Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States

United States Geological Survey Water-Supply Paper 2433

Prepared in cooperation with the Colorado Department of Highways, Arizona Department of Transportation, California Department of Transportation, Idaho Department of Transportation, Nevada Department of Transportation, New Mexico State Highway and Transportation Department, Oregon Department of Transportation, Texas Department of Transportation, and Utah Department of Transportation

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ERRATA SHEET
U.S. Geological Survey Water-Supply Paper 2433

Subsequent to publication of U.S. Geological Survey Water-Supply Paper 2433, "Methods for estimating magnitude and frequency of floods in the southwestern United States," errors were found on pages 48 and 52.

ERROR	CORRECTION
Page 48- Table 11. Exponents for the elevation factor in the equations for the 2-year, 5-year, and 10-year recurrence intervals are negative values.	The exponents should be positive values.
Page 52- Table 13. Exponents for the elevation factor in the equations for the 2-year, 5-year, 10-year, and 25-year recurrence intervals are negative values.	The exponents should be positive values.

We apologize for the inconvenience these errors may have caused.

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By BLAKEMORE E. THOMAS, H.W. HJALMARSON, and S.D. WALTEMEYER

Prepared in cooperation with the Colorado Department of Highways, Arizona Department of Transportation, California Department of Transportation, Idaho Department of Transportation, Nevada Department of Transportation, New Mexico State Highway and Transportation Department, Oregon Department of Transportation, Texas Department of Transportation, and Utah Department of Transportation

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CONTENTS

FIGURES

TABLES

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch (in.)	25.40	millimeter
foot (ft)	0.3048	meter
square mile (mi^2)	2.590	square kilometer
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer

Air temperatures are given in degrees Fahrenheit (°F), which can be converted to degrees Celsius (°C) by the following equation:

°C=5/9(°F)–32

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.

Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States

By Blakemore E. Thomas, H.W. Hjalmarson, *and* S.D. Waltemeyer

Abstract

Equations for estimating 2-, 5-, 10-, 25-, 50-, and 100-year peak discharges at ungaged sites in the southwestern United States were developed using generalized least-squares multiple-regression techniques and a hybrid method that was developed in this study. The equations are applicable to unregulated streams that drain basins of less than about 200 square miles. Drainage area, mean basin elevation, mean annual precipitation, mean annual evaporation, latitude, and longitude are the basin and climatic characteristics used in the equations. The study area was divided into 16 flood regions; Region 1 is a high-elevation region that includes the entire study area.

Floods in the northern latitudes of the study area generally are much smaller than floods in the southern latitudes. Typical unit peak discharges of record range from 316 cubic feet per second per square mile for sites between 29° and 37° latitude to 26 cubic feet per second per square mile for sites between 41° and 45° latitude. An elevation threshold exists in the study area above which large floods caused by thunderstorms are unlikely to occur. For sites between 29° and 41° latitude, the elevation threshold is approximately 7,500 feet. For sites between 41° and 45° latitude, the elevation threshold decreases in a northward direction at a rate of about 300 feet for each degree of latitude.

Detailed flood-frequency analyses were made of more than 1,300 gaging stations with a combined 40,000 station years of annual peak discharges through water year 1986. The log-Pearson Type III distribution and the method of moments were used to define flood-frequency relations. A low-discharge threshold was applied to about one-half of the sites to adjust the relations for low outliers. With few exceptions, the use of the low-discharge threshold resulted in markedly better-appearing fits between the computed relations and the plotted annual peak discharges. After all adjustments were made, 80 percent of the gaging stations were judged to have adequate fits of the computed relations to the plotted data. The individual flood-frequency relations were judged to be unreliable for the remaining 20 percent of the stations because of extremely poor fits of the computed relations to the data, and these relations were not used in the generalized least-squares regional-regression analysis. Most of the stations with unreliable relations were from extremely arid areas with 43 percent of the stations having no flow for more than 25 percent of the years of record. A new regional flood-frequency method, which is named the hybrid method, was developed for those more arid regions.

An analysis of regional skew coefficient was made for the study area. The methods of attempting to define the variation in skew by geographic areas or by regression with basin and climatic characteristics all failed to improve on a mean of zero for the sample. The regional skew used in the study, therefore, was the mean of zero with an associated error equal to the sample variance of 0.31 log units.

Generalized least-squares regression was used to define the regression models in 12 regions where sufficient data allowed a reasonable regional model to be developed using the flood-frequency relations at gaged sites. Four regions had more than 30 percent of the gaged sites with no defined relations; thus, the regression method was not used because of the large amount of missing information. The hybrid method was used in those four regions because individual fitted flood-frequency relations are not required and data from all gaging stations in a region can be

used. Average standard error of prediction of the generalized least-squares regional models for 12 regions ranged from 39 to 95 percent for the 100-year peak discharge, and only three of those models have errors of greater than 70 percent. The estimated average standard error of the hybrid models for four regions, which was computed differently than generalized least-squares errors, ranged from 0.44 to 1.8 log units for the 100-year peak discharge.

INTRODUCTION

Flood-frequency information is needed for the cost-effective design of bridges, culverts, dams, and embankments and for the management of flood plains. In this study, methods were developed by the U.S. Geological Survey for estimating magnitude and frequency of floods of streams in basins of less than about 200 mi^2 in the arid southwestern United States. The reliable estimation of flood-frequency relations for both gaged and ungaged streams that drain these arid basins is complex because rainfall is variable in time and space and the physiography of the drainage basins is extremely variable. The development of accurate flood-frequency relations at gaged sites is unlikely in some areas because of the variability of annual peak discharges and short records. At some sites, most years have no flow. At other sites, commonly used probability distributions do not appear to fit the plot of annual peak discharges.

The understanding of the flood characteristics of streams in arid lands is improved because of the regional perspective of this study. A large data base of streamflow-gaging-station records was evaluated for most of the southwestern United States. The study was done in cooperation with the Departments of Transportation of nine States—Colorado, Arizona, California, Idaho, Nevada, New Mexico, Oregon, Texas, and Utah.

Purpose and Scope

This report describes the results of a study to develop reliable methods for estimating magnitude and frequency of floods for gaged and ungaged streams in the southwestern United States and to improve the understanding of flood hydrology in the southwestern United States. The large study area, which encompasses most of the arid lands of the southwestern United States, provided an opportunity to examine truly regional relations. Current and new methods for estimating regional flood-frequency relations and associated errors were investigated. The study area includes all of Arizona and Utah, and parts of California, Colorado, Idaho, Nevada, New Mexico, Oregon, Texas, and Wyoming (fig. 1).

The data examined in the study include sites with drainage areas of less than 2,000 mi^2 and mean annual precipitation of less than 68 in. The focus of the study, however, was on drainage areas of less than about 200 mi^2 and arid areas with less than 20 in. of mean annual precipitation. The series of annual peak discharges for sites used in this study are unaffected by regulation, and the individual sites have at least 10 years of record through water year 1986.

The basic regional method used in this study is an information-transfer method in which flood-frequency relations determined at gaged sites are transferred to ungaged sites using multiple-regression techniques. Flood-frequency relations were determined at gaged sites using guidelines recommended by the Interagency Advisory Committee on Water Data (1982). Ordinary and generalized least-squares multiple-regression analyses were used to relate the gaged-site flood-frequency relations to basin and climatic characteristics.

During this study, a new method of estimating regional flood-frequency relations was developed (Hjalmarson and Thomas, 1992). The new method, named the hybrid method, combines elements of the station-year method and multiple-regression analysis. Individual flood-frequency relations are not used in the new method; thus, the method is useful for extremely arid areas where development of reliable flood-frequency relations at gaged sites is difficult.

This regional study offers several advantages compared with previous Statewide regional studies. The large data base of more than 1,300 gaged sites with about 40,000 station years of annual maximum peaks can decrease the time-sampling error of flood estimates, which can be a problem with small data sets in the southwestern United States. Some of the recent regional studies developed for single States have large differences in the estimated flood-frequency relations at State boundaries. These different estimates of flood magnitudes at State boundaries were removed in this study. Regional relations that were derived from the large data base with a large range of values are potentially more reliable than relations derived from smaller data bases and can be used with less extrapolation for ungaged streams. The data base for this study is in a section entitled "Basin, Climatic, and Flood Characteristics for Streamflow-Gaging Stations in the southwestern United States" at the end of this report and hereafter is referred to as the data section.

A goal of this study was to define regional flood-frequency relations with a standard error of prediction of less than approximately 50 percent. This goal was accomplished for some regions of the study area. For the more arid regions in particular,

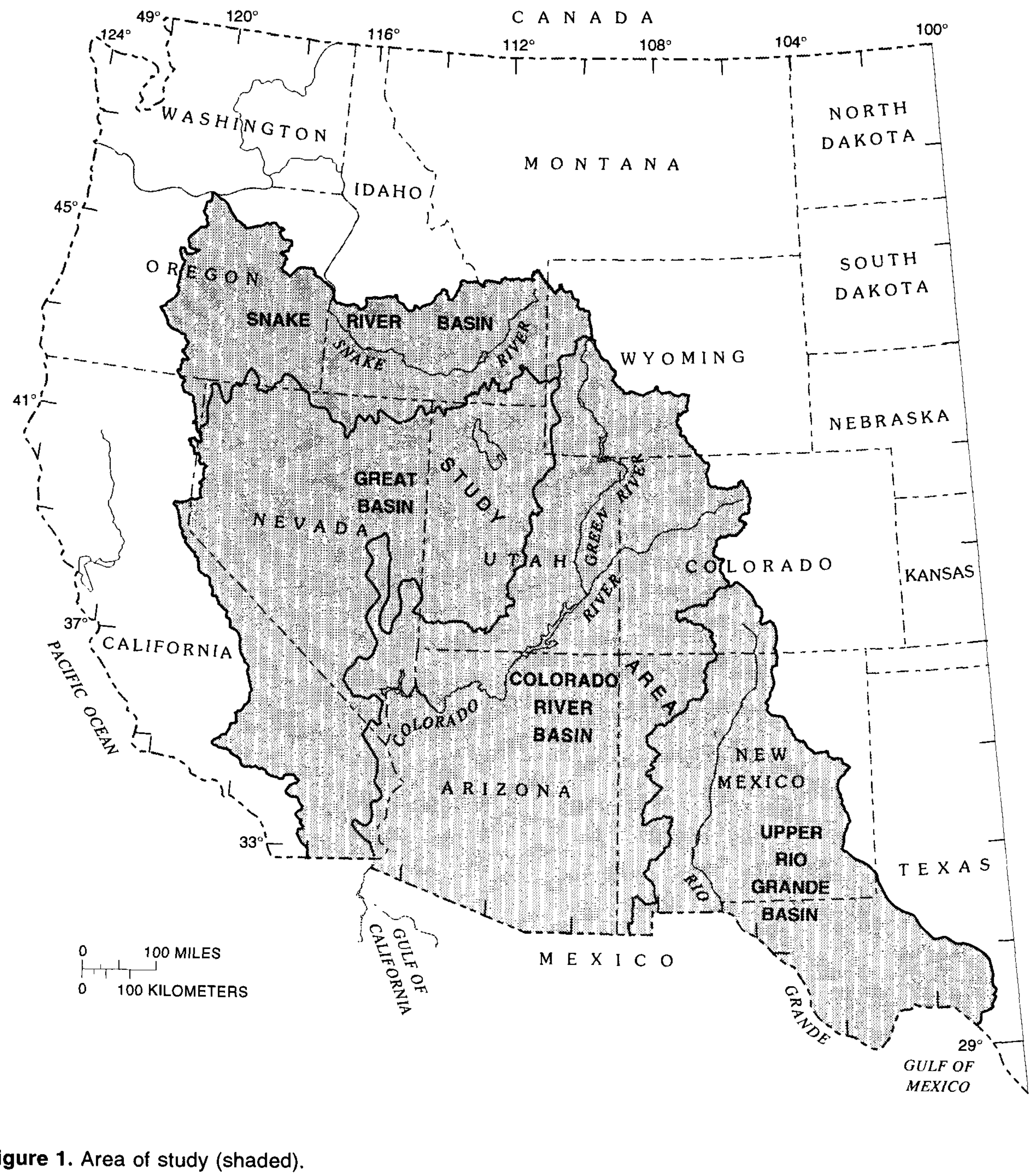


Figure 1. Area of study (shaded).

this goal was impossible to accomplish and errors in excess of 100 percent could not be reduced.

The first sections of this report serve as a design guide for engineers and hydrologists interested in estimating the magnitude and frequency of floods. Maps of the States are used to show flood regions because most users of the method are State oriented. These design guide sections include the design methods, the accuracy of the estimated regional relations, examples of the design methods, and maps and (or) discussions of nonapplication areas within the study area.

Previous Investigations

Many investigations have been done on regional flood-frequency relations in the study area (table 1). Five regional studies of river basins were done using the index-flood method. Benson (1964) was one of the first investigators to use the multiple-regression method.

The multiple-regression method with basin and climatic characteristics as explanatory variables has been used to develop regional flood-frequency relations in the 10 individual States in the study area. Studies for six individual States have used measurements of channel geometry as a predictor of regional flood-frequency relations. An additional channel-geometry study of the western United States included the entire study area (Hedman and Osterkamp, 1982). During the past decade, studies were done using paleoflood hydrologic techniques to extend streamflow records for hundreds or thousands of years (Kochel, 1980; Baker, 1984; Ely and Baker, 1985; Baker and others, 1987; O'Connor and others, 1986a, b; Fuller, 1987; Partridge and Baker, 1987; Roberts, 1987; Webb and others, 1988).

DESCRIPTION OF STUDY AREA

The study area is about 600,000 mi^2 and includes all or parts of ten States—Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Texas, Utah, and Wyoming. The area is bounded by the Rocky Mountains on the east, the northern slopes of the Snake River basin on the north, the Sierra-Cascade Mountains on the west, and the international border with Mexico on the south (figs. 1, 2).

Physiography and Drainage

The topography varies between high rugged mountains and flat continuous plains. The elevation of the crestline of the Sierra-Cascade Mountains to the west and the Rocky Mountains to the east is commonly more than 10,000 ft; some peaks are more than 12,000 ft. In the interior part of the area, isolated mountains are separated by arid desert plains. Most of the mountain ranges trend north and northwest and commonly rise a few thousand feet above the adjacent alluvial plains. A large plateau was incised by the Colorado and Green Rivers in southeastern Utah, northeastern Arizona, southwestern Colorado, and northwestern New Mexico.

Fenneman (1931) provided a detailed description of the physiographic provinces in the study area (fig. 2). The Northern, Middle, and Southern Rocky Mountains in the northern and eastern parts of the study area are high complex mountainous areas separated by lower basins or valleys. The Wyoming Basin province in southwestern Wyoming and northwestern Colorado lies between the Southern and Middle provinces of the Rocky Mountains. The major landform of the Wyoming Basin is an elevated plain or plateau with some isolated low mountains scattered throughout the basin.

The Colorado Plateaus province in the central part of the study area has nearly horizontal sedimentary rocks, generally high elevations of 5,000 to 11,000 ft, and many canyons and escarpments. Landforms include plains, plateaus, pediments, and isolated mountains.

The Basin and Range province in the western and southern part of the study area has mostly isolated block mountains separated by aggraded desert plains. The mountains commonly rise abruptly from the valley floors and have piedmont plains that extend downward to neighboring basin floors. Several large flat desert areas are interspersed between the mountains, and some are old lake bottoms that have not been covered with water for hundreds of years. Many of the piedmont plains contain distributary-flow areas that are composed of material deposited by mountain-front runoff.

The Sierra-Cascade Mountains province, which forms the western boundary of the study area, consists of volcanic mountains in Oregon and northern California and a block mountain range in eastern California. The Columbia Plateaus province in the

Table 1. Areas of study of previous regional flood-frequency investigations

State	Index-flood method	Multiple-regression method	
		Basin and climate	Channel geometry
Arizona	Patterson and Somers (1966)	Roeske (1978) Boughton and Renard (1984) Eychaner (1984)	No data
California	Butler and others (1966) Patterson and Somers (1966)	Wannanen and Crippen (1977)	No data
Colorado	Patterson and Somers (1966)	McCain and Jarrett (1976) Kircher and others (1985)	Hedman and others (1972)
Idaho	Thomas and others (1963)	Thomas and others (1973) Riggs and Harenburg (1976) Kjelstrom and Moffatt (1981)	Riggs and Harenburg (1976) Harenburg (1980)
Nevada	Butler and others (1966) Patterson and Somers (1966)	Moore (1976)	Moore (1974)
New Mexico	Patterson (1965) Patterson and Somers (1966)	Scott (1971) Thomas and Gold (1982) Hejl (1984) Waltemeyer (1986)	Scott and Kunkler (1976)
Oregon	Thomas and others (1963) Hulsing and Kallio (1964) Butler and others (1966)	Harris and Hubbard (1982)	No data
Texas	Patterson (1965)	Massey and Schroeder (1977) Schroeder and Massey (1977)	No data
Utah	Patterson and Somers (1966) Butler and others (1966)	Butler and Cruff (1971) Eychaner (1976) Thomas and Lindskov (1983) Christenson and others (1985)	Fields (1975)
Wyoming	Patterson and Somers (1966) Butler and others (1966)	Lowham (1976) Craig and Rankl (1978) Lowham (1988)	Lowham (1988)
Multiple States		Benson (1964)	Hedman and Osterkamp (1982)

northwestern part of the study area mainly has nearly horizontal sheets of lava with a flat or rolling surface and some broad alluvial terraces and valleys interspersed throughout the area.

Major drainage basins in the study area include the entire Colorado River basin, the upper Rio Grande basin, interior drainage of streams in the Great Basin, and part of the Snake River basin (fig. 1). The large rivers originate in high-elevation mountainous areas where precipitation is abundant and pass through arid desert areas on their way to the oceans or playas.

Most of the streams in the study area flow only in direct response to rainfall or snowmelt. In the northern latitudes and at the higher elevations where the climate is cooler and more humid, most of the streams flow continuously. Streams in alluvial valleys and base-level plains are perennial or intermittent where the stream receives ground-water outflow. Small streams in the southern latitudes commonly flow only a few hours during a year (Hjalmarson, 1991).

Climate

An arid or semiarid climate in the middle latitudes exists where potential evaporation from the soil surface and from vegetation exceeds the average annual precipitation (Trewartha, 1954, p. 267). About 90 percent of the study area is arid or semiarid and has a mean annual precipitation of less than 20 in. In addition to the generally meager precipitation, the climate of the study area is characterized by extreme variations in precipitation and temperature. Mean annual precipitation ranges from more than 50 in. in the Sierra-Cascade Mountains in California to less than 3 in. in the deserts of southwestern Arizona and southeastern California. Temperatures range from about 110°F in the southwestern deserts in the summer to below 0°F in the northern latitudes and mountains in the winter. Pre-

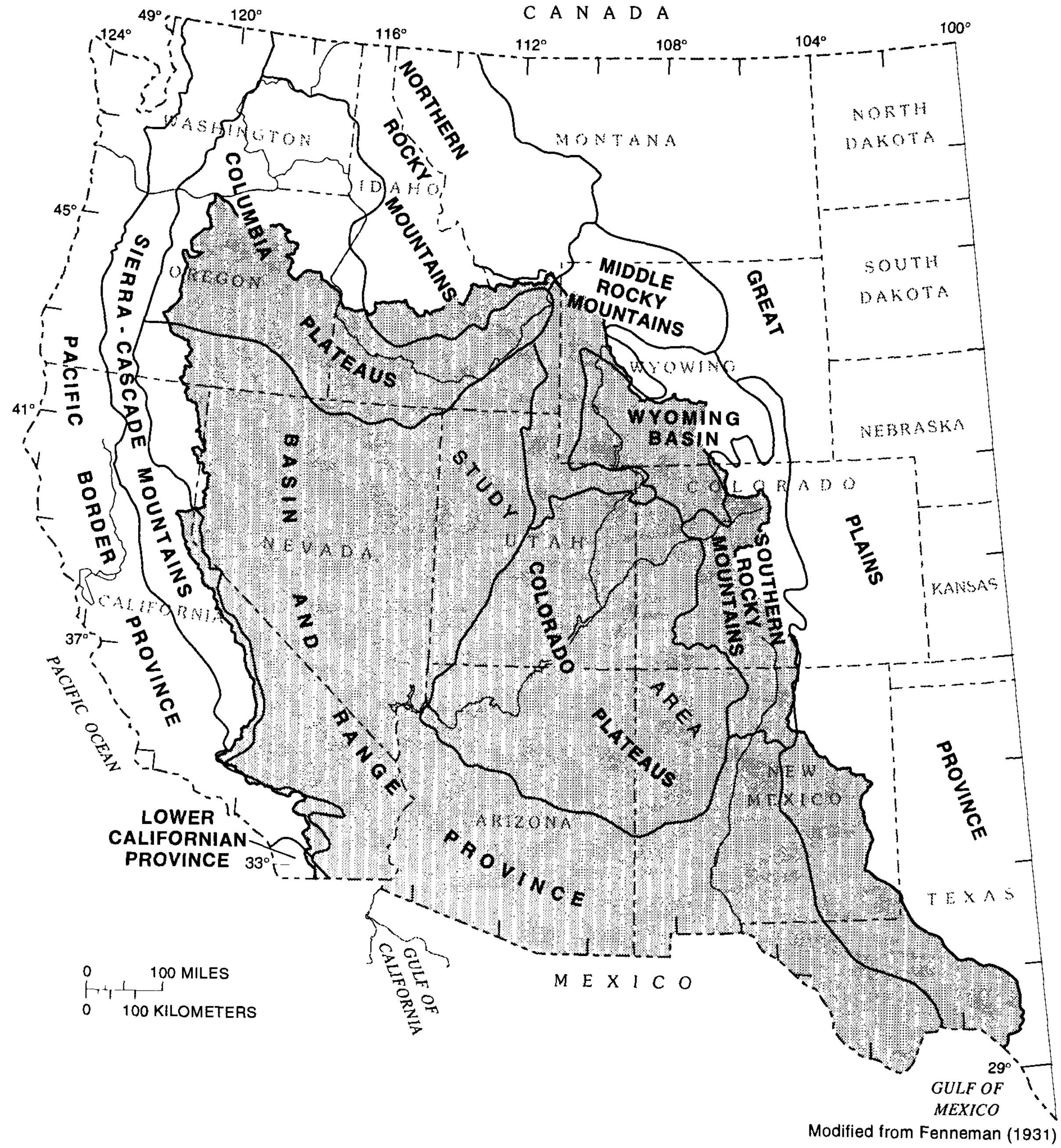


Figure 2. Physiographic provinces in the study area.

cipitation in the study area is variable temporally and spatially. As a general rule, the relative variability of annual precipitation increases with decreasing annual amounts (Trewartha, 1954, p. 269). In some extremely arid parts of the study area, the mean annual precipitation has been exceeded by the rainfall from one or two summer thunderstorms.

Climate in the study area generally is influenced by latitude, elevation, and orographic effects. In the desert lowlands of the southern part of the study area, the climate is hot and dry. The high valleys of the north are cooler and also dry. Elevation has a complex effect on climate. On a small scale, annual precipitation increases and mean temperature decreases with increased elevation. Thus, throughout the study area, the climate can range from humid to arid within a few miles between mountains and adjacent valleys. On a larger scale, large elevation differences that are consistent over large areas cause an orographic effect on the climate. Areas on the leeward side of major mountain ranges such as the Sierra-Cascade Mountains of Oregon and California receive small quantities of precipitation. Areas on the windward side of land masses that intercept prevailing wind movement, such as the southern edge of the Colorado Plateaus in central Arizona, receive large quantities of precipitation.

Flood Hydrology

Floods have been assigned many definitions on the basis of quantity and expected frequency of streamflow, relation of flow to the geometry of the stream channel, and possible damage to property. Thus, a flood can be any flow event that is large, that overtops the natural or artificial banks of a stream, or that results in loss of life or damage to property.

Meteorologic and Hydrologic Characteristics

Floods in the study area can be generated by several processes. High rates of rainfall that exceed infiltration capacity of the soils can cause rapid runoff and floods. Rapid melting of a snowpack as a result of high temperatures or rainfall on a snowpack also can cause floods. A unique combination of accumulation of snowpack, melting of the snowpack, freezing of the melted snow and ground, and then rainfall has caused large floods in northern Nevada and southern Idaho. Nearly all streams in the study area have a mixed population of floods. A mixed population is defined as an aggregation of floods that are caused by two or more distinct and generally independent hydrometeorologic conditions, such as snowmelt and rainfall. Populations of floods in the study area are those caused by snowmelt; by rainfall from thunderstorms, midlatitude cyclonic storms, upper-level low-pressure systems, and tropical cyclones; and by rainfall on snow. The distribution of the populations of floods is related to distance from moisture sources and elevation.

Much of the moisture in the study area comes from the Pacific Ocean and the Gulfs of California and Mexico (fig. 1). In the northern part of the study area, moisture comes from all three sources, and midlatitude cyclonic storms and upper-level low-pressure systems that move from west to east during October through May are the most frequent weather systems. Rainfall or snow and subsequent snowmelt from these weather systems cause most of the larger floods. In the southern part of the study area, the Gulf of Mexico and Gulf of California are the primary moisture sources, and rainfall from summer thunderstorms causes most of the larger floods. Elevation also influences the type of precipitation; snow commonly falls in the high elevations, and rain commonly falls in low elevations. Snow can occur in most of the study area; however, most of the accumulation of snow is at high elevations and in the northern latitudes. Because of a cooler climate, more floods from snowmelt occur at lower elevations in the northern latitudes than in the southern latitudes.

A general picture of the areal distribution of populations of floods in the study area can be seen by examining the season of occurrence of annual peak discharges. Each population of floods usually occurs during a particular season; therefore, the populations can be placed into three groups—peaks that occur in the spring, summer, or fall and winter. Snowmelt causes floods in the spring, and thunderstorms cause floods in the summer. Midlatitude cyclonic storms, upper-level low-pressure systems, and tropical cyclones result in fall or winter floods.

The season of occurrence of annual peak discharges in the study area primarily is related to latitude (table 2). For sites between 29° and 37° latitude, the average gaging-station record has 14 percent of its peaks in the spring, 60 percent in the

Table 2. Relation between season of occurrence of annual peak discharges and latitude in the southwestern United States

Latitude, in degrees	Average percentage of peak discharges in gaging-station records		
	Spring	Summer	Fall-winter
	April–June	July–September	October–March
29–37	14	60	26
37–39	49	38	13
39–41	62	22	16
41–45	70	6	24

summer, and 26 percent in the fall and winter. Thus, most of the annual peaks in the southern part of the study area are caused by summer thunderstorms. At an average site between 41° and 45° latitude, only 6 percent of the annual peaks occur in the summer. Spring peaks (snowmelt) have the opposite relation to latitude; the percentage increases from 14 percent in the south to 70 percent in the north. The percentage of fall-winter peaks (rainfall from cyclonic storms, upper-level lows, and tropical cyclones) is about 25 percent in the south and north, and only 13 to 16 percent in the middle part of the study area. The lower percentage of winter peaks in the middle part of the area may be related to the cold winters in the midlatitudes and to the orographic effect of the high elevations of the Sierra-Cascade Mountains between 35° and 41° latitude, which acts as a barrier to the fall-winter systems.

Summer thunderstorms generally result in the largest unit-peak discharges in the study area. To examine the magnitude and distribution of thunderstorm-caused peaks, the maximum peak discharge of record for all gaged sites was divided by its drainage area, and that value, called unit-peak discharge, was compared with site characteristics. All unit-peak discharges greater than 100 $(ft^3/s)/mi^2$ were caused by rainfall except for one site in Idaho that had a discharge of 130 $(ft^3/s)/mi^2$ caused by snowmelt. Summer thunderstorms caused about 90 percent of the maximum unit peaks greater than 100 $(ft^3/s)/mi^2$. The remainder of the maximum unit peaks greater than 100 $(ft^3/s)/mi^2$ were caused by rainfall from other types of storms.

The magnitude of the unit peaks decreases in a northward direction with a significant decrease at 41° latitude (fig. 3). In the southern part of the study area (between 29° and 37° latitude), where 63 percent of the maximum peaks were caused by summer thunderstorms, the average maximum unit-peak discharge of record is 316 $(ft^3/s)/mi^2$ (table 3). In the northern part of the study area (between 41° and 45° latitude), the average maximum unit-peak discharge of record is 26 $(ft^3/s)/mi^2$, and only 9 percent of those peaks were caused by summer thunderstorms. Typical peak discharges for major floods in the southern latitudes are nearly 10 times greater than peak discharges for major floods in the northern latitudes.

Jarrett (1987) and Tunnell (1991) determined that large floods caused by thunderstorms are unlikely to occur above an elevation threshold. The physical basis of this threshold probably is related to factors that include available energy and moisture in the atmosphere for the convective process and a generally abundant cover of vegetation in high elevations below the timber line that enhances infiltration of rainfall and thereby reduces runoff.

The elevation threshold of large floods that result from thunderstorms was investigated for this study by comparing the relation between the maximum unit-peak discharge of record and site elevation. The relations discovered in this study agree with relations presented by Jarrett (1987). For sites between 29° and 41° latitude, the elevation threshold for large floods caused by thunderstorms is about 7,500 ft (fig. 4). For sites between 41° and 45° latitude, the estimated elevation threshold decreases in a northward direction at a rate of about 300 ft for each degree of latitude (fig. 5), and the general magnitude of unit peaks is much smaller than for sites south of 41° latitude (fig. 4).

Basin and Channel Characteristics

When runoff from rainfall or snowmelt begins, drainage-basin and stream-channel characteristics affect the quantity and rate of runoff. Drainage-basin and stream-channel characteristics that influence flood runoff are vegetation, topography and orographic influences, topography and stream channels, and distributary-flow areas.

Vegetation.—Most of the study area is sparsely covered with vegetation because of the arid climate. A dense cover of vegetation exists only in the high elevations of the mountains where precipitation is abundant. Most of the low-elevation areas are sparsely covered with shrubs and grasses; large areas of sagebrush are in the north, and creosote bush is in the south. At intermediate elevations, juniper and pinyon woodland is common in the isolated mountains of Nevada and in large areas of Utah, Colorado, Arizona, and New Mexico. Forests of pine and fir trees are common in the higher elevations of the mountains.

Topography and orographic influences.— Mountains with high topographic relief influence the quantity and distribution of precipitation and runoff. As moisture moves into the study area from the north, west, or south, mountains act as barriers and cause an uneven areal distribution of precipitation. Along the windward side of mountains,

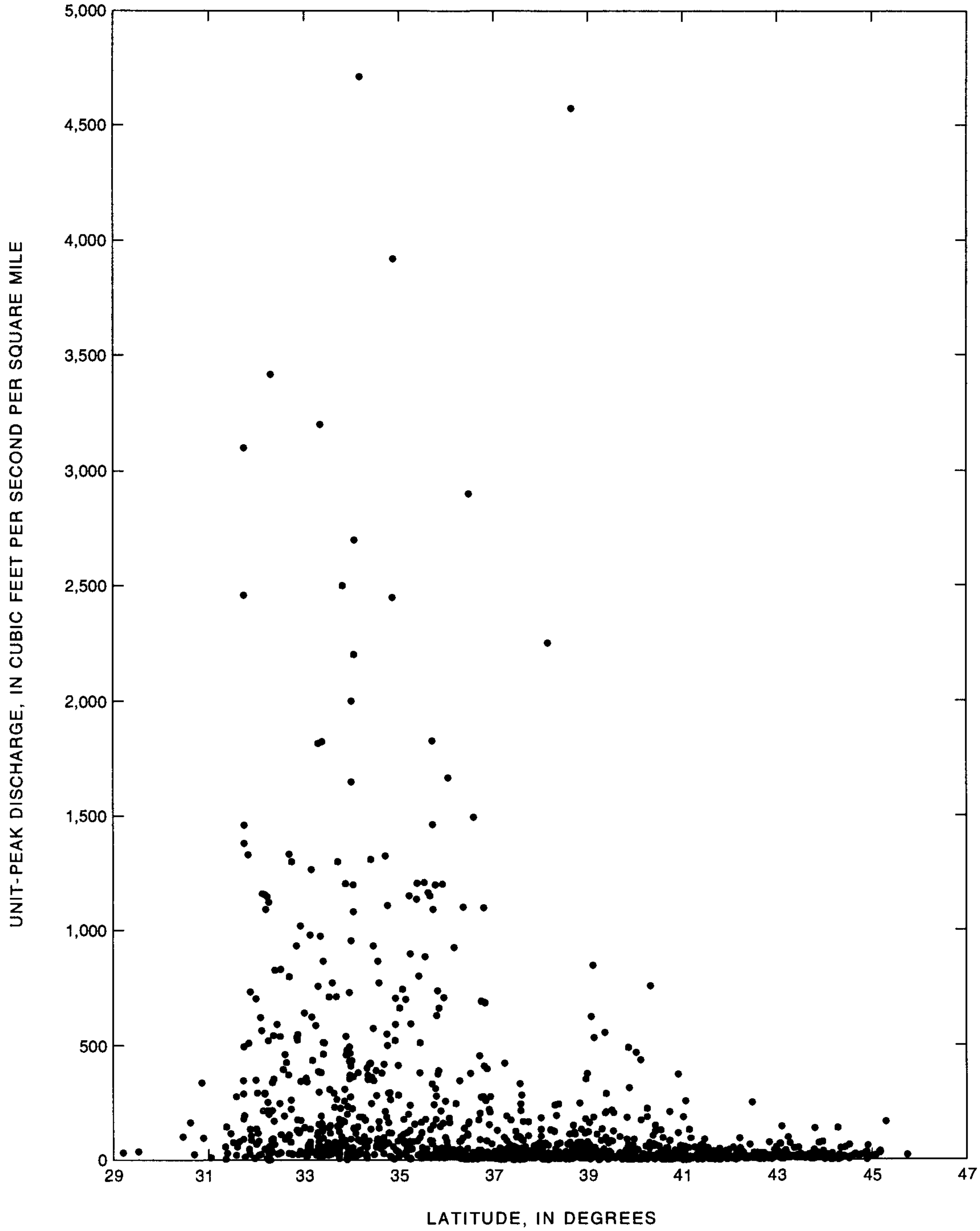


Figure 3. Relation between latitude and the maximum unit-peak discharge of record at gaged sites in the southwestern United States.

Table 3. Magnitude of maximum unit-peak discharge of record compared with latitude and proportions of peaks caused by thunderstorms in the southwestern United States

Latitude, in degrees	Number of sites	Averege		
		Maximum unit-peak discharge of record, in cubic feet per second per square mile	Percentage of maximum peaks of record caused by summer thunderstorms	Percentage of entire record with peaks caused by summer thunderstorms
29–37	559	316	63	60
37–39	256	66	47	38
39–41	226	61	34	22
41–45	282	26	9	6

moving air masses drop much of their moisture as the air is forced to ascend over the mountains. In contrast, on the leeward sides of mountains, air masses usually descend, temperatures increase, and precipitation decreases. In the study area, areas of increased precipitation and heavy runoff on windward sides of mountains occur in central Arizona, central New Mexico, east-central Utah, and southwestern Colorado. Areas of decreased precipitation and smaller runoff on leeward sides of mountains occur in most of Nevada, western Utah, and northeastern Arizona.

Topography and stream channels.—The conveyance properties of stream channels are related to the slope of the channel, material constituting the bed and banks of the channel, geometry of the channel, shape and width of the natural flood plain, and the topography of the area through which the stream is flowing. The topography of the study area can be grouped into three broad categories in which the streams have similar conveyance properties. These categories are (1) mountains, (2) piedmont plains, and (3) base-level plains, plateaus, or alluvial valleys. Burkham (1988) described flood hazards for a similar classification of topography for streams in the Great Basin in California, Idaho, Nevada, Oregon, Utah, and Wyoming.

Mountainous areas typically have V-shaped valleys that are well drained and composed mostly of bedrock and colluvium. The stream channels are typically steep, scoured, and rocky. The flood plain is narrow or nonexistent. The system of stream channels in the mountains is tributary, and the peak discharge of large floods typically increases as the drainage area increases. Much of the Colorado Plateaus province (fig. 2) has stream channels that are deeply incised into the surrounding bedrock. In these areas, the flood-runoff characteristics are similar to mountainous areas.

Piedmont plains are transition areas between mountains and base-level plains or plateaus. The upper elevation limit of a piedmont plain is commonly at a sharp decrease in the slope of the land surface at a mountain front. A piedmont plain consists of pediments, alluvial fans, or old-fan remnants. A pediment is an erosional surface cut on rock and usually covered with a thin layer of alluvium. The upper elevation limit of a pediment is commonly at the mountain front. Alluvial fans are composed of material deposited by streams emerging from mountains or pediments; thus, the upper elevation limit of alluvial fans may be at the mountain front or at the lower part of a pediment. Alluvial fans are active where stream deposition is common and stream systems are distributary. Alluvial fans are inactive where stream deposition is less common and most stream systems are tributary. Thus, active fans are mostly depositional surfaces, and inactive fans are mostly erosional surfaces.

Floodflow on pediments commonly is confined to tributary channels separated by stable ridges that are above the level of large floods. Floodflow on active alluvial fans commonly is unconfined in a distributary system of small channels separated by low and unstable ridges that are often overtopped during large floods. The size and location of channels on active fans can change during flooding. In contrast, floodflow on old-fan remnants commonly

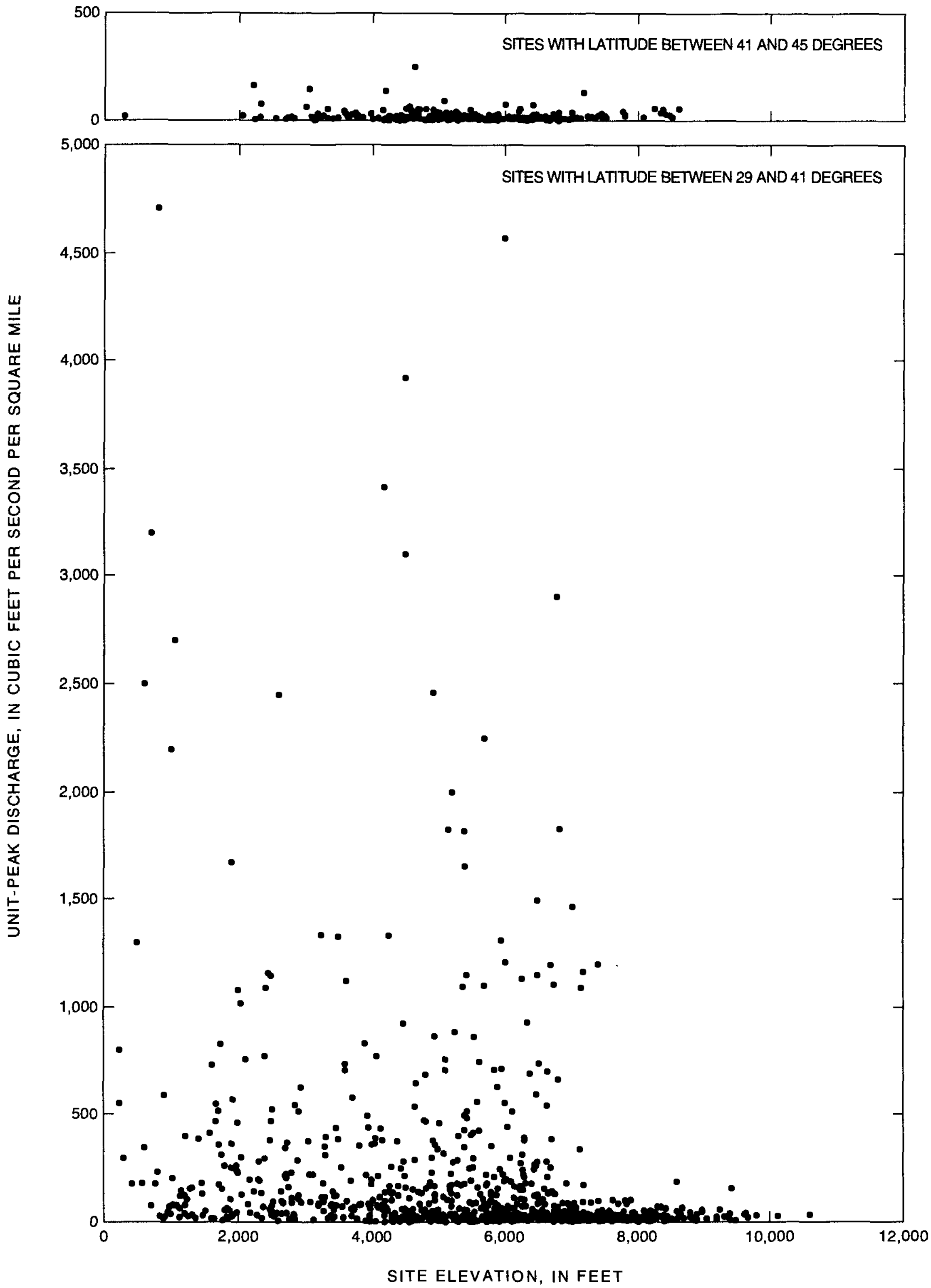


Figure 4. Relation between site elevation, latitude, and maximum unit-peak discharge of record at gaged sites in the southwestern United States.

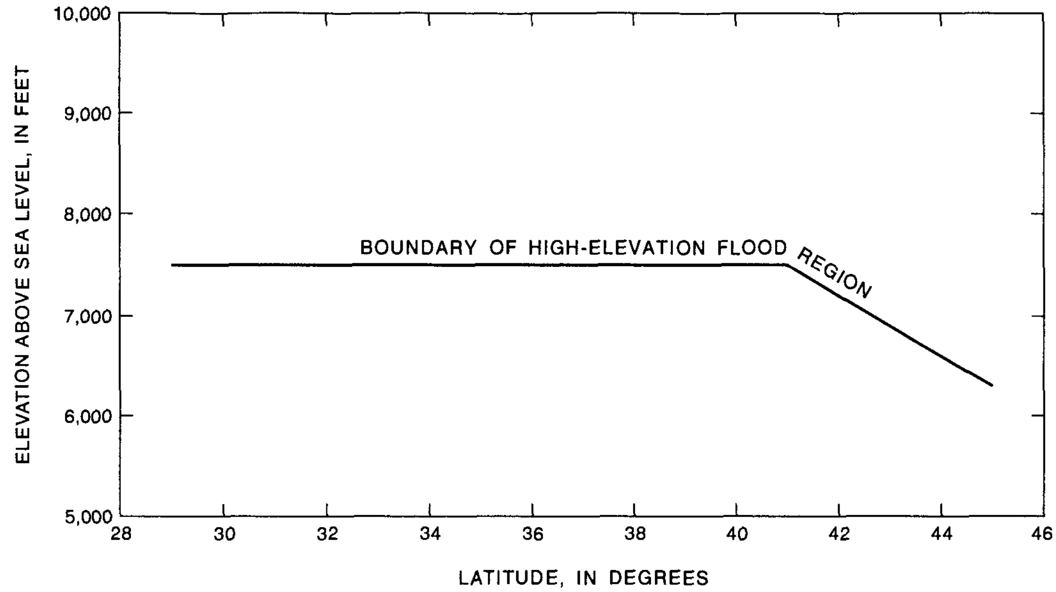


Figure 5. Estimated elevation threshold for large floods caused by thunderstorms in the southwestern United States.

is confined to a tributary system of incised channels.

Typical streams in base-level plains, plateaus, or alluvial valleys have a defined main channel with an adjacent flood plain. During large floods, floodwater may spill over the banks of the main channel onto the flood plain. Flood plains are commonly wide, flat, and covered with riparian vegetation or agricultural crops. These characteristics can cause the peak discharge of large floods to decrease or attenuate, mostly because the floodflow is temporarily stored in the wide, flat, and hydraulically rough flood plains. Some streams in base-level plains, plateaus, or alluvial valleys have small main channels, and most of the floodflow of medium and large floods spreads over wide and flat flood plains. For these streams, the peak discharge of large floods can decrease in the downstream direction even where there is a large increase in drainage area. Other streams may have enlarged channels because of lateral erosion of the channel banks and (or) downcutting of the channel bed. Some of these entrenched channels can convey large floods within the confines of vertical banks.

In a few parts of the study area, streams in base-level plains, plateaus, or alluvial valleys flow through areas of highly permeable geologic material such as limestone, basalt, or sandy alluvial bed material. Large proportional losses of flow to infiltration can occur during the small to medium floods. Most of these areas are localized except for much of the Snake River basin in Idaho (fig. 1), which is a large area of permeable volcanic material. In the Snake River basin, many streams originate in the surrounding mountains and flow onto a flat plain where the water rapidly infiltrates into the ground.

Distributary-flow areas.—Throughout the study area, but especially in Nevada, western Utah, southeastern California, and southern and western Arizona, distributary-flow areas can have a large effect on the flood characteristics of streams. The magnitude of peak discharges leaving a basin can be significantly reduced in basins with distributary-flow areas. A distributary-flow area, which includes active alluvial fans, commonly occurs on piedmont plains downslope from mountains. A distributary-flow area contains a primary diffluence where floodflow in a single channel separates into two or more channels. The channels commonly remain separated and have terraces. In many distributary-flow areas, the channels divide and join over wide areas and the erratic flow paths appear to occur randomly over much of the land surface (Hjalmarson and Kemna, 1991).

In the arid southwestern United States, some of the flood-peak attenuation shown by comparison of flood-frequency relations for sites on the same stream is related to the presence of distributary-flow areas in the intervening drainage area. An example is Brawley Wash in southern Arizona in which the 100-year peak discharge decreases from 24,100 to 20,000 ft^3/s between streamflow-gaging stations 09486800 and 09487000 (see data section, flood region 13). Altar Wash (station 09486800) is a tributary to Brawley Wash (station 09487000). The gross drainage area for these two sites increases from 463 to 776 mi^2. A large percentage of the potential intervening runoff from the mountains and pediments must traverse many distributary-flow areas. The floodflow divides and combines many times and spreads laterally over the permeable soil. Even during large floods, most of the peak discharge in the distributary-flow areas can be lost to infiltration or attenuation.

During this study, a few streamflow-gaging sites that appeared to have unusually small quantities of peak discharge for the size of drainage area were examined and found to be on distributary stream channels. During floodflow, some of the flow was bypassing the gaged sites in other distributary channels. At two sites, some of the flow appeared to leave the drainage basin upstream from the site and enter an adjacent drainage system. Sites with known distributary flow that could bypass the gaging station were excluded from this study.

Distributary-flow areas can be identified on standard 7.5-minute series of USGS topographic maps, which provide much of the information needed to delineate distributary-flow areas. Bifurcating intermittent stream symbols on maps depict distributary-flow areas. Small wash or intermittent stream symbols that end abruptly in an area with smooth contours also may depict distributary flow. Broad areas of piedmont that are marked with the sand symbol (stippled pattern) may depict aggrading areas and possibly distributary flow. Relative drainage-texture domains depicted by contour-crenulation counts (small rounded upslope projection of a contour line) provide excellent clues to the type of landform and potential distributary-flow areas (Hjalmarson and Kemna, 1991). The drainage texture (spacing of the more low-order drainage channels) of active areas of distributary flow normally is uniform in the upslope direction. Smooth contours that are straight and parallel (or slightly convex pointing downstream in plan view) indicate mild relief that may result from distributary flow. Contours with relatively large and narrow crenulations may reveal remnants of old inactive fans.

DESCRIPTION OF METHODS

Methods developed for this study to estimate flood-peak discharge for various recurrence intervals are for gaged and ungaged natural flow streams. A study site will fit into one of three categories—(1) a gaged site, (2) a site near a gaged site on the same stream, or (3) an ungaged site. The methods and their limitations are explained in this section, and step-by-step procedures and examples of using the methods are given in the section entitled "Application of Methods."

Gaged Sites

Flood-frequency relations for gaged sites can be estimated using the relations defined in this study. In the data section at the end of the report, the top line for each station in the peak-discharge columns is the peak discharge from the station flood-frequency relation. The bottom line is a weighted estimate of the peak discharge based on the station flood-frequency relation and the regional relation. Regional regression equations are discussed in the section entitled "Ungaged Sites."

Weighted estimates are considered to be the best estimates of flood frequency at a gaged site and are used to reduce the time-sampling error that may occur in a station flood-frequency estimate. The time-sampling error is the error caused by having a sample of floods that is not representative of the population of floods. Usually, the time-sampling error is decreased as the length of record at a gaged site is increased. A station with a short period of record may have a large time-sampling error because the short period of record may not represent the full range of potential floods at the site. At short-record sites, the observed period of record at a station has the possibility of falling within a wet or dry period, and a preponderance of unusually small or large floods may yield a significantly unrepresentative computed flood-frequency relation. The weighted estimate of flood frequency should be a better indicator of the true values because the regression estimate is an average of the flood histories of many gaging stations over a long period of time.

The weighting procedure used in this study weights the station flood frequency and the regression estimate of flood frequency by the years of record at the station and the equivalent years of record of the regression estimate (Sauer, 1974). The equivalent years of record are an expression of the accuracy of the regression relation. Thus, in a weighted estimate, the flood-frequency relation for a station with a long period of record will be given greater weight than that for a station with a short period of record. Equivalent years of record for each regression estimate were estimated using a procedure described by Hardison (1971). The following equation was used for the weighted estimate (Sauer, 1974):

$$Q_{T(w)} = \frac{Q_{T(s)}N + Q_{T(r)}E}{N + E}, \qquad (1)$$

where

$Q_{T(w)}$ = weighted discharge, in cubic feet per second, for T-year recurrence interval;

$Q_{T(s)}$ = station value of the discharge, in cubic feet per second, for T-year recurrence interval;

$Q_{T(r)}$ = regression value of the discharge, in cubic feet per second, for T-year recurrence interval;

N = number of years of station data used to compute $Q_{T(s)}$; and

E = equivalent years of record for $Q_{T(r)}$.

Sites Near Gaged Sites on the Same Stream

Flood-frequency relations at sites near gaged sites on the same stream can be estimated using a ratio of drainage area for the ungaged and gaged sites. The drainage-area ratio should be approximately between 0.5 and 1.5. Characteristics of the ungaged and gaged drainage basins need to be examined. The method for ungaged sites should be used if a large tributary stream is between the ungaged and gaged sites and the tributary basin has much different topography, geology, vegetation, and other characteristics that may affect flood magnitudes. If the basins have similar characteristics and meet the drainage-area ratio requirement, peak discharges can be computed by the following equation:

$$Q_{T(u)} = Q_{T(g)}(A_u/A_g)^x, \qquad (2)$$

where

$Q_{T(u)}$ = peak discharge, in cubic feet per second, at ungaged site for T-year recurrence interval;

$Q_{T(g)}$ = weighted peak discharge, in cubic feet per second, at gaged site for T-year recurrence interval;

A_u = drainage area, in square miles, at ungaged site;

A_g = drainage area, in square miles, at gaged site; and

x = exponent for each flood region as follows:

Flood region		Exponent *X*
Name	Number	
High-Elevation	1	0.8
Northwest	2	.7
South-Central Idaho	3	.7
Northeast	4	.7
Eastern Sierra	5	.8
Northern Great Basin	6	.6
South-Central Utah	7	.5
Four Corners	8	.4
Western Colorado	9	.5
Southern Great Basin	10	.6
Northeastern Arizona	11	.6
Central Arizona	12	.6
Southern Arizona	13	.5
Upper Gila Basin	14	.5
Upper Rio Grande Basin	15	.5
Southeast	16	.4

The exponent was determined by regressing the six T-year discharges (T=2, 5, 10, 25, 50, 100) on the drainage area for each flood region and taking the average of the drainage-area exponent for the six equations. In addition to the ratio method for sites near gaged sites, if a study site is between two gaged sites, the peak discharge may be estimated by interpolation between values for the two gaged sites with allowance for major tributaries.

Ungaged Sites

Flood-frequency relations at ungaged sites can be estimated using the regional models developed in this study. The models are regression equations that use basin and climatic characteristics as explanatory variables. The regional regression analysis is discussed in the section entitled "Regional Analysis."

Models

Three models were used in this study to express the relation between peak discharge and basin and climatic characteristics. The most common relation is in the multiplicative form:

$$Q_T = aA^bB^c. \qquad (3A)$$

The following linear relation is obtained by logarithmic transformation:

$$\log Q_T = \log a + b\log A + c\log B + \ldots , \qquad (3B)$$

where

Q_T = peak discharge, in cubic feet per second, for T-year recurrence interval;
A and B = explanatory variables; and
a, b, c = regression coefficients.

Throughout the study area, drainage area is the most significant explanatory variable and is used as the first explanatory variable in all regional models. In a few parts of the study area, however, the relation between the logarithm of Q_T and the logarithm of drainage area is not linear as is expressed in equation 3B. In those areas, therefore, another model was used in which drainage area is transformed to produce a linear relation. The following equations perform that function:

$$Q_T = 10^{(a+b\mathrm{AREA}^x)}B^c, \qquad (4A)$$

or the logarithmic transformation:

$$\log Q_T = a + b\mathrm{AREA}^x + c\log B + \ldots , \qquad (4B)$$

where

AREA = drainage area;
B = other basin or climatic characteristic; and
x = exponent for AREA for which the relation is made linear.

The third model used in the study is another method of accounting for a nonlinear relation. In this case, the nonlinear relation is between the residual from the Q_T and AREA relation and a second explanatory variable. The following equations were used to transform the second explanatory variable to yield a linear equation:

$$Q_T = a\mathrm{AREA}^b(B-d)^c, \qquad (5A)$$

or the logarithmic transformation:

$$\log Q_T = \log a + b\log\mathrm{AREA} + c\log(\mathrm{B}-d) + \ldots, \qquad (5B)$$

where

d = a constant, which is less than the minimum value of B, for which the relation is made linear.

Explanatory Variables

For purposes of this report, six basin and climatic characteristics are referred to as explanatory variables and are used as terms in the model equations. Additional explanatory variables that are described in the section entitled "Explanatory Variables Investigated" were considered but were not used. The six explanatory variables that were used are shown for each site in the data section. The abbreviation for each variable and method of measuring the variable are as follows.

1. AREA is the drainage area, in square miles, and is determined by planimetering the contributing drainage area on the largest scale topographic map available.
2. ELEV is the mean basin elevation, in feet above sea level, and is determined by placing a transparent grid over the drainage-basin area, which is drawn on the largest scale topographic map available. The elevations of a minimum of 20 equally spaced points are determined, and the average of the points is taken. As many as 100 points may be needed for large basins.
3. PREC is the mean annual precipitation, in inches, and is determined by placing a transparent grid over an isohyetal map of mean annual precipitation. The drainage-area boundary is drawn on the map, the mean annual precipitation is determined at each grid intersection, and the values are averaged for the basin.

   A single source of isohyetal maps is not available. To use the regression equations in this report, the mean annual precipitation should be determined using the isohyetal maps that were used to determine the values for most of the gaging stations in this study. References for large-scale maps of mean annual precipitation that were used in most of the States are: U.S. Weather Bureau (1963) for Arizona, Colorado, New Mexico, and Utah; Rantz (1969) for California; Thomas and others (1963) for Idaho; U.S. Soil Conservation Service (1964) for Oregon; and Lowham (1988) for Wyoming.

The original isohyetal maps that were used to determine mean annual precipitation for some of the gaging stations are in the "Climates of the States" series of the U.S. Weather Bureau (1959–61). These page-size maps were developed from data from about 1931 to 1955. These maps can be used only if larger scale maps are not available.

