0
1949	24.9	22.8	23.3	25.1	22.2	591.9	130.5	152.2	207.7	133.9	63.2	80.7	1478.0
1950	43.9	37.2	32.7	22.5	35.1	532.8	61.1	79.7	122.5	196.7	148.8	44.1	1357.0
1951	41.0	33.3	33.0	30.3	40.6	496.0	177.8	204.5	313.1	294.3	649.0	307.8	2621.0
1952	176.0	96.3	73.7	72.7	288.0	400.1	238.5	378.0	194.7	169.4	91.1	61.3	2240.0
1953	51.6	44.8	55.1	50.3	75.6	213.1	134.9	176.7	312.2	69.9	82.2	42.1	1308.0
1954	40.7	45.5	31.8	32.6	102.4	180.5	83.9	156.4	740.6	84.7	62.1	59.5	1621.0
1955	61.1	50.6	49.3	40.4	36.8	152.3	62.5	58.7	62.4	66.9	26.3	26.1	693.4
1956	28.7	26.8	23.2	26.1	27.9	46.5	27.4	86.5	130.3	64.1	23.0	21.2	531.7
1957	22.1	25.7	23.3	21.0	24.2	36.0	25.4	50.3	187.1	282.5	45.5	64.0	807.1
1958	42.2	60.5	54.8	38.2	231.8	168.6	113.0	57.2	48.0	184.9	147.1	38.8	1185.0
1959	33.9	35.2	28.1	24.1	23.0	63.9	57.6	295.1	134.1	58.4	91.9	41.2	886.5
1960	37.8	41.0	43.5	26.8	32.7	228.2	819.4	286.5	179.2	94.4	164.6	70.7	2025.0
1961	55.2	46.8	55.2	42.1	78.2	244.3	78.2	62.2	102.2	61.3	55.9	50.1	931.7
1962	43.9	44.2	32.5	33.2	70.8	1468.0	212.8	278.0	470.0	101.0	78.7	59.5	2893.0
1963	54.0	50.5	46.8	42.0	53.1	117.5	54.3	55.8	121.2	80.1	54.2	46.3	775.8
1964	37.1	34.9	31.1	34.8	25.5	55.0	55.2	197.9	208.6	66.3	45.8	47.1	839.3
1965	42.9	36.7	31.9	36.6	254.9	558.7	192.9	331.1	317.3	79.3	53.7	151.2	2087.0
1966	148.7	72.5	74.5	62.3	380.2	130.9	96.3	55.1	135.8	102.2	96.8	60.3	1416.0
1967	53.5	46.0	43.3	33.9	39.6	53.9	43.1	55.5	1413.0	142.2	59.6	47.2	2030.0
Max.	176.0	96.3	74.5	72.7	380.2	1468.0	819.4	378.0	1413.0	294.3	649.0	307.8	2893.0
Min.	20.2	22.8	19.6	21.0	22.2	35.3	25.4	24.5	48.0	36.6	23.0	18.8	480.7
Average for Period of Record													1335.9
Average for 53-67	50.2	44.1	41.6	36.3	97.1	247.2	137.1	146.9	304.1	102.5	72.5	55.0	1334.6

STREAMFLOW DATA

Station Number and Name: 6-8000 Maple Creek near Nickerson

Location: Lat. 41° 32' 44", Long. 96° 30' 09", in NE¼ SW¼ Sec. 10, T.18N., R.8E., on right bank 120 feet upstream from bridge on U.S. Highways 77 and 275, 1½ miles northwest of Nickerson, and 4 miles upstream from mouth

Drainage Area in Sq. Mi.: 450 approximately **Datum of Gage:** 1,194.56' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1952	28.5	18.7	16.6	13.2	54.6	49.4	61.4	61.6	33.6	31.6	35.2	17.6	422.0
1953	9.7	9.4	8.9	10.0	21.1	53.1	35.6	60.5	45.7	20.1	6.4	2.2	282.7
1954	1.8	3.5	4.1	2.4	6.5	8.9	13.3	10.3	6.4	1.4	4.4	1.0	64.0
1955	2.0	1.1	1.4	1.3	0.9	4.5	4.1	1.4	38.7	24.6	2.9	0.9	83.7
1956	0.8	0.9	0.6	0.6	0.8	1.3	1.3	15.0	1.8	4.8	9.3	0.7	37.7
1957	1.4	1.0	1.3	1.1	0.7	0.8	0.8	1.3	164.5	145.3	8.7	19.6	346.4
1958	2.2	4.6	1.9	0.9	62.0	103.3	19.7	5.4	4.8	126.0	172.2	3.7	506.6
1959	1.4	1.7	0.8	0.9	1.0	12.4	32.3	122.4	180.4	43.9	222.8	30.1	650.1
1960	11.1	9.5	10.1	3.3	4.7	109.6	337.2	183.4	744.7	63.1	35.2	19.9	1532.0
1961	12.6	13.2	14.4	9.0	10.1	27.0	16.8	41.3	73.2	25.3	9.2	8.2	260.4
1962	7.6	6.0	4.6	3.4	12.0	414.5	45.1	56.6	150.0	38.3	13.5	17.8	769.3
1963	9.5	7.5	7.4	3.9	34.4	60.3	13.2	9.0	96.8	11.3	6.2	8.8	268.1
1964	3.5	2.6	1.1	1.6	1.5	8.9	8.0	50.7	236.3	21.5	12.1	34.7	382.4
1965	4.5	3.6	3.5	1.8	49.5	153.7	49.9	326.5	112.9	56.3	12.1	227.9	1002.0
1966	104.6	26.3	15.7	12.7	122.4	27.2	39.6	14.3	77.3	52.6	33.7	12.1	538.5
1967	5.0	5.6	8.8	3.9	6.3	12.6	12.3	6.7	566.7	29.6	12.6	8.2	678.4
Max.	104.6	26.3	16.6	13.2	122.4	414.5	337.2	326.5	744.7	145.3	222.8	227.9	1532.0
Min.	0.8	0.9	0.6	0.6	0.7	0.8	0.8	1.3	1.8	1.4	2.9	0.7	37.7
Average for Period of Record													489.0
Average for 53-67	11.8	6.4	5.6	3.8	22.3	66.5	41.9	60.3	166.7	44.3	37.4	26.4	493.4

STREAMFLOW DATA

Station Number and Name: 6-8005 Elkhorn River at Waterloo

Location: Lat. 41° 17' 25", Long. 96° 17' 05", in SW¼, Sec. 3, T.15N., R.10E., on right bank 100 feet upstream from bridge at north edge of Waterloo and 3½ miles downstream from Rawhide Creek.

Drainage Area in Sq. Mi.: 6,900 approximately; 5,900 contributes directly **Datum of Gage:** 1,106.73' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1899	—	—	—	—	—	—	—	963.5	1012.2	535.6	346.2	194.0	—
1900	222.0	250.0	147.0	166.0	86.1	246.0	441.5	717.0	363.0	345.6	385.5	792.0	4160.0
1901	506.7	615.3	356.0	411.0	205.0	595.0	633.7	698.5	1112.1	844.2	258.9	305.9	6540.0
1902	368.3	373.1	369.0	430.0	417.0	840.0	579.5	572.4	464.7	2233.5	893.4	595.6	8140.0
1903	1250.5	625.3	583.0	670.0	727.0	2090.0	1152.0	2452.1	2570.0	1547.0	2181.8	1933.9	17800.0
1904	1158.4	833.0	—	—	—	—	—	—	—	—	—	—	—
1911	—	—	—	—	—	—	—	675.0	631.0	558.0	328.0	205.0	—
1912	575.0	696.0	615.0	706.0	370.0	1030.0	1960.0	8790.0	720.0	429.0	572.0	350.0	8900.0
1913	449.0	402.0	277.0	320.0	338.0	983.0	1350.0	1760.0	791.0	261.0	237.0	158.0	7330.0
1914	225.0	290.0	477.0	546.0	266.0	460.0	490.0	842.0	1360.0	345.0	153.0	296.0	5750.0
1915	267.0	293.0	301.0	350.0	389.0	867.0	1980.0	1890.0	2620.0	3630.0	1400.0	1790.0	15780.0
1928	—	—	—	—	—	—	—	—	—	—	202.0	181.0	—
1929	359.0	454.0	400.0	271.0	167.0	830.0	786.0	861.0	1470.0	984.0	379.0	302.0	7260.0
1930	340.0	352.0	92.2	154.0	611.0	499.0	649.0	2350.0	726.0	250.0	583.0	308.0	6910.0
1931	336.0	421.0	368.0	343.0	433.0	469.0	487.0	445.0	417.0	184.0	128.0	229.0	4260.0
1932	233.0	348.0	423.0	447.0	574.0	1540.0	601.0	1090.0	1290.0	291.0	769.0	356.0	7960.0
1933	303.0	287.0	233.0	298.0	237.0	695.0	591.0	670.0	241.0	575.0	264.0	247.0	4640.0
1934	200.1	235.6	276.7	246.0	320.1	388.4	378.7	201.1	561.4	298.0	80.4	160.0	3346.0
1935	184.0	231.4	161.9	182.9	250.5	374.8	494.7	809.8	1048.0	291.6	251.5	174.9	4456.0
1936	171.3	217.2	226.1	163.7	164.3	1467.0	427.1	445.9	335.3	106.6	128.9	377.8	4231.0
1937	144.7	167.1	181.3	135.3	215.0	633.4	378.8	489.4	614.4	351.1	362.8	219.8	3893.0
1938	219.9	196.5	184.6	171.7	197.3	493.8	439.7	666.3	389.6	715.1	217.9	539.1	4432.0
1939	176.6	223.3	242.2	220.8	152.8	694.1	339.4	351.0	262.4	178.3	123.6	52.3	3017.0
1940	92.4	143.0	152.5	123.9	147.5	388.5	356.5	368.2	2615.0	274.4	413.1	137.0	5212.0
1941	148.9	169.2	194.5	259.3	563.9	723.0	703.2	466.5	512.4	288.3	122.2	376.2	4528.0
1942	312.0	279.3	252.6	195.7	247.3	878.5	531.3	719.9	1215.0	698.1	346.2	425.2	6101.1
1943	263.0	253.1	220.4	256.3	612.3	363.7	390.8	323.5	1113.0	461.2	194.9	146.3	4598.0
1944	163.0	219.2	201.6	239.1	318.7	501.9	927.1	2757.0	6725.0	1180.0	648.1	426.6	14310.0
1945	293.6	285.8	249.1	331.6	570.6	1566.0	667.7	898.5	2670.0	1639.0	426.5	256.8	9855.0
1946	272.6	262.1	240.6	270.0	622.8	706.8	458.5	542.6	647.9	322.2	194.7	277.2	4818.0
1947	640.0	744.5	499.3	355.0	463.9	727.1	1127.0	736.3	4592.0	1225.0	317.7	228.4	11660.0
1948	229.4	341.5	334.2	311.8	869.0	1719.0	495.6	399.1	534.5	516.6	1071.0	453.1	7275.0
1949	283.5	314.1	284.6	341.0	280.9	4304.0	2993.0	1443.0	1691.0	715.3	402.0	520.9	13570.0
1950	362.6	330.0	267.9	236.4	301.3	2033.0	1049.0	1058.0	1374.0	2042.0	1862.0	552.2	11470.0

STREAMFLOW DATA

Station Number and Name: 6-8005 Elkhorn River at Waterloo

Location: Lat. 41° 17' 25", Long. 96° 17' 05", in SW¼, Sec. 3, T.15N., R.10E., on right bank 100 feet upstream from bridge at north edge of Waterloo and 3½ miles downstream from Rawhide Creek.

Drainage Area in Sq. Mi.: 6,900 approximately; 5,900 contributes directly **Datum of Gage:** 1,106.73' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1951	765.1	457.7	375.5	349.7	446.3	3288.0	2014.0	2693.0	2467.0	2182.0	2924.0	1610.0	19570.0
1952	1443.0	862.8	645.3	684.9	1926.0	2589.0	2237.0	1991.0	1060.0	777.3	693.2	425.3	15330.0
1953	356.5	349.1	407.6	417.9	585.2	1456.0	1108.0	2236.0	1443.0	458.5	357.2	219.5	9394.0
1954	234.2	320.8	345.7	281.6	621.3	756.7	648.2	960.8	1997.0	397.7	294.2	250.1	7108.0
1955	334.6	326.5	318.0	272.0	235.3	666.8	485.8	313.4	558.4	477.6	121.2	105.2	4215.0
1956	184.1	186.1	149.2	174.6	182.6	470.2	381.5	375.6	396.3	311.3	153.7	89.3	3054.0
1957	113.9	176.3	169.8	158.0	185.1	387.1	414.3	643.5	1469.0	1186.0	222.4	349.3	5475.0
1958	312.6	357.2	368.6	249.0	704.6	1166.0	1393.0	559.1	363.5	1137.0	1720.0	304.3	8635.0
1959	242.6	262.3	243.6	217.2	219.6	697.4	831.0	1861.0	1279.0	591.7	921.8	267.3	7634.0
1960	315.4	356.5	400.7	285.2	329.1	1261.0	5468.0	3194.0	3714.0	1183.0	727.9	536.5	17770.0
1961	392.7	396.4	381.8	393.4	479.0	1286.0	723.1	736.4	1161.0	458.8	416.6	299.2	7124.0
1962	416.9	420.0	359.9	309.0	532.8	4667.0	1740.0	1549.0	3924.0	1218.0	644.6	470.6	16250.0
1963	412.0	405.5	330.0	285.0	423.2	964.2	539.2	543.5	1050.0	475.2	308.7	330.3	6067.0
1964	297.3	290.0	231.8	302.5	377.1	543.5	703.2	1171.0	1839.0	650.1	451.6	483.8	7341.0
1965	294.9	292.3	242.8	308.6	720.4	1705.0	1256.0	2041.0	1451.0	652.8	321.7	1245.0	10530.0
1966	1168.0	553.6	526.2	377.1	1633.0	1025.0	772.3	590.1	1022.0	625.9	644.0	392.6	9330.0
1967	353.2	334.8	337.1	304.5	322.3	524.7	432.5	357.6	6863.0	823.9	399.6	277.4	11330.0
Max.	1443.0	862.8	645.3	706.0	1926.0	4667.0	5468.0	8790.0	4592.0	3630.0	2924.0	1933.9	19570.0
Min.	92.4	143.0	92.2	123.9	86.1	246.0	339.4	201.1	241.0	106.6	80.4	52.3	3017.0
Average for Period of Record													8262.3
Average for													
53-67	361.9	335.1	320.9	289.0	503.4	1171.8	1126.4	1142.1	1902.0	709.8	513.7	374.7	8750.3

STREAMFLOW DATA

Station Number and Name: 6-7955 Shell Creek near Columbus

Location: Lat. 41° 31' 33", Long. 97° 16' 55", in NE¼ NW¼, Sec. 23, T.18N., R.1E., on right bank 80 feet upstream from county road bridge, 1 mile upstream from Loseke Creek and 7 miles northeast of Columbus.

Drainage Area in Sq. Mi.: 270 approximately Altitude of Gage: 1,435' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1947	—	—	—	—	—	—	—	—	—	—	—	4.4	—
1948	3.9	6.7	7.2	11.8	175.1	179.4	8.6	10.8	65.2	63.7	74.6	3.0	610.0
1949	3.8	6.5	10.3	7.7	8.3	72.4	22.9	43.6	146.8	19.3	12.3	9.3	363.2
1950	5.2	4.7	6.1	4.3	1.7	154.5	11.9	25.8	190.2	224.1	55.7	7.0	691.2
1951	8.3	7.8	8.2	7.5	5.8	76.9	37.1	18.1	32.1	36.1	124.1	42.4	404.4
1952	19.0	13.5	8.5	15.9	17.8	43.7	27.2	29.4	21.3	46.1	48.5	7.3	298.2
1953	6.0	7.5	8.0	10.6	16.0	25.2	28.9	58.7	56.6	9.5	9.0	3.5	239.5
1954	3.8	6.9	9.2	4.5	11.0	13.9	11.8	11.8	18.1	2.4	4.2	3.0	100.6
1955	4.2	3.5	6.4	6.2	6.9	14.2	11.6	9.9	53.0	8.6	1.9	2.2	128.3
1956	2.4	4.8	6.7	9.1	6.7	14.4	7.5	22.0	10.2	2.5	16.8	2.0	105.2
1957	4.6	3.2	4.4	3.7	4.5	11.3	9.1	14.9	109.2	27.1	3.8	11.4	207.2
1958	4.0	6.4	6.4	6.1	15.6	49.3	35.5	8.2	11.2	54.1	9.1	2.4	208.3
1959	1.8	3.1	5.3	4.0	4.1	15.6	15.5	46.4	57.6	20.0	48.0	3.0	224.4
1960	4.5	4.5	5.6	8.5	6.3	86.1	81.2	69.5	134.2	17.3	9.9	4.8	432.4
1961	4.2	5.3	6.8	7.2	11.2	17.2	10.2	9.1	10.3	3.1	20.4	2.8	107.8
1962	3.9	5.0	4.0	3.8	14.3	227.0	22.8	43.0	49.8	43.0	17.2	7.1	440.9
1963	7.8	7.1	7.2	6.2	52.3	23.7	11.0	7.8	55.0	4.5	4.9	5.0	192.5
1964	3.2	4.3	3.8	5.7	6.3	9.8	14.0	21.6	179.2	14.2	18.0	9.4	289.5
1965	7.2	7.4	7.4	8.8	30.1	64.2	24.5	213.2	60.0	20.8	8.0	44.7	496.3
1966	29.8	11.7	8.0	6.8	93.1	19.2	14.1	11.4	59.8	13.3	84.8	13.1	365.1
1967	9.2	8.9	8.7	7.7	7.6	10.0	9.0	7.2	307.3	73.3	30.8	11.5	491.2
Max.	29.8	13.5	10.3	15.9	175.1	227.0	81.2	213.2	307.3	224.1	124.1	44.7	691.2
Min.	1.8	3.1	3.8	3.7	1.7	9.8	7.5	7.2	10.2	2.4	1.9	2.0	100.6
Average for Period of Record													319.8
Average for 53-67	6.4	6.0	6.5	6.6	19.1	40.1	20.4	37.0	78.1	20.9	19.1	8.4	268.6

STREAMFLOW DATA

Station Number and Name: 6-8050 Salt Creek near Ashland

Location: Lat. 41° 02' 50", Long. 96° 20' 30", in SW¼, Sec. 31, T.13N., R.10E., near center of channel on downstream side of pier of bridge on U.S. Highway 6, 1 mile east of Ashland and 2½ miles upstream from mouth.

Drainage Area in Sq. Mi.: 1,640 approximately Datum of Gage: 1,042.04' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1948	61.7	63.1	70.9	74.3	817.8	1187.0	112.0	122.8	159.8	534.4	460.3	214.5	3879.0
1949	70.4	133.2	82.2	91.9	193.6	2434.0	173.1	573.3	1057.0	258.7	157.6	284.8	5510.0
1950	149.5	78.4	67.9	61.5	76.8	314.3	88.0	620.5	120.5	165.6	293.3	78.9	2115.0
1951	221.8	73.2	62.6	67.4	184.4	390.7	350.2	500.8	3263.0	621.3	573.8	293.2	6602.0
1952	171.3	121.8	99.0	170.0	176.0	580.7	780.8	407.0	746.6	500.8	357.7	108.9	4221.0
1953	87.9	96.6	130.3	131.6	180.4	147.8	150.7	166.4	121.1	96.7	74.9	43.9	1428.0
1954	56.5	71.2	74.0	68.3	104.2	78.4	74.5	261.1	436.1	122.2	452.9	67.8	1867.0
1955	99.7	59.2	57.8	65.2	176.5	120.5	116.5	68.5	451.1	62.7	39.1	55.2	1372.0
1956	33.8	40.5	50.3	52.8	51.6	60.2	44.9	86.8	140.5	288.3	234.0	137.2	1221.0
1957	33.7	37.9	52.3	41.1	55.3	77.4	130.2	149.1	842.3	718.0	372.2	161.4	2671.0
1958	179.1	94.8	74.7	84.0	564.8	386.8	165.7	84.5	65.8	1561.0	708.7	449.9	4420.0
1959	90.7	75.0	63.7	61.8	173.4	284.0	196.1	1615.0	324.7	286.6	629.6	122.0	3923.0
1960	125.1	129.0	118.8	96.0	131.1	1432.0	670.3	904.3	949.2	361.8	619.7	158.4	5696.0
1961	147.1	118.6	112.1	112.4	115.6	211.0	190.2	159.2	298.8	111.5	132.5	186.1	1895.0
1962	233.8	206.8	137.1	213.0	400.5	814.2	199.0	276.5	362.7	405.8	192.1	214.6	3656.0
1963	179.5	129.4	114.9	122.8	275.0	624.1	155.1	278.5	1837.0	188.1	158.1	153.6	4216.0
1964	114.7	110.7	64.2	88.8	91.6	121.4	304.9	337.4	1763.0	212.4	162.5	144.0	3516.0
1965	87.6	83.9	96.0	85.8	361.9	798.9	518.6	943.8	1248.0	611.8	144.1	1045.0	6025.0
1966	311.8	149.2	163.0	116.2	206.5	167.4	131.1	218.0	285.8	152.5	182.1	107.5	2191.0
1967	70.3	75.9	71.4	75.9	67.0	88.1	84.1	87.5	2502.0	268.0	127.6	138.1	3656.0
Max.	311.8	206.8	163.0	213.0	817.8	2434.0	780.0	1615.0	3263.0	1561.0	708.7	1045.0	6602.0
Min.	33.7	37.9	50.3	41.1	51.6	60.2	44.9	68.5	65.8	62.7	39.1	43.9	1221.0
Average for Period of Record													3504.0
Average for 53-67	123.4	98.6	92.0	94.4	197.0	360.8	208.8	375.8	775.2	363.2	282.0	212.3	3183.5

STREAMFLOW DATA

Station Number and Name: 6-8055 Platte River Near South Bend, Nebraska

Location: Lat. 41° 01' 30", Long. 96° 17' 50", in NE¼ Sec. 9, T.12N., R.10E., at the right downstream side of bridge on Interstate Highway 80, and 5 miles northwest of South Bend.

Drainage Area in Sq. Mi.: 88,800 approximately **Datum of Gage:** 1,038.53' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1953	—	—	—	—	—	—	—	—	3891.0	1596.0	1228.0	948.3	—
1954	1247.0	2436.0	2846.0	1392.0	4397.0	3703.0	3288.0	4193.0	5004.0	1102.0	1936.0	1098.0	32640.0
1955	1766.0	2128.0	2164.0	1701.0	1798.0	4499.0	3004.0	1567.0	3248.0	1391.0	319.3	579.9	24170.0
1956	1348.0	1330.0	895.3	1922.0	2009.0	3941.0	2575.0	2102.0	1964.0	1249.0	921.3	690.7	20950.0
1957	986.4	1556.0	1419.0	1120.0	1984.0	3012.0	3046.0	4769.0	8058.0	4008.0	1362.0	2091.0	33410.0
1958	2414.0	2732.0	2730.0	2101.0	3842.0	5623.0	6272.0	3732.0	3113.0	6353.0	4427.0	1929.0	45270.0
1959	1528.0	2101.0	1728.0	1513.0	1933.0	5787.0	4903.0	7896.0	3524.0	2729.0	3569.0	1294.0	38500.0
1960	2211.0	2628.0	2677.0	1701.0	3512.0	8432.0	12580.0	8994.0	9482.0	3747.0	2467.0	1725.0	60160.0
1961	2008.0	2366.0	2018.0	2099.0	2806.0	5113.0	3531.0	4243.0	4766.0	1398.0	1388.0	1530.0	33270.0
1962	2517.0	3012.0	1964.0	2081.0	3602.0	9544.0	5617.0	4533.0	9981.0	5263.0	3037.0	2213.0	53360.0
1963	3061.0	2952.0	2694.0	2018.0	3580.0	5792.0	3246.0	2570.0	5235.0	1101.0	1139.0	2299.0	35690.0
1964	1869.0	2343.0	1497.0	2432.0	3002.0	4114.0	4852.0	4690.0	7148.0	2669.0	1630.0	2403.0	38650.0
1965	1888.0	1902.0	1698.0	2009.0	2676.0	5352.0	5918.0	7619.0	7433.0	5152.0	1594.0	6789.0	30030.0
1966	5633.0	3755.0	3881.0	2281.0	5866.0	5634.0	4107.0	2822.0	3205.0	1464.0	4080.0	1942.0	44670.0
1967	2070.0	2285.0	1734.0	2162.0	2519.0	3286.0	2202.0	1853.0	21680.0	4497.0	1735.0	1304.0	47330.0
Max.	5633.0	3755.0	3881.0	2432.0	5866.0	9544.0	12580.0	8994.0	21680.0	6353.0	4427.0	6789.0	60160.0
Min.	986.4	1330.0	895.3	1120.0	1798.0	3012.0	2202.0	1567.0	1964.0	1101.0	319.3	579.9	20950.0
Average for Period of Record													38435.7

STREAMFLOW DATA

Station Number and Name: 6-8215 Arikaree River at Haigler

Location: Lat. 40° 01' 45", Long. 101° 58' 10", in NE¼NE¼, Sec. 29, T.1N., R.41W., on left bank 57 feet (revised) downstream from bridge on U.S. Highway 34, 1.3 miles upstream from Chicago, Burlington & Quincy Railroad Co. bridge, 1.8 miles upstream from confluence with North Fork Republican River, 2 miles northwest of Haigler, and 3.2 miles downstream from Kansas-Nebraska line.

Drainage Area in Sq. Mi.: 1,460 approximately; 1,330 contributes to surface runoff. **Datum of Gage:** 3,250.98' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1932	6.7	8.5	9.4	9.3	15.2	17.5	13.4	14.8	15.5	9.1	53.6	5.1	178.1
1933	8.2	8.6	7.6	10.4	16.7	17.0	13.7	24.2	3.5	72.6	36.6	22.9	242.0
1934	8.9	11.0	14.1	14.8	11.7	13.2	12.8	5.3	24.3	.8	30.4	3.2	150.5
1935	3.7	11.3	13.5	10.5	11.4	10.6	15.8	436.1	356.4	18.5	24.5	4.7	917.0
1936	4.5	7.2	8.2	8.7	11.5	13.2	15.5	54.8	22.8	.5	5.7	7.2	159.8
1937	8.9	9.0	5.5	6.2	37.2	15.5	4.8	6.7	12.4	2.9	.5	13.4	123.0
1938	5.2	5.5	4.0	7.4	4.3	7.8	8.1	51.1	11.5	24.3	68.1	83.0	280.2
1939	4.6	10.1	17.4	9.9	2.7	14.9	10.1	7.8	14.1	11.0	2.4	.7	105.7
1940	4.5	2.0	2.0	3.1	15.7	21.2	7.3	5.3	3.7	5.2	2.4	79.3	151.7
1941	8.0	3.6	2.4	2.7	7.9	9.3	24.9	14.4	43.3	64.7	53.0	11.9	246.1
1942	15.2	8.9	12.3	10.5	13.0	175.5	16.7	11.2	27.6	1.2	6.3	34.6	333.0
1943	24.6	15.9	15.0	9.3	12.9	10.7	9.7	12.9	10.7	1.9	.2	1.8	125.6
1944	4.0	4.7	1.0	5.8	18.1	8.1	46.4	17.1	5.3	8.2	10.5	3.7	132.9
1945	6.4	4.6	3.5	8.9	14.3	5.2	17.4	13.5	16.1	4.7	3.2	4.6	102.4
1946	6.0	5.6	2.1	10.5	10.9	18.7	5.7	29.7	14.8	45.7	.4	3.3	153.4
1947	7.4	18.9	11.9	13.2	15.5	49.7	38.0	24.9	28.2	11.4	.3	1.9	221.3
1948	2.4	1.9	2.6	2.5	11.0	17.8	5.8	24.1	168.3	5.6	3.1	1.1	246.2
1949	6.6	3.7	6.7	1.1	26.7	24.0	32.0	54.2	35.3	8.8	12.3	8.2	219.6
1950	12.6	8.8	5.7	9.0	14.9	13.0	10.5	18.1	4.9	6.2	42.5	16.9	163.1
1951	10.8	10.5	7.5	6.1	12.3	10.3	18.9	35.9	81.7	16.8	7.0	55.5	273.3
1952	16.2	13.6	7.0	14.3	19.0	22.6	24.0	25.6	6.2	.3	.0	1.8	150.6
1953	4.8	1.7	1.2	8.9	12.3	16.0	20.5	11.0	4.9	.3	2.2	.4	84.2
1954	3.1	4.5	1.1	2.2	8.2	11.8	10.2	11.0	2.9	.1	3.8	8.8	67.7
1955	7.7	.8	1.0	1.0	4.2	13.0	10.4	86.9	88.6	2.1	4.3	3.0	223.0
1956	5.8	3.6	.6	2.2	6.4	5.4	5.9	11.1	2.0	21.8	61.7	3.0	129.5
1957	5.9	3.8	6.3	3.2	14.2	13.8	28.2	79.1	40.5	53.3	18.1	4.0	270.4
1958	10.3	4.4	5.9	6.3	7.4	14.9	26.6	22.1	15.4	20.8	55.6	8.0	197.7
1959	4.9	6.8	8.5	9.2	12.7	19.1	17.8	16.7	5.0	3.5	.5	3.3	108.0
1960	8.9	1.0	1.0	.6	10.7	246.2	19.5	16.7	11.6	8.8	.2	2.0	327.2
1961	5.0	.7	.8	2.2	6.7	12.1	13.4	16.6	3.8	3.0	29.3	7.6	101.2
1962	10.3	5.5	4.8	3.4	9.8	9.9	8.5	21.0	72.0	118.6	18.6	6.8	289.4
1963	3.6	8.6	8.2	3.3	15.3	17.6	11.4	8.3	3.9	.6	4.2	26.7	111.7
1964	9.1	5.2	2.1	7.7	12.9	11.7	17.6	10.6	22.4	2.7	1.8	2.4	106.2
1965	7.4	5.9	.6	.5	2.6	5.4	5.3	3.8	26.7	67.8	31.6	11.3	167.9
1966	8.5	8.6	9.6	4.8	9.5	16.7	14.0	5.7	8.3	15.4	16.4	13.1	130.6
1967	11.4	10.3	8.2	11.5	8.3	9.9	11.0	19.0	25.3	10.2	.9	4.3	130.3
Max.	24.6	18.9	17.4	14.8	37.2	246.2	46.4	436.1	356.4	118.6	68.1	83.0	917.0
Min.	2.4	.7	.6	.5	2.6	5.2	4.8	3.8	2.0	.1	.0	.4	67.7
Average for Period of Record													197.8
Average for 53-67	7.1	4.8	4.0	4.5	9.4	28.2	14.7	22.6	22.2	22.4	16.6	7.0	163.5

STREAMFLOW DATA

Station Number and Name: 6-8230 North Fork Republican River at Colorado-Nebraska State Line

Location: Lat. 40° 04' 10", Long. 102° 03' 05", in Sec. 10, T.1N., R.42W., on right bank 100 feet east of Colorado-Nebraska State Line and 9½ miles upstream from confluence with Arikaree River

Drainage Area in Sq. Mi.: 320 approximately; 130 contributes directly Datum of Gage: 3,336.09' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1931	33.2	23.8	36.9	40.6	66.6	55.3	50.3	17.6	12.9	5.0	6.7	10.9	359.8
1932	19.4	30.8	46.1	49.2	48.9	65.2	38.2	19.4	14.8	21.9	36.9	21.8	413.0
1933	26.4	42.9	49.3	46.7	36.7	40.0	27.3	40.5	5.4	17.0	21.3	32.3	386.0
1934	25.7	31.7	46.1	44.9	44.0	44.3	25.7	7.3	32.3	3.3	5.9	10.6	321.8
1935	19.9	21.2	40.4	38.7	31.0	46.5	24.9	34.3	51.6	4.3	17.6	25.5	355.9
1936	12.5	30.8	42.1	36.3	34.9	47.5	40.6	26.7	27.2	3.9	15.7	13.8	332.0
1937	26.0	33.1	33.4	31.2	29.9	35.4	30.5	8.1	13.9	6.7	4.2	12.2	264.6
1938	19.2	27.6	37.0	34.7	28.6	35.2	50.8	39.7	28.6	25.8	7.8	22.1	357.1
1939	15.6	27.3	37.2	37.5	29.7	34.2	33.2	11.3	11.8	4.0	6.0	5.9	253.7
1940	16.1	25.5	34.1	36.5	36.5	43.1	36.1	14.2	18.7	3.5	2.5	32.1	298.9
1941	25.8	27.8	35.9	35.8	33.8	40.1	39.5	30.5	29.9	18.4	20.8	20.1	358.4
1942	39.7	38.7	40.0	42.2	39.0	46.9	41.9	41.0	26.3	8.6	7.4	33.7	405.4
1943	39.7	39.6	43.5	39.9	36.5	39.4	38.2	30.3	15.6	3.8	4.0	9.7	340.2
1944	18.1	28.0	44.0	39.0	38.5	46.2	49.5	44.6	16.4	20.2	7.2	12.6	364.3
1945	26.0	30.2	44.3	41.6	34.6	39.6	39.4	26.9	21.5	11.3	9.5	16.7	341.6
1946	25.8	32.2	36.3	38.9	32.6	44.1	29.9	22.6	12.3	18.0	5.1	14.7	312.5
1947	25.3	38.1	37.3	36.8	35.8	38.0	47.6	43.1	38.0	14.0	5.0	8.8	367.9
1948	16.0	35.9	44.8	40.5	42.5	44.2	38.4	35.0	45.1	31.0	8.1	12.7	394.2
1949	19.3	37.2	40.0	32.0	39.9	47.9	51.0	50.4	47.6	20.0	25.6	28.6	439.5
1950	33.6	44.9	42.9	42.4	42.4	43.4	37.1	22.6	10.2	22.2	44.5	32.1	418.3
1951	19.0	34.9	43.4	38.5	35.6	41.0	39.6	63.9	32.8	19.9	28.3	76.0	472.9
1952	28.8	42.2	42.3	44.4	42.3	49.7	44.5	32.8	7.2	5.3	5.7	8.5	353.7
1953	17.6	36.9	42.3	45.1	35.4	42.0	34.5	24.0	9.3	5.0	8.0	9.1	309.3
1954	19.0	35.9	45.9	44.4	35.5	41.5	15.7	19.6	7.8	5.8	19.8	10.2	301.2
1955	21.0	39.0	42.6	40.7	40.0	45.0	18.3	20.2	23.9	5.5	5.7	9.2	311.1
1956	17.9	30.2	41.0	42.0	40.4	42.1	22.4	11.0	9.5	6.9	33.3	9.6	306.3
1957	20.5	49.7	44.2	40.2	37.9	46.5	47.8	50.0	40.9	31.6	6.6	12.1	428.0
1958	26.6	38.2	43.1	43.9	42.0	50.1	47.6	57.7	29.1	19.9	11.8	15.3	425.3
1959	26.6	43.6	44.1	42.8	36.8	47.9	42.9	34.6	10.9	8.3	7.9	10.2	356.6
1960	30.0	42.8	44.3	43.7	44.2	52.8	40.9	32.4	20.8	19.9	5.0	7.2	384.1
1961	23.9	40.4	43.7	44.3	39.2	45.6	42.8	32.9	19.0	14.1	22.9	19.7	388.5
1962	25.2	41.3	38.7	40.8	40.4	41.4	32.8	27.8	67.2	57.7	25.3	21.4	460.0
1963	41.2	43.1	44.9	39.1	41.3	47.5	19.1	12.9	7.4	4.8	13.0	26.8	341.1
1964	19.8	37.3	36.6	39.3	38.7	42.3	40.8	11.3	22.1	4.3	5.3	8.8	306.6
1965	13.8	28.3	39.7	40.7	40.1	42.5	24.6	15.4	41.1	19.3	17.8	28.7	352.0
1966	40.5	37.8	42.2	43.9	38.0	44.3	39.6	11.0	36.2	24.7	35.8	33.7	427.7
1967	27.6	37.9	36.9	37.5	35.5	37.1	17.4	24.1	47.6	14.0	5.4	14.8	335.8
Max.	41.2	49.7	49.3	49.2	66.6	65.2	51.0	63.9	67.2	57.7	44.5	76.0	472.9
Min.	12.5	21.2	33.4	31.2	28.6	34.2	15.7	7.3	5.4	3.3	2.5	5.9	253.7
Average for Period of Record													360.7
Average for													
53-67	24.7	38.8	42.0	41.9	39.0	44.6	32.5	25.7	26.2	16.1	14.9	15.8	362.2

STREAMFLOW DATA

Station Number and Name: 6-8355 Frenchman Creek at Culbertson, Nebraska

Location: Lat. 40° 14' 05", Long. 100° 52' 40", in SW¼SE¼, Sec. 12, T.3N., R.32W., on right bank 19 feet upstream from bridge on U.S. Highways 6 and 34, 2 miles west of Culbertson, and 4.5 miles upstream from mouth.

