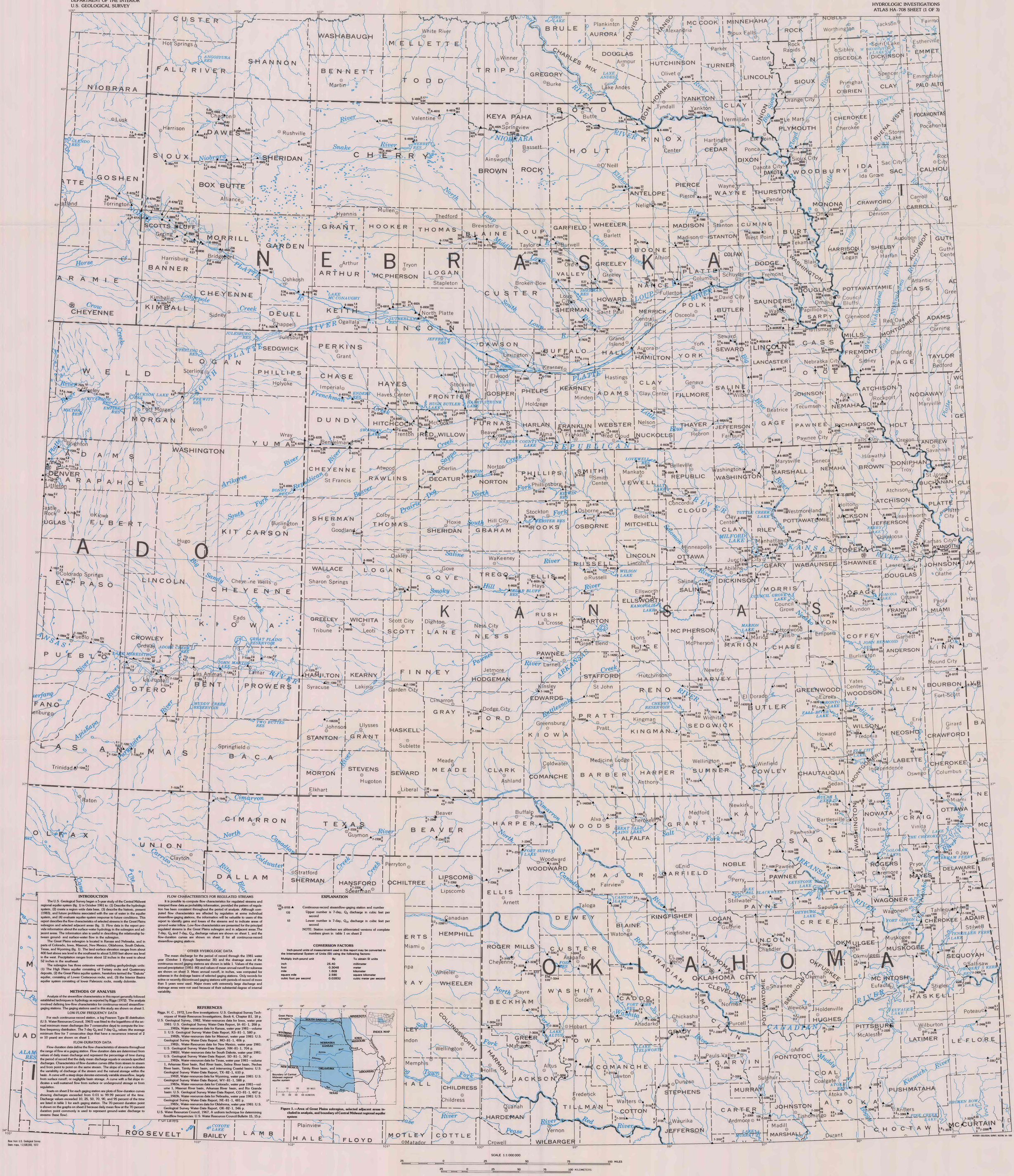

Map showing location of continuous-record streamflow-gaging stations and low-flow frequency data for selected streams

FLOW CHARACTERISTICS FOR SELECTED STREAMS IN THE GREAT PLAINS SUBREGION, OF THE CENTRAL MIDWEST REGIONAL AQUIFER SYSTEM AND SELECTED ADJACENT AREAS—KANSAS AND NEBRASKA, AND PARTS OF COLORADO, IOWA, MISSOURI, NEW MEXICO, OKLAHOMA, SOUTH DAKOTA, TEXAS, AND WYOMING

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INTRODUCTION

The U.S. Geological Survey began a 5-year study of the Central Midwest regional aquifer system (fig. 1) in October 1981 to: (1) Describe the hydrologic system, (2) create a region-wide data base, (3) describe the historic, present (1983), and future problems associated with the use of water in the aquifer system, and (4) evaluate aquifer-system response to future conditions. This report describes the flow characteristics of selected streams in the Great Plains subregion and selected adjacent areas (fig. 1). Flow data in the report provide information about the surface-water hydrology in the subregion and adjacent areas. The information also is useful in describing the relationship between ground- and surface-water flow in the subregion.