4. EVAP is the mean annual free water-surface evaporation, in inches, and was determined for gaged sites by linear interpolation between the isolines of map 3 from Farnsworth and others (1982). The value used for the regression equations was the value at the gaged-site location; therefore, in the application of the regression equations, the study-site location should be used. To use the methods in this report, EVAP should be estimated for the study site by linear interpolation between the isolines of EVAP shown in figs. 7, 11, and 14.
5. LAT is the latitude of the gaged site, in decimal degrees, and is determined using the largest scale topographic map available. The value used for the regression equations was the value at the gaged-site location; therefore, in the application of the regression equations, the study-site location should be used. Decimal degrees are the minutes and seconds of the latitude converted to a decimal.
6. LONG is the longitude of the gaged site, in decimal degrees, and is determined using the largest scale topographic map available. The value used for the regression equations was the value at the gaged-site location; therefore, in the application of the regression equations, the study-site location should be used. Decimal degrees are the minutes and seconds of the longitude converted to a decimal.

Flood Regions and Regression Equations

A single regression model for the entire study area does not adequately explain the variation in flood characteristics. The standard errors of estimate for T-year discharges were more than 100 percent for all attempted single models. In addition, these single models were biased in certain parts of the study area. The study area, therefore, was divided into 16 flood regions, and separate regression equations were developed for each region. Use of the 16 flood regions removes some of the variability in the system that is not explained by available explanatory variables and thus makes the subsequent equations simpler and more accurate. The flood regions were delineated on the basis of the magnitudes of floods, meteorologic cause of floods (snowmelt, summer thunderstorms, or cyclonic rainfall), elevation of the sites, and geographic patterns in residuals from the regression analysis. A consistent geographic pattern in residuals from a single study-wide relation was not discerned; therefore, an explanatory variable that could define the study-wide geographic variation could not be developed.

The first major stratification for the study area was for a high-elevation region that extends throughout the entire study area. The lower boundary of the region corresponds to an estimated elevation threshold for large floods caused by thunderstorms (fig. 5). The elevation of the study site is used to determine if the site fits in the high-elevation region. The remaining 15 flood regions consist of low- to middle-elevation sites (table 4, figs. 6–16) where nearly all boundaries are drainage divides. The exceptions are the boundary between Regions 6 and 10, which is at 37° latitude, and part of the boundary between Region 8 and Regions 6 and 7 in southern Utah.

Information about the 16 flood regions includes the number of gaging stations, time of year of peak discharges, and an index to the many tables and figures that describe the regions (table 4). The number of gaging-station records used for most flood regions is less than the number of available gaging-station records within the region (table 4, figs. 17–49). Flood-frequency relations could not be defined for some sites because the data were unreliable or because a three-parameter distribution did not appear to adequately fit the plot of annual peaks in the records. Also, a few outlier stations were deleted from the regression analysis, and some sites had missing values for explanatory variables and thus were not used. The deleted outliers may be different from the majority of sites by random chance, or occasionally their basin or channel characteristics are much different from the majority of sites. For Regions 6, 10, 11, and 16 where the hybrid method was used, data for all available gaging stations were used (table 4).

The regression equations developed for estimating regional flood-frequency relations (tables 5–20) are applicable for sites with characteristics that fall within the range of explanatory variables for the gaged sites that were used to develop the equations. Plots of the explanatory variables used for the regional equations were prepared for each flood region. Figure numbers for the plots are listed in table 4. The plots depict a cloud of common values. The regression equations are applicable to sites with characteristics that fall within this cloud of common values. The predictive errors of the equations increase with distance from the mean values of the explanatory variables, and errors are unknown and probably are quite large beyond the cloud of common values.

The regression equations are most applicable to sites with drainage areas of less than about 200 mi^2. Gaged sites used in the analysis were selected to ensure a reliable sample to define regional relations for basins of up to about 200 mi^2. Basins between 200 mi^2 and the limits of the cloud of common values for each region were used to better define the relation between peak discharge and drainage area for the small basins. The regression equations are for basins of less than 200 mi^2; judicious use of the equations should be made for basins between 200 mi^2 and the limits of the cloud of common values.

The peak discharges estimated from the regional models can be compared with the relations between the maximum peak discharge of record and drainage area for gaged sites in each flood region and for the entire study area (fig. 17). Figure numbers of the relations for each flood region are listed in table 4. All available gaged sites in a region are shown on these plots. Three relations are drawn on most plots for the flood regions—an envelope curve for maximum peak discharge of record for the gaging stations used in the entire study area, the relation between the 100-year peak discharge and drainage area for the entire low- to middle-elevation study area (Regions 2–16), and the relation between the 100-year peak discharge and drainage area computed for the region. For regional relations with multiple variables, the 100-year peak-discharge relations are for mean values of the variables used in addition to drainage area. Effects of these additional variables are not accounted for in the regional relations between the 100-year peak discharge and drainage area; therefore, the plots of these regression lines may not appear to fit the data.

The envelope curve for the entire study area (fig. 17) is a measure of the maximum potential floodflow at gaged sites in the southwestern United States. The envelope curves for each flood region are similar measures for each region. The curves are based on data at the gaged sites used in this study and do not include miscellaneous data collected at ungaged sites or data at gaged sites with less than 10 years of record. A few extreme floods at ungaged sites in the study area are above the envelope curves and may have been debris flows. Thus, the envelope curves represent only the data used for the statistical analysis.

The plots of maximum peak discharge of record for gaging stations in the study area were compared to three other envelope curves of maximum measured peak discharges. The envelope curve for this study, however, is based on gaging-station records of 10 or more years, and the three other envelope curves are based on measured peak discharges from all available records. Costa (1987) developed an envelope curve for maximum rainfall-runoff floods measured in the United States. The envelope curve for data in this study (fig. 17) is about 40 percent of the magnitude of the curve in Costa (1987) for drainage basins of less than about 100 mi^2. For the larger drainage areas, the envelope curve in this study is only about 20 percent of the magnitude of the curve in Costa (1987). Crippen and Bue (1977) developed envelope curves for 17 regions of the United States. Regions 14 and 16 in Crippen and Bue (1977) are entirely inside the study area of this report. Regions 7, 8, and 11 of this study are comparable to Crippen and Bue's region 14 (1977; see Colorado Plateaus, fig. 2, this report), and Regions 6, 10, 12, 13, 14, and 16 are comparable to Crippen and Bue's region 16 (1977; see Basin and Range, fig. 2, this report). For region 14 of Crippen and Bue (1977), the envelope curve for the applicable

Table 4. Summary of selected characteristics of flood regions in the southwestern United States

[Numbers in parentheses in table heading are for references in text. DA, drainage area; MAP, mean annual precipitation; MBE, mean basin elevation; MAE, mean annual evaporation; LAT, latitude; LONG, longitude. Dashes indicate no data]

[Numbers in parentheses in table heading are for references in text. DA, drainage area; MAP, mean annual precipitation; MBE, mean basin elevation; MAE, mean annual evaporation; LAT, latitude; LONG, longitude. Dashes indicate no data]

Flood region number (1)	Flood region name (2)	Number of stationa		Average percentage of peak discharges in gaging-atation recorda			Explanatory variables used in regional relations (3)	Regional relations		Plots of explanatory variables (figure number) (6)	Regional 100-year peak discherge compared with 100-year peak discharge for study area (7)
		Available	Used in regional relations	Spring April–June	Summer July–September	Fall–winter October–March		Table number (4)	Figure number (5)		
1	High Elevation	184	165	84	13	3	DA, MAP	5	19	18	Much less
2	Northwest	139	108	53	5	42	DA, MBE	6	21	20	Less
3	South-Central Idaho	40	35	80	4	16	DA, MAP	7	23	22	Less
4	Northeast	123	108	79	15	6	DA, MBE	8	25	24	Less
5	Eastern Sierras	52	37	47	16	37	DA, MBE, LAT	9	28	26,27	About the same
6	Northern Great Basin	80	80	28	50	22	DA, MBE	10	30	29	About the same
7	South-Central Utah	31	28	67	27	6	DA, MBE	11	32	31	Less
8	Four Corners	130	108	25	61	14	DA, MBE	12	34	33	More
9	Western Colorado	53	43	75	20	5	DA, MBE	13	36	35	Less
10	Southern Great Basin	104	104	8	50	42	DA	14	37	---	More
11	Northeastern Arizona	46	46	10	61	29	DA, MAE	15	39	38	More
12	Central Arizona	82	68	6	46	48	DA, MBE	16	41	40	More
13	Southern Arizona	90	73	2	78	20	DA	17	42	---	More
14	Upper Gila Basin	29	22	4	67	30	DA, MBE	18	44	43	More
15	Upper Rio Grande Basin	20	17	54	41	5	DA, MBE, LONG	19	47	45,46	About the same
16	Southeast	120	120	21	71	8	DA, MAE	20	49	48	More
1–16	All	1,323	-----	42	38	20	------	-----	-----	-----	------

data in this study has a similar magnitude as the curve for region 14. The magnitude of the envelope curve for region 16 in Crippen and Bue (1977) is similar to the magnitude of the envelope curve in Costa (1987). The envelope curve for the applicable data in this study and the envelope curve for region 16 in Crippen and Bue (1977), therefore, have the same relation as described for this study and Costa (1987).

Transition Zones

At most ungaged sites in the study area, flood-frequency relations can be estimated using the single set of equations for the flood region in which the site is located. When a site is near a regional boundary, however, a weighted estimate of peak discharge may be more appropriate. Computed peak discharges from the equations of two adjacent regions may be quite different for a site near a boundary. The method of dividing the study area into flood regions requires distinct boundaries, but the boundaries do not necessarily imply a distinct change in flood characteristics. Instead of the distinct boundaries, transition zones can be used to provide smooth transitions across boundaries.

Two transition zones are defined in this report where methods are provided to estimate weighted flood-frequency relations—(1) sites with a drainage area in two low- to middle-elevation regions and (2) sites in a low- to middle-elevation flood region with an elevation that is near the boundary of the high-elevation region. A third transition zone is where a site is near a regional boundary, but the drainage area is entirely in one region. Characteristics of the drainage basin of the study site may need to be compared with the general characteristics of the adjacent flood regions. If the site is similar to both regions, a straight average of computed peak discharges from both regions may be appropriate.

Weighted flood-frequency relations should be used when the drainage area of the study site is in two low- to middle-elevation regions. The peak discharge should be computed using the equations for both regions. The basin and climatic characteristics for the entire basin should be used in the computations for both regions. A weighted peak discharge is then computed using the percentage of the drainage area in each region. The following equation should be used:

$$Q_{T(w)} = \frac{Q_{T(a)}\mathrm{AREA}_{(a)} + Q_{T(b)}\mathrm{AREA}_{(b)}}{\mathrm{AREA}}, \quad (6)$$

where

$Q_{T(w)}$ = weighted discharge, in cubic feet per second, for T-year recurrence interval;
$Q_{T(a)}$ = discharge for region (a), in cubic feet per second, for T-year recurrence interval;
$Q_{T(b)}$ = discharge for region (b), in cubic feet per second, for T-year recurrence interval;
$\mathrm{AREA}_{(a)}$ = drainage area in region (a), in square miles;
$\mathrm{AREA}_{(b)}$ = drainage area in region (b), in square miles; and
AREA = total drainage area in both regions, in square miles.

Weighted flood-frequency relations should be used for sites in a low- to middle-elevation flood region when the elevation of the study site is near the boundary of the high-elevation region. A transition zone is defined as a zone of elevation that starts at the boundary of the high-elevation region and extends 700 ft below that boundary (fig. 5). South of 41° latitude, all study sites with an elevation between 6,800 and 7,500 ft are in the transition zone. North of 41° latitude, the zone is at progressively lower elevations as the latitude increases (fig. 5). In the transition zone, discharge should be computed using the equation for the low- to middle-elevation region in which the site is located and by using the equation for the high-elevation region. The characteristics of the entire basin should be used in both computations, and then a weighted discharge should be computed on the basis of the study-site elevation as follows:

$$Q_{T(w)} = Q_{T(l)}\frac{B-E}{700} + Q_{T(h)}\left(1-\frac{B-E}{700}\right), \quad (7)$$

where

$Q_{T(w)}$ = weighted discharge, in cubic feet per second, for T-year recurrence interval;
$Q_{T(l)}$ = discharge from the low- to middle-elevation region, in cubic feet per second, for T-year recurrence interval;
$Q_{T(h)}$ = discharge from the high-elevation region, in cubic feet per second, for T-year recurrence interval;
E = elevation of the study site, in feet; and

B = elevation of the lower boundary of the high-elevation region, in feet (fig. 5).

The weighted discharges are thus close to the low- to middle-elevation models near the lower part of the transition zone and close to the high-elevation model near the upper part of the transition zone.

Excluded Streams and Distributary-Flow Areas

Regional flood-frequency relations that are based on a large sample of flood peaks and explanatory variables are assumed to represent most of the streams in the study area. A few streams, however, have variables that are not represented, and regional relations should not be used for these streams. Streams that may not be represented by the regional relations include (1) streams with basin and climatic characteristics that are outside the range of explanatory variables, (2) streams in basins that have large areas of highly permeable rocks, (3) ungaged streams in some regions that have less base flow than nearby gaged streams, (4) streams with channel characteristics that cause a large quantity of floodflow attenuation, and (5) streams that are part of a system of distributary channels or that have a drainage that includes large distributary-flow areas.

Streams that have basin characteristics that are outside the range of explanatory variables for the gaged sites used to develop the regional relations are not represented by the regional flood-frequency relations. Also, some potentially important basin characteristics are not defined. For example, surficial geology is an important characteristic that affects floodflow, but it is not included specifically as an explanatory variable in the regional relations. The regional relations reflect some large regional differences in geologic conditions, but local effects of surficial geology may not be reflected.

Drainage basins that have large areas of highly permeable rocks are not represented in the regional relations. Only a few stations used in the relations were in basins draining highly permeable rocks such as limestone or volcanic rocks. Large amounts of floodflow can be lost along stream channels that traverse these areas. The quantity of water lost to infiltration appears to vary from stream reach to stream reach, and regional relations of peak discharge for such streams cannot be defined using available explanatory variables. The Snake River Plain in Idaho is an example of a large continuous area for which regional relations were not developed (fig. 10).

For some regions, the sample of gaged streams may be biased because streams that are gaged tend to be those that have more base flow. In the arid west, the network of streamflow-gaging stations was established because of water-supply needs and issues, and flood issues were and continue to be of secondary concern. In some regions, such as central Arizona, most of the gaged sites are on streams that have a large base flow in basins that have a similar aspect. These gaged basins may have storm characteristics, such as orographic effects, that are different from nearby ungaged basins with a different aspect. In places, the sample of gaged sites used for this study was defined by water-supply needs, and the sample may not represent flood characteristics for nearby ungaged streams.

Streams with channel characteristics that cause a large amount of floodflow attenuation are not represented in the regional relations. Such streams may have small channels and large, hydraulically rough flood plains. Drainage basins that have large distributary-flow areas are not represented in the regional relations. The magnitude of peak discharges leaving a basin can be significantly reduced in areas with distributary flow.

Alternative Methods

The methods described in this study apply to streams with flow unaffected by anthropogenic works and are based on a sample of gaging stations on streams draining areas of less than 2,000 mi^2. Existing flood-frequency relations in the referenced reports can be used for sites with flow affected by anthropogenic works and for large drainage areas. In the unusual situations where the described methods of this report do not apply, many alternative methods can be used to estimate flood-frequency relations. Most of the alternative methods require an estimate of rainfall intensity for a specific probability. Runoff characteristics for the estimate of rainfall are then estimated using a deterministic model of rainfall-runoff relations

(Crawford and Linsley, 1966; Leavesley and others, 1983), an empirical relation such as the rational method (Chow, 1964, p. 14–6 to 14–8), or a model such as the unit hydrograph (Chow, 1964, p. 14–13 to 14–34). A nationwide comparison of alternative methods for estimating flood-frequency relations on ungaged streams is provided by the U.S. Water Resources Council (1981).

The channel-geometry method is applicable to many natural stream channels; however, a visit to the study site is required. Estimates from channel-geometry methods are based on the concept that the size and shape of an alluvial channel are measures of the discharge of water and transport of sediment. Reports describing channel-geometry methods within the study area are shown in table 1. A review of channel-geometry methods was made by Wahl (1984).

The methods presented in this report, the rainfall-runoff models, and the channel-geometry method are applicable to streams on tributary systems of channels. Floodflow is much more difficult to estimate on alluvial fans or distributary-flow areas (Dawdy, 1979; McGinn, 1980; Hjalmarson and Kemna, 1991).

Assumptions and Limitations of Methods

It is important to recognize the assumptions and limitations inherent in the statistical methods used to estimate flood-frequency relations. The flood-information transfer method used in this study for most regions has two main components. Flood-frequency relations are first estimated from the series of annual peak discharges at streamflow-gaging stations. Information then is transferred to ungaged sites by relating the peak discharges at specific recurrence intervals at gaged sites to explanatory variables by using multiple-regression techniques. In this approach, the flood-frequency relations determined for gaged sites are the foundation.

Flood-Frequency Relations at Gaged Sites

Flood-frequency relations at gaged sites were estimated by fitting a probability distribution to the gaging-station records. In this study, the log-Pearson Type III distribution was fit to the data using the method of moments. The assumptions for applying a probability distribution to a set of streamflow records are that the record at the gaged site is representative of the population of floods that can occur at the site, and that the annual peak discharges are independent, homogeneous, and random.

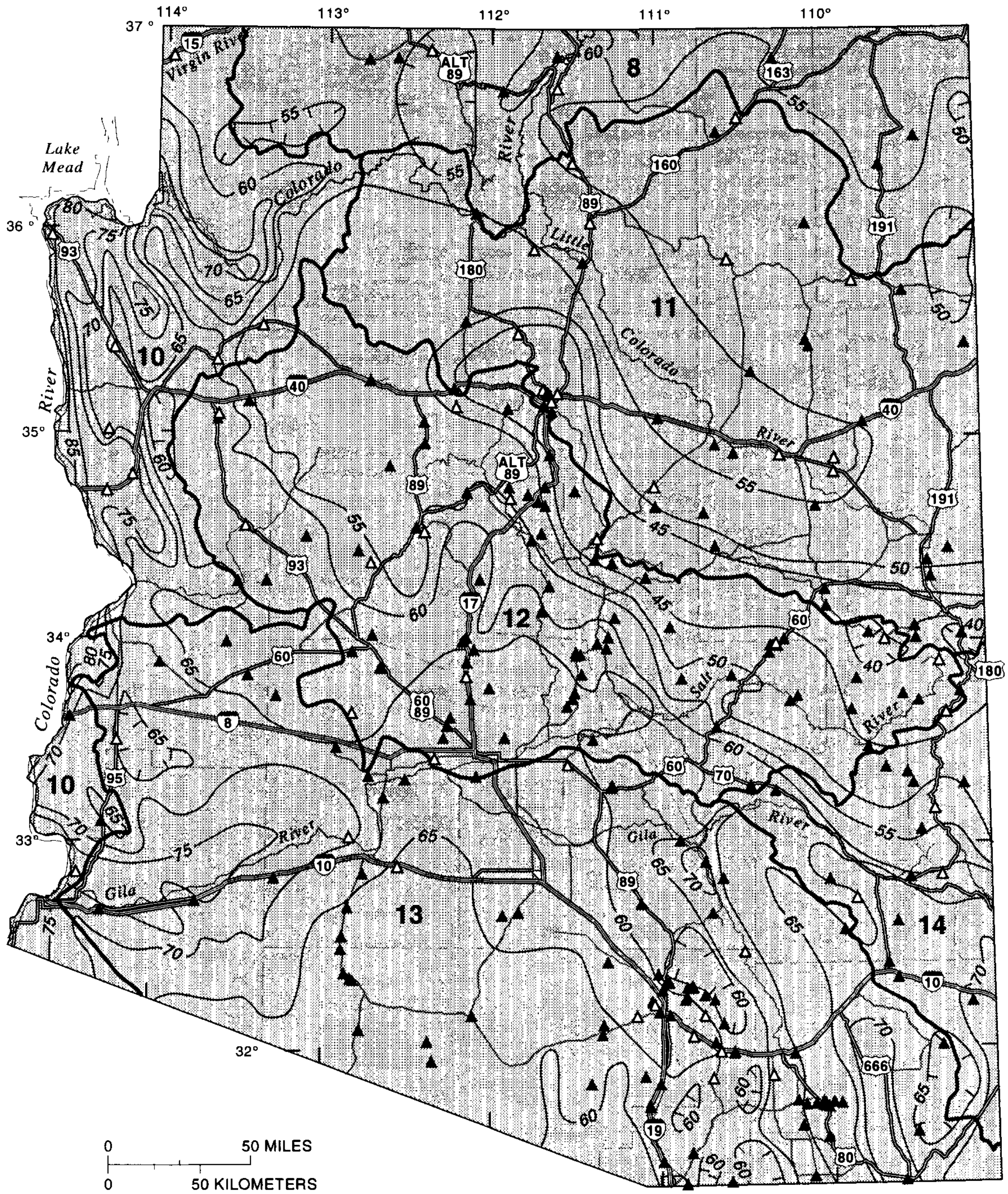
The population of annual peak discharges is defined as the whole class of possible occurrences of annual peak discharges in the past, present, and future. A sample is used that is an observed part of the population to describe and make inferences about this population. The annual peak discharges generally are independent and random; however, homogeneity may be a problem and needs careful examination. The factors that affect the annual peak discharges generally should remain constant to assure a homogeneous sample or population. Thus, watershed conditions should be constant during the period of record for the sample and for the period for which flood frequency is to be estimated. Cover conditions of the watershed such as vegetation, soil, and extent of urban areas generally should be constant. The streamflow regime should not change significantly because of urbanization, channelization, or construction of reservoirs, diversions, and levees. If all the assumptions are met, the relations of magnitude and frequency for past floods are assumed to be applicable to future floods and there-fore are used to predict the future magnitude and frequency of floods.

An unbiased and accurate record of annual peak discharges is needed for a flood-frequency analysis made on the basis of gaged data. Methods used in this study to ensure record accuracy include analysis of the accuracy of measurements of peak discharges, addition of historical and paleoflood information to records, comparisons of systematic records and frequency estimates to envelope curves of maximum measured floods, comparison of records to droughts and wet periods, and stationarity analysis.

Regional Flood-Frequency Relations

The multiple-regression method that was used for determination of most of the regional flood-frequency relations provides a means of estimating design-flood magnitudes at ungaged sites. The regional relations are based on a sample of gaged streams that is assumed to represent the population of flood events and streams in the study area. Thus,

Figure 6. Flood regions in the study area.



EXPLANATION

(heavy line)	BOUNDARY OF FLOOD REGIONS
11	FLOOD-REGION NUMBER
(10)	INTERSTATE HIGHWAY
(89)	U.S. HIGHWAY
(dotted line)	STATE HIGHWAY
—— 60 ——	LINE OF EQUAL FREE WATER-SURFACE EVAPORATION—Interval 5 inches (Farnsworth and others, 1982)

STREAMFLOW-GAGING STATION

▲ Station relation defined

△ Station relation undefined

Figure 7. Flood regions in Arizona.

any errors or uncertainty contained in the estimates of flood-frequency relations from records of gaged sites are transferred to the estimates for ungaged sites. A potentially large problem with an individual relation at a gaged site is the time-sampling error, which is the error caused by having a sample that

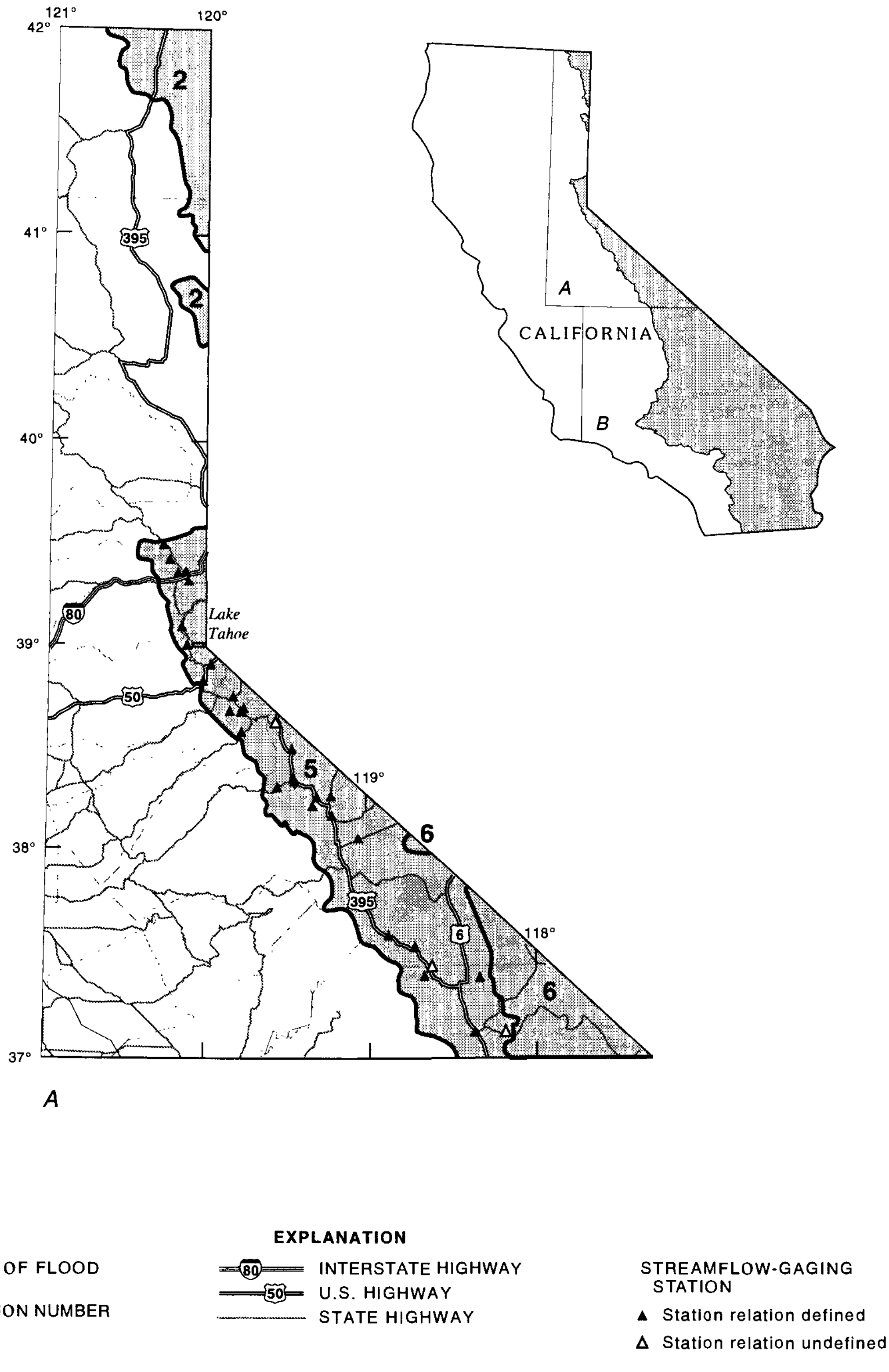


Figure 8A. Flood regions in California.

does not represent the population of floods at the site. This time-sampling error, however, is partially reduced by the combining and averaging of station flood-frequency relations in the regression method.

Flood magnitudes at ungaged sites in Regions 6, 10, 11, and 16 were estimated using a new hybrid method. As in the multiple-regression method, the hybrid regional relations are based on a sample of gaged streams that is assumed to represent the population of flood events and streams in the study area. The hybrid regional relations are subject to a time-sampling error associated with the sample of gaged sites used to represent the regional population of floods.

Use of regional relations with values of explanatory variables outside the range of the sample that is used to define the relations can result in unreliable estimates of peak discharge. Average standard errors of prediction for the regional equations in this report are for the average of the explanatory variables. For values of variables that are much different from the average, errors may be much greater than the average standard error of prediction. For explanatory variables with a large exponent, small departures from the average value of the variable can have corresponding large errors. Application of a regional relation where two or more of the values of the explanatory variables are

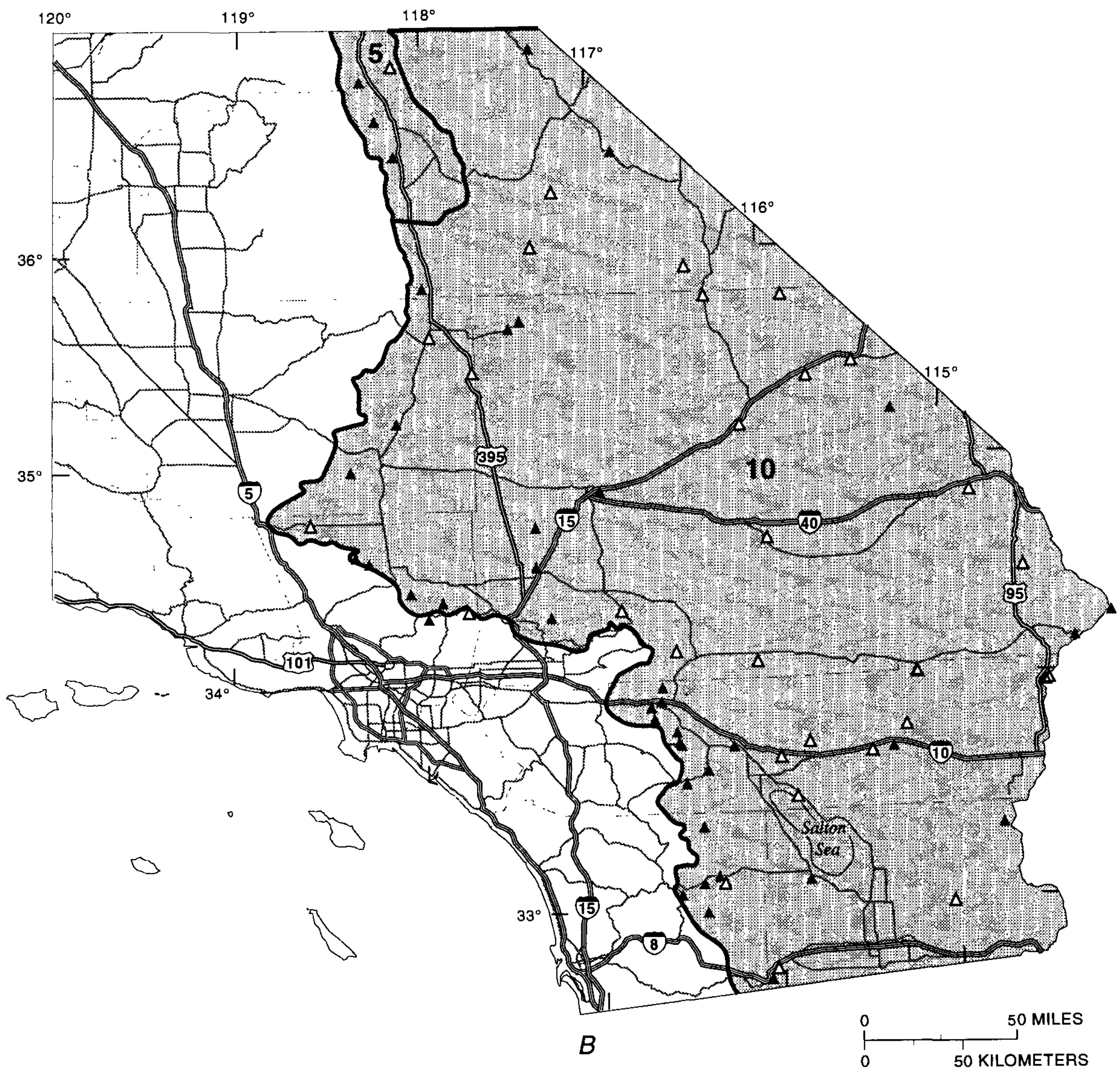
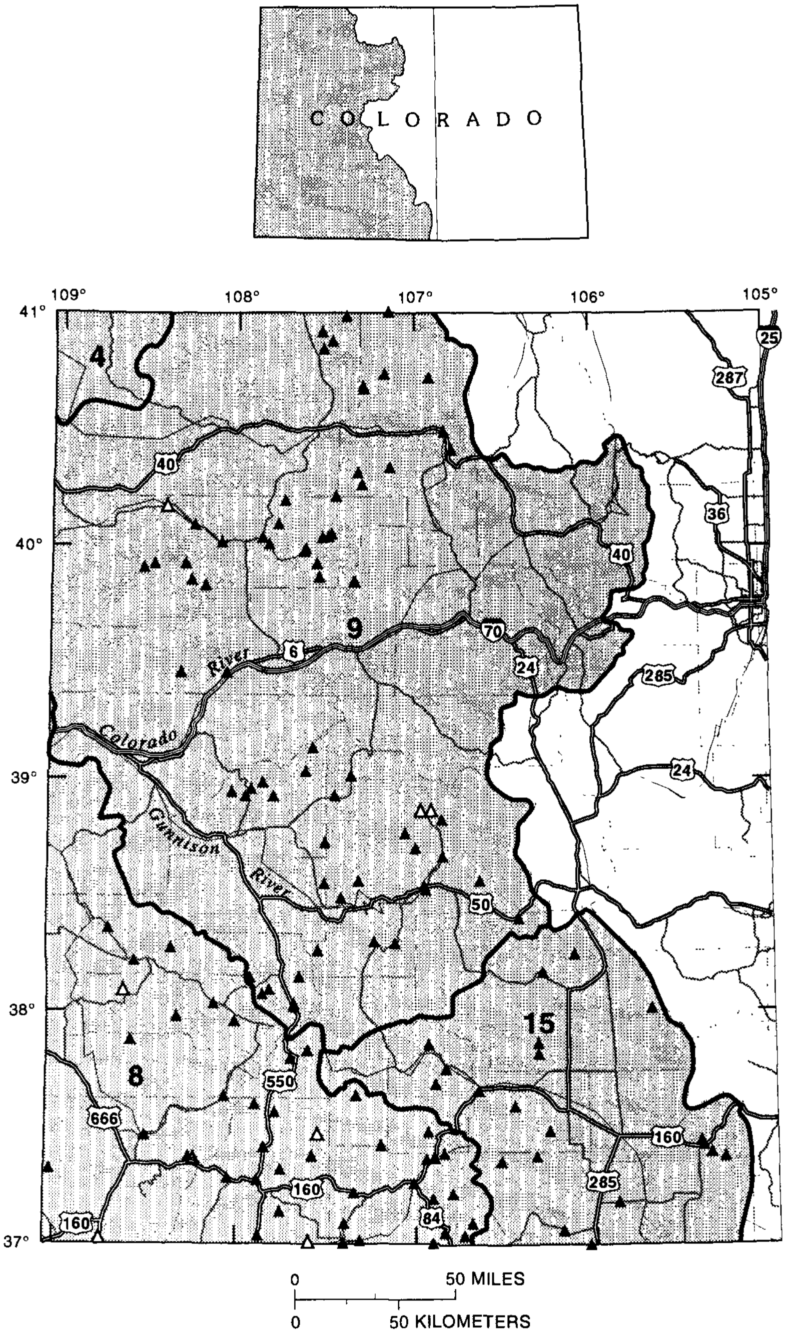


Figure 8B. Flood regions in California.



EXPLANATION

BOUNDARY OF FLOOD REGIONS

9 FLOOD-REGION NUMBER

70 INTERSTATE HIGHWAY

40 U.S. HIGHWAY

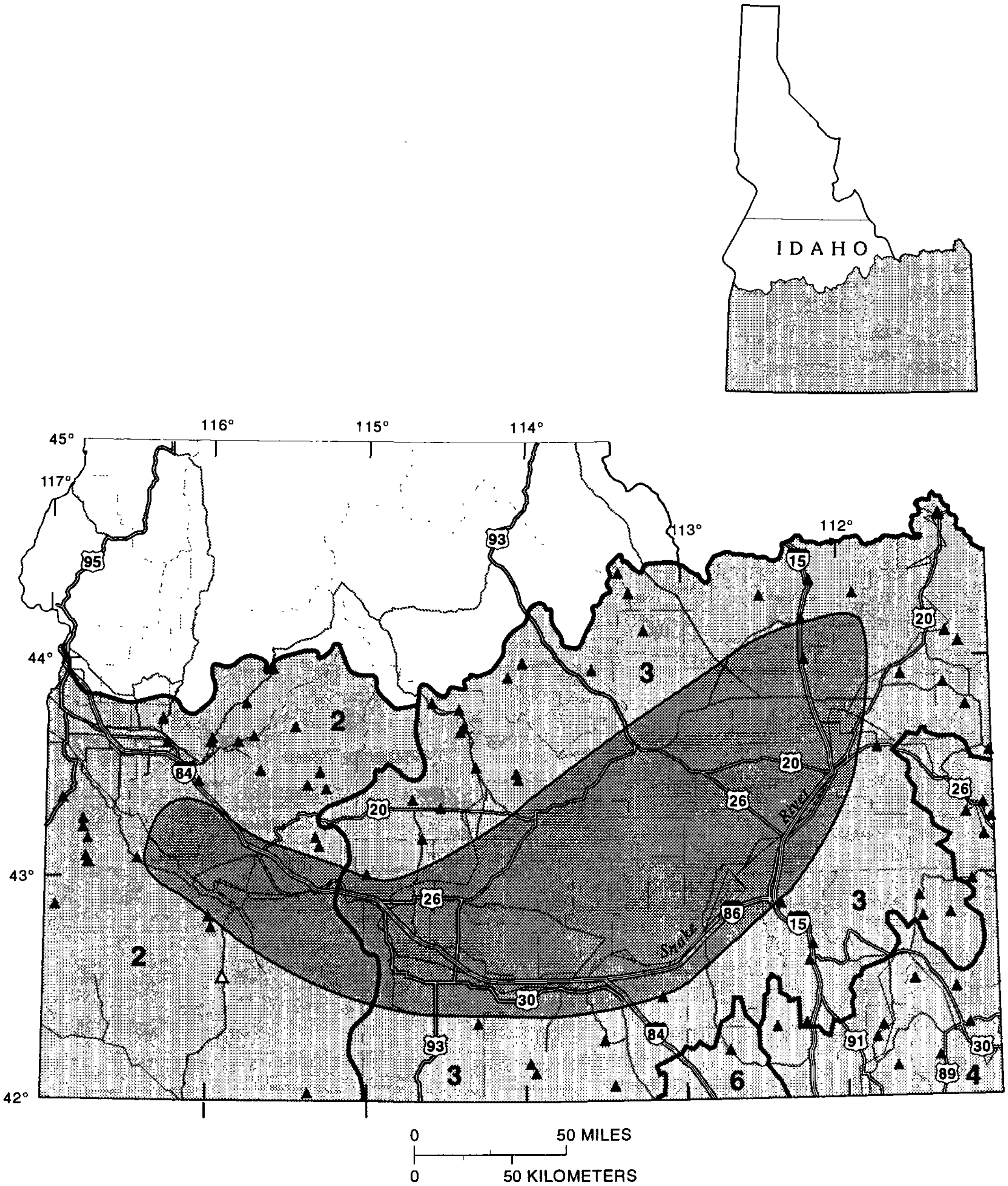
STATE HIGHWAY

STREAMFLOW-GAGING STATION

▲ Station relation defined

△ Station relation undefined

Figure 9. Flood regions in Colorado.



EXPLANATION

SNAKE RIVER PLAIN—Flood frequency undefined

BOUNDARY OF FLOOD REGIONS

3 FLOOD-REGION NUMBER

INTERSTATE HIGHWAY

U.S. HIGHWAY

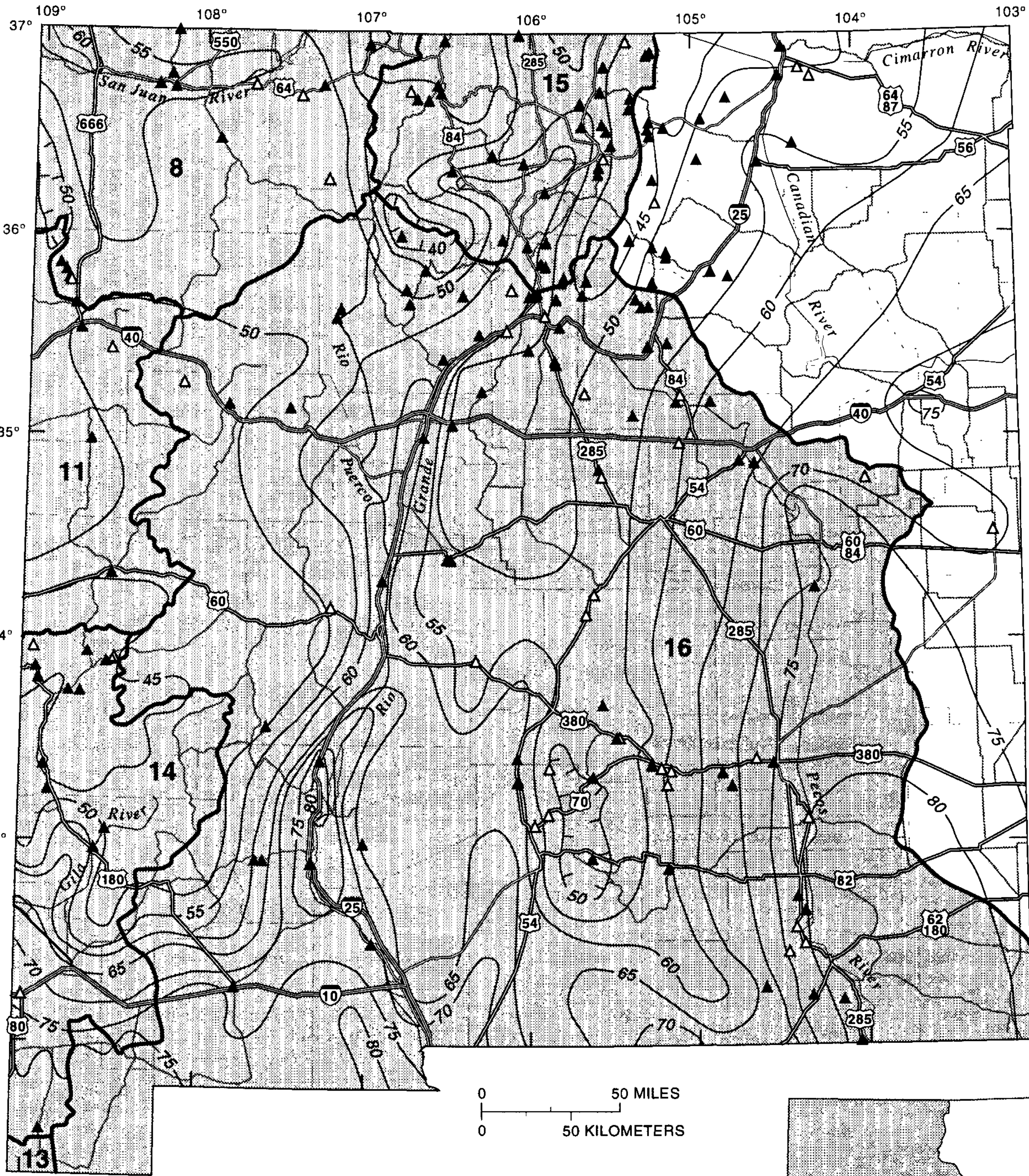
STATE HIGHWAY

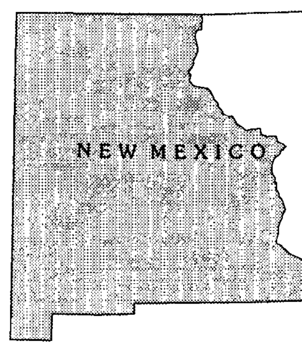
STREAMFLOW-GAGING STATION

▲ Station relation defined

Δ Station relation undefined

Figure 10. Flood regions in Idaho.





EXPLANATION

- BOUNDARY OF FLOOD REGIONS
- 16 FLOOD-REGION NUMBER
- INTERSTATE HIGHWAY
- U.S. HIGHWAY
- STATE HIGHWAY
- —50— LINE OF EQUAL FREE WATER-SURFACE EVAPORATION—Interval 5 inches (Farnsworth and others, 1982)
- STREAMFLOW-GAGING STATION
  - ▲ Station relation defined
  - △ Station relation undefined

Figure 11. Flood regions in New Mexico.

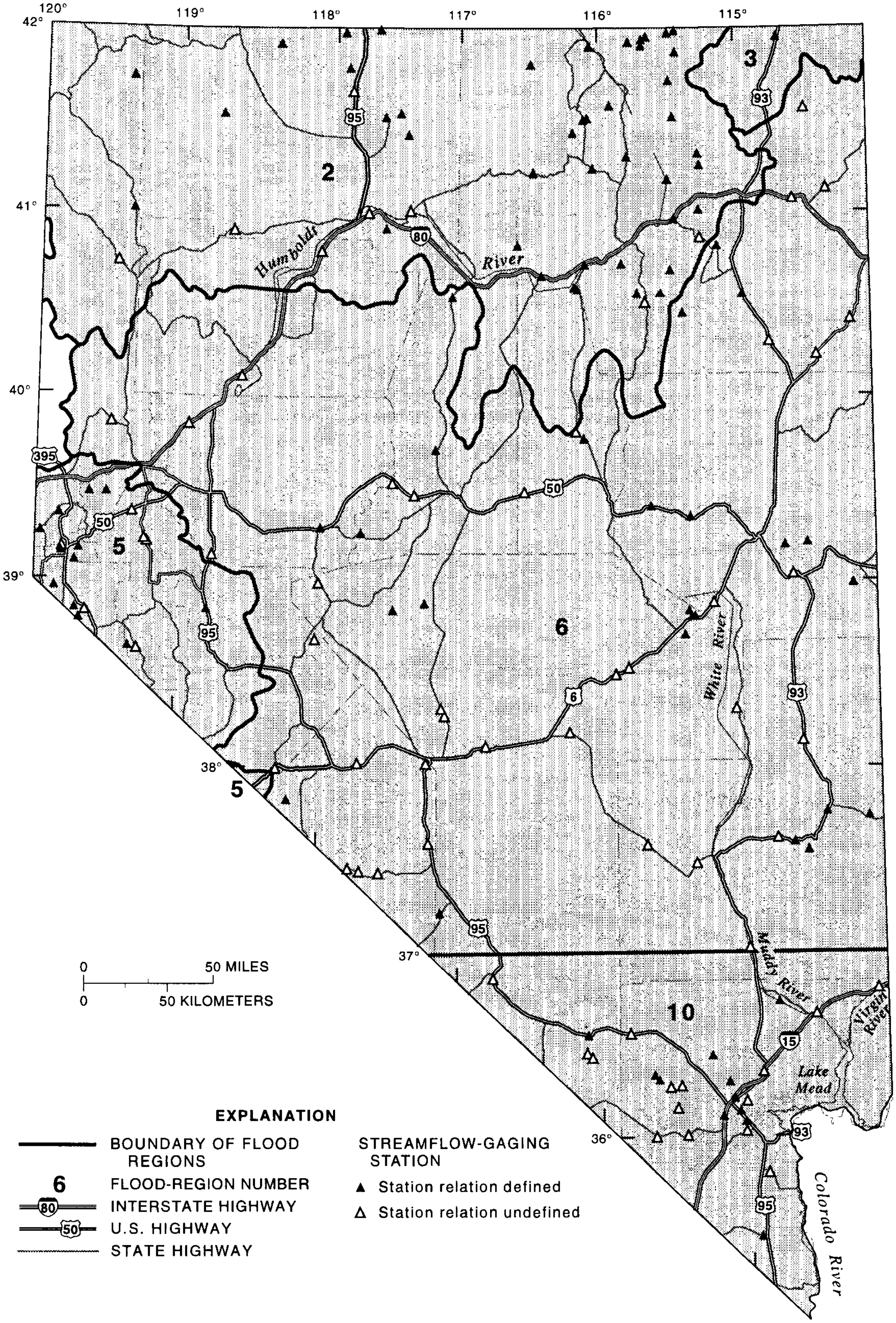
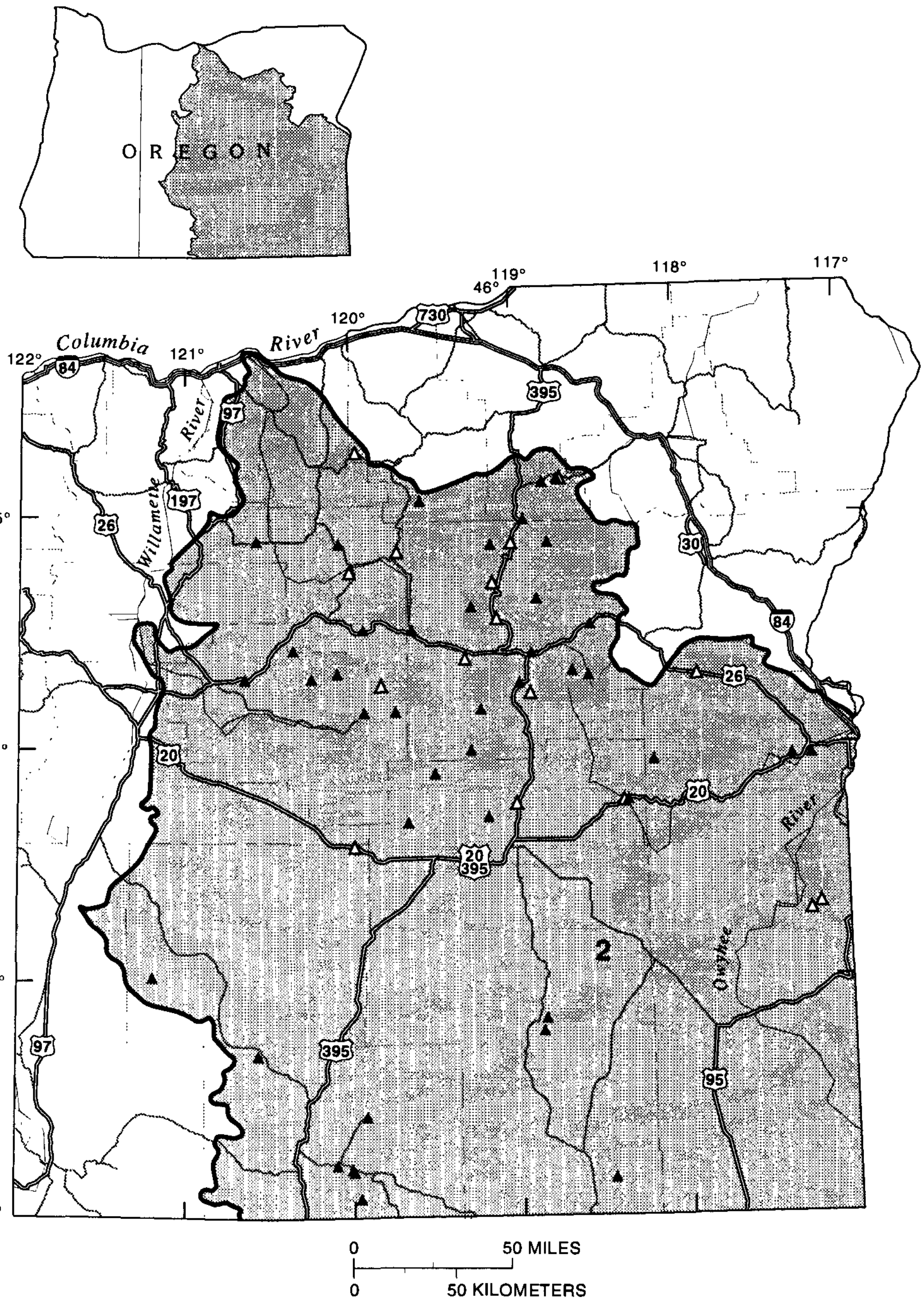


Figure 12. Flood regions in Nevada.



EXPLANATION

BOUNDARY OF FLOOD REGIONS

2 FLOOD-REGION NUMBER

INTERSTATE HIGHWAY

U.S. HIGHWAY

STATE HIGHWAY

STREAMFLOW-GAGING STATION

▲ Station relation defined

△ Station relation undefined

Figure 13. Flood regions in Oregon.

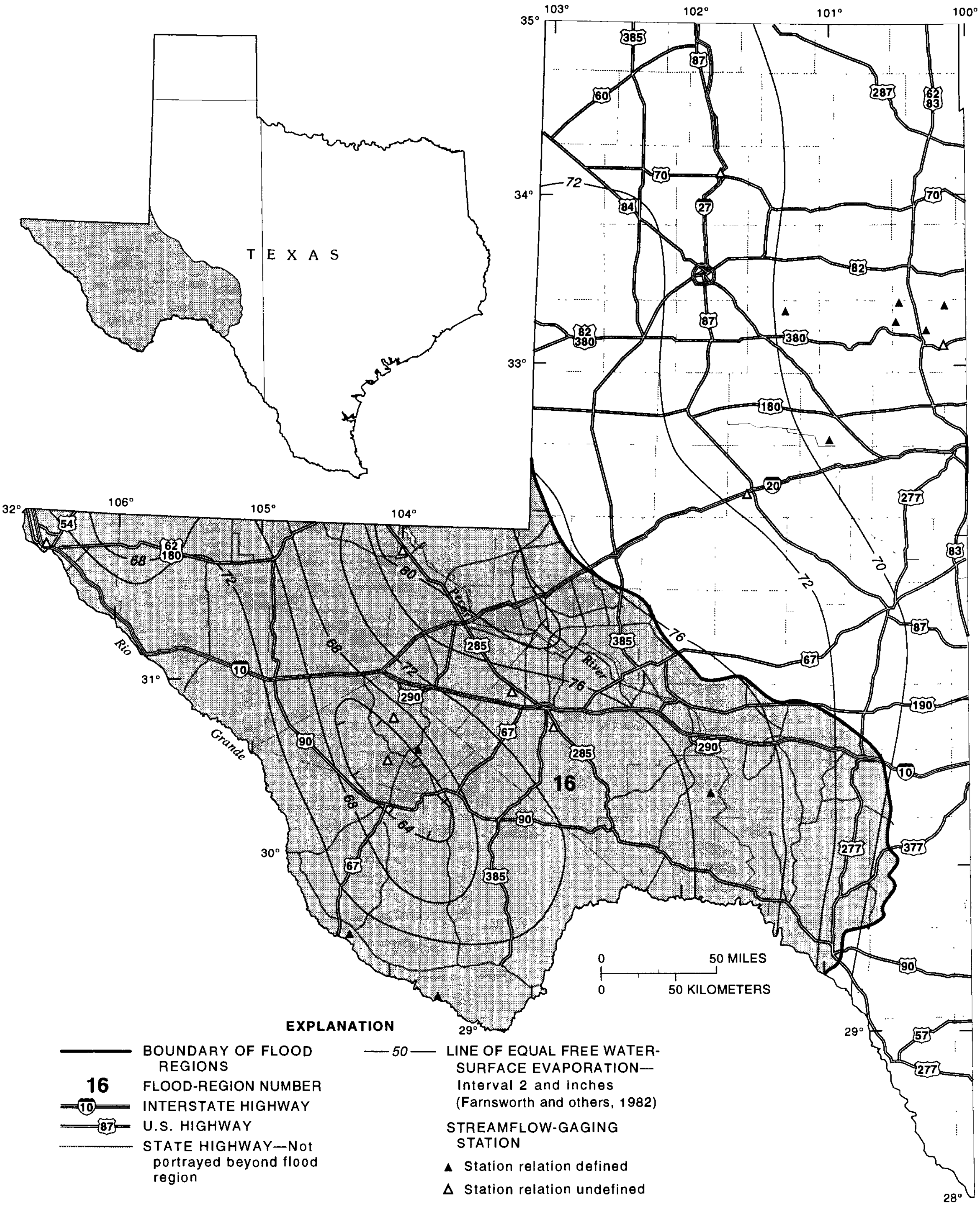
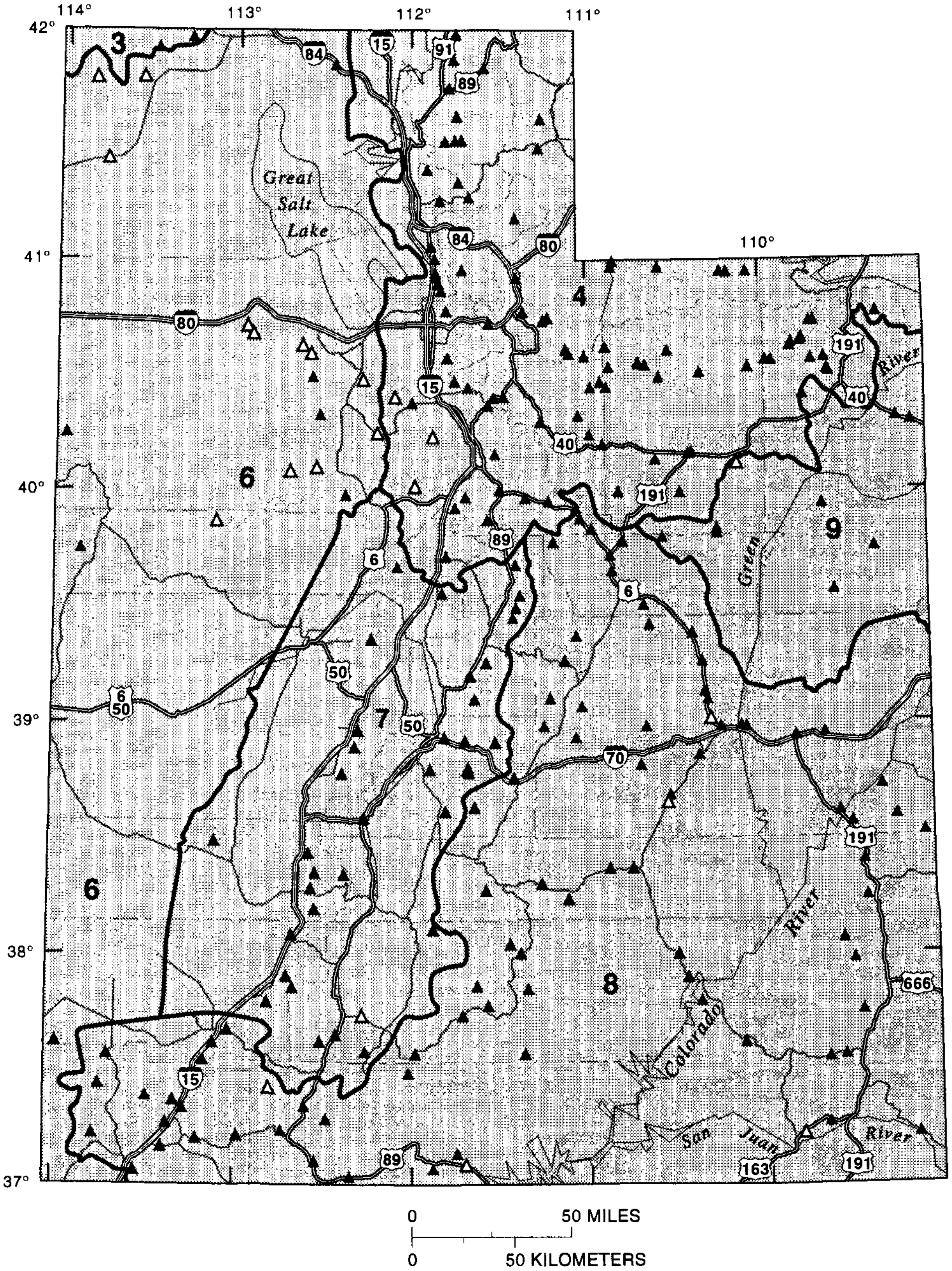


Figure 14. Flood regions in Texas.