Drainage Area in Sq. Mi.: 3,080 approximately, 1,560 contributes directly **Datum of Gage:** 2,583.44' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1931	38.1	68.4	86.1	92.2	88.9	89.2	86.3	66.4	29.3	28.7	82.8	23.3	779.7
1932	43.3	86.3	92.2	95.3	97.8	127.0	87.5	52.9	81.5	28.3	38.1	11.4	842.0
1933	29.9	61.3	82.4	111.0	111.0	122.0	81.5	60.6	14.6	14.6	91.5	124.0	904.4
1934	70.0	55.7	119.9	116.8	107.6	109.4	75.9	18.8	98.3	23.7	17.0	42.2	855.3
1935	31.1	40.0	100.8	108.4	91.6	110.8	68.9	320.8	228.6	72.3	22.5	52.9	1249.0
1936	42.9	77.8	97.1	100.9	103.4	116.7	80.2	96.2	66.2	16.2	13.1	16.7	827.4
1937	13.9	58.9	93.4	71.3	90.1	96.5	65.8	26.2	98.7	27.1	15.1	18.6	675.6
1938	23.0	53.6	91.3	97.8	91.1	91.1	82.9	88.4	99.5	42.7	23.4	52.5	837.3
1939	24.8	43.9	82.2	98.3	81.2	98.8	99.6	34.6	57.9	29.0	14.1	13.8	678.2
1940	19.3	25.5	68.1	69.2	102.6	116.4	91.5	42.9	226.7	29.6	23.9	29.7	845.4
1941	55.7	67.9	127.6	111.2	104.6	103.4	111.3	88.3	102.7	68.2	20.3	34.1	995.3
1942	85.2	90.4	95.0	90.8	101.4	125.6	125.8	140.0	126.4	48.6	27.1	99.9	1156.0
1943	93.4	96.3	103.5	97.7	98.2	106.6	86.5	31.4	80.4	17.4	11.5	12.6	835.5
1944	35.9	75.6	88.0	90.0	106.2	117.7	143.9	123.1	97.9	78.9	25.0	20.2	1002.0
1945	54.4	78.1	94.3	94.0	93.6	94.0	90.9	54.7	115.7	48.6	35.8	50.5	904.6
1946	83.9	82.9	80.6	98.4	92.0	103.1	80.4	63.5	66.5	81.5	16.8	65.1	914.7
1947	125.3	111.6	102.5	98.6	96.9	106.5	100.4	80.1	114.1	95.2	21.2	27.8	1080.0
1948	38.2	86.6	103.0	112.5	103.8	120.6	83.2	45.3	65.6	44.2	25.7	16.5	845.2
1949	45.3	88.9	106.2	70.9	124.2	136.0	149.2	139.4	158.8	43.2	21.8	44.1	1128.0
1950	61.9	97.3	102.3	78.5	107.9	111.7	106.6	73.1	37.0	48.2	38.3	38.4	901.2
1951	47.3	52.9	55.0	49.2	56.3	58.2	42.3	111.9	180.9	94.3	48.9	145.8	943.0
1952	51.5	61.8	52.8	60.1	121.0	153.4	117.0	136.4	33.6	17.7	35.2	32.2	872.7
1953	61.2	67.7	86.8	111.7	79.0	91.7	89.1	41.8	26.4	21.5	20.3	16.9	714.1
1954	40.4	59.7	66.9	62.6	61.6	65.8	38.4	46.5	26.7	12.4	33.9	37.0	551.9
1955	65.0	55.5	56.8	52.5	61.4	102.1	63.4	46.6	89.3	27.4	23.1	36.1	679.2
1956	41.2	65.1	57.8	60.3	74.3	73.0	51.4	22.8	169.7	39.7	56.0	33.7	745.0
1957	47.0	75.7	77.3	64.1	77.9	77.6	76.4	121.9	106.2	79.8	21.8	20.4	846.1
1958	54.8	78.7	65.4	84.5	92.6	112.3	119.7	122.4	69.4	116.5	27.7	29.8	973.8
1959	81.8	81.1	99.8	82.1	91.4	95.6	98.6	126.5	47.3	44.9	24.4	52.9	926.4
1960	68.6	69.5	70.1	61.7	92.2	333.8	172.6	135.9	83.1	40.0	21.8	51.4	1201.0
1961	68.9	70.9	77.8	72.2	70.2	83.5	64.0	92.0	80.5	34.3	25.6	34.1	774.0
1962	52.9	60.0	54.8	54.2	59.7	70.6	40.3	50.1	182.9	165.5	158.7	100.1	1050.0
1963	105.6	86.7	73.3	59.7	94.3	77.8	38.1	23.2	34.8	27.6	23.7	69.8	714.6
1964	63.8	58.8	54.8	63.5	63.9	72.8	53.6	40.7	49.4	39.9	16.4	34.4	612.0
1965	48.9	51.5	54.8	57.9	50.9	63.6	34.1	29.0	69.5	88.0	38.2	90.0	676.4
1966	82.0	71.8	69.6	60.7	67.1	87.0	77.7	34.1	38.6	34.3	34.5	50.1	707.5
1967	58.7	62.8	53.5	67.6	56.1	60.0	23.7	40.5	208.7	115.6	30.5	55.4	833.0
Max.	125.3	111.6	127.6	116.8	124.2	333.8	172.6	320.8	228.6	165.5	158.7	145.8	1249.0
Min.	13.9	25.5	52.8	49.2	50.9	58.2	23.7	18.8	14.6	12.4	11.5	11.4	551.9
Average for Period of Record													867.0
Average for 53-67	62.7	67.7	68.0	67.7	72.8	97.8	69.4	64.9	85.5	59.2	37.1	47.5	800.3

STREAMFLOW DATA

Station Number and Name: 6-8445 Republican River near Orleans

Location: Lat. 40° 07' 53", Long. 99° 30' 08", in NE¼NE¼, Sec. 19, T.2N., R.19W., on right bank 18 feet downstream from bridge on State Highway 89, 200 feet downstream from Chicago, Burlington and Quincy Railroad Co. Bridge, 2 miles west of Orleans, 2 3/4 miles upstream from Sappa Creek and 23 miles upstream from Harlan County Dam.

Drainage Area in Sq. Mi.: 15,400 approximately **Datum of Gage:** 1,972.57' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1948	50.5	158.5	173.4	235.8	307.4	561.5	229.2	179.6	1626.0	483.0	173.5	61.8	4240.0
1949	66.3	173.9	225.4	136.3	428.6	568.3	544.7	709.5	755.5	172.9	140.4	154.5	4076.0
1950	144.6	213.2	147.1	132.3	343.3	292.4	238.8	426.7	115.4	357.1	591.6	149.6	3152.0
1951	99.1	121.6	140.2	128.8	199.3	234.7	229.9	939.3	1003.0	758.4	339.5	1205.0	5399.0
1952	204.2	237.4	174.7	191.0	396.5	468.9	461.3	450.8	86.2	111.1	52.8	8.1	2843.0
1953	21.5	72.9	116.8	241.1	234.2	275.0	251.7	270.8	107.6	61.4	17.8	.2	1671.0
1954	0.3	50.9	61.9	57.8	134.6	125.8	87.8	165.9	47.7	7.5	65.7	.3	806.2
1955	16.8	43.7	60.2	46.6	66.9	169.7	100.7	42.3	302.2	25.7	2.2	1.7	878.7
1956	5.3	37.3	34.9	78.4	84.5	121.0	95.3	33.7	139.0	79.7	30.1	.1	739.3
1957	1.9	49.9	60.5	45.0	94.6	116.1	199.6	933.5	1151.0	300.2	100.1	119.3	3172.0
1958	124.5	176.5	133.1	152.7	283.2	435.9	471.7	455.4	275.6	254.5	119.4	111.4	2994.0
1959	102.6	167.4	232.5	199.1	285.4	386.5	416.6	341.3	156.6	53.3	33.3	35.6	2410.0
1960	84.0	103.9	129.4	77.5	290.3	1057.0	484.3	691.0	738.2	162.5	64.9	38.3	3921.0
1961	72.6	93.7	108.6	94.3	124.4	160.7	159.4	424.7	360.3	59.3	81.7	39.6	1779.0
1962	68.4	86.9	64.1	70.2	123.0	204.3	191.1	213.5	1082.0	985.0	858.4	199.2	4146.0
1963	193.1	158.9	157.8	169.8	349.6	352.7	209.9	87.7	222.4	22.7	35.6	132.6	2093.0
1964	81.8	90.4	61.9	84.4	113.0	203.7	285.3	143.6	177.5	79.4	158.1	39.2	1518.0
1965	50.7	65.2	57.2	87.9	82.1	146.2	140.7	377.3	405.2	468.0	105.8	271.4	2258.0
1966	516.6	308.7	269.3	203.6	393.7	374.1	311.1	144.8	160.8	133.8	226.6	168.6	3212.0
1967	123.6	152.7	118.9	137.2	185.3	152.1	108.6	127.2	999.7	657.6	123.5	96.7	2983.0
Max.	516.6	308.7	269.3	241.1	428.6	1057.0	544.7	939.3	1626.0	985.0	858.4	1205.0	5399.0
Min.	0.3	37.3	34.9	45.0	66.9	116.1	87.8	33.7	47.7	7.5	2.2	.1	739.3
Average for Period of Record													2714.6
Average for 53-67	97.7	110.6	111.1	116.4	189.7	285.4	234.3	296.8	421.7	223.4	134.9	83.6	2305.6

STREAMFLOW DATA

Station Number and Name: 6-8535 Republican River near Hardy

Location: Lat. 40° 00', Long. 97° 56', in Sec. 6, T.1S., R.5W., in Kansas, Jewell County, at downstream side of highway bridge, 1¼ miles southwest of Hardy and at mile 145.1

Drainage Area in Sq. Mi.: 22,400 approximately **Datum of Gage:** 1,501.46' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1904	—	—	—	—	—	—	—	—	947.2	1019.0	290.2	107.7	—
1905	316.0	311.2	—	—	—	858.1	630.7	1185.0	1755.0	3526.0	1895.0	431.4	—
1906	294.5	—	—	—	—	—	416.0	990.0	277.0	408.0	340.0	151.0	—
1907	221.0	363.0	—	—	—	—	308.0	363.0	416.0	267.0	75.6	46.1	—
1908	75.0	143.0	—	—	—	283.0	171.0	207.0	964.0	499.0	540.0	121.0	—
1909	374.0	325.0	418.0	—	—	494.0	387.0	341.0	1000.0	769.0	146.0	411.0	—
1910	124.0	213.0	—	—	—	385.0	214.0	239.0	157.0	71.3	689.0	295.0	—
1911	124.0	142.0	—	184.0	255.0	285.0	162.0	175.0	89.3	664.0	3600.0	421.0	—
1912	261.0	178.0	154.0	—	—	1280.0	867.0	508.0	487.0	215.0	664.0	191.0	—
1913	219.0	253.0	251.0	—	—	528.0	415.0	658.0	192.0	88.5	6.7	9.0	—
1914	20.0	26.8	199.0	258.0	283.0	355.0	229.0	491.0	1370.0	650.0	149.0	103.0	4133.8
1915	46.9	105.0	—	—	—	549.0	478.0	638.0	5730.0	2210.0	3320.0	784.0	—
1931	—	—	—	—	—	—	575.4	691.0	575.0	136.0	348.0	60.7	—
1932	—	—	—	—	837.0	502.0	352.0	301.0	1217.0	217.0	271.0	232.0	—
1933	46.6	87.5	184.0	261.0	225.0	374.0	660.0	830.0	156.0	145.0	553.0	1070.0	4590.0
1934	245.7	214.0	340.3	325.9	269.2	382.9	293.9	127.5	666.3	67.8	11.0	190.2	3135.0
1935	58.0	141.7	152.3	191.5	304.2	322.1	308.4	1111.0	6182.0	632.1	746.1	1041.0	11190.0
1936	235.8	270.1	315.4	188.9	150.2	450.4	333.6	1242.0	726.6	72.7	21.5	98.7	4106.0
1937	37.4	108.7	175.8	99.5	390.0	428.2	234.1	255.4	1035.0	545.1	470.5	276.7	4056.0
1938	85.3	90.0	129.7	254.7	253.2	357.3	321.6	896.6	1002.0	568.1	510.0	499.4	4968.0
1939	75.6	110.3	156.5	175.0	152.5	410.0	507.4	377.1	1398.0	428.0	265.8	19.1	4075.0
1940	12.0	41.2	82.4	63.0	118.2	463.6	261.1	305.2	772.6	381.3	330.0	141.5	2972.0
1941	168.3	155.4	185.3	266.4	337.8	345.2	481.3	649.0	3397.0	1190.0	640.3	938.3	8754.0
1942	465.2	341.0	304.3	276.0	438.7	727.7	1121.0	793.3	2136.0	534.1	725.0	1168.0	9030.0
1943	310.0	334.8	303.0	287.3	514.1	391.4	854.9	285.4	1061.0	237.2	50.8	76.3	4706.0
1944	25.9	89.5	119.9	217.5	291.5	480.5	1042.0	1189.0	1351.0	1928.0	976.3	237.1	7948.0
1945	159.0	221.1	221.8	333.2	364.5	366.3	513.7	800.8	1458.0	905.1	240.1	94.0	5678.0
1946	220.0	176.2	135.7	246.6	382.5	382.2	246.1	391.4	547.5	956.7	244.5	875.2	4805.0
1947	2579.0	818.2	531.0	339.9	320.9	590.1	566.9	538.5	3527.0	902.5	229.0	89.1	11030.0
1948	64.9	162.3	216.6	305.3	499.2	918.8	351.2	246.2	1596.0	752.6	334.8	116.7	5565.0
1949	64.9	187.0	220.4	138.0	626.7	1043.0	739.1	1944.0	2482.0	502.5	378.0	346.2	8674.0
1950	317.3	266.1	213.0	167.7	356.0	480.1	322.0	623.4	316.7	1452.0	1396.0	710.1	6620.0

STREAMFLOW DATA

Station Number and Name: 6-8535 Republican River near Hardy

Location: Lat. 40° 00', Long. 97° 56', in Sec. 6, T.1S., R.5W., in Kansas, Jewell County, at downstream side of highway bridge, 1¼ miles southwest of Hardy and at mile 145.1

Drainage Area in Sq. Mi.: 22,400 approximately **Datum of Gage:** 1,501.46' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1951	351.4	200.2	205.6	219.9	293.7	394.9	386.6	1244.0	2706.0	3003.0	1002.0	2264.0	12270.0
1952	490.2	396.6	343.1	386.4	573.9	706.0	813.6	971.5	320.7	712.7	117.6	47.7	5880.0
1953	36.8	94.1	84.8	170.8	366.0	105.4	74.8	70.4	214.1	70.7	59.9	96.6	1444.0
1954	54.5	71.3	75.9	39.9	70.0	58.5	53.3	181.3	67.4	35.0	99.2	45.4	851.7
1955	43.9	43.2	55.4	50.1	90.5	88.5	49.8	54.3	442.6	64.4	56.0	283.2	1322.0
1956	71.6	55.4	46.9	49.2	59.0	79.4	52.0	29.7	108.8	169.2	60.1	48.1	829.4
1957	33.7	37.7	41.5	31.9	57.4	64.7	73.6	227.6	1500.0	1521.0	268.7	146.0	4004.0
1958	49.5	85.2	149.7	152.7	196.3	523.3	858.1	378.3	428.3	398.5	698.1	444.8	4363.0
1959	243.3	134.0	229.1	273.5	365.2	339.9	394.6	686.7	391.2	244.7	83.9	107.4	3494.0
1960	100.8	70.7	77.0	56.5	102.0	408.3	1437.0	1551.0	1209.0	617.7	110.7	67.9	5809.0
1961	70.2	69.4	71.4	59.5	67.3	78.3	70.8	444.6	1169.0	414.1	103.8	116.5	2735.0
1962	83.7	86.3	64.4	134.3	161.6	179.8	348.6	226.6	962.8	1718.0	1107.0	581.5	5655.0
1963	270.6	125.5	116.7	96.5	296.4	663.6	404.5	131.0	68.5	53.9	209.1	435.8	2872.0
1964	246.1	179.9	139.2	134.5	187.8	106.0	79.3	47.8	101.8	57.1	147.0	277.6	1704.0
1965	64.9	66.7	65.0	88.3	131.2	170.0	125.4	392.2	663.4	968.5	120.0	366.6	3222.2
1966	1211.0	776.1	410.7	391.2	537.5	594.8	401.3	167.4	129.8	346.2	119.1	151.9	5237.0
1967	100.3	85.9	134.5	127.3	296.3	319.6	212.4	124.2	1178.0	1295.0	226.9	160.8	4261.0
Max.	2579.0	818.2	531.0	391.2	837.0	1280.0	1437.0	1944.0	6182.0	3526.0	3600.0	2264.0	12270.0
Min.	12.0	26.8	41.5	31.9	57.4	58.5	49.8	29.7	67.4	35.0	6.7	9.0	829.4
Average for Period of Record													5055.2
Average for 53-67	178.7	132.1	117.5	123.7	199.0	252.0	309.0	314.2	575.7	531.6	231.3	222.0	3186.8

STREAMFLOW DATA

Station Number and Name: 6-8830 Little Blue River near Deweese

Location: Lat. 40° 19' 58", Long. 98° 04' 20", in SW¼ NE¼, Sec. 11, T.4N., R.7W., on right bank about 1500 feet above bridge on State Highway 14, 1 mile upstream from Walnut Creek, 3¼ miles southeast of Deweese, and 6 miles northwest of Angus.

Drainage Area in Sq. Mi.: 979 **Datum of Gage:** 1,632.67' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1953					45.1	50.1	47.9	51.6	96.5	36.4	29.7	31.5	———
1954	37.9	42.4	47.7	47.5	43.4	49.0	79.1	136.1	51.6	28.9	163.4	38.8	765.8
1955	41.0	38.6	44.7	46.2	66.7	58.8	44.4	44.0	225.8	39.2	19.8	54.4	723.6
1956	40.0	38.8	41.9	39.5	44.2	48.0	42.0	44.1	91.0	68.9	63.9	31.0	593.3
1957	32.5	37.3	40.1	32.7	35.2	42.2	44.7	177.3	681.1	53.4	99.1	45.1	1321.0
1958	41.9	42.2	42.2	44.2	36.9	94.8	108.3	49.9	68.9	196.4	166.0	65.1	956.8
1959	39.8	40.9	42.7	42.4	51.4	68.2	81.5	324.1	89.6	266.1	53.2	137.7	1238.0
1960	52.7	42.4	46.1	43.5	43.0	457.4	183.0	289.7	480.2	110.9	40.1	46.9	1836.0
1961	49.8	41.7	44.7	40.4	42.1	47.9	45.5	321.9	207.2	36.9	72.8	45.2	996.1
1962	42.7	45.3	45.2	104.2	73.8	259.5	50.7	94.4	74.9	280.9	105.8	55.1	1232.0
1963	56.9	38.8	43.3	39.8	66.5	52.1	50.6	58.4	75.4	30.5	23.2	291.6	827.1
1964	65.7	41.9	41.5	40.8	39.6	43.5	74.5	66.5	105.2	25.7	113.6	41.6	700.1
1965	33.7	33.9	33.9	41.4	55.5	80.2	69.5	828.7	333.2	397.6	43.4	301.7	2253.0
1966	213.3	45.5	48.3	39.9	90.2	47.0	43.8	40.8	110.6	93.7	39.9	31.7	844.7
1967	33.4	33.5	32.9	40.4	34.6	38.3	35.9	39.6	608.1	67.0	24.0	51.8	1040.0
Max.	213.3	45.5	48.3	104.2	90.2	457.4	183.0	828.7	681.1	397.6	166.0	301.7	2253.0
Min.	32.5	33.5	32.9	32.7	34.6	38.3	35.9	39.6	51.6	25.7	19.8	31.0	593.3
Average for Period of Record													1094.8

STREAMFLOW DATA

Station Number and Name: 6-8840 Little Blue River near Fairbury

Location: Lat. 40° 06' 54", Long. 97° 10' 13", in NW¼ NE¼ Sec. 26, T.2N., R.2E., on right bank 20 feet downstream from bridge on State Highway 15, three quarters of a mile south of Fairbury and 5¼ miles upstream from Rose Creek.

Drainage Area in Sq. Mi.: 2,350 **Datum of Gage:** 1,282.19' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1908								338.0	3060.0	1090.0	842.0	134.0	———
1909	110.0	106.0	113.0	113.0	118.0	121.0	107.0	218.0	702.0	830.0	125.0	390.0	3050.0
1910	129.0	296.0	293.0	197.0	200.0	164.0	111.0	253.0	422.0	138.0	232.0	157.0	2590.0
1911	107.0	101.0	106.0	103.0	83.3	88.5	92.8	90.4	66.6	167.0	395.0	156.0	1560.0
1912	213.0	111.0	119.0	116.0	396.0	1360.0	423.0	303.0	248.0	97.8	303.0	132.0	3820.0
1913	204.0	104.0	135.0	123.0	105.0	187.0	123.0	400.0	180.0	72.6	55.3	43.5	1730.0
1914	65.2	83.9	173.0	154.0	111.0	118.0	109.0	122.0	481.0	181.0	116.0	111.0	1830.0
1915	83.0	94.6	107.0	110.0	144.0	167.0	177.0	166.0	1950.0	1210.0	1100.0	304.0	5610.0
1929	221.0	187.0	157.0	64.5	156.0	261.0	241.0	104.0	152.0	92.2	71.3	64.3	1770.0
1930	83.6	69.0	52.3	46.1	68.3	84.8	146.0	719.0	320.0	89.2	148.0	117.0	1940.0
1931	71.9	104.0	81.8	78.7	72.8	82.4	90.4	250.0	236.0	94.1	141.0	88.7	1390.0
1932	110.0	174.0	106.0	92.2	320.0	188.0	97.0	103.0	320.0	106.0	120.0	73.2	1810.0
1933	78.1	75.6	71.3	91.0	71.1	81.2	91.0	151.0	61.9	70.7	173.0	101.0	1120.0
1934	72.4	71.1	87.2	90.0	73.0	88.6	74.6	68.4	46.5	34.1	31.2	73.7	810.8
1935	57.2	65.2	71.0	64.6	64.6	74.8	150.0	1154.0	1430.0	172.8	60.9	170.8	3536.0
1936	76.5	83.1	81.4	82.3	231.5	108.7	82.2	113.8	60.3	56.4	29.7	53.3	1059.0
1937	55.8	59.7	72.4	54.4	96.7	96.2	76.5	101.5	96.0	218.2	85.9	76.2	1090.0
1938	68.4	63.0	59.6	79.0	68.2	87.6	88.6	405.2	276.4	191.9	190.2	179.6	1758.0
1939	68.9	72.2	67.5	49.5	65.0	154.8	260.3	86.7	544.0	196.3	76.6	41.3	1683.0
1940	52.3	65.3	68.9	58.6	67.8	95.4	75.8	80.4	66.4	41.7	55.7	49.3	777.6
1941	59.9	75.3	80.3	83.3	83.6	207.1	175.3	114.7	1418.0	115.3	90.8	453.1	2957.0
1942	173.7	173.9	148.0	189.8	99.6	138.2	125.4	165.8	503.9	164.6	556.5	656.5	3096.0
1943	106.5	87.1	88.4	97.4	348.3	101.2	173.0	96.2	1193.0	169.1	70.2	48.7	2579.0
1944	59.8	66.4	69.2	73.0	75.7	92.3	229.9	533.4	631.7	196.8	565.9	475.1	3069.0
1945	136.6	97.6	97.3	100.5	84.7	105.4	430.6	1487.0	871.8	613.0	154.4	71.1	4250.0
1946	86.0	74.2	67.1	90.0	113.9	95.2	83.7	95.7	224.2	253.7	80.4	297.4	1562.0
1947	306.0	388.7	98.5	87.6	86.1	158.2	353.9	299.2	1545.0	255.2	79.3	61.6	3719.0
1948	60.6	74.8	74.9	88.1	577.4	1040.0	147.8	124.3	146.3	173.6	242.3	110.7	2861.0
1949	68.6	80.8	81.2	105.1	477.3	1476.0	186.6	1207.0	2474.0	250.5	219.5	773.7	7400.0
1950	255.9	103.2	95.1	94.0	90.8	104.7	95.2	476.0	273.7	1271.0	346.0	778.6	3984.0
1951	590.8	122.6	110.7	111.6	109.3	240.1	268.3	282.9	2818.0	1587.0	450.6	541.5	7233.0
1952	163.7	123.8	108.2	133.0	115.6	289.2	409.3	204.5	602.5	564.3	134.4	87.4	2936.0
1953	92.3	94.8	101.4	121.1	109.8	110.3	104.3	162.9	327.7	87.8	60.9	67.2	1440.0
1954	101.0	140.9	155.3	86.3	100.9	99.1	158.9	422.2	215.1	55.0	267.5	72.5	1875.0
1955	84.3	79.2	80.0	84.0	146.5	120.1	93.5	78.9	464.4	160.1	38.0	82.8	1512.0

STREAMFLOW DATA

Station Number and Name: 6-8840 Little Blue River near Fairbury

Location: Lat. 40° 06' 54", Long. 97° 10' 13", in NW¼ NE¼ Sec. 26, T.2N., R.2E., on right bank 20 feet downstream from bridge on State Highway 15, three quarters of a mile south of Fairbury and 5¼ miles upstream from Rose Creek.

Drainage Area in Sq. Mi.: 2,350 **Datum of Gage:** 1,282.19' m.s.l.

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1956	70.2	66.9	67.9	68.9	87.7	92.4	80.7	91.8	204.2	279.6	83.9	49.6	1244.0
1957	56.7	69.7	65.9	59.6	59.5	87.9	108.9	319.9	1149.0	195.2	526.5	167.9	2867.0
1958	76.9	76.8	77.7	82.7	83.1	284.1	255.2	135.8	205.6	1165.0	247.2	543.4	3234.0
1959	88.8	78.6	76.6	62.5	137.6	164.6	143.8	1063.0	176.2	705.3	123.8	224.6	3045.0
1960	255.9	89.2	91.9	78.6	108.2	1391.0	556.4	422.3	1136.0	285.4	145.2	79.9	4640.0
1961	105.5	81.4	72.4	80.3	83.6	128.6	125.7	1087.0	638.2	162.9	105.2	175.4	2846.0
1962	148.0	130.9	93.1	347.9	297.9	538.1	133.0	143.0	215.2	356.5	174.9	134.6	2713.0
1963	216.9	95.8	77.3	77.9	165.3	126.0	123.2	245.2	207.2	104.1	93.4	548.1	2080.0
1964	145.2	100.9	82.7	84.9	86.9	93.9	175.8	119.3	222.0	58.6	276.1	171.7	1618.0
1965	69.4	74.2	75.5	80.5	411.2	291.0	146.8	849.7	708.8	685.3	111.8	352.4	3857.0
1966	410.0	101.3	96.2	76.3	170.3	102.0	88.0	80.6	143.4	139.9	102.9	87.7	1599.0
1967	52.9	63.1	58.7	60.1	57.5	70.9	63.2	65.5	1394.0	175.7	67.2	200.8	2330.0
Max.	590.8	388.7	293.0	347.9	577.4	1476.0	556.4	1487.0	3060.0	1587.0	1100.0	778.6	7400.0
Min.	52.3	59.7	52.3	46.1	57.5	70.9	63.2	65.5	46.5	34.1	29.7	41.3	777.6
Average for Period of Record													2640.9
Average for 53-67	131.6	89.6	84.8	96.8	140.6	246.7	157.2	352.5	493.8	307.8	161.6	197.3	2460.3

STREAMFLOW DATA

Station Number and Name: 6-8805 Big Blue River at Seward

Location: Lat. 40° 54' 10", Long. 97° 06' 40", in SE¼ SW¼ Sec. 20, T.11N., R.3E., at downstream end of first pier from right abutment of bridge on U. S. Highway 34 at west edge of Seward, 0.2 miles downstream from Lincoln Creek.

