FLOW CHARACTERISTICS OF STREAMS THAT DRAIN THE
FORT APACHE AND SAN CARLOS INDIAN RESERVATIONS,
EAST-CENTRAL ARIZONA, 1930-86

By Stanley Baldys, III, and John A. Bayles

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Conversion Factors

For readers who prefer to use metric (International System) units, the conversion factors for the inch-pound units used in this report are listed below:

<table>
<thead>
<tr>
<th>Inch-pound Unit</th>
<th>By</th>
<th>Metric Unit</th>
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<tbody>
<tr>
<td>inch (in.)</td>
<td>25.40</td>
<td>millimeter (mm)</td>
</tr>
<tr>
<td>foot (ft)</td>
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<td>meter (m)</td>
</tr>
<tr>
<td>mile (mi)</td>
<td>1.609</td>
<td>kilometer (km)</td>
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<tr>
<td>acre</td>
<td>0.4047</td>
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<td>square mile (mi²)</td>
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<td>square kilometer (km²)</td>
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<tr>
<td>cubic foot per second (ft³/s)</td>
<td>0.02832</td>
<td>cubic meter per second (m³/s)</td>
</tr>
<tr>
<td>degree Fahrenheit (°F)</td>
<td>°C = 5/9 x (°F-32)</td>
<td>degree Celsius (°C)</td>
</tr>
</tbody>
</table>

Sea Level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.)
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ABSTRACT

An appraisal of streamflow characteristics of the Salt River and Gila River basins in the Fort Apache and San Carlos Indian Reservations, east-central Arizona, was done in response to pending adjudication of water resources in those basins. Statistical summaries were compiled for 28 streamflow-gaging stations in and near the reservations. Mean annual streamflow for 1930-86 was computed for streamflow-gaging stations with complete records for the period; for those stations with records that did not completely cover the 1930-86 period, record-extension techniques were used. Mean annual streamflow for ungaged sites on streams with gaging stations was estimated by interpolation between data points using drainage-area ratios. Two regression equations were derived to estimate mean annual streamflow at sites on ungaged natural streams. The standard error of the regression for estimation of mean annual flow for sites in the Salt River basin is 37 to 59 percent. The standard error of the regression for estimation of mean annual flow for sites in the Gila River basin is 18 to 21 percent.

INTRODUCTION

The Salt and Gila Rivers are the major surface-water drainages in east-central Arizona (fig. 1), and the rights to use water from those rivers are being claimed by agricultural, industrial, and domestic users. A general adjudication of water rights is underway for the Salt River and Gila River drainage basins to determine the rights of water users to the available supply. The Fort Apache and San Carlos Indian Reservations make up a large part of the Salt River and Gila River drainage basins (fig. 1). A better understanding of year-to-year variations in streamflows and their relation to long-term climatic conditions in the drainage basin will allow estimates to be compiled for the mean annual quantity of surface water available at various points on major streams for use in the adjudication process. As part of the adjudication process, the U.S. Geological Survey, in cooperation with the Arizona Department of Water Resources, did an appraisal of the streamflow characteristics of the Salt and Gila Rivers and their major tributaries in the Fort Apache and San Carlos Indian Reservations (fig. 1).
Figure 1.—Location of Salt River and Gila River drainage basins, Fort Apache and San Carlos Indian Reservations, and Arizona water provinces.
Purpose and Scope

This report presents an appraisal of characteristics of streamflow in the Fort Apache and San Carlos Indian Reservations in east-central Arizona. The first section of the report includes results of the investigation of basin and climatic characteristics at streamflow-gaging stations, analysis of data from streamflow-gaging stations, and an analysis of the stationarity of streamflow and precipitation patterns at selected sites. The second section gives selected estimates of mean annual streamflow at streamflow-gaging stations for the base period of 1930-86 and methods of estimating mean annual streamflow at ungauged sites.

Basin and climatic characteristics calculated for each streamflow-gaging station include drainage area, stream length, mean basin elevation, forested area, soil index, mean annual precipitation, precipitation intensities, and main-channel slope index. Several of these characteristics were updated from those previously calculated on the basis of new or updated 1:24,000 topographic maps and were stored in files of the U.S. Geological Survey.

Streamflow data used in this study were collected at U.S. Geological Survey streamflow-gaging stations. Statistics calculated from streamflow data include mean monthly and annual discharges, magnitude and probability of annual low and high flows, magnitude and probability of instantaneous peak flow, and duration of daily mean flow. Summaries of these statistics for 28 streamflow-gaging stations through water year 1986 are given at the end of the report.

An analysis of the stationarity of streamflow and precipitation data was made at long-term sites within or near reservation boundaries. The analysis was to determine if the base period selected for the estimation of mean annual streamflow represented long-term conditions. Stationarity of streamflow patterns was evaluated at four streamflow-gaging stations—09448500, Gila River at head of Safford Valley, near Solomon; 09448500, San Carlos River near Peridot; 09497500, Salt River near Chrysotile; and 09498500, Salt River near Roosevelt. Precipitation data used in this study are from stations operated by private individuals, corporations, or Federal agencies. The data from those stations were collected and published by the National Oceanic and Atmospheric Administration (1933-86). Major changes in precipitation patterns were investigated at three climatological stations—Globe, Whiteriver, and McNary.

Mean annual streamflow for a base period of 1930-86 was estimated for reaches of streams in the study area where sufficient data allowed a reliable estimate to be made. These estimates are shown on plate 1. Mean annual streamflow for the reach of the Gila River between Solomon and Calva was not estimated because of lack of accurate data for diversions and sumpage of water from the Gila River and problems with estimating the amount of streamflow lost to recharge and evapotranspiration. Mean annual streamflow upstream from the confluence of the San Francisco River and the upper Gila River are not shown on plate 1 because these drainages do not lie within the Fort Apache Indian Reservation or San Carlos Indian Reservation boundaries.
Description of Study Area

The study area in east-central Arizona includes the Fort Apache and San Carlos Indian Reservations, which cover 5,457 mi², and selected adjacent drainages that contain streamflow-gaging stations. The study area is bounded on the north by the Mogollon Rim and the White Mountains and extends southward to the Gila Mountains. The Gila Mountains form the major part of the southeast boundary of the San Carlos Reservation. Several mountain ranges, which include the Sierra Ancha and Pinal Mountains, form the west boundary. Elevations in the study area range from about 2,200 ft above sea level along the Gila River downstream from the San Carlos Reservoir to 11,403 ft at the summit of Mount Baldy in the White Mountains.

Climatic variations are controlled largely by elevation and topography of the land surface. Average annual precipitation ranges from about 15 in. in the low-lying area southwest of the San Carlos Reservoir to about 34 in. in the White Mountains and is between 15 and 25 in. throughout much of the study area (table 1). In the winter months, precipitation that results from frontal storms is widespread and light to moderate in intensity. Localized and sometimes intense rainfall is associated with convective storms in July and August. At San Carlos, which is the lowest elevation climatological station in the reservations, the average daily maximum temperature is 101 °F in July and 61 °F in January (Sellers and others, 1985). At Hawley Lake in the White Mountains, which is the highest elevation station in the reservations, the average daily maximum temperature is 75 °F in July and 41 °F in January (Sellers and others, 1985).

The Salt and Gila Rivers are the two largest rivers that drain the Fort Apache and San Carlos Indian Reservations (pl. 1). The Black and White Rivers join near the center of the study area and form the Salt River. The Black River and its continuation as the Salt River form the boundary between the two reservations. The Gila River flows in a northwesterly and westerly direction through the southern part of the San Carlos Indian Reservation. The San Carlos River drains the central part of the San Carlos Indian Reservation and joins the Gila River at San Carlos Reservoir. Some reaches of the tributary streams are perennial, but the magnitude of flow in most of these streams is unknown.

The Fort Apache and San Carlos Indian Reservations are mainly in the Central highlands water province (Harshbarger and others, 1966; fig. 1, this report). The southwestern part of the San Carlos Reservation, which includes the main channel of the Gila River through Safford Valley and its contributing drainage area, is in the Basin and Range lowlands province (Harshbarger and others, 1966).

The study area consists of drainage basins with diverse surface geology. The Black River and Big Bonito Creek in the Salt River basin head in the White Mountains, which are composed mainly of basalt (Wilson and others, 1960). Cibecue Creek and Carrizo Creek drainage basins are underlain mostly by Coconino Sandstone and Supai Formation (Wilson and others, 1959; 1960). The upper part of the White River drainage basin is underlain mainly by basalt, and the lower part of the basin is underlain mainly by the Supai Formation (Wilson and others, 1959; 1960).
Bonita Creek drainage in the Gila River basin contains volcanic deposits at the higher elevations and sedimentary deposits in the lower elevations of the basin (Wilson and Moore, 1958). The part of the Gila River drainage basin that is within the San Carlos Indian Reservation is underlain mainly by alluvial deposits of gravel, sand, and silt. Mount Turnbull, south of San Carlos Reservoir, is composed of granite and crystalline intrusive rocks (Wilson and Moore, 1958). Eagle Creek basin generally contains volcanic rocks, although there is an area of sedimentary deposits in the Point of Pines area (Wilson and Moore, 1958). Deposits in the areas northwest and southwest of San Carlos Reservoir are a mixture of granitic, volcanic, sedimentary, and metamorphic rocks (Wilson and others, 1959; Wilson and Moore, 1958).

Most of the Salt River drainage basin south of the Salt River is volcanic in composition. The exception is the part of the Salt River basin at the west boundary of the Fort Apache Indian Reservation, which is underlain by a mixture of sandstone, quartzite, limestone, and diabase (Wilson and others, 1959).

**STREAMFLOW CHARACTERISTICS**

Characteristics of streamflow in the study area were determined from streamflow data collected as early as 1915; by 1930, five streamflow-gaging stations were in operation. Streamflow statistics excluding those for frequency of instantaneous peak flows were calculated from values of daily mean flow determined at 28 streamflow-gaging stations (pl. 1). Standard methods (Corbett, 1943, p. 109-115; Rantz and others, 1982a, b) were used in the measurement, collection, and computation of streamflow records. Streamflow records prior to water year 1960 were published in two compilation reports by the U.S. Geological Survey (1954; 1964). Streamflow records for the 1960-86 water years are published in the annual water-data series (U.S. Geological Survey, 1965-74, 1976-82; White and Garrett, 1984, 1988; Wilson and Garrett, 1988).

Standard statistical procedures for compiling streamflow statistics (Chow, 1964, p. 8-6 to 8-8) were used in this study except for procedures used to compute frequency of peak flows. Frequencies of instantaneous peak flows were calculated using log-Pearson Type III frequency distributions only at sites with at least 10 years of record (U.S. Interagency Advisory Committee on Water Data, 1982). The period of record for which streamflow statistics were compiled at streamflow-gaging stations used in this study except for frequencies of instantaneous peak flows is shown in figure 2. All streamflow statistics were calculated on the basis of a water year that begins on October 1 and ends on September 30, with the exception of magnitude and probability of annual low flows, which were calculated on the basis of a climatic year that begins on April 1 and ends on March 31. Different definitions of the year are used for compiling low-flow and high-flow data. The different definitions are needed in order to obtain hydrologically meaningful statistics. Streamflow in eastern Arizona is generally seasonal. Summer dry periods (low-flow events) alternate with winter-spring wet periods (high-flow events). It is the statistical characteristics of these events that are of hydrologic (and socioeconomic) importance. Compilations of low-flow and high-flow data, therefore, should reflect the occurrence of these events. Use of a water
Figure 2.—Period of record of complete years of daily discharge values at streamflow-gaging stations.
A method described by Kendall (1975) was used at four long-term streamflow-gaging stations to test for trends in streamflow. Annual mean flow and a 5-year moving average were plotted to identify short-term trends. Tree-ring data also have been used to evaluate the historic trends in streamflow in the study area (Smith and Stockton, 1981).

Precipitation data were evaluated for stationarity by regression analysis (Alley, 1988, p. 1957) and by a test of difference between two population means (Iman and Conover, 1983, p. 268) at three climatological stations in or near the reservation boundaries. The three stations—Globe, Whiteriver, and McNary—were selected because they had the most complete precipitation record of sites in the area.

**Basin and Climatic Characteristics**

Basin and climatic characteristics were determined for each streamflow-gaging station (table 1) using the following criteria (U.S. Geological Survey, 1977).

- **Drainage area**, in square miles, is the area of a river basin above the gaging station, measured in a horizontal plane, enclosed by a topographic divide so that direct surface runoff from precipitation normally would drain by gravity into the river basin. The area on a map enclosed by the drainage-basin boundary is measured with a planimeter. Drainage areas for gaging stations in this study ranged from 11,470 mi² at Gila River at Calva to less than 0.06 mi² at Cibecue No. 2, Tributary to Carrizo Creek near Show Low.

- **Stream length**, in miles, is the length of the main channel, \( L_c \), from the gaging station to the basin divide. The main channel is chosen at each bifurcation by following the fork that has the largest drainage area. Stream lengths for gaging stations on the Salt River ranged from 0.30 to 205.8 mi. Stream lengths for gaging stations on the Gila River ranged from 18.3 to 225.2 mi.

- **Mean basin elevation**, in feet, is the average distance above sea level of representative points in the basin. Mean basin elevation is computed as the arithmetic average of the elevation of 50 to 100 points at the intersections of equally...
<table>
<thead>
<tr>
<th>Station number</th>
<th>Station name</th>
<th>Period of record, water years</th>
<th>Drainage area, in square miles</th>
<th>Stream length, in miles</th>
<th>Mean basin elevation, in feet</th>
<th>Forested area, in percent</th>
<th>Soil index, in inches</th>
<th>Mean annual precipitation, in inches</th>
<th>Precipitation, in inches, for 24-hour period and indicated recurrence interval</th>
<th>Main-channel slope index, in feet per mile</th>
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<td>102</td>
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<td>8,000</td>
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<td>1958-81</td>
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<td>7,200</td>
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<td>23.4</td>
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1 See footnote at end of table.
Table 1.—Selected basin and climatic characteristics at streamflow-gaging stations in and near the Fort Apache and San Carlos Indian Reservations—Continued

<table>
<thead>
<tr>
<th>Station number</th>
<th>Station name</th>
<th>Period of record, water years</th>
<th>Drainage area, in square miles</th>
<th>Stream length, in miles</th>
<th>Mean basin elevation, in feet</th>
<th>Mean annual precipitation, in inches</th>
<th>Precipitation, in inches, for 24-hour period and indicated recurrence interval</th>
<th>2-year</th>
<th>50-year</th>
<th>Main-channel slope index, in feet per mile</th>
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<td>North Fork White River near Greer</td>
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<td>36.7</td>
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<td>22.0</td>
<td>2.2</td>
<td>4.6</td>
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<td>Cibecue No. 1, Tributary to Carrizo Creek, near Show Low</td>
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<td>0.3</td>
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<td>4.1</td>
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<tr>
<td>09497800</td>
<td>Cibeque Creek near Chrysotile</td>
<td>1960-86</td>
<td>295</td>
<td>38.5</td>
<td>5,700</td>
<td>78</td>
<td>20.7</td>
<td>2.2</td>
<td>4.2</td>
<td>79.6</td>
</tr>
<tr>
<td>09497980</td>
<td>Cherry Creek near Globe</td>
<td>1966-86</td>
<td>200</td>
<td>36.4</td>
<td>5,600</td>
<td>81</td>
<td>2.90</td>
<td>24.0</td>
<td>2.6</td>
<td>5.0</td>
</tr>
<tr>
<td>09498500</td>
<td>Salt River near Roosevelt</td>
<td>1915-86</td>
<td>4,306</td>
<td>206</td>
<td>6,190</td>
<td>71</td>
<td>2.81</td>
<td>22.0</td>
<td>2.3</td>
<td>4.4</td>
</tr>
</tbody>
</table>

1 Water years that had complete daily value records.
spaced grid lines superimposed on a map of the basin. Mean basin elevations ranged from 4,480 ft for San Carlos River near Peridot drainage basin to 9,520 ft for North Fork White River near Greer drainage basin.

- Forested area, in percent, is the percentage of drainage area shown as forested on topographic maps. Forested area is computed by planimetrering the area shown as covered by forests and dividing by total drainage with a multiplication factor of 100. Drainage area covered by forested area ranged from 10 percent for the San Carlos River near Peridot drainage basin to 100 percent for Cibecue No. 1 and No. 2, Tributaries to Carrizo Creek.

- Soil index, in inches, is a numerical index of infiltration and retention characteristics of the soil. It was calculated by applying the grid system to a soils map (U.S. Soil Conservation Service, 1969) that had the drainage basin delineated on the map. The soil index ranged from 1.21 in. at Bonita Creek near Morenci to 3.00 in. at most sites.

- Mean annual precipitation, in inches, is the normal annual precipitation that falls on the drainage basin. Mean annual precipitation is determined by outlining the drainage basin on a normal annual precipitation map (University of Arizona, 1965) and summing the products of the planimetrered subareas and their midrange precipitation value and dividing by total area. The grid system that was used to determine mean basin elevation and soil types also was used to determine the mean annual precipitation. Mean annual precipitation for gaging stations on the Salt River ranged from 18.0 in. at Cibecue No. 1 and No. 2, Tributaries to Carrizo Creek to 34.2 in. at North Fork White River near Greer. Mean annual precipitation for gaging stations on the Gila River ranged from 15.5 in. for Gila River at Calva to 20.0 in. for Eagle Creek near Double Circle Ranch, near Morenci.