EXPLANATION

BOUNDARY OF FLOOD REGIONS

7 FLOOD-REGION NUMBER

INTERSTATE HIGHWAY

U.S. HIGHWAY

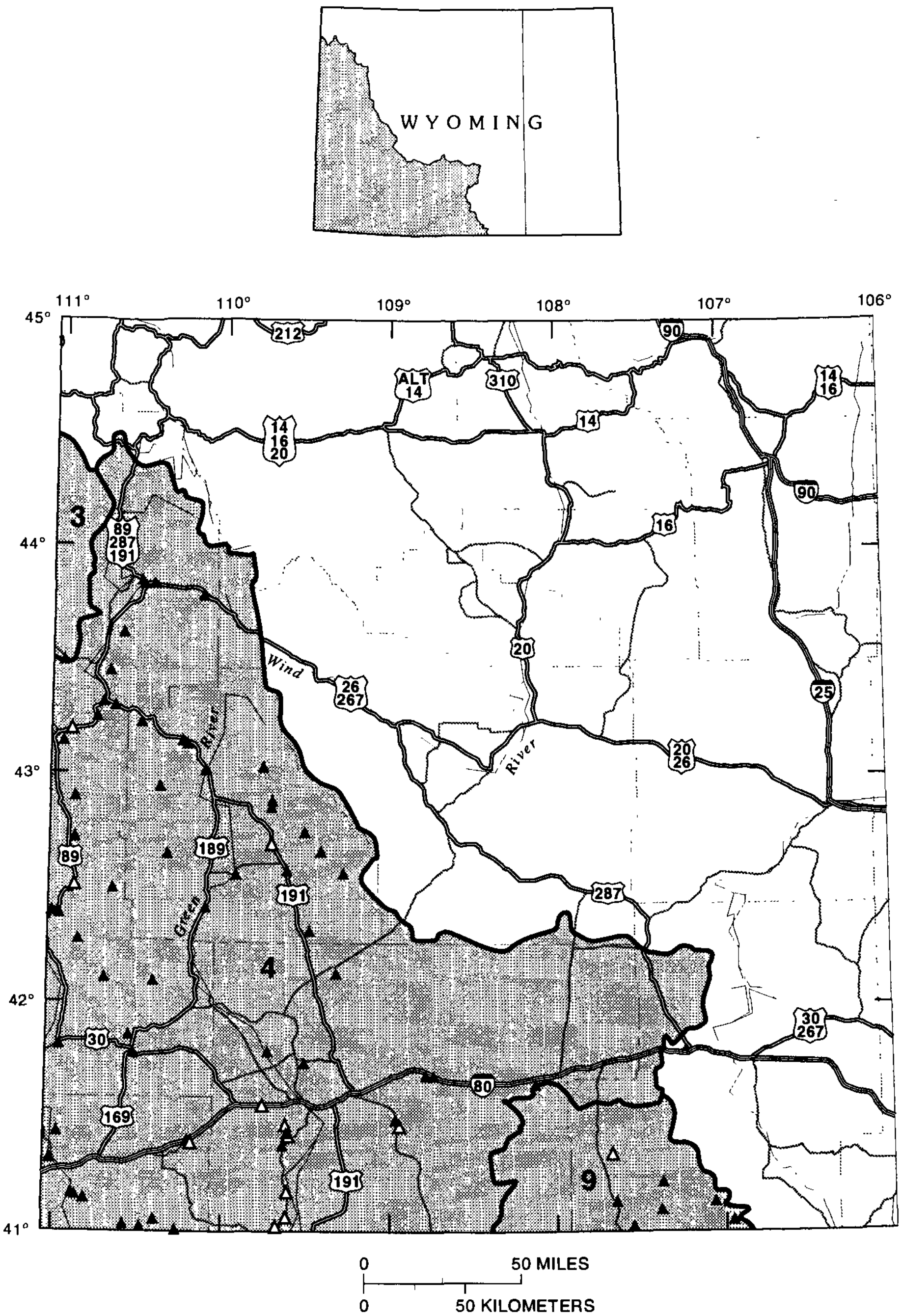
STATE HIGHWAY

STREAMFLOW-GAGING STATION

▲ Station relation defined

△ Station relation undefined

Figure 15. Flood regions in Utah.



EXPLANATION

BOUNDARY OF FLOOD REGIONS

4 FLOOD-REGION NUMBER

80 INTERSTATE HIGHWAY

89 U.S. HIGHWAY

STATE HIGHWAY

STREAMFLOW-GAGING STATION

▲ Station relation defined

Δ Station relation undefined

Figure 16. Flood regions in Wyoming.

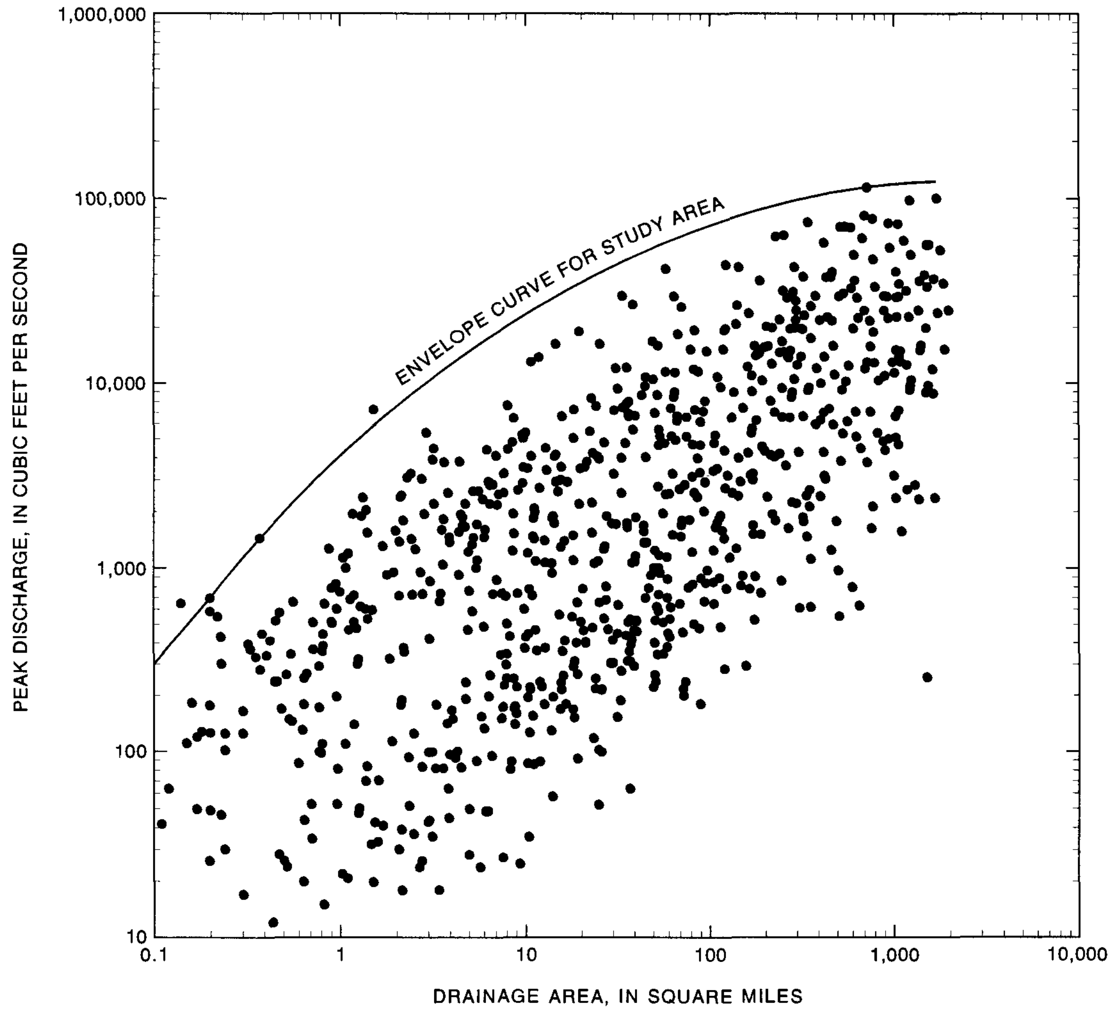


Figure 17. Relation between maximum peak discharge of record and drainage area for gaged sites in the study area.

near the limits of the range of sample values may result in a combination of values that is outside the sample range. Such extrapolations are subject to large potential errors, and the results may be misleading.

Predicted floods from regression models are an average for an entire area; therefore, a particular site may have smaller or larger floods depending on basin, climatic, and channel characteristics that are not used in the regression equations. The user of the regression models should be aware of the characteristics of the basin to which the model is applied. Because of the averaging characteristic of the regression models in this study, another limitation of their application is that estimated peak discharges near many of the flood-region boundaries may be quite different using two adjacent regional models.

APPLICATION OF METHODS

To estimate flood-frequency relations at a study site, the user should use the following steps. Examples are given for sites in one region and for sites near flood-region boundaries.

1. Using latitude and elevation of the study site, determine if the study site is in High-Elevation Region 1 or in a low- to middle-elevation region (fig. 5). If the study site is in a low- to middle-elevation region, determine the flood region of the study site using figures 6–16.
2. Using the flood region and the data section, determine if the study site is on a gaged stream.

3. If the study site is at a gaged site, use the listed weighted flood-frequency values for that site in the data section.
4. If the study site is near a gaged site on the same stream, use the method described in the section that follows entitled "Sites Near Gaged Sites on the Same Stream."
5. If the study site is on an ungaged stream, use the method described in the section that follows entitled "Ungaged Sites."

Sites Near Gaged Sites on the Same Stream

Flood-frequency relations for sites near gaged sites on the same stream can be computed using the drainage-area ratio of ungaged site to gaged site. If the ratio is between 0.5 and 1.5 and the ungaged and gaged sites are draining similar basins, equation 2 should be used to compute the required peak discharges. If the ratio is outside that range or the basins are significantly different, the method for ungaged sites should be used. Flood-frequency relations for sites between gaged sites on the same stream can be determined by interpolating between values of drainage areas for gaged sites in the data section.

The following is an example of determination of the 10- and 100-year peak discharges for the Pecos River in New Mexico at an ungaged site. The drainage area (A_u) is 165 mi^2. In the data section, the station, 08378500 Pecos River near Pecos, New Mexico (drainage area A_g=189 mi^2), is in High-Elevation Region 1 and is downstream from the study site.

1. Check that the drainage-area ratio A_u/A_g is between 0.5 and 1.5. That ratio is as follows:

$$A_u/A_g = \frac{165 \text{ mi}^2}{189 \text{ mi}^2} = 0.87,$$

which meets the ratio requirement. Equation 2 is used.

$$Q_{T(u)} = Q_{T(g)}(A_u/A_g)^x ,$$

where

$Q_{T(g)}$ = weighted peak discharge from the data section, and

x = 0.8 for the High-Elevation Region 1.

2. Obtain the weighted peak discharges at the gaged site from the data section:

$Q_{10(g)}$ = 1,480 ft^3/s, and

$Q_{100(g)}$ = 3,250 ft^3/s.

3. Compute the peak discharges at the ungaged site:

$$Q_{10(u)} = 1{,}480\left(\frac{165}{189}\right)^{0.8} = 1{,}330 \text{ ft}^3\text{/s},$$

$$Q_{100(u)} = 3{,}250\left(\frac{165}{189}\right)^{0.8} = 2{,}920 \text{ ft}^3\text{/s}.$$

The computed 100-year peak discharge appears reasonable in comparison to the plot of maximum peak discharge of record and drainage area for the region (fig. 19).

Ungaged Sites

Flood-frequency relations at ungaged sites can be determined using one of the following procedures, depending on the location of the site and its relation to the flood-region boundaries. The first procedure is for sites with a drainage area in one region. The second procedure is for sites with a drainage area in two low- to middle-elevation regions. The third procedure is for sites in a low- to middle-elevation region with an elevation that is within 700 ft of the lower boundary of High-Elevation Region 1.

Use the following step-by-step procedure to compute flood-frequency relations at ungaged sites.

1. If the drainage area of the study site is entirely within one flood region, compute the required information for one region. If the drainage area of the study site is in two low- to middle-elevation regions or if the elevation of the study site is within 700 ft of the lower boundary of the High-Elevation Region 1, a weighted flood-frequency relation is needed and the required information for the two adjacent regions should be computed.
2. Use table 4 and the flood region(s) of the study site to find the tables and figures containing the required information. The explanatory variables required for each region are in column 3. The numbers of the tables of equations for estimating regional

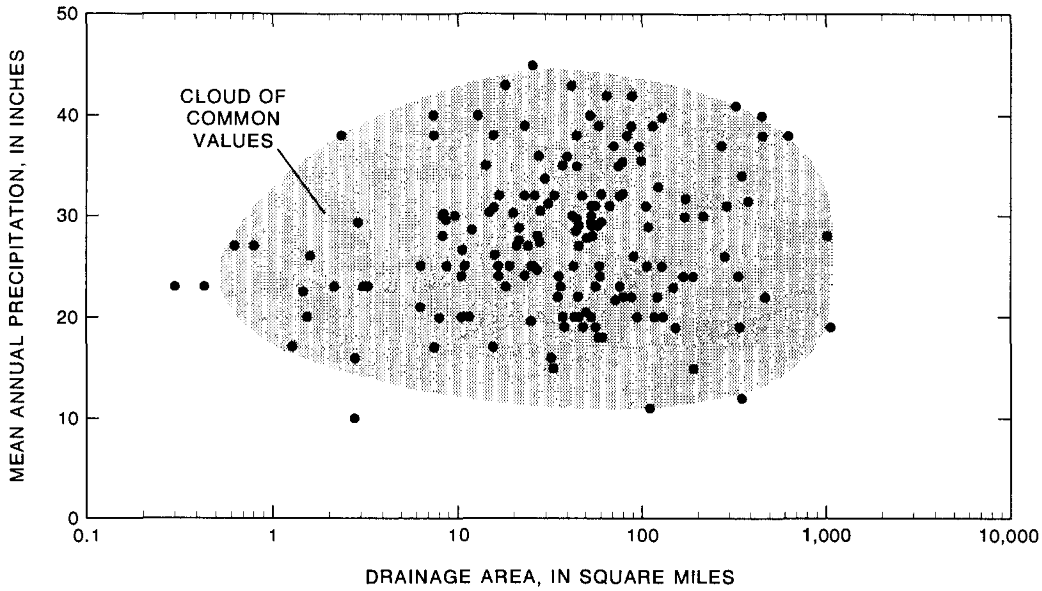


Figure 18. Joint distribution of mean annual precipitation and drainage area for gaged sites in the High-Elevation Region 1.

Table 5. Generalized least-squares regression equations for estimating regional flood-frequency relations for the High-Elevation Region 1

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; PREC, mean annual precipitation, in inches. Data were based on 165 stations, Average number of years of systematic record is 28]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=0.124AREA$^{0.845}$PREC$^{1.44}$	59	0.16
5	Q=0.629AREA$^{0.807}$PREC$^{1.12}$	52	.62
10	Q=1.43AREA$^{0.786}$PREC$^{0.958}$	48	1.34
25	Q=3.08AREA$^{0.768}$PREC$^{0.811}$	46	2.50
50	Q=4.75AREA $^{0.758}$PREC$^{0.732}$	46	3.37
100	Q=6.78AREA$^{0.750}$PREC$^{0.668}$	46	4.19

flood-frequency relations are in column 4. Figures showing the relation between maximum peak discharges of record and drainage area are in column 5. Figures showing plots of explanatory variables and their cloud of common values are in column 6.

3. Compute the required explanatory variables using the methods described on pages 15 and 16.
4. Determine if the values of explanatory variables are within the cloud(s) of common values shown in the figures listed in column 6 of table 4. If they are within the cloud(s) of common values, then proceed to step 5. If they are outside the cloud(s), the methods are not defined for the study site, and the methods should be used with extreme caution.
5. Use the equations for the appropriate region(s) (tables 5–20) to compute the flood-frequency relation at the study site. See the following examples for sites using equations for one region or two regions.

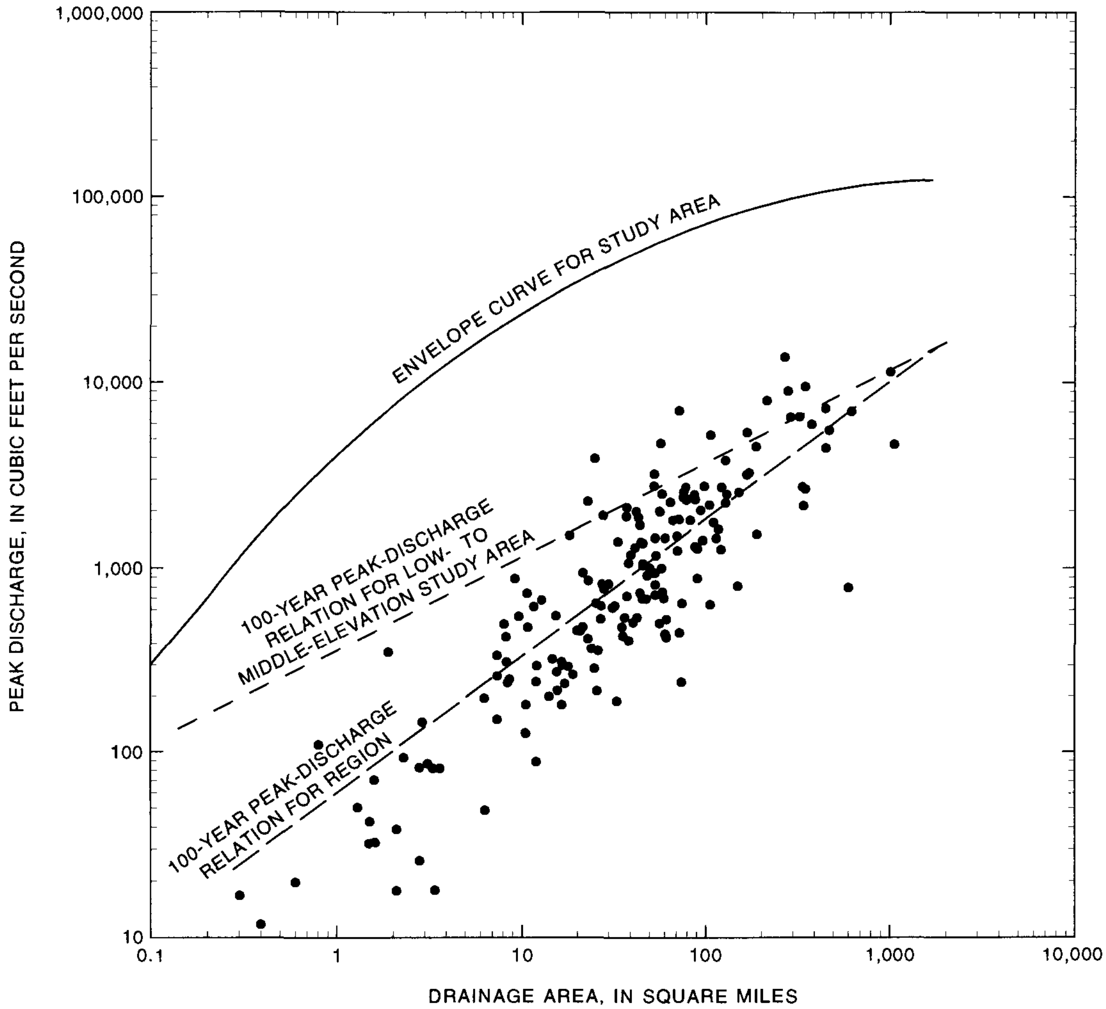


Figure 19. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the High-Elevation Region 1.

Site with a Drainage Area in One Flood Region

The first example is the use of the regression equations with the model described by equation 3. Determine the peak discharges for recurrence intervals of 10 and 100 years for an ungaged site in the Northeast Region 4 (fig. 6, tables 4 and 8). The required basin characteristics are drainage area (AREA), in square miles, and mean basin elevation (ELEV), in feet. Using the procedures described in the section entitled "Explanatory Variables," the drainage area is computed as 35 mi^2 and the mean basin elevation is 7,500 ft. The drainage area and mean basin elevation are in the cloud of common values for the region (fig. 24). The characteristics are inserted into the appropriate equations as follows:

$$Q_{10} = 1.26(\text{AREA})^{0.674}(\text{ELEV}/1{,}000)^{1.64} =$$

$$1.26(35)^{0.674}(7.5)^{1.64} = 377 \text{ ft}^3/\text{s},$$

and

$$Q_{100} = 11.8(\text{AREA})^{0.662}(\text{ELEV}/1{,}000)^{0.835} =$$

$$11.8(35)^{0.662}(7.5)^{0.835} = 668 \text{ ft}^3/\text{s}.$$

The computed 100-year peak discharge appears reasonable in comparison to the plot of maximum peak discharge of record and drainage area for the region (fig. 25).

The second example is for the use of the regression equations with the model described by equation 4. Determine the peak discharges for recurrence intervals of 50 and 100 years for an ungaged site in Central Arizona Region 12 (fig. 6, tables 4 and 16). The required basin character-

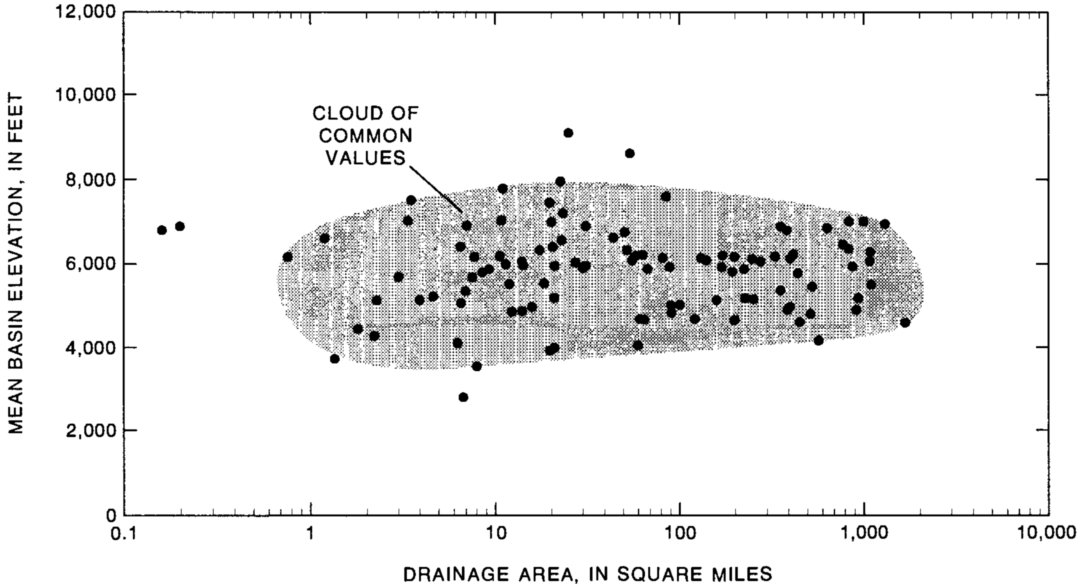


Figure 20. Joint distribution of mean basin elevation and drainage area for gaged sites in the Northwest Region 2.

Table 6. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Northwest Region 2

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 108 stations. Average number of years of systematic record is 26]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=13.1AREA$^{0.713}$	72	0.96
5	Q=22.4AREA$^{0.723}$	66	1.80
10	Q=55.7AREA$^{0.727}$(ELEV/1,000)$^{-0.353}$	61	3.07
25	Q=84.7AREA$^{0.737}$(ELEV/1,000)$^{-0.438}$	61	4.64
50	Q=113AREA$^{0.746}$(ELEV/1,000)$^{-0.511}$	64	5.47
100	Q=148AREA$^{0.752}$(ELEV/1,000)$^{-0.584}$	68	6.05

istics are drainage area (AREA), in square miles, and mean basin elevation (ELEV), in feet. Using the procedures in the section "Explanatory Variables," the drainage area is computed as 110 mi^2, and the mean basin elevation is 5,900 ft. The drainage area and mean basin elevation are in the cloud of common values for the region (fig. 40).

The characteristics are inserted into the appropriate equations as follows:

$$Q_{50} = 10^{(7.36-4.17(\mathrm{AREA})^{-0.08})}(\mathrm{ELEV}/1{,}000)^{-0.440} =$$

$$10^{(7.36-4.17(110)^{-0.08})}(5.90)^{-0.440} = 14{,}400 \text{ ft}^3/\text{s},$$

and

$$Q_{100} = 10^{(6.55-3.17(\mathrm{AREA})^{-0.11})}(\mathrm{ELEV}/1{,}000)^{-0.454} =$$

$$10^{(6.55-3.17(110)^{-0.11})}(5.90)^{-0.454} = 20{,}400 \text{ ft}^3/\text{s}.$$

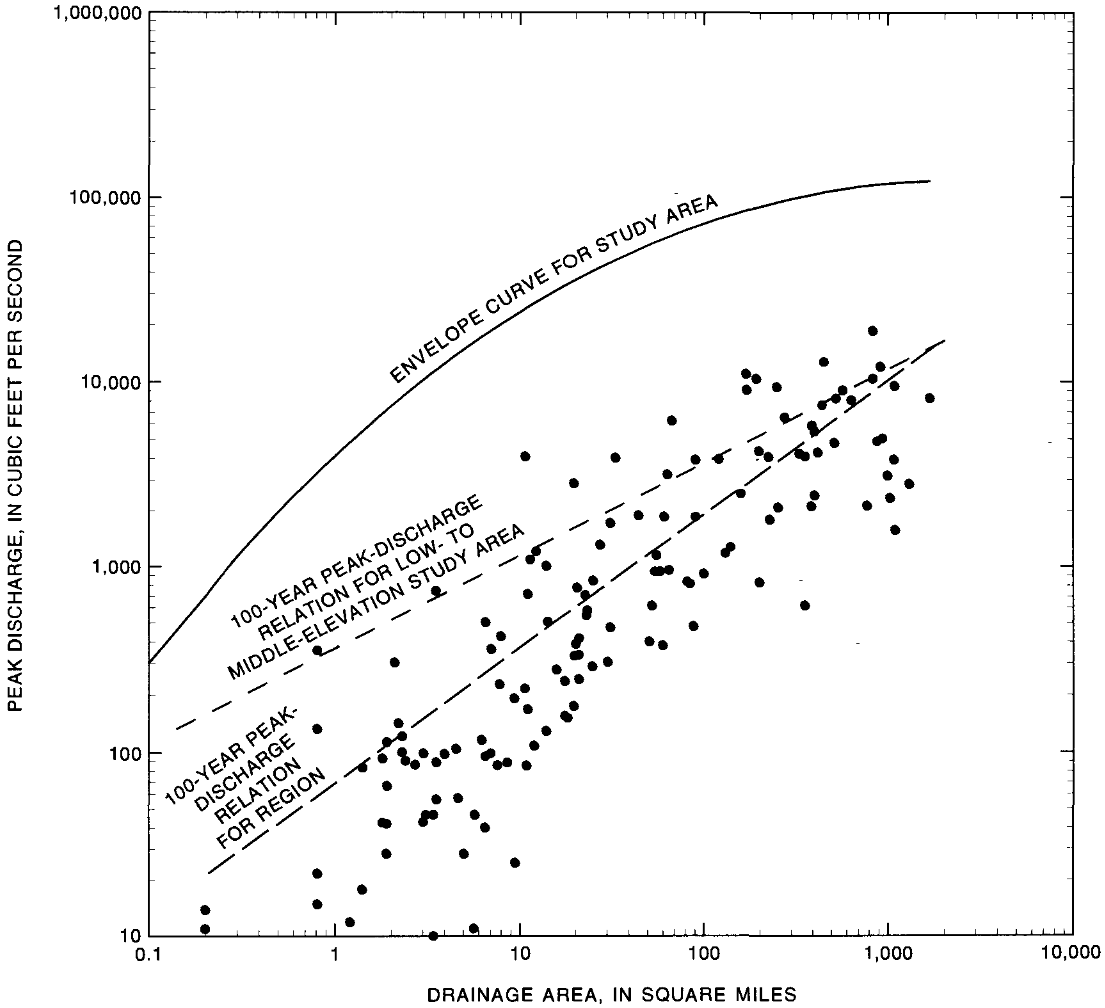


Figure 21. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Northwest Region 2.

The computed 100-year peak discharge appears reasonable in comparison to the plot of maximum-peak discharge of record and drainage area for the region (fig. 41).

Site with a Drainage Area in Two Low- to Middle-Elevation Flood Regions

A hypothetical study site has a drainage area in the Northern and Southern Great Basin Regions (Regions 6 and 10). Thus, an averaging procedure based on the percentage of the drainage area in each region should be used. The peak discharges are estimated for each region as if the drainage area is entirely in one region. Then, a weighted peak discharge is estimated using equation 6.

An example for the use of regression equations for two regions is as follows. Determine the peak discharges for recurrence intervals of 10 and 100 years for an ungaged site with a drainage area in Northern Great Basin Region 6 and Southern Great Basin Region 10 (fig. 6, tables 4, 10, and 14). The required basin and climatic characteristics are drainage area (AREA), in square miles, and mean basin elevation (ELEV), in feet. Using the procedures discussed in "Explanatory Variables," the basin and climatic characteristics are computed as 57 mi^2 for drainage area and 6,500 ft for mean basin elevation. The drainage area and mean basin elevation are within the cloud of common values for Region 6 (fig. 29), and the drainage area is within the range of drainage area for Region 10 (fig. 37). On the topographic map, the drainage area is bisected by

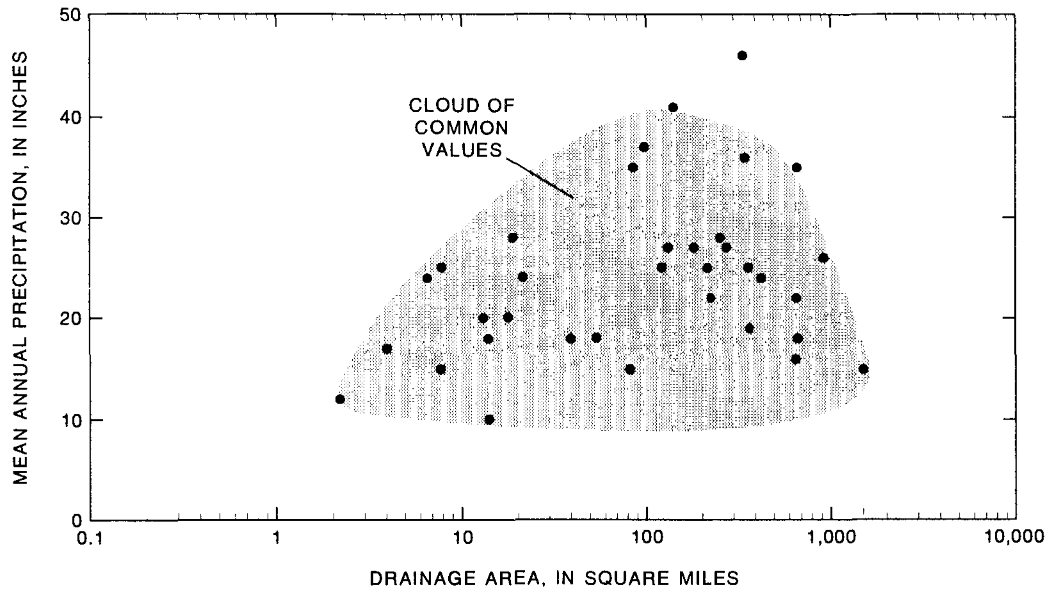


Figure 22. Joint distribution of mean annual precipitation and drainage area for gaged sites in the South-Central Idaho Region 3.

Table 7. Generalized least-squares regression equations for estimating regional flood-frequency relations for the South-Central Idaho Region 3

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; PREC, mean annual precipitation, in inches. Data were based on 35 stations. Average number of years of systematic record is 32]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=0.444AREA$^{0.649}$PREC$^{1.15}$	86	0.29
5	Q=1.21AREA$^{0.639}$PREC$^{0.995}$	83	.49
10	Q=1.99AREA$^{0.633}$PREC$^{0.924}$	80	.77
25	Q=3.37AREA$^{0.627}$PREC$^{0.849}$	78	1.23
50	Q=4.70AREA$^{0.625}$PREC$^{0.802}$	77	1.57
100	Q=6.42AREA$^{0.621}$PREC$^{0.757}$	78	1.92

the regional boundary at 37° latitude. The northern region includes 21 mi^2, and the southern region includes 36 mi^2. The basin and climatic characteristics are inserted into the appropriate regional equations to obtain estimates of T-year discharges for each region. Then, equation 6 is used to obtain weighted estimates of T-year discharges. For the Northern Great Basin Region 6, the equations are as follows:

$$Q_{10} = 590(\text{AREA})^{0.62}(\text{ELEV}/1{,}000)^{-1.6} =$$

$$590(57)^{0.62}(6.5)^{-1.6} = 362 \text{ ft}^3/\text{s},$$

and

$$Q_{100} = 20{,}000(\text{AREA})^{0.51}(\text{ELEV}/1{,}000)^{-2.3} =$$

$$20{,}000(57)^{0.51}(6.5)^{-2.3} = 2{,}120 \text{ ft}^3/\text{s}.$$

For the Southern Great Basin Region 10, the equations are as follows:

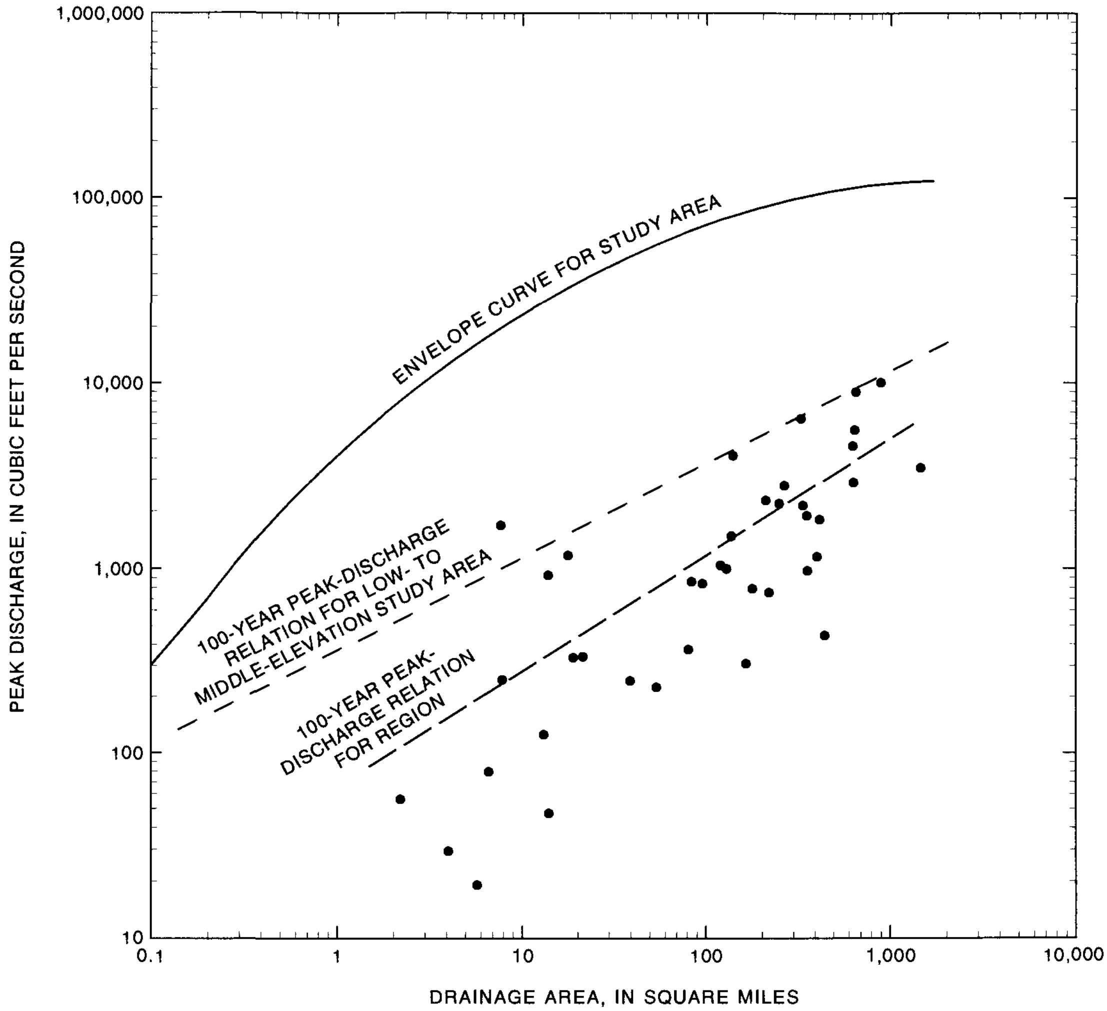


Figure 23. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the South-Central Idaho Region 3.

$$Q_{10} = 200(\text{AREA})^{0.62} = 200(57)^{0.62} = 2{,}450 \text{ ft}^3\text{/s},$$

and

$$Q_{100} = 850(\text{AREA})^{0.69} = 850(57)^{0.69} = 13{,}800 \text{ ft}^3\text{s}.$$

The computed 100-year peak discharges for Regions 6 and 10 appear reasonable in comparison to the plots of maximum peak discharge of record and drainage area for the regions (figs. 30, 37).

Estimates of weighted peak discharges using equation 6 are as follows:

$$Q_{10(w)} = \frac{(362\text{x}21) + (2{,}450\text{x}36)}{57} = 1{,}680 \text{ ft}^3\text{/s},$$

and

$$Q_{100(w)} = \frac{(2{,}120\text{x}21) + (13{,}800\text{x}36)}{57} = 9{,}500 \text{ ft}^3\text{/s}.$$

Low- to Middle-Elevation Site Near the High-Elevation Flood Region

A hypothetical study site is in a low- to middle-elevation flood region but the site elevation is within 700 ft of the boundary of High-Elevation Region 1 (fig. 5). Thus, an averaging procedure based on the relation between the elevation of the study site and the 700-foot transition zone should be used. The peak discharges are estimated for each region as if the drainage area is entirely in one region. Then, a weighted peak discharge is estimated using equation 7.

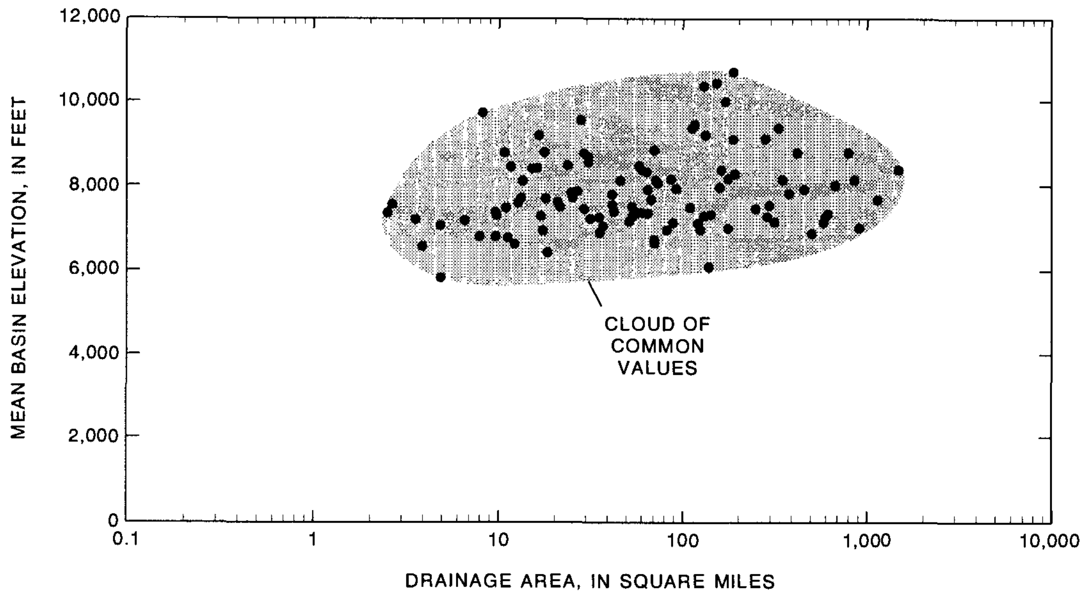


Figure 24. Joint distribution of mean basin elevation and drainage area for gaged sites in the Northeast Region 4.

Table 8. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Northeast Region 4

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 108 stations. Average number of years of systematic record is 28]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=0.0405AREA$^{0.701}$(ELEV/1,000)$^{2.91}$	64	0.39
5	Q=0.408AREA$^{0.683}$(ELEV/1,000)$^{2.05}$	57	.95
10	Q=1.26AREA$^{0.674}$(ELEV/1,000)$^{1.64}$	53	1.76
25	Q=3.74AREA$^{0.667}$(ELEV/1,000)$^{1.24}$	51	3.02
50	Q=7.04AREA$^{0.664}$(ELEV/1,000)$^{1.02}$	52	3.89
100	Q=11.8AREA$^{0.662}$(ELEV/1,000)$^{0.835}$	53	4.65

An example for the use of regression equations for High-Elevation Region 1 and a low- to middle-elevation region is as follows. Determine the peak discharges for recurrence intervals of 2 and 50 years for an ungaged site in the Four Corners Region 8 with a site elevation of 7,100 ft (fig. 6). The site elevation is within 700 ft of the boundary of High-Elevation Region 1, which is 7,500 ft in the latitudes of Region 8 (figs. 5, 6). The regression equations for Region 1 are in table 5, and the equations for Region 8 are in table 12. The required basin and climatic characteristics are drainage area (AREA), in square miles; mean basin elevation (ELEV), in feet; and mean annual precipitation (PREC), in inches. Using the procedures in the section "Explanatory Variables," the drainage area is computed as 45 mi^2, the mean basin elevation is 8,900 ft, and the mean annual precipitation is 28 in.

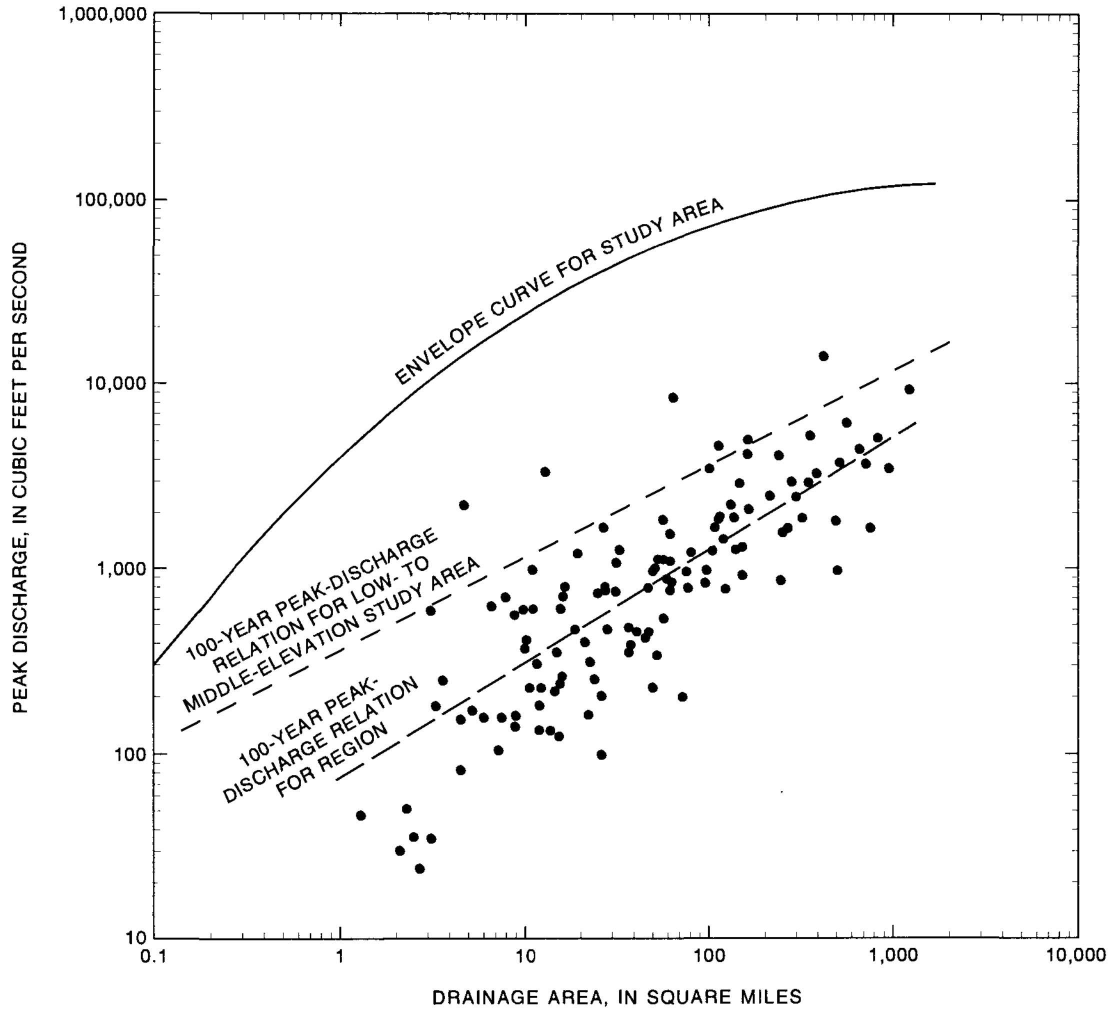


Figure 25. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Northeast Region 4.

The drainage area and mean annual precipitation are in the cloud of common values for Region 1 (fig. 18), and the drainage area and mean basin elevation are in the cloud of common values for Region 8 (fig. 33).

Basin and climatic characteristics are inserted into the appropriate regional equations to obtain estimates of *T*-year discharges for each region. Then, equation 7 is used to obtain weighted estimates of *T*-year discharges. For the Four Corners Region 8, the equations are as follows:

$$Q_2 = 598(\text{AREA})^{0.501}(\text{ELEV}/1{,}000)^{-1.02} =$$

$$598(45)^{0.501}(8.90)^{-1.02} = 433 \text{ ft}^3/\text{s} ,$$

and

$$Q_{50} = 16{,}000(\text{AREA})^{0.390}(\text{ELEV}/1{,}000)^{-1.54} =$$

$$16{,}000(45)^{0.390}(8.90)^{-1.54} = 2{,}440 \text{ ft}^3/\text{s} .$$

For High-Elevation Region 1, the equations are as follows:

$$Q_2 = 0.124(\text{AREA})^{0.845}(\text{PREC})^{1.44} =$$

$$0.124(45)^{0.845}(28)^{1.44} = 375 \text{ ft}^3/\text{s} ,$$

and

$$Q_{50} = 4.75(\text{AREA})^{0.758}(\text{PREC})^{0.732} =$$

$$4.75(45)^{0.758}(28)^{0.732} = 975 \text{ ft}^3/\text{s} .$$

The computed 50-year peak discharges for Regions 1 and 8 appear reasonable in comparison to

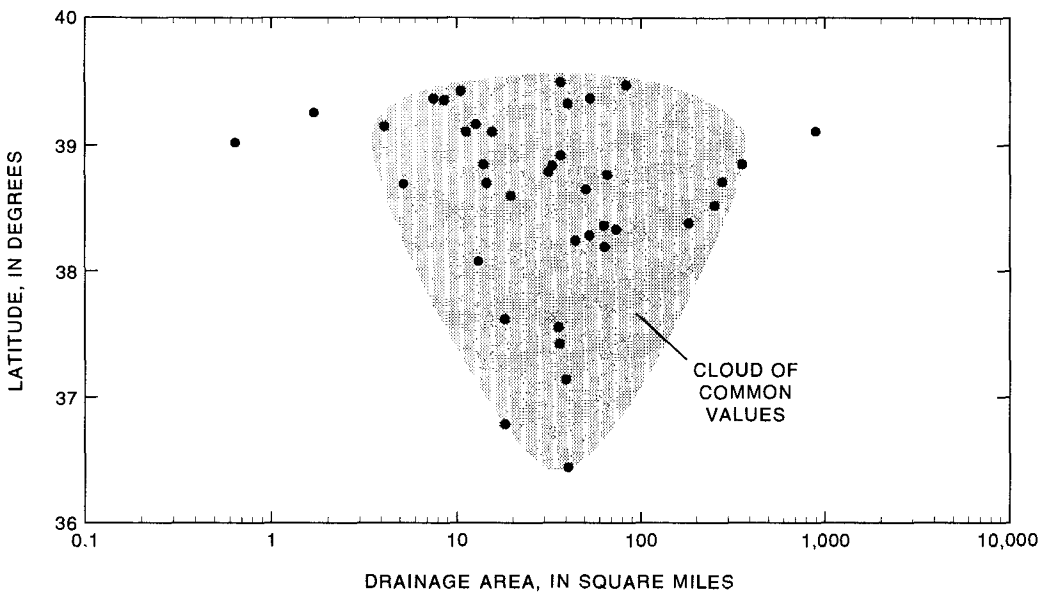


Figure 26. Joint distribution of latitude and drainage area for gaged sites in the Eastern Sierras Region 5.

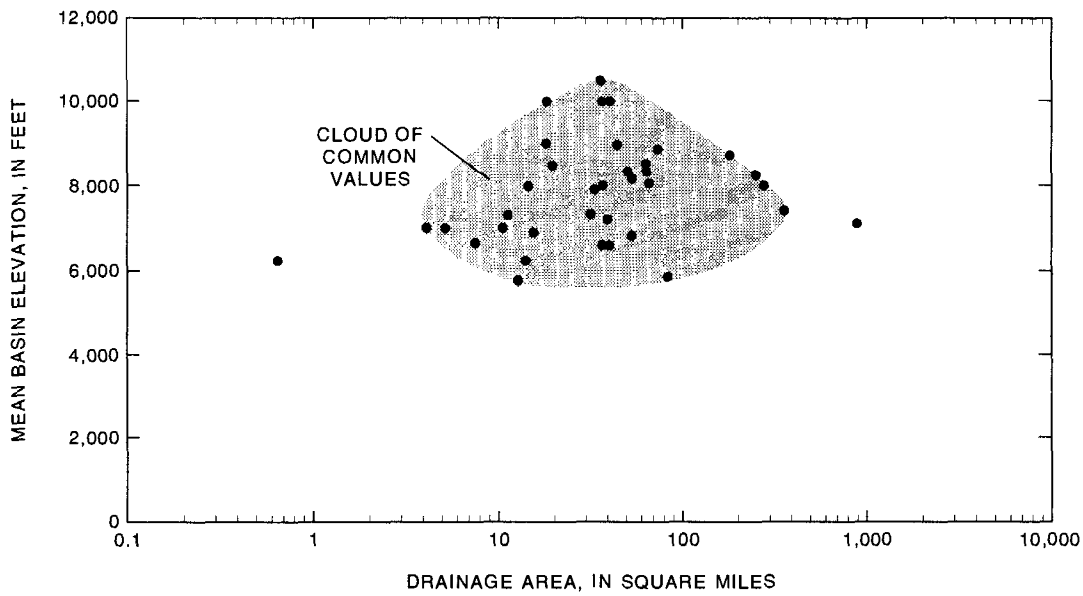


Figure 27. Joint distribution of mean basin elevation and drainage area for gaged sites in the Eastern Sierras Region 5.

the plots of maximum peak discharge of record and drainage area for the two regions (figs. 19, 34).