Drainage Area in Sq. Mi.: 1,099 approximately

Datum of Gage: 1421.49' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1954	8.6	10.7	12.1	11.7	13.2	15.3	29.2	39.9	207.1	16.6	52.1	9.9	426.4
1955	13.3	7.8	8.7	11.8	21.8	32.1	16.0	9.6	45.1	7.8	3.2	11.7	188.9
1956	6.4	6.6	6.1	7.0	8.8	14.7	8.0	24.7	12.3	3.3	2.3	2.5	102.5
1957	2.4	3.1	5.1	5.0	5.3	9.5	21.3	27.1	1030.0	168.3	90.0	110.9	1478.0
1958	14.8	12.0	12.0	11.2	43.8	189.9	58.3	19.2	11.1	371.7	33.3	63.2	839.9
1959	8.8	10.0	11.2	9.6	16.0	25.8	49.2	228.2	70.0	123.6	64.0	11.4	627.8
1960	13.6	10.6	10.8	12.0	13.3	500.8	313.3	122.1	232.2	77.9	162.1	21.1	1490.0
1961	11.7	11.8	11.1	10.9	13.1	17.6	17.2	17.2	27.7	5.4	8.0	32.1	183.8
1962	10.5	9.9	9.2	12.0	103.8	352.4	26.1	34.2	224.4	212.8	40.7	17.6	1058.8
1963	16.2	11.0	9.9	11.7	80.3	178.6	16.1	126.5	424.5	44.4	23.2	39.0	981.4
1964	8.3	7.6	9.1	11.1	9.9	15.7	86.8	52.1	300.9	45.5	9.5	8.7	565.2
1965	5.2	6.2	10.0	8.6	74.4	176.0	102.2	191.1	307.8	173.1	18.7	240.5	1314.0
1966	276.0	20.2	17.6	14.2	264.9	19.7	17.2	20.8	22.0	22.7	71.6	7.6	774.5
1967	7.5	7.7	9.5	9.3	9.9	12.0	12.2	8.8	1780.0	45.3	28.2	30.5	1961.0
Max.	276.0	20.2	17.6	14.2	264.9	500.8	313.3	228.2	1780.0	371.7	162.1	240.5	1961.0
Min.	2.4	3.1	5.1	5.0	5.3	9.5	8.0	8.8	11.1	3.3	2.3	2.5	102.5
Average for Period of Record													856.6

STREAMFLOW DATA

Station Number and Name: 6-8810 Big Blue River near Crete

Location: Lat. 40° 35' 47", Long. 96° 57' 36", in SW¼ SE¼, Sec. 3, T.7N., R.4E, on downstream side of right pier on highway bridge, 1.8 miles south of Missouri Pacific Railroad Station in Crete, 3.3 miles downstream from Walnut Creek and 3.6 miles upstream from Squaw Creek.

Drainage Area in Sq. Mi.: 2,716 **Datum of Gage:** 1,311.7' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1954	51.5	62.9	67.7	53.4	68.6	76.2	110.9	198.9	723.6	62.7	463.8	81.8	2022.0
1955	83.5	58.8	61.2	63.7	162.2	129.9	79.1	59.1	221.6	55.4	17.4	35.9	1028.0
1956	46.4	42.1	50.7	53.7	57.7	76.3	64.7	86.7	165.7	73.2	59.6	59.1	835.9
1957	28.6	24.4	39.4	43.2	44.8	65.2	75.9	114.9	1940.0	378.5	196.0	263.9	3215.0
1958	64.5	58.4	53.6	58.2	102.7	414.5	274.9	82.1	85.7	1451.0	226.2	368.8	3241.0
1959	65.0	59.7	65.4	62.7	90.5	133.0	142.9	1095.0	219.2	524.1	208.2	101.5	2767.0
1960	83.0	87.1	63.8	73.1	76.5	1321.0	1052.0	522.7	860.4	402.6	299.8	100.5	4942.0
1961	75.7	65.2	72.7	72.2	70.9	96.1	95.9	229.5	247.4	99.0	120.4	201.2	1446.0
1962	82.1	91.8	75.8	92.5	337.1	913.5	145.8	107.8	330.2	336.6	164.9	91.3	2769.0
1963	98.4	67.6	67.3	59.0	225.9	310.2	88.2	188.6	621.2	181.7	214.7	195.7	2318.0
1964	72.1	65.1	64.9	77.7	74.3	82.4	190.0	163.7	635.1	98.1	53.4	67.1	1643.9
1965	51.0	52.8	52.9	54.6	251.3	414.2	278.5	794.2	1128.0	485.7	94.3	428.2	4086.0
1966	624.5	89.0	78.3	59.0	486.8	103.5	78.6	96.3	82.1	90.4	179.1	51.4	2019.0
1967	42.4	50.8	48.6	49.8	57.9	61.6	54.8	51.9	3456.0	161.2	123.5	152.3	4311.0
Max.	624.5	91.8	78.3	92.5	486.8	1321.0	1052.0	1095.0	3456.0	1451.0	463.8	428.2	4942.0
Min.	28.6	24.4	39.4	43.2	44.8	61.6	54.8	51.9	82.1	55.4	17.4	35.9	835.9
Average for Period of Record													2617.4

STREAMFLOW DATA

Station Number and Name: 6-8820 Big Blue River at Barneston

Location: Lat. 40° 03', Long. 96° 35', in NE¼, SW¼, Sec. 13, T.1N., R.7E., near left bank in tailrace of powerplant, three quarters of a mile northwest of Barneston, 2 miles upstream from Plum Creek, and 5 miles upstream from Nebraska-Kansas state line.

Drainage Area in Sq. Mi.: 4,444 Datum of Gage: 1164.2' m.s.l.

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1932									1384.0	387.0	738.0	278.0	———
1933	86.1	85.1	101.0	97.2	80.0	133.0	109.0	276.0	86.3	170.0	381.0	148.0	1750.0
1934	48.6	57.9	83.2	20.6	65.7	90.0	78.3	59.0	41.2	18.9	13.0	206.0	832.4
1935	139.9	91.9	81.1	120.6	109.5	110.1	223.5	1241.0	2284.0	390.3	54.8	180.9	5028.0
1936	76.9	126.4	90.1	81.3	611.6	660.3	122.2	267.5	123.3	23.9	19.7	41.1	2244.0
1937	46.2	46.1	55.1	41.6	170.9	193.6	80.5	114.9	292.8	278.8	208.9	69.6	1599.0
1938	56.7	61.7	70.9	75.1	69.8	143.2	132.9	902.7	808.6	508.9	203.9	360.0	3394.0
1939	55.6	90.0	78.2	82.2	74.5	514.9	185.5	94.6	497.9	255.7	168.7	30.1	2128.0
1940	49.1	56.7	68.8	58.5	66.8	143.0	95.1	105.2	158.6	41.2	308.0	53.8	1205.0
1941	37.8	70.8	85.3	96.6	364.7	484.1	234.4	216.5	2423.0	112.8	117.6	1657.0	5901.0
1942	693.3	343.1	402.3	518.7	154.9	540.8	158.5	1168.0	1028.0	260.8	289.8	542.3	6100.0
1943	108.4	99.1	110.2	141.3	852.3	146.6	125.9	287.6	3029.0	645.8	179.2	64.7	5790.0
1944	71.4	82.6	77.5	89.7	90.4	154.3	827.7	1044.0	2546.0	774.7	879.9	695.3	7334.0
1945	235.0	170.9	139.2	157.8	171.7	607.2	814.8	2376.0	2018.0	1032.0	324.1	105.4	8152.0
1946	200.0	116.0	101.5	156.1	306.2	237.7	116.6	125.9	654.2	597.6	113.0	102.6	2827.0
1947	221.7	527.1	125.5	117.4	154.2	213.2	1109.0	288.6	4775.0	454.1	120.9	84.8	8192.0
1948	84.1	71.9	82.2	154.8	129.4	317.4	26.9	144.1	296.9	634.4	831.5	335.8	7372.0
1949	94.7	145.8	126.1	716.3	1175.0	3547.0	423.3	1503.0	2603.0	1056.0	586.2	1692.0	13670.0
1950	377.5	156.1	130.3	129.8	172.7	473.5	158.4	1879.0	593.8	1973.0	746.4	394.7	7185.0
1951	1321.0	173.5	140.4	129.9	209.9	607.0	715.3	1012.0	6226.0	2553.0	1597.0	1311.0	16000.0
1952	300.6	217.6	187.8	264.7	221.8	1202.0	1477.0	609.0	1083.0	1835.0	688.5	206.4	8293.0
1953	126.6	156.7	194.7	188.5	259.6	220.5	171.2	257.2	315.3	177.5	139.7	74.9	2282.0
1954	77.1	128.1	147.6	109.6	141.3	129.0	160.2	621.1	1674.0	139.4	3214.0	184.9	6726.0
1955	276.8	127.2	120.3	127.1	535.0	261.6	148.5	113.0	445.0	232.3	32.9	58.4	2478.0
1956	82.7	65.2	80.8	84.3	94.9	116.4	85.2	147.6	486.4	769.4	141.6	81.7	2236.0
1957	57.5	58.5	76.1	70.8	85.6	107.4	208.5	298.9	2549.0	500.0	265.2	457.2	4735.0
1958	210.7	108.7	95.5	103.2	441.6	767.5	419.8	181.6	249.0	3358.0	399.7	1541.0	7876.0
1959	116.3	109.1	108.2	100.6	261.9	397.4	220.8	2570.0	458.6	1166.0	246.5	254.4	6010.0
1960	593.4	152.6	117.6	142.7	302.1	2438.0	2628.0	911.9	1598.0	830.6	685.8	252.5	10650.0
1961	187.6	124.7	129.5	130.2	141.9	377.9	393.1	664.7	568.1	209.8	144.0	840.3	3912.0
1962	636.4	353.6	144.9	590.1	862.7	1748.0	314.5	554.4	672.8	460.5	233.2	192.7	6764.0
1963	471.1	126.5	128.4	107.0	419.6	568.0	207.7	422.7	1424.0	364.5	478.6	382.8	5101.0
1964	198.5	104.6	100.5	116.7	113.6	120.7	259.7	343.1	1114.0	131.2	131.6	172.6	2907.0
1965	116.5	83.4	86.6	87.2	465.9	1426.0	412.7	1076.0	2409.0	1701.0	139.9	692.5	8697.0
1966	822.4	164.8	153.7	122.5	627.9	162.6	139.7	138.1	117.6	86.7	330.9	115.3	2982.0
1967	62.8	76.4	75.3	98.1	104.3	119.7	109.2	105.6	4704.0	450.1	222.3	343.4	6471.0
Max.	1321.0	527.1	402.3	716.3	1175.0	3547.0	2628.0	2570.0	6626.0	3358.0	3214.0	1692.0	16000.0
Min.	37.8	46.1	55.1	20.6	65.7	90.0	26.9	59.0	41.2	18.9	13.0	30.1	832.4
Average for Period of Record													5566.4
Average for													
53-67	269.1	129.3	117.3	145.2	323.9	597.4	391.9	560.4	1252.3	705.1	453.7	376.3	5321.9

STREAMFLOW DATA

Station Number and Name: 6-8065 Weeping Water Creek at Union

Location: Lat. 40° 47' 35", Long. 95° 54' 40", NW¼ Sec. 36 T. 10N., R. 13E., near left bank on downstream side of pier of bridge on U.S. Highways 73 and 75, 1½ miles southeast of Union and 2 3/4 miles downstream from South Branch Weeping Water Creek.

Drainage Area in Sq. Mi.: 238 **Datum of Gage:** 929.72' **m.s.l.**

Discharge in 100 Acre-Feet													
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1950						25.7	6.9	559.7	71.5	94.6	332.6	24.4	——
1951	67.7	14.0	11.5	9.6	43.2	69.0	111.4	273.1	446.6	286.8	156.6	90.7	1580.0
1952	51.4	34.7	28.1	50.4	32.8	87.1	124.2	91.7	63.6	66.6	92.5	23.9	747.0
1953	19.3	20.5	34.4	32.5	37.8	30.4	29.1	24.4	15.0	10.7	6.9	1.3	262.3
1954	2.0	5.8	5.7	3.2	14.7	8.5	8.9	72.9	13.5	.9	123.9	6.7	266.7
1955	20.4	6.5	12.5	8.5	12.8	22.8	13.8	7.8	61.5	5.8	.4	9.5	182.3
1956	.7	1.0	1.9	1.4	2.5	4.7	2.7	1.9	1.4	23.1	80.8	22.1	144.2
1957	.3	.8	1.3	1.2	2.3	4.8	14.2	28.7	97.6	71.2	20.0	7.4	249.8
1958	9.1	8.5	8.4	15.2	30.5	32.0	21.3	12.2	4.7	89.5	173.8	95.4	500.5
1959	42.2	14.5	13.8	11.9	90.2	58.5	36.0	332.5	61.5	30.0	28.3	22.9	742.3
1960	26.1	19.2	18.1	21.3	29.5	173.2	165.4	77.4	103.6	52.3	95.4	37.1	818.6
1961	25.7	24.4	20.9	21.0	22.2	41.8	46.9	47.8	63.4	25.1	25.4	72.5	437.1
1962	92.1	76.4	48.1	53.9	162.3	126.9	63.7	135.4	81.9	123.0	43.7	39.6	1047.0
1963	32.4	27.2	23.6	18.4	31.5	158.1	31.8	119.3	30.3	14.4	16.5	16.5	520.0
1964	9.6	9.8	7.9	13.6	11.3	16.3	20.6	33.6	295.4	49.8	15.9	16.6	500.4
1965	8.0	11.6	11.2	11.4	59.6	178.9	29.0	220.8	237.6	342.5	30.4	121.8	1263.0
1966	49.9	37.4	36.0	24.0	31.1	31.9	23.3	16.9	39.5	10.5	20.8	14.7	336.0
1967	6.1	8.1	7.6	12.0	10.0	11.1	13.8	10.1	425.7	55.0	19.7	18.1	597.2
Max.	92.1	76.4	48.1	53.9	162.3	178.9	165.4	559.7	446.6	342.5	332.6	121.8	1580.0
Min.	.3	.8	1.3	1.2	2.3	4.7	2.7	1.9	1.4	.9	.4	1.3	144.2
Average for Period of Record													599.7
Average for													
53-67	22.9	18.1	16.8	16.6	36.6	60.0	34.7	76.1	102.2	60.3	46.8	33.5	524.5

STREAMFLOW DATA

Station Number and Name: 6-8115 Little Nemaha River at Auburn

Location: Lat. 40° 23' 32", Long. 95° 48' 48", in NW¼ NW¼, Sec. 23 T.5N., R.14E., near left bank on downstream side of bridge on State Highway 3, 1 mile downstream from Longs Creek and 1 mile east of Auburn.

Drainage Area in Sq. Mi.: 801 **Datum of Gage:** 889.87' m.s.l.

	Discharge in 100 Acre-Feet												
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1949												139.9	———
1950	40.1	36.4	25.5	25.7	70.2	88.8	36.7	1247.0	198.3	171.9	379.9	149.3	2470.0
1951	489.1	60.9	49.2	39.1	109.6	206.6	454.2	687.4	2097.0	1297.0	465.4	294.7	6250.0
1952	151.6	109.6	76.4	150.5	114.9	451.1	491.0	230.4	469.2	520.5	483.6	89.5	3338.0
1953	62.6	63.2	92.6	92.4	129.9	107.5	88.2	89.0	59.2	34.6	40.2	16.5	875.9
1954	17.3	26.9	27.8	19.0	47.2	31.7	36.3	153.7	571.9	21.6	338.9	29.1	1321.0
1955	167.8	34.1	34.0	37.6	117.0	69.5	55.9	28.0	300.4	25.0	8.6	35.0	912.9
1956	16.8	15.3	15.0	13.1	16.3	31.6	18.2	18.4	42.6	242.2	156.9	17.2	603.6
1957	30.8	17.2	14.4	12.1	17.8	30.2	111.0	154.6	293.5	145.1	61.7	55.9	944.3
1958	105.9	41.4	34.8	39.8	153.6	183.4	87.1	83.0	40.2	1492.0	526.6	537.5	3325.0
1959	65.2	58.2	57.4	44.3	192.7	281.6	119.7	819.7	264.6	153.9	87.5	84.2	2229.0
1960	244.7	74.5	72.5	148.4	171.2	1110.0	373.6	197.5	178.3	169.6	272.9	129.6	3133.0
1961	78.7	62.3	66.8	60.8	68.9	129.4	163.4	162.6	233.4	128.2	52.2	263.1	1470.0
1962	367.2	265.9	110.0	149.2	408.6	435.7	139.9	341.8	283.1	212.2	96.1	134.3	2944.0
1963	106.4	76.0	51.6	45.8	84.3	336.6	98.6	342.5	442.6	104.9	95.2	109.5	1894.0
1964	46.4	43.6	28.8	38.5	44.1	49.9	109.8	101.4	532.3	72.7	36.3	48.3	1152.0
1965	20.9	27.6	27.2	31.8	185.5	429.1	72.2	303.1	1147.0	769.1	61.0	278.8	3353.0
1966	89.1	79.4	64.7	55.5	53.3	74.3	46.2	31.3	102.5	24.1	75.0	87.4	783.0
1967	20.6	21.9	23.4	43.5	44.8	36.4	43.7	36.0	880.1	99.1	34.4	38.7	1323.0
Max.	489.1	265.9	110.0	150.5	408.6	1110.0	491.0	1247.0	2097.0	1492.0	526.6	537.5	6250.0
Min.	16.8	15.3	14.4	12.1	16.3	30.2	18.2	18.4	40.2	21.6	8.6	16.5	603.6
Average for Period of Record													2129.0
Average for 53-67	96.0	60.5	48.1	55.5	115.7	222.5	104.3	190.8	358.1	246.3	129.6	124.3	1751.7

STREAMFLOW DATA

Station Number and Name: 6-8150 Nemaha River at Falls City

Location: Lat. 40° 02' 00" Long. 95° 35' 30" on line between Secs. 22 and 23, T.1N., R.16E., near right bank on downstream side of pier of bridge on U.S. Highway 73, 1 mile south of Falls City and 13 miles upstream from mouth.

Drainage Area in Sq. Mi.: 1,340 approximately **Datum of Gage:** 861.24' m.s.l.

Discharge in 100 Acre-Feet

WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1944							1185.0	1006.0	909.0	293.3	632.1	318.9	——
1945	342.4	98.8	117.2	189.6	174.4	696.3	992.7	1936.0	947.0	326.5	135.1	53.1	6009.0
1946	61.0	48.4	29.0	66.5	50.9	256.8	69.3	71.8	242.2	76.2	20.7	1145.0	2138.0
1947	229.2	126.7	63.6	75.5	45.8	149.8	987.0	288.5	2327.0	298.7	40.3	37.4	4670.0
1948	22.8	26.5	45.5	31.7	205.2	572.8	206.1	97.3	120.7	332.7	380.4	192.4	2234.0
1949	100.9	117.6	42.5	709.5	1665.0	595.0	288.5	602.1	3070.0	831.1	237.5	671.2	8931.0
1950	97.9	63.4	61.1	52.0	129.2	101.7	52.0	1053.0	179.7	305.7	632.8	204.8	2933.0
1951	1008.0	105.0	71.9	65.1	128.3	363.5	557.3	1974.0	4651.0	2867.0	1148.0	1614.0	14550.0
1952	263.6	277.6	146.2	204.1	177.1	1154.0	1146.0	883.4	281.1	523.0	1241.0	178.9	6476.0
1953	71.9	121.6	190.6	186.2	223.1	276.9	199.5	227.7	100.9	59.8	100.3	30.2	1789.0
1954	19.7	31.4	35.0	21.4	60.6	36.1	36.2	165.2	2060.0	61.9	2397.0	94.3	5019.0
1955	143.0	56.5	54.0	52.6	525.0	184.3	190.5	81.6	524.0	81.6	24.8	20.0	1938.0
1956	22.6	21.8	25.4	20.6	29.8	26.1	19.2	30.1	78.6	303.0	42.0	9.9	629.1
1957	12.9	16.7	14.8	12.2	23.4	28.5	164.4	143.3	342.5	57.9	35.9	89.9	942.4
1958	365.8	55.6	35.2	48.0	399.9	546.8	107.1	237.4	255.5	2391.0	289.3	2028.0	6760.0
1959	119.7	89.0	74.7	61.9	303.7	668.5	304.0	1164.0	261.5	597.8	102.7	552.3	4300.0
1960	1020.0	174.2	158.2	698.6	484.1	2163.0	592.8	397.1	729.8	247.4	313.2	117.9	7096.0
1961	108.8	72.7	64.9	63.1	91.1	412.5	472.3	371.0	528.7	308.9	100.5	1244.0	3838.0
1962	1086.0	743.5	222.9	500.2	624.4	652.1	219.6	676.7	458.2	820.8	126.4	168.7	6300.0
1963	350.9	112.4	91.0	53.5	138.0	254.6	204.8	353.7	458.0	100.7	330.5	92.9	2541.0
1964	42.4	42.3	26.7	40.5	46.6	51.2	314.2	133.8	901.9	86.2	64.6	149.4	1900.0
1965	31.1	45.7	33.9	36.7	188.6	705.6	148.8	190.8	1909.0	949.8	83.0	1113.0	5436.0
1966	162.5	95.5	112.1	93.1	81.7	76.4	50.2	45.3	111.6	31.1	55.1	90.4	1005.0
1967	21.7	23.4	25.3	48.2	46.2	39.5	67.3	32.0	1505.0	194.4	50.2	56.4	2110.0
Max.	1086.0	743.5	222.9	709.5	1665.0	2163.0	1185.0	1974.0	4651.0	2867.0	2397.0	2028.0	14550.0
Min.	12.9	16.7	14.8	12.2	23.4	26.1	19.2	30.1	78.6	31.1	20.7	9.9	629.1
Average for Period of Record													4328.0
Average for 53-67	238.6	113.5	77.6	129.1	217.7	408.1	206.1	283.3	681.7	419.5	274.4	390.5	3440.1

STREAMFLOW DATA

Station Number and Name: 6-4675 Missouri River at Yankton, South Dakota

Location: Lat. 42° 52', Long. 97° 24', between Sec. 18, T.93N., R.55W., and Sec. 13, T.93N., R.56W., on downstream end of left pier of Meridian Highway Bridge on U.S. Highway 81 in Yankton, 8.3 miles upstream from James River, 5.3 miles downstream from Gavins Point Dam.

Drainage Area in Sq. Mi.: 279,500 approximately **Datum of Gage:** 1,139.68' m.s.l.

Discharge in 100 Acre-Feet

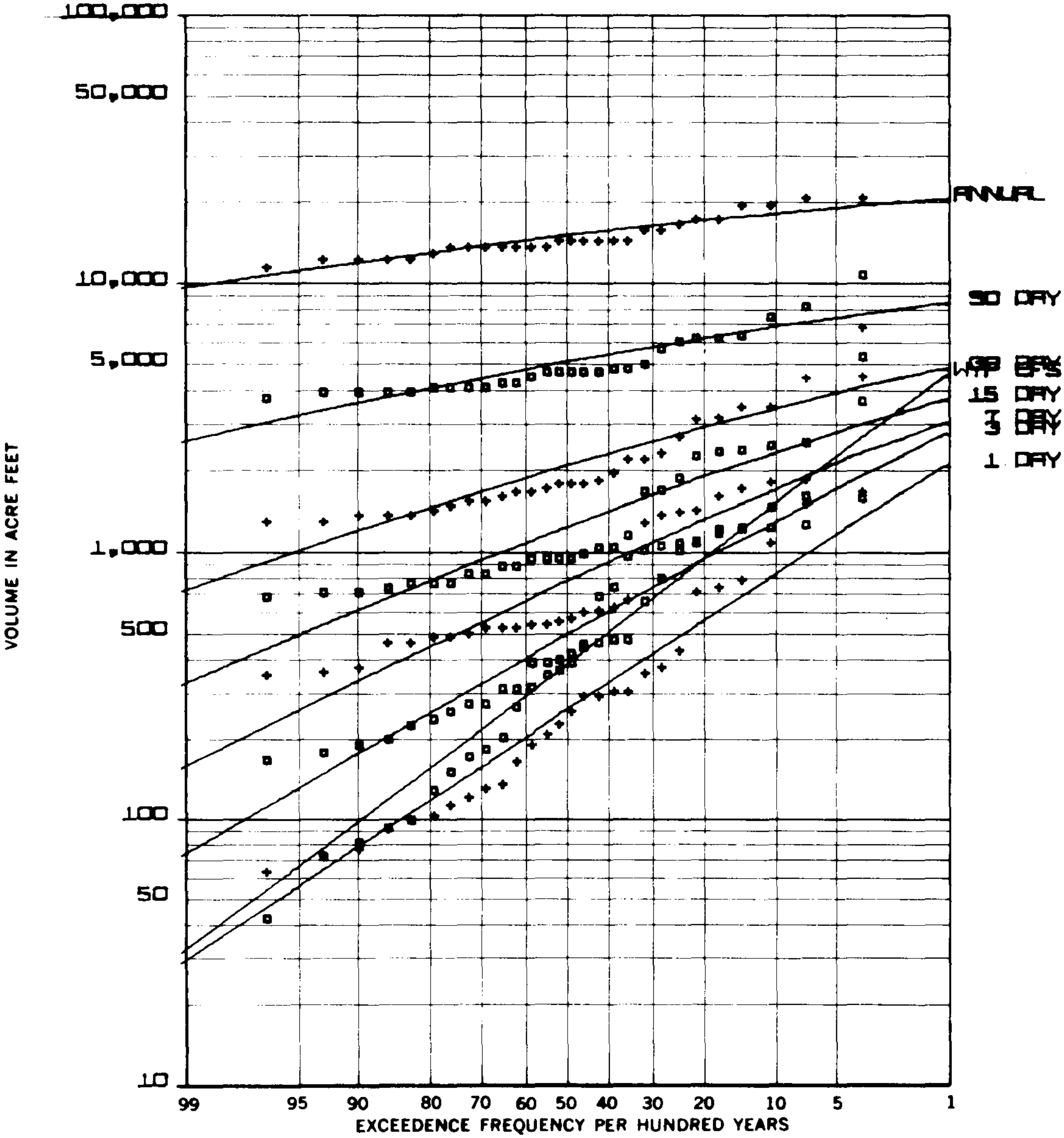
WATER YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	TOTAL
1931	9900.0	8390.0	4860.0	5230.0	8890.0	10100.0	11300.0	9470.0	19000.0	12900.0	6640.0	4950.0	112000.0
1932	6400.0	5830.0	3810.0	4300.0	4950.0	13200.0	19000.0	26100.0	46100.0	33000.0	13600.0	8570.0	185000.0
1933	7380.0	5950.0	3710.0	5510.0	4900.0	16500.0	18900.0	26400.0	42500.0	24200.0	8920.0	11200.0	176000.0
1934	7228.0	7867.0	5651.0	4481.0	6280.0	15670.0	12230.0	16100.0	17740.0	11620.0	5556.0	4057.0	114500.0
1935	5271.0	6069.0	3531.0	3447.0	5820.0	8551.0	14400.0	14210.0	34150.0	29850.0	10720.0	6040.0	142100.0
1936	5418.0	4044.0	4540.0	4443.0	4171.0	23490.0	17150.0	17540.0	23770.0	13120.0	7353.0	6068.0	131100.0
1937	5697.0	6657.0	4311.0	4381.0	3520.0	10040.0	15430.0	10170.0	33470.0	29700.0	9661.0	4792.0	137800.0
1938	6530.0	5322.0	3195.0	4350.0	3921.0	20570.0	12200.0	11230.0	27520.0	45480.0	17260.0	14520.0	172100.0
1939	11020.0	9446.0	6588.0	7952.0	5155.0	16130.0	32890.0	18820.0	29700.0	22220.0	10170.0	6243.0	176300.0
1940	6030.0	6780.0	6240.0	2313.0	3205.0	5433.0	12410.0	14400.0	16900.0	13280.0	12720.0	9187.0	108900.0
1941	8354.0	4824.0	5189.0	4298.0	3983.0	6708.0	15940.0	12880.0	32600.0	15600.0	13550.0	14930.0	138900.0
1942	12930.0	9269.0	4804.0	4193.0	4760.0	11880.0	16150.0	44590.0	41630.0	22700.0	14880.0	12710.0	200500.0
1943	13340.0	12420.0	4295.0	5137.0	4774.0	20400.0	55850.0	16410.0	38510.0	41040.0	16940.0	18040.0	247200.0
1944	17390.0	16980.0	10670.0	9128.0	8634.0	9049.0	45460.0	15540.0	52490.0	42250.0	18900.0	14500.0	261000.0
1945	14570.0	15790.0	8652.0	9031.0	11880.0	32140.0	15720.0	8947.0	24340.0	28230.0	16570.0	13940.0	199800.0
1946	17660.0	11480.0	5480.0	5800.0	5940.0	14610.0	12630.0	14330.0	26400.0	25130.0	13370.0	17660.0	170500.0
1947	19110.0	11350.0	4310.0	6238.0	7452.0	14850.0	40390.0	27450.0	43970.0	38130.0	23210.0	19380.0	255800.0
1948	22390.0	16100.0	7498.0	7682.0	7016.0	20710.0	31940.0	20290.0	43800.0	37830.0	24540.0	17610.0	257400.0
1949	22190.0	18340.0	6173.0	7267.0	7918.0	26300.0	44800.0	20410.0	24670.0	19420.0	16390.0	17110.0	231000.0
1950	17820.0	12630.0	5808.0	5014.0	5284.0	15470.0	67790.0	28580.0	22700.0	29620.0	20400.0	18930.0	250000.0
1951	20750.0	16440.0	7503.0	10400.0	7991.0	12160.0	37570.0	20460.0	30800.0	24390.0	25220.0	25980.0	239700.0
1952	26480.0	22450.0	8340.0	9128.0	13080.0	18400.0	99970.0	29650.0	29220.0	18920.0	17720.0	16830.0	310200.0
1953	17700.0	13690.0	5494.0	7981.0	8315.0	20830.0	15460.0	22730.0	38680.0	23240.0	18090.0	19640.0	211800.0
1954	20060.0	10550.0	8192.0	6298.0	8134.0	12750.0	15190.0	16450.0	14260.0	18230.0	18760.0	18800.0	167700.0
1955	17760.0	6922.0	6863.0	5488.0	5107.0	9418.0	15610.0	19010.0	17840.0	17420.0	19720.0	20560.0	161700.0
1956	19790.0	7048.0	5570.0	5219.0	5587.0	14640.0	17200.0	17810.0	17710.0	18500.0	20350.0	20200.0	169600.0
1957	15920.0	7025.0	5655.0	5671.0	4702.0	4971.0	10560.0	16400.0	13620.0	16920.0	18810.0	16890.0	137100.0
1958	17290.0	7020.0	5135.0	5412.0	4829.0	5918.0	13850.0	16170.0	16630.0	15970.0	17350.0	17200.0	142800.0
1959	18430.0	5738.0	5765.0	6298.0	5849.0	6870.0	14730.0	13860.0	14580.0	16770.0	18320.0	18140.0	145400.0
1960	17280.0	6350.0	5148.0	5533.0	4721.0	6622.0	8313.0	11610.0	12360.0	15840.0	17140.0	16280.0	127200.0
1961	16730.0	11190.0	5725.0	5821.0	4370.0	5793.0	13400.0	14380.0	12960.0	17260.0	16900.0	16400.0	140900.0
1962	7735.0	3506.0	5161.0	5532.0	4288.0	5988.0	6520.0	11300.0	11180.0	14810.0	13960.0	14900.0	104900.0
1963	15600.0	13630.0	5254.0	5055.0	3035.0	6506.0	15470.0	16330.0	15010.0	18500.0	17810.0	16580.0	148800.0
1964	17880.0	14320.0	5206.0	3801.0	4019.0	8044.0	14390.0	15350.0	15840.0	17660.0	19410.0	16070.0	152000.0
1965	18100.0	15420.0	5657.0	4718.0	4385.0	5423.0	11490.0	14900.0	14110.0	16410.0	19480.0	16820.0	146900.0
1966	18180.0	16570.0	10440.0	10040.0	9205.0	11030.0	15340.0	17010.0	17740.0	20560.0	19560.0	18340.0	184000.0
1967	19630.0	17290.0	7587.0	6823.0	4352.0	11250.0	17760.0	19850.0	14310.0	19060.0	21910.0	21150.0	181000.0
Max.	26480.0	22450.0	10670.0	10400.0	13080.0	32140.0	99970.0	44590.0	52490.0	45480.0	25220.0	25980.0	310200.0
Min.	5271.0	3506.0	3195.0	2313.0	3035.0	4971.0	6520.0	8497.0	11180.0	11620.0	5556.0	4057.0	104900.0
Average for Period of Record													176746.0
Average for													
53-67	17206.0	10417.8	6190.0	5979.3	5393.2	9070.2	13685.5	16210.6	16455.3	17810.0	18504.6	17864.6	154787.1

ATTACHMENT 2

HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES

Note: These curves were prepared by the Work Group on Hydrologic Analyses and Projections for the Missouri River Basin Comprehensive Framework Study.