- Precipitation, in inches, for a 24-hour storm period with recurrence intervals of 2 years and 50 years, was determined by outlining the drainage basin on a precipitation map (U.S. Weather Bureau, 1967), summing the products of planimetrered subareas of a drainage basin and the midrange precipitation value, and dividing by total area. Precipitation in a 24-hour time period with a 2-year recurrence interval ranged from 1.7 in. at Gila River at head of Safford Valley, near Solomon and Gila River at Calva to 2.9 in. for the North Fork White River near Greer and North Fork White River near McNary drainage basins. Precipitation in a 24-hour time period with a 50-year recurrence interval ranged from 3.4 in. at Gila River at head of Safford Valley to 5.5 in. for the North Fork White River near Greer drainage basins.

- Main-channel slope index, in feet per mile, is an index of the slope of the main channel and was computed from the difference in streambed elevation at points that are 10 and
85 percent of the distance along the main channel from the gaging station to the basin divide. The 10 and 85 percent distance points are selected to provide an index with a relative standard error of estimate of 5 percent by excluding in the computation parts of the basin with nonuniform main-channel slope. Main-channel slope index was computed from the equation

\[ S_c = \frac{(E_{85} - E_{10})}{0.75L_c}, \]

where

- \( S_c \) = main-channel slope index, in feet per mile;
- \( E_{85} \) = elevation at 85 percent of main-channel distance, in feet;
- \( E_{10} \) = elevation at 10 percent of main-channel distance, in feet; and
- \( L_c \) = length of main channel, in miles.

Main-channel slope index ranged from 20.4 ft/mi for the Gila River at Calva to 363.6 ft/mi for the Cibecue No. 1, Tributary to Carrizo Creek near Show Low. In the study area, 75 percent of the drainage basins had main-channel slope indices of less than 100 ft/mi.

**Explanation of Statistical Summaries**

Statistical summaries of streamflow data were computed on the basis of daily mean values of flow and instantaneous peak flows and were compiled for each of the 28 streamflow-gaging stations in the study area (see statistical summaries at end of the report). Summaries were determined for mean monthly and annual discharges, magnitude and probability of annual low and high flows, magnitude and probability of instantaneous peak flow, and percent of time that a given daily mean flow was exceeded or equaled. With the exception of magnitude and probability of instantaneous peak flow, values of the streamflow characteristics were computed from water year data sets containing complete daily mean streamflow records. The calculation of the magnitude and probability of instantaneous peak flow may include a peak outside the systematic record. For example, the peak flow that occurred in the 1916 water year at Salt River near Chrysotile was included in the calculation of the magnitude and probability of instantaneous peak flow but was not used in the determination of the other streamflow characteristics for that station. Streamflow statistics for recurrence intervals greater than two times the length of record have uncertain reliability and a potential error that is caused by the extrapolation of the statistic beyond the period of record.

Statistics of mean monthly discharges show the flow distribution by month and are used to determine when the largest flow is expected. For
example, the mean monthly and annual discharge table for Salt River near Chrysotile shows that the largest quantity of flow per month can be expected to occur in April (1,740 ft³/s) and the smallest quantity of flow per month in July (227 ft³/s).

Low-flow magnitude and probability were calculated for 1-, 3-, 7-, 14-, 30-, 60-, 90-, 120-, and 183-day periods. High-flow magnitude and probability were calculated for 1-, 3-, 7-, 15-, 30-, 60-, and 90-day periods. These statistics indicate the non-exceedance probability for low flows and exceedance probability for high flows that have 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals. An example of these streamflow characteristics is the 7-day low- and high-flow discharge for a 50-year recurrence interval for Salt River near Chrysotile. A 2-percent chance exists that 7-day mean flows of 56 ft³/s or less will occur in any year and a 2-percent chance that 7-day mean flows of about 19,600 ft³/s or more will occur in any year.

Instantaneous peak-flow magnitude and probability were calculated for stations with at least 10 years of record. Instantaneous peak-flow magnitudes for the 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals or 50, 20, 10, 2 and 1 percent exceedance probabilities were calculated. For example, at Salt River near Chrysotile, the probability of an instantaneous peak flow of 121,000 ft³/s being equaled or exceeded in a given water year is 1 percent. The probability of exceedance is the chance that an instantaneous peak flow of given magnitude will be exceeded in any one year. Recurrence interval is the reciprocal of the probability of occurrence and is the average number of years between occurrences. Recurrence intervals imply no regularity of occurrence; a 50-year flood might be exceeded in consecutive years or it might not be exceeded in a 50-year period. The weighted skew, mean, and standard deviation shown in the statistical summaries section are in logarithmic units.

The percentage of time a given daily mean discharge was equaled or exceeded is expressed in terms of a duration analysis or duration table. Discharges were calculated for the 1, 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 95, 98, 99, 99.5, and 99.9 percentiles. For example, at Salt River near Chrysotile, daily mean flows of 108 ft³/s were exceeded 95 percent of the days in the period of record.

**Trends in Streamflow**

Trends in streamflow were studied at four of the five streamflow-gaging stations that were in operation in the study area by 1930. Data for streamflow-gaging station, Gila River at Calva, were not used in the analysis of trends because agricultural diversions upstream from the station would distort the results. Two of the five stations—Gila River at head of Safford Valley, near Solomon, and Salt River near Roosevelt—were in operation in the 1915 water year. Annual mean streamflow and 5-year moving averages (Pollard, 1977, p. 26) were computed for four of the five long-term stations—Gila River at head of Safford Valley, near Solomon; San Carlos River near Peridot; Salt River near Chrysotile; and Salt River near Roosevelt (fig. 3).
Figure 3.—Annual mean streamflow and 5-year moving average.
Annual mean streamflow data for 1915-86 for Gila River at head of Safford Valley, near Solomon, and Salt River near Roosevelt generally show higher-than-average flow conditions for 1916-20 and 1978-86 (fig. 3). The 5-year moving average of annual mean discharge for the four gaging stations indicates that 1945-55 had the smallest quantities of streamflow. A Kendall tau test (Kendall, 1975) on annual mean streamflow that uses annual precipitation as an explanatory variable did not show a constantly increasing or decreasing trend in streamflow for the period of record at any of the four streamflow-gaging stations. Instead, the 5-year moving average showed a generally decreasing trend for 1916-22, a generally increasing trend for 1970-86, and a fairly stable period for 1923-69.

**Trends in Precipitation**

Precipitation data at climatological stations Globe, Whiteriver, and McNary were analyzed for trends to evaluate stationarity of the data. Changes in precipitation patterns on the study area would have an effect on the runoff yield from the drainage basins. Climatological data have been collected at several other sites in the study area; however, these three sites were selected for precipitation-data analysis because of the length of record, range in elevation covered between sites, and period of record that is concurrent with the operation of streamflow-gaging stations in the study area (pl. 1). Elevations ranged from 3,550 ft at the Globe climatological station to 7,320 ft at the McNary station. Collection of precipitation data began at Globe in 1888 (systematic collection began in 1908), at Whiteriver in 1923, and at McNary in 1934. Although the records generally are continuous, periods of no data collection occurred at each site (table 2). Where gaps in records exist, precipitation data were estimated using multiple-regression analysis from one of the other two precipitation stations to provide a systematic record so that a 5-year moving average could be computed (fig. 4). Precipitation data followed the same pattern as the streamflow data. Above-average annual precipitation with a decreasing trend occurred in 1916-22 at the Globe station. Above-average annual precipitation with a generally increasing trend occurred in 1978-85 at each of the three stations. Precipitation totals for 1942-52 generally were less than average (fig. 4).

Precipitation data at the three sites for the period of data collection were evaluated for monotonic trends (significantly increasing or decreasing with time) using a linear-regression analysis of precipitation against time and analyzing the slope of the regression line (Alley, 1988, p. 1957). The parametric test, linear-regression analysis, was chosen over the Kendall tau test (a nonparametric test) because of the distribution of the precipitation data. The regression analysis did not show a statistically significant trend (95-percent confidence level) in precipitation amounts at the three sites (table 2). The slope of the three regression lines was positive and probably was influenced by the larger-than-average amounts of precipitation for 1978-85 (fig. 4). Precipitation amounts were analyzed for two separate time periods—1930-86 and from the start of data collection through 1986—using a difference between two population-means test (Iman and Conover, 1983, p. 268) to determine if annual precipitation for the two periods was different. The statistical test did not find a significant difference between the
Table 2.--Results of trend analysis on precipitation data at Globe, Whiteriver, and McNary

(Dashes indicate no data)

<table>
<thead>
<tr>
<th>Climatological station</th>
<th>Period of record, in water years</th>
<th>Altitude, in feet</th>
<th>Period of record</th>
<th>Average annual precipitation, in inches</th>
<th>Significant differences between periods</th>
<th>Regression analysis²</th>
<th>Significant at a 95-percent confidence level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whiteriver</td>
<td>1923-33, 1941-86</td>
<td>5,280</td>
<td>18.80</td>
<td>18.93</td>
<td>No</td>
<td>Increasing</td>
<td>No</td>
</tr>
<tr>
<td>McNary</td>
<td>1934-37, 1939, 1943-86</td>
<td>7,320</td>
<td>26.93</td>
<td>---</td>
<td>--</td>
<td>Increasing</td>
<td>No</td>
</tr>
</tbody>
</table>

¹(Iman and Conover, 1983, p. 268).
³Includes records estimated from regression analyses of data collected at the three sites.

precipitation amounts for Globe and Whiteriver for the two time periods (table 2). The precipitation record at McNary was not evaluated using this procedure because data collection at the site did not start until 1934.

ESTIMATION OF MEAN ANNUAL STREAMFLOW

An accurate estimate of mean annual streamflow for sites in the study area is necessary to provide the framework for the adjudication of water rights within the two reservation boundaries. This report provides estimates of streamflow for a base time period for sites on streams in the study area using one of several methods. The method available to estimate mean annual flow at a site depends on the data available near or at the site. Sites are classified as gaged sites at gaging stations, unaged sites near gaged sites, sites on unaged natural streams, and sites on stream reaches affected by diversions.
Figure 4.—Annual precipitation and 5-year moving average.
Selection of Base Period

A base period was selected so that statistics computed at various locations could be compared to define spatial relations without interference caused by temporal variations. The selection of a base period for computation of mean annual streamflow is based on two major criteria: (1) The period should encompass the range of hydrologic conditions that can be expected in the study area and (2) the period must be one in which streamflow data have been collected or can be estimated with a high degree of reliability. The base period also should be as long as possible subject to availability of data in the region and be of sufficient length to remove the effects of any short-term trends.

Time-series plots of annual streamflow data and, to a less pronounced extent, precipitation data show a u-shaped pattern with periods of larger quantities of streamflow and precipitation at the ends of the data-collection period (figs. 3 and 4). The smallest quantities of streamflow and precipitation generally occur in the center of the data sets. The exception is the 1941 water year in which larger-than-normal quantities of streamflow and precipitation were recorded.

The second criterion for the selection of a base period for computation of mean annual streamflow is based on the availability of reliable streamflow data. Daily streamflow data for an entire water year were collected in the study area as early as water year 1914 at Salt River near Roosevelt and as early as water year 1915 at Gila River at head of Safford Valley, near Solomon. Systematic streamflow-data collection began at Salt River at Chrysotile in 1925, at Gila River at Calva in 1930, and at San Carlos River near Peridot in 1930.

The reach of the Gila River between streamflow-gaging stations Gila River at head of Safford Valley, near Solomon and Gila River at Calva has several diversions of streamflow for agricultural purposes. Although these diversions were monitored from 1922 to 1931, water in excess of irrigation needs was not monitored and was returned to the Gila River to be rediverted. Streamflow measured as diverted water at an upstream diversion was remeasured again as diverted water at the next downstream diversion. Data collection at the diversions was discontinued during the 1932-35 water years. When the Gila River Decree came into effect on January 1, 1936, water diverted in excess of irrigation needs was reduced to an insignificant amount and data collection at the 12 largest diversions and direct pumping from the Gila River was resumed (U.S. Geological Survey, 1954; 1964). The problems in extending streamflow record at Gila River at Calva include inaccurate or nonexistent records of water returned to the river before 1936 and lack of diversion data for 1932-35. Both problems preclude the reliable estimation of streamflow record during periods of missing record at the Gila River at Calva gaging station before 1936.

Reliable estimation of streamflow before 1930 at San Carlos River at Peridot is difficult because of the lack of correlation with other gaging stations in the same basin. The mouth of the San Carlos River at Peridot is at the north end of San Carlos Reservoir. Coolidge Dam, which regulates the San Carlos Reservoir, was put into operation November 15, 1928. Before 1928, the closest gaging station in operation was downstream station Gila River at Kelvin. Several ungaged tributaries to the Gila
River are present in the reach between Gila River at Kelvin and San Carlos River at Peridot that preclude the use of streamflow records from Gila River at Kelvin to estimate streamflow at San Carlos River at Peridot.

The base period of 1930-86 was selected for the calculation of mean annual streamflow at sites in the study area. This period allows a reliable estimate of mean annual streamflow at points throughout both reservations using systematic streamflow data collected at five streamflow gaging stations. Three of the stations are in the Gila River drainage basin and two are in the Salt River drainage basin. All five stations were in operation throughout the period. Analysis of precipitation and streamflow data for changes in stationarity during 1930-86 did not show statistically significant long-term trends in the data sets. The 57-year period is of sufficient length to minimize the effects of short-term trends in streamflow. The base period contains periods of high flow as well as periods of drought. Periods of record that extend beyond the base period are not used, as in the record before 1930 at Salt River near Roosevelt and Gila River at head of Safford Valley, near Solomon. The period 1930-86 appears to be the most reliable base period because of the availability of data from which to define areal variations of mean annual streamflow in the study area.

**Gaged Sites**

Mean annual streamflow was calculated for 27 of 28 streamflow sites for 1930-86 (table 3, plate 1). Mean annual streamflow at Bonita Creek near Morenci was not calculated because streamflow data were not collected at the site for a minimum of 10 years. Streamflow data were collected for 5 years and, although correlation with downstream gaging station Gila River at head of Safford Valley, near Solomon is high, more data are needed before a reliable extension of record can be made.

For the five streamflow-gaging stations that have data sets that span the base period, calculation of the mean annual streamflow at the gaging station is a straightforward mathematical determination. Annual flows at each gaging station are summed for the base period and divided by 57.

Least-squares linear-regression techniques were used to extend the record at the short-term stations. Regression relations using streamflow data were developed between long-term and short-term gaging stations on the same stream or in an adjacent drainage basin and were used to fill in gaps of missing record at the short-term station. When gaps in the 57-year base period remained after the record had been extended by linear regression, record at the short-term station was further adjusted in proportion to flow at one of the five base stations (table 3).