Estimates of weighted peak discharges using equation 7 are as follows:

$$Q_{2(w)} = 433(\frac{7{,}500-7{,}100}{700}) + 375(1-\frac{7{,}500-7{,}100}{700}) = 408 \text{ ft}^3/\text{s} ,$$

and

$$Q_{50(w)} = 2{,}440(\frac{7{,}500-7{,}100}{700}) + 975(1-\frac{7{,}500-7{,}100}{700}) = 1{,}810 \text{ ft}^3/\text{s} .$$

Table 9. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Eastern Sierras Region 5

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet; LAT, latitude of site, in decimal degrees. Data were based on 37 stations. Average number of years of systematic record is 31]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=0.0333AREA$^{0.853}$(ELEV/1,000)$^{2.68}$[(LAT-28)/10]$^{4.1}$	135	0.21
5	Q=2.42AREA$^{0.823}$(ELEV/1,000)$^{1.01}$[(LAT-28)/10]$^{4.1}$	101	.73
10	Q=28.0AREA$^{0.826}$[(LAT-28)/10]$^{4.3}$	84	1.69
25	Q=426AREA$^{0.812}$(ELEV/1,000)$^{-1.10}$[(LAT-28)/10]$^{4.3}$	87	2.62
50	Q=2,030AREA$^{0.798}$(ELEV/1,000)$^{-1.71}$[(LAT-28)/10]$^{4.4}$	91	3.26
100	Q=7,000AREA$^{0.782}$(ELEV/1,000)$^{-2.18}$[(LAT-28)/10]$^{4.6}$	95	3.80

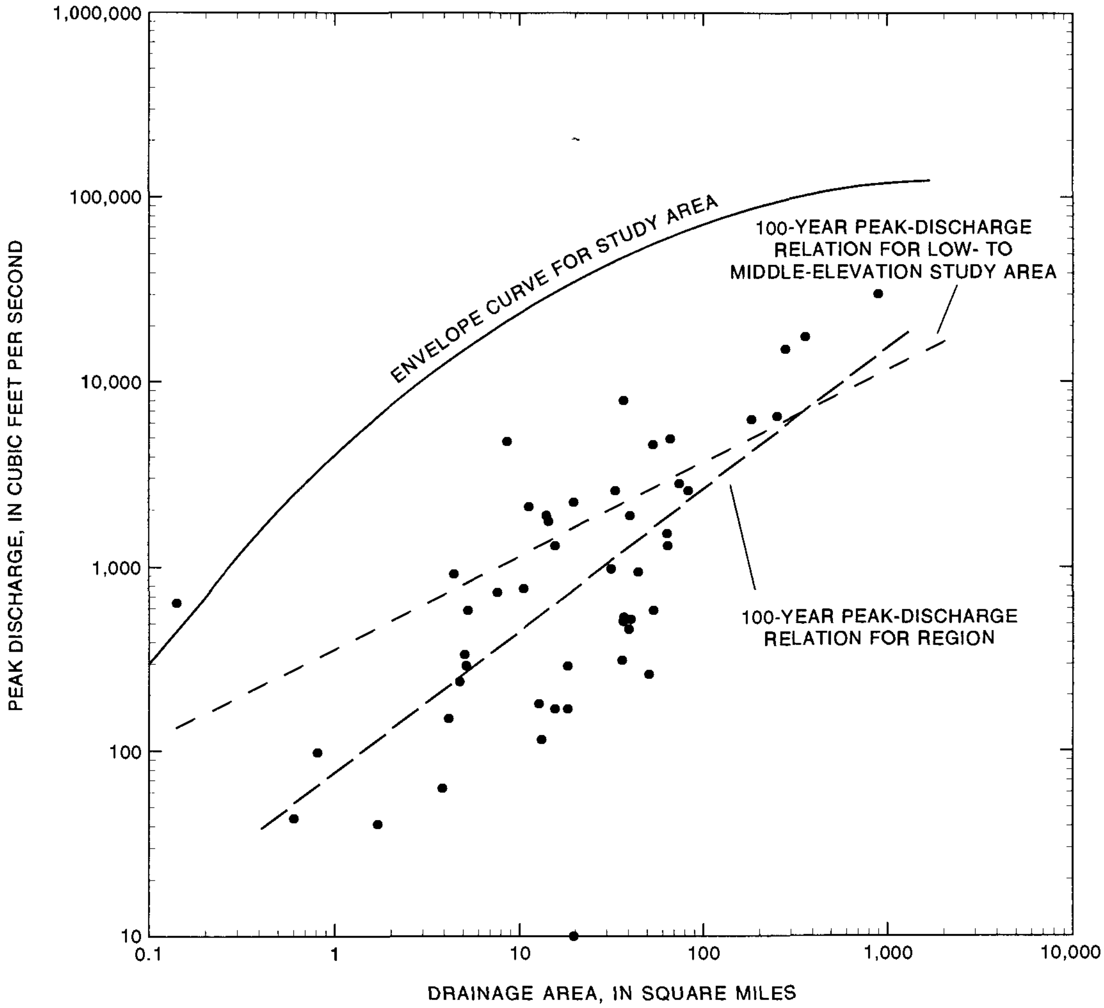


Figure 28. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Eastern Sierras Region 5.

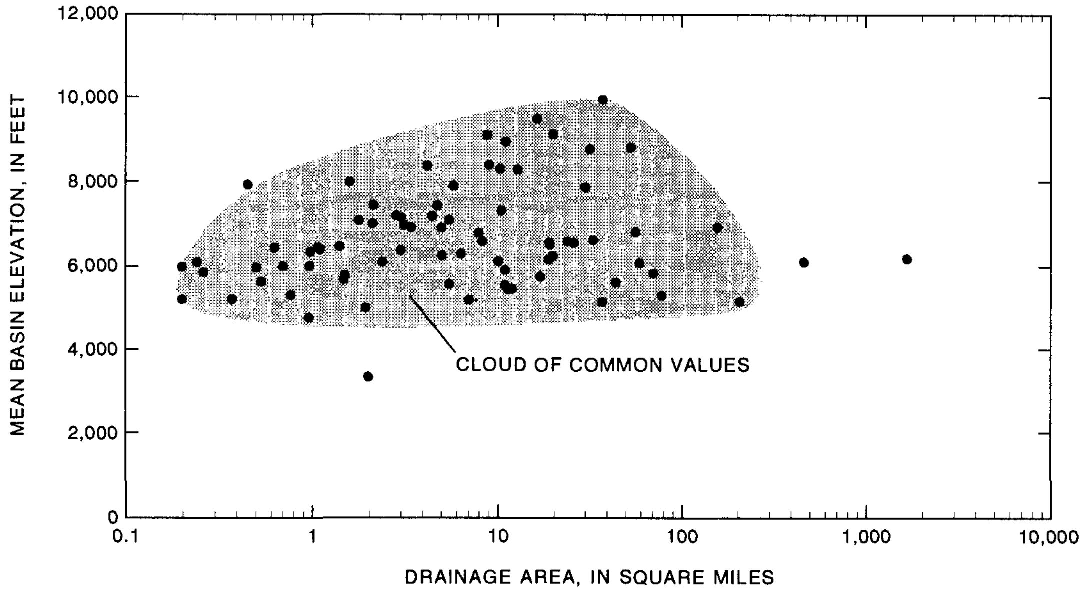


Figure 29. Joint distribution of mean basin elevation and drainage area for gaged sites in the Northern Great Basin Region 6.

Table 10. Hybrid equations for estimating regional flood-frequency relations for the Northern Great Basin Region 6

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 80 stations. Dashes indicate no data. Average number of years of systematic record is 19. Estimated average standard error of regression for the hybrid method includes much of the within-station residual variance and therefore is not comparable to standard error of estimate from an ordinary least-squares regression. See section entitled "Hybrid Method" for explanation of error]

Recurrence interval, in years	Equation	Estimated average standard error of regression, in log units	Equivalent years of record
2	Q=0	--	--
5	Q=32AREA$^{0.80}$(ELEV/1,000)$^{-0.66}$	1.47	0.233
10	Q=590AREA$^{0.62}$(ELEV/1,000)$^{-1.6}$	1.12	.748
25	Q=3,200AREA$^{0.62}$(ELEV/1,000)$^{-2.1}$	.796	2.52
50	Q=5,300AREA$^{0.64}$(ELEV/1,000)$^{-2.1}$	1.10	1.75
100	Q=20,000AREA$^{0.51}$(ELEV/1,000)$^{-2.3}$	1.84	.794

ANALYSIS OF GAGING-STATION RECORDS

Gaging-station records of annual peak discharges are the foundation of the data base used in this study. Records throughout the study area were selected and examined for accuracy and the required assumptions for a statistical analysis. Flood-frequency relations were computed using statistical and graphical analyses. The final best-fit individual relations then were used to develop regional flood-frequency relations using the meth-

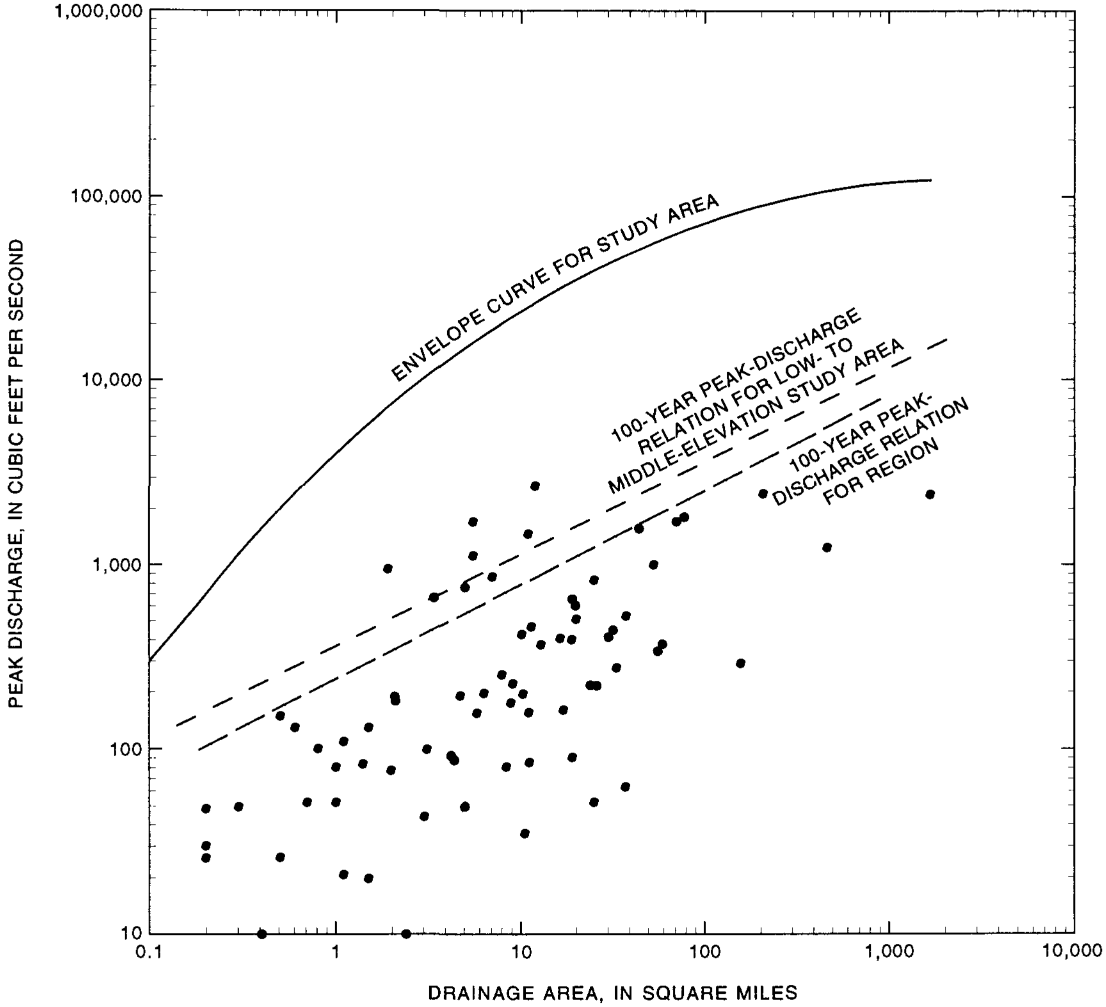


Figure 30. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Northern Great Basin Region 6.

ods described in the following section "Regional Analysis."

Records Used

Records for 1,323 gaging stations in the USGS peak-flow file were used in this analysis. The records contain the maximum peak discharge for each water year (October 1–September 30). Gaging stations selected for this study (1) are mostly within the study-area boundary, (2) have 10 years or more of systematic record, (3) have annual peak discharges that were not significantly affected by regulation or diversions, and (4) are on a system of tributary streams.

The systematic gaging-station records are for data collected by the USGS during 1890 to 1986. Systematic data are the result of regular observations over a period of time. The systematic records range in length from 10 to 83 years, and approximately 32,500 station years of data are included in the 1,323 records. The period of record was extended at 119 sites with historic floods and at 5 sites with paleofloods. A historic flood or paleoflood is the largest in a known period beyond the systematic record. Historic-flood records ranged from 12 to 200 years, and paleoflood records ranged from 280 to 2,100 years. The historic and paleoflood information added about 7,500 station

Table 11. Generalized least-squares regression equations for estimating regional flood-frequency relations for the South-Central Utah Region 7

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 28 stations. Average number of years of systematic record is 23]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	$Q=0.0150AREA^{0.697}(ELEV/1{,}000)^{-3.16}$	56	0.25
5	$Q=0.306AREA^{0.590}(ELEV/1{,}000)^{-2.22}$	45	1.56
10	$Q=1.25AREA^{0.526}(ELEV/1{,}000)^{-1.83}$	45	3.07
25	$Q=122AREA^{0.440}$	49	4.60
50	$Q=183AREA^{0.390}$	53	5.27
100	$Q=264AREA^{0.344}$	59	5.68

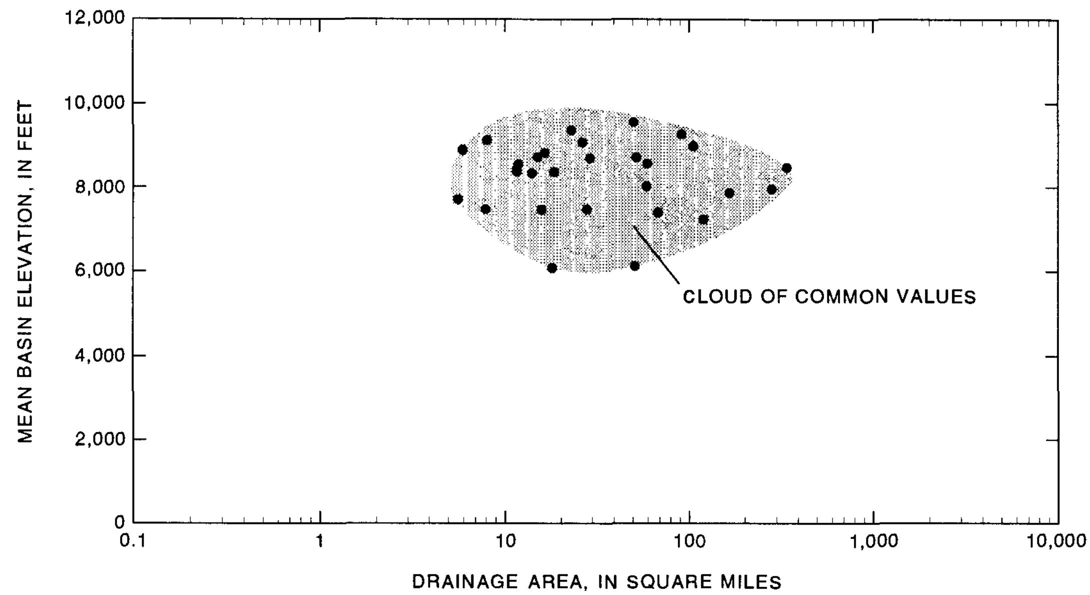


Figure 31. Joint distribution of mean basin elevation and drainage area for gaged sites in the South-Central Utah Region 7.

years for a total of 40,000 station years in the data base.

The gaging stations are fairly well distributed in the study area (fig. 50). Several gaging stations outside the study-area boundary in northeastern New Mexico and west-central Texas were included in the analysis to add some information to that part of the study area. The stations are most dense in the humid mountainous areas and least dense in the arid desert areas. The average systematic record length for all sites is 25 years and ranges from 19 to 35 years for the 16 flood regions defined in this study. Record length tends to increase with drainage area because most early data-collection efforts were concentrated in the larger basins for water-supply purposes (table 21).

The annual peak discharges, in cubic feet per second, are converted to common (base 10) logarithms for the flood-frequency analyses in this study. The average of the mean peak discharges in each record is 2.3 log units, the average standard deviation is 0.45, and the average skew coefficient is 0.028.

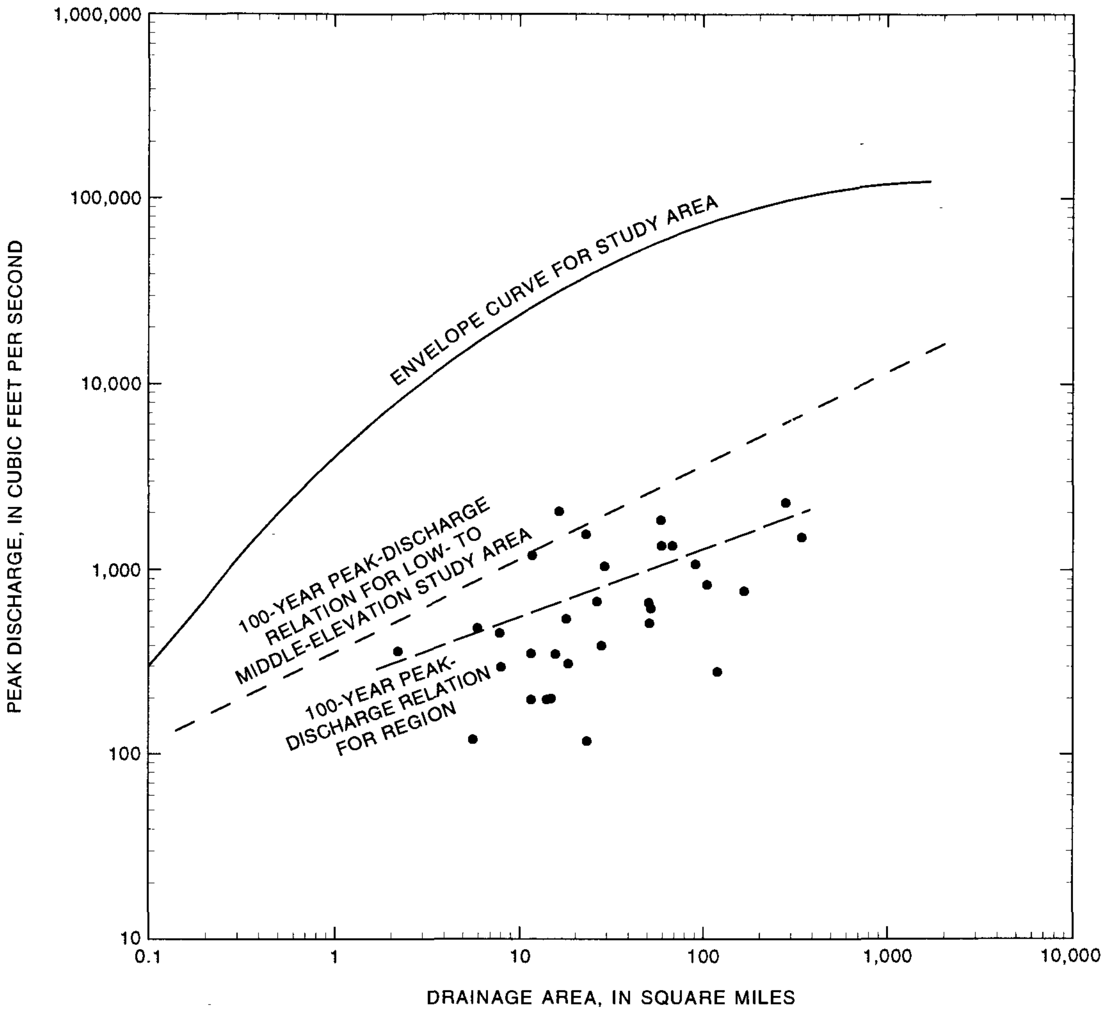


Figure 32. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the South-Central Utah Region 7.

Stationarity and Trend Tests

One of the assumptions needed for a statistical flood-frequency analysis is that the series of annual peak discharges is homogeneous. One aspect of a homogeneous series is that the annual peaks should be stationary over time. The factors that affect the annual peak discharges generally should remain constant during the period of record for the sample and for the period of time for which flood frequency is to be estimated.

The time series of annual peak discharges were examined for long-term changes using the two-sided nonparametric Kendall tau statistical test. The 340 gaging stations that had at least 30 years of record were used for the test. At least 30 years of record was considered necessary for reliable detection of trends. Eighty-two percent of the stations had no trend significant at the 5-percent level (α=0.05), and about an equal number of stations had positive and negative trends (table 22). The computed trend apparently is independent of drainage area because stations that had a wide range of drainage area had no trend or equal amounts of increasing and decreasing trends.

The results indicate no significant trend in time for annual peak discharge at the gaging stations in the study area. A nonuniform geographic distribution of computed trends, however, indicates a systematic effect. A negative trend of decreasing magnitudes of annual peaks for several gaging stations was detected in the southeastern part of the study area. Fourteen percent of the selected stations in Colorado and New Mexico have a decreasing

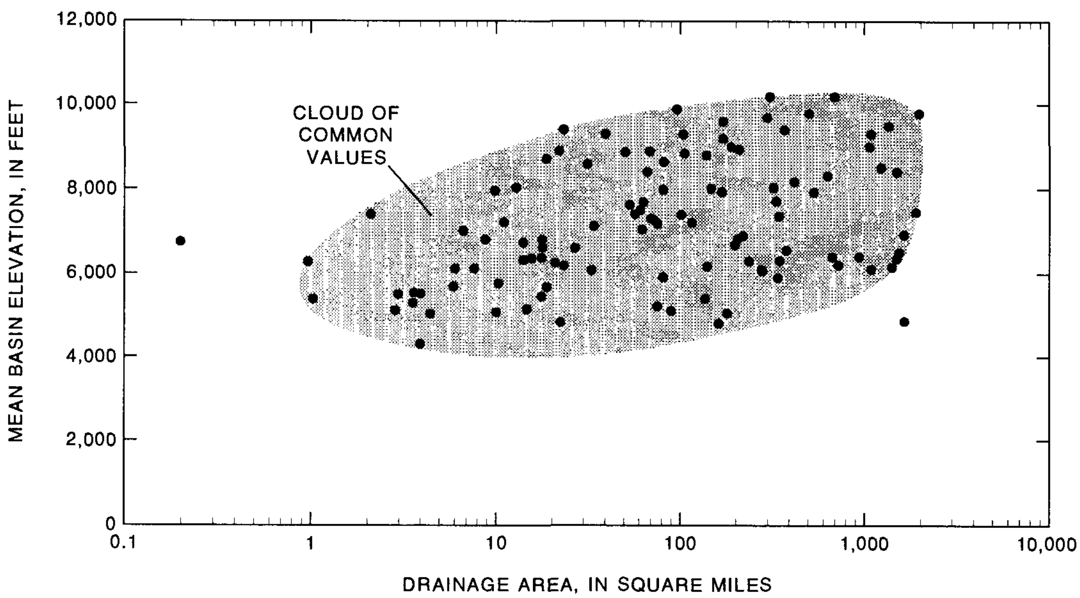


Figure 33. Joint distribution of mean basin elevation and drainage area for gaged sites in the Four Corners Region 8.

Table 12. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Four Corners Region 8

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 108 stations. Average number of years of systematic record is 27]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=598AREA$^{0.501}$(ELEV/1,000)$^{-1.02}$	72	0.37
5	Q=2,620AREA$^{0.449}$(ELEV/1,000)$^{-1.28}$	62	1.35
10	Q=5,310AREA$^{0.425}$(ELEV/1,000)$^{-1.40}$	57	2.88
25	Q=10,500AREA$^{0.403}$(ELEV/1,000)$^{-1.49}$	54	5.45
50	Q=16,000AREA$^{0.390}$(ELEV/1,000)$^{-1.54}$	53	7.45
100	Q=23,300AREA$^{0.377}$(ELEV/1,000)$^{-1.59}$	53	9.28

trend, and only 2 percent of the selected stations have an increasing trend. In the northern part of the study area, 27 percent of the selected stations in Oregon, Idaho, and Wyoming have an increasing trend, and no decreasing trends were detected at any stations.

Changes of the physical conditions of the basins in the northern and southeastern part of the study area that may have caused changes in the magnitude of flood peaks were unknown for this study. If the computed trends are related to climatic variation, extrapolation of the trend to the future is considered tenuous and beyond the scope of this study. An analysis of possible trends and climatic variability for the Santa Cruz River in southern Arizona showed that these factors introduce uncertainty in flood-frequency estimates (Webb and Betancourt, 1992). Adjustment of the computed flood-frequency relations was not made because there was no known physical condition in the basins that could explain the computed trends and because

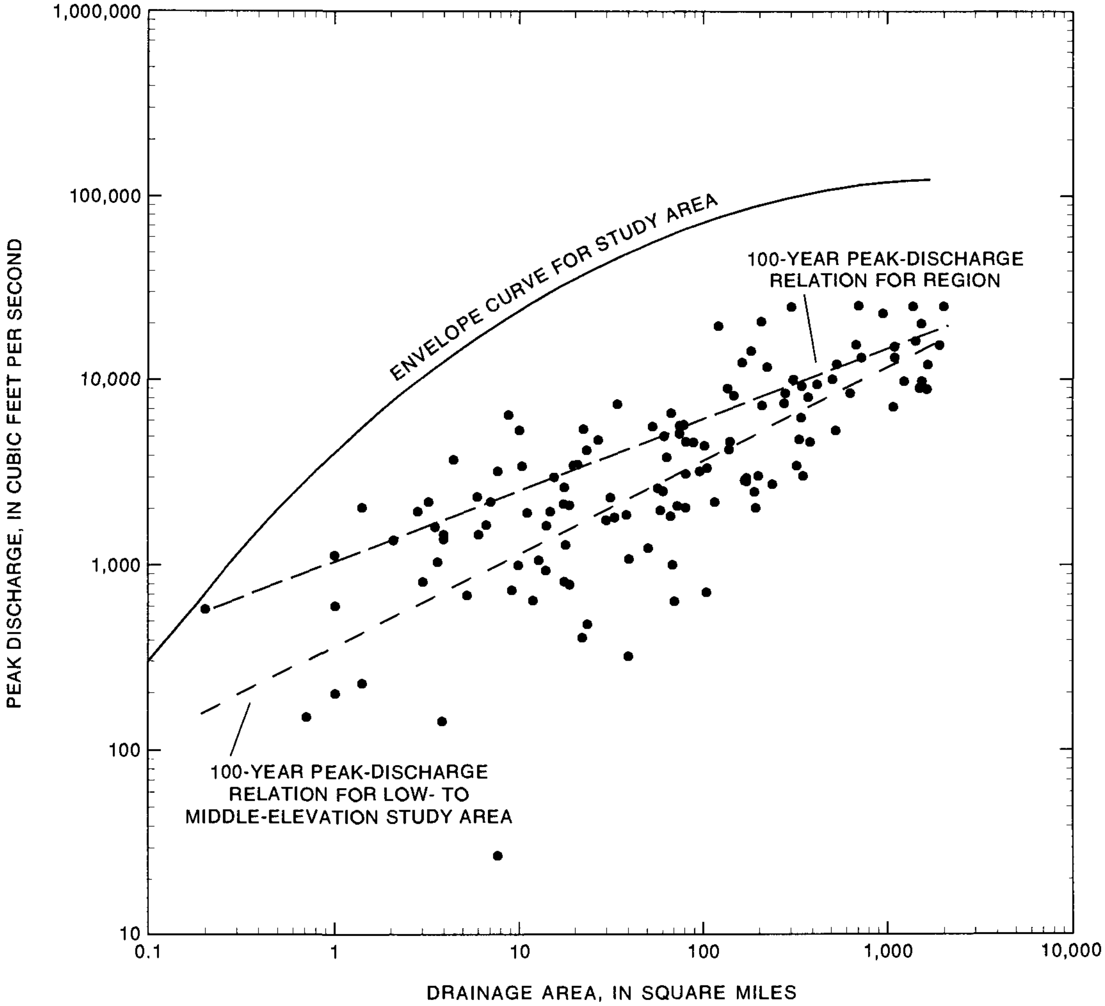


Figure 34. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Four Corners Region 8.

trends were detected at only a few of the stations in the northern and southeastern parts of the study area.

Flood-Frequency Analyses

Analyses were made to determine flood-frequency relations at 1,323 gaging stations. The relation of annual peak discharge to exceedance probability, or to recurrence interval, is referred to as a flood-frequency relation or curve. Exceedance probability is the chance that a flood will equal or exceed a given magnitude in any year. Recurrence interval is the reciprocal of the exceedance probability and is the average number of years between exceedances.

In the flood-frequency analyses, peak-discharge records were analyzed by mathematical fitting and graphical analysis. Some adjustments were made to obtain the best fit of the flood-frequency relations to the data. Individual frequency relations were defined for 1,059 sites. Relations were not defined for 264 sites because of inadequate samples and poor fits of the relations to the data. A small sample of gaging-station records with mixed populations was analyzed to estimate the effect of such populations on the frequency relations. A detailed analysis was done to estimate the regional relations of skew coefficient for the study area. The final flood-frequency relations presented in this study reflect the individual adjustments and the incorporation of the new information on regional skew coefficient.

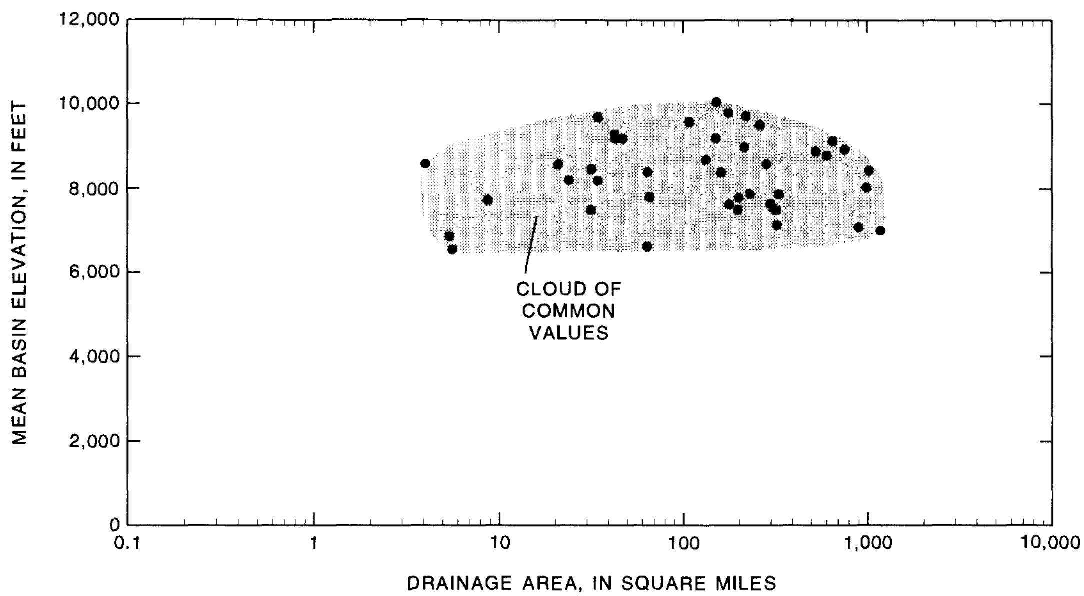


Figure 35. Joint distribution of mean basin elevation and drainage area for gaged sites in the Western Colorado Region 9.

Table 13. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Western Colorado Region 9

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 43 stations. Average number of years of systematic record is 28]

Recurrence interval, in years	Equation	Averege standard error of prediction, in percent	Equivalent years of record
2	Q=0.0204AREA$^{0.606}$(ELEV/1,000)$^{-3.5}$	68	0.14
5	Q=0.181AREA$^{0.515}$(ELEV/1,000)$^{-2.9}$	55	.77
10	Q=1.18AREA$^{0.488}$(ELEV/1,000)$^{-2.2}$	52	1.70
25	Q=18.2AREA$^{0.465}$(ELEV/1,000)$^{-1.1}$	53	2.81
50	Q=248AREA$^{0.449}$	57	3.36
100	Q=292AREA$^{0.444}$	59	3.94

The log-Pearson Type III probability distribution (LPIII) and the method of moments were used to define flood-frequency relations for gaging-station records (Interagency Advisory Committee on Water Data, 1982). In this method, the series of annual floods at a site is assumed to represent a random sample from a single distribution whose characteristics do not change with time. The LPIII is a three-parameter generalization of the log-normal statistical distribution that provides sufficient flexibility to approximate many observed flood distributions. To fit the LPIII to a sample of data using the method of moments, the annual floods are converted to logarithms and three statistics are computed—mean, standard deviation, and skew coefficient. The mean and standard deviation of the sample define the position and slope of a plot of the data on log-normal probability paper. Log-

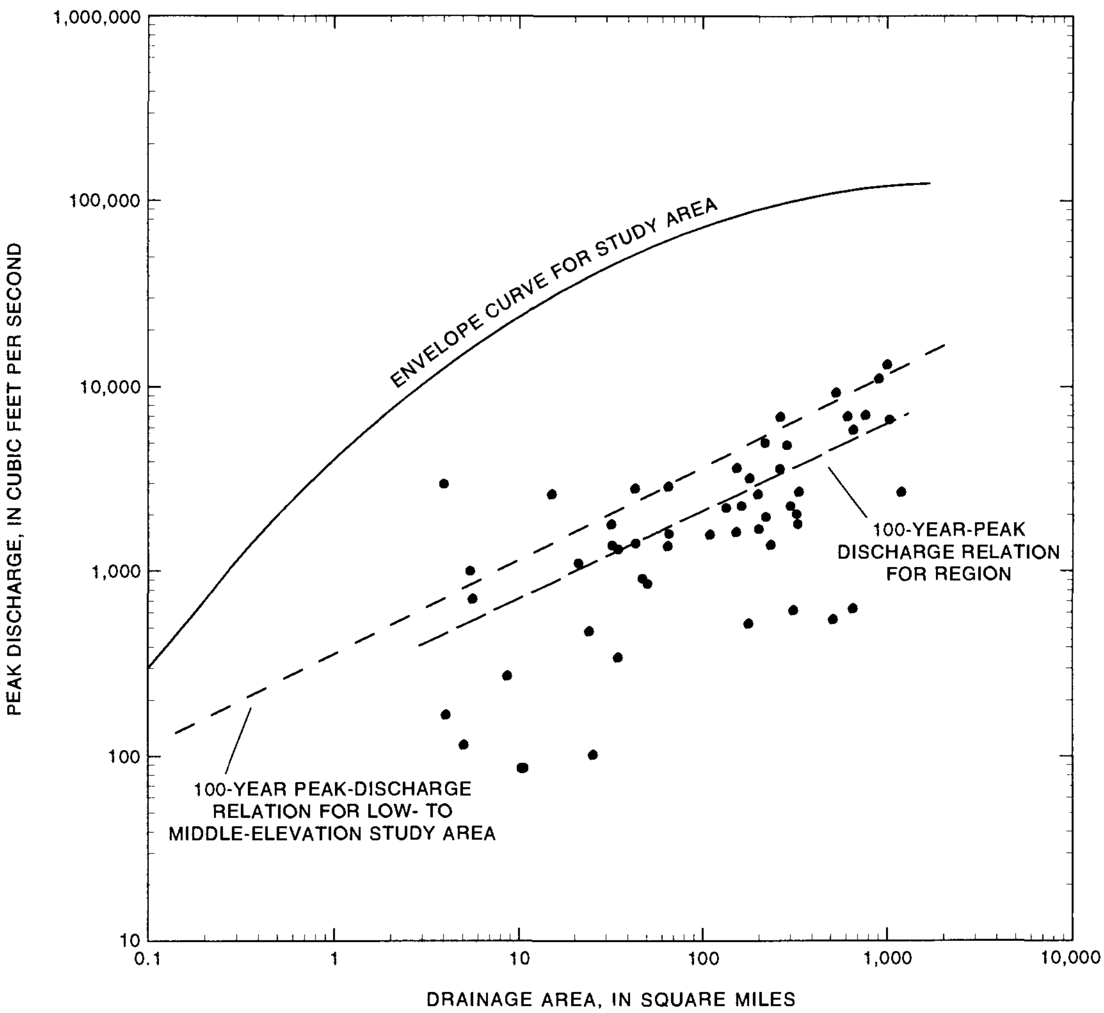


Figure 36. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Western Colorado Region 9.

normal data plot as a straight line, and LPIII data plot as a curve with the skew coefficient defining the amount and sense of curvature.

Detailed evaluations of the computed flood-frequency relations were made by visual examination of the fit of the LPIII probability distribution to the plotted annual peak discharges. The Cunnane plotting position formula was used to plot the data on log-normal probability paper. The Cunnane plotting position essentially is unbiased and distribution free and provides a satisfactory visual comparison between the computed flood-frequency relation and the plotted peak discharges (Cunnane, 1978).

The shape of flood-frequency relations for sites is assumed to have limitations. The expected slope of the relations is positive because peak discharge increases with decreasing probability of occurrence. The expected shape of a relation in log-probability space is a straight line or a smooth curve with no sharp breaks or discontinuities; therefore, a three-component LPIII distribution was used to fit relations. Also the fitted relation is expected to visually agree with the plotted data; for example, a persistent departure of the smaller annual peaks from the fitted relation is not considered a satisfactory fit.

The reliability of station flood-frequency relations was assessed by how well the computed relations fit the plotted peak discharges, by the presence or absence of outliers, and by the shape of the distribution of the plotted peaks. The assessment showed that 264 sites have a poor fit of the computed relation to the plotted peaks, odd-appearing plotted peaks, and usually a large vari-

Table 14. Hybrid equations for estimating regional flood-frequency relations for the Southern Great Basin Region 10

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles. Data were based on 104 stations. Average number of years of systematic record is 21. Estimated average standard error of regression for the hybrid method includes much of the within-station residual variance and therefore is not comparable to standard error of estimate from an ordinary least-squares regression. See section entitled "Hybrid Method" for explanation of error]

Recurrence interval, in years	Equation	Estimated average standard error of regression, in log units	Equivalent years of record
2	Q=12AREA$^{0.58}$	1.14	0.618
5	Q=85AREA$^{0.59}$	.602	3.13
10	Q=200AREA$^{0.62}$	.675	3.45
25	Q=400AREA$^{0.65}$	.949	2.49
50	Q=590AREA$^{0.67}$	.928	3.22
100	Q=850AREA$^{0.69}$	1.23	2.22

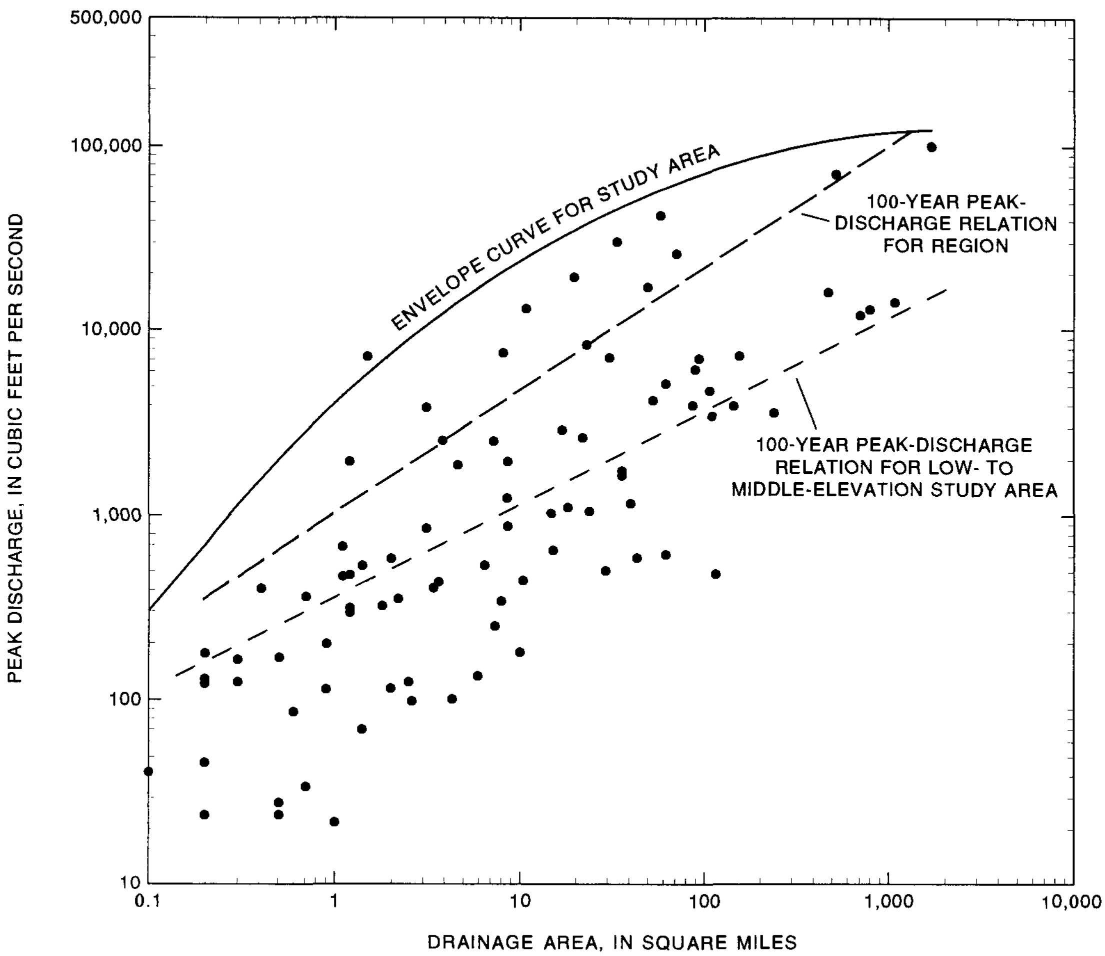


Figure 37. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Southern Great Basin Region 10.

ance. The peaks at many of these 264 sites that have inadequate flood-frequency relations were used in the hybrid analysis to estimate regional flood-frequency relations. The remaining 1,059 sites were judged to have adequate flood-frequency relations.

Examination of the plotted peaks found some similar characteristics that occurred in many of the records with defined relations (table 23). Thirty-eight percent of the sites had plotted peaks with the expected smooth shape of a LPIII distribution. The remaining sites had one or more departures from expected shape. Adjustments to the frequency relations were made for sites with low outliers (Interagency Advisory Committee on Water Data, 1982, appendix 5). When available, historical periods were applied to sites with high outliers. Other departures from expectation, such as sites with discontinuities (jumps) or sharp breaks (doglegs) in the plotted peaks were coded, but no adjustments were made.

The percentage of gaged sites with low discharge thresholds, high outliers, doglegs, and jumps in their plotted peaks was compared with the basin and climatic characteristics of the sites (table 24). The gaged sites were placed into three incremental classes of the characteristics, and an analysis of variance (ANOVA) was performed to test if there is a significant difference in the percentages between the three classes. The ANOVA was performed by coding the gaged sites with a 1 if the attribute is present and a 0 if the attribute is absent. Thus, the mean of the 1's and 0's in each class of basin or climatic characteristic is the percentage of the attributes in each class. The following three sections discuss the results of these comparisons.

Low Outliers and Low-Discharge Threshold

Low outliers can have an adverse effect on computed flood-frequency relations for gaged sites by causing a large negative skew coefficient that can distort the frequency relation by flattening the upper end of the relation. Low outliers are small peak discharges that depart from the low end of a fitted flood-frequency relation. In addition, zero-flow years in gaged records are low outliers. For many sites, the departure of the small peaks from the fitted relation may be related to characteristics of the basin or stream channel. This type of departure should be called a hydrologic low outlier to emphasize that it is defined by hydrologic considerations rather than by statistical tests. Hydrologic low outliers often define a different relation than the midrange and large peaks. A peak-discharge record with characteristics of a hydrologic low outlier may be evidence that the smaller peaks are from a different flood population than the larger peaks. Meteorologic processes and watershed characteristics may affect small flood peaks differently than large peaks.

Small peaks that are identified as low outliers using a statistical test and zero-flow years are truncated, and a conditional probability adjustment is made to obtain the final frequency relation in the procedure recommended by the Interagency Advisory Committee on Water Data (1982, p. 17–19, appendix 5). The statistical procedure detects the smallest peaks; however, many small peaks that depart from the fitted relation are not identified as outliers. In this study, therefore, a low-discharge threshold was used to adjust for those small peaks that depart from the fitted relation but are not detected by the statistical test. Application of this low-discharge threshold also used the conditional probability adjustment to obtain the final frequency relation. The statistical procedure (Interagency Advisory Committee on Water Data, 1982) generally is successful in making appropriate adjustments for low outliers; however, computed results need to be examined for hydrologic low outliers if the procedure is not successful.

The low-discharge threshold was applied to sites primarily on the basis of the visual fit of the computed relation to annual peak discharges using the Cunnane plotting positions. At many sites, the plot of annual peak discharges has a segment of small peaks that curves steeply downward. The low-discharge threshold was commonly set at a sharp downward break in the relation and always was set at a probability greater than 0.7, which is a recurrence interval of less than 1.4 years. The low-discharge threshold was applied to 48 percent of the sites with defined flood-frequency relations (table 23), and many of those sites have a statistical low outlier. The stations with an applied low-discharge threshold are identified in the data section by a 1 in the L column under the heading "Relation Characteristic." With few exceptions, the use of the low-discharge threshold resulted in better fits between the relations and the plotted peak discharges.

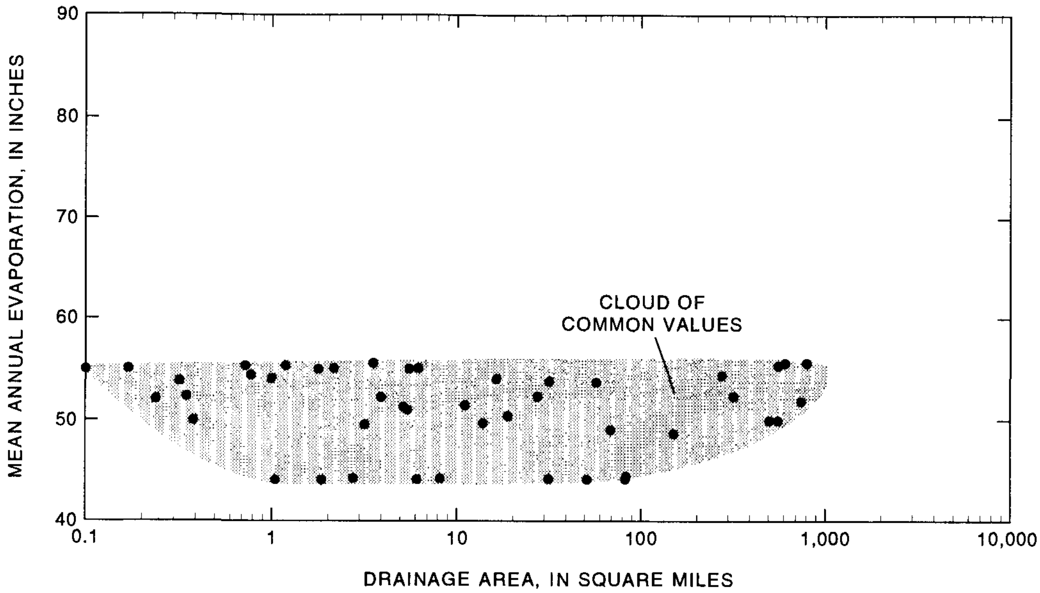


Figure 38. Joint distribution of mean annual evaporation and drainage area for gaged sites in the Northeastern Arizona Region 11.

Table 15. Hybrid equations for estimating regional flood-frequency relations for the Northeastern Arizona Region 11

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; EVAP, mean annual evaporation, in inches. Data were based on 46 stations. Average number of years of systematic record is 20. Estimated average standard error of regression for the hybrid method includes much of the within-station residual variance and therefore is not comparable to standard error of estimate from an ordinary least-squares regression. See section entitled "Hybrid Method" for explanation of error]

Recurrence interval, in years	Equation	Estimated average standard error of regression, in log units	Equivalent years of record
2	Q=26AREA$^{0.62}$	0.609	0.428
5	Q=130AREA$^{0.56}$	.309	2.79
10	Q=0.10AREA$^{0.52}$EVAP$^{2.0}$	.296	4.63
25	Q=0.17AREA$^{0.52}$EVAP$^{2.0}$	.191	17.1
50	Q=0.24AREA$^{0.54}$EVAP$^{2.0}$	.294	9.20
100	Q=0.27AREA$^{0.58}$EVAP$^{2.0}$	.863	1.32

Another method used to select the appropriate low-discharge threshold was to examine the effect on skew coefficient and *T*-year discharges as successive increments of peaks were truncated. The threshold was selected when computed skew coefficient and *T*-year discharge stabilized (changed less than about 1 percent). At a few sites with a departure of the smaller peaks from the fitted relation, the application of the low-discharge threshold did not result in a satisfactory fit. As the threshold was successively raised to the point of departure, a new fitted relation was computed and a new departure of additional peaks with an apparent higher threshold occurred. Relations for these

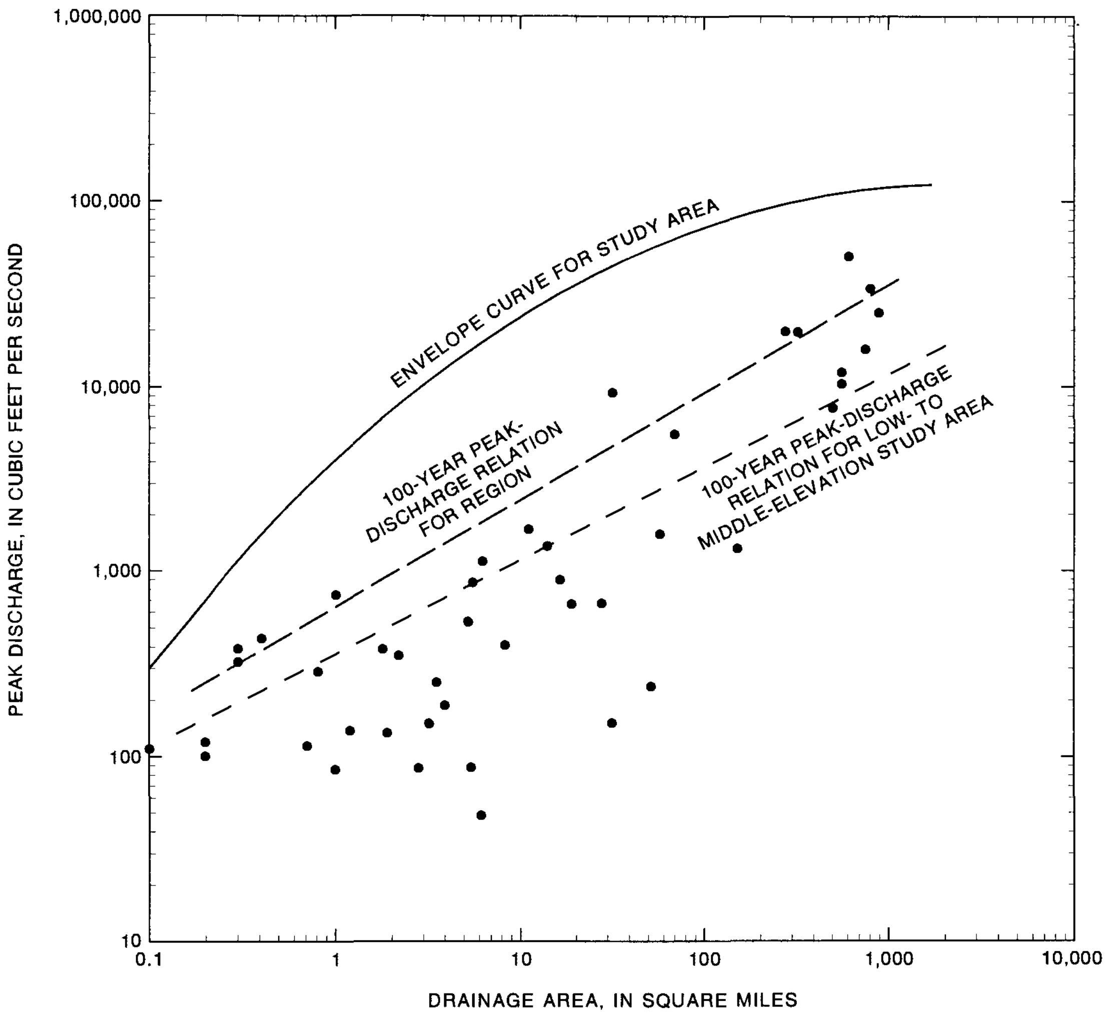


Figure 39. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Northeastern Arizona Region 11.

sites had a negative skew coefficient, and the skew coefficient would not stabilize as the threshold was successively increased. For these sites, the lower peaks may be a part of the entire population of peaks, and no threshold was used. The unadjusted computed relation that was used, however, did not appear to be an ideal fit to the smaller peaks.

In this study, the interest is on the midrange and larger peaks of a sample (2- to 100-year floods). Using the method of truncation with a low-discharge threshold at a recurrence interval of less than 1.4 years, the magnitude and frequency of the midrange and larger peaks are used to fit the frequency relation. The existence and frequency of the small peaks are used for the conditional probability adjustment; however, the magnitude, which does not fit the relation defined by the other peaks, is not used.

A geographic pattern is not apparent in the distribution of sites with a low-discharge threshold (fig. 51). The percentage of sites with an applied low-discharge threshold was compared with basin and climatic characteristics (table 24). In general, low-discharge thresholds were used at more sites in arid areas in the southern latitudes. The sites were at lower elevations, had smaller amounts of mean annual precipitation, and had larger amounts of mean annual evaporation. Many intermittent and ephemeral streams in the southwestern United States have characteristics that indicate a low-discharge threshold. Plots of samples of annual peaks at many of these streams have a segment of small peaks that curves steeply downward. The cause of this steep lower segment in the plotted peaks often is the large infiltration losses of the smaller annual peaks.

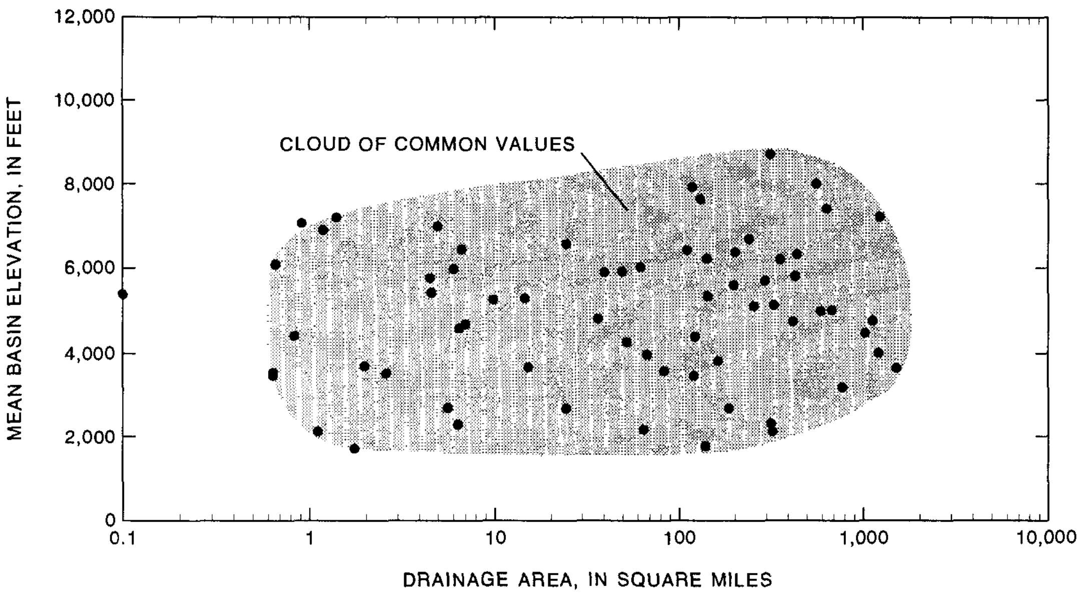


Figure 40. Joint distribution of mean basin elevation and drainage area for gaged sites in the Central Arizona Region 12.