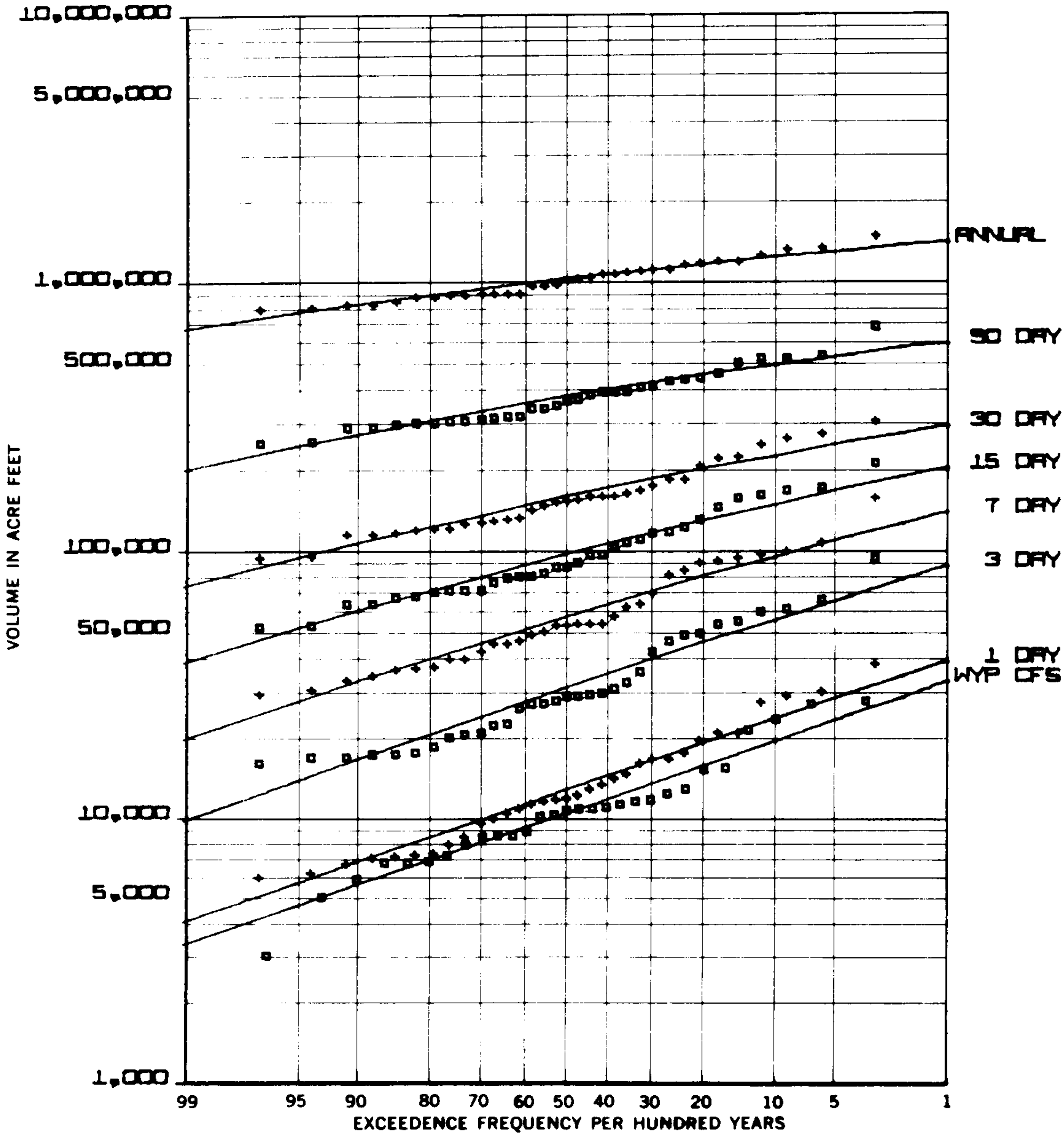
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



WHITE RIVER AT CRAWFORD, NEBR.

1932-43,46-63 06-4440.00

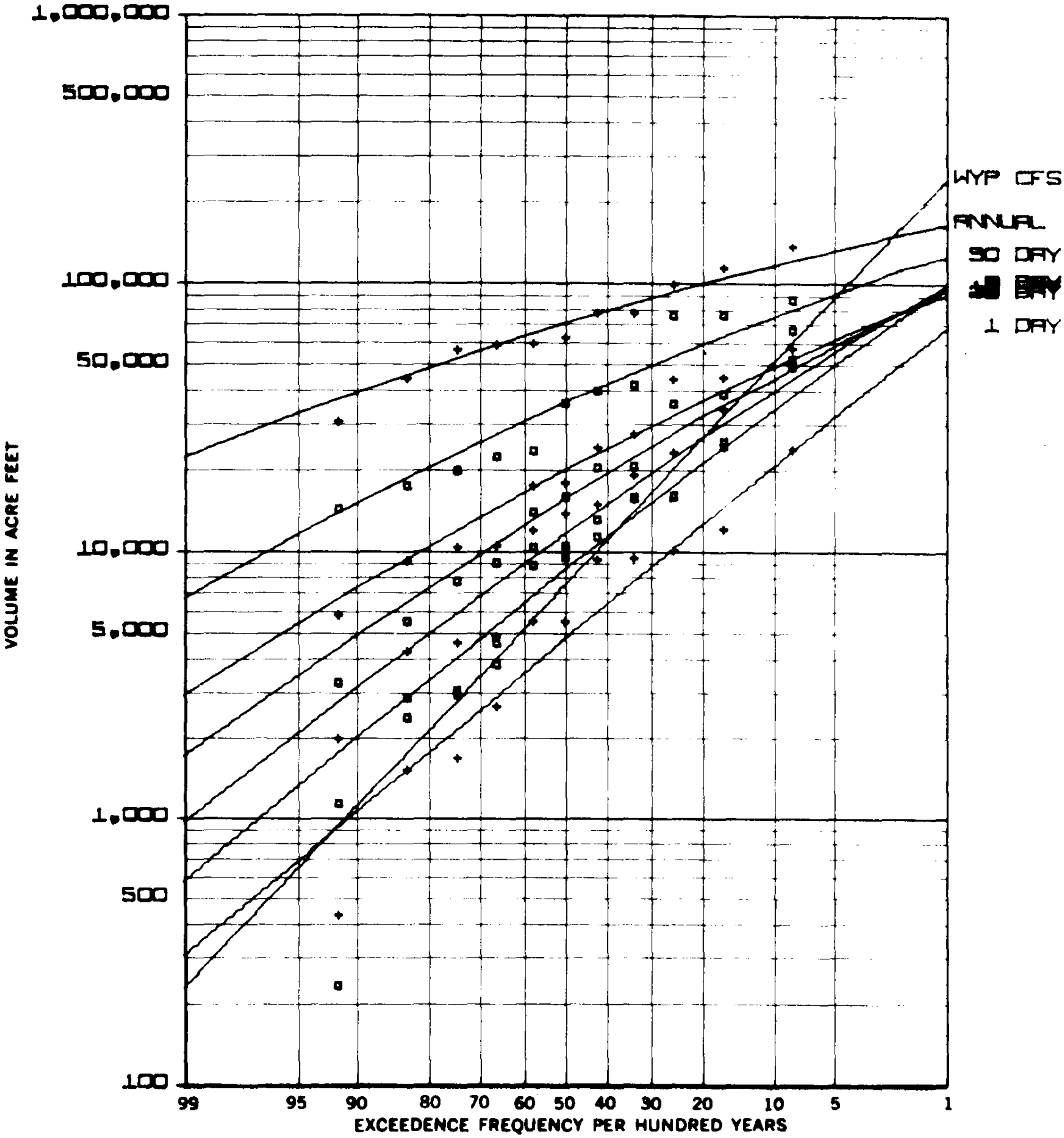
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



NIOBRARA RIVER NEAR SPENCER (LYNCH), NEBR.

1914,28-36,41-63 06-4650.00

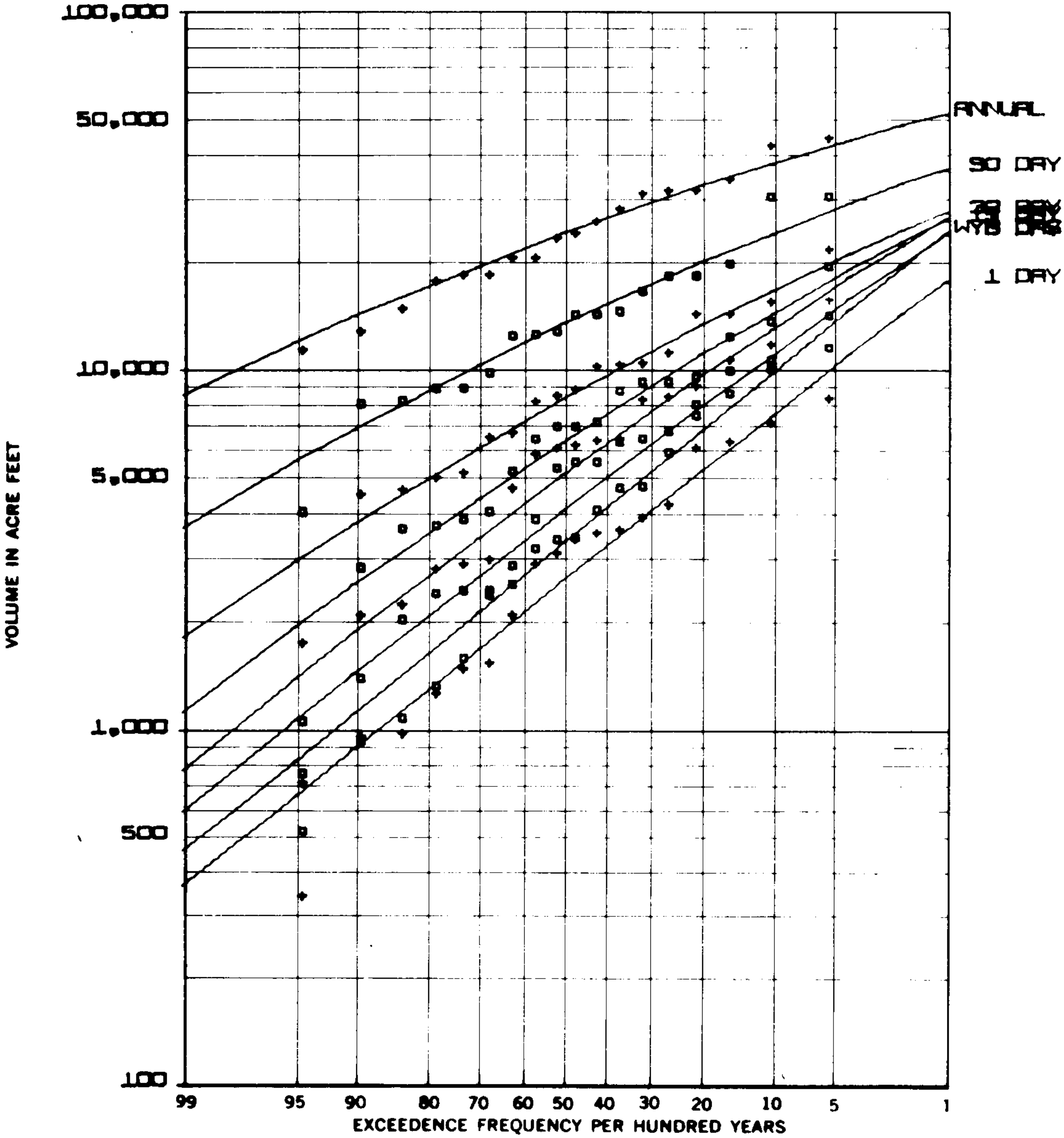
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



BRZILE CREEK NEAR NIOBRARA, NEBR.

1953-1963 06-4665.00

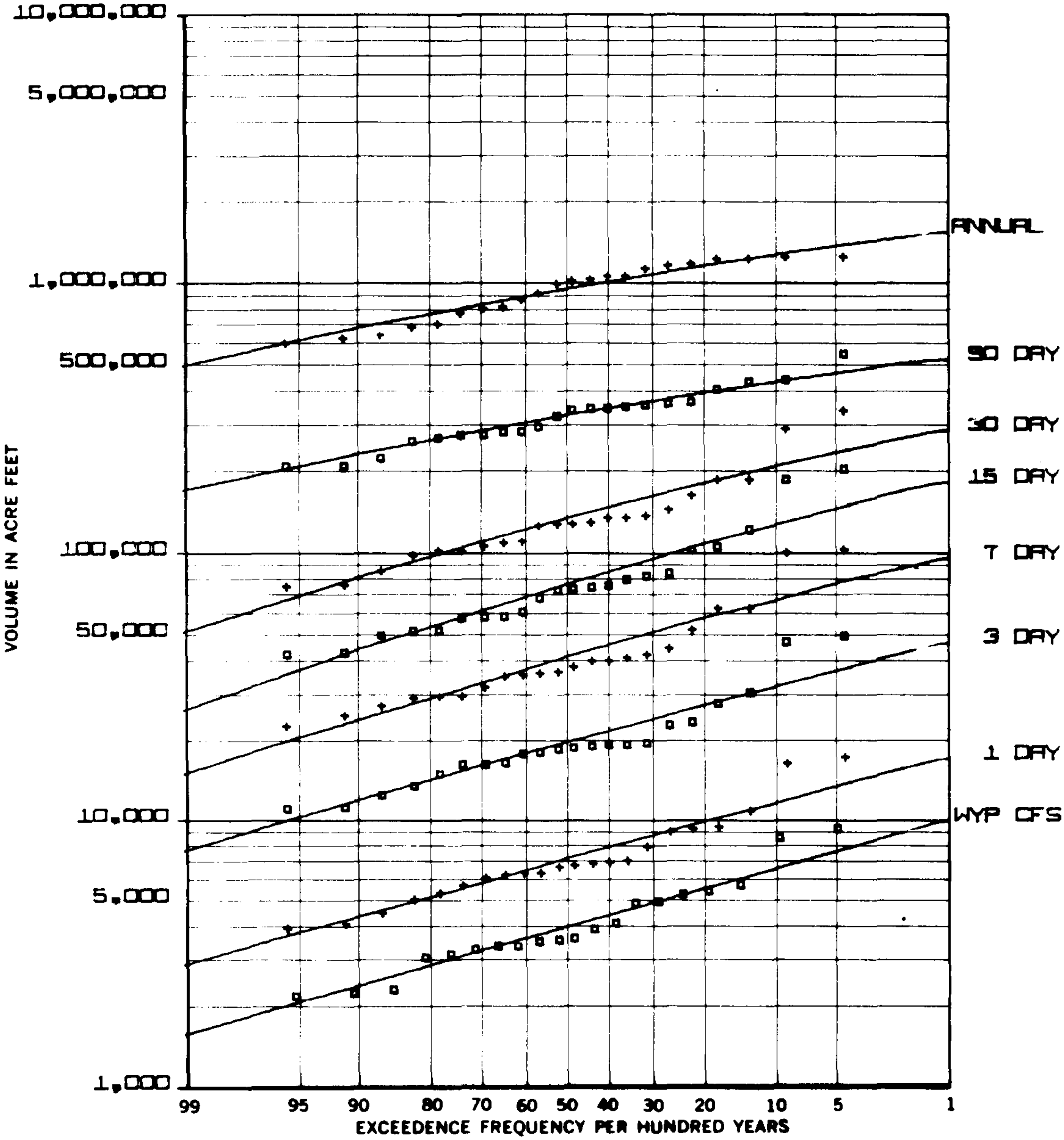
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



OMAHA CREEK AT HOMER, NEBR.

1946-1963 06-6010.00

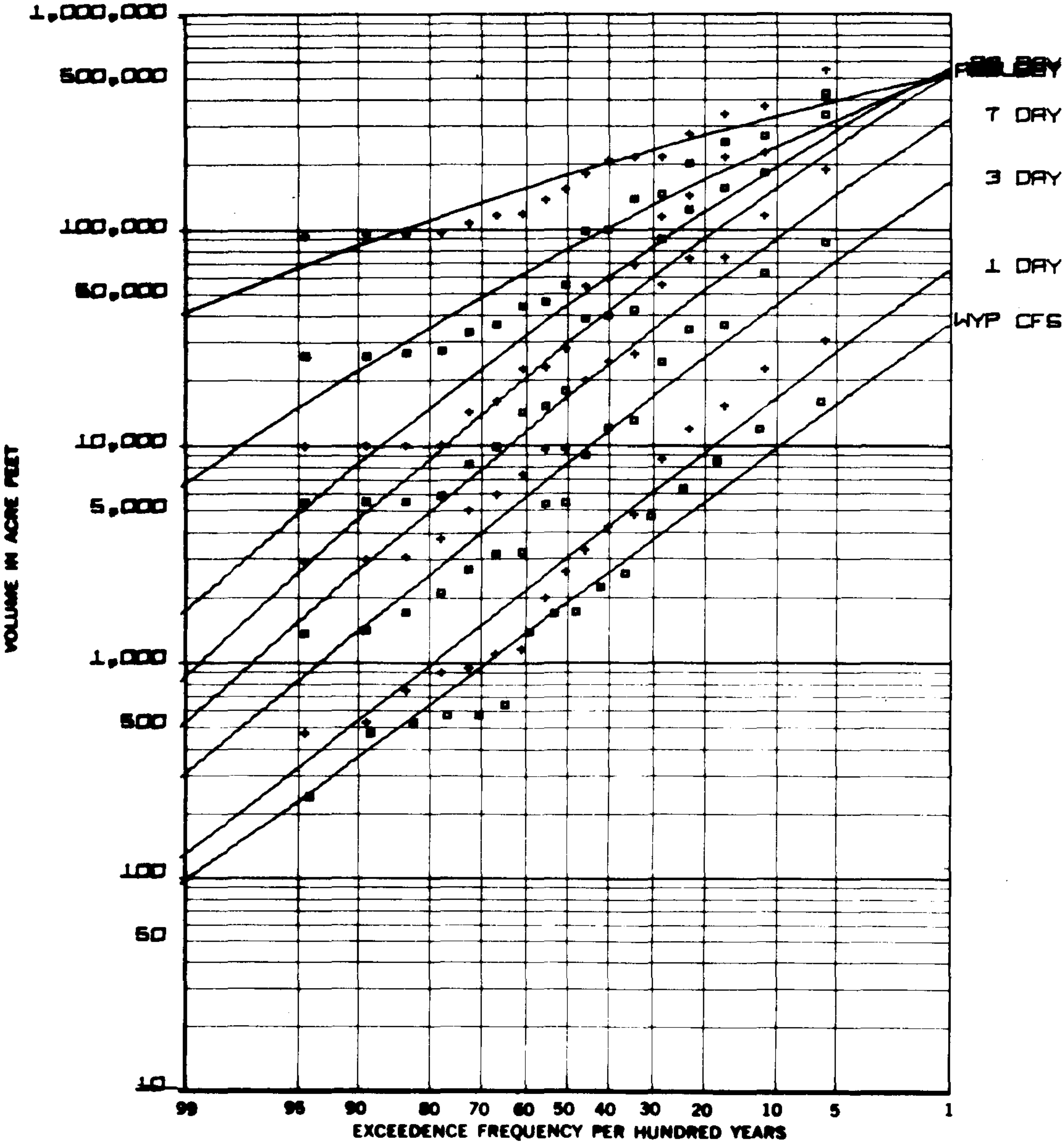
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



N. PLATTE RIVER AT LEWELLEN, NEBR.

1942-1963 06-6875.00

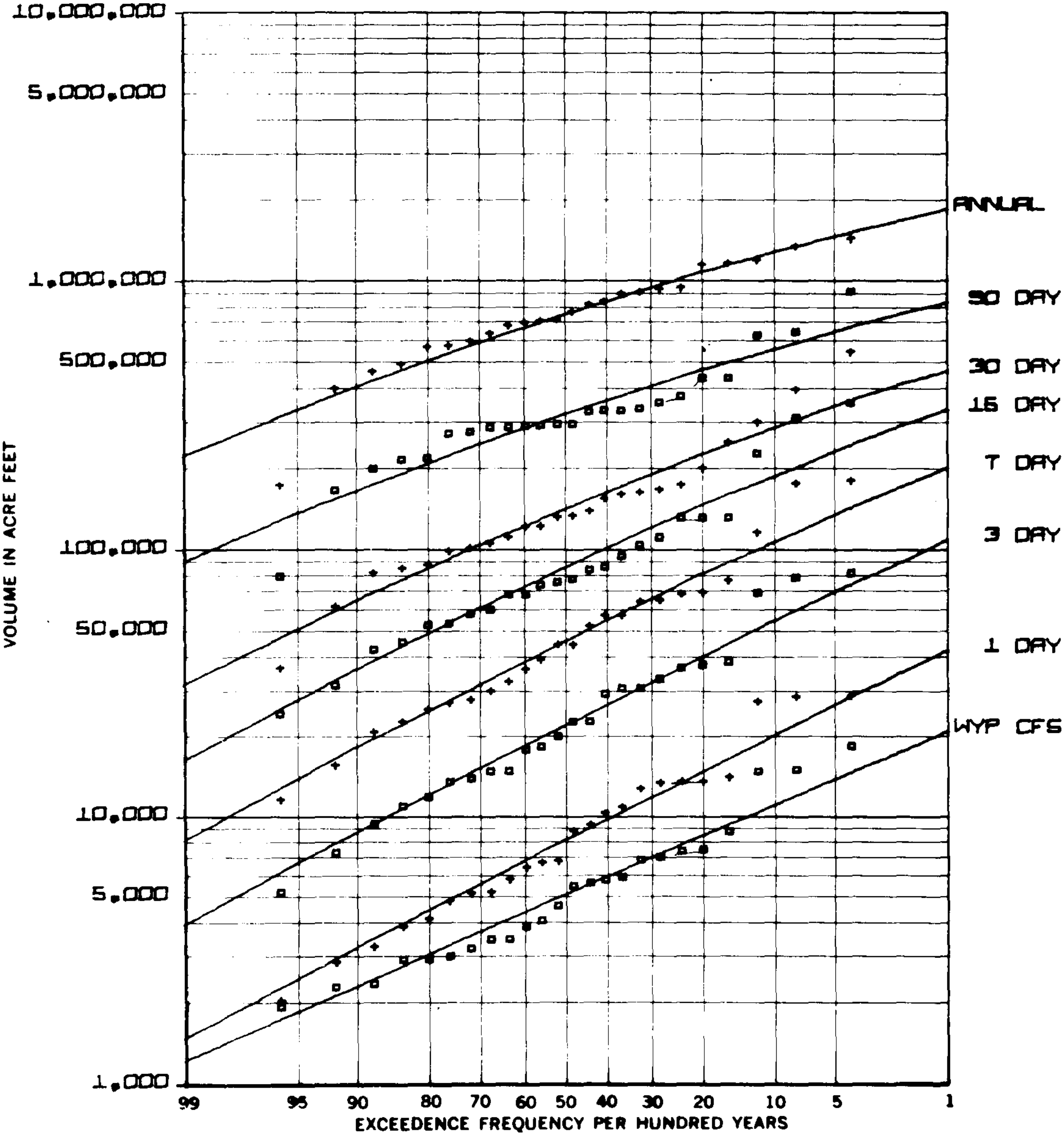
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



SOUTH PLATTE RIVER AT NORTH PLATTE, NEBR.

1947-1963 06-7655.00

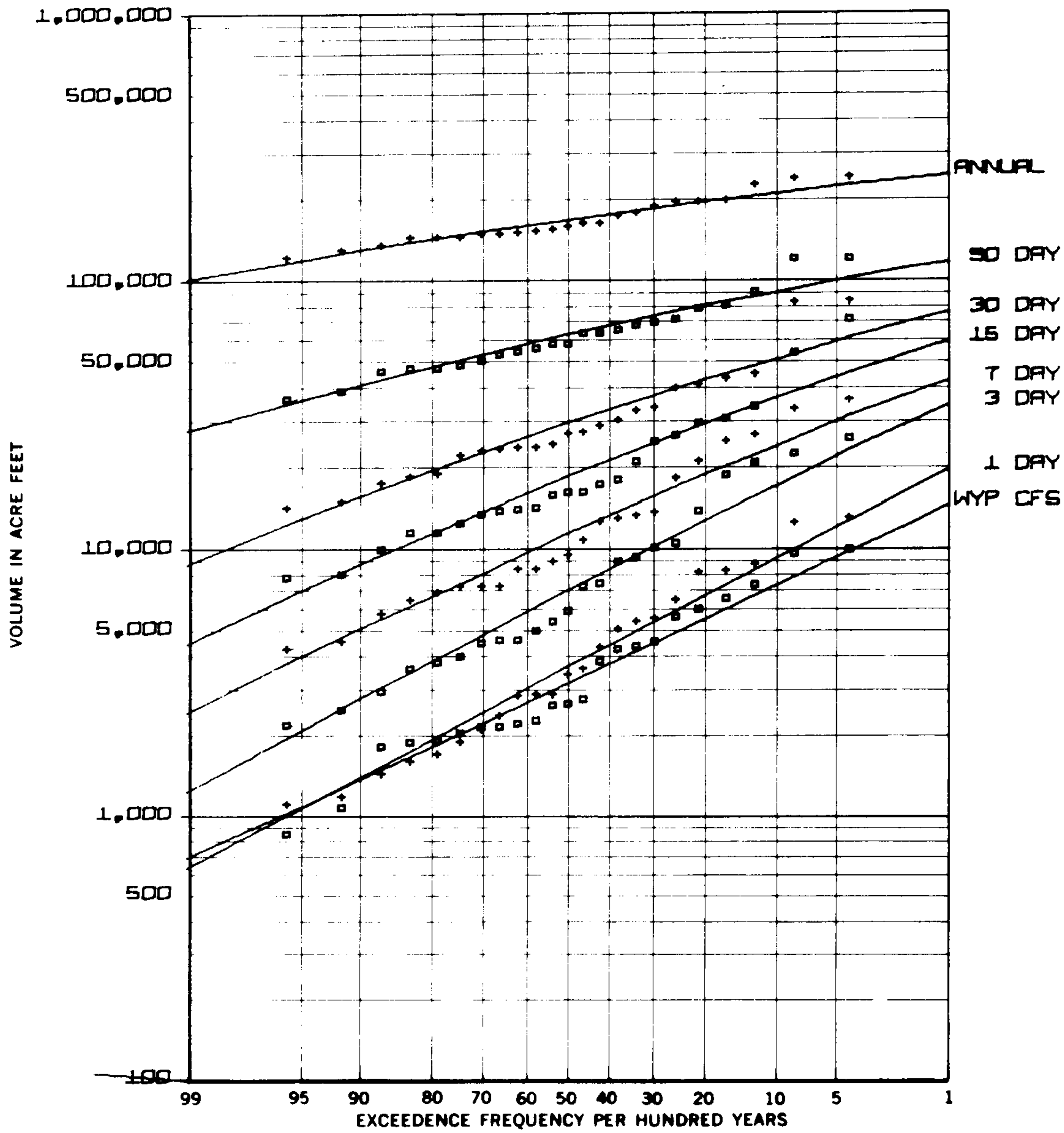
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



PLATTE RIVER NEAR OVERTON, NEBR.

1940-1963 06-7660.00

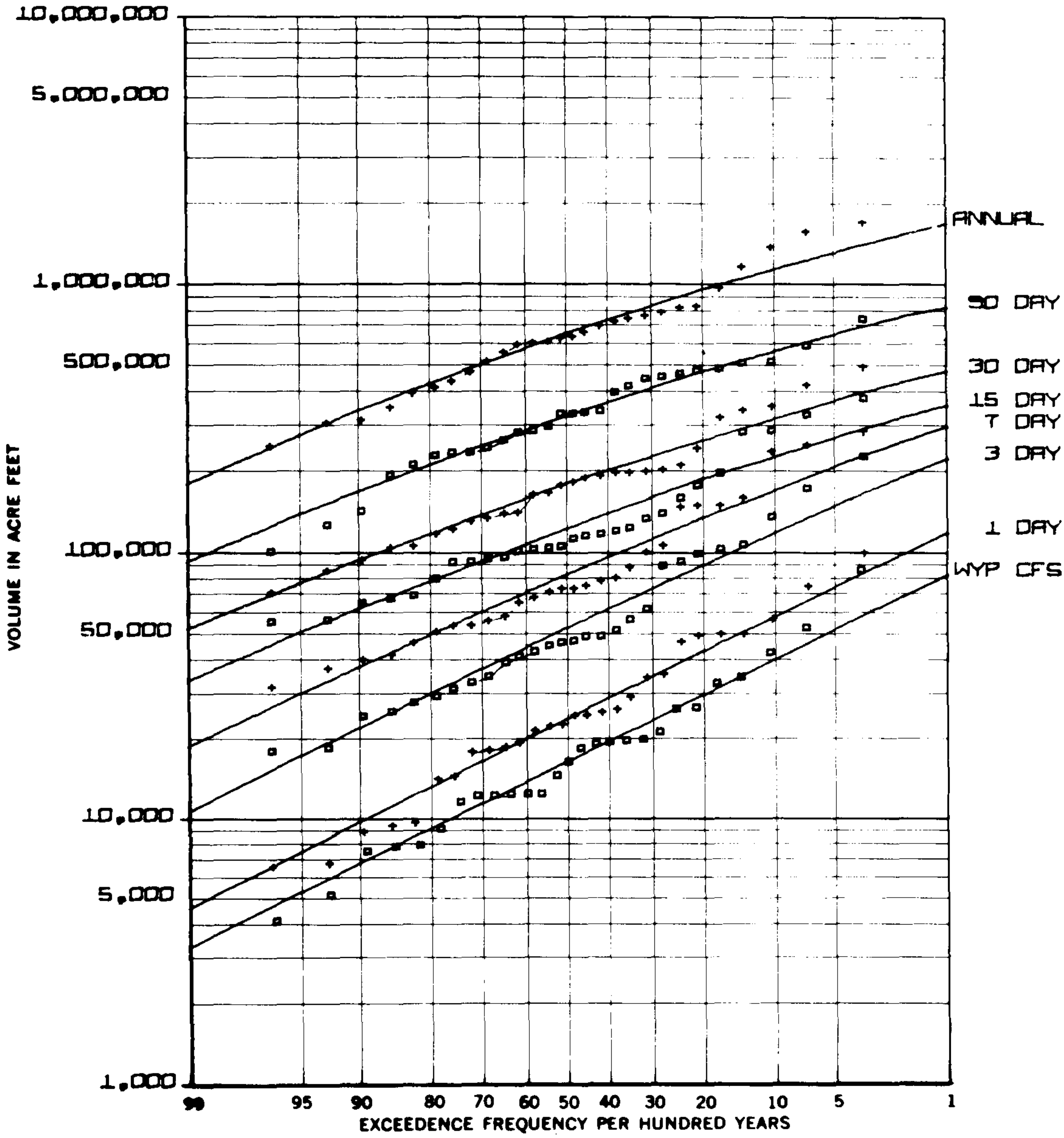
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



CEDAR RIVER NEAR FULLERTON, NEBR.