For example, the short-term station, Eagle Creek near Double Circle Ranch, was in operation from 1944 to 1967 (1945 was the first full year of data collection) and mean annual streamflow for this period was 17.8 ft³/s. The long-term downstream gaging station, Eagle Creek above pumping plant, near Morenci, was in operation from 1944 through 1986 (1945 was the first full year of data collection). Annual streamflow for the two stations was correlated using the least-squares linear-regression
Table 3.—Mean annual streamflow for period of record, period of record extension, and 1930-86 at selected streamflow-gaging stations

[Values are in cubic feet per second except as indicated; dashes indicate no data]

<table>
<thead>
<tr>
<th>Station number</th>
<th>Station name</th>
<th>Period of record</th>
<th>Period of record extension</th>
<th>Adjusted mean annual discharge, 1930-86</th>
</tr>
</thead>
<tbody>
<tr>
<td>09445500</td>
<td>Willow Creek near Point of Pines, near Morenci</td>
<td>1945-67</td>
<td>1968-86</td>
<td>6.14</td>
</tr>
<tr>
<td>09446000</td>
<td>Willow Creek near Double Circle Ranch, near Morenci</td>
<td>1945-67</td>
<td>1967-86</td>
<td>9.52</td>
</tr>
<tr>
<td>09446500</td>
<td>Eagle Creek near Double Circle Ranch, near Morenci</td>
<td>1945-67</td>
<td>1967-86</td>
<td>26.8</td>
</tr>
<tr>
<td>09447000</td>
<td>Eagle Creek above pumping plant, near Morenci</td>
<td>1945-86</td>
<td></td>
<td>46.8</td>
</tr>
<tr>
<td>09448500</td>
<td>Gila River at head of Safford Valley, near Solomon</td>
<td>1915-86</td>
<td></td>
<td>441</td>
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<tr>
<td>09466500</td>
<td>Gila River at Calva</td>
<td>1930-86</td>
<td></td>
<td>326</td>
</tr>
<tr>
<td>09468500</td>
<td>San Carlos River near Peridot</td>
<td>1930-86</td>
<td></td>
<td>55.8</td>
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<tr>
<td>09489070</td>
<td>North Fork of East Fork Black River near Alpine</td>
<td>1966-78, 1979-86</td>
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<td>13.2</td>
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<tr>
<td>09489100</td>
<td>Black River near Maverick</td>
<td>1963-82, 1983-86</td>
<td></td>
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</tr>
<tr>
<td>09489200</td>
<td>Pacheta Creek at Maverick</td>
<td>1958-80, 1981-86</td>
<td></td>
<td>8.58</td>
</tr>
<tr>
<td>09489500</td>
<td>Black River below pumping plant, near Point of Pines</td>
<td>1954-86</td>
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</tr>
<tr>
<td>09489700</td>
<td>Big Bonito Creek near Fort Apache</td>
<td>1958-80, 1981-86</td>
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<td>64.5</td>
</tr>
<tr>
<td>09490500</td>
<td>Black River near Fort Apache</td>
<td>1913-15, 1958-86</td>
<td></td>
<td>388</td>
</tr>
<tr>
<td>09490800</td>
<td>North Fork White River near Greer</td>
<td>1966-78, 1979-86</td>
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</tr>
<tr>
<td>09491000</td>
<td>North Fork White River near McNary</td>
<td>1966, 1951-54, 1958-85</td>
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<td>46.1</td>
</tr>
</tbody>
</table>

See footnote at end of table.
### Table 3. Mean annual streamflow for period of record, period of record extension, and 1930-86 at selected streamflow-gaging stations—Continued

<table>
<thead>
<tr>
<th>Station number</th>
<th>Station name</th>
<th>Period of record</th>
<th>Mean annual discharge</th>
<th>Regression equation $R^2$</th>
<th>Period of record extension</th>
<th>Mean annual discharge</th>
<th>Adjusted mean annual discharge 1930-86</th>
</tr>
</thead>
<tbody>
<tr>
<td>09492400</td>
<td>East Fork White River near Fort Apache</td>
<td>1958-85</td>
<td>37</td>
<td></td>
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<td>33.1</td>
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<tr>
<td>09494000</td>
<td>White River near Fort Apache</td>
<td>1958-86</td>
<td>211</td>
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<td>189</td>
</tr>
<tr>
<td>09494300</td>
<td>Carrizo Creek above Corduroy Creek, near Show Low</td>
<td>1954-66</td>
<td>11.9</td>
<td>0.89</td>
<td>1967-86</td>
<td>17.7</td>
<td>17.0</td>
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<tr>
<td>09494500</td>
<td>Corduroy Creek above Forestdale Creek, near Show Low</td>
<td>1953-60</td>
<td>3.96</td>
<td>0.99</td>
<td>1961-86</td>
<td>8.54</td>
<td>8.36</td>
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<tr>
<td>09496000</td>
<td>Corduroy Creek near mouth, near Show Low</td>
<td>1952-75</td>
<td>22.7</td>
<td>0.99</td>
<td>1976-86</td>
<td>23.2</td>
<td>22.1</td>
</tr>
<tr>
<td>09496500</td>
<td>Carrizo Creek near Show Low</td>
<td>1952-60, 1978-86</td>
<td>51.7</td>
<td>0.97</td>
<td>1961-77</td>
<td>44.5</td>
<td>42.5</td>
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<td>09496600</td>
<td>Cibecue No. 1, Tributary to Carrizo Creek, near Show Low</td>
<td>1959-71</td>
<td>0.01</td>
<td></td>
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<tr>
<td>09496700</td>
<td>Cibecue No. 2, Tributary to Carrizo Creek, near Show Low</td>
<td>1959-71</td>
<td>0.01</td>
<td></td>
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<tr>
<td>09497500</td>
<td>Salt River near Chrysotile</td>
<td>1925-86</td>
<td>659</td>
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<td>668</td>
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<tr>
<td>09497800</td>
<td>Cibeque Creek near Chrysotile</td>
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<td>40.6</td>
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<tr>
<td>09497900</td>
<td>Cherry Creek near Globe</td>
<td>1966-86</td>
<td>42.6</td>
<td></td>
<td></td>
<td></td>
<td>36.4</td>
</tr>
<tr>
<td>09498500</td>
<td>Salt River near Roosevelt</td>
<td>1914-86</td>
<td>901</td>
<td></td>
<td></td>
<td></td>
<td>848</td>
</tr>
</tbody>
</table>

1Water years used to calculate average discharge (U.S. Geological Survey, 1954; 1964; 1960-89).
techniques for the common period of record. Streamflow for 1968-86 at Eagle Creek near Double Circle Ranch was estimated from the regression using actual streamflow data from the downstream station. Before the regression analysis was made, streamflow data for both stations was adjusted for flow diverted from the Black River into the Eagle Creek drainage. Using values of annual mean flows estimated from the regression analysis for 1968-86, mean annual streamflow for 1945-86 for Eagle Creek near Double Circle Ranch was 26.8 ft\(^3\)/s. Because available data at both gaging stations did not cover the entire base period 1930-86, mean annual streamflow values at the stations were further adjusted by comparing the quantity of flow at Gila River at head of Safford Valley, near Solomon to that of the station in question. For example, summing the annual mean flows at base station Gila River at head of Safford Valley for 1945-86 yields a figure of 18,759 ft\(^3\)/s. Repeating this procedure at the same site for 1930-86 yields a value of 25,154 ft\(^3\)/s. Summing gaged and estimated annual mean flows at Eagle Creek near Double Circle Ranch for 1945-86 yields a value of 1,125 ft\(^3\)/s, and a value, \(x\), was assigned for a comparable figure for 1930-86 at the site. The total quantity of streamflow at Eagle Creek near Double Circle Ranch for 1930-86 was determined by using the known sums of annual mean flows at both sites and solving for \(x\). The mean annual streamflow at the site was then determined by dividing by 57. The sum of annual mean flows for 1945-86 at Eagle Creek above pumping plant, near Morenci was used in a similar manner to determine mean annual flow for 1930-86. Therefore, adjusted mean annual streamflow for 1930-86 is 26.5 ft\(^3\)/s for Eagle Creek near Double Circle Ranch and 46.8 ft\(^3\)/s for Eagle Creek above pumping plant, near Morenci.

Two transbasin diversions occur in the study area. Forestdale diversion, in operation since May 1953, diverts flow from Show Low Creek in the Little Colorado River basin into the headwaters of Forestdale Creek, which is tributary to the Salt River. Willow Creek diversion, in operation since April 1945, diverts flow from Black River to the headwaters of Willow Creek, which is tributary to Eagle Creek. The quantity of water diverted into Forestdale Creek (and subsequently Corduroy and Carrizo Creeks) and Willow Creek (and subsequently Eagle Creek) was subtracted from the flows at the downstream gaging stations. Mean annual streamflow at gaging stations Salt River at Chrysotile, Salt River near Roosevelt, and Gila River at head of Safford Valley, near Solomon was not adjusted to reflect the diverted flow.

\textbf{Ungaged Sites near Gaged Sites}

Mean annual streamflow for 1930-86 for ungaged sites that are upstream from a gaging station and are not between two gaging stations is calculated by using drainage-area ratios and the mean annual streamflow at the gaging station. Equation 1 compares the contributing drainage area for an ungaged site with the contributing drainage area for a gaged site for determination of mean annual streamflow.

\[
Q_u = Q_g \cdot \left( \frac{A_u}{A_g} \right)^x
\]
where

\[ Q_u = \text{mean annual discharge, in cubic feet per second, at ungaged site}; \]
\[ Q_g = \text{mean annual discharge, in cubic feet per second, at gaged site}; \]
\[ A_u = \text{drainage area, in square miles, at ungaged site}; \]
\[ A_g = \text{drainage area, in square miles, at gaged site}; \]
\[ x = \text{exponent}. \]

The exponent, \( x \), was determined by regressing the logarithm of the mean annual discharge, \( Q_s \), for the base period against the logarithm of the drainage area, \( A_g \), using equation, \( Q_s = a(A_g)^x \) for each of two regions where \( a \) is the regression constant (Christensen and others, 1986, p. 5).

The two regions were identified by elevations. Stations with mean basin elevations that are more than 7,500 ft (all are in the Salt River basin) composed one region. Stations with mean basin elevations that are less than 7,500 ft composed the second region, which was further divided into Salt River or Gila River basins. Roeske (1978) used a similar separation of gaging stations using a 7,500-ft elevation as the division in the analysis of magnitude and frequency of floods in Arizona. The exponent, \( x \), was 0.88 for Salt River high-elevation basins, 1.04 for Salt River low-elevation basins, and 0.97 for Gila River low-elevation basins. Equation 1, with 0.88 as the exponent, \( x \), value, was used in the Salt River basin for sites upstream from stations 09430000, Carrizo Creek above Corduroy Creek, near Show Low; 09450000, Cibeque Creek near Chrysotile; and 09497980, Cherry Creek near Globe. Equation 1 can be applied to ungaged sites only where the ratio of the area of the ungaged site to that of the area of the gaged site is 0.75 to 1.00 (Christensen and others, 1986, p. 5).

Mean annual streamflow for sites that are between two gaging stations or on reaches where the gaging stations are on two streams that are tributary is estimated by using drainage areas and quantities of flow at the gaged sites (equation 2). This method is dependent on data from two gaging stations and has a higher degree of accuracy than equation 1. Equation 2, which relates drainage area and discharge at two sites to determine mean annual flow at an ungaged site, is as follows:

\[ Q_u = (Q_{dg} - Q_{ug}) \left( \frac{A_u}{A_{dg} - A_{ug}} \right) + Q_{ug}, \]
where

\[ Q_u = \text{mean annual discharge, in cubic feet per second, at ungaged site between two gaged sites;} \]

\[ Q_{dg} = \text{mean annual discharge, in cubic feet per second, at downstream gaged site;} \]

\[ Q_{ug} = \text{mean annual discharge, in cubic feet per second, at upstream gaged site;} \]

\[ A_{dg} = \text{drainage area, in square miles, at downstream gaged site;} \]

\[ A_{ug} = \text{drainage area, in square miles, at upstream gaged site;} \]

\[ A_u = \text{drainage area, in square miles, at ungaged site.} \]

Sites on Ungaged Natural Streams

An estimate of the mean annual streamflow for 1930-86 at a site that is not at or near a streamflow-gaging station can be made using 1 of 2 equations determined by regional-regression analyses of streamflow and basin characteristics. Separate equations were derived for the Salt River basin and the Gila River basin. In this study, the regional-regression analyses included 25 of the 28 streamflow-gaging stations listed in table 1. The equations should not be used to estimate mean annual streamflow at sites that have upstream diversions of flow or that return excess water to the river. Gaging station 09466500, Gila River at Calva, was excluded from the analyses because of upstream diversions. Gaging station 09448500, Gila River at head of Safford Valley, near Solomon, was excluded because most of the drainage basin is outside the reservation boundaries with basin characteristics dissimilar to those of the lower Gila River drainage basin. Gaging station 09447800, Bonita Creek near Morenci, was excluded because of the short length of record.

Stepwise regression was used to derive the equations by regressing basin characteristics against mean annual streamflow. In the stepwise-regression procedure, explanatory variables (basin characteristics) are added one by one to the model with the criteria that the F statistic for a variable to be added must be significant. The selected level of significance for a variable to be added to the equation was 0.10. Once a variable is added to the equation, all variables in the equation are examined and those variables that do not produce an F statistic at the 0.10 level are removed from the equation. The procedure continues by adding new variables to the equation until all variables in the model are significant and none can be added at the 0.10 level (SAS Institute, Inc., 1982, p. 102). Basin characteristics used in the regression analyses are those computed for the intervening drainage area between two gaging stations on the same stream. Following is an example of mean annual precipitation computed for the intervening basin between two stations on Willow Creek. Mean annual precipitation for the entire Willow...
Creek near Double Circle Ranch drainage basin is 19.2 in. and that for upstream station Willow Creek near Point of Pines drainage basin is 19.8 in. The computed average annual precipitation assigned to the Willow Creek near Double Circle Ranch for the intervening basin between the two stations using drainage area as a weighting factor is 17.9 in. Mean annual flow quantities for a gaging station downstream from another gaging station were computed by a simple subtraction of the mean annual flow at both sites. A logarithmic base-10 transformation was used on individual basin characteristics before the stepwise regression was applied.

The relation between the computed mean annual streamflow data and drainage area for gaging stations (fig. 5) indicated that separate equations for each basin were necessary. Equation 3 was derived for the Gila River drainage basin and equation 4 was derived for the Salt River drainage basin. Drainage basins in the Salt River basin generally yield larger quantities of streamflow per square mile than do similar-sized basins in the Gila River basin. Stepwise analysis of streamflow and basin characteristics data in the Gila River basin indicates that equation 3 with one predictor variable, drainage area, can be used to estimate mean annual streamflow for sites in the basin not affected significantly by diversion or regulation and for which equations 1 or 2 could not be used.

\[
Q_{\log} = -1.04 + 0.945 (A_{\log}),
\]

where

\[
Q_{\log} \quad \text{is the logarithm, base 10 of mean annual streamflow, in cubic feet per second, 1930-86, and}
\]

\[
A_{\log} \quad \text{is the logarithm, base 10 of contributing drainage area, in square miles.}
\]

The coefficient of determination for equation 3 is 97.5 and the standard error of regression is 0.0866 log units (-18 to +21 percent). Following is an example of the use of equation 3 to determine the mean annual streamflow at a site on the reach of a river in the Gila River basin with no streamflow-gaging stations and no upstream diversion of regulating structure. If the site meets these requirements and has a hypothetical drainage basin size of 50 mi², the following calculations apply.

\[
\log_{10} (50 \text{ mi}^2) = 1.6990
\]

\[
Q_{\log} = -1.04 + 0.945(1.6990)
\]

\[
Q_{\log} = 0.5655
\]

antilog 0.5655 = 3.67 ft³/s with a range of -18 to +21 percent.

Stepwise analysis of streamflow and basin-characteristics data in the Salt River basin indicates that equation 4 with two predictor variables, drainage area and precipitation, may be used to estimate mean
annual streamflow for sites in the basin not affected significantly by diversion or regulation and for which equations 1 or 2 could not be used.

$$Q_{\log} = -5.71 + 0.948(A_{\log}) + 3.76(P_{\log}),$$  \hspace{1cm} (4)

where

$$Q_{\log} = \log_{10} \text{ of mean annual streamflow, in cubic feet per second, 1930-86;}$$

$$A_{\log} = \log_{10} \text{ of contributing drainage area, in square miles;}$$

$$P_{\log} = \log_{10} \text{ of mean annual precipitation, in inches.}$$
The coefficient of determination is 97.3 and the standard error of regression is 0.2020 log units (-37 to +59 percent). Following is an example of the use of equation 4 to determine the mean annual flow for a site on the reach of a river in the Salt River basin that has no streamflow-gaging stations and no upstream diversion or regulating structure. If the site meets these requirements, has a hypothetical drainage basin size of 20 mi², and has a mean basin precipitation of 25.0 in./yr, the computation is as follows:

\[
\log_{10} (20 \text{ mi}^2) = 1.3010 \\
\log_{10} (25.0 \text{ in./yr}) = 1.3979 \\
Q_{\log} = -5.71 + 0.948(1.3010) + 3.76(1.3979) \\
Q_{\log} = 0.7795 \\
\text{antilog (0.7795) = 6.02 ft}^3/\text{s with a range of -37 to +59 percent.}
\]

This report presents three methods of estimating mean annual flow at ungaged sites. The first method used equation 1 to estimate flow above gaged sites. The second method used equation 2 to estimate flow between two gaged sites. Estimates of the mean annual flow for sites in the study area calculated from equations 1 and 2 are shown on plate 1. The first two methods give more accurate estimates than the method using equations 3 or 4, which estimates flow using regression analysis. Estimates of mean annual flow from equations 3 and 4 are not shown on plate 1. Ungaged sites, where values of mean annual flow are shown on plate 1, were not chosen because of socioeconomic importance but because of their location on tributaries.

Sites on Stream Reaches Affected by Diversions

Mean annual streamflow for 1930-86 for ungaged sites on the reach of the Gila River between gaging stations Gila River at head of Safford Valley, near Solomon and Gila River at Calva was not estimated because of lack of accurate data for upstream diversions, direct pumpage from the Gila River, ungaged irrigation return flows prior to 1936, and unaccounted quantities of flow in this reach that may have been lost to evapotranspiration and infiltration. The magnitude of the problem can be seen by noting that tributary flow calculated by using equation 3 for the contributing drainage basin of 3,574 mi² between the two gaging stations is 170 to 251 ft³/s. This quantity added to the mean annual flow of 441 ft³/s at Gila River at head of Safford Valley would place the calculation of mean annual flow of Gila River at Calva gaging station between 611 and 692 ft³/s; however, only 326 ft³/s was gaged for the 1930-86 period. This poor correlation can be attributed to the factors mentioned above. In addition, the relation used to calculate mean annual streamflow for this reach was extended beyond the largest drainage basin data point of 1,000 mi² to 3,574 mi². Because of the complexities of the hydrology in Safford Valley, further study of this area would require that components of a water budget be determined for the reach of the Gila River in Safford Valley before an estimate of mean annual streamflow can be made for selected sites.
Streamflow characteristics of the Salt and Gila Rivers in the Fort Apache and San Carlos Indian Reservations were appraised because of pending water-resource adjudication by the State of Arizona. Temporal changes in annual streamflow and precipitation through 1986 were evaluated by statistical analyses. The analyses of streamflow and precipitation data did not show a statistically significant long-term change. Statistics of streamflow data collected at 28 streamflow-gaging stations were computed for mean monthly and annual discharges, magnitude and probability of annual low and high flows, magnitude and probability of instantaneous peak flows, and duration of daily mean flows. Mean annual streamflow for a base period of 1930-86 was computed for 27 of the 28 gaging stations and was used to estimate the mean annual discharge throughout the study area. Two regression equations were derived that related mean annual streamflow for 1930-86 to basin characteristics. The regression equation for the Gila River basin has a coefficient of determination of 97.5 and a standard error of regression of -18 to +21 percent. The regression equation for the Salt River basin has a coefficient of determination of 97.3 and a standard error of regression of -37 to +59 percent.