Table 16. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Central Arizona Region 12

[Equation: *Q*, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 68 stations. Average number of years of systematic record is 21]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	$Q=41.1\text{AREA}^{0.629}$	105	0.23
5	$Q=238\text{AREA}^{0.687}(\text{ELEV}/1{,}000)^{-0.358}$	68	1.90
10	$Q=479\text{AREA}^{0.661}(\text{ELEV}/1{,}000)^{-0.398}$	52	6.24
25	$Q=942\text{AREA}^{0.630}(\text{ELEV}/1{,}000)^{-0.383}$	40	17.8
50	$Q=10^{(7.36-4.17\text{AREA}^{-0.08})}(\text{ELEV}/1000)^{-0.440}$	37	27.5
100	$Q=10^{(6.55-3.17\text{AREA}^{-0.11})}(\text{ELEV}/1{,}000)^{-0.454}$	39	32.1

The following two examples of gaging-station records with low outliers show the effect on computed relations of using all peaks in the record compared with using the low-discharge threshold. At streamflow-gaging station 09480000, Santa Cruz River near Lochiel, Arizona, the 100-year peak discharge for an unadjusted relation is 5,200 ft^3/s, which is about one-half of the discharge for the relation with the low-discharge threshold adjustment (fig. 52). The unadjusted relation is far below the two largest annual peaks. No known physical characteristic of the drainage basin can explain the flattening of the flood-frequency relation for large floods. Also, the unadjusted relation has a 100-year discharge that is about one-quarter of the discharge using a regional estimation procedure (Reich, 1988, p. 30). The use of the low-discharge threshold of 450 ft^3/s, which is greater than 5 of the 41 annual peaks, results in a

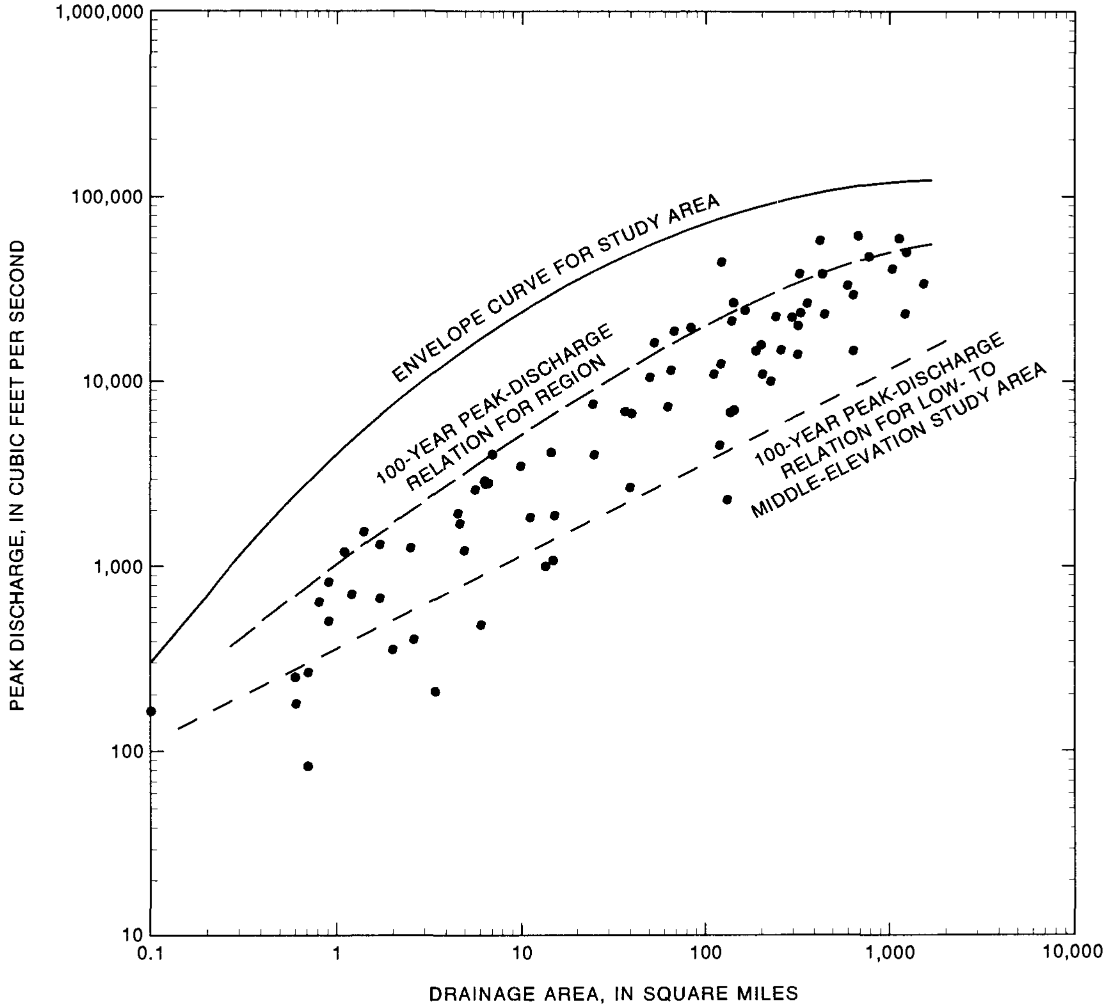


Figure 41. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Central Arizona Region 12.

flood-frequency relation that better fits the data using a Cunnane plotting position. The default statistical adjustment for this station produced a satisfactory relation for the 2- to 100-year floods (Interagency Advisory Committee on Water Data, 1982, appendix 5); however, the computed skew coefficient was considered too negative, and the low-discharge threshold of 450 ft^3/s was used.

At streamflow-gaging station 09513910, New River near Glendale, Arizona, use of a low-discharge threshold of 2,500 ft^3/s results in a change in the 100-year peak discharge from 75,100 ft^3/s to 58,800 ft^3/s (fig. 53). The channel bed is permeable sand, and a large percentage of small peaks is lost to infiltration. No peaks were below the statistical threshold for the unadjusted relation, and six peaks were below the low-discharge threshold of 2,500 ft^3/s for the adjusted relation. The adjusted relation more closely fits the large annual peaks, including the historic peak that was outside the period of systematic record.

High Outliers and Historical Periods

High outliers can have a significant effect on computed flood-frequency relations at gaged sites. High outliers are large peak discharges that depart from the high end of a fitted flood-frequency relation. Gaging-station records with high outliers usually have a large positive skew coefficient and a large variance. Many large peaks that are part of the systematic record at gaging stations are high outliers because the large peak is the maximum for an extended period of time that is much longer than the period of systematic record. Flood-frequency relations fit to those samples often have large computed discharges for the infre-

Table 17. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Southern Arizona Region 13

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles. Data were based on 73 stations. Average number of years of systematic record is 21]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	$Q=10^{(6.38-4.29AREA^{-0.06})}$	57	2.0
5	$Q=10^{(5.78-3.31AREA^{-0.08})}$	40	6.25
10	$Q=10^{(5.68-3.02AREA^{-0.09})}$	37	11.1
25	$Q=10^{(5.64-2.78AREA^{-0.10})}$	39	15.0
50	$Q=10^{(5.57-2.59AREA^{-0.11})}$	43	15.9
100	$Q=10^{(5.52-2.42AREA^{-0.12})}$	48	16.1

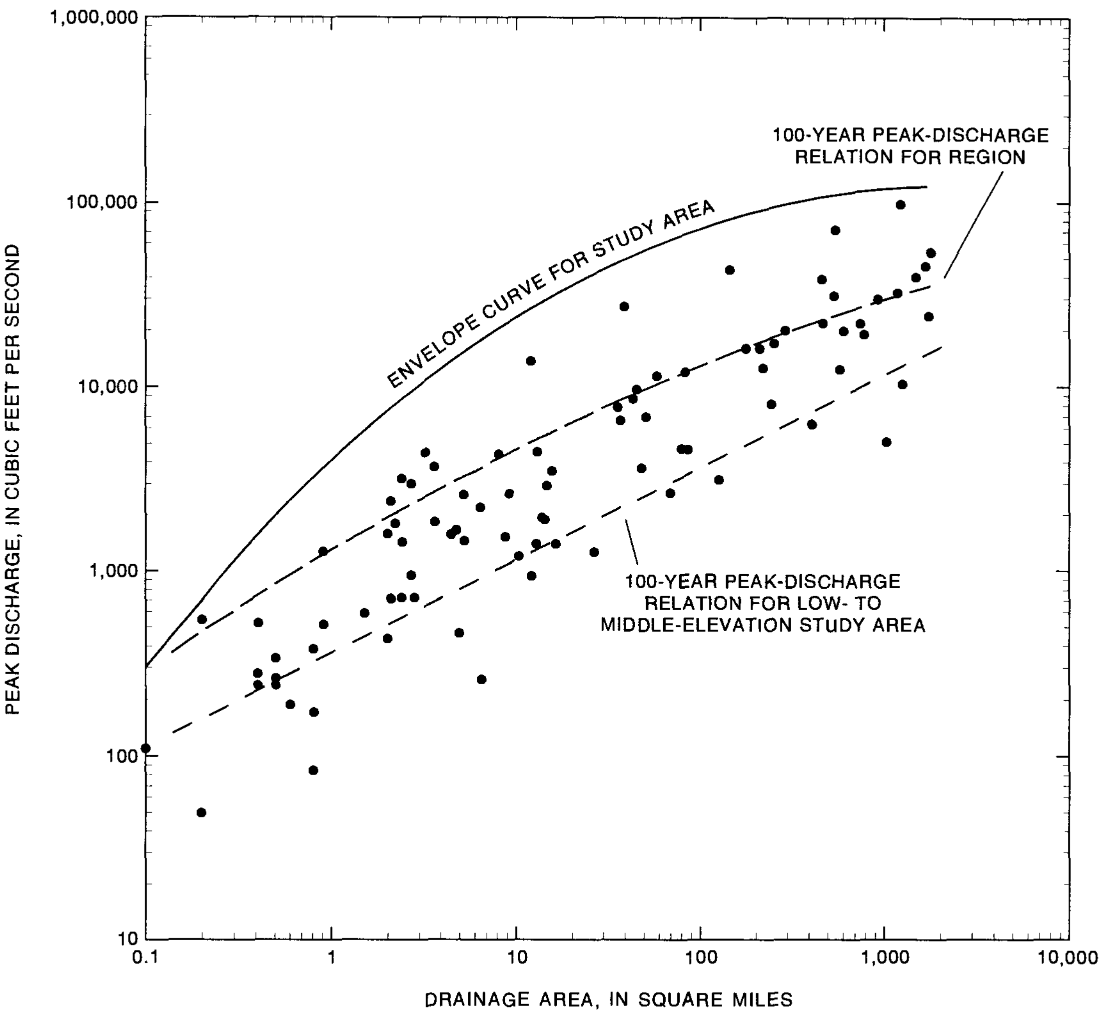


Figure 42. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Southern Arizona Region 13.

quent floods and may not represent the true flood population. Large peaks that are considered high outliers can be adjusted by use of a historical period for which the peak is a maximum.

Seventeen percent, or 178, of the gaged sites with defined flood-frequency relations had high outliers (table 23). The stations with a high outlier are identified in the data section by a 1 in the H column under the heading "Relation Characteristic." Most of these outliers were statistically identified (Interagency Advisory Committee on Water Data, 1982, p. 17–19); however, about 10 percent of the outliers were defined visually by the observed departure from the fitted flood-frequency relation. Available information that often defines an extended period during which the high-outlier floods are known to be maximum flows are included in the analysis. For example, if the outlier peak was the largest known flood for the past 75 years on the basis of reliable newspaper accounts, a historical period of 75 years would be used. A historical period was estimated for 124 (12 percent) gaged sites.

No pattern is apparent in the geographic distribution of gaging stations with high outliers (fig. 54). The percentage of high outliers in gaging-station records was compared to basin and climatic characteristics (table 24). Only drainage area had a significant relation (α=0.02), and that has no linear trend as seen by the percentage of stations for the three strata of drainage areas (table 24). High outliers, therefore, appear to be random and unrelated to some of the more important variables that are related to the magnitudes of floods.

Use of historical flood information, such as the historical or extended period outside the period of systematic record for outlier peaks, commonly is assumed to add information and improve the accuracy of flood-frequency relations. In this study, the exclusion of the outlier peaks would have had a significant effect on the regional relations. If the high outlier peaks are excluded, the average computed 100-year discharge for the 178 records is 38 percent smaller than the average computed 100-year discharge with the high outliers included. The overall effects of the high outliers and the use of historical periods on the regional analysis were not investigated. Clearly, if the high outliers were excluded from the 178 records, estimated regional 100-year discharges would be smaller than the estimated discharges using the high outliers; however, the magnitude of the effect on the regional relations is unknown. The high outliers were not excluded because of the recommendation to retain high outliers by the Interagency Advisory Committee on Water Data (1982, p. 17).

Sharp Breaks or Discontinuities in Plotted Peaks

For most gaged sites in the study area, the series of annual peak discharges displayed on log-normal probability paper were either a straight line or a smooth curve. Two departures from this expected shape were identified in about 16 percent of the sites with defined flood-frequency relations. These sites had sharp breaks or discontinuities in the plot of peak discharges. One hundred sites had plotted peaks with a sharp break, or "dogleg," appearance (table 23). A site with a sharp break in the plotted peaks has a lower and upper segment; the lower segment generally has a steeper slope than the upper segment. Thus, a sharp break is shown at the intersection of the two slopes. Sixty-eight sites had plotted peaks with a substantial discontinuity, or "jump," in the plotted peak discharges where two or more segments are displaced vertically (table 23, fig. 55). The stations with a dogleg or jump in the plotted peaks are identified in the data section by a 1 in the D column under the heading "Relation Characteristic."

When plotted peaks have a dogleg shape and only a few small peaks are included in the lower segment, the small peaks can be truncated with the low-discharge threshold and a uniform relation can be fit to the data. The 100 sites classified as dogleg, however, either have the break in plotted peaks at a recurrence interval greater than 1.4 years, which is the limit for truncation with low-discharge threshold that was defined in this study, or a successive incremental application of a low-discharge threshold did not change the dogleg shape.

The cause of doglegs and jumps may be related to physical characteristics of the stream channel or drainage basin, types of storms causing floods, and instability of small sample sizes. Because of the nature of statistical samples, some of the log-normal probability plots for sites with short records might be expected to substantially depart from an expected smoother curve. As the sample size is increased, smoother plots might be expected. Therefore, the frequency of doglegs and jumps was compared with record length, but no significant relation was found for the sites in this study area.

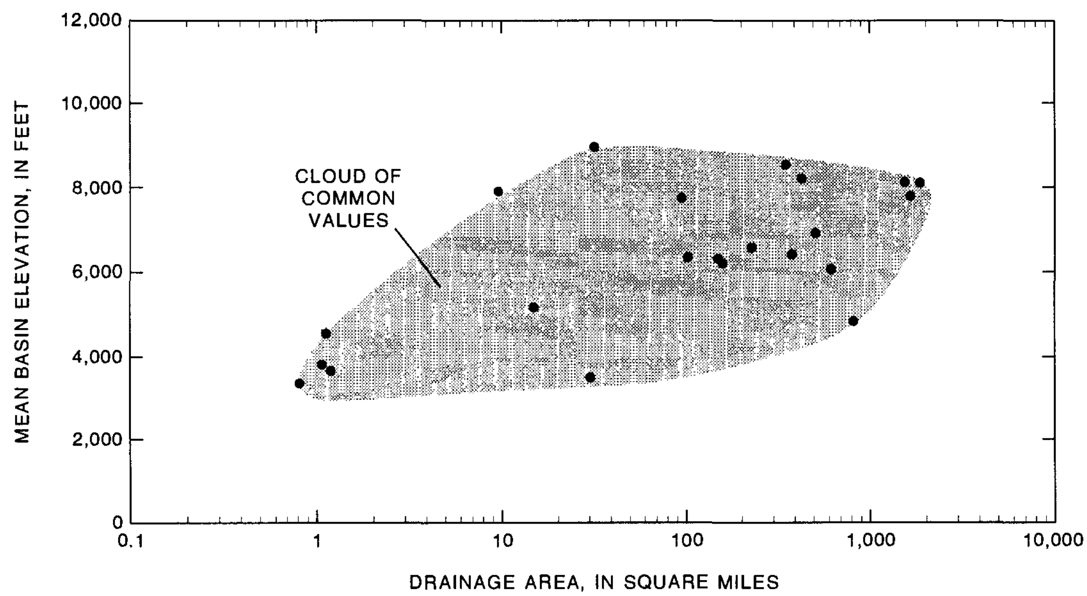


Figure 43. Joint distribution of mean basin elevation and drainage area for gaged sites in the Upper Gila Basin Region 14.

Table 18. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Upper Gila Basin Region 14

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet. Data were based on 22 stations. Average number of years of systematic record is 26]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=583AREA$^{0.588}$(ELEV/1,000)$^{-1.3}$	74	1.69
5	Q=618AREA$^{0.524}$(ELEV/1,000)$^{-0.70}$	63	3.54
10	Q=361AREA$^{0.464}$	65	4.95
25	Q=581AREA$^{0.462}$	63	7.75
50	Q=779AREA$^{0.462}$	64	9.65
100	Q=1,010AREA$^{0.463}$	56	11.2

Dogleg shapes may be caused by attenuation of peak discharge because of stream-channel characteristics, such as channels with bed material that have high infiltration rates, wide channels, or small channels with wide flood plains. Causes of jumps in a record may be mixed flood populations, such as floods from snowmelt or summer thunderstorms, and different flood populations caused by the different effects of the watershed on small or large peaks.

No pattern is apparent in the geographic distribution of gaging stations with doglegs and jumps (fig. 56). The percentage of doglegs or jumps in station records was compared with basin and climatic characteristics (table 24). The percentage of doglegs increases with increasing size of drainage area, possibly because of the increasing opportunity for attenuation of small peaks. The percentage of jumps decreases with increasing amounts of mean annual precipitation. This relation may be a function of mixed populations. Stations in areas with mean annual precipitation of greater than 25 in. usually have frequency relations dominated by

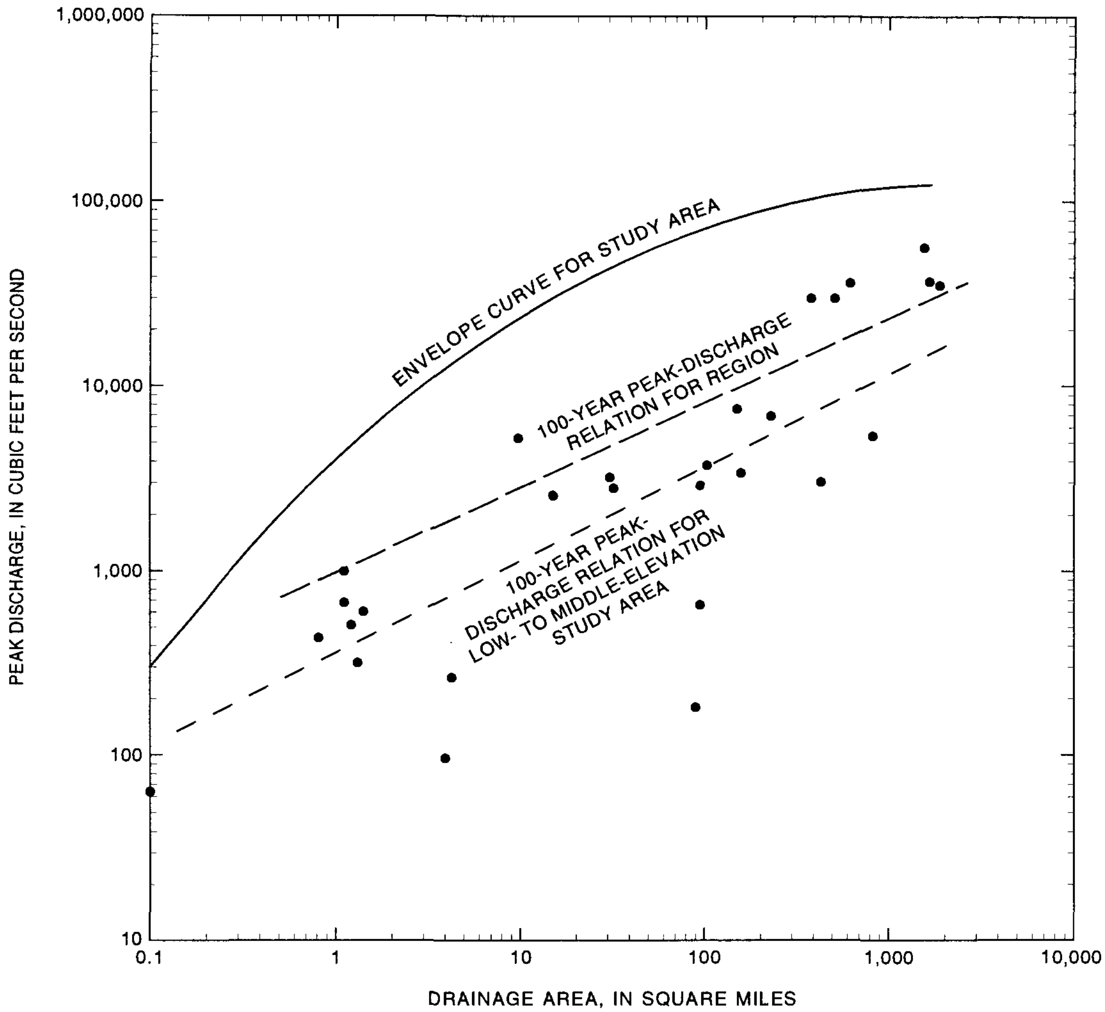


Figure 44. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Upper Gila Basin Region 14.

snowmelt runoff and little influence of mixed populations. The percentage of doglegs also is smaller in the middle latitudes, although the reason is unknown. Evaluation of the reliability of a flood-frequency relation fit to a gaged record with plotted peak discharges that have dogleg or jump shapes is difficult. The records, therefore, were identified and used in the regional flood-frequency analysis.

The accuracy of the annual peak-discharge data was examined for several stations with plots of peaks that had the largest departures from an expected smooth shape. For most of these stations, the stage-discharge relations used to determine peak discharges were poorly defined. Several of the ratings were for unstable channel controls, or were improperly fitted to the measurements of discharge, or the measurements of discharge used to define the rating appeared to be inaccurate. For some stations, a discontinuity of the rating curve coincided with a discontinuity of the plot of annual peak discharges on log-normal probability paper. For other stations, the indirect measurements of peak discharge used to define the rating were made in unstable channels that probably scoured during the peak and subsequently filled when the measurement was made. For a few stations, indirect measurements of peak discharge may have been made for debris flows. For one station, a wide inundated flood plain that was beyond the end of the measuring cableway was incorrectly assumed to have negligible flow velocity. Twelve stations were excluded from this study because a significant number of annual peaks were considered unreliable. Those stations are 08351500, 09279100, 09336000, 09355000, 09371000,

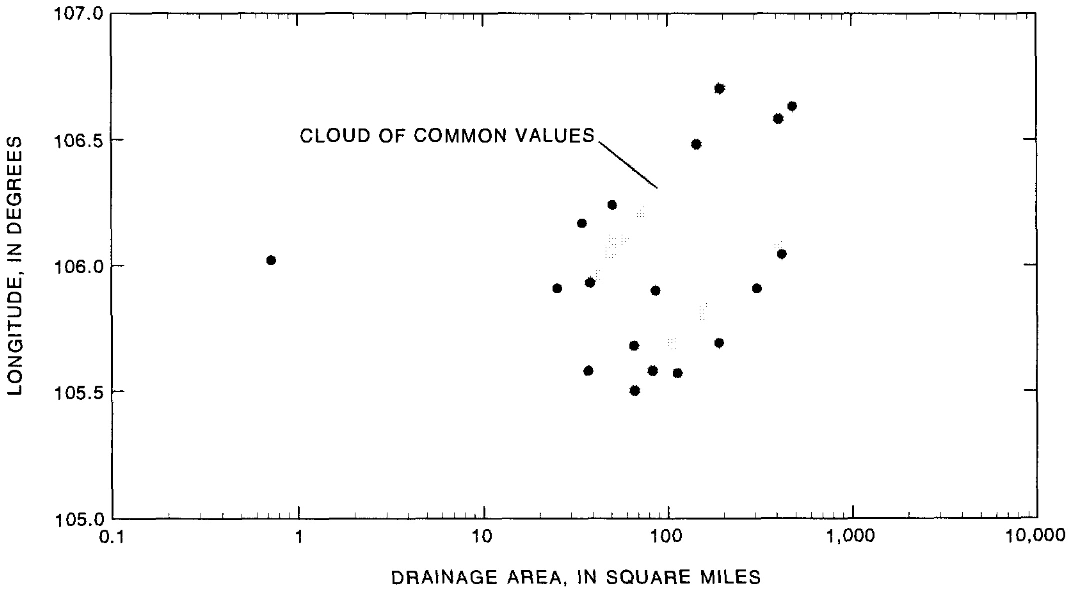


Figure 45. Joint distribution of longitude and drainage area for gaged sites in the Upper Rio Grande Basin Region 15.

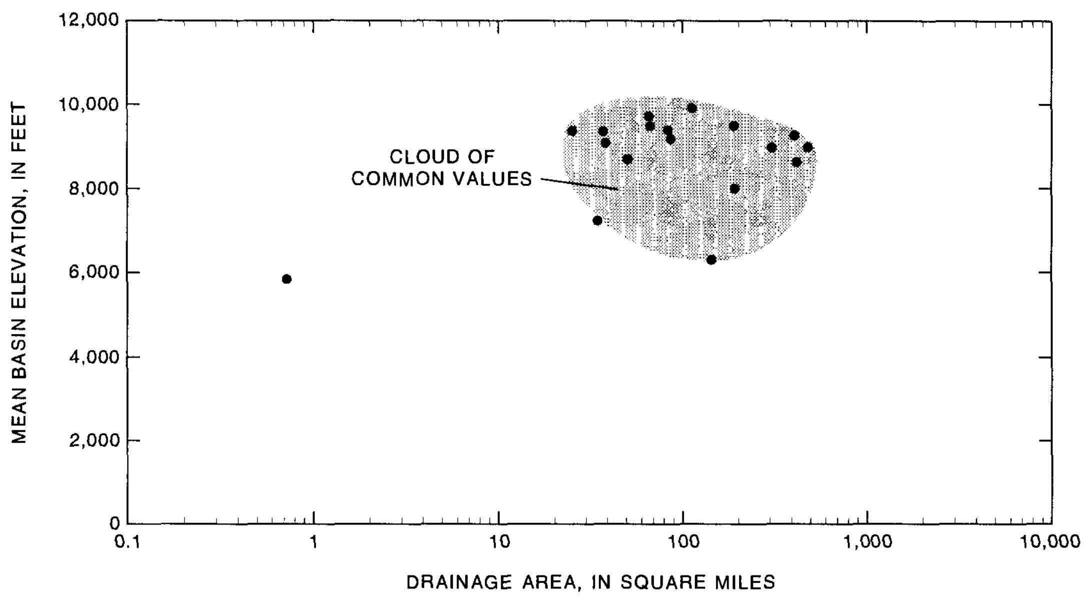


Figure 46. Joint distribution of mean basin elevation and drainage area for gaged sites in the Upper Rio Grande Basin Region 15.

09419660, 09482000, 10241600, 10253350, 10255810, 13027500, and 13061100.

Gaged Sites with Inadequate Samples or Non-Log-Pearson Type III Distribution

Detailed investigations were made of the flood-frequency relations computed for the 1,323 gaging stationrecords. For 264 station records, a visual examination showed extremely poor fits of the LPIII probability distribution to the plotted annual peak discharges. Four examples of these poor fits are shown in figure 57. Flood-frequency relations computed from the data do not fit the plotted data, and the relations are much different from regional relations computed for the sites. The variability of the annual peak discharges is extremely large at most of these stations. The average standard deviation for the 264 records

Table 19. Generalized least-squares regression equations for estimating regional flood-frequency relations for the Upper Rio Grande Basin Region 15

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; ELEV, mean basin elevation, in feet; LONG, longitude of site, in decimal degrees. Data were based on 17 stations. Average number of years of systematic record is 35]

Recurrence interval, in years	Equation	Average standard error of prediction, in percent	Equivalent years of record
2	Q=18,700AREA$^{0.730}$(ELEV/1,000)$^{-2.86}$[(LONG–99)/10)]$^{2.8}$	64	0.13
5	Q=31,700AREA$^{0.646}$(ELEV/1,000)$^{-2.67}$[(LONG–99)/10)]$^{2.7}$	66	.64
10	Q=26,000AREA$^{0.582}$(ELEV/1,000)$^{-2.27}$[(LONG–99)/10)]$^{2.7}$	68	1.24
25	Q=34,800AREA$^{0.532}$(ELEV/1,000)$^{-2.15}$[(LONG–99)/10)]$^{2.6}$	71	2.04
50	Q=44,200AREA$^{0.501}$(ELEV/1,000)$^{-2.11}$[(LONG–99)/10)]$^{2.5}$	73	2.60
100	Q=91,800AREA$^{0.439}$(ELEV/1,000)$^{-2.22}$[(LONG–99)/10)]$^{2.5}$	76	3.12

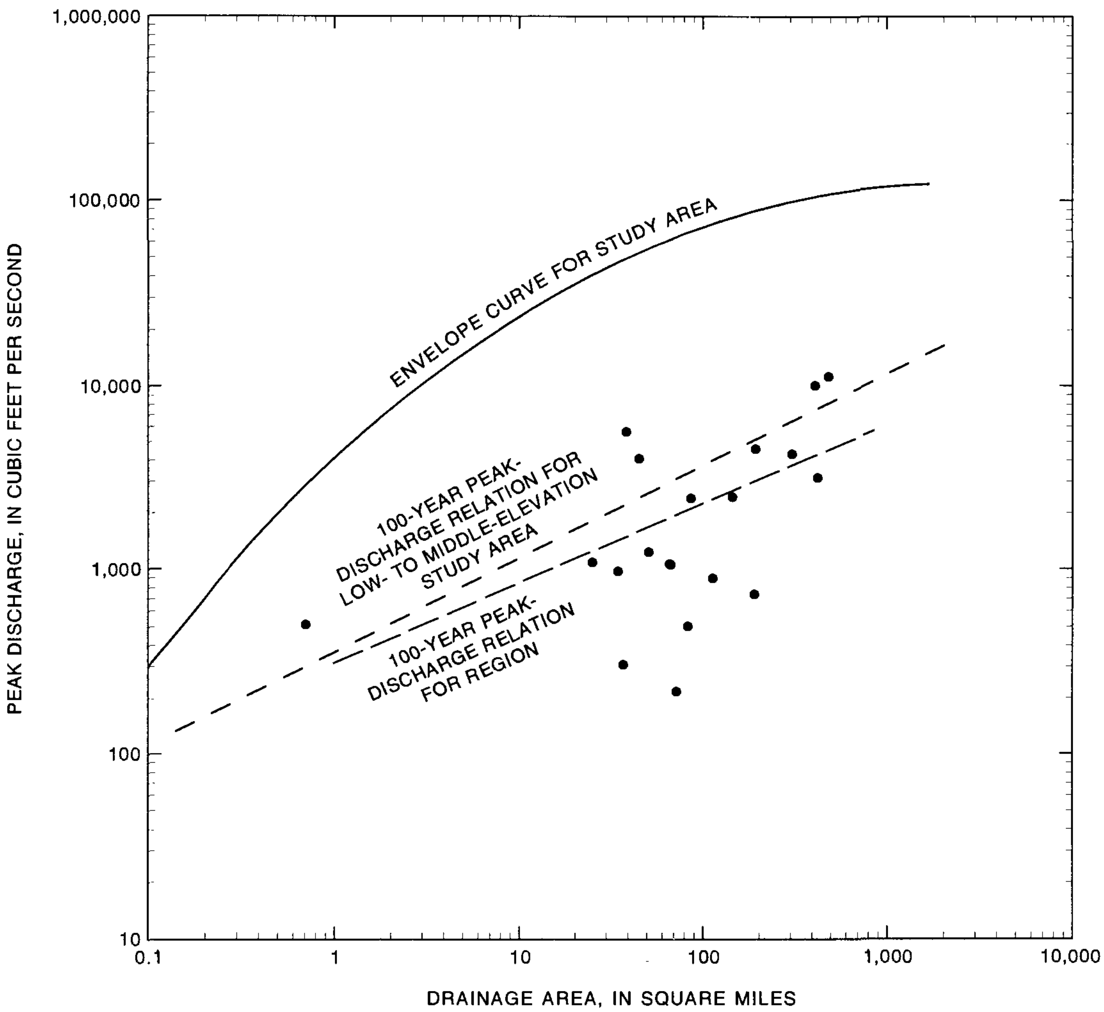


Figure 47. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Upper Rio Grande Basin Region 15.

Table 20. Hybrid equations for estimating regional flood-frequency relations for the Southeast Region 16

[Equation: Q, peak discharge, in cubic feet per second; AREA, drainage area, in square miles; EVAP, mean annual evaporation, in inches. Data were based on 120 stations. Average number of years of systematic record is 30. Estimated average standard error of regression includes much of the within-station residual variance and therefore is not comparable to standard error of estimate from an ordinary least-squares regression. See section entitled "Hybrid Method" for explanation of error]

Recurrence interval, in years	Equation	Estimated avarage standard error of regresaion, in log units	Equivalent yeara of record
2	Q=14AREA$^{0.51}$(EVAP–32)$^{0.55}$	0.664	0.410
5	Q=37AREA$^{0.48}$(EVAP–32)$^{0.63}$	.269	3.77
10	Q=52AREA$^{0.47}$(EVAP–32)$^{0.67}$	.177	12.6
25	Q=70AREA$^{0.48}$(EVAP–32)$^{0.74}$	.425	3.20
50	Q=110AREA$^{0.47}$(EVAP–34)$^{0.74}$	.367	5.38
100	Q=400AREA$^{0.50}$(EVAP–37)$^{0.45}$	.442	4.54

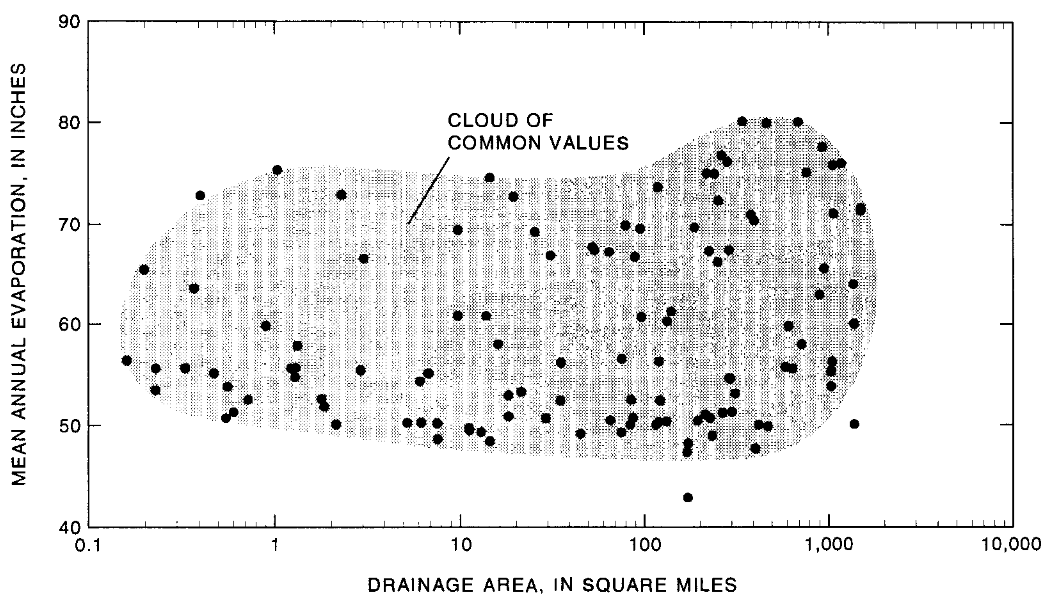


Figure 48. Joint distribution of mean annual evaporation and drainage area for gaged sites in the Southeast Region 16.

is 0.88 log units. The average standard deviation of the 1,059 stations with defined relations is 0.37 log units. An additional problem in defining relations is a short average record length of 17 years. The relations that were computed for the annual series of peak discharges are unreliable especially for extrapolations to the 100-year flood. The computed 95-percent confidence interval typically is 2 to 3 orders of magnitude for these stations.

Most of these sites that had no defined flood-frequency relations are in the most arid parts of the study area, including most of Nevada, southeastern California, and southwestern Arizona (fig. 58). Of 264 stations, 42 percent had more than 25 percent of the years with no flow, and 15 percent had more than 50 percent of the years with no flow. The procedures defined in the Interagency Advisory Committee on Water Data (1982,

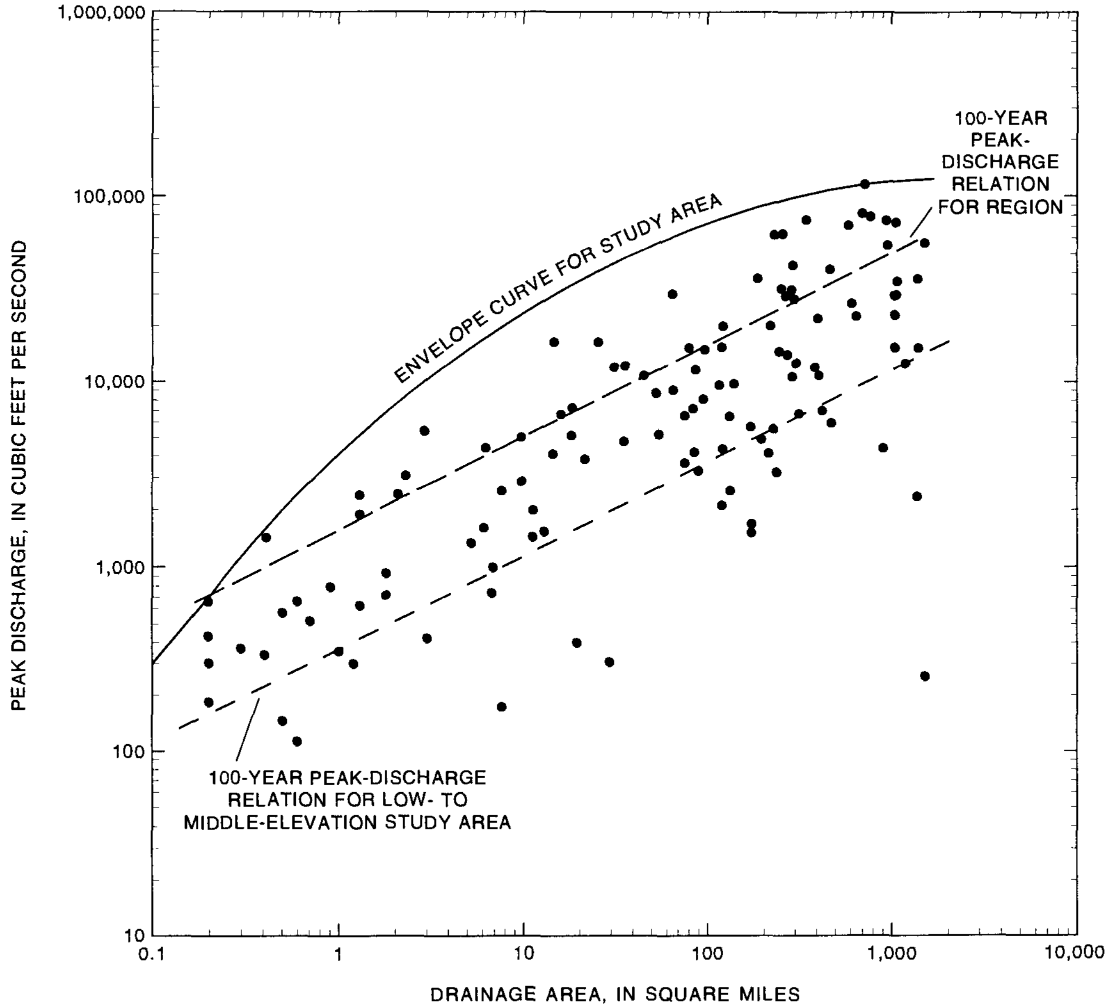


Figure 49. Relations between 100-year peak discharge and drainage area and plot of maximum peak discharge of record and drainage area for gaged sites in the Southeast Region 16.

p. 5–11) for computing flood-frequency relations are not recommended when more than 25 percent of a gaged record has no flow.

The percentage of gaging stations with undefined flood-frequency relations was compared to basin and climatic characteristics (table 25). Significantly more ($\alpha<0.01$) undefined relations were found at sites with smaller drainage areas, sites in the lower latitudes, sites with lower elevations, sites with lower mean annual precipitation, and sites with higher mean annual evaporation. At the 264 undefined sites, no convincing evidence exists that the plot of annual peak discharges can be fit by the LPIII probability distribution. The records may be insufficient in length and too unstable to define a relation. The sites, therefore, are classified as having inadequate samples or non-LPIII distribution. Flood-frequency relations for these sites are considered unreliable and were not used in the standard regional regression analysis. Data from many of these sites, however, were used in the hybrid analysis, which developed regional relations for Regions 6, 10, 11, and 16.

Mixed Populations

More than 80 percent of the sites in the study area have a mixed population of floods. Populations of floods were identified by the time of year that the annual floods occurred. A mixed population of floods is an aggregation of floods that are caused by two or more distinct and generally independent hydrometeorologic conditions. Populations in the study area include floods caused by snowmelt, rainfall, and rainfall on snow. Rainfall is caused by summer thunderstorms, winter midlatitude-cyclonic storms, winter upper-level low-pressure systems, or tropical cyclones.

When a sample of annual peaks contains a mixed population, a single flood-frequency relation can be much different from a compositional relation (Webb and Betancourt, 1992). The computed differences in the mean, variance, and skew (moments) of each population cause this distortion. Differences in moments between two populations in a gaging-station record may result in relations with abnormally large skew coefficients and abnormal slope changes when plotted on log-normal probability paper

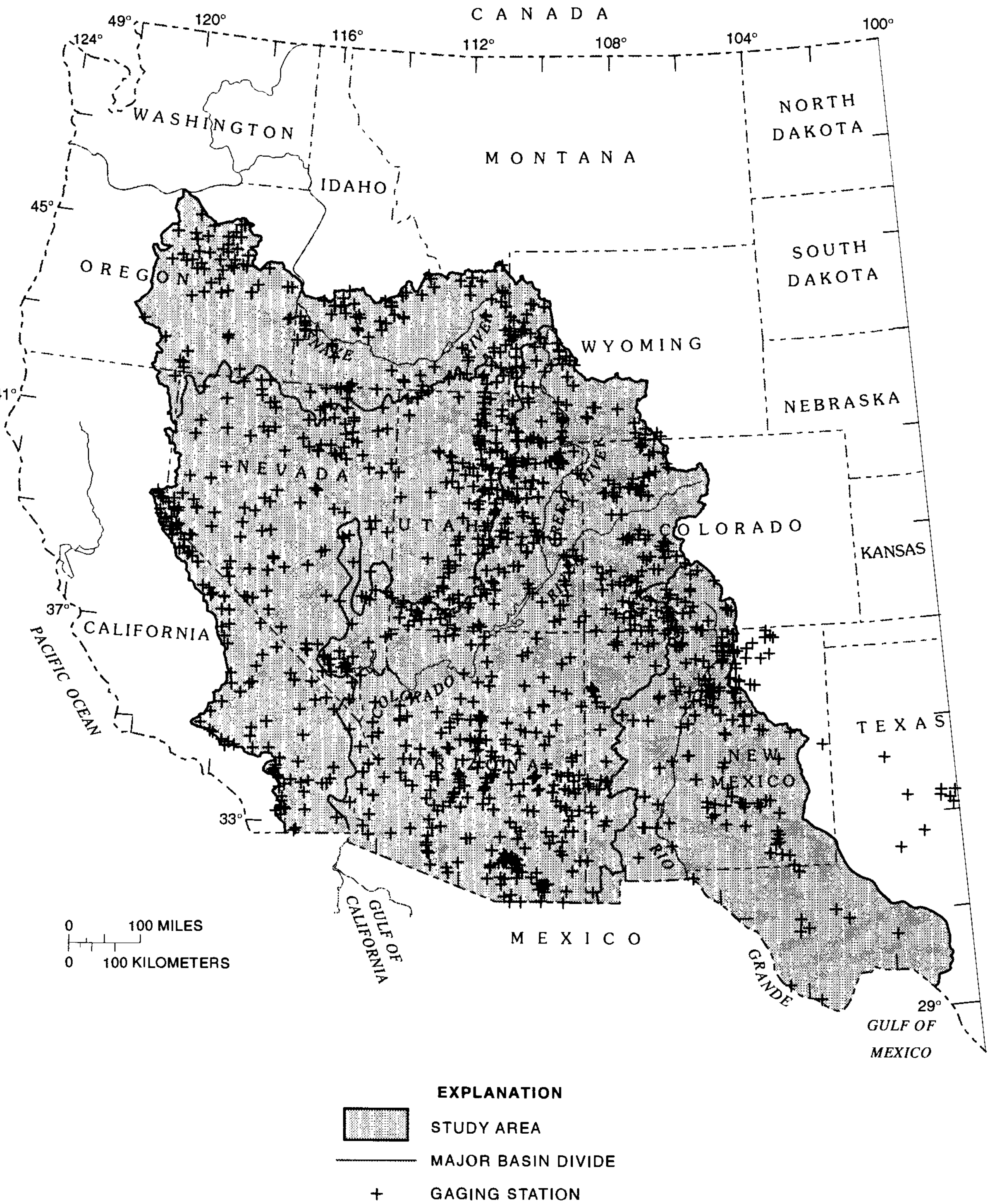


Figure 50. Gaging stations used in this study.

Table 21. *Drainage area and years of systematic record at gaging stations in the southwestern United States*

Drainage area, in square miles	Number of gaging stations	Average years of systematic record
Less than 1	120	16.4
1–10	299	17.3
10–100	507	23.1
100–1,000	342	34.2
1,000–2,000	55	37.4

Table 22. Significance of trends over time in annual peak discharges for gaging stations with at least 30 years of record in the southwestern United States

State	Number of gaging stations			
	At least 30 years of record	Trend		
		Positive	Negative	None
Arizona.........	31	2	3	26
California	24	1	1	22
Colorado.......	55	1	9	45
Idaho............	22	7	0	15
Nevada	17	3	0	14
New Mexico	90	2	12	76
Oregon..........	15	5	0	10
Texas	4	0	0	4
Utah..............	55	5	4	46
Wyoming......	27	5	0	22
Total.............	340	31	29	280

(Interagency Advisory Committee on Water Data, 1982, p. 16). A method that can be used to account for mixed populations is the composite-probability analysis.

In a composite-probability analysis, an annual peak discharge is determined for each population and a separate flood-frequency relation is computed for each population. The relations are combined using a formula for the probability distribution of the maximum of independent random variables. The formula for computing a composite relation for two populations of floods is as follows (Crippen, 1978):

Table 23. *Summary of characteristics of station flood-frequency relations in the southwestern United States*

Flood-frequency characteristics	Number of stations	Percentage of stations with defined relations
Smooth shape of plotted data....	399	38
Applied low-discharge threshold..................................	512	48
High outlier	178	17
Historical period used	124	12
High outlier and historical period used	1 52	5
Jump (discontinuity) in plotted data..	68	6
Dogleg (break in slope) in plotted data..........................	100	9

$$P_C(x) = P_A(x) + P_B(x) - P_A(x)P_B(x) \; , \qquad (8)$$

where

$P_C(x)$ = probability that the annual flood in the composite population will exceed x,

$P_A(x)$ = probability that the annual flood in population A will exceed x, and

$P_B(x)$ = probability that the annual flood in population B will exceed x.

The significance of mixed populations on the flood-frequency relations computed for sites in the study area is uncertain. At some sites with a certain combination of samples of populations, the composite relation will be significantly different from the relation computed from the annual maximum peaks (mixed population); however, at many sites, the two relations will be similar.

To estimate the significance of the mixed-population problem, composite analyses were made of many representative sites with a combination of floods caused by snowmelt and floods caused by rainfall from summer thunderstorms. The snowmelt and summer thunderstorm populations were selected for analysis because that combination is the most common in the study area. Jarrett and Costa (1982) and Thomas (1985) found that a composite flood-frequency relation for that combination may be significantly different from the relation based on annual maximum peaks (mixed population).

Table 24. Characteristics of station flood-frequency relations compared with basin and climatic characteristics in the southwestern United States

[ANOVA, analysis of variance significance level. The gaging stations were coded with a 1 if the attribute is present and a 0 if the attribute is not present. The mean of the 1's and 0's in each class of basin or climatic characteristic is the percentage of the attributes in each class. ANOVA was performed on the three classes to test if a significant difference in means (percentages) exists between the three groups (three classes of basin or climatic characteristic). Dogleg in plotted data is indicated by a sharp break or dogleg appearance. The data fit into two segments with different slopes. Jump in plotted data is indicated by a discontinuity or jump where two or more segments are displaced vertically]

Class	Number of stations	Percentage of streamflow-gaging stations with specified characteristic and ANOVA significance level							
		Low discharge threshold	ANOVA	High outlier	ANOVA	Dogleg in plotted data	ANOVA	Jump in plotted data	ANOVA
Drainage area, in square miles									
Less than 50	536	48		17		7		6	
50 to 200	268	48	0.83	12	0.02	9	0.01	9	0.18
More than 200	255	49		21		14		5	
Latitude, in degrees									
Less than 37	409	53		14		11		6	
37 to 41	404	46	.09	19	.10	6	.03	8	.35
More than 41	246	45		18		11		5	
Mean basin elevation, in feet									
Less than 6,000	287	55		17		11		7	
6,000 to 8,000	382	49	.01	16	.70	11	.08	7	.82
More than 8,000	361	43		18		7		6	
Mean annual precipitation, in inches									
Less than 16	358	56		18		11		8	
16 to 25	408	45	.01	16	.45	9	.17	7	.03
More than 25	254	43		15		7		3	
Mean annual evaporation, in inches									
Less than 40	383	45		16		9		6	
40 to 55	429	47	.02	19	.42	9	.78	8	.10
More than 55	247	56		15		10		4	

About 50 percent of the sites in the study area have a mixed population of floods caused by snowmelt and summer thunderstorms. These sites occur throughout the study area mostly in an elevation zone (fig. 59) between mountainous areas and the plains or plateau areas. Above the elevation zone, flood characteristics are dominated by snowmelt runoff; below the elevation zone, flood characteristics are dominated by thunderstorms (McCain and Jarrett, 1976, p. 31; Thomas, 1985, p. 382). The upper-elevation limit for sites with mixed populations is near or above the previously estimated upper limit for large thunderstorm-caused floods. The elevation zone of the mixed population in the southern latitudes is about 6,200 to 8,200 ft. In the northern latitudes, the elevation zone decreases to about 4,500 to 6,500 ft. About 35 percent of the sites in the study area are in this mixed-population elevation zone.

The elevation zone for the mixed population contains most of the sites that have the potential for significantly different composite and annual maximum flood-frequency relations. Within and near the elevation zone, 51 gaged sites with more than 20 years of record that had drainage areas that ranged from 2 to 1,100 mi^2 were selected (table 26, fig. 60). Composite relations were computed for the

51 sites, which are about 14 percent of the sites in the elevation zone. Most of the sites are in northern and central New Mexico, southwestern Colorado, and Utah.

In the composite analysis, the rainfall peaks were estimated from the annual peak discharge records with peaks above a base. Missing peaks were accounted for by using a conditional-probability adjustment. Snowmelt peaks were estimated from the same records, and peaks below the base discharge were estimated as mean daily discharges from historical records. The relations for rainfall, snowmelt, and annual maximum peaks were computed using a station skew coefficient.

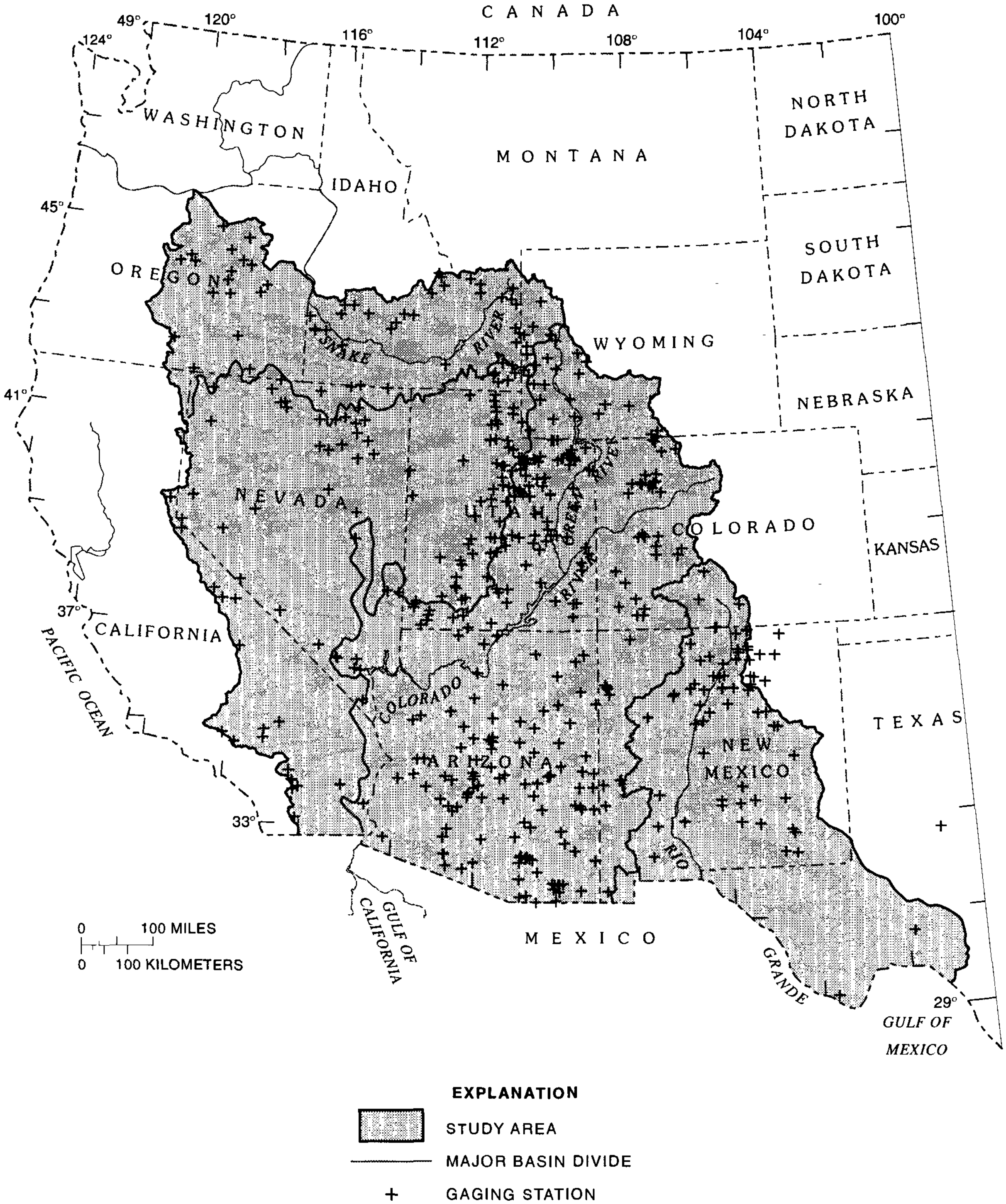


Figure 51. Gaging stations with an applied low-discharge threshold.