1941-1963 06-7920.00

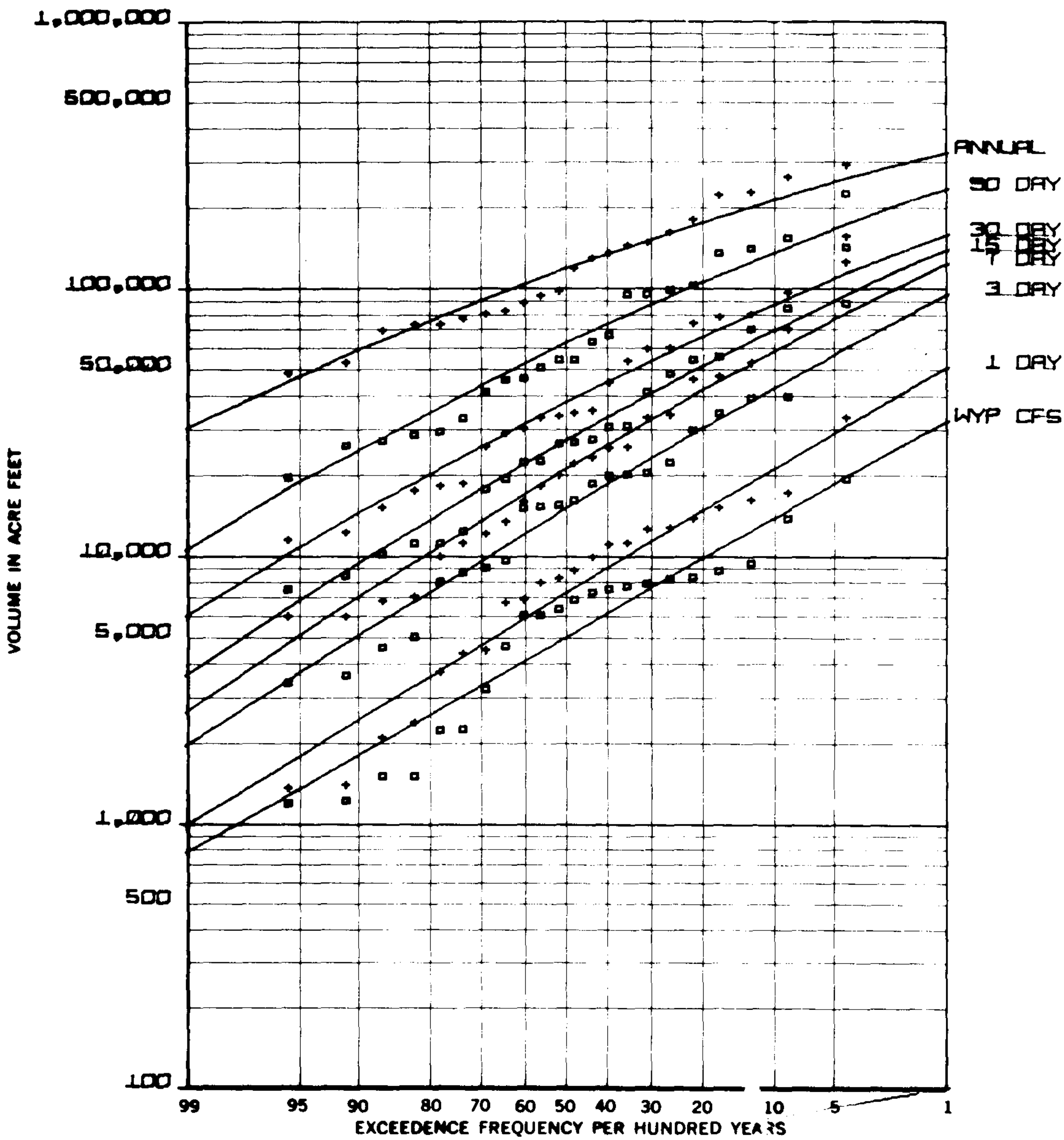
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



LOUP RIVER AT COLUMBUS, NEBR.

1936-1963 06-7945.00

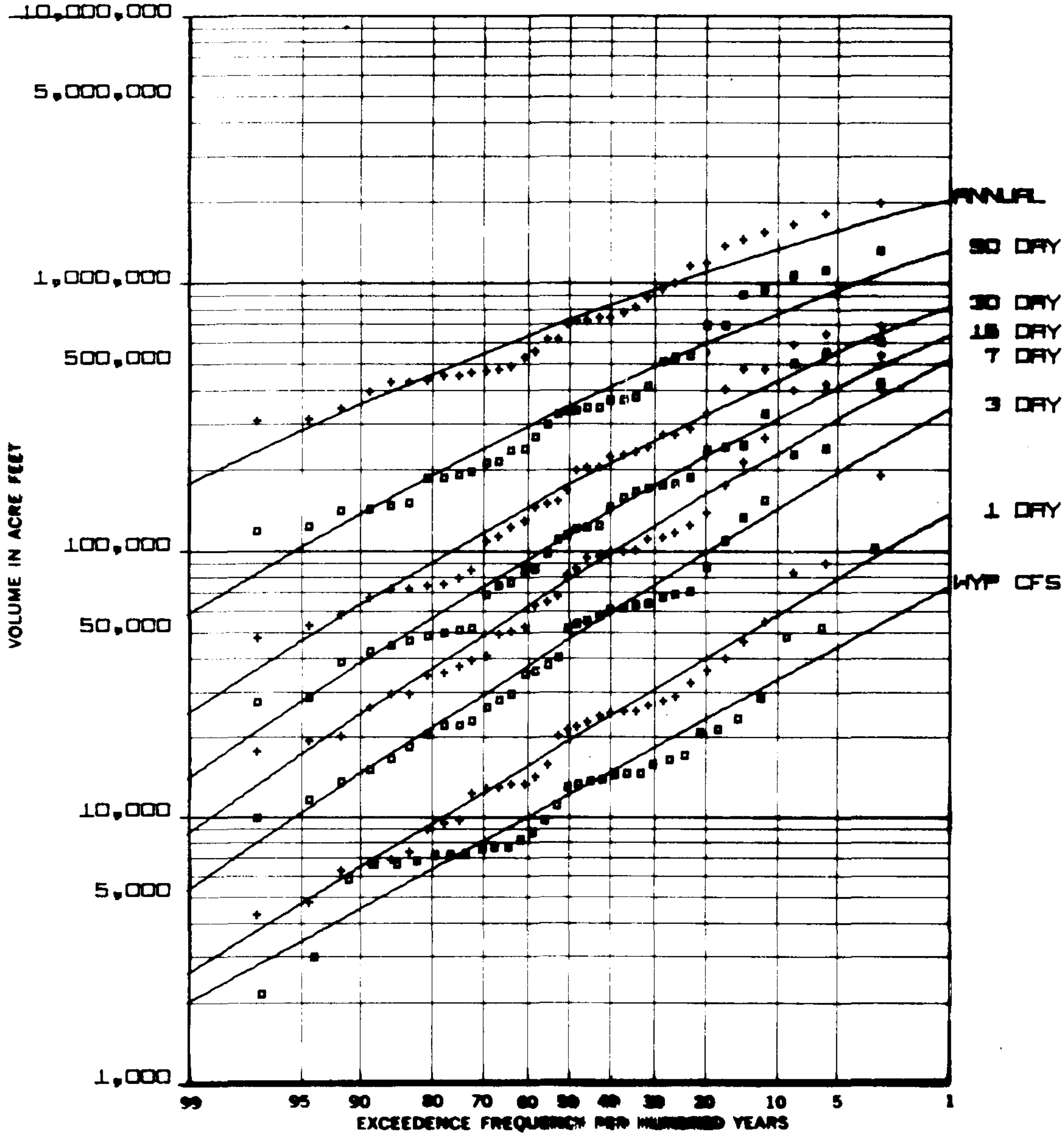
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



LOGAN CREEK NEAR UEHLING, NEBR.

1942-1963 06-7995.00

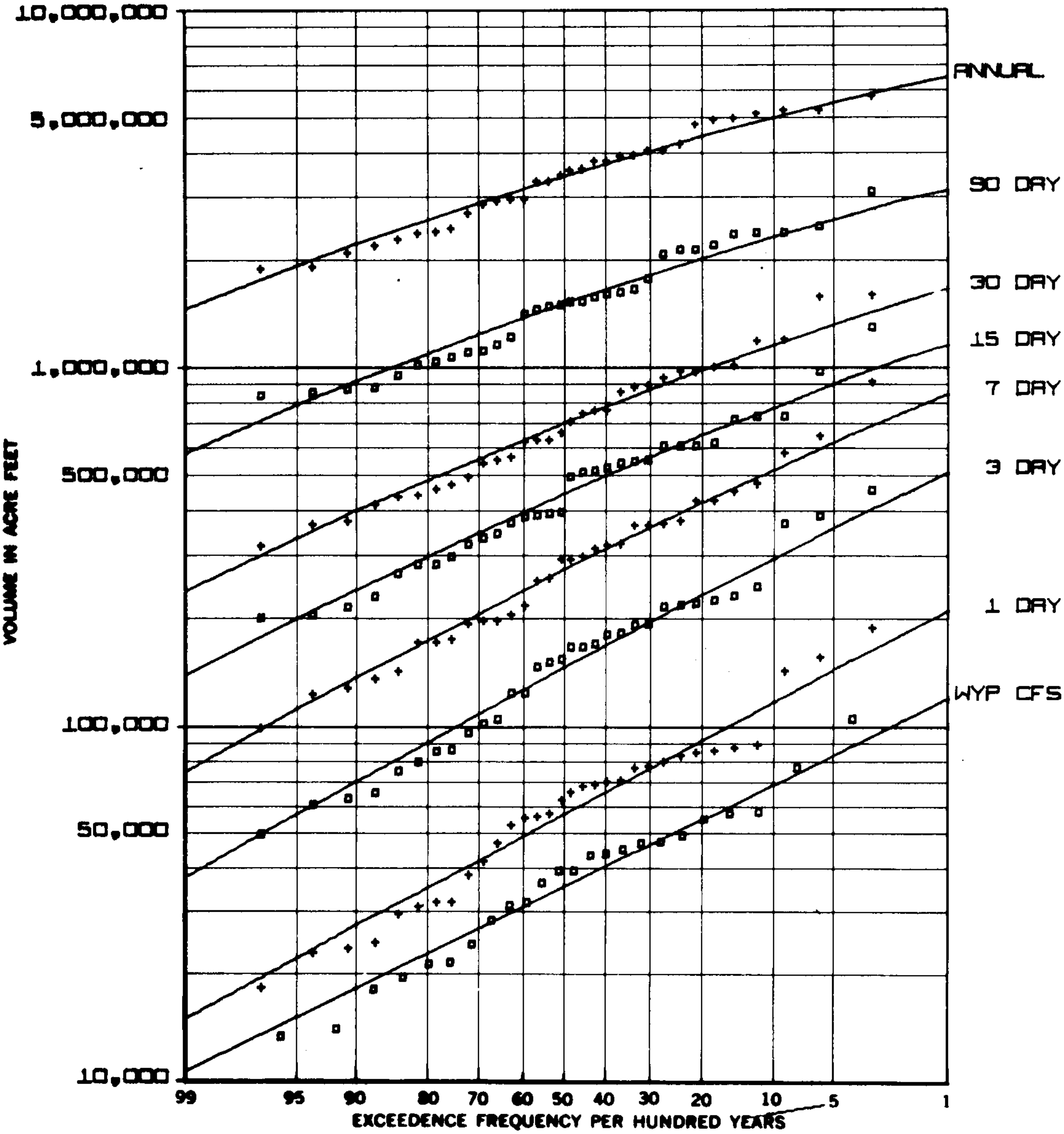
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



ELKHORN RIVER AT WATERLOO (ARLINGTON), NEBR.

1929-1963 06-8005.00

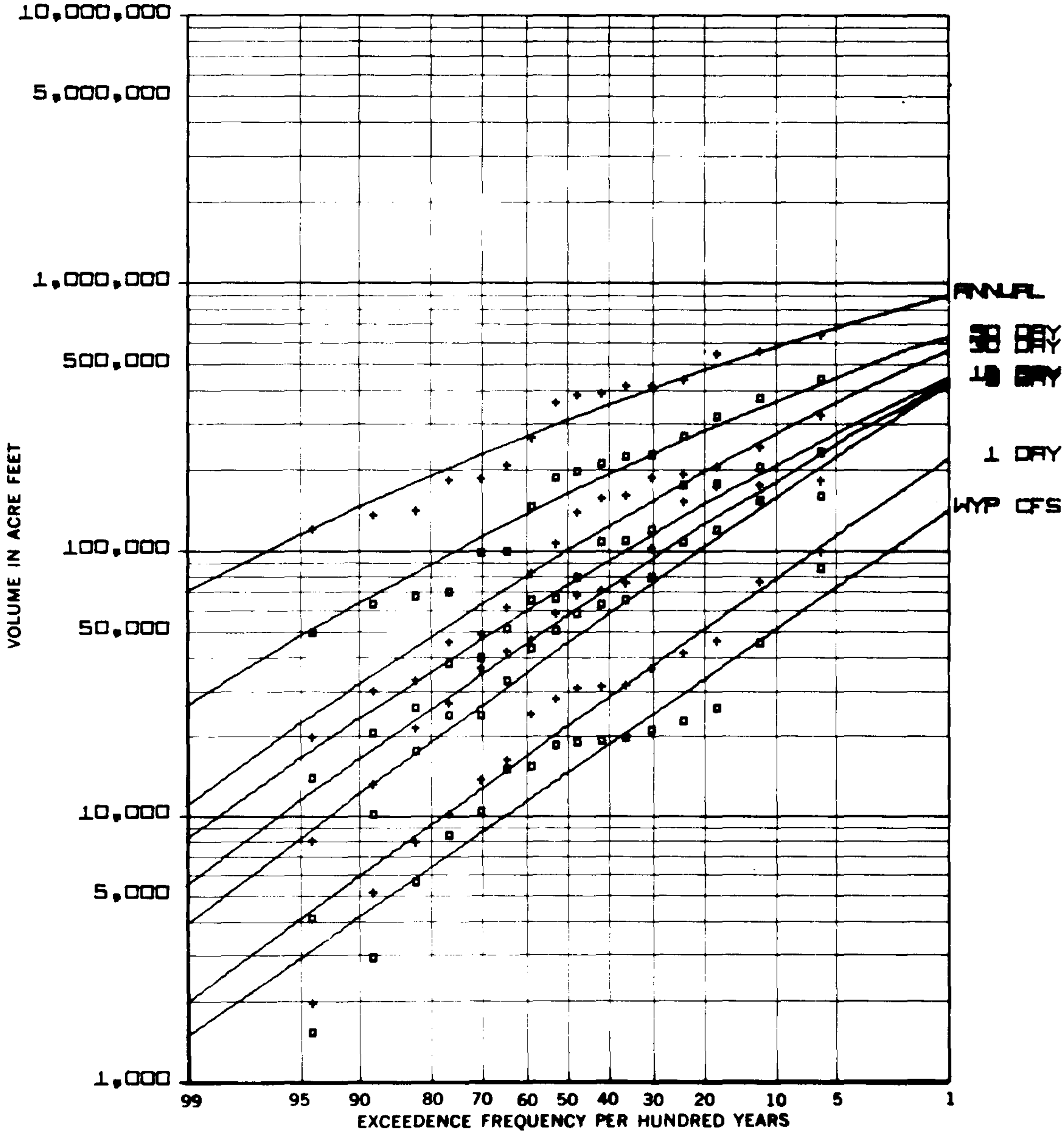
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



PLATTE RIVER NEAR ASHLAND, NEBR.

1929-1960 06-8010.00

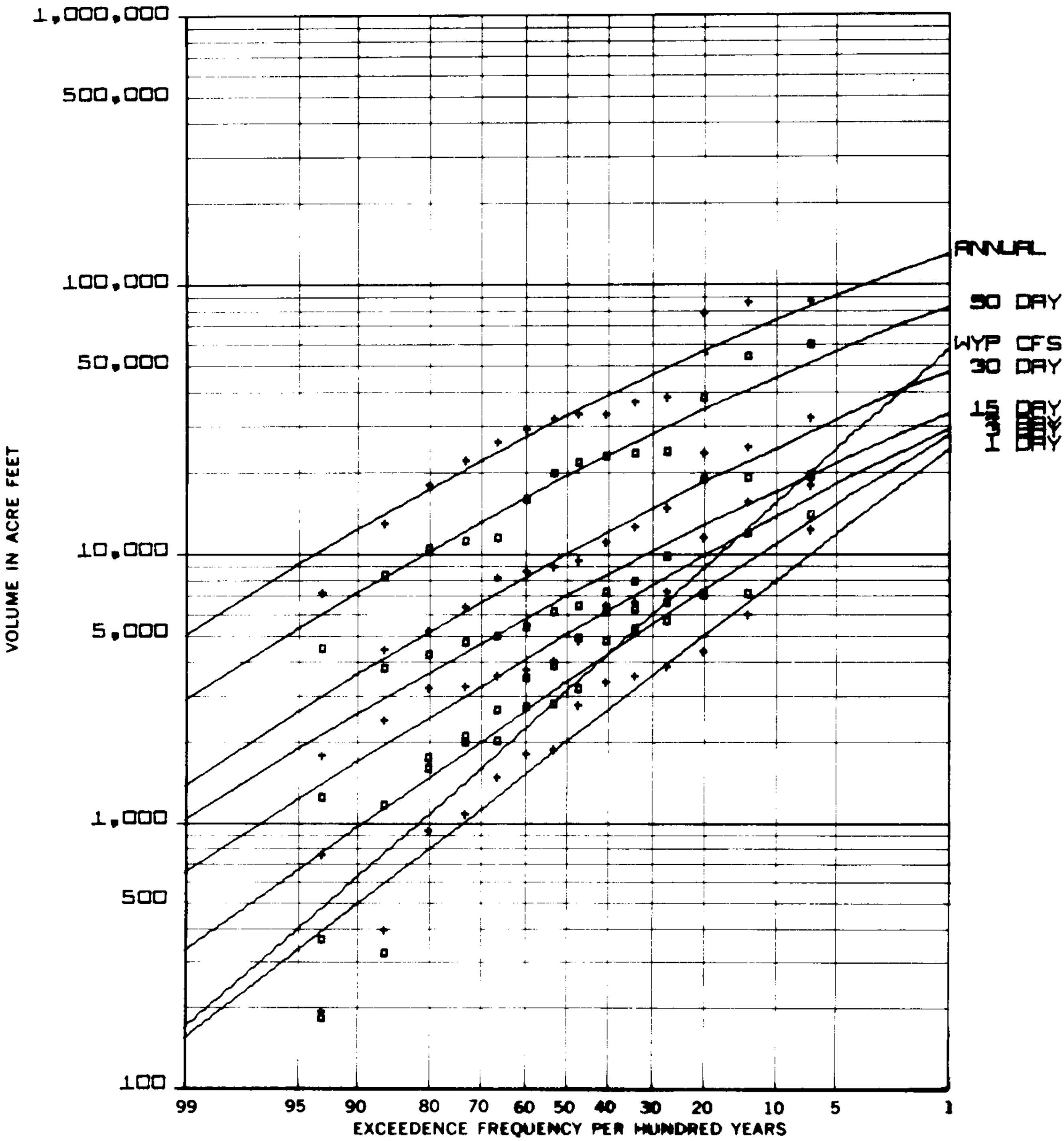
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



SALT CREEK NEAR ASHLAND, NEBR.

1948-1963 06-8050.00

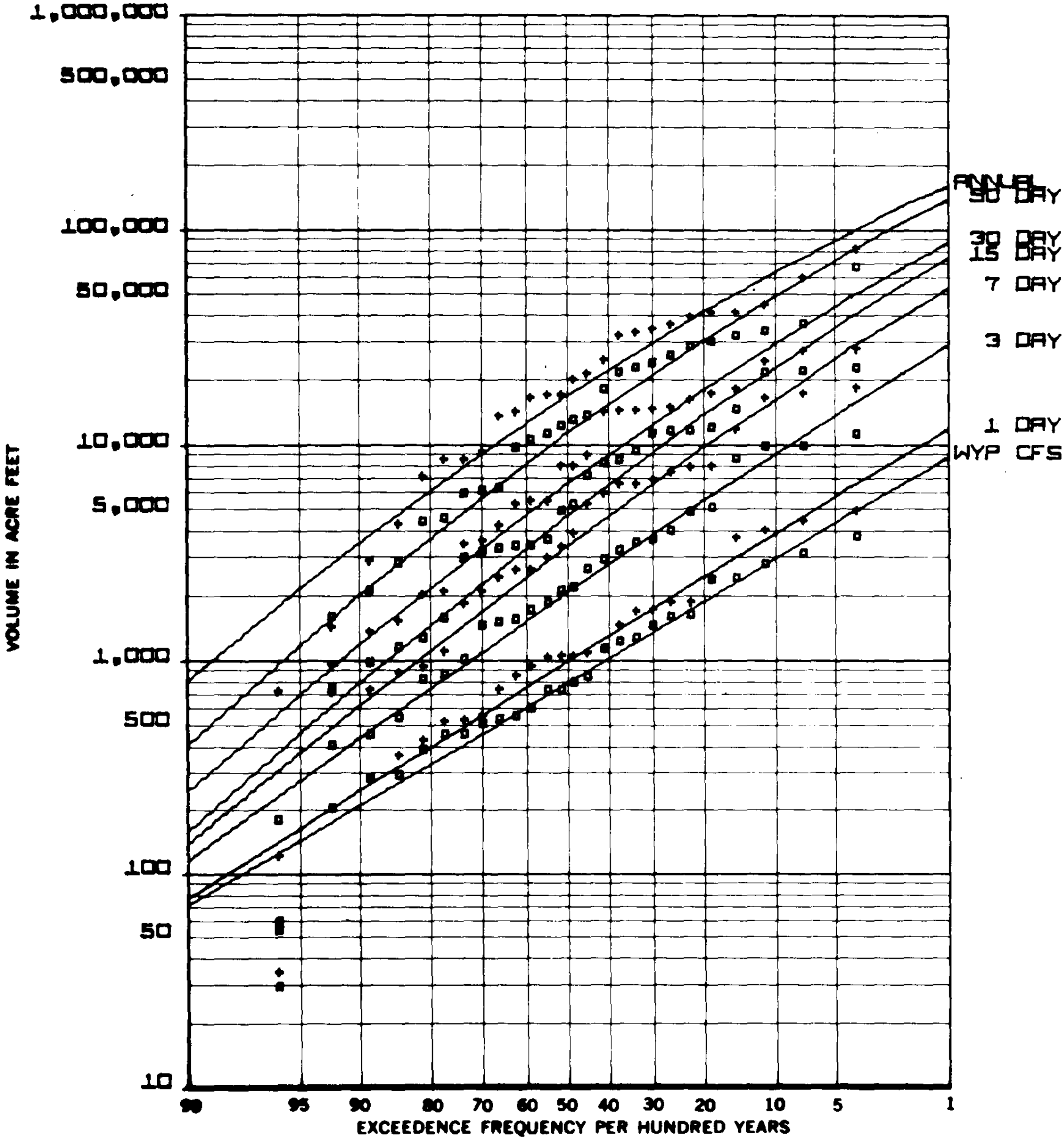
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



S. FK. REPUBLICAN RIVER NEAR BENKELMAN, NEBR.

1950-1963 06-8275.00

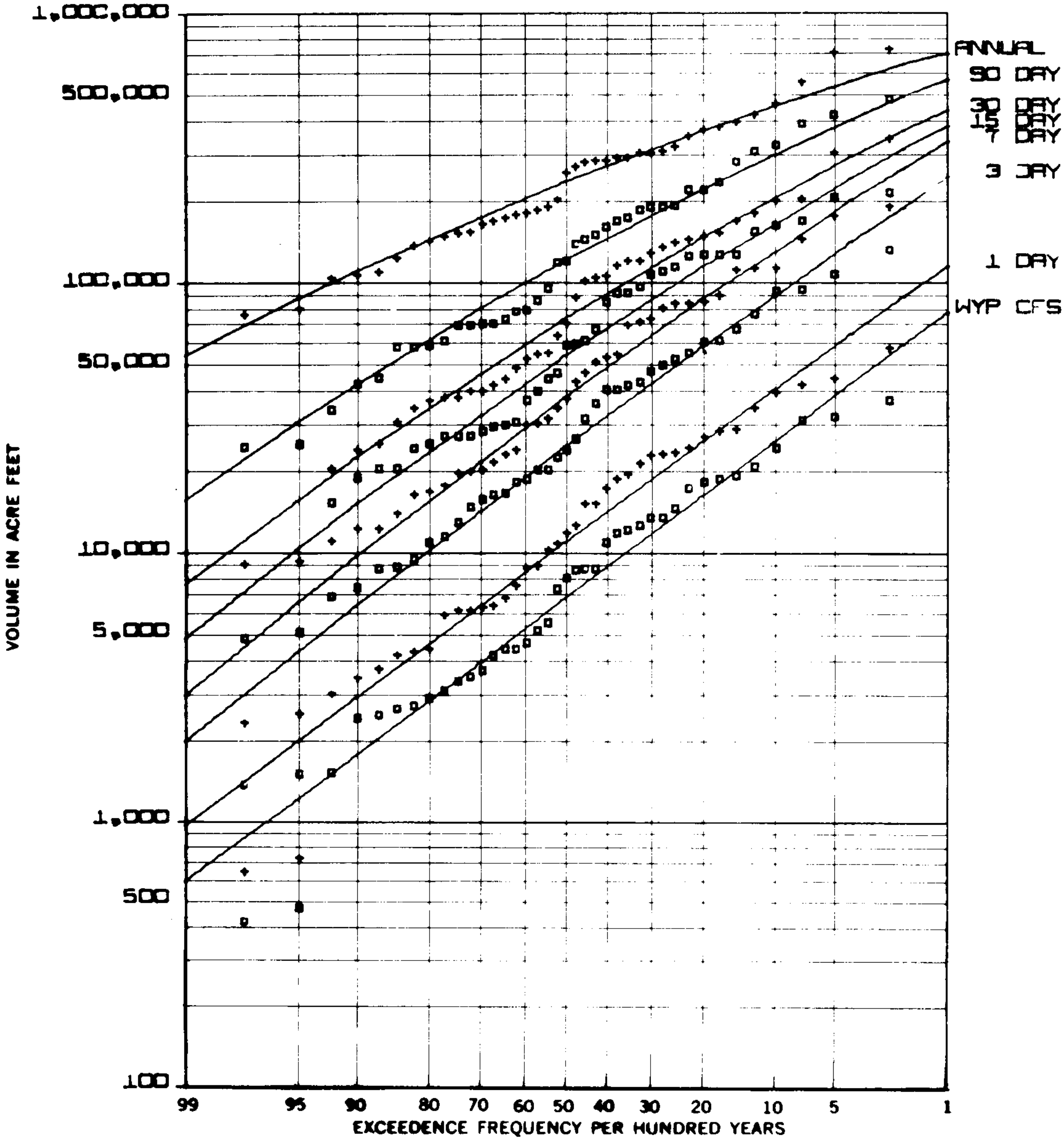
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



BEAVER CREEK NR. BEAVER CITY, NEBR.

1938-1963 06-8470.00

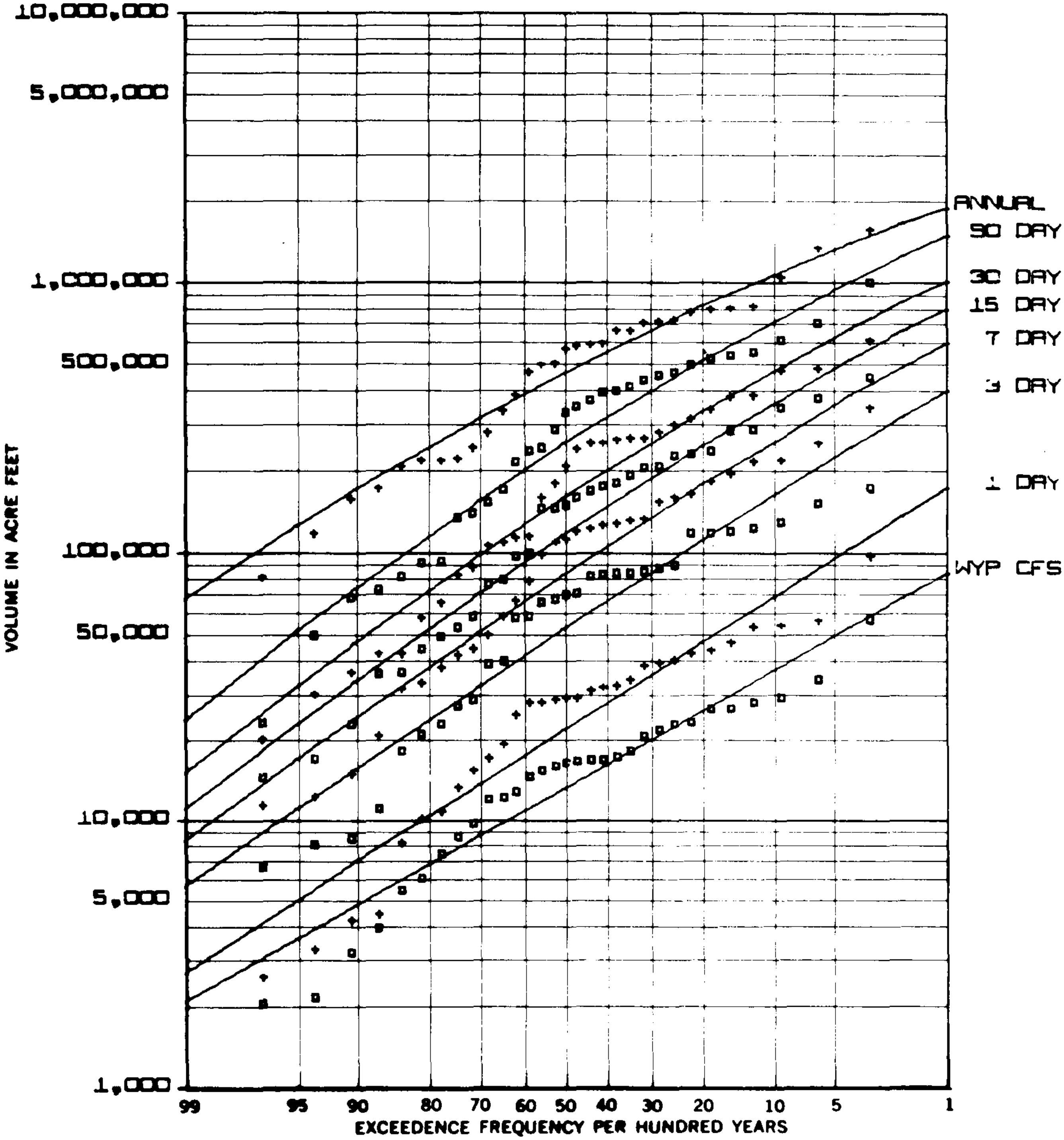
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



LITTLE BLUE RIVER NR. FAIRBURY (ENDICOTT), NEBR.

1911-15,30-63 06-8840.00

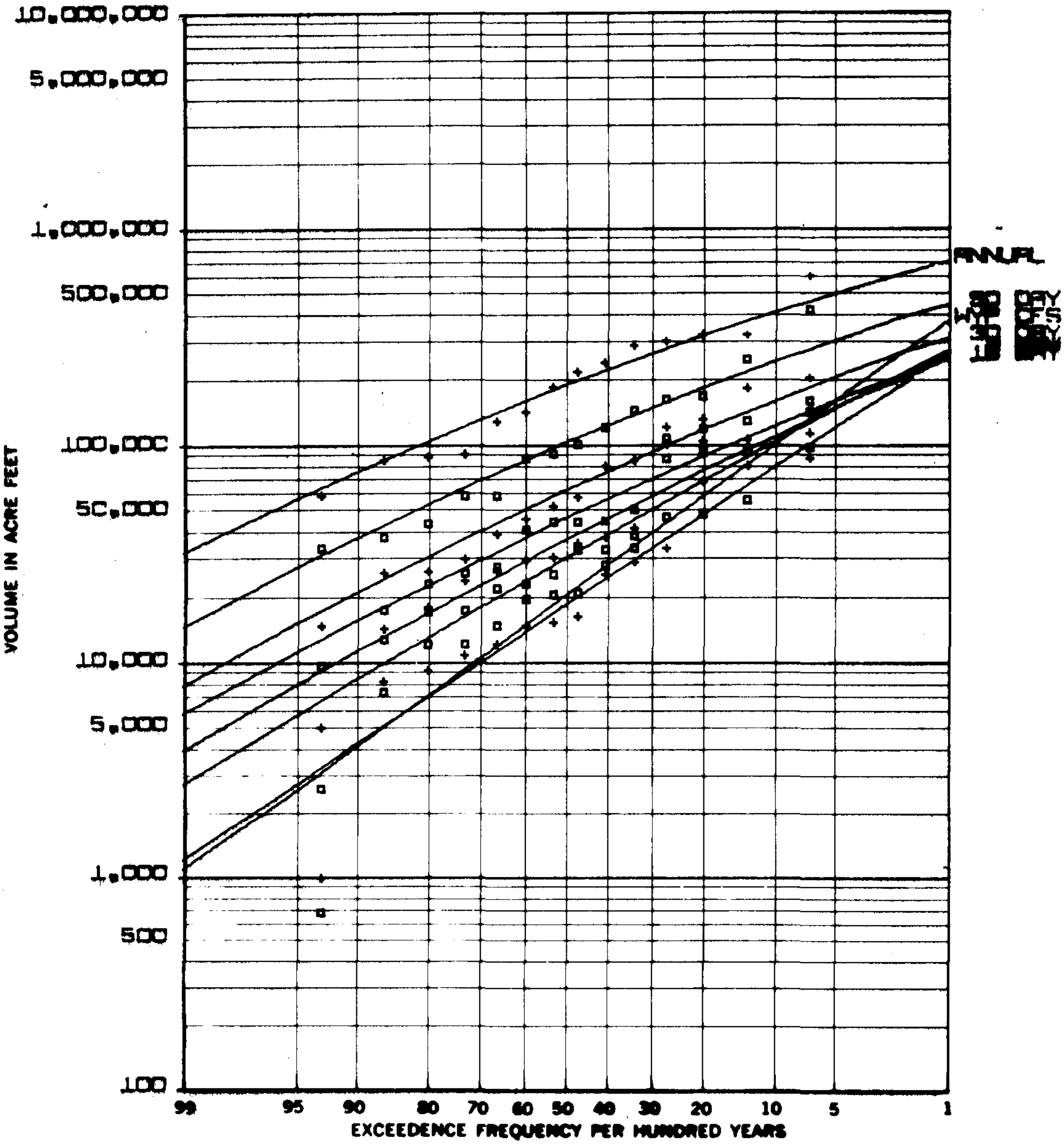
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



BIG BLUE RIVER AT BARNESTON, NEBR.