SELECTED REFERENCES


Brown, D.E., Carmony, N.B., and Turner, R.M., compilers, 1981, Drainage map of Arizona showing perennial streams and some important wetlands: Arizona Game and Fish Department map, scale 1:1,000,000.


Wilson, E.D., Moore, R.T., and O'Haire, R.T., 1960, Geologic map of Navajo and Apache Counties, Arizona: Arizona Bureau of Mines County Geologic Map Series 3-7, scale 1:375,000.

STATISTICAL SUMMARIES

Mean monthly and annual discharges, magnitude and probability of annual low and high flows, magnitude and probability of instantaneous peak flows, and percent of time that a given daily mean flow was exceeded or equaled at selected streamflow-gaging stations in and near the Fort Apache and San Carlos Indian Reservations.

[Ft$^3$/s, cubic feet per second; years of record may include historic years other than those in period of record]
MAGNITUDE AND PROBABILITY OF ANNUAL DISCHARGES, 1945-67

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM</th>
<th>MINIMUM</th>
<th>MEAN</th>
<th>SDDEV</th>
<th>COEFFICIENT</th>
<th>PERCENT VARIATION</th>
<th>ANNUAL RUNOFF</th>
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</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>21</td>
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<td>9.6</td>
<td>6.6</td>
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<tr>
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<td>0.84</td>
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<td>32</td>
<td>2.9</td>
<td>8.1</td>
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<td>103</td>
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<td>25</td>
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<td>8.6</td>
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<td>4.5</td>
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<td>12</td>
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<tr>
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<td>12</td>
<td>5.9</td>
<td>0.49</td>
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<td>JULY</td>
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<td>12</td>
<td>6.0</td>
<td>0.50</td>
<td>8.7</td>
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</tr>
<tr>
<td>AUGUST</td>
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<td>6.2</td>
<td>0.42</td>
<td>10.9</td>
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<tr>
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<tr>
<td>ANNUAL</td>
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<td>1.0</td>
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<td>6.3</td>
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MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1946-67

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
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<td>50% 20% 10% 5% 2% 1%</td>
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<tr>
<td></td>
<td>108 710 1,560 2,660 4,380</td>
</tr>
<tr>
<td></td>
<td>3 120 772 1,310 2,170</td>
</tr>
<tr>
<td></td>
<td>7 187 499 1,150 1,900</td>
</tr>
<tr>
<td></td>
<td>15 115 206 409 662</td>
</tr>
<tr>
<td></td>
<td>30 77 225 351 540</td>
</tr>
<tr>
<td></td>
<td>60 36 71 113 191</td>
</tr>
<tr>
<td></td>
<td>90 32 42 55 66</td>
</tr>
</tbody>
</table>

WEIGHTED SKEW (LOGS) = -0.04
MEAN (LOGS) = 2.83
STANDARD DEV. (LOGS) = 0.36

MAGNITUDE AND PROBABILITY OF ANNUAL HIGH FLOW, BASED ON WATER YEARS 1945-67

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50% 20% 10% 5% 2% 1%</td>
</tr>
<tr>
<td></td>
<td>108 710 1,560 2,660 4,380</td>
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<td></td>
<td>3 120 772 1,310 2,170</td>
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<td>7 187 499 1,150 1,900</td>
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<td></td>
<td>60 36 71 113 191</td>
</tr>
<tr>
<td></td>
<td>90 32 42 55 66</td>
</tr>
</tbody>
</table>

DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1945-67

| DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME |
|-------------------------------------|----------------------------------|
| 3% 10% 15% 20% 30% 40% 50% 60% 70% 80% 90% 95% 98% 99% 99.5% 99.9% |
| 66 24 20 18 17 15 13 10 6.3 0.49 0.07 0.04 0.02 0.01 0.00 0.00 0.00 |

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1945-67

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (cfs)</th>
<th>Minimum (cfs)</th>
<th>Mean (cfs)</th>
<th>Maximum Deviation of Mean</th>
<th>Annual Deviation of Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>22.04</td>
<td>10.0</td>
<td>6.1</td>
<td>0.61</td>
<td>6.3</td>
</tr>
<tr>
<td>November</td>
<td>19.86</td>
<td>8.1</td>
<td>5.6</td>
<td>0.69</td>
<td>5.0</td>
</tr>
<tr>
<td>December</td>
<td>27.3</td>
<td>18.0</td>
<td>56.3</td>
<td>3.1</td>
<td>11.2</td>
</tr>
<tr>
<td>January</td>
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<td>19.0</td>
<td>40.1</td>
<td>2.1</td>
<td>11.8</td>
</tr>
<tr>
<td>February</td>
<td>36.86</td>
<td>7.9</td>
<td>11.1</td>
<td>1.4</td>
<td>4.9</td>
</tr>
<tr>
<td>March</td>
<td>103.79</td>
<td>19.0</td>
<td>23.1</td>
<td>1.2</td>
<td>11.8</td>
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<td>April</td>
<td>23.76</td>
<td>13.0</td>
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<td>0.41</td>
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</tr>
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<td>May</td>
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<td>0.42</td>
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<tr>
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<tr>
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<td>0.52</td>
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<tr>
<td>September</td>
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<td>5.4</td>
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<td>Annual</td>
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<td>8.3</td>
<td>0.62</td>
<td>100</td>
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</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1946-67

<table>
<thead>
<tr>
<th>Period (Days)</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>50t</th>
<th>100t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought Coefficient of Mean Runoff</td>
<td>0.84</td>
<td>0.86</td>
<td>0.93</td>
<td>0.90</td>
<td>0.86</td>
<td>0.79</td>
</tr>
</tbody>
</table>
| Magnitude and Probability of Annual Low Flow, Based on Period of Record 1944-67, 1973

| Discharge, in cfs, for indicated recurrence interval in years, and exceedance probability, in percent |
|-------------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Period (Days) | 2 | 5 | 10 | 20 | 50t | 100t |
| Weighted Skew (logs) | -0.04 | 3.15 | 0.37 |
| Mean (logs) | 3.15 | 100 |
| Standard Dev. (logs) | 0.37 | 50 |

### Magnitude and Probability of Annual High Flow, Based on Water Years 1945-67

| Discharge, in cfs, for indicated recurrence interval in years, and exceedance probability, in percent |
|-------------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Period (Days) | 2 | 5 | 10 | 20 | 50t | 100t |
| Weighted Skew (logs) | -0.04 | 3.15 | 0.37 |
| Mean (logs) | 3.15 | 100 |
| Standard Dev. (logs) | 0.37 | 50 |

### Duration Table of Daily Mean Flow, Water Years 1945-67

| Discharge, in cfs, which was equaled or exceeded for indicated percent of time |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| 1% | 5% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.5% | 99.9% |
| 83 | 26 | 21 | 18 | 16 | 14 | 12 | 10 | 7.3 | 2.9 | 1.4 | 0.97 | 0.67 | 0.27 | 0.04 | 0.02 | 0.00 |

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1945-67

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT₃/S)</th>
<th>MINIMUM (FT₃/S)</th>
<th>MEAN (FT₃/S)</th>
<th>STANDARD DEVIATION (FT₃/S)</th>
<th>COEFFICIENT OF VARIATION</th>
<th>PERCENT ANNUAL RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>33</td>
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<td>18</td>
<td>5.9</td>
<td>0.33</td>
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<td>14</td>
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<td>4.5</td>
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<td>11.6</td>
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<td>41</td>
<td>76</td>
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<td>13.3</td>
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<tr>
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<td>101</td>
<td>4.1</td>
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<td>27</td>
<td>1.2</td>
<td>7.1</td>
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<td>213</td>
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<td>48</td>
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<td>13.1</td>
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<tr>
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<td>8.9</td>
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<td>5.0</td>
</tr>
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<td>13</td>
<td>21</td>
<td>6.3</td>
<td>0.30</td>
<td>6.7</td>
</tr>
<tr>
<td>AUGUST</td>
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<td>15</td>
<td>38</td>
<td>25</td>
<td>0.66</td>
<td>12.1</td>
</tr>
<tr>
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<td>11</td>
<td>20</td>
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<td>0.45</td>
<td>6.4</td>
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<td>11</td>
<td>26</td>
<td>16</td>
<td>0.62</td>
<td>100</td>
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</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1946-67

<table>
<thead>
<tr>
<th>PERIOD (COMBINED)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENT INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE DAYS</td>
<td>50%</td>
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<tr>
<td>2</td>
<td>4.1</td>
</tr>
<tr>
<td>5</td>
<td>4.2</td>
</tr>
<tr>
<td>10</td>
<td>4.3</td>
</tr>
<tr>
<td>20</td>
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</tr>
<tr>
<td>50†</td>
<td>5.8</td>
</tr>
<tr>
<td>100†</td>
<td>6.8</td>
</tr>
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### Magnitude and Probability of Instantaneous Peak Flow, Based on Period of Record 1944-67, 1973

<table>
<thead>
<tr>
<th>PERIOD (COMBINED)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENT INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE DAYS</td>
<td>50%</td>
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<tr>
<td>2</td>
<td>2,510</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
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<tr>
<td>10</td>
<td>38</td>
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<tr>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>50†</td>
<td>14</td>
</tr>
<tr>
<td>100†</td>
<td>7.9</td>
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</table>

### Duration Table of Daily Mean Flow, Water Years 1945-67

<table>
<thead>
<tr>
<th>PERIOD (COMBINED)</th>
<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE DAYS</td>
<td>1%</td>
</tr>
<tr>
<td>10</td>
<td>193</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
### MEAN MONTHLY AND ANNUAL DISCHARGES, 1945-86

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>DEVIATION OF MEAN (FT³/S)</th>
<th>VARIATION COEFFICIENT</th>
<th>ANNUAL DISCHARGE (FT³/S)</th>
</tr>
</thead>
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<tr>
<td>OCTOBER</td>
<td>1,170</td>
<td>13</td>
<td>67</td>
<td>182</td>
<td>2.7</td>
<td>9.5</td>
</tr>
<tr>
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<td>10</td>
<td>31</td>
<td>32</td>
<td>1.0</td>
<td>4.5</td>
</tr>
<tr>
<td>DECEMBER</td>
<td>884</td>
<td>11</td>
<td>89</td>
<td>176</td>
<td>2.0</td>
<td>12.7</td>
</tr>
<tr>
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<td>96</td>
<td>185</td>
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<td>13.7</td>
</tr>
<tr>
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<td>989</td>
<td>11</td>
<td>97</td>
<td>180</td>
<td>1.9</td>
<td>13.7</td>
</tr>
<tr>
<td>MARCH</td>
<td>700</td>
<td>14</td>
<td>97</td>
<td>135</td>
<td>1.4</td>
<td>13.8</td>
</tr>
<tr>
<td>APRIL</td>
<td>214</td>
<td>11%</td>
<td>50</td>
<td>41</td>
<td>0.82</td>
<td>7.1</td>
</tr>
<tr>
<td>MAY</td>
<td>81</td>
<td>9.2</td>
<td>30</td>
<td>16</td>
<td>0.52</td>
<td>4.3</td>
</tr>
<tr>
<td>JUNE</td>
<td>40</td>
<td>5.3</td>
<td>23</td>
<td>8.5</td>
<td>0.38</td>
<td>3.2</td>
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<tr>
<td>JULY</td>
<td>98</td>
<td>16</td>
<td>37</td>
<td>18</td>
<td>0.50</td>
<td>5.2</td>
</tr>
<tr>
<td>AUGUST</td>
<td>203</td>
<td>19</td>
<td>55</td>
<td>39</td>
<td>0.72</td>
<td>7.8</td>
</tr>
<tr>
<td>SEPTEMBER</td>
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<td>13</td>
<td>33</td>
<td>19</td>
<td>0.56</td>
<td>4.7</td>
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<tr>
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<td>17</td>
<td>59</td>
<td>51</td>
<td>0.87</td>
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</tbody>
</table>

### MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1945-86

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEQUENTIAL TIVE</td>
<td>2</td>
</tr>
<tr>
<td>DAYS</td>
<td>50%</td>
</tr>
<tr>
<td>DISCHARGE, IN FT³/S</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>409</td>
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<tr>
<td>7</td>
<td>259</td>
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<tr>
<td>15</td>
<td>175</td>
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<td>128</td>
</tr>
<tr>
<td>60</td>
<td>93</td>
</tr>
<tr>
<td>90</td>
<td>76</td>
</tr>
</tbody>
</table>

### MAGNITUDE AND PROBABILITY OF ANNUAL HIGH FLOW, BASED ON WATER YEARS 1945-86

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEQUENTIAL TIVE</td>
<td>2</td>
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<tr>
<td>DAYS</td>
<td>50%</td>
</tr>
<tr>
<td>DISCHARGE, IN FT³/S</td>
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### DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1945-86

<table>
<thead>
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<th>RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEQUENTIAL TIVE</td>
<td>2</td>
</tr>
<tr>
<td>DAYS</td>
<td>1%</td>
</tr>
<tr>
<td>DISCHARGE, IN FT³/S</td>
<td>554</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1982-86

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (FT³/S)</th>
<th>Minimum (FT³/S)</th>
<th>Mean (FT³/S)</th>
<th>Mean Deviation</th>
<th>Mean Coefficient of Variation</th>
<th>Mean Annual Runoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>176</td>
<td>4.6</td>
<td>40</td>
<td>6.6</td>
<td>1.9</td>
<td>27.2</td>
</tr>
<tr>
<td>November</td>
<td>6.5</td>
<td>3.6</td>
<td>5.6</td>
<td>1.2</td>
<td>0.21</td>
<td>3.8</td>
</tr>
<tr>
<td>December</td>
<td>30</td>
<td>6.3</td>
<td>16</td>
<td>9.7</td>
<td>0.62</td>
<td>10.5</td>
</tr>
<tr>
<td>January</td>
<td>29</td>
<td>6.5</td>
<td>15</td>
<td>9.3</td>
<td>0.62</td>
<td>10.3</td>
</tr>
<tr>
<td>February</td>
<td>55</td>
<td>4.1</td>
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<td>21</td>
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<tr>
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<td>17</td>
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<td>10.9</td>
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<td>3.3</td>
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<td>1.8</td>
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<td>3.3</td>
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<td>4.2</td>
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<td>0.46</td>
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<tr>
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<td>4.6</td>
<td>1.3</td>
<td>3.1</td>
<td>1.4</td>
<td>0.45</td>
<td>2.1</td>
</tr>
<tr>
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<td>8.7</td>
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<td>2.0</td>
<td>0.37</td>
<td>3.6</td>
</tr>
<tr>
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<td>9.1</td>
<td>5.4</td>
<td>7.0</td>
<td>1.6</td>
<td>0.23</td>
<td>4.7</td>
</tr>
<tr>
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<td>11</td>
<td>4.6</td>
<td>7.2</td>
<td>2.3</td>
<td>0.33</td>
<td>4.9</td>
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<tr>
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<td>100</td>
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### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1983-86

<table>
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<tr>
<th>Period (Consecutive Days)</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>1.9</td>
<td>1.0</td>
<td>0.71</td>
<td>0.49</td>
<td>0.31</td>
<td>0.22</td>
</tr>
<tr>
<td>3</td>
<td>1.9</td>
<td>1.1</td>
<td>0.76</td>
<td>0.54</td>
<td>0.35</td>
<td>0.26</td>
</tr>
<tr>
<td>7</td>
<td>2.0</td>
<td>1.1</td>
<td>0.82</td>
<td>0.60</td>
<td>0.41</td>
<td>0.32</td>
</tr>
<tr>
<td>14</td>
<td>2.1</td>
<td>1.4</td>
<td>0.91</td>
<td>0.72</td>
<td>0.51</td>
<td>0.41</td>
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<td>1.5</td>
<td>1.1</td>
<td>0.84</td>
<td>0.62</td>
<td>0.50</td>
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<tr>
<td>60</td>
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<td>1.2</td>
<td>0.91</td>
<td>0.65</td>
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<td>1.5</td>
<td>1.2</td>
<td>0.66</td>
<td>0.70</td>
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<tr>
<td>120</td>
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<td>2.7</td>
<td>2.2</td>
<td>1.9</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>183</td>
<td>5.4</td>
<td>4.6</td>
<td>4.2</td>
<td>3.9</td>
<td>3.5</td>
<td>3.3</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1982-86