The Interagency Advisory Committee on Water Data (1982) recommends weighting the station skew with a generalized skew when computing station flood-frequency relations. The purposes of this study, however, which were to compare differences in composite and mixed relations, are adequately served by using station skews.

Typical differences in flood-frequency relations between sites above, in, and below the mixed-population elevation zone are described in the following three examples. A typical high-elevation site with snowmelt runoff is South Fork of Rock Creek near Hanna, Utah (09278000), which has a drainage area of 15.7 mi^2 and a site elevation of 7,860 ft (fig. 61). Floods caused by snowmelt represent 90 percent of the record. In the frequency relations, the magnitude of the snowmelt relation is greater than the rainfall relation until a recurrence interval of greater than 100 years (exceedance probability of 0.01), where the curves would cross. The computed relation using the array of annual maximum peaks is adequate until the curves intersect. Thus, estimates of floods with recurrence intervals of greater than 100 years may need a composite relation.

A middle-elevation site that has a mixed population of rainfall and snowmelt peaks is Big Creek near Randolph, Utah (10023000), which has a drainage area of 52.2 mi^2 and a site elevation of 6,410 ft (fig. 62). The magnitudes and distributions of the rainfall and snowmelt peaks are mixed; 31 percent is caused by rainfall, and 69 percent is caused by snowmelt. About one-half of the largest 25 percent of the peaks were caused by rainfall, and the largest peak was caused by rainfall. The composite 100-year peak is 26 percent larger than the 100-year peak based on annual maximum peaks. In this particular case, the composite relation is a more accurate depiction of the flood characteristics than the annual maximum relation.

Mill Creek near Moab, Utah (09184000), is a typical low-elevation site that has runoff dominated by rainfall, and has a drainage area of 74.9 mi^2 and a site elevation of 4,240 ft (fig. 63). Peaks caused by rainfall represent 84 percent of the record. The rainfall and composite relation are mostly coincident and are greater than the snowmelt relation for all recurrence intervals. The composite relation is not needed for such low-elevation sites.

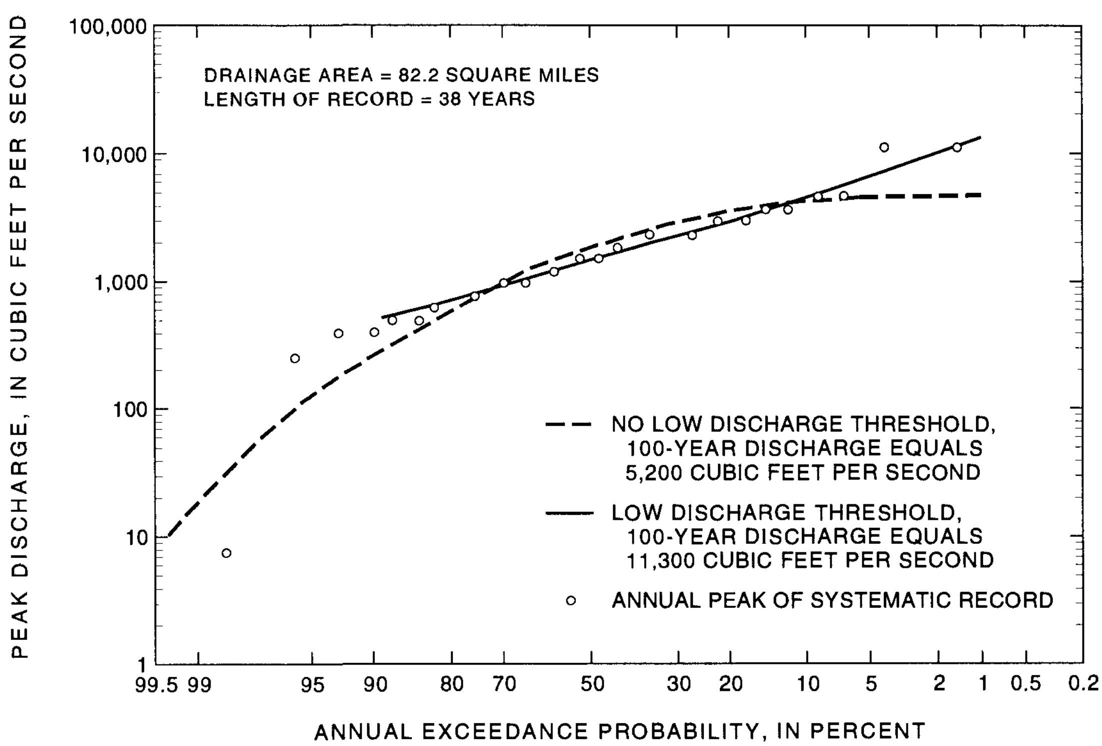


Figure 52. Flood-frequency relations for Santa Cruz River near Lochiel, Arizona (09480000).

The ratio of the 100-year composite peak to the 100-year annual maximum peak (mixed) for the 51 analyzed sites was used to evaluate the significance of the composite analysis. A significant difference between the composite relation and mixed relation may be at the 50- to 100-year recurrence intervals, where there is a greater influence of the potential difference in mean, variance, and skew of the two populations. The difference between relations usually is not significant for the 2- to 25-year recurrence intervals. The 100-year composite peak discharges were greater than the annual maximum peak discharges for 36 sites. Statistics for the composite to annual maximum ratio are a mean of 1.08, a median of 1.04, and a standard deviation of 0.13. The composite 100-year peaks, although systematically larger than the annual maximum 100-year peaks, are only an average of 8 percent larger. This difference is considered small because of all the uncertainties inherent in flood-frequency analysis.

Jarrett (1987) examined 29 streamflow-gaging station records for mixed populations in the Colorado River basin (part of this study area). The average ratio of composite 100-year peak to annual maximum 100-year peak for the 29 stations was 1.12 and is similar to the average ratio of 1.08 in this study. The potential problem of mixed populations of floods caused by rainfall and snowmelt, therefore, does not appear to be significant in the study area for estimating floods of as much as the 100-year peak discharge.

The ratio of composite to annual maximum 100-year peak discharge was compared with size of drainage area, site elevation, mean basin elevation, and geographic area. No relations were found except for geographic area, where some concentrations of higher ratios were found in south-central Utah and northern New Mexico (fig. 60).

In conclusion, analysis of the mixed population of floods caused by snowmelt and summer thunderstorms indicates that flood-frequency relations computed from the mixed populations apparently are adequate descriptions of the flood characteristics for the 100-year flood and less. Separation of populations and a composite analysis for 51 sites did not appear to significantly change the flood-frequency relations. Sites identified with the greatest potential for a significant composite relation are in middle elevations. For some ungaged streams that drain basins in the middle elevations,

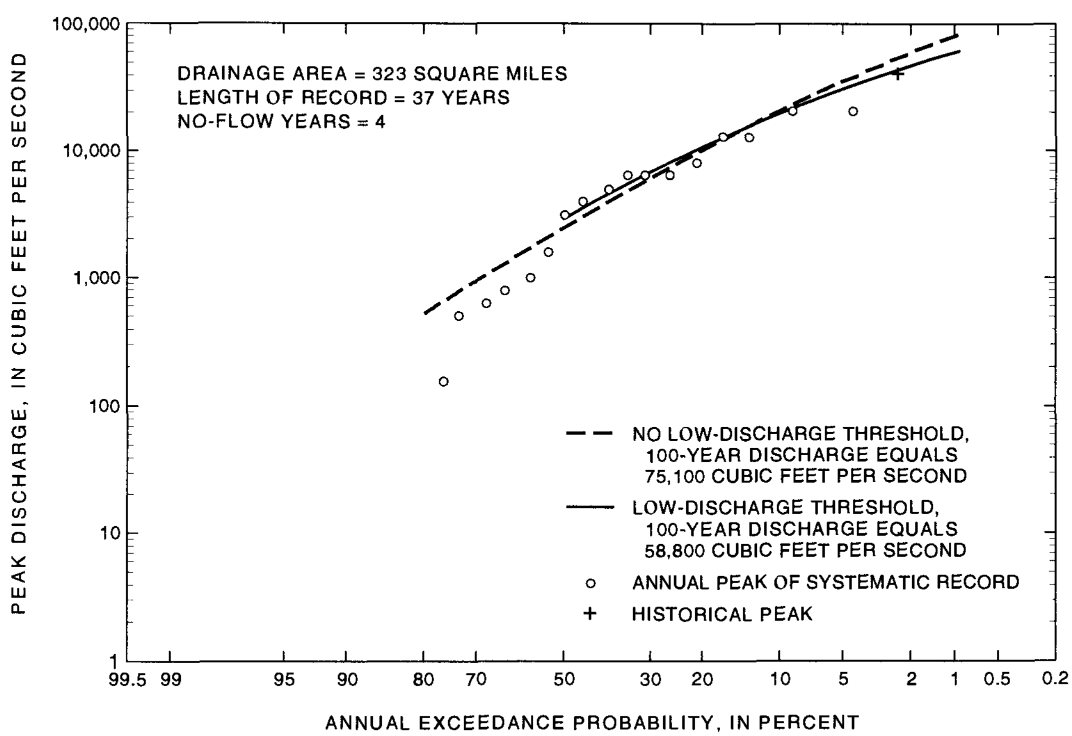


Figure 53. Flood-frequency relations for New River near Glendale, Arizona (09513910).

the regional relations for estimating the 100-year peak discharge may be about 10 percent too small.

Regional Skew Coefficient

The method of moments was used to fit the LPIII probability distribution to the series of annual peak discharges at gaged sites. In this method, an estimate of skew coefficient is required. An accurate estimate of skew coefficient is difficult to obtain from samples of less than 50 data points because of its sensitivity to extreme events (Viessman and others, 1977, p. 169). Thus, skew

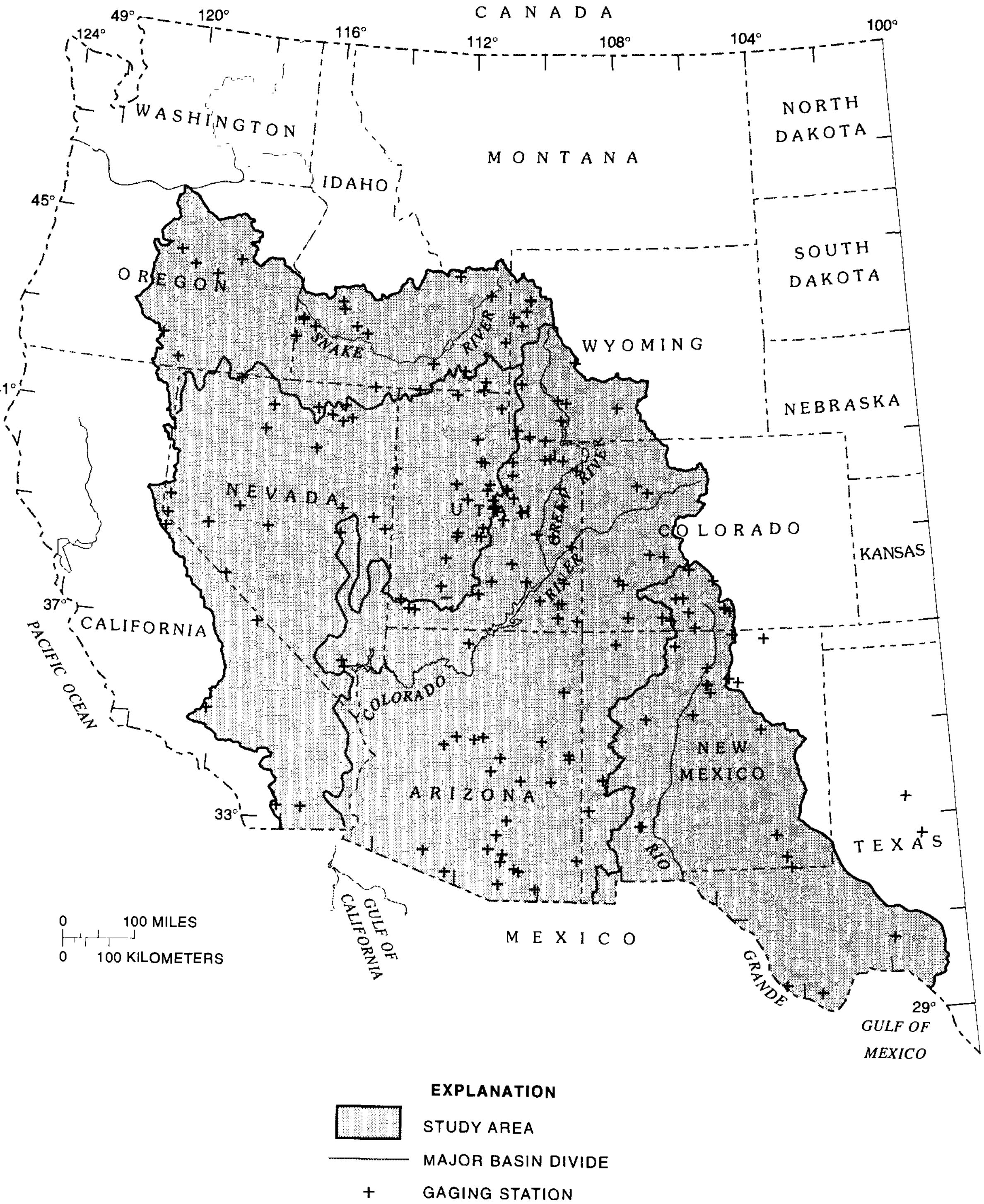


Figure 54. Gaging stations with a high outlier.

coefficients estimated from the peak-discharge records in this study area are often unreliable because the average record length is 27 years and only 10 percent of the sites have more than 50 years of record. The estimate of station skew coefficient is improved by weighting the station skew with a regional skew (Interagency Advisory Committee on Water Data, 1982, p. 10–12).

An analysis was made of regional skew coefficient for the series of annual peak discharges at gaging stations in the study area. The study hypothesis was that regional relations for skew coefficient cannot be de-

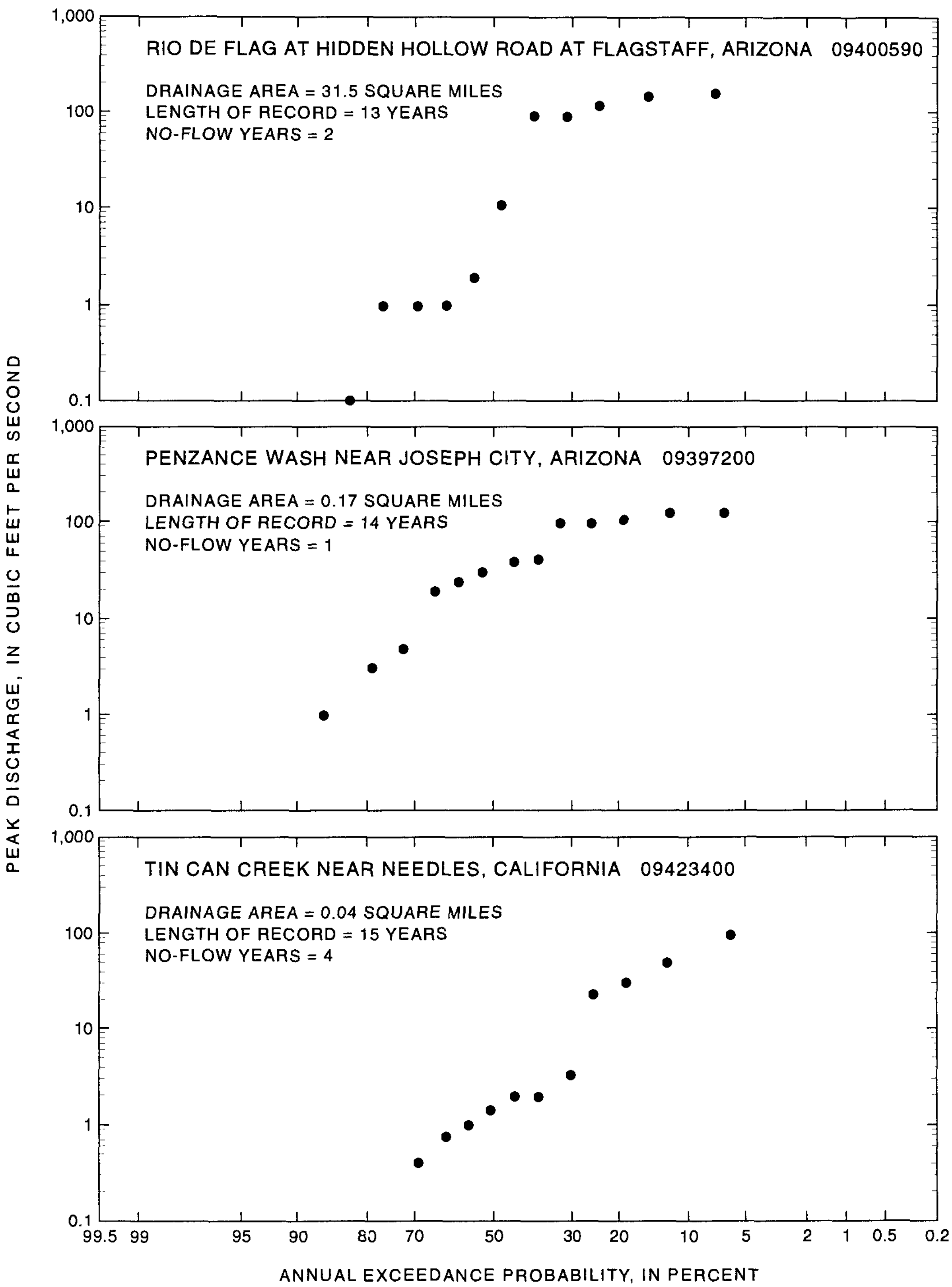


Figure 55. Examples of gaging-station records with sharp breaks or discontinuities in their plotted peaks.

fined, and therefore, that the regional skew is equal to the mean value of zero for the sample with an associated error equal to the sample variance of 0.31. That is, the logarithms of peak discharges at individual sites do have skewed distributions, but there is no definable regional pattern to the variation of skew among sites. The model for regional site-to-site variation of skew is a regional mean value plus a random component that is uncorrelated with any definable site characteristic. Alternative hypothesis A was that regional relations

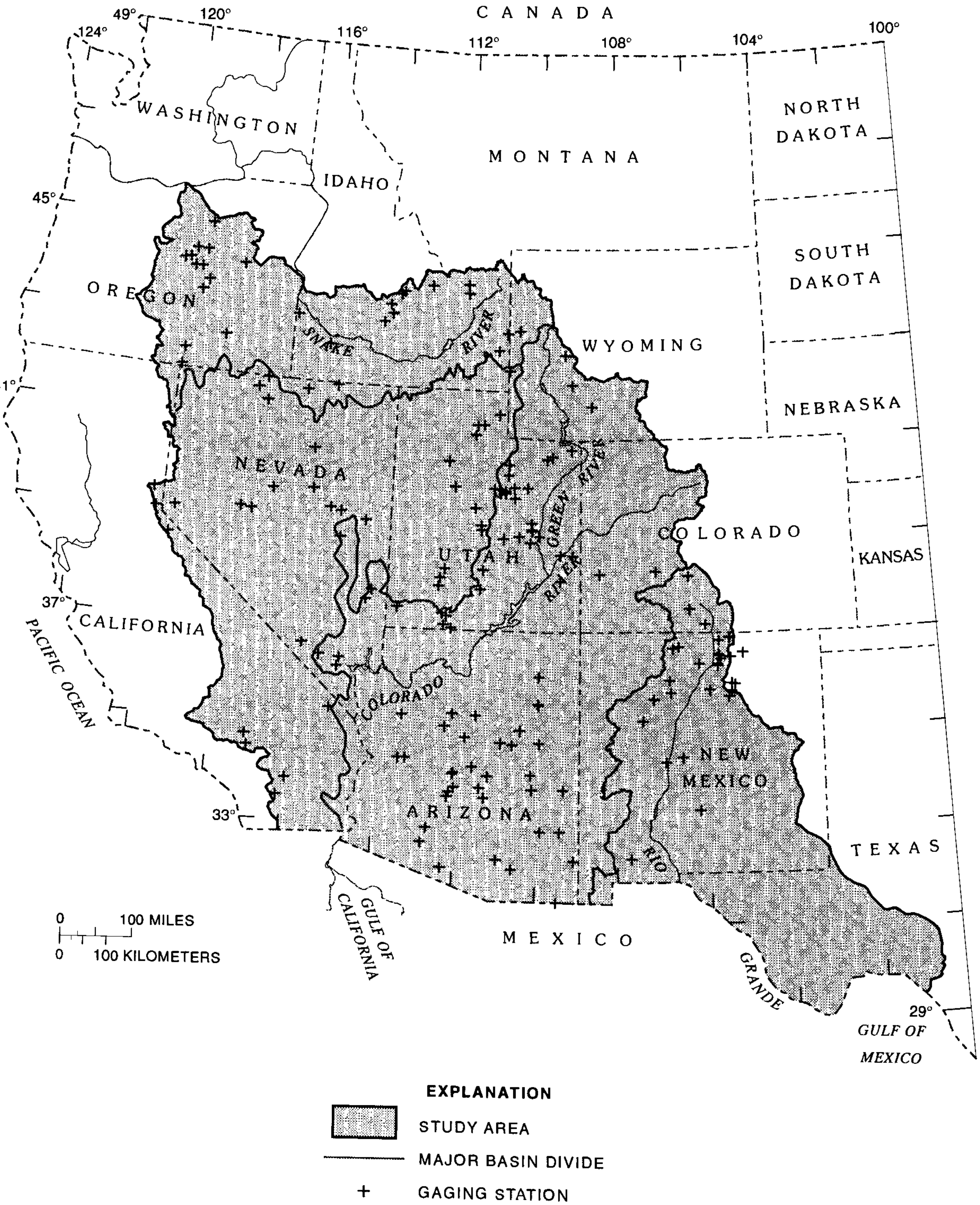


Figure 56. Gaging stations with sharp breaks or discontinuities in their plotted peaks.

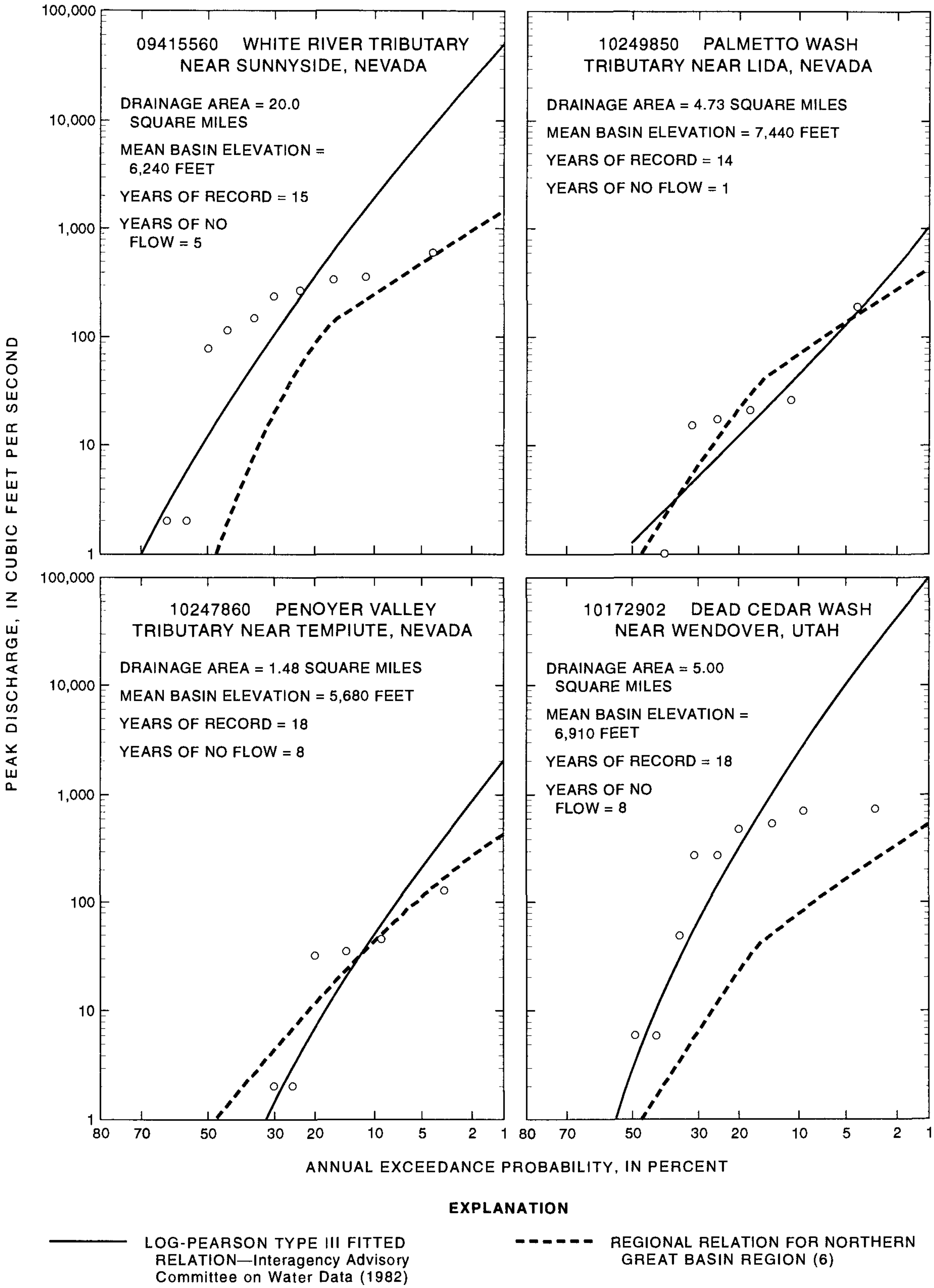


Figure 57. Examples of plotted peaks for gaging stations with samples that are inadequate to define a flood-frequency relation.

of skew coefficient can be defined. Alternative hypothesis B was that the gaging-station records fit the log-normal distribution, and therefore, station and regional skew equal zero.

Data and methods.—A sample of 1,061 gaging-station records was used to estimate relations of regional skew coefficient for the study area. A station skew coefficient was computed for the logarithms of the series of annual peak discharges at each gaged site. A skew computed from a sample by the method of moments is a biased estimate of the population skew; therefore, the computed skew

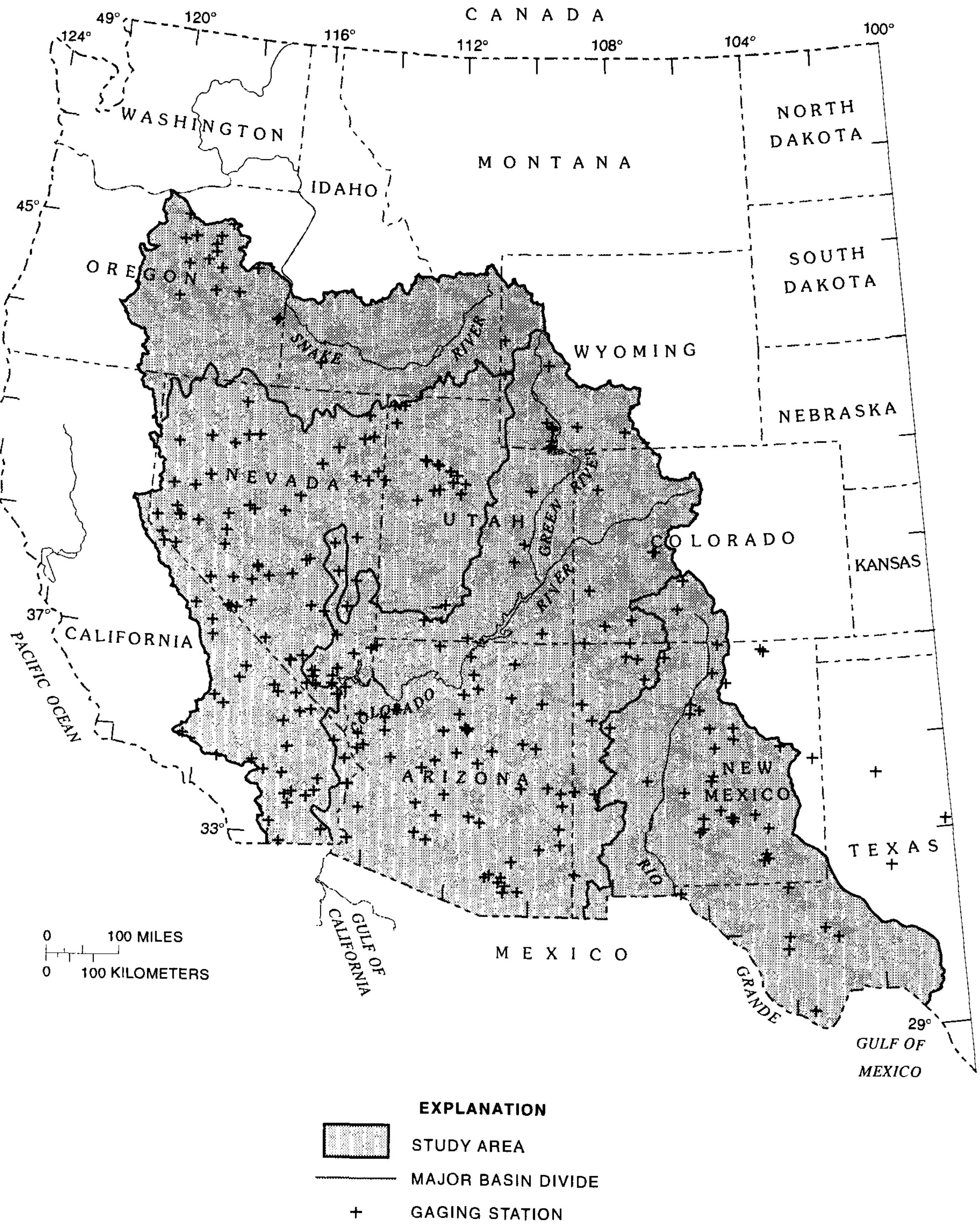


Figure 58. Gaging stations with samples that are inadequate to define a flood-frequency relation.

Table 25. Percentage of gaging stations with undefined flood-frequency relations compared with basin and climatic characteristics in the southwestern United States

[ANOVA, analysis of variance significance level. The gaging stations were coded with a 1 if the attribute is present and a 0 if the attribute is not present. The mean of the 1's and 0's in each class of basin or climatic characteristic is the percentage of the attributes in each class. An ANOVA was performed on the three classes to test if there is a significant difference in means (percentages) between the three groups (three classes of basin or climatic characteristic)]

Class	Number of stations	Percentage of stations with undefined flood-frequency relations	ANOVA significance level
Drainage area, in square miles			
Less than 50	756	29	
50 to 200	293	9	<0.01
More than 200	274	7	
Latitude, in degrees			
Less than 37	559	27	
37 to 41	482	16	<.01
More than 41	282	13	
Mean basin elevation, in feet			
Less than 6,000	408	30	
6,000 to 8,000	471	19	.01
More than 8,000	381	5	
Mean annual precipitation, in inches			
Less than 16	535	33	
16 to 25	442	8	<.01
More than 25	266	5	
Mean annual evaporation, in inches			
Less than 40	421	9	
40 to 55	541	21	<.01
More than 55	361	32	

was multiplied by a correction factor of $1+(6/N)$, in which N is sample size, to obtain a nearly unbiased estimate (Tasker and Stedinger, 1986). The adjusted skew coefficient was used for all sites.

A cumulative distribution plot of the skew coefficients was a straight line on an arithmetic-normal scale, but the line had a sharp break at a skew of about 1.5. Nineteen sites with a skew greater than 1.5 were considered to represent a different population and therefore were deleted from the regional analysis. All the sites with skews greater than 1.5 had a peak discharge that is a high outlier in their individual sample; therefore, those 19 sites were considered to be contaminated by the high outliers. The final sample of 1,042 adjusted skew coefficients has a cumulative distribution that plots as a straight line and has a mean of 0.028, a median of 0.011, and a variance of 0.31. Thus, the distribution is considered normal with a mean of about zero.

Seven regional skew relations were tested in this analysis: one relation for the study hypothesis, five relations for hypothesis A, and one relation for hypothesis B.

1. Regional relations of skew coefficient cannot be defined. The regional skew is equal to the mean value of zero for the sample with an associated error equal to the sample variance of 0.31 (study hypothesis).
2. Spatial relations for hypothesis A were tested using a published geographic isoline map of skew coefficient (Interagency Advisory Committee on Water Data, 1982, plate 1).
3. Spatial relations for hypothesis A were tested by determining new geographic isoline maps of skew coefficient.
4. Spatial relations for hypothesis A were tested by dividing the study area into geographic regions of uniform skew coefficient.
5. Relations between skew coefficient and basin and climatic characteristics for hypothesis A were tested using multiple-regression analysis.
6. Relations between skew coefficient and basin and climatic characteristics and geographic regions of uniform skew for hypothesis A were tested together using multiple-regression analysis.
7. Gaging-station records fit the log-normal distribution, and, therefore, regional and station skew are equal to zero (hypothesis B).

The overall accuracy of the estimated regional skew relations was evaluated by comparing the computed mean-square error of each relation. A split-sample approach was used to estimate the mean-square error. The sample of gaged sites was split into 695 sites to develop the regional relations for estimating skew coefficient, and the relations were applied to the remaining 347 sites to estimate the mean-square error. The mean-square error is the variance of the difference between skew estimated from the regional relation and the at-site skew. The sites were listed numerically by station number and then assigned alternately to the first or second group. The procedure resulted in two samples with similar basin and climatic characteristics.

Another method used to evaluate the accuracy of the different regional skew relations was to apply the estimated regional skews to predictions of regional 100-year peak discharges. For the regional relations with a station skew coefficient, 100-year peak discharges were computed for each station using skew coefficients weighted by the associated errors of the station skew and each regional skew (Interagency Advisory Committee on Water Data, 1982, p. 10–14). For the relation of a log-normal distribution, 100-year peak discharges were computed by fitting the log-normal distribution to the station records. Regional regression relations were then developed for the 100-year peak discharge for each regional skew. To reduce the large variation in flood characteristics for the study area and to provide a more homogeneous sample for a comparison of regional skews, the study area was divided into 23 regions with similar flood characteristics. Regional regression equations were developed for those 23 regions, which were preliminary and are not the final flood regions used in the report. The 23 regions were delineated during the procedure to estimate geographic regions of uniform skew. All the regression relations used for comparison among the different regional skew relations had the same explanatory variables.

Application of the relations for regional skew to the estimation of regional 100-year peak discharges was evaluated by comparing a weighted average standard error of estimate of the regression relations. The weighted average standard error of estimate is the average standard error of estimate for the 23 regions weighted by the number of gaged sites in each region.

Study hypothesis.—The study hypothesis is that regional relations of skew coefficient cannot be defined, and, therefore, the regional skew is equal to the mean value of zero for the sample. For a comparison with the other regional skew relations, the sample variance of 0.31 can be considered analogous to a mean-square error. The application of the regional skew to a regression of 100-year peak discharge in 23 regions resulted in a weighted average standard error of estimate of 0.29 log units.

Published isoline map.—The Interagency Advisory Committee on Water Data (1982, plate I) developed an isoline map using peak-discharge records from about 3,000 gaging stations throughout the United States. The isoline map has an overall mean-square error of 0.30, which is similar to the mean-square error computed for the other

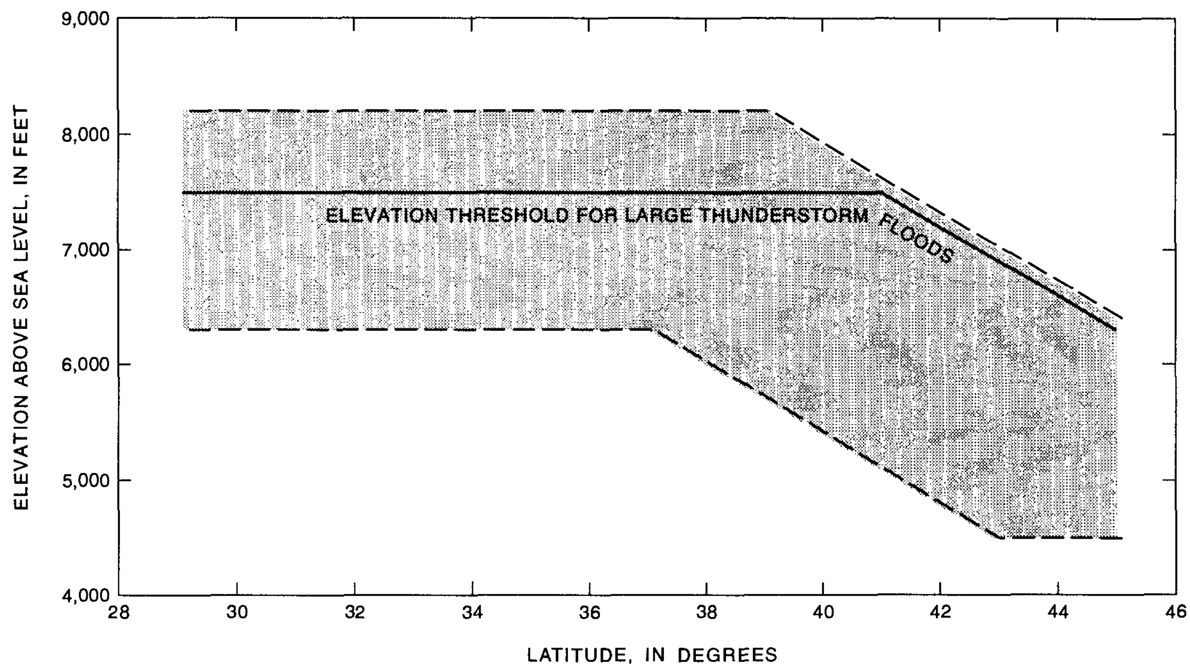


Figure 59. Elevation zone for mixed population of floods caused by thunderstorms and snowmelt in the southwestern United States.

Table 26. Summary of analyses of mixed-population flood records for the southwestern United States

Station number	Drain-age area, in square miles	Site elevation, in feet	100-year peak discharge, in cubic feet per second				Ratio of composite to annual maximum
			Rainfall	Snowmelt	Com-posite	Annual maximum	
07204000	73.8	8,197	301	234	320	298	1.07
07204500	56.0	8,195	650	650	760	741	1.03
07206400	7.4	7,860	240	65	240	186	1.29
07208500	65.0	6,720	3,060	1,260	3,300	3,000	1.10
08252500	25.1	9,429	1,140	308	1,140	1,070	1.07
08268500	65.6	6,670	1,290	706	1,290	1,250	1.03
08275600	37.0	7,223	590	447	680	572	1.19
08279000	305.0	5,859	3,710	2,400	3,710	3,740	.99
08284300	45.0	7,189	4,820	2,300	4,820	4,500	1.07
08284500	193.0	6,945	3,890	4,750	5,500	5,450	1.01
08378500	189.0	7,503	3,070	2,390	3,400	3,400	1.00
08381000	87.0	6,675	7,100	1,750	7,100	6,070	1.17
09146400	14.1	8,400	349	160	349	295	1.18
09177500	12.0	8,120	882	811	1,060	959	1.11
09182000	7.6	7,070	47	37	51	51	1.00
09184000	74.9	4,240	12,000	1,200	12,000	12,500	.96
09216600	7.9	6,300	1,020	135	1,020	982	1.04
09224820	3.6	6,200	763	36	763	770	.99
09225200	6.6	6,200	839	325	860	865	.99
09278000	15.7	7,860	200	240	250	250	1.00
09288000	140.0	6,670	1,000	1,020	1,250	1,320	.95
09288150	56.1	6,790	3,530	988	3,530	3,170	1.11
09288500	950.0	5,512	2,810	3,720	3,900	3,850	1.01
09307500	297.0	6,000	2,450	500	2,450	2,410	1.02
09308500	32.0	7,190	1,830	1,290	2,220	2,410	.92
09313000	415.0	6,000	9,570	2,610	9,700	9,330	1.04
09318000	190.0	6,210	2,920	1,700	2,920	2,620	1.11
09324500	208.0	6,050	5,620	2,760	5,620	4,860	1.16
09326500	138.0	6,210	4,370	2,050	4,370	3,920	1.11
09330500	105.0	6,400	3,520	2,430	4,100	4,110	1.00
09337000	68.1	6,400	1,700	493	1,700	1,790	.95
09338500	1.9	8,600	957	267	957	774	1.24
09340000	86.9	7,598	2,250	2,340	2,650	2,620	1.01
09342500	298.0	7,052	15,700	7,280	15,700	15,600	1.01
09344000	69.8	7,941	1,460	1,360	1,500	1,650	.91
09363000	97.4	7,302	3,440	2,370	3,440	3,340	1.03
09363500	1,090	5,960	13,300	15,100	15,800	15,700	1.01
09365500	37.0	8,105	1,850	1,430	1,940	1,800	1.08
09366500	331.0	5,975	6,620	2,140	6,620	5,900	1.12
09384000	747.0	6,010	12,100	4,090	12,100	10,700	1.13
09404450	69.2	5,900	1,610	895	1,800	1,490	1.21
10023000	52.2	6,410	444	221	444	352	1.26
10146000	95.6	5,280	1,010	754	1,120	1,090	1.03
10148200	19.4	6,120	990	126	1,000	1,020	.98
10148500	490.0	5,027	1,250	1,600	1,700	1,730	.98
10165500	9.8	5,320	685	365	685	570	1.20
10172700	25.0	6,200	1,500	470	1,500	870	1.72
10210000	16.4	6,760	2,660	436	2,660	2,160	1.23
10216400	59.4	6,000	2,120	993	2,120	1,740	1.22
10241400	15.8	6,740	1,150	286	1,150	1,240	.93
13083000	53.7	4,820	210	141	245	241	1.02

methods used in this analysis. The application of regional skews obtained from the isoline map to a regression of 100-year peak discharge in 23 regions resulted in a weighted average standard error of estimate of 0.29 log units.

Isoline maps.—An isoline map of skew coefficient was developed using a kriging procedure where the study area was divided into a uniform grid of 33 rows and 33 columns. Thus, the square cells are about one-half degree on a side. The mag-

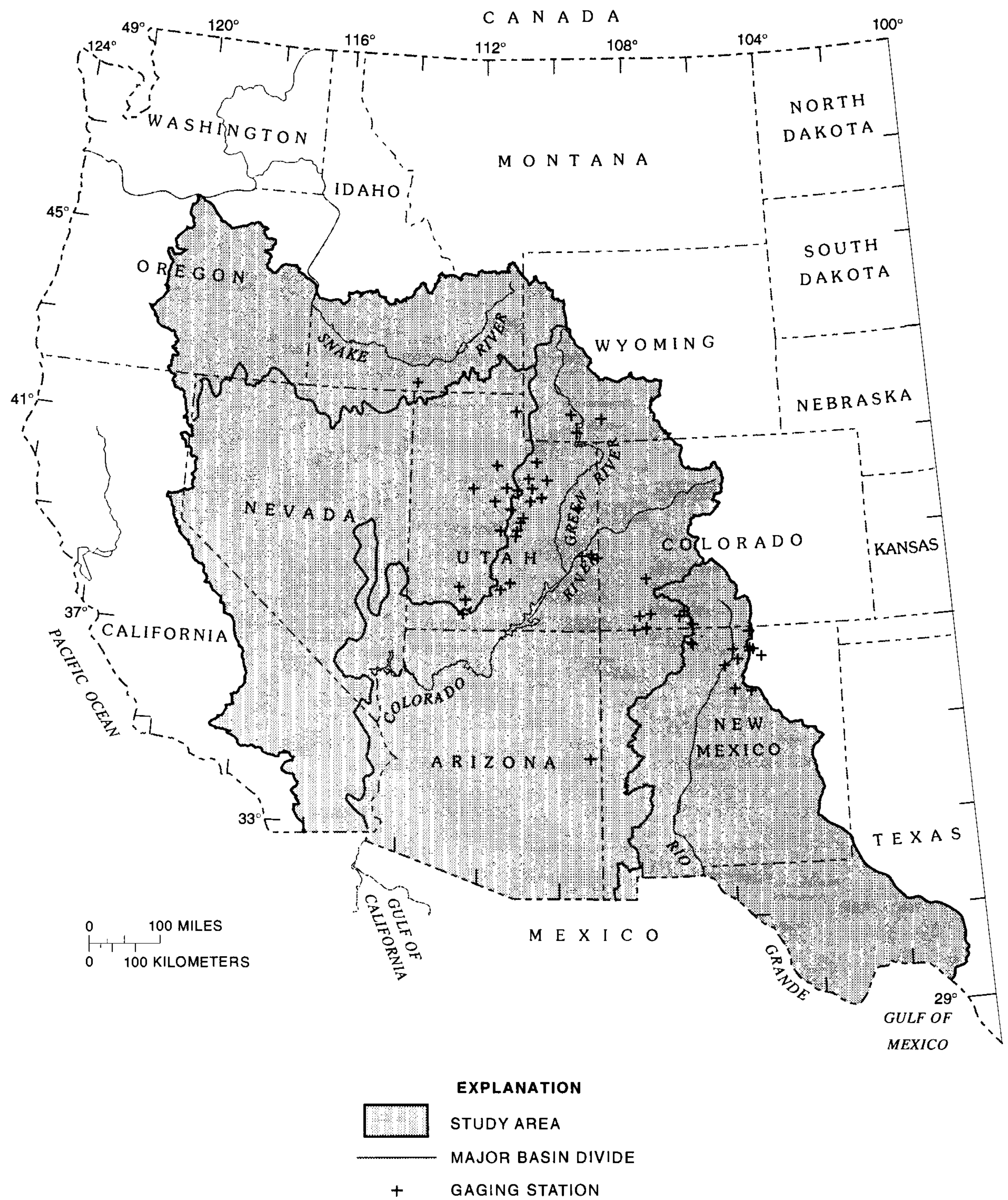


Figure 60. Gaging stations with an analysis for a mixed population of floods caused by thunderstorms and snowmelt.

nitude of estimated isolines ranged from –0.4 to 0.3, with an estimated mean skew of zero. The kriged map had a mean-square error of 0.31, and application of the kriged isoline regional skew to a regression of 100-year peak discharge in 23 regions resulted in a weighted average standard error of estimate of 0.29 log units.

An isoline map also was developed using a geographic-information system procedure. No grid was used, and the isolines were estimated from the irregularly spaced gaged-site locations using a two-variable five-step interpolation method. The magnitude of the estimated isolines ranged from –0.6 to 0.5 with an estimated mean skew of zero. The mean-square error from that map is 0.29 log units.

Geographic regions of uniform skew coefficient.—The optimum number of geographic regions with a uniform skew coefficient was determined using the following procedure. Twenty-five regions were first delineated using boundaries of drainage-basin divides and large rivers. The regions were selected on the basis of similar flood characteristics and potentially similar skew coefficients. The second step was to examine the uniformity of skew coefficient within each region. Skew coefficient was plotted against latitude and longitude, and the magnitudes and areal trends in skew coefficient were compared with adjacent regions. Several region boundaries were moved to ensure uniformity of skew coefficient within each region. These initial adjustments resulted in a reduction in the number of regions to 22.

Statistical tests were used to evaluate if the populations of skew coefficient in adjacent regions were significantly different. The mean was used as the primary measure of central tendency of skew coefficient for a region because the majority of regions have a normal distribution of skew coefficient. Thus, a *t*-test was the primary test used to evaluate the difference between means of regions. A nonparametric Mann-Whitney test was a secondary test used to evaluate the difference between medians of regions.

The two statistical tests were performed on all adjacent regions, and in all comparisons the Mann-Whitney test gave the same results as the *t*-test. If two adjacent regions did not have significantly different skew coefficients, the regions were combined. During consolidation of the regions, the new combined regions were tested against adjacent regions each time a new combined region was made. The final number of significantly different regions was nine, and the range in values of mean skew coefficient was –0.22 to 0.18.

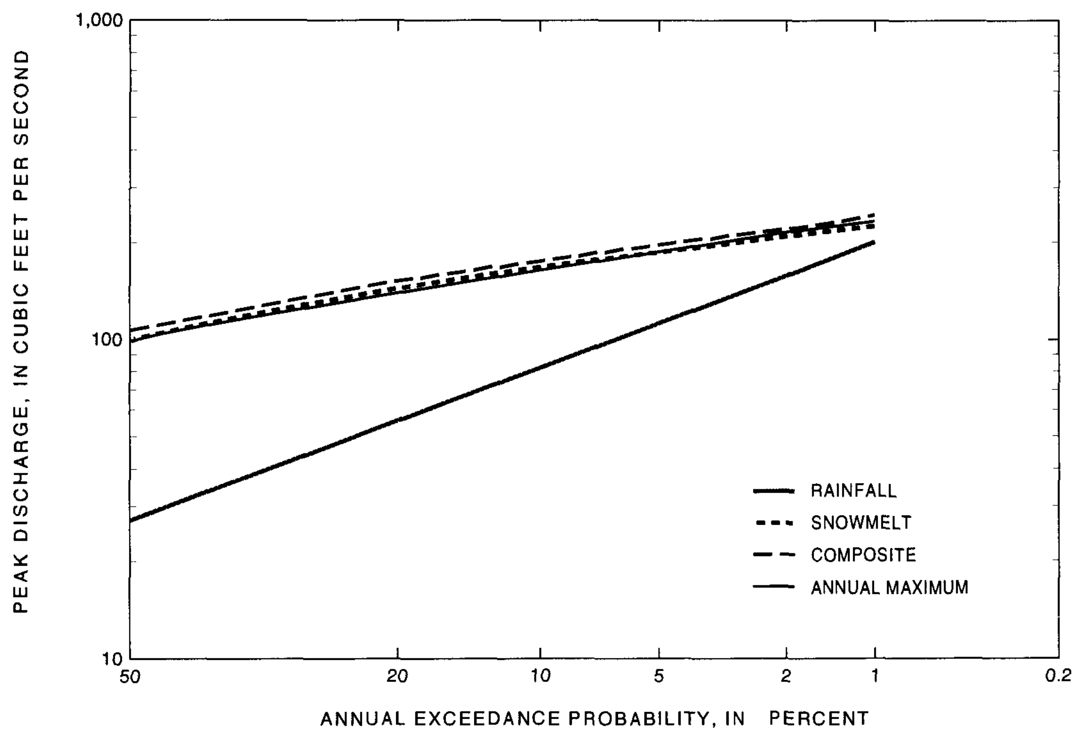


Figure 61. Flood-frequency relations for South Fork of Rock Creek near Hanna, Utah (09278000).

Regression analysis was used as a further test of significance of the regions and to estimate the mean-square errors of the uniform-region method. The nine regions were grouped into four regions of uniform skew for the regression analysis. The nine regions are needed for a geographical representation because some areas of similar skew coefficient are separated by an area of different skew coefficient and could not be combined in the two-dimensional space. The mean skew coefficients of the four regions are –0.20, –0.062, 0.078, and 0.17.

Three dummy variables were used to represent the four regions in the regression analysis. The variables were coded as follows:

Region	Variable		
	RA	RB	RC
A	1	0	0
B	0	1	0
C	0	0	1
D	0	0	0

The three dummy variables and regression constant are all significant at better than the 0.05 level. The regression equation representing the four regions has an R^2 value of 5.2 percent and a mean-square error of 0.32. Thus, the four regions only explain 5.2 percent of the variation in skew coefficient, and the mean-square error is about the same as the variance of the sample of 1,042 gaged sites, which is 0.31. The application of the four regions of uniform skew to a regression of 100-year peak discharge in 23 regions resulted in a weighted average standard error of estimate of 0.29 log units.

Relation between skew coefficient and basin and climatic characteristics.—Multiple-regression analysis was used to investigate the relation between skew coefficient and basin and climatic characteristics. Investigated characteristics were drainage area, in square miles; stream length, in miles; main channel slope, in feet per mile; mean basin elevation, in feet; site elevation, in feet; mean annual precipitation, in inches; precipitation intensity for 24 hours and 100-year recurrence interval (I24_100), in inches; and mean minimum January temperature, in degrees Fahrenheit.

The regression analysis used both log-transformed and untransformed independent variables, and generally the log-transformed values had more significant relations. Several combinations of the log of mean annual precipitation, mean basin elevation, and I24_100 are significant at better than

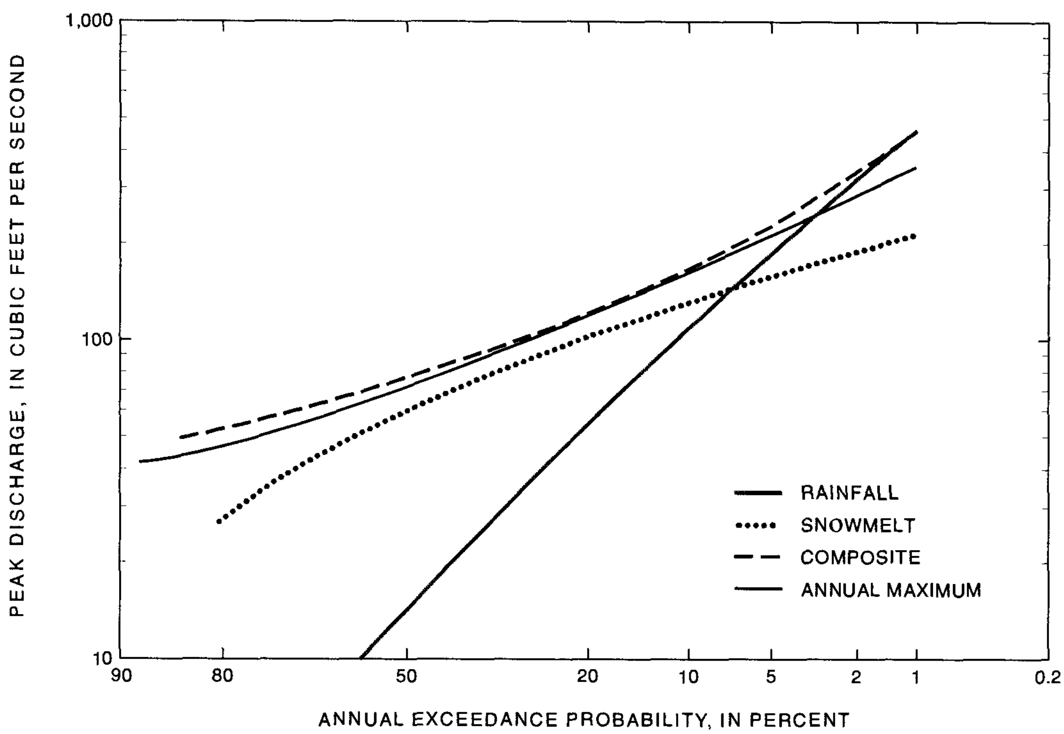


Figure 62. Flood-frequency relations for Big Creek near Randolph, Utah (10023000).

the 0.05 level. The largest R^2 value of combinations of those variables, however, is 3 percent. Thus, only 3 percent of the variation in skew coefficient can be explained by the investigated explanatory variables. The smallest mean-square error from the regression models is 0.31, which is the same value as the variance of the sample of 1,042 gaged sites. The application of the best skew-prediction equation of regional skew to a regression of 100-year peak discharge in 23 regions resulted in a weighted average standard error of estimate of 0.29 log units.