1933-1963 06-8820.00

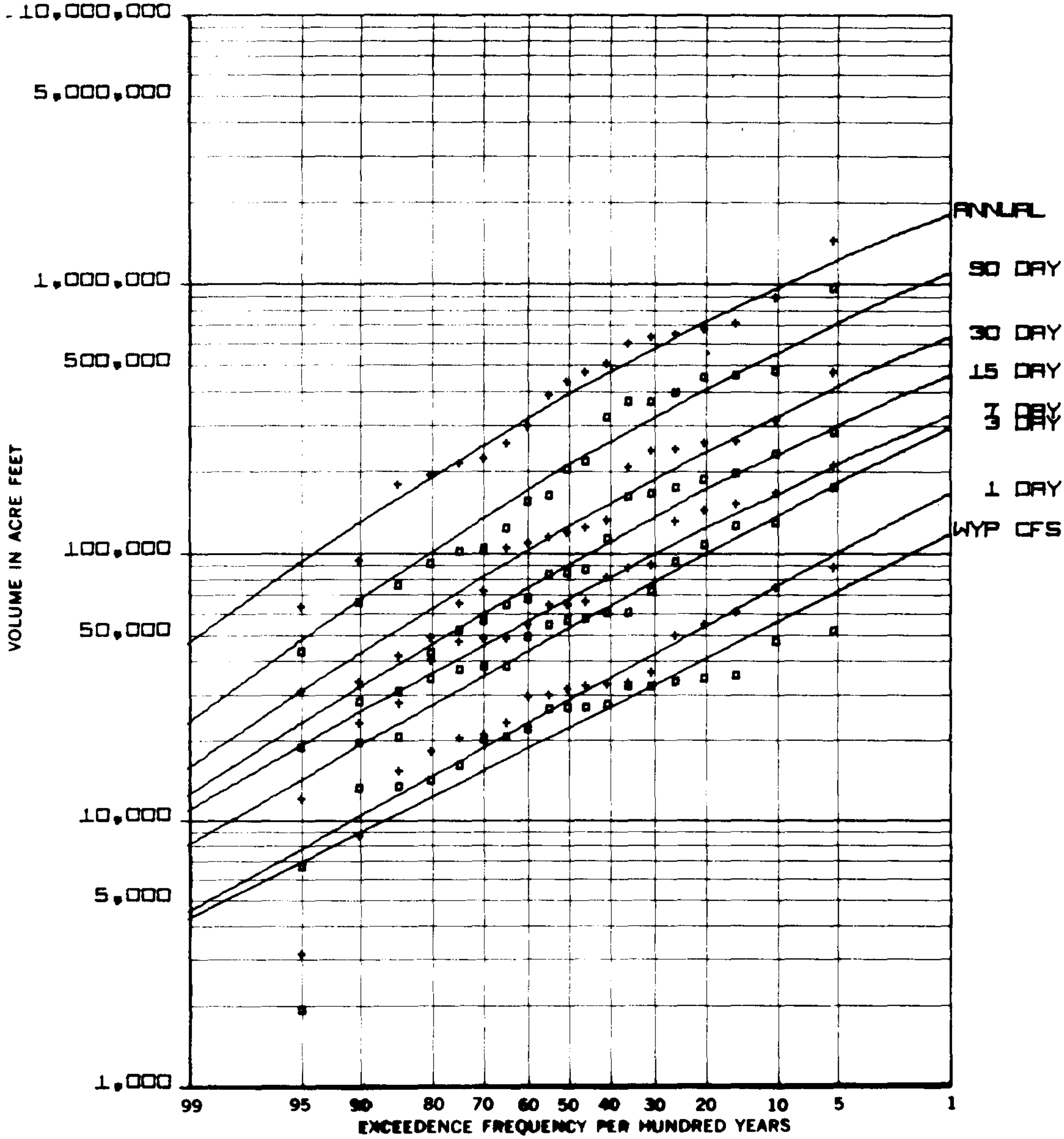
HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES



LITTLE NEMAHA RIVER AT AUBURN, NEBR.

1950-1963 06-8115.00

HIGH-FLOW VOLUME-FREQUENCY DURATION CURVES

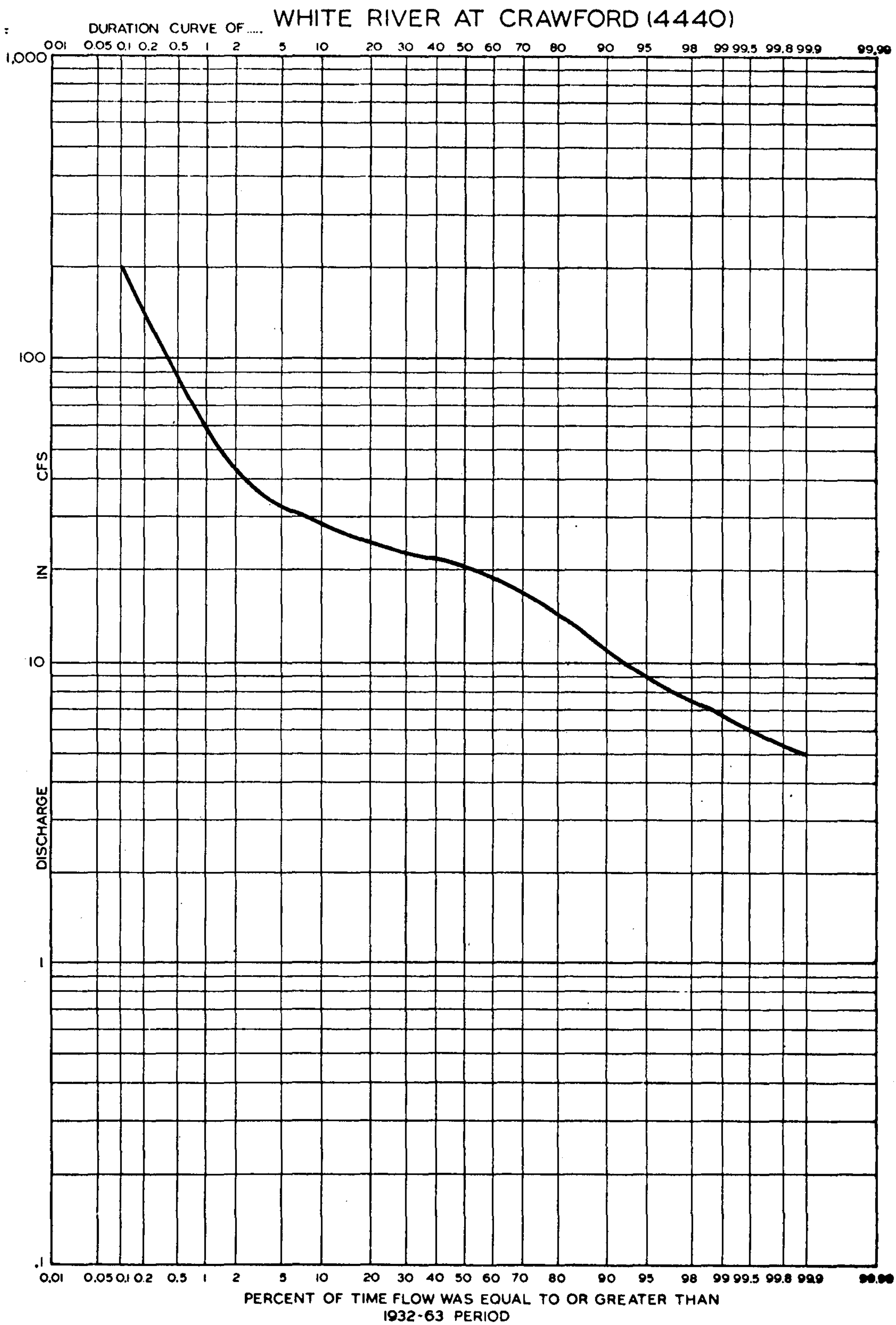


NEMAHA RIVER AT FALLS CITY, NEBR.

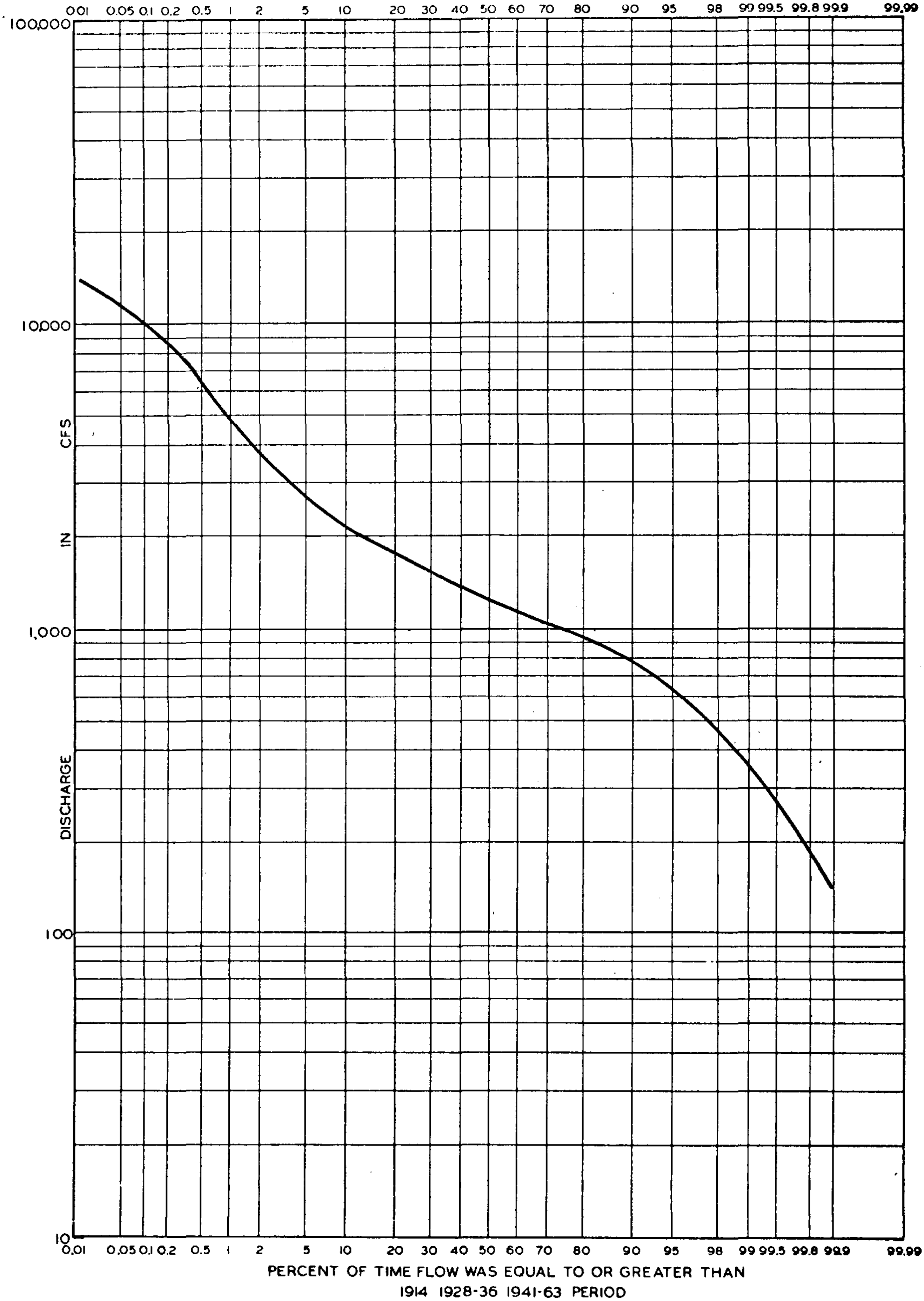
1945-1963 06-8150.00

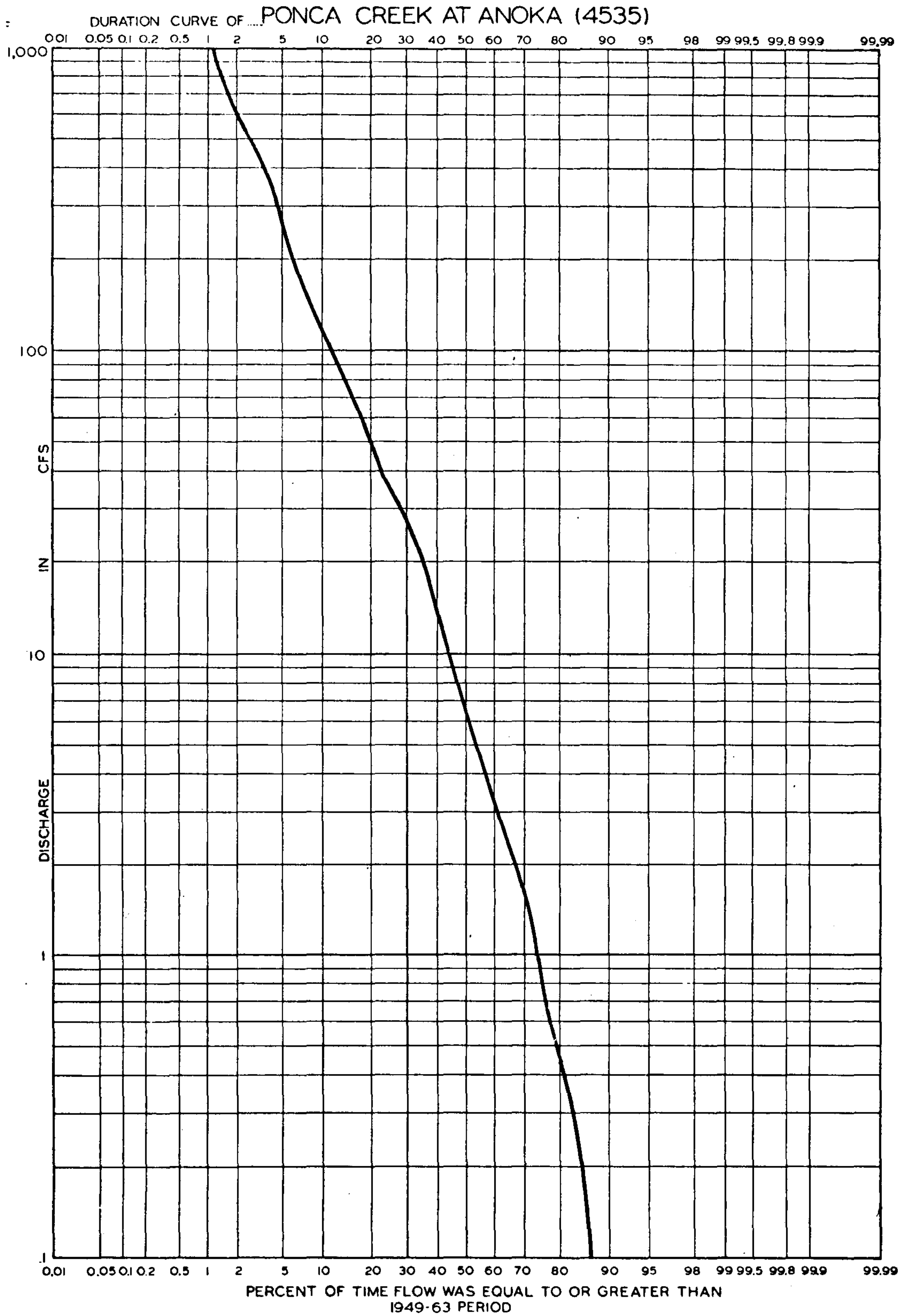
ATTACHMENT 3

FLOW - DURATION CURVES

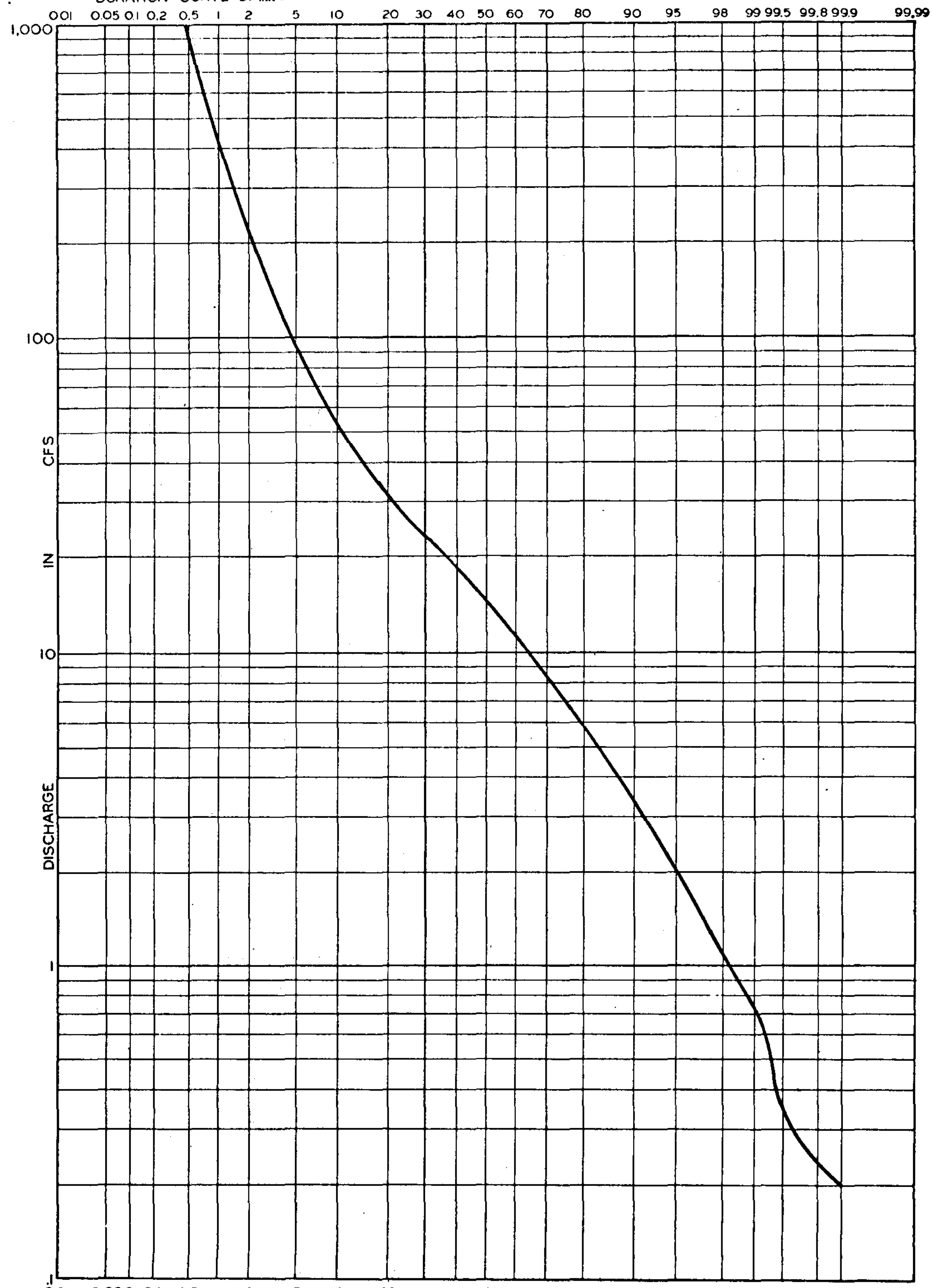

DURATION CURVE OF..... WHITE RIVER AT CRAWFORD (4440)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
1,000
100
10
1
.1
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1932-63 PERIOD

DURATION CURVE OF ....NIOBRARA RIVER NEAR SPENCER (4650)



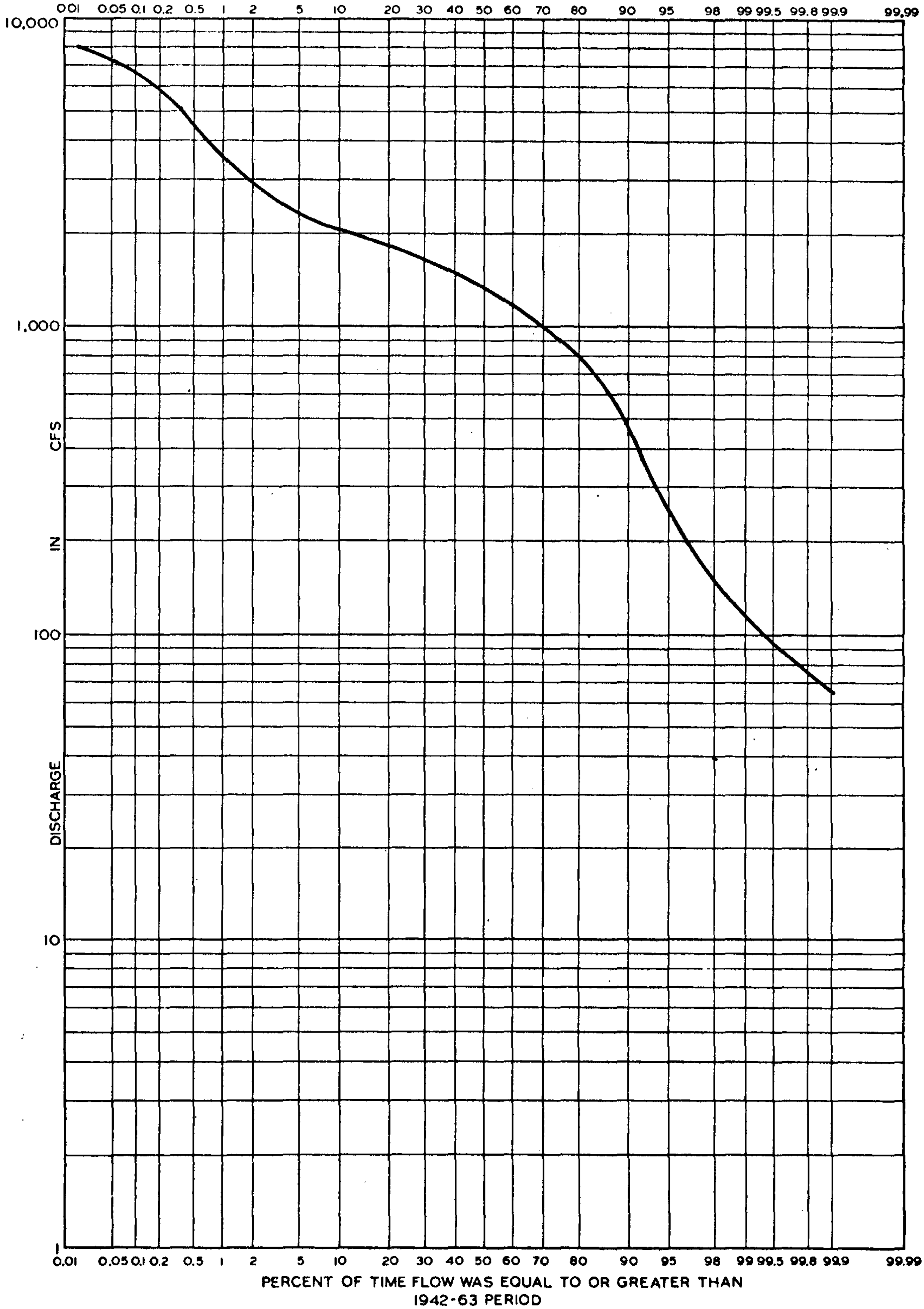

DURATION CURVE OF PONCA CREEK AT ANOKA (4535)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
1,000
100
10
1
.1
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1949-63 PERIOD

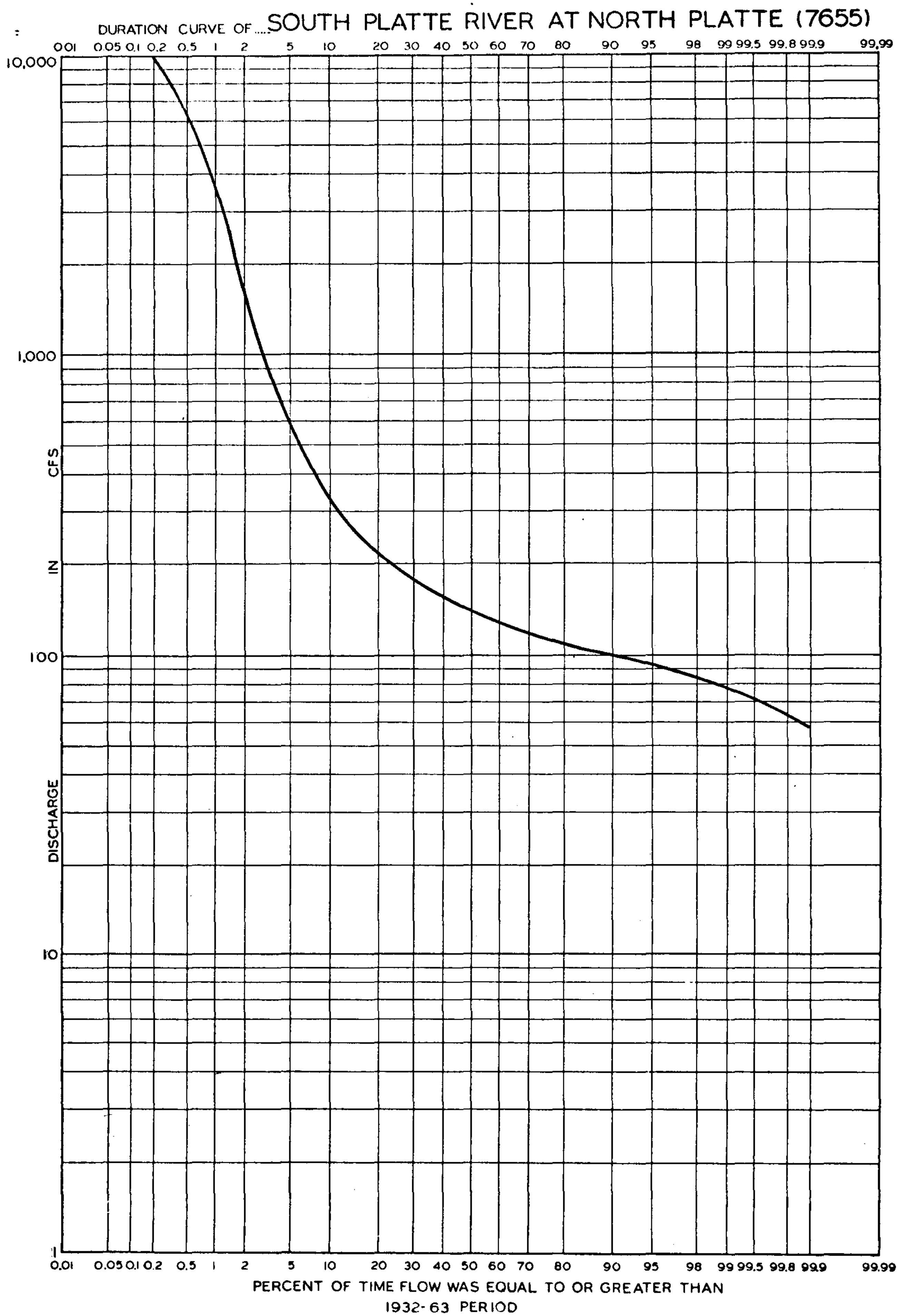
DURATION CURVE OF OMAHA CREEK AT HOMER (6010)

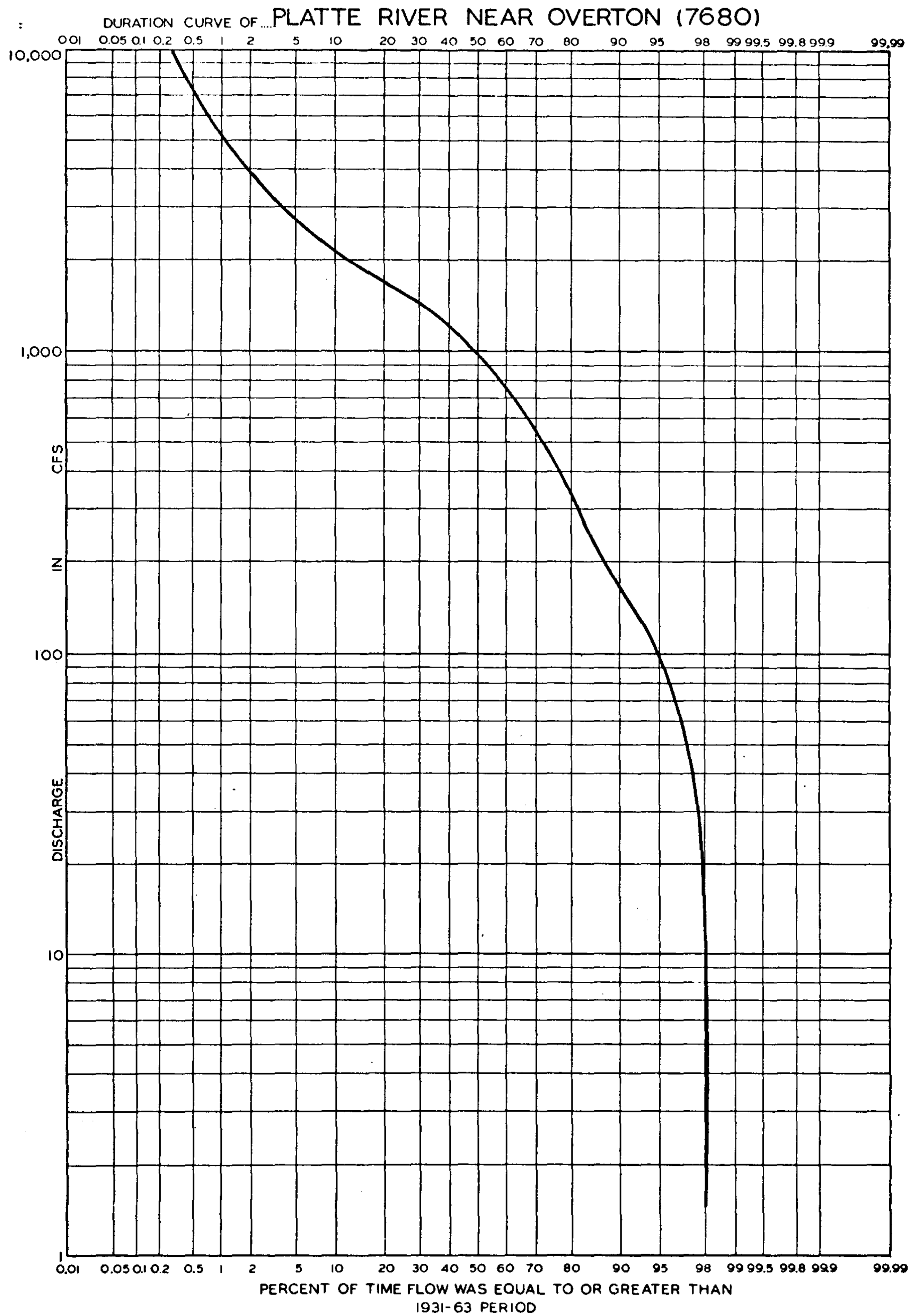


PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1946-63 PERIOD

DURATION CURVE OF NORTH PLATTE RIVER AT LEWELLEN (6875)