<table>
<thead>
<tr>
<th>Period (Consecutive Days)</th>
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<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>222</td>
<td>855</td>
<td>2,140</td>
<td>6,720</td>
<td>15,500</td>
<td>35,200</td>
</tr>
<tr>
<td>3</td>
<td>133</td>
<td>506</td>
<td>1,220</td>
<td>3,590</td>
<td>7,820</td>
<td>16,700</td>
</tr>
<tr>
<td>7</td>
<td>98</td>
<td>326</td>
<td>661</td>
<td>1,490</td>
<td>2,610</td>
<td>4,410</td>
</tr>
<tr>
<td>15</td>
<td>62</td>
<td>187</td>
<td>346</td>
<td>883</td>
<td>1,080</td>
<td>1,640</td>
</tr>
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<td>30</td>
<td>40</td>
<td>107</td>
<td>180</td>
<td>317</td>
<td>459</td>
<td>642</td>
</tr>
<tr>
<td>60</td>
<td>30</td>
<td>69</td>
<td>104</td>
<td>159</td>
<td>207</td>
<td>262</td>
</tr>
<tr>
<td>90</td>
<td>23</td>
<td>49</td>
<td>72</td>
<td>107</td>
<td>137</td>
<td>171</td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1982-86

| Discharge, in FT³/S, Which Was Equaled or Exceeded for Indicated Percent of Time |
|---------------------------------|----------------|-------|-------|-------|-------|-------|
| 1%                              | 26%            | 13%   | 8.8%  | 7.4%  | 6.7%  | 6.0%  |
| 5%                              | 4.3%           | 3.4%  | 2.4%  | 1.6%  | 1.3%  | 1.2%  |
| 10%                             | 1.2%           | 1.1%  | 0.73% |       |       |       |

† Reliability of values in column is uncertain, and potential errors are large.
**GILA RIVER AT HEAD OF SAFFORD VALLEY, NEAR SOLOMON, AZ**

**Mean Monthly and Annual Discharges, 1933, 1936-86**

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (ft³/s)</th>
<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Annual Discharge (ft³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>7,450</td>
<td>40</td>
<td>1,190</td>
<td>1,680</td>
</tr>
<tr>
<td>November</td>
<td>2,250</td>
<td>49</td>
<td>2,230</td>
<td>439</td>
</tr>
<tr>
<td>December</td>
<td>5,800</td>
<td>60</td>
<td>1,040</td>
<td>373</td>
</tr>
<tr>
<td>January</td>
<td>3,370</td>
<td>93</td>
<td>761</td>
<td>204</td>
</tr>
<tr>
<td>February</td>
<td>3,870</td>
<td>103</td>
<td>942</td>
<td>38</td>
</tr>
<tr>
<td>March</td>
<td>3,380</td>
<td>82</td>
<td>996</td>
<td>193</td>
</tr>
<tr>
<td>April</td>
<td>2,780</td>
<td>64</td>
<td>638</td>
<td>101</td>
</tr>
<tr>
<td>May</td>
<td>2,040</td>
<td>38</td>
<td>395</td>
<td>72</td>
</tr>
<tr>
<td>June</td>
<td>388</td>
<td>20</td>
<td>86</td>
<td>38</td>
</tr>
<tr>
<td>July</td>
<td>721</td>
<td>44</td>
<td>129</td>
<td>20</td>
</tr>
<tr>
<td>August</td>
<td>1,930</td>
<td>66</td>
<td>381</td>
<td>109</td>
</tr>
<tr>
<td>September</td>
<td>2,080</td>
<td>36</td>
<td>345</td>
<td>73</td>
</tr>
</tbody>
</table>

**Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1922-33, 1937-86**

<table>
<thead>
<tr>
<th>Period (Days)</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>90%</th>
<th>95%</th>
<th>98%</th>
<th>99%</th>
<th>99.5%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>183</td>
</tr>
</tbody>
</table>

**Magnitude and Probability of Instantaneous Peak Flow, Based on Period of Record 1914-86**

<table>
<thead>
<tr>
<th>Discharge (ft³/s)</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>90%</th>
<th>95%</th>
<th>98%</th>
<th>99%</th>
<th>99.5%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>30</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>183</td>
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</table>

**Duration Table of Daily Mean Flow, Water Years 1933, 1936-86**

<table>
<thead>
<tr>
<th>Percent of Time</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>95%</th>
<th>98%</th>
<th>99%</th>
<th>99.5%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4,150</td>
<td>1,700</td>
<td>943</td>
<td>609</td>
<td>452</td>
<td>273</td>
<td>200</td>
<td>161</td>
<td>133</td>
<td>109</td>
<td>83</td>
<td>57</td>
<td>43</td>
<td>33</td>
<td>28</td>
<td>23</td>
<td>18</td>
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</tbody>
</table>
### Mean Monthly and Annual Discharges, 1930-86

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (ft³/s)</th>
<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Standard Deviation (ft³/s)</th>
<th>COEFFICIENT OF VARIATION (%)</th>
<th>PERCENT</th>
<th>Runoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>8,490</td>
<td>0.00</td>
<td>383</td>
<td>1,280</td>
<td>3.3</td>
<td>9.8</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>1,540</td>
<td>0.00</td>
<td>158</td>
<td>248</td>
<td>1.6</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>5,650</td>
<td>0.00</td>
<td>411</td>
<td>945</td>
<td>2.3</td>
<td>10.5</td>
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<tr>
<td>January</td>
<td>3,580</td>
<td>22</td>
<td>480</td>
<td>760</td>
<td>1.6</td>
<td>12.2</td>
<td></td>
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<tr>
<td>February</td>
<td>3,550</td>
<td>29</td>
<td>646</td>
<td>887</td>
<td>1.4</td>
<td>16.5</td>
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<tr>
<td>March</td>
<td>2,940</td>
<td>10</td>
<td>655</td>
<td>886</td>
<td>1.3</td>
<td>16.7</td>
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<tr>
<td>April</td>
<td>2,330</td>
<td>1.3</td>
<td>349</td>
<td>542</td>
<td>1.5</td>
<td>8.9</td>
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<tr>
<td>May</td>
<td>2,080</td>
<td>1.3</td>
<td>175</td>
<td>375</td>
<td>2.1</td>
<td>4.5</td>
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<tr>
<td>June</td>
<td>292</td>
<td>0.00</td>
<td>33</td>
<td>64</td>
<td>2.0</td>
<td>0.8</td>
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</tr>
<tr>
<td>July</td>
<td>838</td>
<td>0.05</td>
<td>92</td>
<td>149</td>
<td>1.6</td>
<td>2.4</td>
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<tr>
<td>August</td>
<td>1,660</td>
<td>4.9</td>
<td>315</td>
<td>391</td>
<td>1.2</td>
<td>8.0</td>
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<tr>
<td>September</td>
<td>1,680</td>
<td>0.00</td>
<td>225</td>
<td>280</td>
<td>1.2</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>1,520</td>
<td>29</td>
<td>326</td>
<td>345</td>
<td>1.1</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1931-86

<table>
<thead>
<tr>
<th>Period (Days)</th>
<th>Non-Exceedance Probability, in Percent</th>
<th>Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedance probability, in percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5%</td>
<td>6,490</td>
</tr>
<tr>
<td>5</td>
<td>20%</td>
<td>2,470</td>
</tr>
<tr>
<td>10</td>
<td>10%</td>
<td>1,400</td>
</tr>
<tr>
<td>25</td>
<td>2%</td>
<td>500</td>
</tr>
<tr>
<td>50</td>
<td>1%</td>
<td>100</td>
</tr>
<tr>
<td>100</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1930-86

<table>
<thead>
<tr>
<th>Period (Days)</th>
<th>Non-Exceedance Probability, in Percent</th>
<th>Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedance probability, in percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5%</td>
<td>6,250</td>
</tr>
<tr>
<td>5</td>
<td>20%</td>
<td>3,090</td>
</tr>
<tr>
<td>10</td>
<td>10%</td>
<td>1,620</td>
</tr>
<tr>
<td>25</td>
<td>2%</td>
<td>250</td>
</tr>
<tr>
<td>50</td>
<td>1%</td>
<td>20</td>
</tr>
<tr>
<td>100</td>
<td>0.0%</td>
<td>8.0</td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1930-86

| Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1%                                | 5%                                | 10%                              | 15%                              |
| 2%                                | 5%                                | 10%                              | 15%                              |
| 20%                               | 5%                                | 10%                              | 15%                              |
| 30%                               | 5%                                | 10%                              | 15%                              |
| 40%                               | 5%                                | 10%                              | 15%                              |
| 50%                               | 5%                                | 10%                              | 15%                              |
| 60%                               | 5%                                | 10%                              | 15%                              |
| 70%                               | 5%                                | 10%                              | 15%                              |
| 80%                               | 5%                                | 10%                              | 15%                              |
| 90%                               | 5%                                | 10%                              | 15%                              |
| 95%                               | 5%                                | 10%                              | 15%                              |
| 98%                               | 5%                                | 10%                              | 15%                              |
| 99%                               | 5%                                | 10%                              | 15%                              |
| 99.5%                             | 5%                                | 10%                              | 15%                              |
| 99.9%                             | 5%                                | 10%                              | 15%                              |

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1930-86

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (ft³/s)</th>
<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Standard Deviation (ft³/s)</th>
<th>Coefficient of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>519</td>
<td>33</td>
<td>90</td>
<td>2.8</td>
<td>4.9</td>
</tr>
<tr>
<td>November</td>
<td>178</td>
<td>18</td>
<td>27</td>
<td>1.5</td>
<td>2.7</td>
</tr>
<tr>
<td>December</td>
<td>1,580</td>
<td>109</td>
<td>259</td>
<td>2.4</td>
<td>16.2</td>
</tr>
<tr>
<td>January</td>
<td>870</td>
<td>95</td>
<td>157</td>
<td>1.7</td>
<td>13.8</td>
</tr>
<tr>
<td>February</td>
<td>1,500</td>
<td>7.0</td>
<td>158</td>
<td>1.6</td>
<td>23.5</td>
</tr>
<tr>
<td>March</td>
<td>1,260</td>
<td>138</td>
<td>251</td>
<td>1.8</td>
<td>20.4</td>
</tr>
<tr>
<td>April</td>
<td>170</td>
<td>22</td>
<td>32</td>
<td>1.5</td>
<td>3.2</td>
</tr>
<tr>
<td>May</td>
<td>42</td>
<td>6.8</td>
<td>7.2</td>
<td>1.1</td>
<td>1.9</td>
</tr>
<tr>
<td>June</td>
<td>18</td>
<td>2.8</td>
<td>3.7</td>
<td>1.3</td>
<td>0.7</td>
</tr>
<tr>
<td>July</td>
<td>85</td>
<td>19</td>
<td>19</td>
<td>1.0</td>
<td>2.8</td>
</tr>
<tr>
<td>August</td>
<td>294</td>
<td>50</td>
<td>56</td>
<td>1.1</td>
<td>7.4</td>
</tr>
<tr>
<td>September</td>
<td>166</td>
<td>24</td>
<td>31</td>
<td>1.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Annual</td>
<td>278</td>
<td>56</td>
<td>56</td>
<td>1.0</td>
<td>100</td>
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</tbody>
</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1931-86

<table>
<thead>
<tr>
<th>Period (Secu.)</th>
<th>Discharge, in ft³/s</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1,810</td>
<td>8,700</td>
<td>15,700</td>
<td>23,100</td>
<td>32,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1,000</td>
<td>5,070</td>
<td>9,420</td>
<td>14,200</td>
<td>20,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>754</td>
<td>2,690</td>
<td>4,880</td>
<td>7,230</td>
<td>10,300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>327</td>
<td>1,450</td>
<td>2,560</td>
<td>3,720</td>
<td>5,230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>199</td>
<td>850</td>
<td>1,490</td>
<td>2,150</td>
<td>3,020</td>
<td></td>
<td></td>
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<tr>
<td>100</td>
<td>128</td>
<td>325</td>
<td>538</td>
<td>935</td>
<td>1,350</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>242</td>
<td>403</td>
<td>704</td>
<td>1,020</td>
<td></td>
<td></td>
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</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1930-86

<table>
<thead>
<tr>
<th>Period (Secu.)</th>
<th>Discharge, in ft³/s</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1,810</td>
<td>8,700</td>
<td>15,700</td>
<td>23,100</td>
<td>32,800</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>1,000</td>
<td>5,070</td>
<td>9,420</td>
<td>14,200</td>
<td>20,600</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>754</td>
<td>2,690</td>
<td>4,880</td>
<td>7,230</td>
<td>10,300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>327</td>
<td>1,450</td>
<td>2,560</td>
<td>3,720</td>
<td>5,230</td>
<td></td>
<td></td>
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<tr>
<td>50</td>
<td>199</td>
<td>850</td>
<td>1,490</td>
<td>2,150</td>
<td>3,020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>128</td>
<td>325</td>
<td>538</td>
<td>935</td>
<td>1,350</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>242</td>
<td>403</td>
<td>704</td>
<td>1,020</td>
<td></td>
<td></td>
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</tbody>
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### Duration Table of Daily Mean Flow, Water Years 1930-86

<table>
<thead>
<tr>
<th>Percent of Time</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>95%</th>
<th>98%</th>
<th>99%</th>
<th>99.5%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge, in ft³/s</td>
<td>960</td>
<td>148</td>
<td>64</td>
<td>37</td>
<td>25</td>
<td>15</td>
<td>11</td>
<td>8.9</td>
<td>6.6</td>
<td>4.6</td>
<td>2.8</td>
<td>0.84</td>
<td>0.07</td>
<td>0.03</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
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</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
**MEAN MONTHLY AND ANNUAL DISCHARGES, 1966-78**

<table>
<thead>
<tr>
<th>MONTH</th>
<th>OCTOBER</th>
<th>NOVEMBER</th>
<th>DECEMBER</th>
<th>JANUARY</th>
<th>FEBRUARY</th>
<th>MARCH</th>
<th>APRIL</th>
<th>MAY</th>
<th>JUNE</th>
<th>JULY</th>
<th>AUGUST</th>
<th>SEPTEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM</td>
<td>33</td>
<td>8.7</td>
<td>16</td>
<td>13</td>
<td>15</td>
<td>103</td>
<td>362</td>
<td>134</td>
<td>9.8</td>
<td>4.7</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>MINIMUM</td>
<td>0.83</td>
<td>0.67</td>
<td>0.33</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>2.4</td>
<td>1.2</td>
<td>0.49</td>
<td>0.41</td>
<td>0.38</td>
<td>0.38</td>
</tr>
<tr>
<td>MEAN</td>
<td>5.8</td>
<td>3.0</td>
<td>2.5</td>
<td>1.9</td>
<td>2.7</td>
<td>13.5</td>
<td>83</td>
<td>1.2</td>
<td>1.8</td>
<td>1.2</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>STDEV</td>
<td>9.9</td>
<td>2.9</td>
<td>4.2</td>
<td>3.3</td>
<td>4.1</td>
<td>29</td>
<td>362</td>
<td>2.5</td>
<td>2.5</td>
<td>2.0</td>
<td>2.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

**MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1967-78**

<table>
<thead>
<tr>
<th>PERIOD DAYS</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>50†</th>
<th>100†</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>DISCHARGE, IN FT³/S</td>
<td>0.37</td>
<td>0.39</td>
<td>0.40</td>
<td>0.42</td>
<td>0.47</td>
<td>0.55</td>
</tr>
<tr>
<td>NON-EXCEEDANCE PROBABILITY, IN PERCENT</td>
<td>0.24</td>
<td>0.25</td>
<td>0.27</td>
<td>0.29</td>
<td>0.31</td>
<td>0.36</td>
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</tbody>
</table>

**MAGNITUDE AND PROBABILITY OF ANNUAL HIGH FLOW, BASED ON WATER YEARS 1966-78**

<table>
<thead>
<tr>
<th>PERIOD DAYS</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>50†</th>
<th>100†</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>DISCHARGE, IN FT³/S</td>
<td>0.17</td>
<td>0.17</td>
<td>0.19</td>
<td>0.21</td>
<td>0.22</td>
<td>0.25</td>
</tr>
<tr>
<td>NON-EXCEEDANCE PROBABILITY, IN PERCENT</td>
<td>0.14</td>
<td>0.14</td>
<td>0.16</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
</tr>
</tbody>
</table>

**DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1966-78**

<table>
<thead>
<tr>
<th>PERCENTAGE</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>95%</th>
<th>98%</th>
<th>99%</th>
<th>99.5%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGE, IN FT³/S</td>
<td>253</td>
<td>53</td>
<td>22</td>
<td>12</td>
<td>6.7</td>
<td>3.4</td>
<td>2.2</td>
<td>1.5</td>
<td>1.2</td>
<td>0.91</td>
<td>0.66</td>
<td>0.46</td>
<td>0.33</td>
<td>0.26</td>
<td>0.23</td>
<td>0.21</td>
<td>0.20</td>
<td></td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
**Mean Monthly and Annual Discharges, 1963-82**

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>STANDARD DEVIATION (FT³/S)</th>
<th>COEFFICIENT OF VARIATION</th>
<th>ANNUAL RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
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<td>726</td>
<td>20</td>
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<td>1.9</td>
<td>5.4</td>
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<td>18</td>
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<td>62</td>
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<td>3.6</td>
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<tr>
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<td>15</td>
<td>72</td>
<td>134</td>
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<td>4.2</td>
</tr>
<tr>
<td>JANUARY</td>
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<td>18</td>
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<td>3.6</td>
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<td>21</td>
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</tr>
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<td>334</td>
<td>44</td>
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<td>17</td>
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<td>44</td>
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<td>3.9</td>
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**Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1964-82**