Relation between skew coefficient and basin and climatic characteristics and uniform regions.—Multiple-regression analysis was used to investigate the relations between skew coefficient, basin and climatic characteristics, and the four regions of uniform skew. The model for this evaluation was to log-transform all independent variables and to use the three dummy variables to represent the four regions of uniform skew.

The four uniform regions formed the best three-variable model with an R^2 of 5.2 percent and a mean-square error of 0.32. Adding drainage area, 24-hour precipitation intensity for 100-year recurrence interval, and stream length to the equation increases the R^2 to 6.6 and reduces the mean-square error to 0.30. Thus, the six-variable model is a small improvement over the three-variable model, but none of the models explain a sufficient portion of the variation in skew coefficient to be accurate or reliable.

Log-normal distribution.—This hypothesis is that the gaging-station records fit the log-normal distribution, and therefore, station and regional skew equal zero. Comparison to the other regional skew relations cannot be made using mean-square error because no prediction of skew is made. Also, this relation has no station skew and thus no variance of skews. One comparison can be made and that is by using the 100-year peak discharges computed from fitting the log-normal distribution to the records at each site and applying the regional regression relations for the 23 regions. This application resulted in a weighted average standard error of estimate of 0.29 log units.

Discussion.—The analysis of regional skew coefficient failed to reject the study hypothesis. The study hypothesis was that regional relations of skew coefficient cannot be defined and thus the regional skew is equal to the mean value of zero for the sample with an associated error equal to the sample variance of 0.31. Five methods were used to

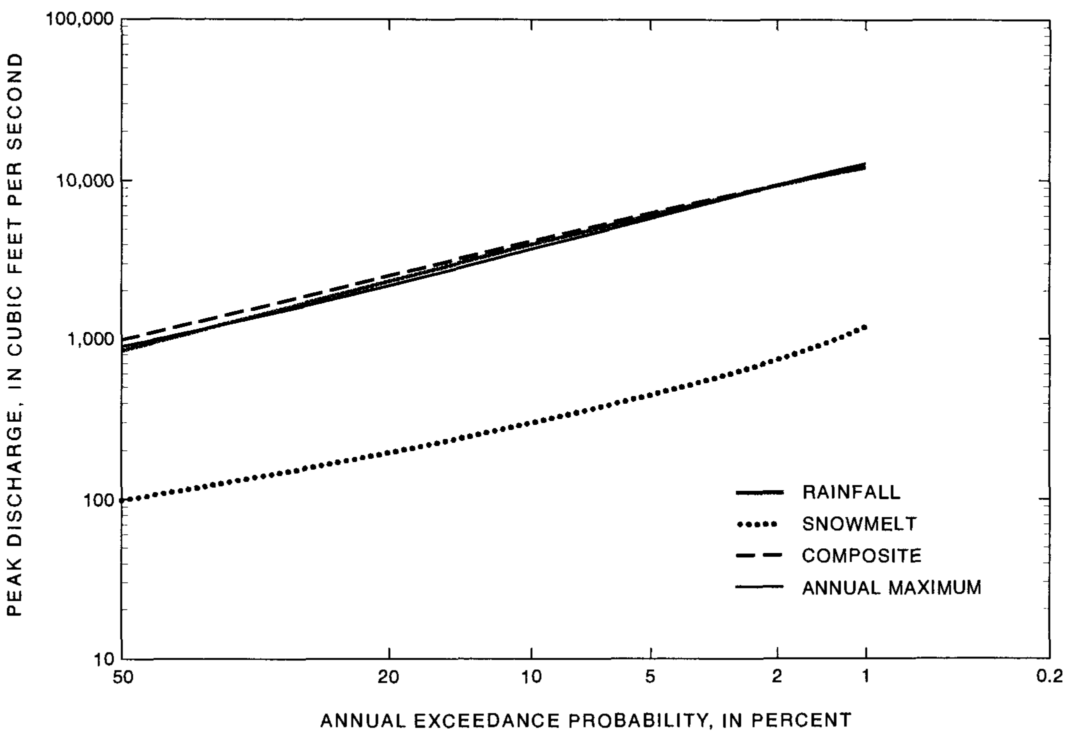


Figure 63. Flood-frequency relations for Mill Creek near Moab, Utah (09184000).

predict regional skew and to test hypothesis A—that regional relations of skew can be defined. The five methods are a published isoline map, new isoline maps, geographic regions of uniform skew, relation between skew and basin and climatic characteristics, and relation between skew and basin and climatic characteristics and geographic regions of uniform skew. These methods have mean-square errors of between 0.30 and 0.32; therefore, they all failed to improve on the mean skew of zero for the sample. The second test of applying the predicted regional skews to a regional regression of 100-year peak discharge also showed that the prediction methods offer no improvement in accuracy compared with using a mean regional skew of zero. The weighted average standard errors of estimate from the regression analyses were 0.29 log units for the study hypothesis and all the predicted regional skews.

Results of the analyses support the study hypothesis that the regional skew is zero for the study area. The methods and results, however, did not provide conclusive evidence that hypothesis B is more or less accurate than the study hypothesis. Hypothesis B is that the gaging-station records fit the log-normal distribution, and, therefore, station and regional skew equal zero. Application of hypothesis B to prediction of regional 100-year peak discharges had the same average accuracy (weighted average standard error of estimate of 0.29) as the other regional skews. This similarity in accuracy does provide some evidence that many of the sites in the study area may have a log-normal distribution of annual peak discharges. However, classification of all sites as having a log-normal distribution cannot be made because many sites with long records have a clearly skewed distribution of the peaks plotted on log-normal probability paper. Characteristics of basin soils, storage capacity of the basin, stream-channel size, and flood-plain width may cause a skewed distribution by having different effects on peak discharge, depending on the magnitude and frequency of the discharge. In addition, some samples of mixed populations of floods also may cause a skewed distribution.

The regional skew coefficient used in this study was zero with an associated mean-square error equal to the sample variance of 0.31. The weighted skew coefficients for station flood-frequency relations computed with this regional skew thus allow individual variations in skew according to the mean-square error of the station record and the regional skew. Although this study did not prove that the log-normal distribution is applicable to many sites in the southwestern United States, the study results do justify further investigation of this hypothesis.

Summary of Analyses

Flood-frequency analyses were made of records at 1,323 gaging stations. The reliability of station flood-frequency relations was assessed by visual examination of how well the computed relations fit the plotted peak discharges, the presence or absence of outliers, and the shape exhibited by the plotted peaks. This examination resulted in defining flood-frequency relations at 1,059 gaged sites. The remaining 264 undefined sites were classified as having unreliable relations because of extremely poor fits of the computed relations to the peak-discharge data. The sites may have inadequate samples to define a relation or a non-LPIII distribution.

Sites with defined flood-frequency relations were classified as having plots of data that exhibit certain characteristics (table 23). Some sites have more than one characteristic. The expected smooth shape of an LPIII distribution was found at 38 percent of the sites. At 48 percent of the sites, a low-discharge threshold was used to truncate peaks identified as low outliers and a conditional-probability adjustment was used to compute the flood-frequency relation. High outliers were identified at 17 percent of the sites. Historical periods were used to extend the period of record at 12 percent of all sites. A jump or dogleg in the plotted peaks was identified at 16 percent of the sites, and no adjustments were made to the frequency relations for these departures from the expected smooth shape.

The percentage of sites with plots of data that departed from the expected smooth shape was compared with incremental classes of some basin and climatic characteristics (table 24). Generally, the departures were not related to basin and climatic characteristics of the gaged sites. The few significant relations were that (1) low-discharge thresholds increased in more arid areas, (2) doglegs increased as drainage area increased, and (3) jumps decreased as mean annual precipitation increased.

An analysis was made of the mixed population of annual peaks caused by snowmelt and summer thunderstorms. A small sample of 51 gaging-station records was selected at sites expected to have a potential difference in flood-frequency relations computed from the mixed population and computed by separating the peaks, computing separate relations, and combining the relations into a composite relation. The average ratio of composite 100-year peak-discharge relation to mixed relation for the 51 sites was 1.08. That difference is considered small because of all the uncertainties inherent in flood-frequency analysis. Thus, the flood-frequency relations computed from the mixed populations apparently are adequate and no adjustments were made for this condition.

An analysis of regional skew coefficient was made for the study area. The methods of attempting to define a regional skew by spatial variation or by regression with basin and climatic characteristics all failed to improve on a uniform value of zero for the study area. The regional skew used in the study, therefore, was a value of zero, which was the mean of all the station skews analyzed with an associated error equal to the sample variance of 0.31 log units.

REGIONAL ANALYSIS

Multiple-regression analysis was used to relate flood-frequency relations that could be determined at gaged sites to basin and climatic characteristics. Ordinary least-squares (OLS) and generalized least-squares (GLS) regression analyses were used. A hybrid analysis (Hjalmarson and Thomas, 1992) of the station-year method and multiple regression developed during this study also was applied and used for areas where the standard multiple-regression method was judged to be inadequate. The final regional flood-frequency relations were defined for 12 regions (Regions 1–5, 7–9, 12–15) using GLS regression and for four regions (Regions 6, 10, 11, 16) using hybrid analysis. All 12 regions with GLS relations had less than 20 percent of their gaging stations with undefined flood-frequency relations, and all 4 regions with hybrid relations had more than 30 percent undefined station relations. Results of these analyses are the regional equations for estimating flood-frequency relations at ungaged sites (tables 5–20).

Multiple Regression

The multiple-regression analysis consisted of an investigation of geographic variation of flood magnitudes, different forms of models, and the significance of available explanatory variables. The geographic variation of flood characteristics is not linear or consistent. Incorporation of geographic variables into the regression equations, therefore, is not practical, and the study area was divided into geographic regions of similar flood characteristics. The objective was to obtain the smallest number of geographic regions with predictive equations that are accurate, physically reasonable, and efficient for the user.

OLS and GLS regression analyses were used in this study. OLS analysis was used for preliminary analyses of delineation of flood regions, investigation of models, and selection of significant explanatory variables. GLS analysis was used for refinement and to compute the final regression models.

GLS regression is considered to be a more appropriate method for developing regional regression models of streamflow characteristics than is OLS regression (Stedinger and Tasker, 1985). Regional regression models of streamflow characteristics, such as flood-frequency relations, are commonly developed by regressing gaged-site flood-frequency relations on basin and climatic characteristics. Using flood-frequency relations at gaged sites as a response variable may violate two assumptions of OLS regression. Those assumptions are (1) that the response variable at each site is independent and (2) that it has equal variance. Peak discharges for nearby watersheds may be correlated as a result of similar climatic events. Streamflow records have different lengths and at-site variability, and therefore the computed flood-frequency relations have unequal variances. GLS takes into account the possible cross correlation and unequal variance of flood-frequency estimates at gaged sites.

Models Investigated

Several model forms were investigated. The objective was to find the model form that has the best fit for the relations of flood characteristics compared with basin and climatic characteristics. The model should be intrinsically linear in order to perform standard linear-regression techniques. Many previous studies have shown that the multiplicative model (all variables are log-transformed) is applicable to regional flood-frequency studies. When the response and explanatory variables are log-transformed, the resulting model commonly is linear. That model was used as the base method, and other models were investigated and evaluated. Polynomial models were tested, dummy variables were used, and various transformations of the explanatory and response variables such as reciprocals, interaction terms, and fractional exponents (Draper and Smith, 1981, p. 218–225) were tested.

Explanatory Variables Investigated

Nineteen explanatory variables were investigated as possible predictors of T-year discharges. The following list shows the variables, units of measurement, and number of sites with the variable measured:

1. Drainage area, in square miles (1,059);
2. Main channel slope, in feet per mile (1,027);
3. Main channel length, in miles (1,018);
4. Mean basin elevation, in feet above sea level (1,031);
5. Elevation of gage datum, in feet above sea level (963);
6. Forested area, in percent (1,010);
7. Latitude of gaged site, in decimal degrees (1,059);
8. Longitude of gaged site, in decimal degrees (1,059);
9. Mean annual precipitation, in inches (1,020);
10. 100-year 24-hour maximum precipitation, in inches (1,043);
11. Mean annual free water-surface evaporation, in inches (1,054);
12. Distance from major moisture source, Gulf of Mexico, in hundreds of miles (1,059);
13. Distance from major moisture source, Gulf of California, in hundreds of miles (1,059);
14. Relation of gaged site to major orographic barriers, attribute dimensionless (1,059);
15. Basin shape, length squared divided by drainage area, dimensionless (1,018);
16. Potential vegetation at gaged site, in discrete units (1,059);
17. Field-measured channel geometry, active channel width, in feet (59);
18. Channel slope of lower one-third stream length, in feet per mile (142);
19. Isoerodent factor, dimensionless (220).

Variables 1–8, 15, and 18 were determined from the largest scale topographic maps available. Mean annual precipitation was determined from maps of mean annual precipitation for each State published by several different sources (see p. 16). The distance from major moisture sources was determined by measuring the distance from gaged sites to points selected near the Texas coast for the Gulf of Mexico (28° latitude, 97° longitude) and in the northern part of the Gulf of California (29° latitude, 113° longitude). The 100-year 24-hour maximum precipitation (Miller and others, 1973a–i), mean annual free water-surface evaporation (Farnsworth and others, 1982), and relation to orographic barriers were determined at gaged sites using geographic-information-systems techniques.

The relation of gaged site to major orographic barriers was determined in several steps. First, the major orographic barriers were selected and outlined on a map of the study area. Such barriers include the Sierra-Cascade Mountains of eastern California and the mountains of central Arizona. Windward and leeward sides of the barriers were delineated on the basis of dominant directions of moisture or storm movement. The sites on the windward side were assigned positive numbers, and sites on the leeward side were assigned negative numbers. A scale of −3 to +3 was used. The largest numbers were assigned to the highest and most continuous barriers. The angle of moisture movement also was factored in; right angles received larger numbers and obtuse angles received smaller numbers.

A map of potential natural vegetation (Kuchler, 1964) was examined for possible use as an explanatory variable in the study area. The locations of the 1,059 gaged sites were plotted on the map. The types of vegetation were grouped into two major classes: (1) forests and dense shrubs and (2) shrubs and grasslands. Differences of the standardized values of the 100-year peak discharge ($Q_{100}/\text{AREA}^{0.5}$) for the two general vegetation types at the gaging stations were examined visually and using statistical tests of subsamples.

A partial sample of 59 field measurements of channel geometry was obtained from Hedman and Osterkamp (1982). The channel slope of the lower one-third stream length was measured from the largest scale topographic map available for 26 gaged sites with drainage areas ranging from 0.5 to 1,700 mi^2 in southern Arizona. The same variable was measured for an additional 116 sites with a drainage area of greater than 200 mi^2 throughout the study area. An isoerodent factor (Fletcher and others, 1977) was determined for 220 gaged sites in New Mexico using a geographic-information-systems technique.

Results

Flood regions.—A single regression equation for the entire study area does not adequately explain the variation in flood characteristics. The OLS standard errors of estimate for *T*-year discharges were more than 100 percent for all attempted single models. In addition, except for a high-elevation region, a single relation for a stratum of an explanatory variable was not found. The study area, therefore, was divided into 16 flood regions, and separate regression equations were developed for each region. Use of the 16 flood regions removes some of the variation in the system not explained by available explanatory variables and thus makes the subsequent equations simpler. The flood regions were delineated on the basis of general magnitudes of floods, the meteorologic cause of floods (snowmelt, summer thunderstorms, or cyclonic rainfall), elevation of the sites, and geographic patterns in residuals from the regression analysis. No obvious, consistent geographic patterns in residuals were found; therefore, an explanatory variable could not be developed that could explain the study-wide geographic variation. Geographic clusters of residuals from study-wide regressions were used to help delineate boundaries of the regions.

The first stratification was into High-Elevation Region 1, which occurs throughout the entire study area. Sixteen percent of the gaged sites were placed in this region. A regression of 100-year peak discharge on drainage area was made for all sites in the study area, and 90 percent of the residuals for the high-elevation sites were negative. High-Elevation Region 1 is dominated by floods caused by snowmelt (table 4). Thunderstorms occur in this region, although large floods caused by thunderstorms are rare. The lower boundary of the high-elevation region coincides with the estimated elevation threshold for large floods caused by thunderstorms (fig. 5). To determine if a study site fits in this region, the elevation of the study site is used—not the mean basin elevation. The elevation threshold remains constant at 7,500 ft for all sites south of 41° latitude, and the threshold decreases north of that latitude. North of 41° latitude, the threshold is approximately a flat plane that slopes about 300 ft for each increment of 1° of latitude.

The second stratification of data was into 15 geographic low- to middle-elevation flood regions where the elevations of the gaged sites are below the boundary of High-Elevation Region 1. The boundaries of these regions are based mainly on drainage divides.

Models.—The model that best describes most regional flood-frequency relations for this study is the multiplicative model (equations 3*A*, 3*B*), where all variables are log-transformed. The most significant explanatory variable is drainage area, and in most flood regions the log of drainage area is linearly related to the log of the *T*-year discharge. In two flood regions (Regions 12 and 13), however, a plot of log *T*-year peak discharge and log of drainage area indicates a slightly curvilinear relation. Eychaner (1984) found this relation for a region in southern Arizona and fit the data using a second-order polynomial described by the following equation:

$$\log Q_T = a + b_1 \log \text{AREA} + b_2 (\log \text{AREA})^2, \quad (9)$$

where

Q_T = peak discharge, in cubic feet per second, for *T*-year recurrence interval;

AREA = drainage area, in square miles; and

a, b_1, and b_2 = regression coefficients.

This model fits the two regions with curvilinear relations in this study. Tasker and others (1986), however, used a transformation other than logs to account for the nonlinearity for the same data as Eychaner (1984). The transformation consisted of raising drainage area to a negative fractional power. The equation used in Tasker and others (1986, p. 112) is shown as equation 4*B* in this report and is repeated here for just one explanatory variable:

$$\log Q_T = a + b\text{AREA}^x.$$

The model suggested by Tasker and others (1986) was used in this study to fit the nonlinear relations for T-year discharge and drainage area in the two flood regions. The equations were fit by iteratively selecting an exponent for drainage area, performing a regression analysis with log-transformations for all other variables, and comparing the standard error of estimate and plotting until the plot appeared linear. Illustrations of the two models and how they fit the data in the Southern Arizona Region 13 are shown in figures 64 (equation 9) and 65 (equation 4*B*).

A third model (equations 5*A*, 5*B*) was used in the Southeast Region 16. In Southeast Region 16, drainage area and mean annual evaporation are significant explanatory variables using equation 3*A*. The plot of log Q_T and logAREA appears linear. A plot of the residuals from that relation and the log of mean annual evaporation, however, exhibits a slight curvilinear relation with more curvature and smaller residuals for large values of mean annual evaporation. In addition, the sample of gaged sites in the region has few sites with small drainage areas and large values of mean annual evaporation. To account for the apparent curvilinear relation of the residual from the Q_T and drainage-area relation and the poor definition of the relation for small drainage areas with large mean annual evaporation, equation 5*B* was fit to the data:

$$\log Q_T = \log a + b\log \text{AREA} + c\log(\text{EVAP}-d).$$

This relation has the best fit for larger values of AREA and smaller values of EVAP. For large values of EVAP, the relation is an average of the relation between $\log Q_T$ and logAREA and the nonlinear relation between $\log Q_T$ and logAREA and logEVAP. Averaging where EVAP is large produced the most reliable overall relation; the distribution of residuals about the relation is more random in appearance and homoscedastic.

Significance of explanatory variables.—The explanatory variables used in the predictive equations for the 16 flood regions are drainage area, mean basin elevation, mean annual precipitation, mean annual evaporation, latitude, and longitude. In the study area, the ranges for these variables are drainage area, 0.01 to 1,990 mi^2; mean basin elevation, 350 to 12,000 ft; mean annual precipitation, 2 to 68 in.; mean annual evaporation, 29 to 100 in.; latitude, 29 to 45°; and longitude, 100 to 121°. The range of values for explanatory variables in each of the 16 flood regions is shown in the plots of explanatory variables used in the 16 sets of regional flood-frequency relations. The figure numbers of these plots are referenced in column 6 of table 4. The range of values in a region can be large or quite small depending on the available data. For example, the range of drainage area for gaging stations in Region 7 is about 6 to 350 mi^2, and the range of drainage area in Region 12 is about 0.1 to 1,500 mi^2.

All the explanatory variables investigated in this study except potential vegetation were significantly related to T-year discharge in regressions for the entire study area. Only six variables were used in the regional regression equations because either the other variables were correlated to those six variables or the other variables were not significant in the reduced variability within the 16 individual flood regions.

The explanatory variables that were measured for at least 90 percent of the gaged sites were investigated as possible predictors of T-year discharges in all 16 flood regions. These 15 variables are numbered 1 to 15 on page 88. Routines, such as all possible regressions and stepwise regressions, were used to select the best possible models for each region. Drainage area was always the most significant variable and the first variable selected in all models. Multiple-variable models were used only if the second or third variable reduced the standard error of prediction by at least 5 percent and the coefficients of the additional variables were reasonable (that is, the sign and magnitude matched the conceptual model of flood characteristics).

Potential natural vegetation (Kuchler, 1964) was not included in the regression analysis because an initial investigation showed it had no significant relation to flood characteristics. The variable was examined by plotting the gaged-site locations on a map of the study area and grouping the vegetation into two major classes. Differences of the standardized values of the 100-year peak discharge (Q_{100}/AREA$^{0.5}$) for the two general vegetation types at the gaging stations were examined visually and using statistical tests of subsamples. The coefficient of variation was nearly 1 for the standardized flood values, and no difference between the mean of the standardized flood values for the two general types of potential vegetation was detected at the 5-percent significance level (α<0.05).

Potential natural vegetation at a gaged site as an explanatory variable has limited application for regional flood-frequency analysis. For large basins, the vegetation at the gaged site may be much different from the vegetation in the basin. Because the basin boundaries for the gaging stations have not been digitized, a comprehensive examination of vegetation as an explanatory variable was not made.

Three additional explanatory variables that were measured for only a small sample of the gaged sites were field-measured channel geometry, channel slope of lower one-third stream length, and the isoerodent factor (items 17–19, p. 88). A sample of 59 field measurements of channel geometry was obtained from a published report (Hedman and Osterkamp, 1982). Previous studies indicated that field measurements of channel geometry are effective predictors of flood characteristics (Wahl, 1984). Although field measurement of channel geometry is a valid method, it was rejected as an explanatory variable for this study. Regression analyses of the sample of gaged sites indicated that adding a channel-geometry variable to regression equations with basin characteristics did not significantly improve the accuracy of the estimating equations. Other reasons for rejecting channel geometry are the requirement of field visits, the required field training, and a question of stationarity at some sites.

The channel slope of the lower one-third stream length was examined for 26 gaged sites with drainage areas ranging from 0.5 to 1,700 mi^2 in southern Arizona and for an additional 116 sites with a drainage area of greater than 200 mi^2 throughout the study area. Attenuation of peak discharge was previously estimated for streams in southern Arizona by Eychaner (1984, p. 39), who recognized the difficulty of quantifying attenuation. The channel slope of the lower one-third stream length can be consistently measured, and this variable could be a measure of the lateral spreading and attenuation of peak discharge. A significant relation ($\alpha<0.05$) between T-year discharges and slope of the lower one-third of the stream channel was found for the sample of streams in southern Arizona ($n=26$), where attenuation of peak discharges has been observed at many sites. The estimation of T-year discharge, however, was not improved using the lower one-third slope variable for a sample of sites with large drainage areas ($n=116$) for much of the study area. The relation for the streams in southern Arizona may have been significant because of the influence of other factors, such as reduced tributary inflow from distributary-flow areas that are common in southern Arizona. Because there was no improvement in regression relations for the sample of sites with large drainage basins, this variable was not determined for all the sites in the study area.

The isoerodent factor that was determined for 220 sites in New Mexico was a significant explanatory variable in a nationwide flood study by Fletcher and others (1977). That factor was rejected in this study because it is highly correlated with the T-year maximum precipitation intensity. The 100-year 24-hour maximum precipitation is considered a more reliable variable than the isoerodent factor. The 100-year 24-hour maximum precipitation factor was determined for all sites in the study area. In addition, the isoerodent factor is not an accurate indicator of flood characteristics in middle- to high-elevation areas. In middle- to high-elevation areas, the isoerodent factor increases as the magnitude of peak discharge decreases.

Regression relations.—Study-wide relations of flood characteristics are discussed in this section. Two correlation matrices were computed for low- to middle-elevation sites and for high-elevation sites (table 27). The correlation matrices show the degree of correlation between all pairs of explanatory variables that were determined for more than 90 percent of the sites and between the 100-year peak discharge and each of the explanatory variables. The coefficients reflect the degree of correlation between pairs of variables but do not take into account the fact that other variables can affect the simple two-way correlation.

Some important information contained in the correlation matrices is the degree of correlation between explanatory variables. Using highly correlated variables in a regression relation can cause multicollinearity, which can cause unrealistic and unstable regression coefficients. Highly correlated explanatory variables ($r>0.7$), therefore, should not be used in the same regression equation. The selection of which correlated variable to use in a predictive equation in this study was based on the regression error associated with the variable and the relative ease of determining the particular variable.

To obtain a general picture of the relative importance of the explanatory variables in the study area, a stepwise regression was performed on all sites in the low- to middle-elevation group for the 10- and 100-year peak discharges (table 28). The stepwise regression was based on an F-statistic criterion (F>4) in which each variable is added according to the largest partial correlation, and variables already in the equation can be removed (Minitab, 1988, p. 121–127). All variables shown in table 28 are significant at better than the 5-percent significance level. A stepwise regression also was developed for the high-elevation region, and drainage area and mean annual precipitation were the most significant variables for this region (table 5). For the 100-year peak discharge in the low- to middle-elevation regions, the most significant explanatory variables in order of importance were drainage area, latitude, orographic influence, mean basin elevation, basin shape, precipitation intensity, mean annual precipitation, and distance from the Gulf of Mexico. The 10-year peak-discharge relation is similar to the 100-year relation in the significant variables and the order of importance of variables.

An example of two highly correlated variables is latitude and mean annual evaporation, where latitude appears in the study-wide stepwise regression and mean annual evaporation appears in regional relations for two flood regions. The correlation coefficient between those variables is –0.82. In the flood regions where flood characteristics are more homogeneous and relations are more reliable, mean annual evaporation is a better predictor of T-year discharge than latitude.

The magnitude and signs of the coefficients of the explanatory variables in the study-wide relations provide some information about the study area (table 28). The coefficient or exponent for drainage area averages about 0.6. The coefficient for latitude is negative, which indicates that peak discharges decrease in magnitude in a northward direction. Orographic influence is significant, and that influence is incorporated in the geographic boundaries of the 15 low- to middle-elevation flood regions. The coefficient for mean basin elevation is negative, which indicates that peak discharges decrease in magnitude as elevation increases. The coefficient for distance from the Gulf of Mexico is negative, which indicates decreased peak discharge with increased distance. Basin shape and precipitation intensity (24-hour 100-year recurrence interval) coefficients have positive signs, which indicate increased discharge with increased magnitude of these variables.

Mean annual precipitation was one of the least significant variables in the 100-year discharge equation for the entire low- to middle-elevation study area (table 28). The negative coefficient for mean annual precipitation does not agree with the positive coefficients determined for Regions 1 and 3 (tables 5, 7). This disagreement shows one of the limitations in attempting to define a single peak-discharge relation for a heterogeneous area such as the arid southwestern United States.

The flood regions have vastly different flood characteristics. Some similarities are apparent, however, when the regions are grouped into areas on the basis of latitude. The relations between 100-year peak discharge and drainage area were compared for three groups of regions (fig. 66). The northern regions (2–4) have an average regression constant of 61 and an average exponent for drainage area of 0.69. The middle regions (5–9, 15) have an average regression constant of 400 and an average exponent for drainage area of 0.45. The southern regions (10–14, 16) have an average regression constant of 970 and an average exponent for drainage area of 0.54.

The 100-year peak-discharge relations for the northern regions have a small variability among regions, small peak discharges for small drainage areas, and a generally steep slope of the relations (fig. 66). The relations for the middle regions have a large variability among regions, moderate magnitude peak discharges for small drainage areas, and a moderate slope of the relations. The magnitude of peak discharges estimated for large drainage areas is similar for the northern and middle regions. The relations for the southern regions have a moderate variability among regions, consistently large peak discharges for all size drainage areas, and a moderate slope of the relations.

Stratification of the data into increments of explanatory variables was evaluated. The final flood regions and models are stratified by elevation, where all sites above a specified elevation are placed into a single high-elevation flood region. The remaining low- to middle-elevation sites are placed into 15 geographic regions. A stratification based on drainage area was tested. In each flood region, sites were placed into two groups depending on whether drainage area was less than or greater than 50 mi^2. A multiple-regression analysis was performed on each group, and the results were compared with the relations for nonstratified sites. The standard errors and regression coefficients for the unstratified and stratified samples were about the same. There tended to be larger standard errors for the small drainage-area group and smaller standard errors for the large drainage-area group, but the differences in errors were small. Significant improvement in regression relations, however, was not made with the drainage-area stratification.

A total of 41 gaging stations were considered to have flood-frequency relations that were regional outliers in the regression analyses. The stations were deleted from the computation of the final GLS regression relations. The outliers are 5 percent of the total stations in the 12 flood regions for which GLS regression equations were derived. One region—Western Colorado Region 9—had 14 percent, two regions had about 7 percent, and the remaining regions had less than 5 percent of the stations deleted. The stations were deleted on the basis of visual examination of the plots of residuals. About two-thirds of the outliers were more than two standard deviations from the mean of the residuals.

Because of their extreme values in a sample, outliers can cause spurious correlations, mask legitimate correlations, or add important information to the sample. Therefore, the change in regression relations caused by deleting outliers needs to be examined. The deletion of outliers in this study caused an average decrease of about 15 percent in the prediction errors for the 100-year peak-discharge equations—a significant improvement in accuracy. The deletion of outliers caused small changes in the regression exponent for drainage area. For the 100-year peak-discharge equations, the average change in the exponent for drainage

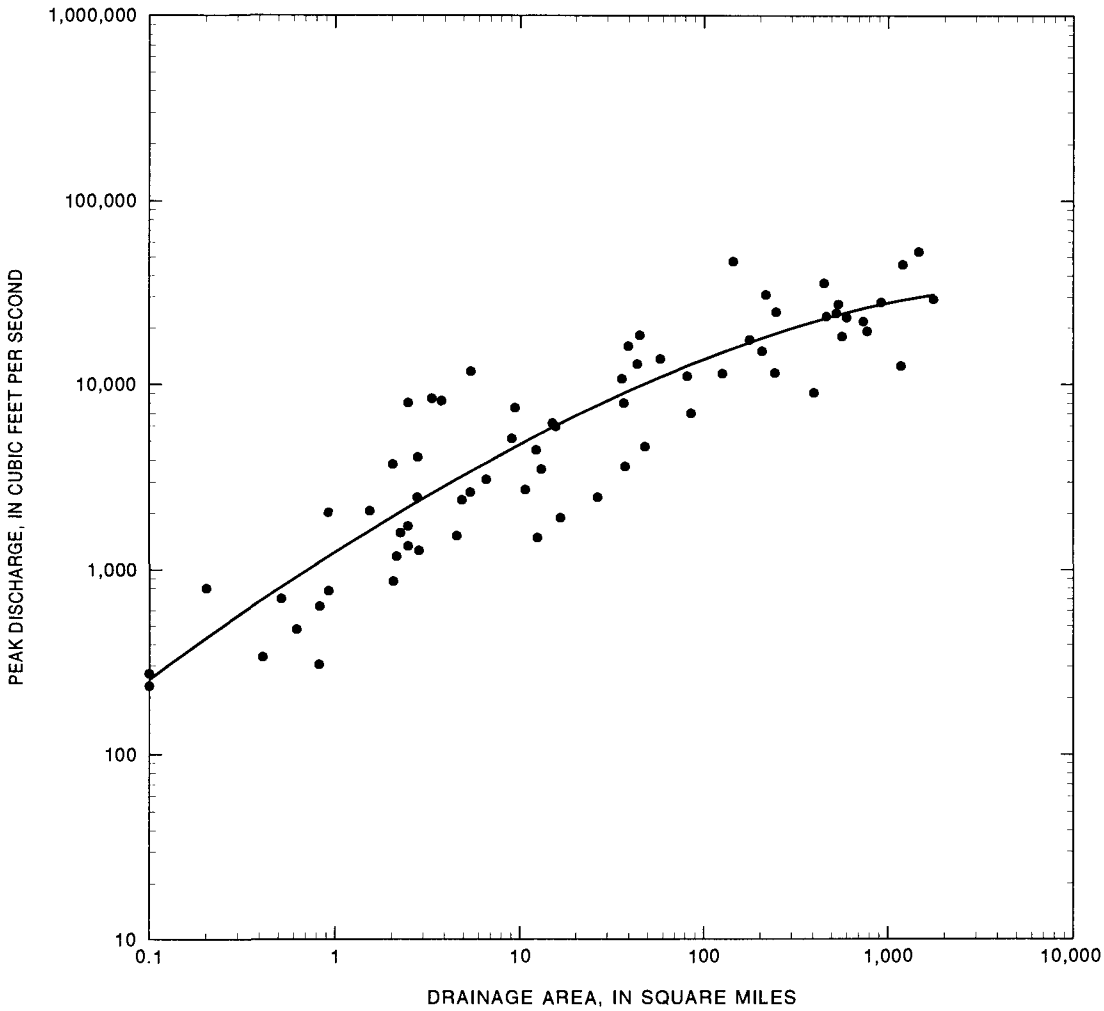


Figure 64. Relation between 100-year peak discharge and drainage area for Southern Arizona Region 13.

area was about 6 percent. The deletion of outliers had a larger effect on the second variable in the 100-year peak-discharge equations, where the average change in exponent was about 20 percent. This change matched the conceptual model for that variable in all the regions, and in 70 percent of the regions, the second explanatory variable became more significant when the outliers were deleted.

Many of the outlier stations have basin or stream-channel characteristics that are not defined by available explanatory variables and that do not fit the population of streams represented by the majority of the sample of stations. These characteristics, such as basins with large areas of permeable rocks or distributary flow or stream channels that cause a large quantity of floodflow attentuation, were described in the section entitled "Excluded Streams and Distributary-Flow Areas." The regional models used in this study may not apply to streams with such characteristics.

Accuracy and split-sample analysis.—The accuracy of the GLS regression models was determined by the average standard error of prediction, which is a measure of how well regression models estimate the response variable at the calibration sites (tables 5–20). The process of determining the best regression equation is often called calibration. Another method of assessing accuracy that was

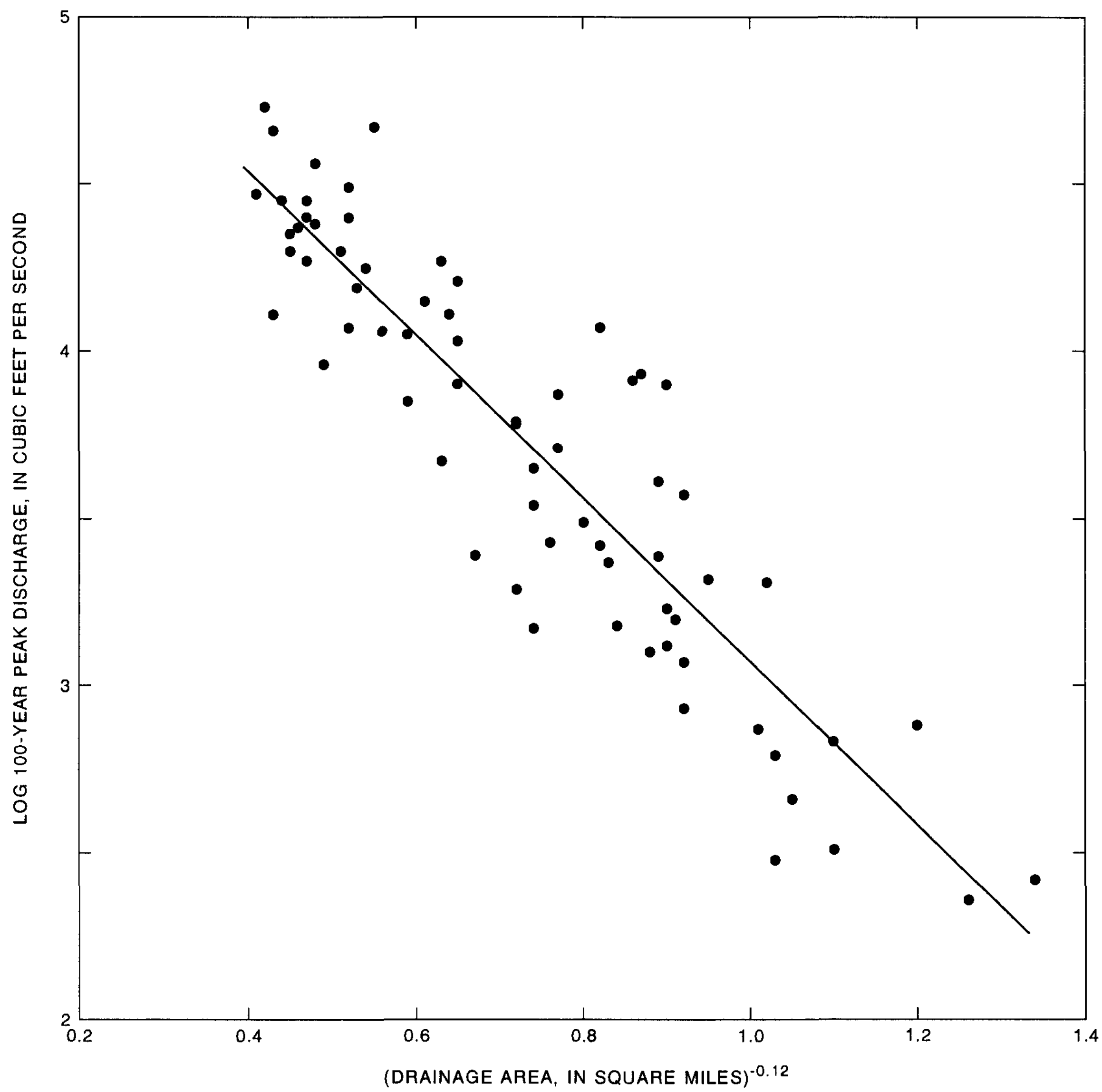


Figure 65. Relation between logarithm of 100-year peak discharge and drainage area for Southern Arizona Region 13.

used in this study was to estimate the prediction error using a split-sample technique, which is a measure of how well regression models estimate the response variable at sites other than calibration sites.

When a split-sample analysis is used to estimate prediction error, the data are split into two parts; one part is used to calibrate a new predictive model, and the other part is used to evaluate or validate the new model's performance. The new calibrated model is applied to the validation data set to estimate the average prediction error and to evaluate the significance of the explanatory variables. If the sample contains a wide range and even distribution of the explanatory variables and the new model is well calibrated, the explanatory variables that were significant in the original model will be significant in the split-sample analysis.

A split-sample analysis was made for the predictive equations for the 12 flood regions with GLS regional equations (table 29). For each region, the gaging-station records were divided into one group with two-thirds of the data used for calibration of a new model. The second group with the remaining one-third of the data was used for validation and estimation of prediction error. The stations were ordered by station number and assigned alternately to each group. This procedure resulted in the calibration group and validation group having similar basin and climatic characteristics.

The new regression models developed for the split-sample analysis had coefficients that were very similar to the original models (tables 5–20). In a few of the new models, some of the explanatory variables were not significant at the 5-percent level; however, to estimate prediction error, all new models used the same explanatory variables as the original models.

Most split-sample prediction errors are larger than the corresponding GLS prediction errors. Split-sample prediction errors estimated for Regions 3, 5, 7, 9, 14, and 15 are questionable because of the small sample size: less than 15 stations had data for error estimation. For example, the average computed split-sample prediction error for the six recurrence-interval peak discharges is smaller than the average GLS prediction error in Regions 3 and 14. The average split-sample prediction error for the six regions with more than 20 stations for error estimation is about 8 percent larger than the average GLS prediction error.

In addition to the split-sample analysis, another method was used to assess the accuracy or validity of the regression relations of 100-year peak discharges for the 16 flood regions. Design-probability theory (Riggs, 1968, p. 13) was used to compare the computed 100-year relations to the plotted maximum peak discharges of record (figs. 19, 21, 23, 25, 28, 30, 32, 34, 36, 37, 39, 41, 42, 44, 47, and 49). Using the average length of independent station records in a region, the percentage of stations that should not have a 100-year peak discharge can be estimated. For example, design probability indicates that for a number of independent 20-year records about 82 percent should not have a 100-year peak discharge. For all the flood regions, the number of annual maximum peak discharges that plotted below the relation for the 100-year flood closely agreed with the number expected from the design-probability method.

Hybrid Method

The hybrid method was developed as part of this study to define regional flood-frequency relations for Regions 6, 10, 11, and 16, where many of the station flood-frequency relations appear unreliable. Flood-frequency relations could not be determined for more than 30 percent of the gaging stations in those regions because there were too few years with flow or the plot of the series of annual peaks could not be reliably fit by a LPIII probability distribution. The plots of the annual series of peaks frequently do not appear to define a smooth curve, and no basis exists for using a LPIII distribution or any other three-parameter relation to estimate the flood-frequency characteristics at these stations.

The hybrid method combines all the records of annual peaks at all the gaging stations in a region as in the station-year approach (Fuller, 1914) to produce regional flood-frequency relations. The station-year method is based on the assumption that independent records of annual peak discharge from a region can be combined to form one long composite record if the peaks of the individual records can be reduced to a common base. In previous applications of a station-year approach (Carrigan, 1971; Wahl, 1982), annual flood records were reduced to a common base by dividing each peak from a particular record by the mean of that record. The standardized peaks are assumed to be from the same flood population

Table 27. Correlation matrix with 100-year peak discharge and explanatory variables for the southwestern United States

[Variables: All variables are log-transformed except ORG, which is an integer attribute ranging from –3 to +3. Q_{100}, 100-year peak discharge, in cubic feet per second; AREA, drainage area, in square miles; SLOPE, main channel slope, in feet per mile; ELEV, mean basin elevation, in feet above sea level; PREC, mean annual precipitation, in inches; INT, 100-year 24-hour maximum precipitation, in inches; ORG, an integer attribute representing orographic influence, –3 to +3; SHAPE, length squared divided by area, dimensionless; LONG, longitude, in decimal degrees; FORS, forested area, in percent; EVAP, mean annual free water-surface evaporation, in inches; LAT, latitude, in decimal degrees; DGOC, distance from Gulf of California, in hundreds of miles; DGOM, distance from Gulf of Mexico, in hundreds of miles; LENG, stream length, in miles; and DATUM, site elevation, in feet above sea level]

	Q100	AREA	SLOPE	ELEV	PREC	INT	ORG	SHAPE	LONG	FORS	EVAP	LAT	DGOC	DGOM	LENG	DATUM
Low- to middle-elevation regions (887 stations)																
Q100	1.00															
AREA	.66	1.00														
SLOPE	–.56	–.62	1.00													
ELEV	–.13	.25	.13	1.00												
PREC	–.05	.20	.19	.58	1.00											
INT	.17	–.18	.21	–.21	.19	1.00										
ORG	.28	.14	–.19	.03	.04	.07	1.00									
SHAPE	.09	–.07	–.08	–.10	–.11	.01	.10	1.00								
LONG	–.29	–.17	.27	–.19	–.06	.08	–.28	–.19	1.00							
FORS	–.05	.24	.20	.65	.60	.02	.07	–.11	–.04	1.00						
EVAP	.35	–.14	–.12	–.59	–.52	.43	.03	.16	–.21	–.47	1.00					
LAT	–.43	.09	.11	.38	.30	–.57	–.16	–.15	.40	.26	–.82	1.00				
DGOC	–.36	.14	.08	.51	.32	–.54	–.15	–.12	.21	.34	–.76	.92	1.00			
DGOM	–.42	–.09	.27	.05	.09	–.24	–.26	–.21	.87	.10	–.53	.74	.52	1.00		
LENG	.67	.96	–.63	.22	.17	–.18	.17	.19	–.21	.21	–.08	.04	.09	–.14	1.00	
DATUM	–.31	–.01	.14	.89	.45	–.28	.00	–.12	–.16	.54	–.60	.39	.50	.08	–.04	1.00
High-elevation region (172 stations)																
Q100	1.00															
AREA	.87	1.00														
SLOPE	–.62	–.74	1.00													
ELEV	.20	.18	.17	1.00												
PREC	.26	.13	.11	.24	1.00											
INT	–.22	–.40	.44	.08	.28	1.00										
ORG	.30	.21	–.08	.02	.28	.34	1.00									
SHAPE	–.03	.02	–.21	–.19	–.21	–.11	–.19	1.00								
LONG	–.12	–.21	.04	–.52	.20	.08	–.12	.15	1.00							
FORS	–.06	–.03	.17	.02	.14	.10	–.06	.00	–.05	1.00						
EVAP	–.19	–.24	.22	.03	–.43	.31	–.10	.08	–.26	.10	1.00					
LAT	.03	.07	–.18	–.41	.11	–.47	–.22	.05	.58	–.12	–.63	1.00				
DGOC	.05	.12	–.16	–.29	.06	–.55	–.23	–.02	.34	–.11	–.56	.94	1.00			
DGOM	–.04	–.07	–.09	–.50	.11	–.25	–.21	.12	.87	–.10	–.50	.89	.72	1.00		
LENG	.81	.95	–.77	.12	.06	–.41	.14	.33	–.15	–.04	–.21	.08	.11	.03	1.00	
DATUM	–.34	–.38	.28	.61	–.02	.24	–.15	–.18	–.36	–.02	.18	–.43	–.37	–.41	–.41	1.00

Table 28. Stepwise ordinary least-squares regression of *T*-year discharge and basin and climatic characteristics for the entire low- to middle-elevation study area

[The stepwise regression equations are based on 819 gaged sites. All variables are log-transformed except ORG. AREA, drainage area, in square miles; LAT, latitude of gaged site, in decimal degrees minus 28; ORG, orographic factor is an integer attribute ranging from −3 to +3; ELEV, mean basin elevation, in thousands of feet above sea level; DGOM, distance from Gulf of Mexico, in hundreds of miles; PREC, mean annual precipitation, in inches; SHAPE, shape factor of drainage basin, dimensionless; and INT, precipitation intensity for 24-hour, 100-year recurrence interval, in inches]

Recurrence interval (years)	Regression coefficients									Standard error of estimate (percent)
	Constant	AREA	LAT	ORG	SHAPE	ELEV	DGOM	INT	PREC	
	113	0.56	--	--	--	--	--	--	--	133
	3,520	.60	−1.6	--	--	--	--	--	--	99
	3,050	.58	−1.5	0.083	--	--	--	--	--	97
10	2,100	.59	−1.5	.077	0.21	--	--	--	--	96
	2,640	.60	−1.4	.082	.20	−0.31	--	--	--	95
	10,900	.60	−.98	.069	.17	−.47	−0.81			94
	6,650	.60	-.58	.065	.18	-.59	-1.2	0.51	--	93
	352	.52	--	--	--	--	--	--	--	165
	25,900	.56	−2.0	--	--	--	--	--	--	113
	22,200	.54	−1.9	0.088	--	--	--	--	--	110
100	31,100	.56	−1.7	.096	--	−0.48	--	--	--	108
	22,400	.56	−1.7	.091	.18	−.47	--	--	--	107
	10,500	.57	−1.5	.091	.20	−.50	--	0.34		107
	10,000	.58	−1.4	.092	.19	−.30	--	.63	−0.35	106
	23,200	.58	−1.0	.082	.18	−.44	−.65	.78	−.37	106

(the coefficient of variation is constant at all stations); therefore, a single-probability distribution can be fit to the composite record. In the hybrid and station-year methods, spatial sampling is assumed to be equivalent to time sampling if the records are independent. Thus, a combination of 10 records, each with 10 years of record, results in a 100-year composite record. A complete description of the hybrid method and associated assumptions is given in Hjalmarson and Thomas (1992).

The hybrid method incorporates the station-year approach to produce regional flood-frequency relations based on basin and climatic characteristics. Wahl's (1982) application of a modified station-year approach to a semiarid region in Wyoming standardized the logarithms of annual peak discharges by dividing by the mean of the logarithms of the peaks. Wahl (1982) noted, however, that in a record containing many years of no flow, the average becomes a meaningless statistic and a new standardization technique is needed. The hybrid method addresses the problem of no-flow years in flood records, a common problem in the southwestern United States. The method reduces flood records to a common base by dividing annual peaks by a function of common hydrologic characteristics.

In the hybrid method, records of annual peak discharges from gaging stations are combined into three or more levels of a common basin characteristic, such as drainage area. For this study, each level had at least 100 annual peaks to avoid extrapolation to the 100-year flood and to allow for application of the Weibull plotting-position formula. Annual peak discharges within each level are standardized using an approximate factor and combined to form a single composite record as in the station-year method. The standardizing factor is refined with an iterative technique that uses regression and flood-frequency analysis. Standardized flood-frequency relations are determined for each basin-characteristic level at each iteration, and regional flood-frequency relations using basin and climatic characteristics are determined at the final iteration.

Drainage area is the first characteristic used for the iterative technique, and additional characteristics are individually added using the same iterative technique to yield the final regional relation. Additional characteristics are added only if they significantly ($\alpha<0.05$) reduce the standard error of regression of the regional relation. The explanatory variables used in the four regions with hybrid relations (Regions 6, 10, 11, and 16) are drainage area, mean basin elevation, and mean annual evaporation.

A major advantage of the hybrid method is that no extrapolation is needed for the flood probability of interest, assuming independence of peak-discharge data, and elementary plotting-position formulas can be used to define flood-frequency relations. Because little is known about how to obtain valid estimates of probability for the many ephemeral streams of the more arid regions of this study, the probabilities were simply computed using the Weibull plotting-position formula. The use of the Weibull method with the compositing of records avoids the problem of attempting to fit a smooth curve through the data.

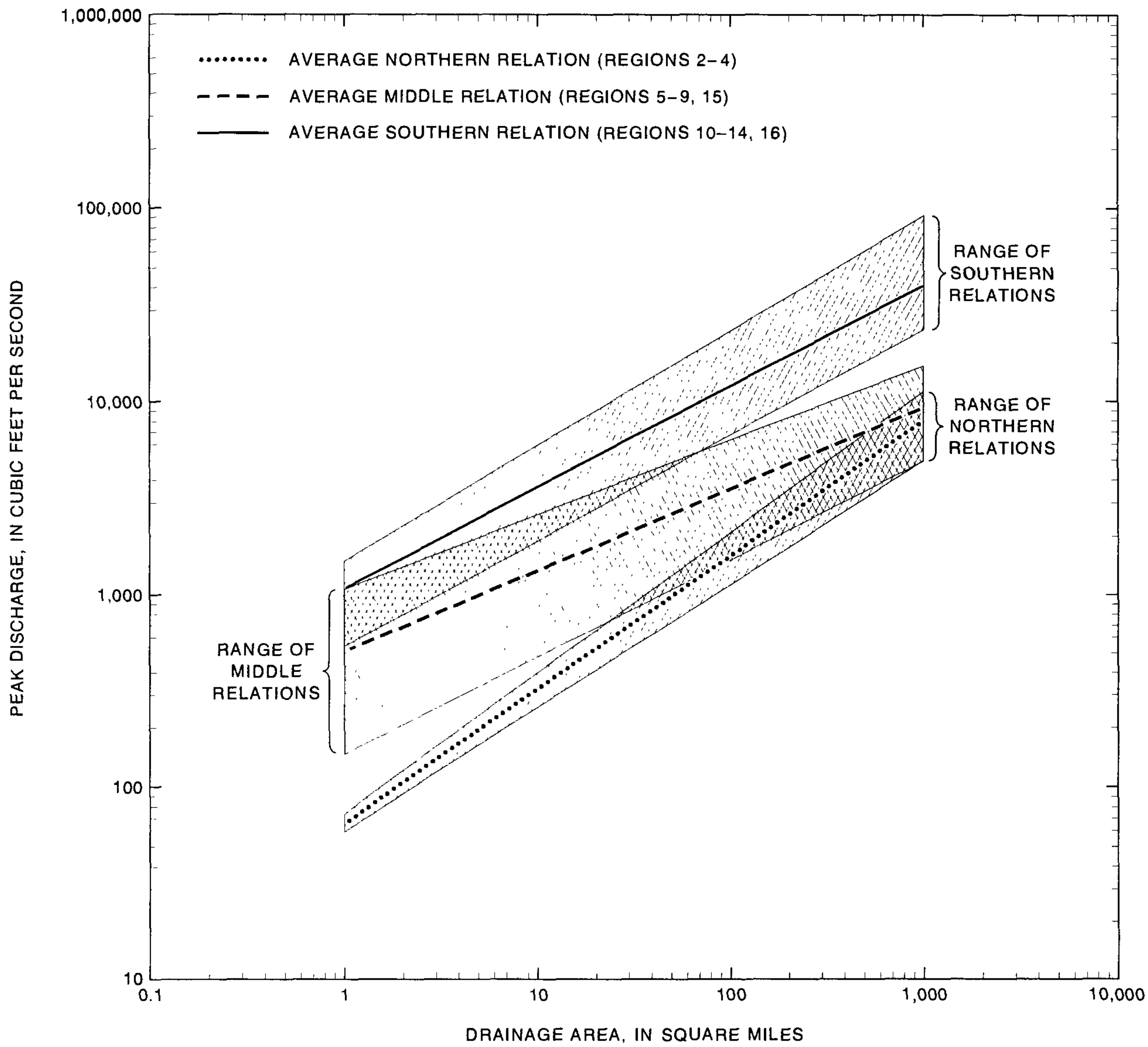


Figure 66. Relation between 100-year peak discharge and drainage area for the northern, middle, and southern parts of the study area.

In the application of the hybrid method to a particular region, three assumptions need to be evaluated; the annual peaks at gaging stations should be independent, and the explanatory variables should be independent and normally distributed. The sample of gaging stations and peak discharges in the four arid regions with hybrid relations in this study (6, 10, 11, and 16) appear to meet the assumption of independence. Significant floods did not tend to occur in the same years at most sites. The gaged sites generally are far apart, and most have small drainage areas. The median drainage area of the gaged sites is about 11 mi^2, and about two-thirds of the sites have a drainage area of less than 50 mi^2. Smaller drainage areas would be less likely to experience the same storms that produce the annual peaks. About 60 percent of the annual peaks are caused by summer thunderstorms, which generally have a small areal extent and occur in an erratic fashion. Independence of the samples of log-transformed explanatory variables is indicated because of small correlation coefficients (r); drainage area and mean basin elevation in Region 6 have an r value of 0.19, drainage area and mean annual evaporation in Region 11 have an r value of –0.06, and drainage area and mean annual evaporation in Region 16 have an r value of 0.21. The explanatory variables are distributed fairly evenly through their range of values (figs. 29, 37, 38, and 48), and boxplots of the log-transformed variables appear normal.

For regions where most station flood-frequency relations can be defined, the hybrid method and the station-relation regression method (GLS) produce regional relations with similar coefficients, but the standard errors of estimate are computed differently and thus the magnitudes of the errors are different. Standard errors for GLS relations are similar to the well-known OLS standard errors, and the differences between OLS and GLS errors are explained in Stedinger and Tasker (1985). A discussion of how hybrid error is computed is found in Hjalmarson and Thomas (1992), and a brief explanation is given here.