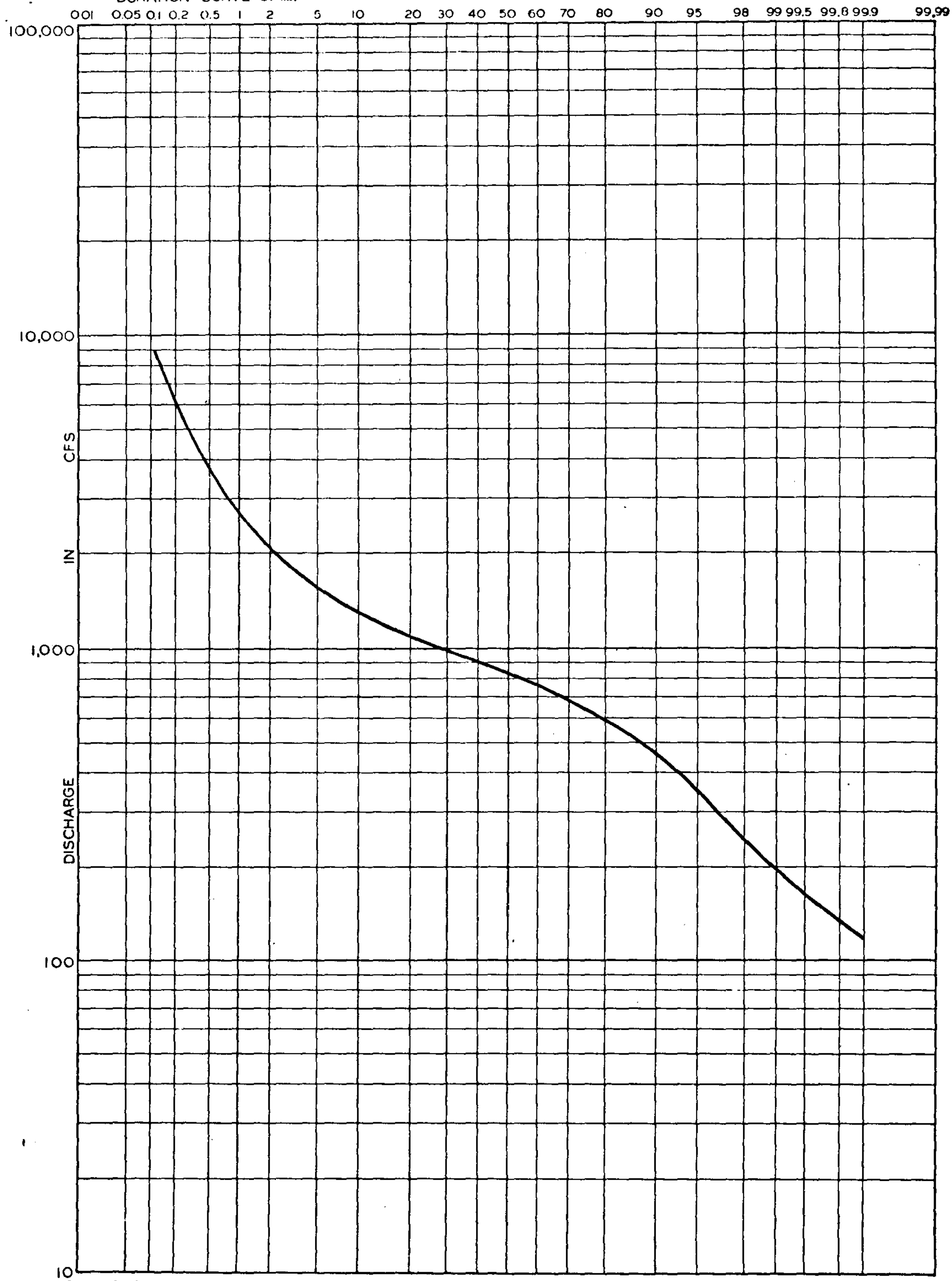



DURATION CURVE OF SOUTH PLATTE RIVER AT NORTH PLATTE (7655)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
10,000
1,000
100
10
1
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1932-63 PERIOD



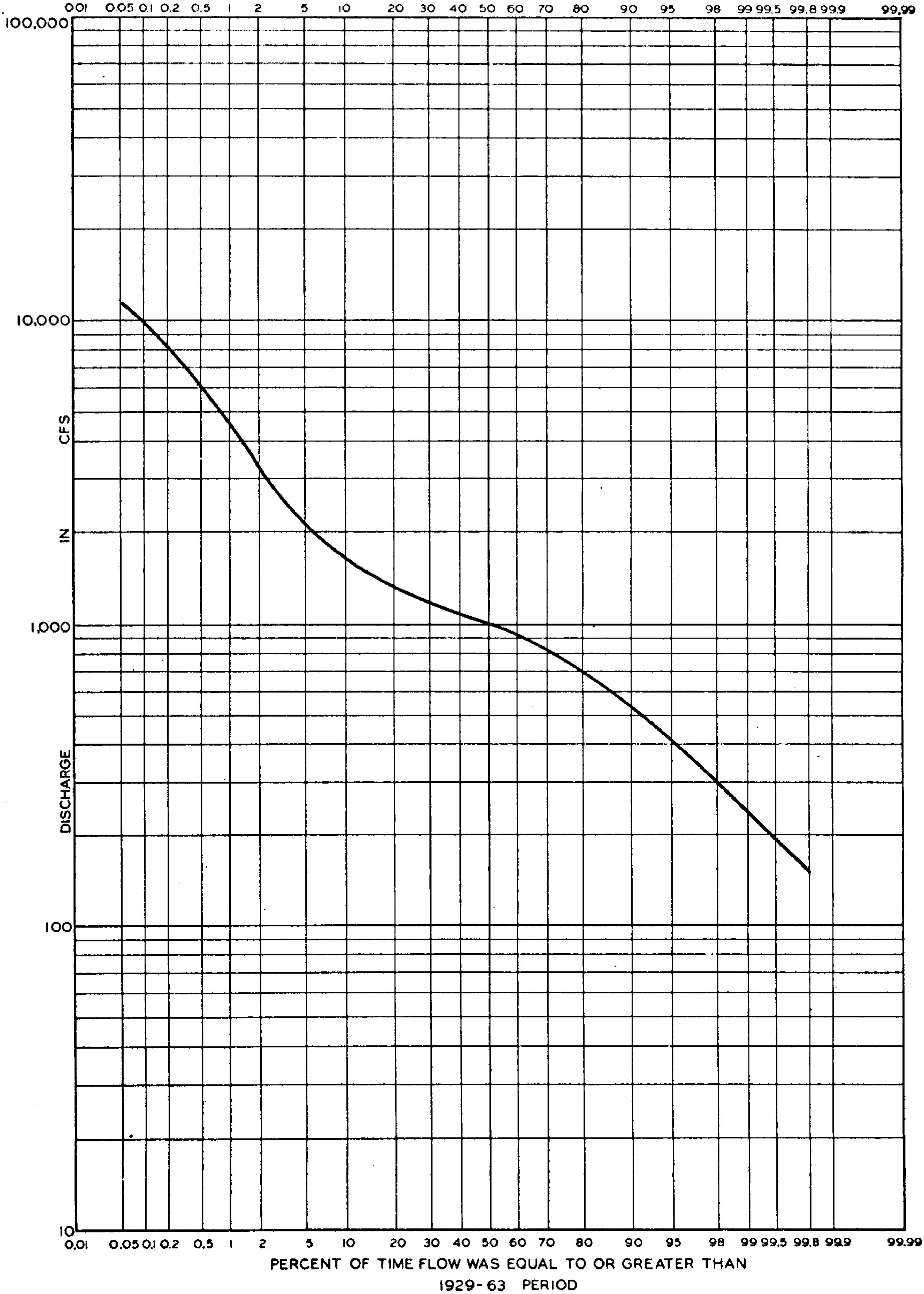
DURATION CURVE OF PLATTE RIVER NEAR OVERTON (7680)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
10,000
1,000
100
10
1
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1931-63 PERIOD

DURATION CURVE OF NORTH LOUP RIVER NEAR ST. PAUL (7905)

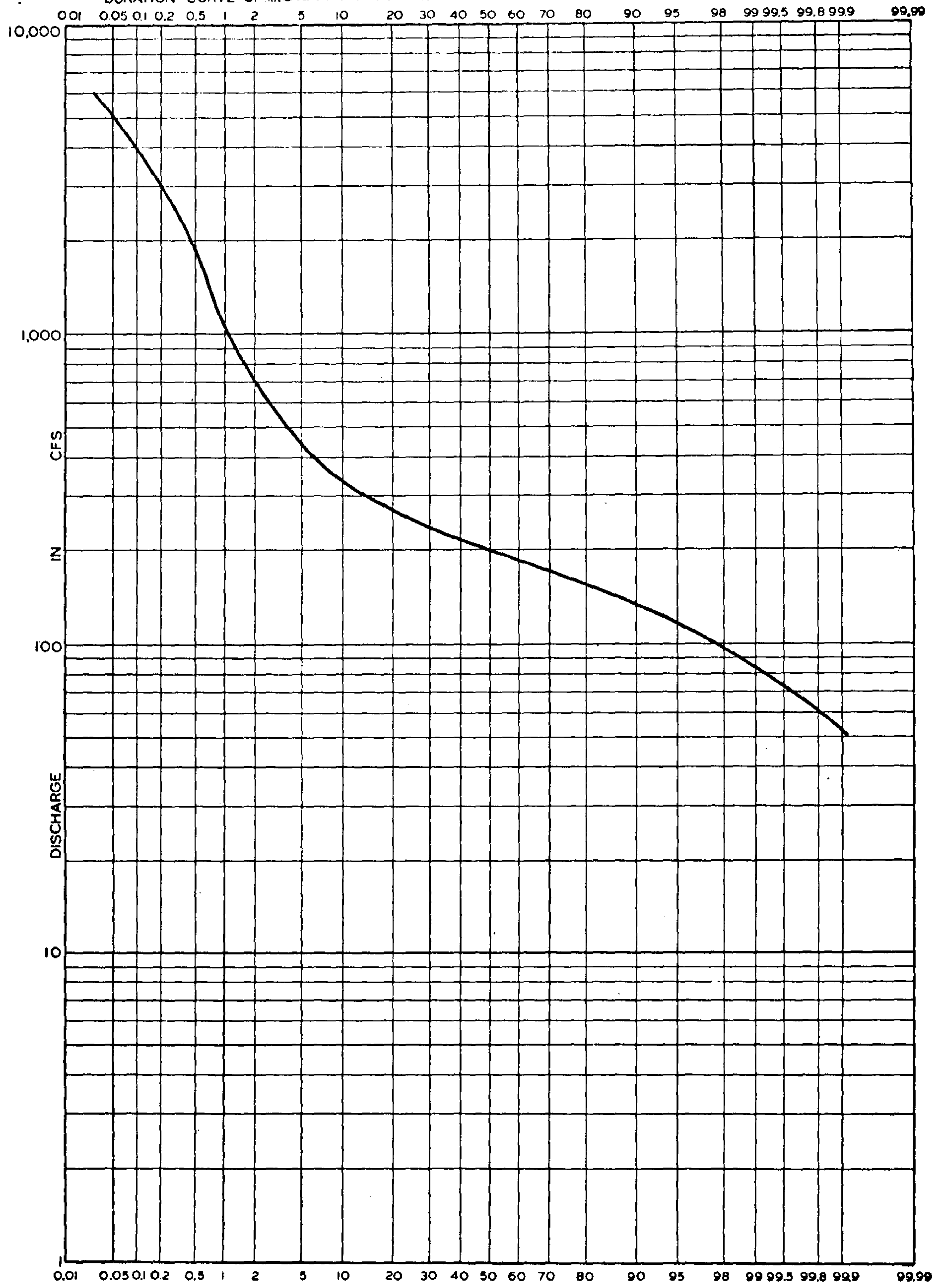


PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1929-63 PERIOD

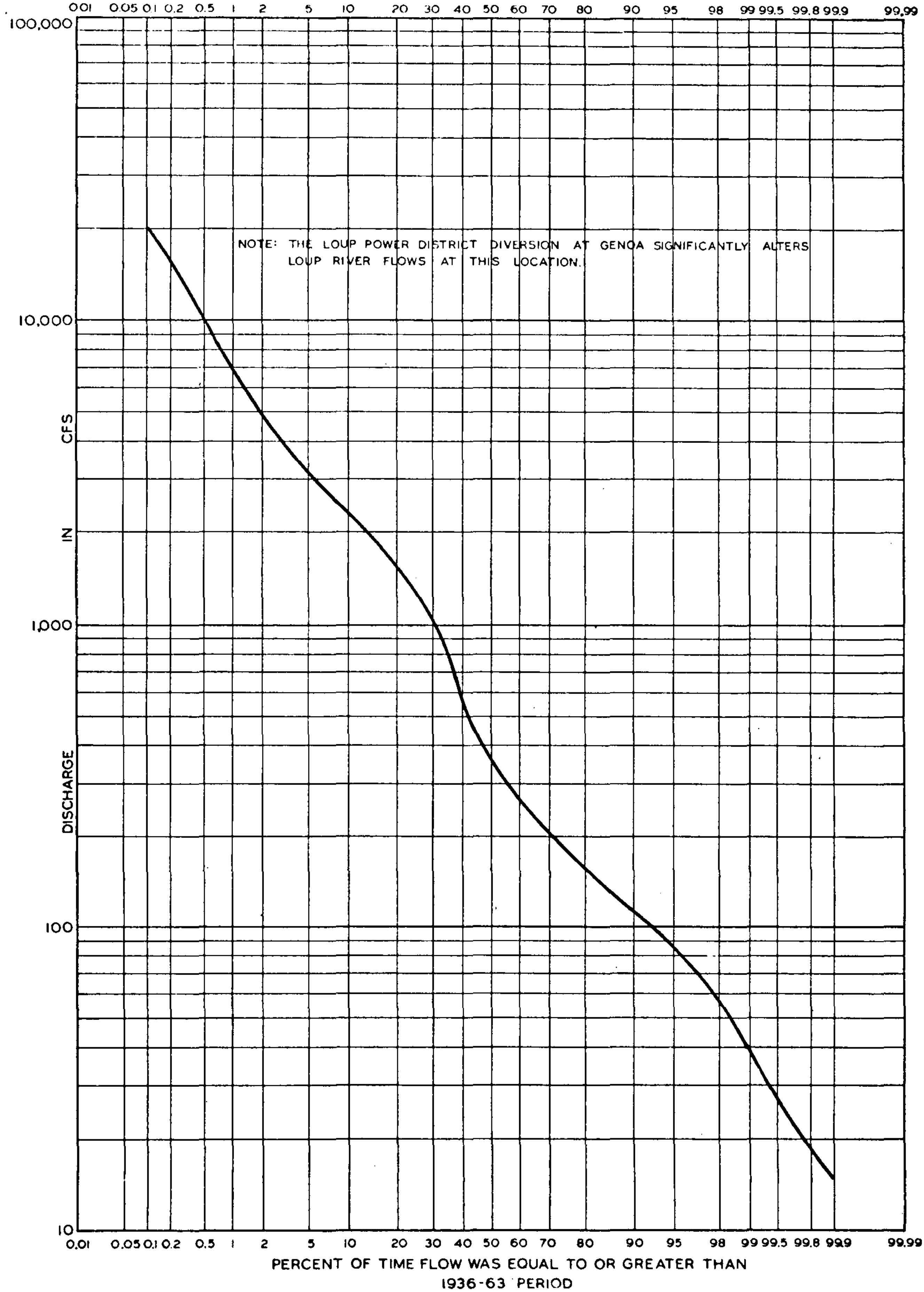
DURATION CURVE OF ....MIDDLE LOUP RIVER AT ST. PAUL (7850)

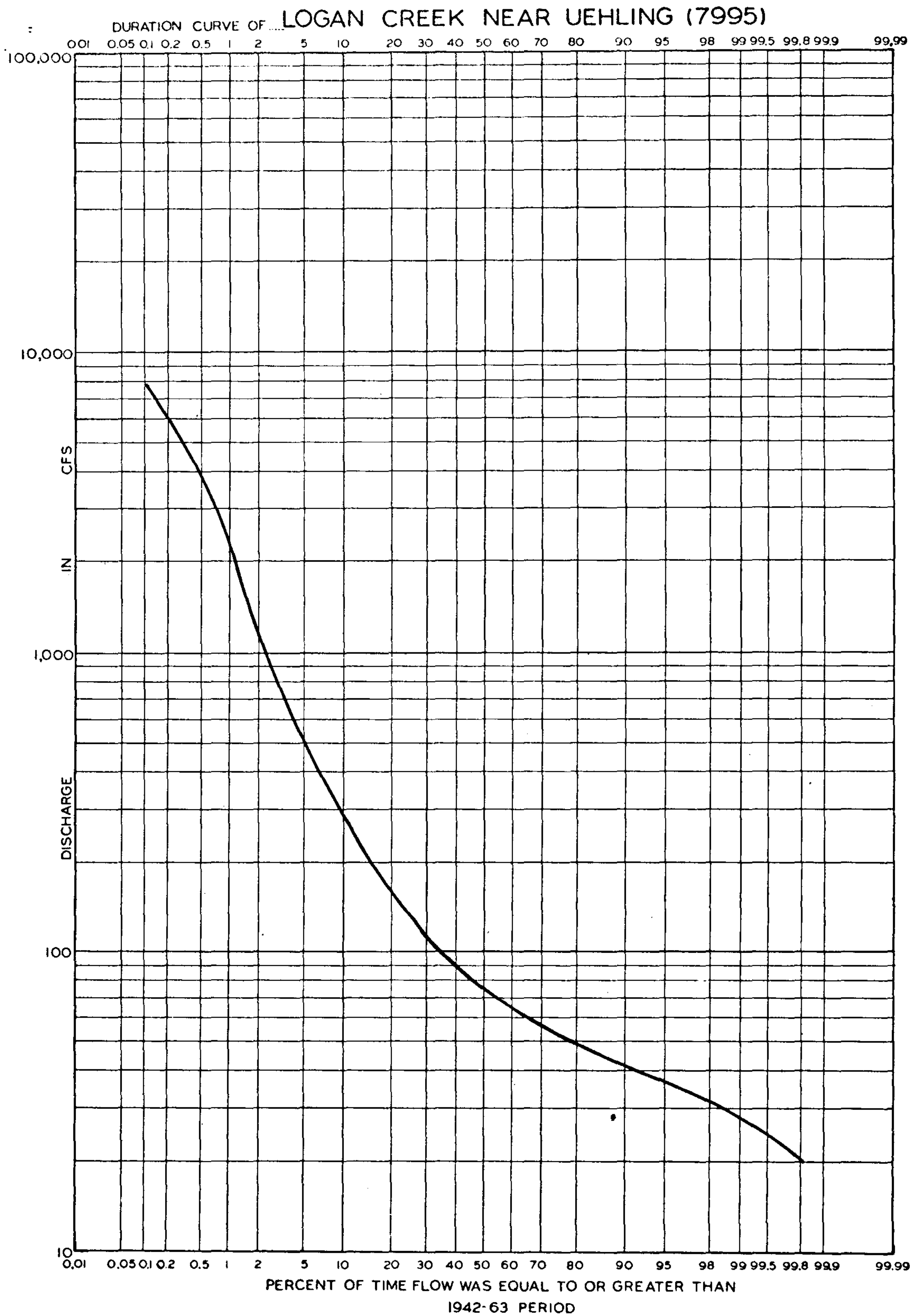


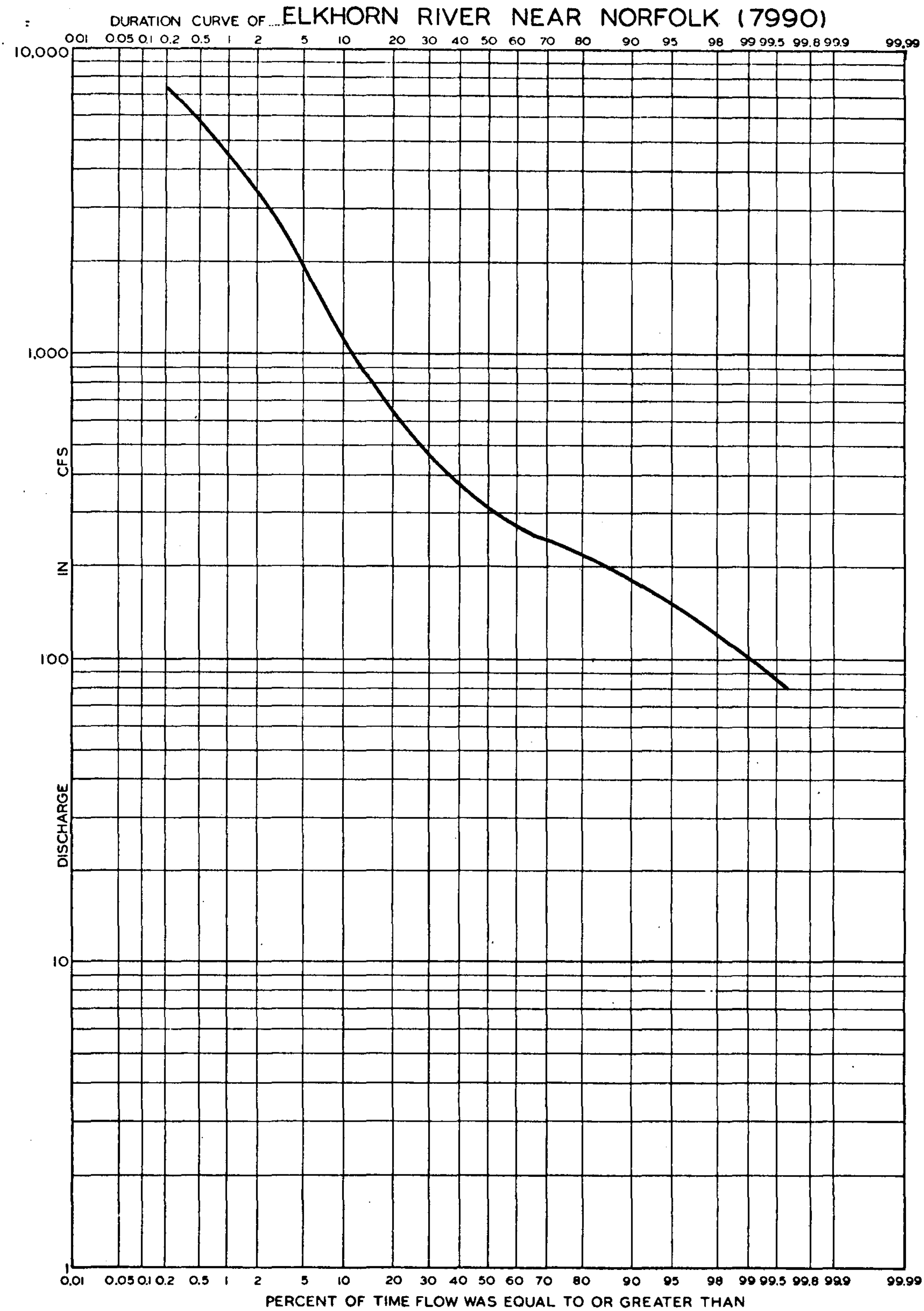
DURATION CURVE OF CEDAR RIVER NEAR FULLERTON (7920)

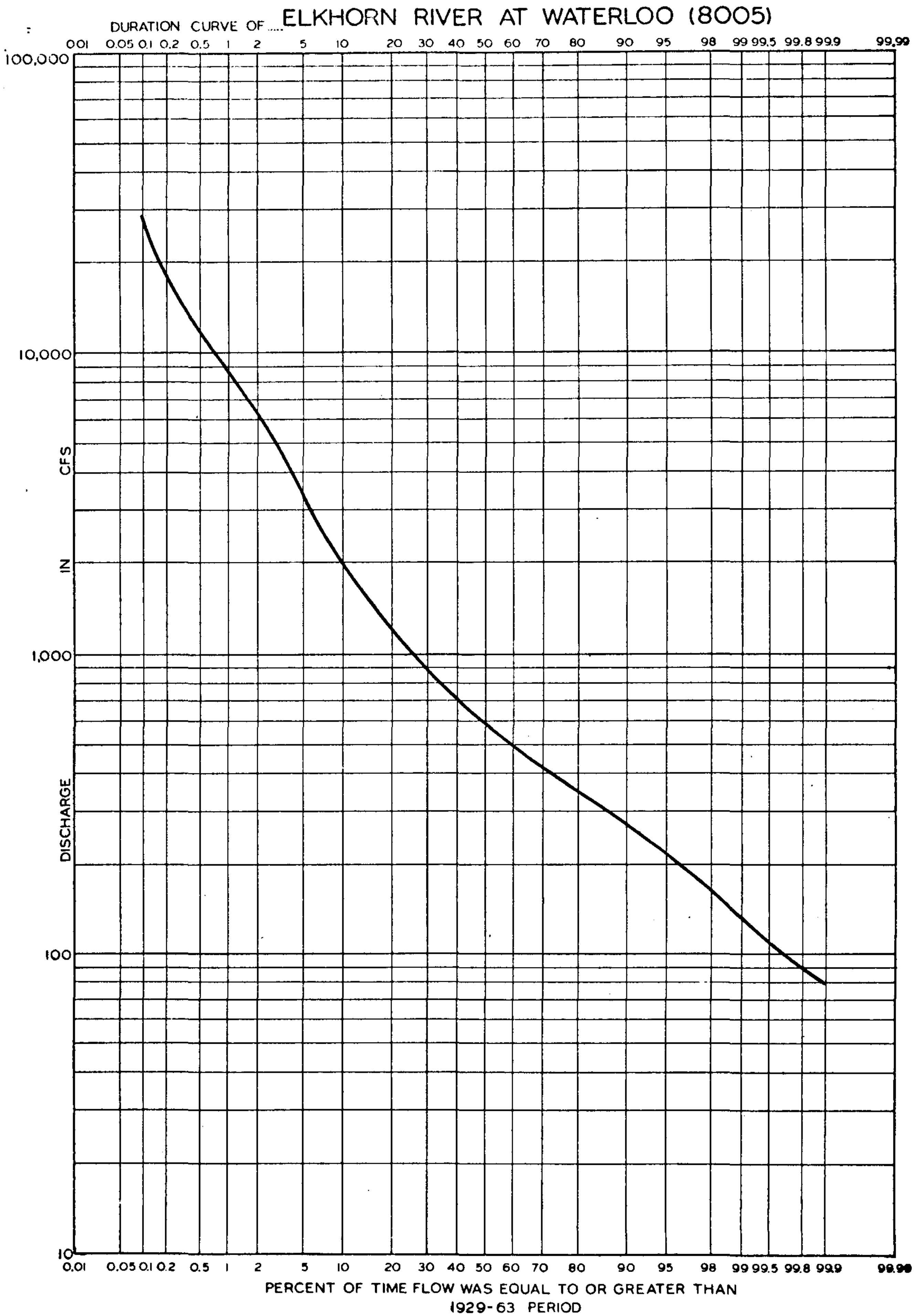


DURATION CURVE OF LOUP RIVER AT COLUMBUS (7945)

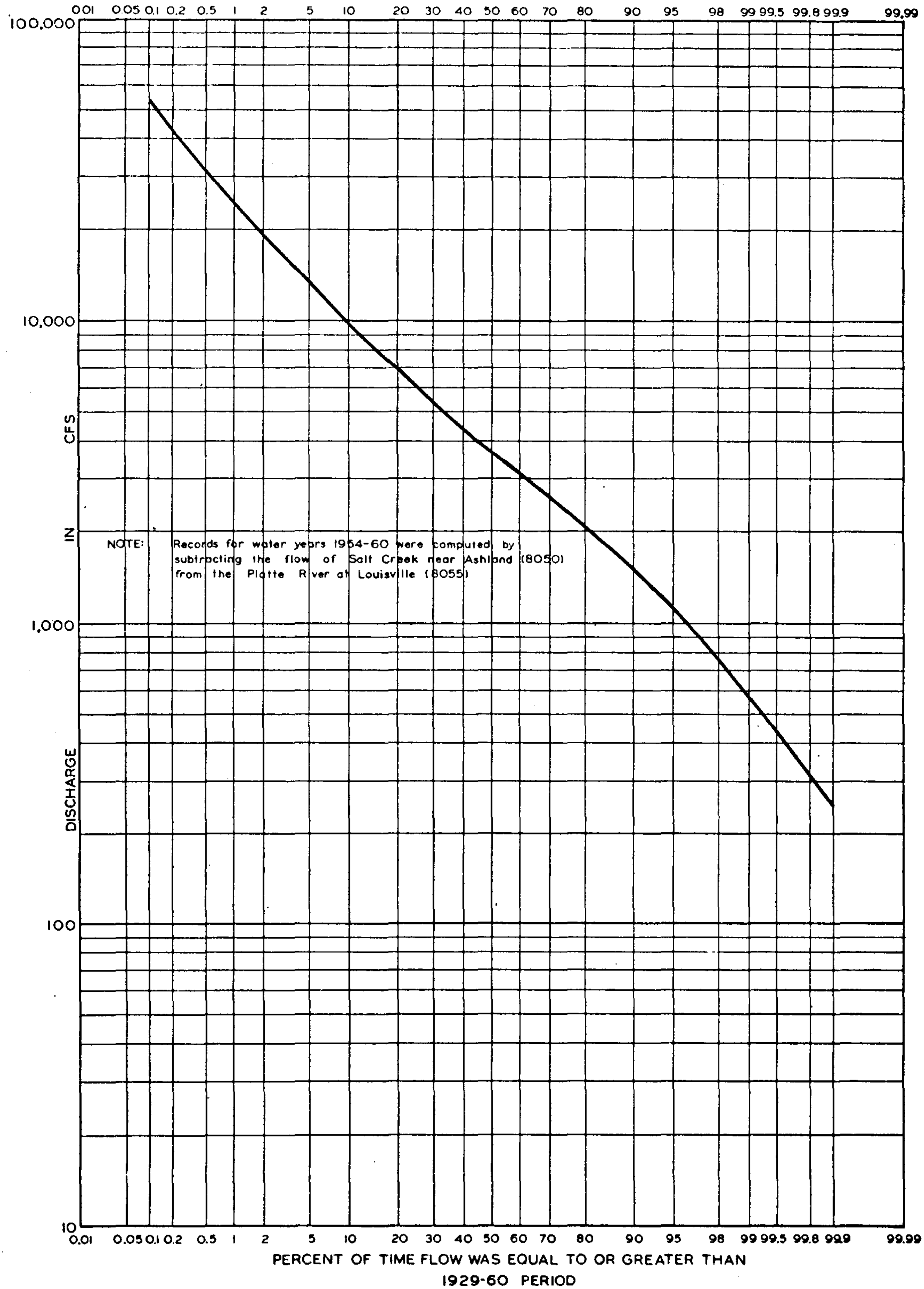



DURATION CURVE OF LOGAN CREEK NEAR UEHLING (7995)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
100,000
10,000
1,000
100
10
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1942-63 PERIOD

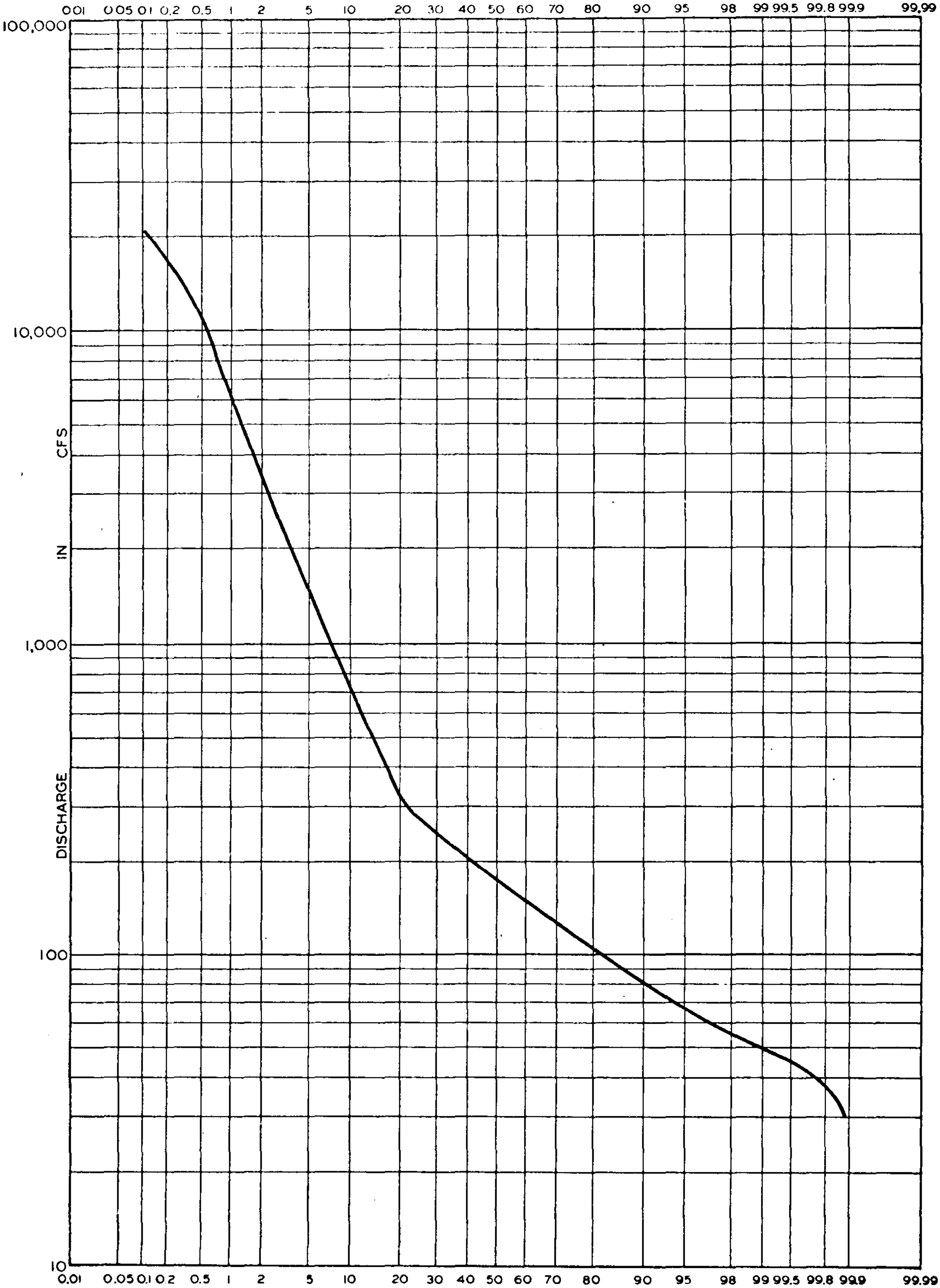

DURATION CURVE OF ELKHORN RIVER NEAR NORFOLK (7990)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
10,000
1,000
100
10
1
DISCHARGE IN CFS
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1946-63 PERIOD