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
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<tbody>
<tr>
<td>TIVE</td>
<td>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL AND PROBABILITY.</td>
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<tr>
<td>DAYS</td>
<td>50%</td>
</tr>
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<td>2</td>
<td>1</td>
</tr>
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<td>10</td>
<td>7</td>
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<tr>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>50†</td>
<td>30</td>
</tr>
<tr>
<td>100†</td>
<td>60</td>
</tr>
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**Magnitude and Probability of Annual High Flow, Based on Water Years 1963-82**

<table>
<thead>
<tr>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIOD</td>
</tr>
<tr>
<td>DAYS</td>
</tr>
<tr>
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</tr>
<tr>
<td>10%</td>
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<td>25%</td>
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<tr>
<td>50%</td>
</tr>
<tr>
<td>100%</td>
</tr>
<tr>
<td>1,620</td>
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**Duration Table of Daily Mean Flow, Water Years 1963-82**

<table>
<thead>
<tr>
<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIOD</td>
</tr>
<tr>
<td>DISCHARGE</td>
</tr>
</tbody>
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† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1958-80

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (ft³/s)</th>
<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Standard Deviation (ft³/s)</th>
<th>Coefficient of Variation</th>
<th>Annual Magnitude (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>24</td>
<td>0.53</td>
<td>3.3</td>
<td>3.5</td>
<td>1.6</td>
<td>3.0</td>
</tr>
<tr>
<td>November</td>
<td>12</td>
<td>0.35</td>
<td>2.5</td>
<td>2.5</td>
<td>1.0</td>
<td>2.2</td>
</tr>
<tr>
<td>December</td>
<td>27</td>
<td>0.68</td>
<td>3.3</td>
<td>3.7</td>
<td>1.7</td>
<td>3.0</td>
</tr>
<tr>
<td>January</td>
<td>15</td>
<td>0.59</td>
<td>3.3</td>
<td>4.3</td>
<td>1.3</td>
<td>3.0</td>
</tr>
<tr>
<td>February</td>
<td>14</td>
<td>0.59</td>
<td>4.2</td>
<td>4.0</td>
<td>0.94</td>
<td>3.8</td>
</tr>
<tr>
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<td>11</td>
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<td>17</td>
<td>17</td>
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</tr>
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</tr>
<tr>
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<td>19</td>
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<td>4.6</td>
<td>1.3</td>
<td>3.1</td>
</tr>
<tr>
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<td>0.25</td>
<td>2.0</td>
<td>1.5</td>
<td>0.76</td>
<td>1.8</td>
</tr>
<tr>
<td>August</td>
<td>12</td>
<td>0.37</td>
<td>2.6</td>
<td>2.2</td>
<td>0.87</td>
<td>2.3</td>
</tr>
<tr>
<td>September</td>
<td>15</td>
<td>0.33</td>
<td>3.3</td>
<td>3.7</td>
<td>1.1</td>
<td>3.0</td>
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<tr>
<td>Annual</td>
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<td>9.1</td>
<td>7.0</td>
<td>0.76</td>
<td>100</td>
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### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1959-80

<table>
<thead>
<tr>
<th>Period (Cons. Days)</th>
<th>Discharge, in ft³/s</th>
<th>2%</th>
<th>5%</th>
<th>10%</th>
<th>20%</th>
<th>50%</th>
<th>90%</th>
<th>95%</th>
<th>98%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.89</td>
<td>0.50</td>
<td>0.34</td>
<td>0.23</td>
<td>0.14</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.89</td>
<td>0.50</td>
<td>0.34</td>
<td>0.23</td>
<td>0.14</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
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<td>0.35</td>
<td>0.24</td>
<td>0.14</td>
<td>0.10</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0.95</td>
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<td>0.16</td>
<td>0.11</td>
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<td></td>
<td></td>
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<tr>
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<td>0.61</td>
<td>0.43</td>
<td>0.31</td>
<td>0.20</td>
<td>0.14</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1.11</td>
<td>0.69</td>
<td>0.50</td>
<td>0.37</td>
<td>0.25</td>
<td>0.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>1.2</td>
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<td>0.57</td>
<td>0.42</td>
<td>0.28</td>
<td>0.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>1.4</td>
<td>0.86</td>
<td>0.63</td>
<td>0.47</td>
<td>0.32</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>183</td>
<td>1.6</td>
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<td>0.70</td>
<td>0.54</td>
<td>0.39</td>
<td>0.32</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Instantaneous Peak Flow

- **Weighted Skew (logs)**: -0.18
- **Mean (logs)**: 2.02
- **Standard Dev. (logs)**: 0.28

### Duration Table of Daily Mean Flow, Water Years 1958-80

| Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time |
|----------------------------------|----------------------------------|
| 1%                               | 5%                               | 10%                              | 15%                              | 20%                              | 30%                              | 40%                              | 50%                              | 60%                              | 70%                              | 80%                              | 90%                              | 95%                              | 98%                              | 99%                              | 99.5%                             | 99.9%                             |
| 116                              | 49                               | 23                               | 14                               | 8.4                              | 3.9                              | 2.4                              | 1.9                              | 1.6                              | 1.4                              | 1.2                              | 0.38                             | 0.56                             | 0.31                             | 0.26                             | 0.23                             | 0.21                             |

† Reliability of values in column is uncertain, and potential errors are large.
<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>STANDARD DEVIATION</th>
<th>COEFFICIENT OF VARIATION</th>
<th>ANNUAL RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>1,210</td>
<td>14</td>
<td>134</td>
<td>258</td>
<td>1.9</td>
<td>5.2</td>
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<td>71</td>
<td>0.89</td>
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<td>220</td>
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<td>8.6</td>
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<td>64</td>
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<td>2.4</td>
</tr>
<tr>
<td>JULY</td>
<td>122</td>
<td>17</td>
<td>44</td>
<td>23</td>
<td>0.53</td>
<td>1.7</td>
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<td>104</td>
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<td>81</td>
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<td>157</td>
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### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1955-86

<table>
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<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50%</td>
</tr>
<tr>
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<td>3</td>
</tr>
<tr>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>60</td>
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<td>183</td>
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### Magnitude and Probability of Instantaneous Peak Flow, Based on Period of Record 1954-86

<table>
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<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
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<tbody>
<tr>
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<td>90</td>
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### Duration Table of Daily Mean Flow, Water Years 1954-86

<table>
<thead>
<tr>
<th>PERCENT OF TIME</th>
<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED</th>
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<tr>
<td>1%</td>
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<td>5%</td>
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<tr>
<td>10%</td>
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<tr>
<td>15%</td>
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<tr>
<td>20%</td>
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<tr>
<td>30%</td>
<td>138</td>
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<tr>
<td>40%</td>
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<tr>
<td>98%</td>
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<tr>
<td>99%</td>
<td>11</td>
</tr>
<tr>
<td>99.5%</td>
<td>8.7</td>
</tr>
<tr>
<td>99.9%</td>
<td>5.5</td>
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</table>

† Reliability of values in column is uncertain, and potential errors are large.
### MEAN MONTHLY AND ANNUAL DISCHARGES, 1958-80

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>VARIATION (%)</th>
<th>ANNUAL RUNOFF (FT³/S)</th>
<th>STANDARD DEVIATION (LOGS)</th>
<th>COEFFICIENT OF VARIATION (%)</th>
<th>PERCENT RELIABILITY</th>
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<td>3.7</td>
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<tr>
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<td>19</td>
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<td>39</td>
<td>57</td>
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<td>4.8</td>
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<td>3%</td>
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<td>35</td>
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<td>7.9</td>
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<td>5%</td>
</tr>
<tr>
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<td>119</td>
<td>0.90</td>
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<td>6%</td>
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<tr>
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<td>6.3</td>
<td>34</td>
<td>39</td>
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<td>4.1</td>
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<td>9%</td>
</tr>
<tr>
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<td>6.5</td>
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<td>11</td>
<td>0.56</td>
<td>2.4</td>
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<tr>
<td>AUGUST</td>
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<td>7.8</td>
<td>40</td>
<td>29</td>
<td>0.73</td>
<td>4.9</td>
<td></td>
<td>11%</td>
</tr>
<tr>
<td>SEPTEMBER</td>
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<td>7.0</td>
<td>31</td>
<td>26</td>
<td>0.83</td>
<td>3.8</td>
<td></td>
<td>12%</td>
</tr>
<tr>
<td>ANNUAL</td>
<td>167</td>
<td>17</td>
<td>69</td>
<td>43</td>
<td>0.62</td>
<td>100</td>
<td></td>
<td>13%</td>
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### MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1959-81

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
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<td>4.2</td>
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<td>3.4</td>
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<td>3.5</td>
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<td>6.3</td>
<td>5.6</td>
<td>5.0</td>
<td>4.5</td>
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<td>6.4</td>
<td>5.8</td>
<td>5.1</td>
<td>4.7</td>
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<tr>
<td>60</td>
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<td>8.0</td>
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<td>6.3</td>
<td>5.7</td>
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<tr>
<td>90</td>
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<td>10</td>
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<td>7.8</td>
<td>7.3</td>
</tr>
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<tr>
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<td>12</td>
<td>11</td>
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### MAGNITUDE AND PROBABILITY OF ANNUAL HIGH FLOW, BASED ON WATER YEARS 1958-80

<table>
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<th>PERIOD (CONSECUTIVE DAYS)</th>
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<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>969</td>
<td>1,440</td>
<td>2,190</td>
<td>2,860</td>
<td>3,640</td>
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<tr>
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<td>391</td>
<td>791</td>
<td>1,140</td>
<td>1,670</td>
<td>2,130</td>
<td>2,650</td>
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<tr>
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<td>623</td>
<td>859</td>
<td>1,190</td>
<td>1,470</td>
<td>1,760</td>
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<td>15</td>
<td>269</td>
<td>503</td>
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<td>1,350</td>
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<td>30</td>
<td>219</td>
<td>416</td>
<td>576</td>
<td>806</td>
<td>997</td>
<td>1,200</td>
</tr>
<tr>
<td>60</td>
<td>172</td>
<td>330</td>
<td>456</td>
<td>638</td>
<td>786</td>
<td>965</td>
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<tr>
<td>90</td>
<td>140</td>
<td>271</td>
<td>375</td>
<td>520</td>
<td>638</td>
<td>761</td>
</tr>
</tbody>
</table>

### DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1958-80

| PERCENT RELIABILITY | 1% | 5% | 10% | 15% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | 99% | 99.5% | 99.9% | 4.4 |
|---------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|
| 597                 | 293| 177| 122 | 87  | 53  | 34  | 24  | 18  | 15  | 12  | 9.9 | 8.1 | 6.4 | 5.6 | 5.1  | 4.4  |
### Mean Monthly and Annual Discharges, 1915, 1958-86

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>STANDARD deviations</th>
<th>COEFFICIENT OF VARIATION</th>
<th>PERCENT OF ANNUAL RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>2,730</td>
<td>31</td>
<td>276</td>
<td>579</td>
<td>2.1</td>
<td>5.3</td>
</tr>
<tr>
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<td>38</td>
<td>265</td>
<td>526</td>
<td>0.92</td>
<td>2.8</td>
</tr>
<tr>
<td>DECEMBER</td>
<td>1,070</td>
<td>37</td>
<td>548</td>
<td>334</td>
<td>0.97</td>
<td>6.7</td>
</tr>
<tr>
<td>JANUARY</td>
<td>3,150</td>
<td>57</td>
<td>610</td>
<td>661</td>
<td>1.1</td>
<td>11.6</td>
</tr>
<tr>
<td>FEBRUARY</td>
<td>3,860</td>
<td>90</td>
<td>1,060</td>
<td>959</td>
<td>0.91</td>
<td>20.1</td>
</tr>
<tr>
<td>MARCH</td>
<td>4,420%</td>
<td>75</td>
<td>1,270%</td>
<td>1,900%</td>
<td>0.85</td>
<td>24.3</td>
</tr>
<tr>
<td>APRIL</td>
<td>3,110%</td>
<td>39</td>
<td>560</td>
<td>678</td>
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<td>10.7</td>
</tr>
<tr>
<td>MAY</td>
<td>448</td>
<td>17</td>
<td>117</td>
<td>123</td>
<td>1.0</td>
<td>2.2</td>
</tr>
<tr>
<td>JUNE</td>
<td>763</td>
<td>30</td>
<td>92</td>
<td>131</td>
<td>1.4</td>
<td>1.8</td>
</tr>
<tr>
<td>JULY</td>
<td>659</td>
<td>35</td>
<td>185</td>
<td>166</td>
<td>0.90</td>
<td>3.5</td>
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<tr>
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<td>501</td>
<td>31</td>
<td>139</td>
<td>117</td>
<td>0.85</td>
<td>2.6</td>
</tr>
<tr>
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<td>78</td>
<td>436</td>
<td>321</td>
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</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1915, 1959-86

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>183</td>
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</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1915, 1958-86

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>7</td>
</tr>
<tr>
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<td>15</td>
</tr>
<tr>
<td></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>90</td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1915, 1958-86

| DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME |
|---------------------------------|----------------------------------|
| %                               | 5%                               |
| 1%                              | 5%                               |
| 10%                             | 10%                              |
| 25%                             | 25%                              |
| 50%                             | 50%                              |
| 60%                             | 60%                              |
| 70%                             | 70%                              |
| 80%                             | 80%                              |
| 90%                             | 90%                              |
| 95%                             | 95%                              |
| 99%                             | 99%                              |
| 99.5%                           | 99.5%                            |
| 99.9%                           | 99.9%                            |
| 4,210                           | 1,910                            |
| 1,210                           | 789                              |
| 511                             | 511                              |
| 268                             | 268                              |
| 164                             | 164                              |
| 110                             | 110                              |
| 81                              | 81                               |
| 64                              | 64                               |
| 51                              | 51                               |
| 38                              | 38                               |
| 24                              | 24                               |
| 21                              | 21                               |
| 18                              | 18                               |
| 13                              | 13                               |

† Reliability of values in column is uncertain, and potential errors are large.
09490800 NORTH FORK WHITE RIVER NEAR GREER, AZ

### Mean Monthly and Annual Discharges, 1966-78

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (ft³/s)</th>
<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation</th>
<th>Annual Discharge (ft³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>54</td>
<td>8.7</td>
<td>20</td>
<td>15</td>
<td>0.76</td>
<td>6.7</td>
</tr>
<tr>
<td>November</td>
<td>27</td>
<td>6.6</td>
<td>13</td>
<td>7.4</td>
<td>0.35</td>
<td>4.5</td>
</tr>
<tr>
<td>December</td>
<td>25</td>
<td>6.1</td>
<td>11</td>
<td>5.3</td>
<td>0.49</td>
<td>3.7</td>
</tr>
<tr>
<td>January</td>
<td>19</td>
<td>6.0</td>
<td>9.6</td>
<td>3.3</td>
<td>0.35</td>
<td>3.3</td>
</tr>
<tr>
<td>February</td>
<td>21</td>
<td>6.0</td>
<td>10</td>
<td>3.7</td>
<td>0.35</td>
<td>3.5</td>
</tr>
<tr>
<td>March</td>
<td>54</td>
<td>9.8</td>
<td>21</td>
<td>13</td>
<td>0.62</td>
<td>7.0</td>
</tr>
<tr>
<td>April</td>
<td>97</td>
<td>17</td>
<td>52</td>
<td>28</td>
<td>0.53</td>
<td>17.6</td>
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<tr>
<td>May</td>
<td>233</td>
<td>14</td>
<td>63</td>
<td>57</td>
<td>0.90</td>
<td>21.4</td>
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<tr>
<td>June</td>
<td>152</td>
<td>7.9</td>
<td>39</td>
<td>39</td>
<td>0.98</td>
<td>13.3</td>
</tr>
<tr>
<td>July</td>
<td>44</td>
<td>8.4</td>
<td>17</td>
<td>9.5</td>
<td>0.55</td>
<td>5.9</td>
</tr>
<tr>
<td>August</td>
<td>47</td>
<td>9.9</td>
<td>20</td>
<td>9.9</td>
<td>0.49</td>
<td>6.9</td>
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<tr>
<td>September</td>
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<td>10</td>
<td>0.57</td>
<td>6.2</td>
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<td>13</td>
<td>25</td>
<td>12</td>
<td>0.47</td>
<td>100</td>
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### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1967-78

<table>
<thead>
<tr>
<th>Period (Complete Days)</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
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<td>Recurrence Interval</td>
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<td></td>
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<td></td>
</tr>
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<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Discharge (ft³/s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>15</td>
<td>30</td>
<td>60</td>
</tr>
</tbody>
</table>
| Magnitude and Probability of Annual High Flow, Based on Water Years 1966-78

<table>
<thead>
<tr>
<th>Period (Complete Days)</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence Interval</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Discharge (ft³/s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>1</td>
<td>3</td>
<td>7</td>
<td>15</td>
<td>30</td>
<td>60</td>
</tr>
</tbody>
</table>

### Weighted Skew (LOGS) = 0.17
Mean (LOGS) = 2.27
Standard Dev. (LOGS) = 0.19

### Duration Table of Daily Mean Flow, Water Years 1966-78

| Discharge (ft³/s) | 1% | 5% | 10% | 15% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.5% | 99.9% |
|-------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                   | 193| 79 | 59  | 42  | 32  | 22  | 17  | 14  | 12  | 10  | 8.9 | 7.9 | 7.2 | 6.4 | 6.0 | 5.3  | 4.7  |