The Great Plains subregion is located in Kansas and Nebraska, and in parts of Colorado, Iowa, Missouri, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (fig. 1). The land-surface elevation ranges from about 400 feet above sea level in the southeast to about 5,000 feet above sea level in the west. Precipitation ranges from about 12 inches in the west to about 52 inches in the southeast.

The subregion has three extensive water-yielding geohydrologic units: (1) The High Plains aquifer consisting of Tertiary rocks and Quaternary deposits, (2) the Great Plains aquifer system, heretofore termed the "Dakota" aquifer, consisting of Lower Cretaceous rocks, and, (3) the Interior Basins aquifer system consisting of lower Paleozoic rocks, mostly dolomite.

METHODS OF ANALYSIS

Analysis of the streamflow characteristics in this report generally followed established techniques in hydrology as reported by Riggs (1972). The analysis involved defining low-flow characteristics for continuous-record streamflow-gaging stations. The gaging stations used in this study are shown on sheet 1.

LOW-FLOW FREQUENCY DATA

For each continuous-record station, a log-Pearson Type-III distribution (U.S. Water Resources Council, 1967) was fitted to the logarithms of the annual minimum mean discharges (for 7 consecutive days) to compute the low-flow frequency distribution. The 7-day Q_2 and 7-day Q_{10} values (the average minimum flow for 7 consecutive days that have a recurrence interval of 2 or 10 years) are shown on sheet 1.

FLOW-DURATION DATA

Flow-duration data define the flow characteristics of streams throughout the range of flow at a gaging station. Flow-duration data are determined from values of daily mean discharge and represent the percentage of time during the period of record that the daily mean discharge equals or exceeds specified discharges. Characteristics of flow-duration curves differ from stream to stream and from point to point on the same stream. The slope of a curve indicates the variability of discharge of the stream and the natural storage within the basin. A curve with a steep slope denotes extremely variable streamflow, largely from surface runoff; or negligible basin storage. A curve with a flat slope indicates a well-sustained flow from surface or underground storage or from regulation.

Insets on sheet 2 for each gaging station are plots of flow-duration curves showing discharges exceeded from 0.01 to 99.99 percent of the time. Discharge values exceeded 10, 25, 50, 70, 90, and 95 percent of the time are listed in table 1 for each gaging station. The 70-percent duration point is shown on the graphs on sheet 2 because daily mean flow at the 70-percent duration point commonly is used to represent ground-water discharge to streams (base flow).

FLOW CHARACTERISTICS FOR REGULATED STREAMS

It is possible to compute flow characteristics for regulated streams and interpret these data as probability information, provided the pattern of regulation has been consistent throughout the period of analysis. Although computed flow characteristics are affected by regulation at some individual streamflow-gaging stations, the information will be valuable to users of this report to identify gains and losses of the streams and to indicate areas of ground-water inflow. Low-flow characteristics are presented for the principal regulated streams in the Great Plains subregion and in adjacent areas. The 7-day, Q_2 and 7-day, Q_{10} discharge values are shown on sheet 1, and the flow-duration curves are shown on sheet 2 for all continuous-record streamflow-gaging stations.

OTHER HYDROLOGIC DATA

The mean discharge for the period of record through the 1981 water year (October 1 through September 30) and the drainage area of the continuous-record gaging stations are shown in table 1. Values of the mean annual precipitation (1951–80) and values of mean annual runoff for subareas are shown on sheet 3. Mean annual runoff, in inches, was computed for subareas in the drainage basins of selected gaging stations. Only records for active or recently discontinued gaging stations with periods of record of more than 5 years were used. Major rivers with extremely large discharge and drainage areas were not used because of their substantial degree of internal variability.

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EXPLANATION

120 / 53 6-8155 ▲	Continuous-record streamflow-gaging station and number
120	Upper number is 7-day, Q_2 discharge in cubic feet per second
53	Lower number is 7-day, Q_{10} discharge in cubic feet per second

NOTE: Station numbers are abbreviated versions of complete numbers given in table 1 on sheet 2

CONVERSION FACTORS

Inch-pound units of measurement used in this report may be converted to the International System of Units (SI) using the following factors:

Multiply inch-pound unit	By	To obtain SI units
inch	25.40	millimeter
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
cubic foot per second	0.02832	cubic meter per second

Figure 1.—Area of Great Plains subregion, selected adjacent areas included in analysis, and boundary of Central Midwest regional aquifer system

Base from U.S. Geological Survey State maps, 1:2,500,000, 1972

For sale by U.S. Geological Survey, Map Distribution, Box 25286, Federal Center, Denver, CO 80225