DURATION CURVE OF ELKHORN RIVER AT WATERLOO (8005)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
100,000
10,000
1,000
100
10
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1929-63 PERIOD

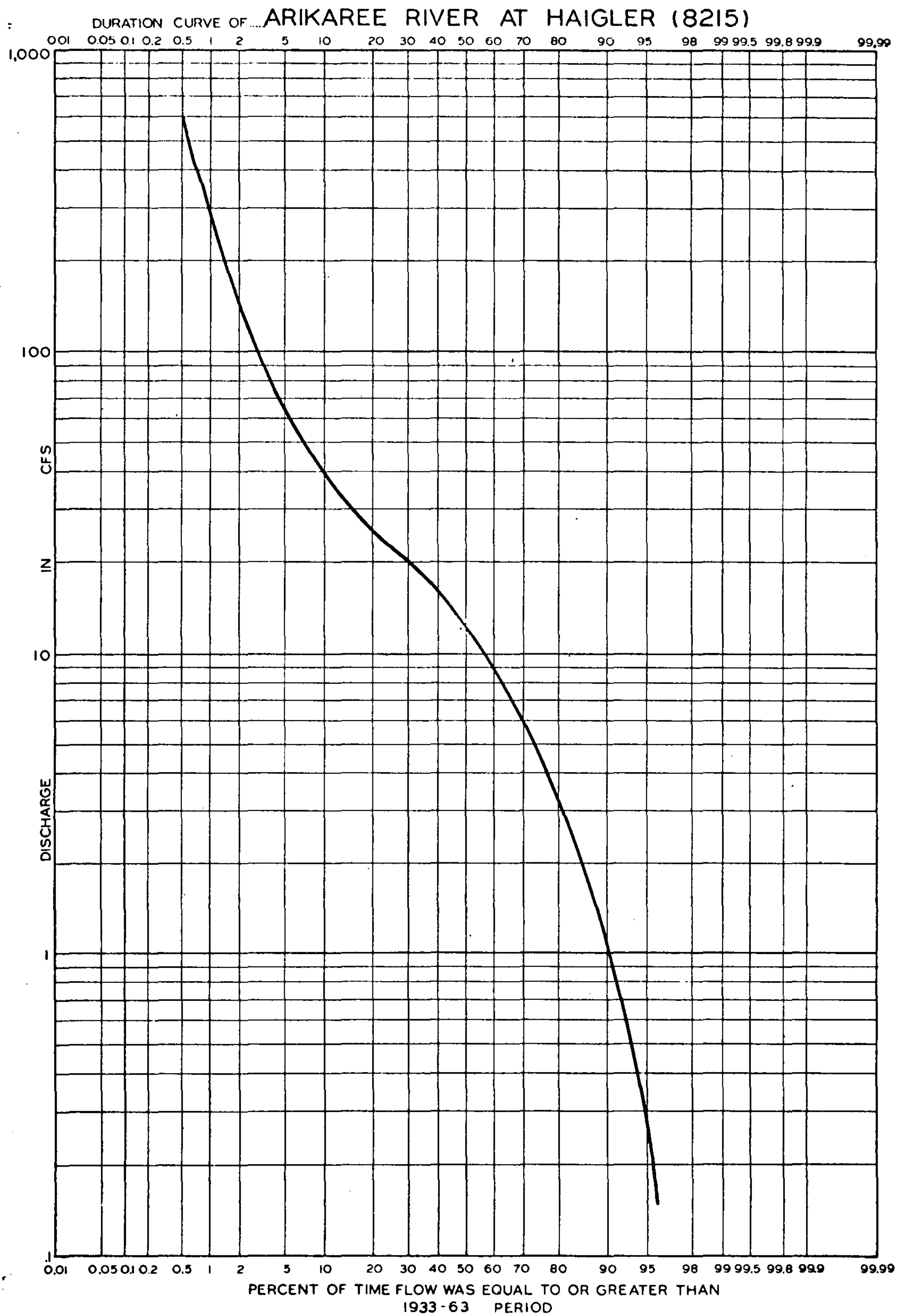
DURATION CURVE OF.....PLATTE RIVER NEAR ASHLAND (8010)



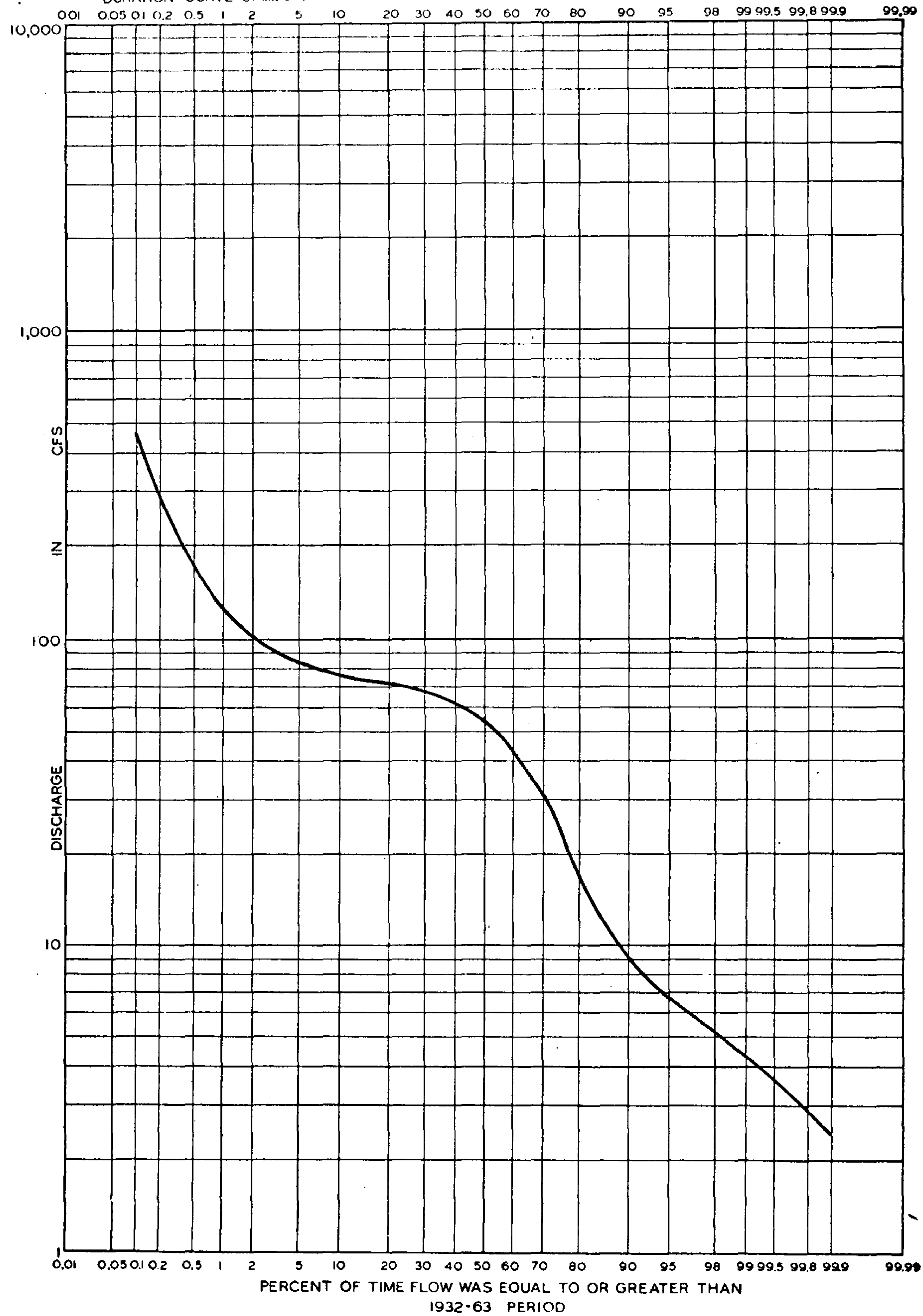
DURATION CURVE OF SALT CREEK NEAR ASHLAND (8050)

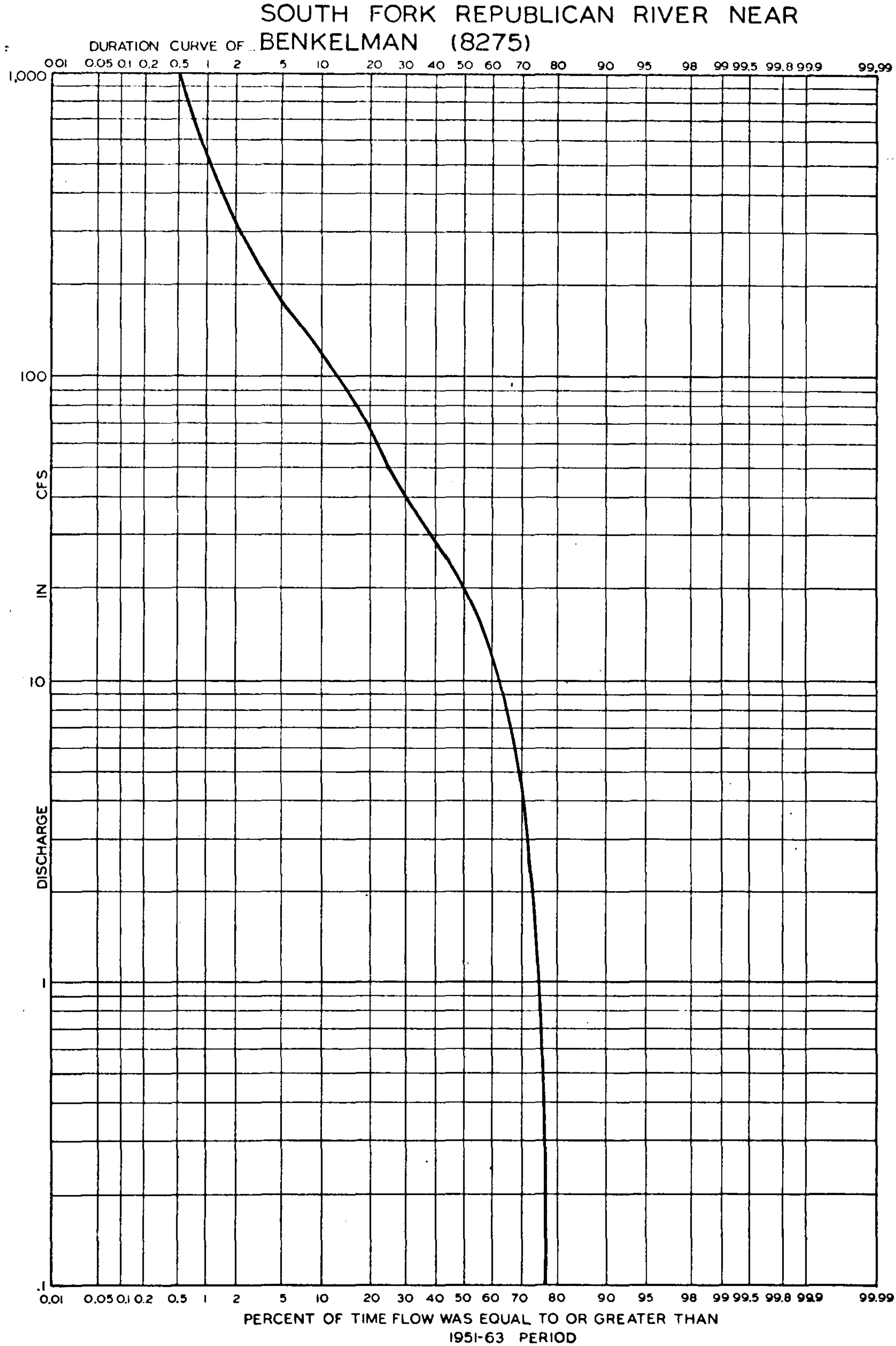


PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1948-63 PERIOD

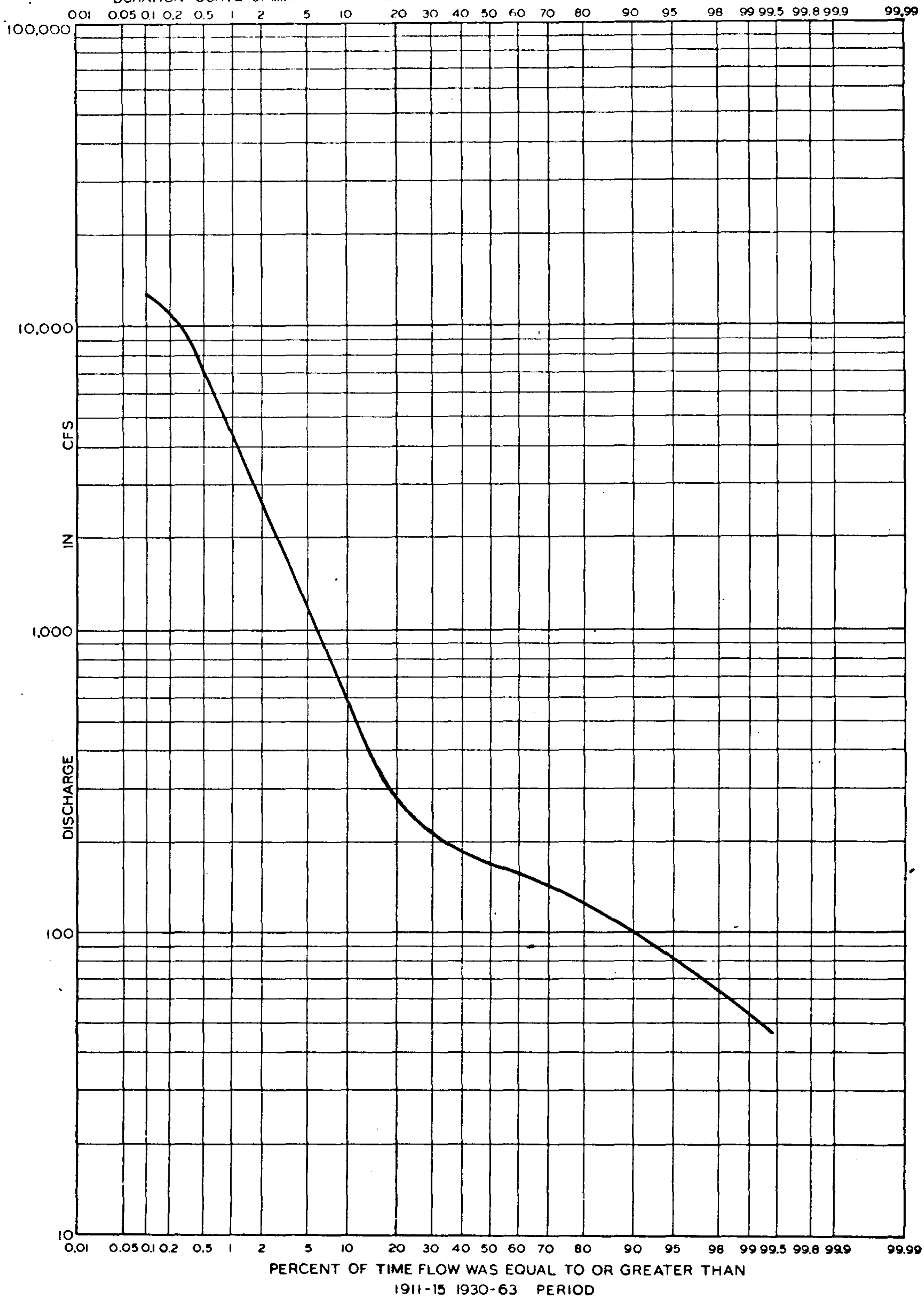

DURATION CURVE OF ARIKAREE RIVER AT HAIGLER (8215)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
1,000
100
10
1
.1
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1933-63 PERIOD

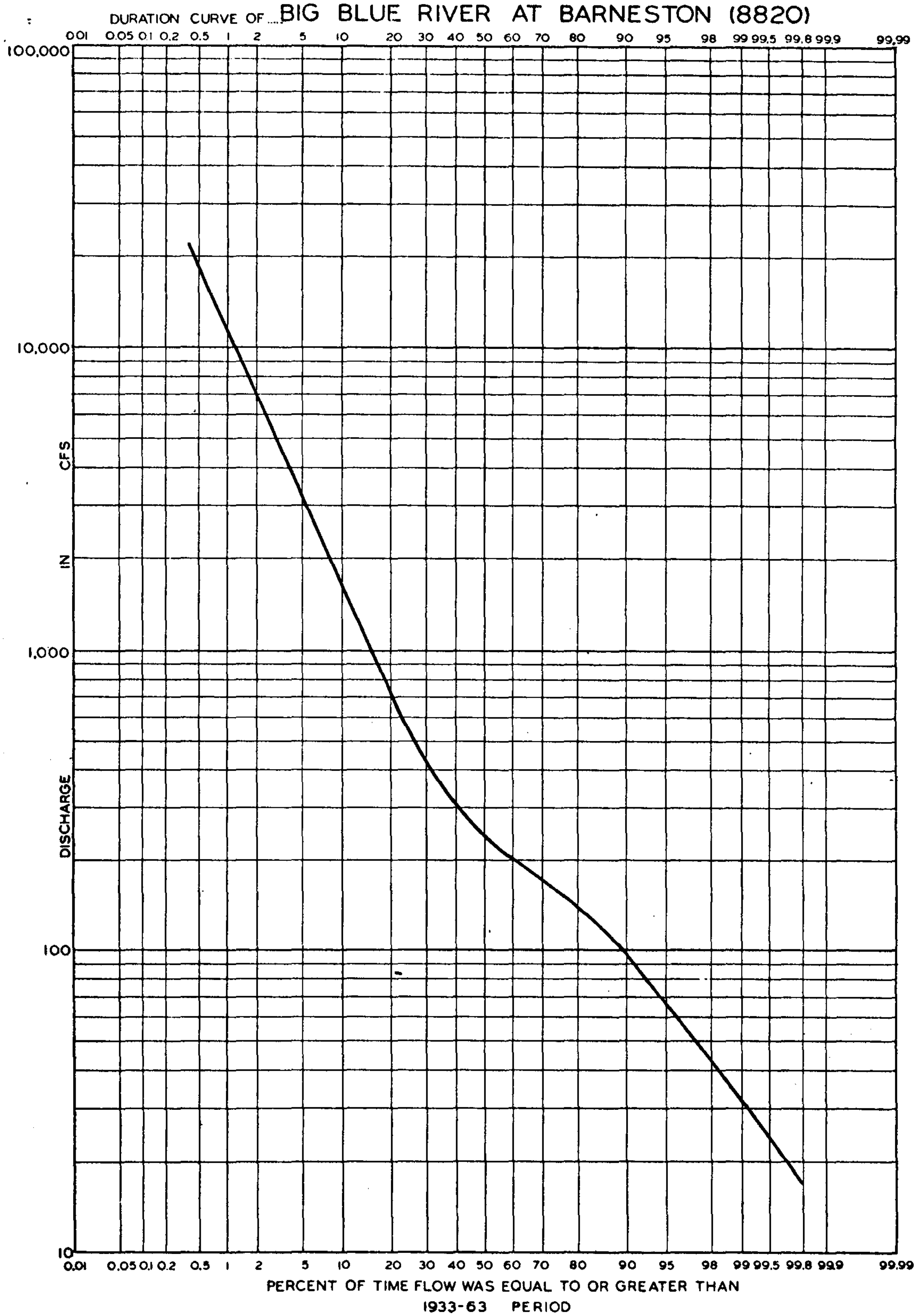
NORTH FORK REPUBLICAN RIVER AT
DURATION CURVE OF .....COLO.-NEBR. STATE LINE (8230)



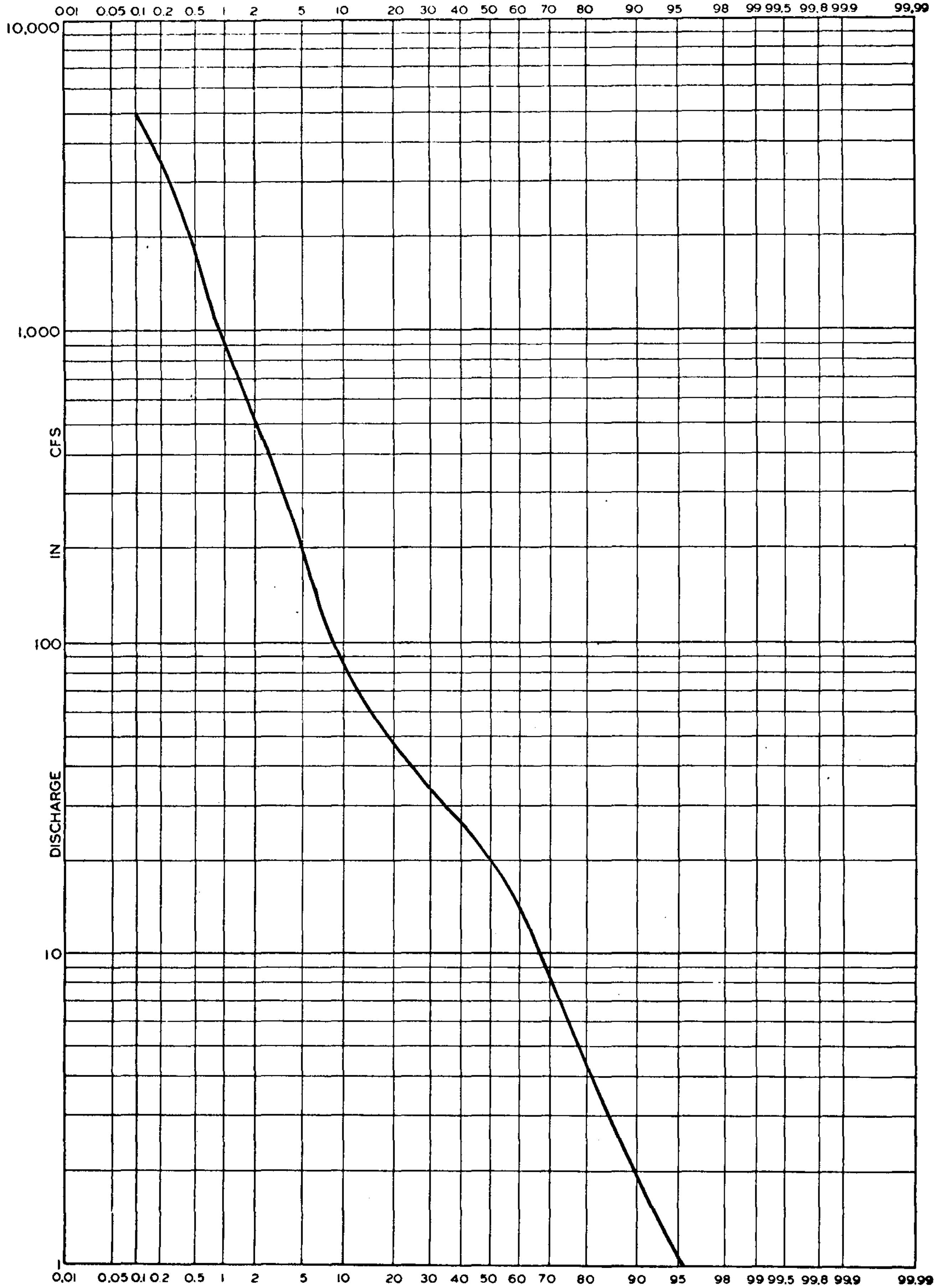

SOUTH FORK REPUBLICAN RIVER NEAR
DURATION CURVE OF BENKELMAN (8275)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
1,000
100
10
1
.1
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1951-63 PERIOD

DURATION CURVE OF LITTLE BLUE RIVER NEAR FAIRBURY (8840)



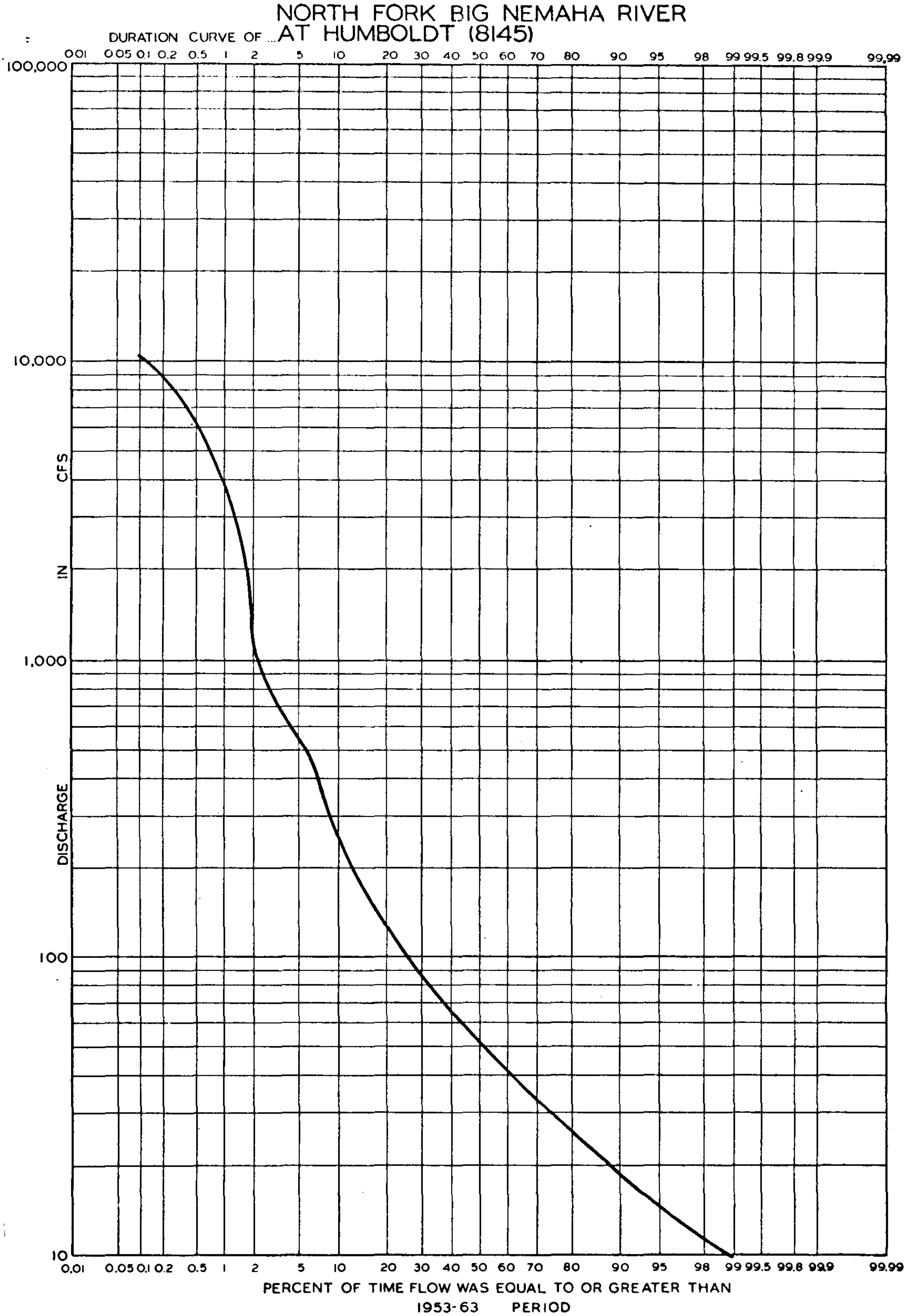

DURATION CURVE OF.... BIG BLUE RIVER AT BARNESTON (8820)
DISCHARGE IN CFS
100,000
10,000
1,000
100
10
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1933-63 PERIOD

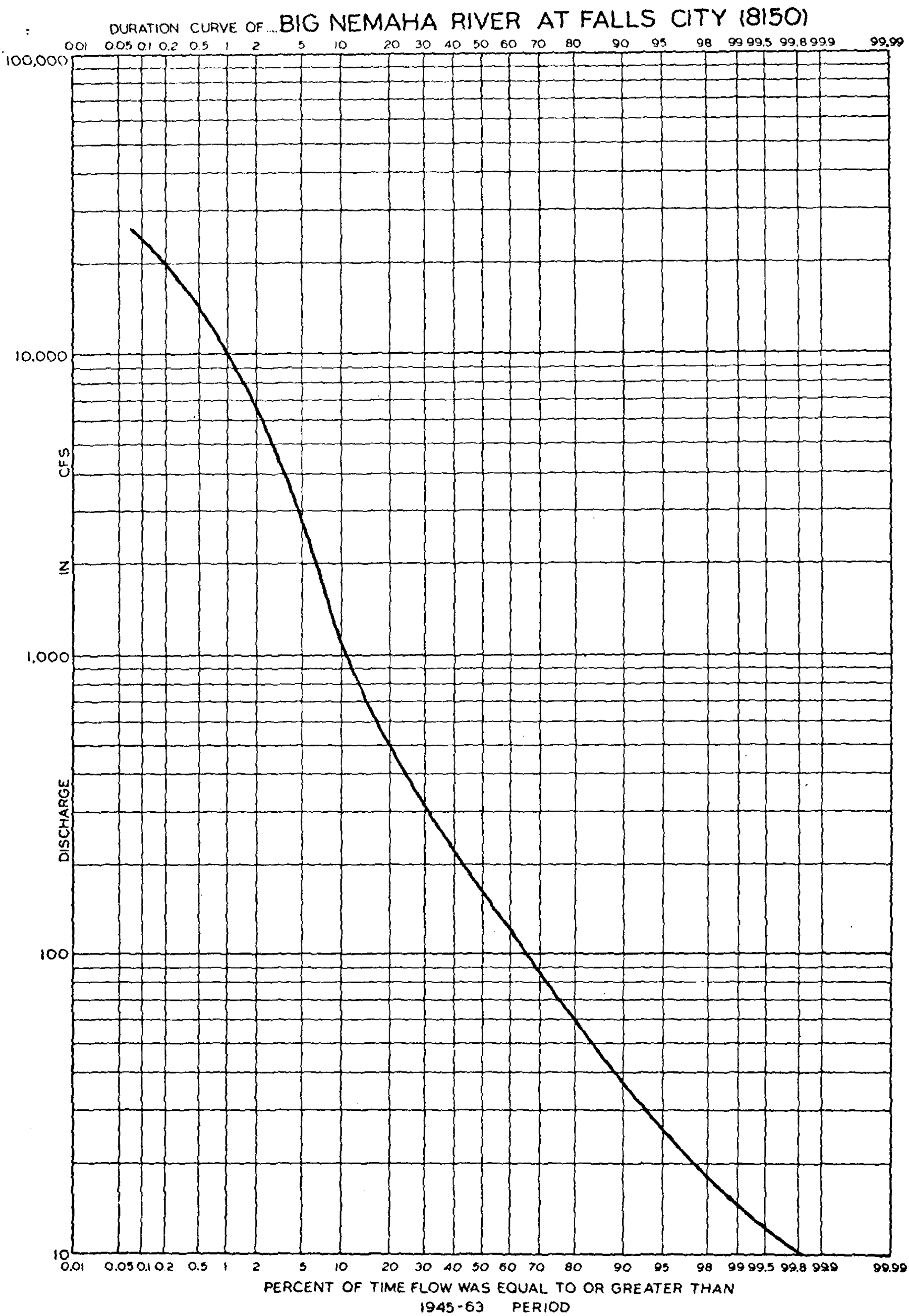
DURATION CURVE OF LITTLE NEMAHA RIVER NEAR SYRACUSE (8105)



PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN

1952-63 PERIOD


NORTH FORK BIG NEMAHA RIVER
DURATION CURVE OF AT HUMBOLDT (8145)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
100,000
10,000
1,000
100
10
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1953-63 PERIOD


DURATION CURVE OF ... BIG NEMAHA RIVER AT FALLS CITY (8150)
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99
100,000
10,000
1,000
100
10
DISCHARGE IN CFS
PERCENT OF TIME FLOW WAS EQUAL TO OR GREATER THAN
1945-63 PERIOD