† Reliability of values in column is uncertain, and potential errors are large.
## Mean Monthly and Annual Discharges, 1946, 1951-54, 1958-85

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>STAN­DARD DEVIATION (FT³/S)</th>
<th>COEFFI- CIENT OF VARIATION</th>
<th>PERCENT ANNUAL RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>213</td>
<td>9.4</td>
<td>31</td>
<td>39</td>
<td>1.3</td>
<td>5.2</td>
</tr>
<tr>
<td>NOVEMBER</td>
<td>49</td>
<td>8.4</td>
<td>21</td>
<td>10</td>
<td>0.48</td>
<td>3.6</td>
</tr>
<tr>
<td>DECEMBER</td>
<td>98</td>
<td>7.5</td>
<td>21</td>
<td>17</td>
<td>0.81</td>
<td>3.7</td>
</tr>
<tr>
<td>JANUARY</td>
<td>78</td>
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<td>20</td>
<td>15</td>
<td>0.72</td>
<td>3.5</td>
</tr>
<tr>
<td>FEBRUARY</td>
<td>41</td>
<td>8.7</td>
<td>19</td>
<td>7.7</td>
<td>0.40</td>
<td>3.3</td>
</tr>
<tr>
<td>MARCH</td>
<td>170</td>
<td>14</td>
<td>45</td>
<td>33</td>
<td>0.74</td>
<td>7.7</td>
</tr>
<tr>
<td>APRIL</td>
<td>282</td>
<td>28</td>
<td>127</td>
<td>79</td>
<td>0.62</td>
<td>21.7</td>
</tr>
<tr>
<td>MAY</td>
<td>454</td>
<td>17</td>
<td>134</td>
<td>104</td>
<td>0.78</td>
<td>23.0</td>
</tr>
<tr>
<td>JUNE</td>
<td>293</td>
<td>10</td>
<td>72</td>
<td>72</td>
<td>0.99</td>
<td>12.4</td>
</tr>
<tr>
<td>JULY</td>
<td>80</td>
<td>10</td>
<td>27</td>
<td>17</td>
<td>0.62</td>
<td>4.7</td>
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<tr>
<td>AUGUST</td>
<td>82</td>
<td>14</td>
<td>33</td>
<td>15</td>
<td>0.47</td>
<td>5.6</td>
</tr>
<tr>
<td>SEPTEMBER</td>
<td>123</td>
<td>9.5</td>
<td>33</td>
<td>25</td>
<td>0.74</td>
<td>5.7</td>
</tr>
<tr>
<td>ANNUAL</td>
<td>108</td>
<td>16</td>
<td>49</td>
<td>25</td>
<td>0.51</td>
<td>100</td>
</tr>
</tbody>
</table>

## Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1947, 1952-54, 1959-85

<table>
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<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
</tr>
</thead>
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<td>1,300</td>
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<tr>
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<td>99</td>
<td>175</td>
<td>233</td>
<td>314</td>
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## Magnitude and Probability of Annual High Flow, Based on Water Years 1946, 1951-54, 1958-85

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<td>175</td>
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## Duration Table of Daily Mean Flow, Water Years 1946, 1951-54, 1958-85

| DISCHARGE, IN FT³/S, WHICH WAS EQUALLED OR EXCEEDED FOR INDICATED PERCENT OF TIME |
|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1%                              | 388 | 189 | 121 | 77  | 58  | 40  | 30  | 23  | 20  | 17  | 15  | 12  | 10  | 8.4 | 7.6 | 6.7 |
| 5%                              |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 10%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 15%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 20%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 30%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 40%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 50%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 60%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 70%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 80%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 90%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 95%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 98%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 99%                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 99.5%                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 99.9%                           |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1958-85

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<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Minimum Deviation</th>
<th>Coefficient of Variation</th>
<th>Standard Coefficient of Variation</th>
<th>Annual Discharge (ft³/s)</th>
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<tr>
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<td>4.5</td>
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<td>8.4</td>
<td>9.7</td>
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<tr>
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### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1959-85

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<tr>
<th>Period (Days)</th>
<th>Recurrence Interval, in Years</th>
<th>Exceedance Probability, in Percent</th>
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<td>120</td>
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<td>9</td>
<td>183</td>
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### Magnitude and Probability of Annual High Flow, Based on Water Years 1958-85

<table>
<thead>
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<th>Recurrence Interval, in Years</th>
<th>Exceedance Probability, in Percent</th>
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### Duration Table of Daily Mean Flow, Water Years 1958-85

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<th>95%</th>
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<th>99%</th>
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† Reliability of values in column is uncertain, and potential errors are large.
MEAN MONTHLY AND ANNUAL DISCHARGES, 1958-86

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<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
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<th>COEFFICIENT OF VARIATION</th>
<th>PERCENT</th>
<th>STANDARD COEFFICIENT OF ANNUAL RUNOFF</th>
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MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1959-86

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MAGNITUDE AND PROBABILITY OF INSTANTANEOUS PEAK FLOW, BASED ON PERIOD OF RECORD 1958-86

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<th>25</th>
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DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1958-86

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<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME</th>
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### Mean Monthly and Annual Discharges, 1954-66

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>MAXIMUM VARIATION (% MEAN)</th>
<th>ANNUAL AVERAGE RUNOFF (FT³/S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>6.8</td>
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</tr>
<tr>
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<td>135</td>
<td>3.5</td>
<td>25</td>
<td>1.6</td>
<td>17.5</td>
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<tr>
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<td>3.5</td>
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<td>10.3</td>
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<td>44</td>
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<td>8.2</td>
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<td>0.00</td>
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<td>1.4</td>
<td>1.4</td>
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<tr>
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<td>0.00</td>
<td>6.4</td>
<td>1.3</td>
<td>4.5</td>
</tr>
<tr>
<td>SEPTEMBER</td>
<td>10</td>
<td>0.00</td>
<td>3.1</td>
<td>1.1</td>
<td>2.2</td>
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<tr>
<td>ANNUAL</td>
<td></td>
<td></td>
<td>12</td>
<td>13</td>
<td>1.1</td>
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</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1955-67

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
<td>20%  10%  5%  2%  1%</td>
</tr>
<tr>
<td>DAYS</td>
<td>50%  20%  10%  5%  2%  1%</td>
</tr>
<tr>
<td>2</td>
<td>0.01  0.00  0.00  0.00  0.00  0.00</td>
</tr>
<tr>
<td>5</td>
<td>0.38  0.00  0.00  0.00  0.00  0.00</td>
</tr>
<tr>
<td>10</td>
<td>0.82  0.34  0.16  0.00  0.00  0.00</td>
</tr>
<tr>
<td>20</td>
<td>1.6   0.72  0.40  0.23  0.11  0.06</td>
</tr>
<tr>
<td>50†</td>
<td>1.1   0.71  0.37  0.22</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1954-66

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
<td>20%  10%  5%  2%  1%</td>
</tr>
<tr>
<td>DAYS</td>
<td>50%  20%  10%  5%  2%  1%</td>
</tr>
<tr>
<td>25</td>
<td>1,800 1,020 503 279 889</td>
</tr>
<tr>
<td>50†</td>
<td>3,760 2,160 1,010 538 834 1,250</td>
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</table>

### Magnitude and Probability of Instantaneous Peak Flow, Based on Period of Record 1954-67

<table>
<thead>
<tr>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
</tr>
<tr>
<td>DAYS</td>
</tr>
<tr>
<td>1%</td>
</tr>
<tr>
<td>5%</td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1954-66

<table>
<thead>
<tr>
<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%  5%  10%  15%  20%  30%  40%  50%  60%  70%  80%  90%  95%  98%  99%  99.5%  99.9%</td>
</tr>
<tr>
<td>144 37 17 9.7 7.0 5.4 4.4 3.7 2.8 1.7 0.63 0.07 0.04 0.01 0.01 0.00 0.00</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
09494500 CORDUROY CREEK ABOVE FORESTDALE CREEK, NEAR SHOW LOW, AZ

MEAN MONTHLY AND ANNUAL DISCHARGES, 1953-60

<table>
<thead>
<tr>
<th>MONTH</th>
<th>OCTOBER</th>
<th>NOVEMBER</th>
<th>DECEMBER</th>
<th>JANUARY</th>
<th>FEBRUARY</th>
<th>MARCH</th>
<th>APRIL</th>
<th>MAY</th>
<th>JUNE</th>
<th>JULY</th>
<th>AUGUST</th>
<th>SEPTEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM (FT³/S)</td>
<td>2.9</td>
<td>51</td>
<td>46</td>
<td>53</td>
<td>13</td>
<td>43</td>
<td>11</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.09</td>
</tr>
<tr>
<td>MINIMUM (FT³/S)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.09</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>MEAN (FT³/S)</td>
<td>1.0</td>
<td>18.5</td>
<td>16.5</td>
<td>18.5</td>
<td>2.5</td>
<td>19.5</td>
<td>1.7</td>
<td>0.09</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>VARIATION (FT³/S)</td>
<td>2.3</td>
<td>2.8</td>
<td>2.8</td>
<td>2.5</td>
<td>1.3</td>
<td>0.99</td>
<td>2.1</td>
<td>1.0</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ANNUAL</td>
<td>17</td>
<td>0.22</td>
<td>4.0</td>
<td>5.5</td>
<td>1.4</td>
<td>100</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</table>

MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1954-61

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>20†</th>
<th>50†</th>
<th>100†</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>30</td>
<td>60</td>
</tr>
</tbody>
</table>

MAGNITUDE AND PROBABILITY OF ANNUAL HIGH FLOW, BASED ON WATER YEARS 1953-60

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>25†</th>
<th>50†</th>
<th>100†</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</td>
<td>1</td>
<td>101</td>
<td>402</td>
<td>841</td>
<td>1,870</td>
<td>3,140</td>
</tr>
</tbody>
</table>

DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1953-60

| PERCENT OF TIME | 1% | 5% | 10% | 15% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.5% | 99.9% |
|-----------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| DISCHARGE, IN FT³/S, WHICH WAS EQUALLED OR EXCEEDED FOR INDICATED | 74 | 15 | 3.9 | 1.4 | 0.57 | 0.16 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

† Reliability of values in column is uncertain, and potential errors are large.
09496000 CORDUROY CREEK NEAR MOUTH, NEAR SHOW LOW, AZ

MEAN MONTHLY AND ANNUAL DISCHARGES, 1952-75

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>STANDARD DEVIATION OF MEAN</th>
<th>COEFFICIENT OF VARIATION</th>
<th>ANNUAL RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>161.0</td>
<td>1.6</td>
<td>36.0</td>
<td>2.8</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>NOVEMBER</td>
<td>94.0</td>
<td>1.8</td>
<td>24.0</td>
<td>2.2</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>DECEMBER</td>
<td>347.0</td>
<td>1.2</td>
<td>80.0</td>
<td>2.3</td>
<td>12.7</td>
<td></td>
</tr>
<tr>
<td>JANUARY</td>
<td>434.0</td>
<td>1.8</td>
<td>94.0</td>
<td>2.1</td>
<td>16.3</td>
<td></td>
</tr>
<tr>
<td>FEBRUARY</td>
<td>260.0</td>
<td>2.0</td>
<td>72.0</td>
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<td>14.7</td>
<td></td>
</tr>
<tr>
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<td>429.0</td>
<td>2.0</td>
<td>91.0</td>
<td>1.4</td>
<td>23.9</td>
<td></td>
</tr>
<tr>
<td>APRIL</td>
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<td>1.8</td>
<td>43.0</td>
<td>1.6</td>
<td>9.8</td>
<td></td>
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<tr>
<td>MAY</td>
<td>72.0</td>
<td>1.3</td>
<td>16.0</td>
<td>1.4</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>JUNE</td>
<td>28.0</td>
<td>1.3</td>
<td>9.2</td>
<td>1.2</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>JULY</td>
<td>31.0</td>
<td>1.4</td>
<td>8.8</td>
<td>1.1</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>AUGUST</td>
<td>24.0</td>
<td>1.6</td>
<td>6.4</td>
<td>0.85</td>
<td>2.7</td>
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<tr>
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<td>3.6</td>
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<td>1.2</td>
<td>100</td>
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</table>

MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1953-75

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
<td>2</td>
</tr>
<tr>
<td>DAYS</td>
<td>50%</td>
</tr>
<tr>
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<tr>
<td>3</td>
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<td>30</td>
<td>1.3</td>
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<td>60</td>
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<td>90</td>
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</tr>
<tr>
<td>120</td>
<td>1.8</td>
</tr>
<tr>
<td>183</td>
<td>2.0</td>
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MAGNITUDE AND PROBABILITY OF ANNUAL HIGH FLOW, BASED ON WATER YEARS 1952-75

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
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<tr>
<td>DAYS</td>
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</tr>
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<tr>
<td>3</td>
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<td>49</td>
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<tr>
<td>60</td>
<td>34</td>
</tr>
<tr>
<td>90</td>
<td>27</td>
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</table>

DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1952-75

<table>
<thead>
<tr>
<th>PERCENT</th>
<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>5%</td>
</tr>
<tr>
<td>364</td>
<td>80</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM (FT³/S)</th>
<th>MINIMUM (FT³/S)</th>
<th>MEAN (FT³/S)</th>
<th>STD. DEV. (FT³/S)</th>
<th>COEFFICIENT OF VARIATION (%)</th>
<th>ANNUAL DISCHARGE (FT³/S)</th>
<th>ANNUAL PERCENTAGE OF ANNUAL RUNOFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>397</td>
<td>1.6</td>
<td>37</td>
<td>86</td>
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<td>201</td>
<td>5.8</td>
</tr>
<tr>
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<td>147</td>
<td>2.5</td>
<td>25</td>
<td>38</td>
<td>1.5</td>
<td>57</td>
<td>3.7</td>
</tr>
<tr>
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<td>762</td>
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<td>111</td>
<td>200</td>
<td>1.8</td>
<td>54</td>
<td>3.7</td>
</tr>
<tr>
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<td>5.4</td>
<td>89</td>
<td>158</td>
<td>1.8</td>
<td>60</td>
<td>1.6</td>
</tr>
<tr>
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<td>965</td>
<td>6.3</td>
<td>120</td>
<td>206</td>
<td>1.7</td>
<td>41</td>
<td>0.87</td>
</tr>
<tr>
<td>MARCH</td>
<td>698</td>
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<td>162</td>
<td>185</td>
<td>1.2</td>
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<td>56</td>
<td>80</td>
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<td>38</td>
<td>0.26</td>
</tr>
<tr>
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<td>23</td>
<td>30</td>
<td>3.3</td>
<td>25</td>
<td>0.18</td>
</tr>
<tr>
<td>JUNE</td>
<td>41</td>
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<td>14</td>
<td>12</td>
<td>3.3</td>
<td>10</td>
<td>0.13</td>
</tr>
<tr>
<td>JULY</td>
<td>41</td>
<td>1.3</td>
<td>15</td>
<td>13</td>
<td>3.3</td>
<td>10</td>
<td>0.13</td>
</tr>
<tr>
<td>AUGUST</td>
<td>42</td>
<td>3.2</td>
<td>17</td>
<td>11</td>
<td>2.6</td>
<td>10</td>
<td>0.13</td>
</tr>
<tr>
<td>SEPTEMBER</td>
<td>30</td>
<td>0.91</td>
<td>10</td>
<td>8.1</td>
<td>1.5</td>
<td>10</td>
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<td>5.8</td>
<td>57</td>
<td>54</td>
<td>0.96</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1953-61, 1969-75, 1979-86

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENT INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 5 10 20 50† 100†</td>
</tr>
<tr>
<td></td>
<td>50% 20% 10% 5% 2% 1%</td>
</tr>
<tr>
<td></td>
<td>1 1.5 0.60 0.38 0.26 0.18 0.13</td>
</tr>
<tr>
<td></td>
<td>3 1.6 0.67 0.44 0.32 0.22 0.18</td>
</tr>
<tr>
<td></td>
<td>7 1.7 0.79 0.54 0.40 0.29 0.23</td>
</tr>
<tr>
<td></td>
<td>14 2.0 0.94 0.65 0.48 0.35 0.29</td>
</tr>
<tr>
<td></td>
<td>30 2.7 0.93 0.69 0.46 0.37 0.33</td>
</tr>
<tr>
<td></td>
<td>60 4.1 2.1 1.3 1.0 0.74 0.58</td>
</tr>
<tr>
<td></td>
<td>90 5.4 2.9 2.1 1.6 1.2 1.0</td>
</tr>
<tr>
<td></td>
<td>120 6.4 3.7 2.8 2.3 1.8 1.5</td>
</tr>
<tr>
<td></td>
<td>183 8.4 5.6 4.7 4.1 3.6 3.3</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENT INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 5 10 25 50 100†</td>
</tr>
<tr>
<td></td>
<td>50% 20% 10% 5% 2% 1%</td>
</tr>
<tr>
<td></td>
<td>1 1,020 3,560 6,820 13,600 21,200 31,600</td>
</tr>
<tr>
<td></td>
<td>3 681 2,260 4,150 7,630 11,200 15,500</td>
</tr>
<tr>
<td></td>
<td>7 414 1,310 2,330 4,180 6,020 8,290</td>
</tr>
<tr>
<td></td>
<td>15 251 766 1,330 2,350 3,350 4,580</td>
</tr>
<tr>
<td></td>
<td>30 167 489 834 1,440 2,030 2,740</td>
</tr>
<tr>
<td></td>
<td>60 115 324 538 898 1,230 1,630</td>
</tr>
<tr>
<td></td>
<td>90 91 261 435 729 1,000 1,320</td>
</tr>
</tbody>
</table>

### Weighted Skew (LOGS) = 0.22, Mean (LOGS) = 3.52, Standard Dev. (LOGS) = 0.42

### Duration Table of Daily Mean Flow, Water Years 1952-60, 1966, 1968-75, 1978-86

<table>
<thead>
<tr>
<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALLED OR EXCEEDED FOR INDICATED PERCENT OF TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1% 5% 10% 15% 20% 30% 40% 50% 60%</td>
</tr>
<tr>
<td>745 220 89 51 37 27 18 12 7.9 6.3 4.7 2.6 1.6 0.98 0.72 0.56 0.41</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1959-71

<table>
<thead>
<tr>
<th>MONTH</th>
<th>OCTOBER</th>
<th>NOVEMBER</th>
<th>DECEMBER</th>
<th>JANUARY</th>
<th>FEBRUARY</th>
<th>MARCH</th>
<th>APRIL</th>
<th>MAY</th>
<th>JUNE</th>
<th>JULY</th>
<th>AUGUST</th>
<th>SEPTEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.05</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1960-71

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
<td>2</td>
</tr>
<tr>
<td>DAYS</td>
<td>50%</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Instantaneous Peak Flow

**Based on Period of Record 1958-71**

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIVE</td>
<td>2</td>
</tr>
<tr>
<td>DAYS</td>
<td>50%</td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1959-71

| PERCENT OF TIME | 1% | 5% | 10% | 15% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | 98% | 99% | 99.5% | 99.9% |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED | 0.36 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1959-71

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (ft³/s)</th>
<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Standard Deviation (ft³/s)</th>
<th>Coefficient of Variation (percent)</th>
<th>Annual Discharge (ft³/s)</th>
<th>Percent of Time (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>0.05</td>
<td>0.00</td>
<td>0.01</td>
<td>1.6</td>
<td>9.0</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>November</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>1.6</td>
<td>3.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>December</td>
<td>0.09</td>
<td>0.00</td>
<td>0.03</td>
<td>2.2</td>
<td>11.9</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>January</td>
<td>0.03</td>
<td>0.00</td>
<td>0.01</td>
<td>2.6</td>
<td>3.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>February</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>March</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>3.6</td>
<td>0.7</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>April</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>May</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>June</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>July</td>
<td>0.13</td>
<td>0.00</td>
<td>0.04</td>
<td>1.8</td>
<td>18.7</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>August</td>
<td>0.21</td>
<td>0.00</td>
<td>0.06</td>
<td>1.5</td>
<td>36.6</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>September</td>
<td>0.06</td>
<td>0.00</td>
<td>0.02</td>
<td>1.1</td>
<td>17.2</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Annual</td>
<td>0.03</td>
<td>0.00</td>
<td>0.01</td>
<td>0.93</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1960-71

<table>
<thead>
<tr>
<th>Period (Consecutive Days)</th>
<th>Discharge (ft³/s)</th>
<th>Recurrence Interval, in Years, and Non-Exceedance Probability, in Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>0.77</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td>0.32</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td>0.16</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>0.09</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>0.06</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>0.03</td>
<td>0.05</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1959-71

<table>
<thead>
<tr>
<th>Period (Consecutive Days)</th>
<th>Discharge (ft³/s)</th>
<th>Recurrence Interval, in Years, and Exceedance Probability, in Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>0.52</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>0.59</td>
<td>0.44</td>
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<tr>
<td></td>
<td>0.67</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td>0.89</td>
<td>0.76</td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1959-71

<table>
<thead>
<tr>
<th>Discharge (ft³/s), Which Was Equaled or Exceeded for indicated Percent of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>0.29</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1925-86

<table>
<thead>
<tr>
<th>Month</th>
<th>Mean Discharge (ft³/s)</th>
<th>Maximum Discharge (ft³/s)</th>
<th>Minimum Discharge (ft³/s)</th>
<th>Standard Deviation (ft³/s)</th>
<th>Coefficient of Variation</th>
<th>Mean Deviation of Anomaly (%)</th>
<th>Percent of Annual Runoff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>3,780</td>
<td>361</td>
<td>599</td>
<td>1.7</td>
<td>4.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>1,300</td>
<td>260</td>
<td>200</td>
<td>0.77</td>
<td>3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>3,980</td>
<td>498</td>
<td>802</td>
<td>1.6</td>
<td>6.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>4,250</td>
<td>554</td>
<td>722</td>
<td>1.3</td>
<td>7.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>6,180</td>
<td>853</td>
<td>1,040</td>
<td>1.2</td>
<td>10.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>6,030</td>
<td>1,430</td>
<td>2,220</td>
<td>0.85</td>
<td>18.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>4,850</td>
<td>1,740</td>
<td>1,300</td>
<td>0.75</td>
<td>21.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>5,070</td>
<td>934</td>
<td>954</td>
<td>1.0</td>
<td>11.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>1,190</td>
<td>318</td>
<td>262</td>
<td>0.82</td>
<td>4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>547</td>
<td>227</td>
<td>104</td>
<td>0.46</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>1,250</td>
<td>406</td>
<td>233</td>
<td>0.58</td>
<td>5.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>1,180</td>
<td>336</td>
<td>239</td>
<td>0.71</td>
<td>4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Annual</strong></td>
<td><strong>2,010</strong></td>
<td><strong>659</strong></td>
<td><strong>436</strong></td>
<td><strong>0.66</strong></td>
<td><strong>100</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1926-86

<table>
<thead>
<tr>
<th>Period (Consecutive Days)</th>
<th>Discharge, in ft³/s, for Indicated Recurrence Interval, in Years, and Non-Exceedance Probability, in Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>5,720</td>
</tr>
<tr>
<td></td>
<td>4,320</td>
</tr>
<tr>
<td></td>
<td>3,090</td>
</tr>
<tr>
<td></td>
<td>2,350</td>
</tr>
<tr>
<td></td>
<td>1,860</td>
</tr>
<tr>
<td></td>
<td>1,340</td>
</tr>
<tr>
<td></td>
<td>900</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1925-86

<table>
<thead>
<tr>
<th>Period (Consecutive Days)</th>
<th>Discharge, in ft³/s, for Indicated Recurrence Interval, in Years, and Exceedance Probability, in Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>5,720</td>
</tr>
<tr>
<td></td>
<td>4,320</td>
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<tr>
<td></td>
<td>3,090</td>
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<tr>
<td></td>
<td>2,350</td>
</tr>
<tr>
<td></td>
<td>1,860</td>
</tr>
<tr>
<td></td>
<td>1,340</td>
</tr>
<tr>
<td></td>
<td>900</td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1925-86

<table>
<thead>
<tr>
<th>Percent of Time</th>
<th>Discharge, in ft³/s, which was Equaled or Exceeded for Indicated Percent of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>5,170 2,560 1,550 1,060 782 490 350 262 213 182 158 128 108 87 77 71 61</td>
</tr>
<tr>
<td>5%</td>
<td>10% 15% 20% 30% 40% 50% 60% 70% 80% 90% 95% 98% 99% 99.5% 99.9%</td>
</tr>
</tbody>
</table>
MEAN MONTHLY AND ANNUAL DISCHARGES, 1960-86

| MONTH  | MAXIMUM (FT³/S) | MINIMUM (FT³/S) | MEAN (FT³/S) | STANDARD Deviation (FT³/S) | Coefficient of VARIATION | PERCENT RUNOFF |
|--------|----------------|----------------|--------------|-----------------------------|--------------------------|----------------|----------------|
| OCTOBER | 277            | 11             | 41           | 56                          | 1.4                      | 8%             | 54%            |
| NOVEMBER | 368           | 11             | 66           | 87                          | 1.3                      | 11%            | 9%             |
| DECEMBER | 550           | 11             | 77           | 107                         | 1.4                      | 13%            | 5%             |
| JANUARY | 209            | 11             | 51           | 50                          | 0.98                     | 8.9            | 5%             |
| FEBRUARY | 550           | 11             | 77           | 107                         | 1.4                      | 13.4           | 5%             |
| MARCH   | 477            | 12             | 108          | 122                         | 1.1                      | 19%            | 5%             |
| APRIL   | 274            | 11%            | 63           | 64                          | 1.0                      | 11%            | 5%             |
| MAY     | 131            | 5.6            | 26           | 26                          | 1.0                      | 4.6            | 5%             |
| JUNE    | 40             | 5.0            | 14           | 8.8                         | 0.61                     | 2.5            | 5%             |
| JULY    | 69             | 6.6            | 25           | 14                          | 0.55                     | 4.4            | 5%             |
| AUGUST  | 106            | 13             | 36           | 21                          | 0.58                     | 6.3            | 5%             |
| SEPTEMBER | 85            | 13             | 33           | 20                          | 0.60                     | 5.8            | 5%             |
| ANNUAL  | 133            | 16             | 47           | 32                          | 0.67                     | 100            | 5%             |

MAGNITUDE AND PROBABILITY OF ANNUAL LOW FLOW, BASED ON CLIMATIC YEARS 1961-86

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE NON-EXCEEDANCE PROBABILITY, IN PERCENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENT INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</td>
</tr>
<tr>
<td>DAYS</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

MAGNITUDE AND PROBABILITY OF ANNUAL HIGH FLOW, BASED ON WATER YEARS 1960-86

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE NON-EXCEEDANCE PROBABILITY, IN PERCENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENT INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</td>
</tr>
<tr>
<td>DAYS</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

DURATION TABLE OF DAILY MEAN FLOW, WATER YEARS 1960-86

<table>
<thead>
<tr>
<th>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED FOR INDICATED PERCENT OF TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCENTAGE</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>DISCHARGE, IN FT³/S</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1967-78, 1981-86

<table>
<thead>
<tr>
<th>Month</th>
<th>Maximum (ft³/s)</th>
<th>Minimum (ft³/s)</th>
<th>Mean (ft³/s)</th>
<th>Variance (ft³/s)</th>
<th>Coefficient of Variation</th>
<th>Annual Runoff (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>296.0</td>
<td>32.0</td>
<td>67.0</td>
<td>2.1</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>101.0</td>
<td>19.0</td>
<td>24.0</td>
<td>1.3</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>537.0</td>
<td>73.0</td>
<td>151.0</td>
<td>1.8</td>
<td>15.6</td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>179.0</td>
<td>45.0</td>
<td>48.0</td>
<td>1.1</td>
<td>9.6</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>568.0</td>
<td>102.0</td>
<td>139.0</td>
<td>1.4</td>
<td>21.9</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>423.0</td>
<td>101.0</td>
<td>131.0</td>
<td>1.3</td>
<td>21.7</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>195.0</td>
<td>31.0</td>
<td>44.0</td>
<td>1.6</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>66.0</td>
<td>13.0</td>
<td>14.0</td>
<td>1.0</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>18.0</td>
<td>7.7</td>
<td>4.4</td>
<td>0.4</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>23.0</td>
<td>10.0</td>
<td>4.5</td>
<td>0.4</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>35.5</td>
<td>14.0</td>
<td>7.4</td>
<td>0.5</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>151.0</td>
<td>18.0</td>
<td>32.0</td>
<td>1.8</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>Annual</td>
<td>130.8</td>
<td>39.2</td>
<td>32.0</td>
<td>0.8</td>
<td>10.0</td>
<td></td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1966-78, 1980-86

<table>
<thead>
<tr>
<th>Period (days)</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge (ft³/s)</td>
<td>7.4</td>
<td>6.2</td>
<td>5.4</td>
<td>4.8</td>
<td>3.8</td>
<td>3.0</td>
</tr>
<tr>
<td>Non-exceedance probability, in percent</td>
<td>1%</td>
<td>2%</td>
<td>5%</td>
<td>10%</td>
<td>20%</td>
<td>50%</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Instantaneous Peak Flow, Based on Period of Record 1966-86

<table>
<thead>
<tr>
<th>Discharge (ft³/s)</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>25</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighted Skew (logs)</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (logs)</td>
<td>3.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Dev. (logs)</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Duration Table of Daily Mean Flow, Water Years 1966-78, 1980-86

<table>
<thead>
<tr>
<th>Discharge (ft³/s)</th>
<th>99%</th>
<th>99.5%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>3.0</td>
<td>4.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

† Reliability of values in column is uncertain, and potential errors are large.
### Mean Monthly and Annual Discharges, 1914-86

<table>
<thead>
<tr>
<th>MONTH</th>
<th>MAXIMUM</th>
<th>MINIMUM</th>
<th>MEAN</th>
<th>STANDARD COEFFICIENT OF VARIATION</th>
<th>ANNUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCTOBER</td>
<td>4,830</td>
<td>86</td>
<td>466</td>
<td>797</td>
<td>902</td>
</tr>
<tr>
<td>NOVEMBER</td>
<td>2,150</td>
<td>122</td>
<td>372</td>
<td>362</td>
<td>663</td>
</tr>
<tr>
<td>DECEMBER</td>
<td>6,330</td>
<td>127</td>
<td>796</td>
<td>1,290</td>
<td>1,010</td>
</tr>
<tr>
<td>JANUARY</td>
<td>16,000</td>
<td>161</td>
<td>1,000</td>
<td>2,060</td>
<td>500</td>
</tr>
<tr>
<td>FEBRUARY</td>
<td>9,070</td>
<td>168</td>
<td>1,370</td>
<td>1,790</td>
<td>1,280</td>
</tr>
<tr>
<td>MARCH</td>
<td>10,400</td>
<td>220</td>
<td>1,970</td>
<td>1,950</td>
<td>1,610</td>
</tr>
<tr>
<td>APRIL</td>
<td>6,280</td>
<td>212</td>
<td>2,050</td>
<td>1,570</td>
<td>1,370</td>
</tr>
<tr>
<td>MAY</td>
<td>5,950</td>
<td>127</td>
<td>1,060</td>
<td>1,660</td>
<td>1,060</td>
</tr>
<tr>
<td>JUNE</td>
<td>1,370</td>
<td>79</td>
<td>370</td>
<td>303</td>
<td>340</td>
</tr>
<tr>
<td>JULY</td>
<td>3,280</td>
<td>78</td>
<td>345</td>
<td>397</td>
<td>330</td>
</tr>
<tr>
<td>AUGUST</td>
<td>3,610</td>
<td>151</td>
<td>596</td>
<td>484</td>
<td>440</td>
</tr>
<tr>
<td>SEPTEMBER</td>
<td>3,850</td>
<td>78</td>
<td>454</td>
<td>334</td>
<td>340</td>
</tr>
<tr>
<td>ANNUAL</td>
<td>3,250</td>
<td>236</td>
<td>902</td>
<td>663</td>
<td>0.74</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual Low Flow, Based on Climatic Years 1915-86

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND NON-EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>125, 92, 78, 68, 59, 53</td>
</tr>
<tr>
<td>2</td>
<td>128, 94, 80, 70, 60, 54</td>
</tr>
<tr>
<td>3</td>
<td>133, 97, 82, 72, 62, 56</td>
</tr>
<tr>
<td>4</td>
<td>135, 103, 87, 76, 65, 58</td>
</tr>
<tr>
<td>5</td>
<td>137, 114, 97, 84, 72, 65</td>
</tr>
<tr>
<td>10</td>
<td>157, 116, 97, 84, 72, 65</td>
</tr>
<tr>
<td>20</td>
<td>160, 124, 116, 102, 89, 81</td>
</tr>
<tr>
<td>50</td>
<td>185, 168, 116, 102, 89, 81</td>
</tr>
<tr>
<td>100</td>
<td>212, 185, 116, 102, 89, 81</td>
</tr>
</tbody>
</table>

### Magnitude and Probability of Annual High Flow, Based on Water Years 1914-86

<table>
<thead>
<tr>
<th>PERIOD (CONSECUTIVE DAYS)</th>
<th>DISCHARGE, IN FT³/S, FOR INDICATED RECURRENCE INTERVAL, IN YEARS, AND EXCEEDANCE PROBABILITY, IN PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7,270, 2,060, 1,390, 1,010, 637, 451, 340, 272, 233, 197, 156, 128, 101, 89, 79, 66</td>
</tr>
</tbody>
</table>

### Weighted Skew (LOGS)= 0.09

Mean (LOGS)= 4.17

Standard Dev. (LOGS)= 0.48

Duration Table of Daily Mean Flow, Water Years 1914-86

<table>
<thead>
<tr>
<th>PERCENT OF TIME</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>95%</th>
<th>98%</th>
<th>99%</th>
<th>99.5%</th>
<th>99.9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGE, IN FT³/S, WHICH WAS EQUALED OR EXCEEDED</td>
<td>7,270</td>
<td>3,390</td>
<td>2,060</td>
<td>1,390</td>
<td>1,010</td>
<td>637</td>
<td>451</td>
<td>340</td>
<td>272</td>
<td>233</td>
<td>197</td>
<td>156</td>
<td>128</td>
<td>101</td>
<td>89</td>
<td>79</td>
<td>66</td>
</tr>
</tbody>
</table>