The standard errors of the hybrid relations for Regions 6, 10, 11, and 16 are much larger than the standard errors of GLS relations for the remaining regions. The ratio of the average hybrid error to the average error of the GLS relations is more than 10 for Region 6, about 6 for Region 10, and less than 2 for Regions 11 and 16. Two basic reasons for this difference are that the two methods have computational differences and are applied to regions with different flood characteristics.

The average standard error of regression in the hybrid method is estimated using a variation of a direct assessment procedure where subsets of station records are randomly selected without replacement, estimates of T-year discharge are made for each subset of stations, the sample variance of the estimates of T-year discharge is computed, and the population variance or standard error is computed using a relation between the variance about the mean value of T-year discharge for a region and the variance about the mean value of T-year discharge for a sample. In this study, thirty subsets of stations were selected for each step of the error analysis.

The hybrid errors are larger than the GLS errors because the hybrid errors include much of the within-station residual variance, which is the variance of annual peak discharges about the flood-frequency relation that is fitted to the record at a particular gaging station. The GLS method takes into account the fact that stations in a region have unequal lengths of record, which results in estimates of T-year discharges with unequal variances; however, all the variance associated with the fitting of a relation to peak discharges at a particular gaging station is not taken into account in GLS errors.

The hybrid errors are larger than the GLS errors in this report because the hybrid relations are applied to four regions with more variable flood characteristics than the 12 GLS regions. The magnitude of the hybrid errors is closely related to the variability of the annual peak discharges and the percentage of undefined station flood-frequency relations in a region. The largest hybrid errors are in Regions 6 and 10, and the hybrid errors for Regions 11 and 16 are of moderate magnitude. The average standard deviation of peak discharges in gaging-station records is about 0.9 log units for Regions 6 and 10, 0.5 log units for Regions 11 and 16, and 0.4 log units for the 12 GLS regions. The average percentage of undefined station flood-frequency relations is about 55 percent for Regions 6 and 10, 30 percent for Regions 11 and 16, and 11 percent for the 12 GLS regions. The hybrid relations are developed from all station records in the regions, and the GLS relations are developed from only the stations with defined flood-frequency relations.

Table 29. Summary of estimated prediction errors of generalized least-squares regional models

[Recurrence interval, in years: PE, the estimated average standard error of prediction from calibration of generalized least-squares model, in percent; PES, the estimated average prediction error from split-sample analysis, in percent. Number of stations is the total number of stations in region used for regression analysis]

Region	Number of stations	Recurrence interval, in years											
		2		5		10		25		50		100	
		PE	PES	PE	PES	PE	PES	PE	PES	PE	PES	PE	PES
1	165	59	64	52	55	48	52	46	52	46	52	46	54
2	108	72	76	66	65	61	65	61	68	64	70	68	74
3	35	86	74	83	67	80	64	78	62	77	61	78	62
4	108	64	66	57	56	53	54	51	53	52	53	53	54
5	37	135	151	101	123	84	115	87	109	91	107	95	105
7	28	56	75	45	64	45	62	49	52	53	52	59	55
8	108	72	81	62	69	57	65	54	61	53	60	53	60
9	43	68	87	55	60	52	51	53	48	57	48	59	53
12	68	105	88	68	57	52	50	40	50	37	58	39	63
13	73	57	51	40	36	37	38	39	47	43	55	48	64
14	22	74	51	63	34	65	28	63	29	64	25	66	25
15	17	64	75	66	80	68	84	71	93	73	101	76	111

The large errors of the hybrid relations in Regions 6 and 10 indicate that much of the variation in flood characteristics remains unexplained by the relations; therefore, those relations must be considered as only rough estimates. The magnitude of the errors is too large to have much meaning, but it does show the relative differences between relations for the different recurrence intervals. GLS relations were not determined in those regions because they would be based on less than half the available peak-discharge information.

Transition Zones

At most ungaged sites in the study area, flood-frequency relations can be estimated using the single set of regression equations for the flood region in which the site is located. When a site is near a regional boundary, however, a weighted estimate of peak discharge may be more appropriate. Computed peak discharges from the equations of two adjacent regions may be quite different for a site near a boundary. Two transition zones are defined in this report where methods are provided to weight estimated flood-frequency relations: (1) sites with a drainage area in two low- to middle-elevation regions and (2) sites in a low- to middle-elevation flood region where the basin is near the boundary of the high-elevation region.

Weighted flood-frequency relations for sites with a drainage area in two low- to middle-elevation regions are computed using the percentage of the drainage area in each region (equation 6). Peak discharges are estimated for each region as if the drainage area were entirely in one region, and then the weighted average of these discharges is computed.

Weighted flood-frequency relations for sites in a low- to middle-elevation flood region with an elevation that is within 700 ft of the boundary of the high-elevation region are computed using equation 7. Equation 7 is an averaging procedure based on how the elevation of the study site fits into the elevation boundaries of the 700-foot transition zone. Peak discharges are estimated for each region as if the drainage area were entirely in one region, and then the weighted average discharge is computed. The weighted discharges are close to the low- to middle-elevation models near the lower part of the transition zone and close to the high-elevation model near the upper part of the transition zone.

The selection of the 700-foot transition zone was made by comparing residuals computed from the low- to middle-elevation regional models with those from the high-elevation regional models. Gaged sites were placed into four groups with gaged-site elevations between the boundary of the High-Elevation Region 1 and 500, 700, 1,000, and 1,200 ft below that boundary. The 100-year peak-discharge equations for the appropriate low- to middle-elevation regions and the high-elevation region were then used to compute residuals for each site (table 30). The mean and median of the residuals should ideally be zero, which would indicate no bias, and the magnitude of the standard deviation indicates the accuracy. The low- to middle-elevation models have a slight positive bias for all groups, and the high-elevation model has a slight negative bias for all groups. As the transition zone becomes larger and more lower elevation sites are added to the groups, the bias becomes smaller and the standard deviation remains about the same for the low- to middle-elevation models. Bias and standard deviation become larger for the high-elevation model. These comparisons indicate that as the transition zone gets larger, the low- to middle-elevation models get slightly better; however, the high-elevation model becomes more biased and less accurate.

The criterion for selecting the most appropriate size of a transition zone was based on the composite residuals in table 30. For each site, an average predicted 100-year peak discharge was computed using the predicted discharges from the appropriate low- to middle-elevation model and the high-elevation model. The composite residual is the average predicted discharge minus the station value of the discharge. The best transition zone, therefore, has the smallest bias and smallest dispersion of composite residuals. The transition zone of 700 ft was selected for this study because the mean and median composite residuals are closest to zero and the standard deviation of the composite residuals is similar to the other three transition zones (table 30).

Two statistical tests were made to compare the central tendency or bias of the composite residuals in the four transition zones. The hypothesis that the mean is equal to zero was tested with a *t*-test, and the mean of the residuals is significantly different than zero for the zones of 1,000 and 1,200 ft ($\alpha<0.05$). The hypothesis that the median is equal to zero was tested with a Wilcoxon signed rank procedure. None of the transition zones had a median that was significantly different than zero. The 700-foot zone, however, has the largest alpha value; the alphas for the zones are 0.23 for 500 ft, 0.87 for 700 ft, 0.15 for 1,000 ft, and 0.06 for 1,200 ft (Minitab, 1988, p. 97, 191–192).

ADDITIONAL DATA AND STUDY NEEDS

A better understanding of flood characteristics is needed for flood-frequency studies in the southwestern United States. Because streamflow is extremely variable, data obtained from the sparse areal distribution of gaging stations and the short records at many stations commonly result in samples that do not represent the populations of floods that occur in the area. More streamflow- and crest-stage gaging stations throughout the study area that have longer records would provide an improved data base. Crest-stage stations are an efficient method for obtaining records of annual maximum peak discharges, and more peak-discharge information is needed especially in the low- to middle-elevation areas where streamflow is more variable. Existing peak-discharge records could be augmented by historical information. Such information is obtained from newspapers and other cultural information, from observation of mudlines after peak flows, from records of bridge and culvert construction, and from paleoflood investigations.

Statistical and probability analyses commonly are used to estimate flood-frequency relations at gaged and ungaged sites. More research is needed on which probability distributions are applicable to streams in arid areas. The analysis of regional skew coefficient in this study indicated that the log-normal distribution may be applicable to many sites in the study area.

The hybrid method developed during this study uses elementary plotting-position formulas to estimate regional flood-frequency relations. Thus, it avoids the potential problem of fitting an incorrect probability distribution to the data. The method combines elements of the station-year method and multiple-regression analysis to determine regional relations directly from the peak-discharge data. The method, however, assumes independence of the peak discharges, and the explanatory variables should be independent and normally distributed. More evaluation of the potential effects of dependence or nonnormality on hybrid coefficients and errors is needed.

The large errors of the hybrid relations in Regions 6 and 10 indicate that much of the variation in flood characteristics remains unexplained by the relations. These two regions have the most arid climate in the study area. Reliable flood-frequency relations are difficult to define at many gaging stations because the available records have many years with no flow and a large variability of the peak discharges. More studies are needed in those regions to find alternative methods of estimating flood-frequency relations. Commonly used statistical methods that are based on station flood-frequency relations do not appear to be well suited to such areas. The hybrid method, which does not use station flood-frequency relations, needs to be developed and refined. Other new methods with perhaps a multidiscipline approach need to be investigated.

Two methods are commonly used for estimating flood-frequency relations at ungaged sites—(1) transferring flood-frequency relations from gaged to ungaged sites by multiple-regression or index-flow techniques and (2) estimating runoff by applying a rainfall intensity of a specific probability to a deterministic or empirical rainfall-runoff model. Both methods would benefit from additional precipitation data, especially in middle- to high-elevation areas. A definition of precipitation intensity for specific recurrence intervals could be obtained from such data. Additional data and information that are needed for the information-transfer method used in this report include more explanatory variables to define the variation in basin and flood characteristics of the southwestern United States. Some potentially significant basin characteristics include soils, geologic material, vegetation, and drainage network.

The technology used in geographic-information systems has a potential for determining new explanatory variables. In this study, values of maximum precipitation intensity, mean annual evaporation, potential natural vegetation, and orographic influence were determined for gaged-site locations using geographic-information-systems technology, and all characteristics except potential natural vegetation were significantly related to flood characteristics. When drainage-area boundaries for the gaging stations are defined in a geographic-information system, significant information would be available to develop future studies and models. The use of geographic-information-systems technology to more uniformly redefine explanatory variables, such as mean basin elevation and mean annual precipitation, also has potential for improving regional flood-frequency relations.

The sample of gaging stations used in this study did not represent some of the hydrologic conditions that exist in the study area. Streams in permeable volcanic or limestone terrain, distributary-flow areas (such as active alluvial fans), and playas were not adequately sampled. Transferring flood information from gaged to ungaged sites may be inadequate in low- or middle-elevation sites in deserts where the drainage area is large and where a large peak-discharge attenuation often occurs. Investigations of flood-frequency characteristics in the areas where flood magnitude decreases along the stream as drainage area increases would add significantly to future studies.

Peaks at miscellaneous sites were excluded from this study because some extreme peaks at ungaged sites in the study area have been found to be erroneous. Some extreme peaks in the arid southwestern United States that were estimated using indirect methods such as the slope-area method probably were debris flows. The slope-area method is inappropriate for these non-Newtonian flows and commonly greatly overestimates the peak discharge. The drainage-basin area for some miscellaneous sites was determined several years ago from small-scale topographic maps, and these computed areas may have large errors. A review of indirect measurements for the extreme peaks is needed, including an examination of photographs for evidence of debris flows and recomputation of the drainage basins using the latest topographic maps.

SUMMARY

The general magnitude of peak discharges in the southwestern United States decreases in a northward direction. In the southern part of the area

(between 29° and 37° latitude), the mean maximum unit-peak discharge of record is 316 $(ft^3/s)/mi^2$. In contrast, the mean maximum unit-peak discharge of record is 26 $(ft^3/s)/mi^2$ in the northern part of the area (between 41° and 45° latitude).

An elevation threshold exists in the study area where large floods caused by thunderstorms rarely occur above that threshold. For sites between 29° and 41° latitude, the elevation threshold is approximately 7,500 ft above sea level. Between 41° and 45° latitude, the elevation threshold decreases in a northward direction at a rate of about 300 ft for each degree of latitude. For example, at 42° latitude, the threshold is 7,200 ft, and at 43° latitude, the threshold is 6,900 ft.

Detailed flood-frequency analyses were made of more than 1,300 gaging stations with a combined 40,000 station years of annual peak discharges. The LPIII probability distribution and the method of moments were used to define flood-frequency relations for most gaging-station records. The reliability of station flood-frequency relations was assessed by visual examination of how well the computed relations fit the plotted peak discharges, the presence or absence of outliers, and the shape exhibited by the plotted peaks.

Generally, the computed flood-frequency relations agreed well with the plotted peak discharges. A low-discharge threshold was applied to about one-half of the sites to adjust the relations for low outliers. With few exceptions, the use of the low-discharge threshold resulted in markedly better appearing fits between the relations and the peak-discharge data. About one-third of the sites had a high outlier, or an odd-appearing shape of the plotted peaks such as a discontinuity or a sharp break; however, these sites were judged to have adequate fits and the computed relations were used. The individual flood-frequency relations for 264 of the sites were judged to be unreliable because of extremely poor fits of the computed relations to the peak-discharge data. The sites may have had inadequate samples to define a relation or non-LPIII probability distributions; therefore, the computed relations at these sites were not used in the standard regional analysis on the basis of station flood-frequency relations. Peak-discharge records at the 264 sites that had unreliable relations are extremely variable and had an average standard deviation of 0.88 log units. Most of the 264 sites were from extremely arid areas. One hundred and twelve (42 percent) of the sites had more than 25 percent of the annual records with no flow.

The hybrid method developed during this study was used to define regional relations in the arid regions, where there were many years of no flow at the gaging stations and where many of the station relations were unreliable. A major advantage of the new hybrid method, which has no extrapolation to the recurrence interval of interest assuming independence of the data, is that elementary plotting-position formulas can be used to define the regional flood-frequency relations. The hybrid method uses all of the available peak-discharge data in the extremely arid regions, while the standard method that is based on station flood-frequency relations uses only the defined station relations. Data in station records with undefined flood-frequency relations are not used.

A mixed-population analysis was performed on a sample of 51 gaging stations with peaks caused by snowmelt and summer thunderstorms. Significant differences were not found between flood-frequency relations computed from the mixed populations and from composite relations computed by separating the peaks, computing separate relations, and combining the separate relations.

An analysis of regional skew coefficient was made for the study area. The methods of attempting to define the variation in skew by geographic areas or by regression with basin and climatic characteristics all failed to improve on a mean of zero for the sample. The regional skew used in the study, therefore, was the mean of zero with an associated error equal to the sample variance of 0.31 log units.

The regional analysis consisted of an investigation of different forms of models, the significance of all available explanatory variables, and the geographic variation of flood magnitudes at selected recurrence intervals. The geographic variation of flood characteristics was explained by dividing the study area into 16 flood regions. A high-elevation region was defined for the entire study area with the lower boundary coinciding with the elevation threshold for large floods caused by thunderstorms.

The model that best describes most regional flood-frequency relations for this study area is the multiplicative model, where all variables are log-transformed. Eighteen of the 19 investigated explanatory variables were significantly related to flood characteristics in some part of the study area; however, only drainage area, mean basin elevation,

Table 30. Summary of residuals from low- to middle-elevation regional models, the high-elevation model, and a composite model for gaged sites in a transition zone

[Transition zone—The zone includes gaged sites with elevations between the boundary of the high-elevation region and 500, 700, 1,000, and 1,200 feet below that boundary. Composite model—A composite 100-year peak discharge is computed by taking the average of the predicted discharge from the appropriate low- to middle-elevation model and the high-elevation model. The composite residual is the composite discharge, in log units, minus the station discharge, in log units]

Trsnsition zone, in feet	Number of sites	Regression residuals from 100-year peak-dischsrge models, in log units								
		Low- to middle-elevation models			High-elevation model			Composite model		
		Mesn	Medisn	Standard deviation	Mean	Median	Standard devistion	Mesn	Median	Standsrd devistion
500	64	0.14	0.10	0.36	–0.08	–0.02	0.45	0.03	0.04	0.35
700	100	.11	.07	.36	–.15	–.03	.50	–.02	.00	.38
1,000	162	.09	.06	.35	–.23	–.10	.53	–.07	–.02	.39
1,200	198	.09	.06	.34	–.24	–.10	.54	–.08	–.02	.39

mean annual precipitation, mean annual evaporation, latitude, and longitude are needed to use the regional models.

GLS regression was used to define the regression models in 12 regions where sufficient data allowed a reasonable regional model to be developed using the flood-frequency relations at gaged sites. Four regions had more than 30 percent of the gaged sites with no defined relations; therefore, the regression method was not used because of the large amount of missing information. The hybrid analysis was used in those four regions because the method does not use station flood-frequency relations and the method uses all the data from gaging stations in a region. The average standard error of prediction in the 12 regions with GLS models ranged from 39 to 95 percent for the 100-year peak discharge, and only three of these models had errors of greater than 70 percent. The estimated average standard error in the four regions with hybrid models, computed differently than the GLS errors, ranged from 0.442 to 1.84 log units for the 100-year peak discharge.

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BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN SOUTHWESTERN UNITED STATES

The data in the following section and the annual peak-discharge data used in this study may be accessed on the Internet at the following address: http://h2o.er.usgs.gov/public/nawdex/o93-419.html

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES

Peak discharge: First line, station value used in regression analysis, and second line, value weighted with station and regional value. For stations with no defined relation, second line, regional value of peak discharge.

Dashes indicate no data.

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
07204000	Moreno Creek at Eagle Nest, N. Mex.	1	36.554	105.267	49	73.80	10,200	20.0	45.0
07204500	Cieneguilla Creek near Eagle Nest, N. Mex.	1	36.485	105.265	48	56.00	9,400	19.0	44.9
07205000	Six Mile Creek near Eagle Nest, N. Mex.	1	36.519	105.275	52	10.50	9,500	20.0	44.9
07206400	Clear Creek near Ute Park, N. Mex.	1	36.526	105.175	23	7.44	9,770	17.0	45.0
07214500	Mora River near Holman, N. Mex.	1	35.110	105.376	21	57.00	10,000	22.0	53.3
07214800	Rio La Casa near Cleveland, N. Mex.	1	35.974	105.389	14	23.00	9,000	24.0	44.6
07217000	Coyote Creek below Black Lake, N. Mex.	1	36.272	105.247	12	48.00	9,300	19.0	43.9
07217100	Coyote Creek above Guadalupita, N. Mex.	1	36.164	105.230	17	71.00	9,420	19.0	44.7
08216500	Willow Creek at Creed, Colo.	1	37.856	106.927	32	35.30	11,500	24.0	35.0
08218000	Goose Creek near Wagonwheel Gap, Colo.	1	37.687	106.889	15	53.60	11,000	28.0	35.0
08218500	Goose Creek at Wagonwheel Gap, Colo.	1	37.752	106.829	31	90.00	10,700	26.0	35.0
08219500	South Fork Rio Grande at South Fork, Colo.	1	37.657	106.649	63	216.00	10,400	30.0	37.9
08220500	Pinos Creek near Del Norte, Colo.	1	37.592	106.449	47	53.00	10,500	30.0	40.2
08223500	Rock Creek near Monte Vista, Colo.	1	37.490	106.259	25	32.90	10,400	15.0	40.1
08224500	Kerber Creek at Ashley Ranch, near Villa Grove, Colo.	1	38.241	106.116	49	38.00	10,500	19.0	35.3
08227000	Saguache Creek near Saguache, Colo.	1	38.163	106.290	71	595.00	10,200	16.0	39.6
08227500	North Crestone Creek near Crestone, Colo.	1	38.014	105.692	46	10.70	11,300	20.0	41.2
08230500	Carnero Creek near La Garita, Colo.	1	37.860	106.319	57	117.00	10,100	20.0	41.0
08231000	La Garita Creek near La Garita, Colo.	1	37.813	106.318	60	61.00	10,100	18.0	42.3
08236000	Alamosa Creek above Terrace Reservoir, Colo.	1	37.375	106.334	54	107.00	11,000	29.0	35.0
08240500	Trinchera Creek above Turners Run, near Ft. Garland, Colo.	1	37.375	105.294	59	45.00	10,400	22.0	45.2
08241000	Trinchera Creek above Mountain Home Reservoir near Ft. Garland, Colo.	1	37.395	105.369	32	61.00	10,000	18.0	47.3
08241500	Sangre De Cristo Creek near Ft. Garland, Colo.	1	37.425	105.414	58	190.00	9,200	15.0	46.5
08242500	Ute Creek near Ft. Garland, Colo.	1	37.447	105.425	59	32.00	10,000	16.0	45.4
08245500	Conejos River at Platoro, Colo. Platoro, Colo.	1	37.354	106.524	14	44.40	11,200	35.0	35.0
08246500	Conejos River near Mogote, Colo.	1	37.054	106.187	43	282.00	10,300	26.0	41.6
08247500	San Antonio River at Ortiz, Colo.	1	36.993	106.038	62	110.00	9,500	11.0	47.0
08248000	Los Pinos River near Ortiz, Colo.	1	36.982	106.073	68	167.00	9,900	24.0	46.2

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES

Relation characteristic: L, low-discharge threshold used to compute station relation; H, high outlier detected in station record; D, relation fit through the plotted annual peak flows has the appearance of a dogleg or jump; O, station is regional outlier deleted from generalized least-squares regression analysis; U, relation was undefined. 1, code applies; 0, code does not apply; and -, code is not applicable.

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
07204000	1	0	0	1	0	71	121	159	212	256	302	240
						72	127	175	248	311	378	
07204500	1	0	1	0	0	122	243	345	497	626	768	505
						122	245	351	509	642	786	
07205000	0	0	0	0	0	28	55	79	117	151	190	128
						28	56	81	121	157	198	
07206400	0	0	0	0	0	20	45	68	106	142	184	151
						20	45	70	110	146	187	
07214500	0	0	0	1	0	560	1,630	2,860	5,230	7,720	11,000	4,700
						558	1,600	2,730	4,760	6,790	9,360	
07214800	0	1	0	0	0	193	449	717	1,210	1,710	2,350	2,260
						193	442	685	1,100	1,480	1,950	
07217000	1	0	0	0	0	42	178	394	952	1,710	2,940	913
						45	188	405	901	1,500	2,410	
07217100	-	-	-	-	1	----	----	----	----	----	----	1,820
						316	531	685	886	1,040	1,190	
08216500	0	0	0	0	0	190	301	377	476	550	624	430
						190	303	382	487	567	647	
08218000	0	0	0	0	0	418	701	920	1,230	1,490	1,760	1,170
						418	699	910	1,190	1,420	1,650	
08218500	0	0	0	0	0	371	559	691	863	995	1,130	879
						372	566	709	901	1,050	1,200	
08219500	0	1	0	0	0	1,510	2,350	2,970	3,820	4,510	5,240	8,000
						1,510	2,350	2,960	3,790	4,450	5,140	
08220500	1	0	0	0	0	176	304	402	538	648	763	720
						177	309	414	563	682	806	
08223500	0	0	1	0	0	86	148	192	249	292	335	190
						86	150	197	263	315	369	
08224500	0	0	0	0	0	93	156	206	277	336	401	407
						94	158	212	290	356	428	
08227000	1	0	0	1	0	326	529	669	850	986	1,120	790
						329	545	714	955	1,150	1,350	
08227500	0	1	0	0	0	84	149	208	304	395	505	735
						84	149	207	299	386	488	
08230500	0	0	0	0	0	139	322	501	803	1,090	1,430	1,600
						140	328	514	826	1,120	1,450	
08231000	0	0	0	0	0	158	291	395	540	658	781	530
						158	293	399	549	670	797	
08236000	0	1	0	0	0	944	1,400	1,730	2,180	2,550	2,930	5,200
						944	1,400	1,720	2,160	2,510	2,870	
08240500	0	1	0	0	0	114	217	305	441	560	695	689
						114	219	310	452	574	710	
08241000	0	0	0	0	0	114	228	322	457	568	686	421
						115	232	332	479	599	725	
08241500	0	1	0	0	0	158	350	536	847	1,140	1,500	1,520
						159	356	551	876	1,180	1,540	
08242500	1	1	0	0	0	143	215	267	335	389	445	630
						143	215	268	338	395	454	
08245500	0	0	0	0	0	1,030	1,220	1,330	1,460	1,550	1,630	1,380
						1,020	1,200	1,290	1,390	1,470	1,540	
08246500	0	1	0	0	0	2,640	3,660	4,400	5,420	6,240	7,110	9,000
						2,640	3,640	4,350	5,300	6,060	6,840	
08247500	1	0	0	0	0	505	819	1,040	1,350	1,580	1,820	1,750
						504	815	1,030	1,330	1,550	1,780	
08248000	1	0	0	0	0	1,380	1,900	2,230	2,650	2,960	3,270	3,160
						1,380	1,900	2,220	2,630	2,930	3,230	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
08248500	San Antonio River at mouth, near Manassa, Colo.	1	37.177	105.877	59	348.00	9,100	12.0	50.0
08252500	Costilla Creek above Costilla Dam, N. Mex.	1	36.898	105.254	48	25.10	11,430	25.0	42.7
08253000	Casias Creek near Costilla, N. Mex.	1	36.897	105.260	49	16.60	11,100	25.0	42.7
08253500	Santistevan Creek near Costilla, N. Mex.	1	36.884	105.281	49	2.15	10,500	26.0	43.1
08255000	Ute Creek near Amalia, N. Mex.	1	36.953	105.410	10	12.00	10,700	26.0	46.0
08263000	Latir Creek near Cerro, N. Mex.	1	36.829	105.547	32	10.50	11,500	24.0	47.1
08264000	Red River near Red River, N. Mex.	1	36.622	105.389	24	19.10	10,790	25.0	44.3
08264500	Red River below ZW DS near Red River, N. Mex.	1	36.674	105.381	10	25.70	10,530	25.0	44.6
08267500	Rio Hondo near Valdez, N. Mex.	1	36.542	105.556	52	36.20	10,100	23.0	49.3
08271000	Rio Lucero near Arroyo Seco, N. Mex.	1	36.508	105.530	58	16.60	10,790	24.0	48.7
08281200	Wolf Creek near Chama, N. Mex.	1	36.956	106.536	13	27.70	9,600	27.4	35.3
08284000	Rito de Tierra Amarilla at Tierra Amarilla, N. Mex.	1	36.699	106.557	24	49.70	8,850	20.5	40.1
08295200	Rio en Medio near Santa Fe, N. Mex.	1	35.792	105.794	20	0.63	11,300	27.0	49.6
08302200	North Fork Tesuque Creek near Santa Fe, N. Mex.	1	35.770	105.809	11	1.60	11,000	26.0	50.2
08316000	Santa Fe River near Santa Fe, N. Mex.	1	35.687	105.843	14	18.20	9,970	23.0	51.8
08321900	Rio de las Vacas near Senorita, N. Mex.	1	35.993	106.796	30	26.80	9,470	24.6	39.1
08377900	Rio Mora near Terrero, N. Mex.	1	35.777	105.657	23	53.20	10,260	29.0	44.7
08378500	Pecos River near Pecos, N. Mex.	1	35.708	105.682	64	189.00	9,910	24.0	45.4
08397400	Hyatt Canyon near Cloudcroft, N. Mex.	1	32.933	105.633	16	3.08	8,320	23.0	49.6
09110500	East River near Crested Butte, Colo.	1	38.864	106.909	12	90.30	10,900	39.0	35.0
09111500	Slate River near Crested Butte, Colo.	1	38.866	106.967	12	70.10	10,400	33.0	35.0
09112000	Cement Creek near Crested Butte, Colo.	1	38.824	106.852	12	26.10	10,900	32.0	35.0
09112500	East River at Almont, Colo.	1	38.664	106.847	56	289.00	10,200	31.0	37.7
09113300	Ohio River at Baldwin, Colo.	1	38.766	107.058	12	47.20	10,200	32.0	35.0
09113500	Ohio Creek near Baldwin, Colo.	1	38.702	106.998	26	121.00	10,000	22.0	35.5
09114500	Gunnison River near Gunnison, Colo.	1	38.542	106.949	58	1,012.00	9,900	28.0	40.3
09115500	Tomichi Creek at Sargents, Colo.	1	38.395	106.422	41	149.00	10,100	23.0	35.0
09118000	Quartz Creek near Ohio City, Colo.	1	38.560	106.636	24	106.00	10,700	25.0	36.7
09119000	Tomichi Creek at Gunnison, Colo.	1	38.522	106.940	48	1,061.00	9,600	19.0	40.5
09122000	Cebolla Creek at Powderhorn, Colo.	1	38.291	107.114	18	340.00	10,500	19.0	38.9
09122500	Soap Creek near Sapinero, Colo.	1	38.561	107.316	11	57.40	9,900	29.0	38.7

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
08248500	0	0	1	0	0	816	1,440	1,860	2,370	2,740	3,080	2,620
						815	1,440	1,850	2,360	2,730	3,070	
08252500	1	1	0	0	0	62	139	225	397	588	854	3,870
						62	141	230	402	587	838	
08253000	1	0	1	0	0	61	101	129	167	195	223	181
						62	103	133	176	210	243	
08253500	1	0	1	1	0	9	13	16	19	21	23	18
						9	13	17	22	26	30	
08255000	-	-	-	-	1	----	----	----	----	----	----	88
						110	180	229	292	339	385	
08263000	1	0	1	0	0	48	79	102	132	156	180	126
						48	80	106	140	169	197	
08264000	0	0	0	0	0	107	166	208	263	305	348	264
						107	168	214	276	325	375	
08264500	0	0	0	0	0	96	160	206	267	315	363	216
						97	169	229	315	384	452	
08267500	0	0	1	0	0	163	272	354	467	558	653	541
						163	273	357	474	568	665	
08271000	1	0	1	0	0	127	190	232	286	326	365	310
						127	190	233	289	331	372	
08281200	0	0	0	0	0	558	920	1,210	1,650	2,020	2,440	1,900
						554	895	1,140	1,480	1,740	2,030	
08284000	0	0	1	0	0	281	547	757	1,060	1,300	1,550	1,000
						281	544	746	1,030	1,240	1,460	
08295200	0	0	1	0	0	8	14	19	25	30	35	20
						8	14	19	26	31	37	
08302200	0	0	0	0	0	9	15	20	29	36	45	33
						9	16	23	35	45	56	
08316000	0	1	0	0	0	94	232	388	695	1,030	1,490	1,500
						94	231	379	645	913	1,260	
08321900	0	0	1	0	0	259	407	504	625	711	795	530
						259	405	500	617	700	781	
08377900	0	0	0	0	0	228	389	515	697	848	1,010	820
						230	397	532	727	885	1,050	
08378500	1	0	0	0	0	601	1,070	1,470	2,090	2,640	3,270	4,500
						602	1,070	1,480	2,100	2,640	3,250	
08397400	1	0	0	0	0	37	58	72	92	107	123	86
						37	57	72	92	108	124	
09110500	-	-	-	-	1	----	----	----	----	----	----	1,270
						1,090	1,440	1,650	1,910	2,110	2,300	
09111500	-	-	-	-	1	----	----	----	----	----	----	1,240
						691	975	1,150	1,370	1,140	1,700	
09112000	0	0	0	0	0	209	271	311	361	396	431	358
						210	279	331	407	465	525	
09112500	1	0	0	0	0	2,280	3,160	3,790	4,650	5,320	6,030	6,500
						2,280	3,160	3,780	4,620	5,260	5,940	
09113300	0	0	0	0	0	364	524	631	768	870	972	683
						365	532	650	806	924	1,040	
09113500	0	0	0	0	0	664	965	1,150	1,370	1,520	1,670	1,260
						664	965	1,150	1,380	1,540	1,710	
09114500	1	0	0	0	0	3,900	5,640	6,790	8,230	9,290	10,300	11,400
						3,900	5,650	6,820	8,280	9,350	10,400	
09115500	0	0	0	0	0	350	547	677	840	958	1,070	804
						352	557	702	897	1,040	1,190	
09118000	0	0	0	0	0	361	503	591	697	771	843	640
						363	515	624	773	888	1,000	
09119000	0	1	0	0	0	777	1,290	1,690	2,260	2,730	3,250	4,620
						785	1,330	1,800	2,500	3,080	3,710	
09122000	0	0	1	0	0	658	1,150	1,550	2,120	2,590	3,110	2,150
						663	1,170	1,610	2,220	2,720	3,250	
09122500	0	1	0	0	0	451	613	728	881	1,000	1,130	1,000
						451	619	743	914	1,050	1,190	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09124500	Lake Fork at Gateview, Colo.	1	38.299	107.229	49	334.00	10,900	24.0	39.5
09125000	Curecanti Creek near Sapinero, Colo.	1	38.488	107.414	27	35.00	9,700	22.0	40.2
09126000	Cimarron River near Cimarron, Colo.	1	38.262	107.544	15	66.60	10,900	31.0	39.3
09127500	Crystal Creek near Maher, Colo.	1	38.552	107.506	21	42.20	9,600	25.0	40.1
09130600	West Muddy Creek near Ragged Mountain, Colo.	1	39.131	107.575	10	7.42	9,400	38.0	40.0
09132900	West Hubbard Creek near Paonia, Colo.	1	39.032	107.613	13	2.34	10,300	38.0	39.7
09140700	Cottonwood Creek near Grand Mesa, Colo.	1	38.927	107.950	11	2.15	9,200	23.0	39.9
09143000	Surface Creek near Cedaredge, Colo.	1	38.985	107.854	47	27.40	9,700	36.0	39.5
09145000	Uncompahgre River at Ouray, Colo.	1	38.019	107.676	14	42.00	11,400	30.0	35.1
09146000	Uncompahgre River below Ouray, Colo.	1	38.031	107.674	16	75.20	11,300	32.0	35.3
09146400	West Fork Dallas Creek near Ridgway, Colo.	1	38.074	107.851	15	14.10	10,200	35.0	38.1
09146500	East Fork Dallas Creek near Ridgway, Colo.	1	38.093	107.813	16	16.80	10,800	32.0	38.2
09146600	Pleasant Valley Creek near Noel, Colo.	1	38.146	107.919	12	7.98	9,100	20.0	39.9
09147100	Cow Creek near Ridgway, Colo.	1	38.149	107.644	18	45.40	10,700	29.0	38.8
09165000	Dolores River below Rico, Colo.	1	37.639	108.060	35	105.00	10,600	31.0	35.2
09172000	Fall Creek near Fall Creek, Colo.	1	37.958	108.005	18	33.40	10,000	32.0	38.4
09175000	West Naturita Creek near Norwood, Colo.	1	37.976	108.327	12	53.00	8,500	31.0	42.1
09177500	Taylor Creek near Gateway, Colo.	1	38.519	109.109	23	15.40	9,000	17.0	44.6
09188500	Green River at Warren Branch near Daniel, Wyo.	1	43.019	110.117	55	468.00	9,320	22.0	36.6
09189500	Horse Creek at Sherman Ranger Station, Wyo.	1	42.944	110.389	20	43.00	8,880	20.0	37.2
09196500	Pine Creek above Fremont Lake, Wyo.	1	43.031	109.769	32	75.80	10,200	23.0	35.0
09198500	Pole Creek below Half Moon Lake near Pinedale, Wyo.	1	42.883	109.717	33	87.50	11,000	22.0	35.7
09199500	Fall Creek near Pinedale, Wyo.	1	42.856	109.720	33	37.20	9,460	20.0	35.9
09203000	East Fork River near Big Sandy, Wyo.	1	42.667	109.417	48	79.20	9,580	22.0	37.0
09204000	Silver Creek near Big Sandy, Wyo.	1	42.750	109.517	30	45.40	9,750	20.0	36.0
09204700	Sand Springs Draw Tributary near Boulder, Wyo.	1	42.585	109.623	18	2.77	7,300	10.0	39.0
09205500	North Piney Creek near Mason, Wyo.	1	42.658	110.342	43	58.00	8,920	18.0	38.8
09208000	La Barge Creek near La Barge MDWS Ranger Station, Wyo.	1	42.508	110.669	33	6.30	8,970	25.0	38.0
09212500	Big Sandy River at Lechie Ranch near Big Sandy, Wyo.	1	42.571	109.283	47	94.00	9,250	20.0	37.4
09217900	Blacks Fork near Robertson, Wyo.	1	40.965	110.577	22	130.00	10,640	20.0	34.5
09218500	Blacks Fork near Millburne, Wyo.	1	41.032	110.579	31	152.00	10,270	19.0	34.6

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09124500	0	0	0	0	0	1,680	2,200	2,520	2,900	3,160	3,420	2,720
						1,680	2,200	2,530	2,930	3,210	3,500	
09125000	0	0	0	0	0	252	350	410	483	534	583	480
						252	350	412	491	550	608	
09126000	0	0	0	0	0	826	1,180	1,430	1,770	2,050	2,330	1,790
						824	1,170	1,400	1,700	1,930	2,160	
09127500	1	0	0	0	0	282	407	486	582	651	717	542
						282	409	492	599	679	758	
09130600	0	0	0	0	0	85	158	218	307	384	469	260
						86	160	219	300	366	433	
09132900	0	0	0	0	0	46	61	71	84	94	104	93
						46	61	73	89	101	114	
09140700	1	0	0	0	0	24	34	40	47	52	57	38
						24	34	41	52	60	68	
09143000	1	0	0	0	0	296	429	526	656	759	868	824
						296	430	528	659	762	870	
09145000	0	0	0	0	0	966	1,360	1,650	2,050	2,360	2,690	2,000
						960	1,330	1,570	1,870	2,090	2,320	
09146000	0	0	0	0	0	1,440	1,920	2,220	2,590	2,860	3,120	2,400
						1,430	1,890	2,140	2,430	2,640	2,840	
09146400	0	0	0	0	0	81	126	159	206	244	284	200
						82	132	174	237	287	338	
09146500	0	0	0	0	0	173	230	266	307	336	364	297
						173	233	274	326	366	407	
09146600	0	0	0	0	0	150	282	388	543	671	810	500
						149	273	362	479	569	662	
09147100	0	0	0	0	0	640	894	1,070	1,300	1,480	1,670	1,360
						638	884	1,050	1,250	1,410	1,570	
09165000	1	0	0	0	0	1,270	1,690	1,960	2,270	2,490	2,700	2,170
						1,270	1,680	1,940	2,240	2,450	2,650	
09172000	0	1	0	0	0	198	392	575	882	1,170	1,530	1,390
						199	396	578	867	1,120	1,420	
09175000	1	0	0	0	0	384	598	753	963	1,130	1,300	943
						386	604	765	978	1,140	1,310	
09177500	0	0	0	0	0	111	264	407	636	842	1,080	555
						111	261	395	598	773	967	
09188500	1	0	0	0	0	2,880	3,620	4,100	4,680	5,110	5,540	5,490
						2,880	3,610	4,090	4,660	5,090	5,530	
09189500	0	0	0	0	0	1,090	1,390	1,590	1,840	2,040	2,230	1,860
						1,080	1,360	1,520	1,710	1,850	1,990	
09196500	0	0	0	0	0	1,720	2,030	2,220	2,450	2,610	2,770	2,550
						1,710	2,010	2,170	2,350	2,480	2,610	
09198500	0	0	0	0	0	937	1,130	1,240	1,360	1,440	1,510	1,300
						935	1,120	1,230	1,350	1,430	1,510	
09199500	0	0	0	0	0	425	550	622	703	757	807	707
						424	546	615	693	748	801	
09203000	0	0	0	0	0	1,290	1,570	1,720	1,880	1,980	2,070	2,330
						1,290	1,560	1,700	1,840	1,930	2,020	
09204000	1	0	1	0	0	725	880	970	1,070	1,150	1,210	1,030
						722	870	950	1,040	1,110	1,170	
09204700	0	0	0	0	0	10	27	46	81	115	157	82
						10	27	45	76	106	140	
09205500	1	0	0	0	0	396	523	602	698	766	831	747
						395	522	601	700	773	844	
09208000	1	0	0	0	0	129	164	185	209	225	241	196
						129	163	183	206	223	240	
09212500	1	1	0	0	0	928	1,220	1,410	1,640	1,800	1,960	2,030
						926	1,210	1,400	1,620	1,770	1,920	
09217900	0	0	0	0	0	1,640	2,130	2,420	2,760	2,990	3,200	2,480
						1,630	2,100	2,350	2,630	2,820	3,000	
09218500	0	0	0	0	0	1,460	1,830	2,070	2,380	2,600	2,820	2,530
						1,460	1,810	2,040	2,320	2,530	2,730	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09220000	East Fort of Smith Fork near Robertson, Wyo.	1	41.054	110.398	40	53.00	10,250	20.0	34.7
09220500	West Fork of Smith Fork near Robertson, Wyo.	1	41.022	110.479	42	37.20	9,790	20.0	35.0
09223000	Hams Fork below Pole Creek near Frontier, Wyo.	1	42.111	110.709	34	128.00	8,380	25.0	38.1
09226000	Henrys Fork near Lonetree, Wyo.	1	41.006	110.270	30	56.00	10,270	23.0	34.7
09226500	Middle Fork Beaver Creek near Lonetree, Wyo.	1	40.944	110.179	22	28.00	10,480	30.5	34.2
09227500	West Fork Beaver Creek near Lonetree, Wyo.	1	40.947	110.217	14	23.00	10,490	32.0	35.0
09228500	Burnt Fork near Burntfork, Wyo.	1	40.946	110.066	32	52.80	10,300	29.3	34.3
09235600	Pot Creek above Diversions, near Vernal, Utah	1	40.768	109.318	28	25.00	8,167	19.6	34.5
09244500	Elkhead Creek near Clark, Colo.	1	40.732	107.169	15	45.40	8,600	27.0	40.1
09251800	North Fork Little Snake River near Encampment, Wyo.	1	41.050	106.958	10	9.64	9,470	30.0	39.8
09253400	Battle Creek near Encampment, Wyo.	1	41.133	107.064	10	12.80	9,590	40.0	40.0
09264000	Ashley Creek below Trout Creek near Vernal, Utah	1	40.733	109.678	11	27.00	9,930	28.0	34.4
09264500	South Fork Asheley Creek near Vernal, Utah	1	40.733	109.703	12	20.00	10,480	30.3	34.8
09268000	Dry Fork above Sinks, near Dry Fork, Utah	1	40.626	109.819	37	44.40	10,240	29.7	34.6
09268500	North Fork of Dry Fork near Dry Fork, Utah	1	40.643	109.810	41	8.62	10,122	29.6	34.6
09268900	Brownie Canyton above Sinks, near Dry Fork, Utah	1	40.659	109.750	26	8.24	10,107	28.0	34.3
09269000	East Fork of Dry Fork near Dry Fork, Utah	1	40.650	109.761	18	12.00	9,360	28.6	34.2
09273000	Duchesne River at Provo River Trail, near Hanna, Utah	1	40.625	110.889	21	39.00	9,730	35.9	35.0
09275000	West Fork Duchesne River, Dry Hollow near Hanna, Utah	1	40.449	110.975	26	43.80	9,100	28.5	35.0
09276000	Wolf Creek above Rhodes Canyon, near Hanna, Utah	1	40.471	110.918	38	10.60	9,040	26.6	35.0
09277800	Rock Creek above South Fork near Hanna, Utah	1	40.557	110.697	19	98.90	10,360	35.5	35.0
09278000	South Fork Rock Creek near Hanna, Utah	1	40.548	110.694	32	15.70	10,000	30.8	35.0
09278500	Rock Creek near Hanna, Utah	1	40.546	110.656	32	122.00	10,200	32.9	35.0
09280400	Hobble Creek at Daniels Summit near Wallsburg, Utah	1	40.298	111.264	21	2.89	9,060	29.3	34.8
09287000	Currant Creek Below Red Leg Hollow, near Fruitland, Utah	1	40.324	111.045	32	50.10	8,880	27.8	35.0
09289500	Lake Fork River above Moon Lake near Mountain Home, Utah	1	40.607	110.526	38	77.90	10,800	35.4	35.0
09302450	Lost Creek near Buford, Colo.	1	40.050	107.468	22	21.50	8,960	27.5	40.0
09302500	Marvine Creek near Buford, Colo.	1	40.038	107.487	12	59.70	9,780	32.2	40.0
09303300	South Fork White River at Budges Resort, Colo.	1	39.843	107.334	11	52.30	10,569	40.0	40.0
09303320	Wagonwheel Creek at Budges Resort, Colo.	1	39.843	107.336	11	7.36	10,640	40.0	40.0
09303400	South Fork White River near Budges Resort, Colo.	1	39.864	107.533	11	128.00	10,250	40.0	40.0

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
09220000	0	0	0	0	0	501	743	929	1,200	1,420	1,660	1,450
						500	738	917	1,170	1,380	1,600	
09220500	0	1	0	0	0	439	703	910	1,210	1,460	1,730	2,100
						438	698	895	1,170	1,400	1,640	
09223000	1	1	0	0	0	875	1,190	1,390	1,660	1,860	2,070	2,230
						875	1,190	1,390	1,670	1,870	2,090	
09226000	0	0	0	0	0	577	896	1,150	1,530	1,850	2,210	2,010
						576	889	1,130	1,480	1,760	2,080	
09226500	1	0	0	0	0	315	480	603	772	908	1,050	775
						315	479	598	758	884	1,010	
09227500	1	0	0	0	0	168	253	316	404	476	553	417
						169	259	329	429	509	592	
09228500	1	1	0	0	0	281	504	713	1,070	1,410	1,830	3,200
						282	507	717	1,070	1,380	1,770	
09235600	1	0	1	0	0	74	142	202	295	377	472	286
						74	144	207	304	388	483	
09244500	0	0	0	0	0	648	898	1,050	1,230	1,360	1,480	1,060
						645	884	1,020	1,170	1,290	1,390	
09251800	0	0	0	0	0	368	467	530	608	665	721	548
						364	450	493	542	578	614	
09253400	0	0	0	0	0	335	459	546	662	754	849	670
						333	450	524	617	687	758	
09264000	1	0	0	0	0	432	562	640	731	794	854	630
						429	552	621	703	763	824	
09264500	1	0	0	0	0	312	414	476	550	601	650	460
						311	409	468	539	592	644	
09268000	1	0	1	0	0	525	744	889	1,070	1,200	1,340	1,010
						524	742	883	1,060	1,180	1,320	
09268500	1	1	0	0	0	80	118	145	181	210	240	249
						80	119	147	185	216	248	
09268900	1	0	0	0	0	196	286	348	428	489	551	425
						195	283	340	411	464	517	
09269000	1	0	0	0	0	135	179	208	243	270	296	240
						135	180	211	252	285	318	
09273000	0	0	0	0	0	695	882	996	1,130	1,230	1,320	1,180
						693	876	983	1,110	1,210	1,290	
09275000	1	0	1	0	0	475	668	786	926	1,020	1,110	740
						474	666	781	919	1,010	1,110	
09276000	1	1	0	0	0	49	69	85	108	127	148	181
						49	71	90	118	142	169	
09277800	1	0	0	0	0	1,720	2,120	2,360	2,650	2,850	3,050	2,760
						1,710	2,100	2,310	2,560	2,740	2,920	
09278000	1	0	0	0	0	100	142	171	208	235	263	216
						100	144	177	223	257	294	
09278500	1	0	0	0	0	1,790	2,160	2,370	2,610	2,770	2,920	2,710
						1,790	2,150	2,350	2,570	2,730	2,880	
09280400	1	0	0	0	0	72	97	114	135	151	167	145
						72	96	112	132	148	163	
09287000	1	0	0	0	0	278	442	567	746	893	1,050	946
						279	445	574	759	908	1,070	
09289500	1	0	0	0	0	1,300	1,700	1,970	2,310	2,570	2,830	2,700
						1,300	1,690	1,950	2,270	2,500	2,740	
09302450	1	0	0	0	0	595	754	847	953	1,030	1,090	944
						592	742	820	905	966	1,020	
09302500	0	0	0	0	0	315	400	450	507	547	585	442
						319	421	504	625	721	817	
09303300	1	1	0	0	0	1,200	1,650	1,970	2,400	2,750	3,110	2,750
						1,190	1,610	1,880	2,190	2,440	2,680	
09303320	1	0	0	0	0	189	264	312	373	418	462	336
						188	260	304	357	395	433	
09303400	0	0	0	0	0	2,100	3,110	3,790	4,670	5,320	5,980	3,770
						2,090	3,050	3,620	4,280	4,730	5,170	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09310500	Fish Creek above reservoir, near Scofield, Utah	1	39.774	111.190	49	60.10	8,710	29.4	37.3
09329050	Seven Mile Creek near Fish Lake, Utah	1	38.628	111.647	22	24.00	10,025	27.0	39.2
09338000	East Fork Boulder Creek near Boulder, Utah	1	38.042	111.449	20	21.40	10,500	28.8	39.7
09338500	East Fork Deer Creek near Boulder, Utah	1	38.001	111.389	20	1.90	9,290	20.7	40.0
09339900	East Fork San Juan River above Sand Creek, near Pagosa Springs, Colo.	1	37.390	106.841	30	64.10	10,400	42.0	36.0
09340000	East Fork San Juan River near Pagosa Springs, Colo.	1	37.369	106.892	46	86.90	10,200	39.0	36.8
09340500	West Fork San Juan River above Borns Lake, near Pagosa Springs, Colo.	1	37.486	106.930	17	41.20	10,700	43.0	34.6
09341500	West Fork San Juan River near Pagosa Springs, Colo.	1	37.379	106.899	28	87.90	10,000	42.0	36.6
09342000	Turkey Creek near Pagosa Springs, Colo.	1	37.369	106.940	13	23.00	10,000	39.0	37.3
09343000	Rio Blanco near Pagosa Springs, Colo.	1	37.213	106.794	37	58.00	10,000	39.0	36.7
09344000	Navajo River at Banded Peak Ranch, near Chromo, Colo.	1	37.085	106.689	41	69.80	10,500	37.0	35.0
09344300	Navajo River above Chromo, Colo.	1	37.032	106.732	14	96.40	10,000	37.0	36.5
09347500	Piedra River at BR Ranger Station, near Pagosa Spring, Colo.	1	37.429	107.193	14	82.30	10,300	38.0	37.4
09352500	Los Pinos River near Snowslide Canyon near Weminuche, Colo.	1	37.639	107.333	13	25.30	11,200	45.0	34.9
09352900	Vallecito Creek near Bayfield, Colo.	1	37.477	107.543	24	72.10	11,400	46.0	34.5
09353500	Los Pinos River near Bayfield, Colo.	1	37.383	107.577	13	270.00	10,400	37.0	36.5
09357500	Animas River at Howardsville, Colo.	1	37.833	107.599	47	55.90	11,900	31.0	35.0
09359000	Mineral Creek near Silverton, Colo.	1	37.797	107.695	14	43.90	11,700	38.0	35.0
09359500	Animas River above Tacoma, Colo.	1	37.570	107.780	11	348.00	11,200	34.0	34.9
09365500	La Plata River at Hesperus, Colo.	1	37.290	108.040	72	37.00	10,200	35.0	40.5
09369500	Middle Mancos River near Mancos, Colo.	1	37.374	108.230	15	12.10	9,300	28.0	42.8
09383400	Little Colorado River at Greer, Ariz.	1	34.017	109.457	23	30.90	9,400	31.2	43.8
09383600	Fish Creek near Eagar, Ariz.	1	34.076	109.462	13	15.90	9,160	26.1	45.2
09419610	Lee Canyon near Charleston Park, Nev.	1	36.340	115.650	26	9.20	9,350	19.5	64.9
09419623	Deer Creek near Charleston Park Nev.	1	36.312	115.619	15	1.27	9,650	17.1	65.2
09442650	Romero Creek near Arizona State Line near Luna, N. Mex.	1	33.950	108.983	19	10.80	9,000	19.0	41.5
09444100	Campbell Blue Creek near Alpine, Ariz. (USFS)	1	33.746	109.205	28	11.60	8,300	20.0	40.1
09489070	North Fork of East Fork Black River near Alpine, Ariz.	1	33.903	109.322	13	38.10	9,060	27.5	41.1
09489080	Hannagan Creek near Hannagan Meadow, Ariz.	1	33.647	109.289	13	1.61	9,160	30.0	41.3
09489200	Pacheta Creek near Maverick, Ariz.	1	33.740	109.540	23	14.80	8,810	30.3	39.7

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
09310500	1	0	0	0	0	595	828	985	1,190	1,340	1,500	1,450
						595	827	983	1,190	1,340	1,490	
09329050	1	0	0	0	0	180	243	284	335	371	408	369
						180	245	291	353	400	449	
09338000	0	0	0	0	0	199	303	375	467	536	606	483
						199	304	376	470	540	611	
09338500	0	1	0	1	0	20	64	122	248	399	615	350
						20	63	117	227	352	523	
09339900	0	C	0	0	0	665	1,010	1,270	1,630	1,930	2,250	2,260
						666	1,010	1,270	1,620	1,910	2,200	
09340000	0	0	0	0	0	922	1,350	1,640	2,020	2,320	2,620	2,460
						922	1,350	1,640	2,010	2,300	2,590	
09340500	0	0	0	0	0	733	978	1,140	1,350	1,510	1,670	1,290
						732	974	1,130	1,320	1,470	1,610	
09341500	0	0	0	0	0	1,310	1,830	2,180	2,630	2,970	3,320	2,330
						1,310	1,820	2,160	2,580	2,890	3,200	
09342000	0	0	0	0	0	335	521	659	849	1,000	1,160	860
						335	519	650	820	948	1,080	
09343000	0	1	0	0	0	851	1,200	1,450	1,780	2,040	2,310	2,500
						851	1,200	1,440	1,750	2,000	2,240	
09344000	0	0	0	0	0	649	897	1,070	1,290	1,460	1,630	1,480
						650	900	1,080	1,300	1,480	1,650	
09344300	0	0	0	0	0	716	984	1,170	1,420	1,620	1,830	1,400
						720	1,000	1,210	1,500	1,720	1,950	
09347500	0	0	0	0	0	876	1,270	1,560	1,940	2,250	2,560	1,800
						877	1,270	1,550	1,910	2,190	2,460	
09352500	0	0	0	0	0	322	517	659	849	999	1,150	650
						324	521	662	842	977	1,110	
09352900	-	-	-	-	1	----	----	----	----	----	----	7,050
						1,140	1,450	1,620	1,840	2,010	2,170	
09353500	0	0	0	0	0	2,310	3,250	3,860	4,610	5,170	5,710	13,800
						2,310	3,250	3,850	4,550	5,060	5,550	
09357500	0	0	0	0	0	979	1,270	1,460	1,690	1,860	2,020	1,980
						977	1,260	1,450	1,660	1,820	1,970	
09359000	0	0	0	0	0	827	1,100	1,300	1,560	1,760	1,980	1,700
						824	1,090	1,270	1,490	1,650	1,830	
09359500	0	0	0	0	0	5,370	7,300	8,540	10,100	11,100	12,200	9,500
						5,330	7,110	8,070	9,120	9,740	10,400	
09365500	1	0	0	0	0	450	756	986	1,300	1,560	1,820	1,880
						450	755	981	1,290	1,540	1,780	
09369500	-	-	-	0	1	----	----	----	----	----	----	297
						124	196	247	312	360	407	
09383400	0	0	0	0	0	174	316	427	586	715	854	615
						175	320	435	597	725	859	
09383600	1	0	0	0	0	73	158	230	336	423	518	236
						74	161	235	340	423	508	
09419610	1	0	1	1	0	11	85	249	769	1,580	3,020	880
						11	86	244	718	1,420	2,640	
09419623	1	0	0	0	0	4	16	32	66	105	158	50
						4	16	32	62	94	135	
09442650	-	-	-	-	1	----	----	----	----	----	----	480
						64	116	156	209	249	289	
09444100	1	0	0	0	0	43	113	195	357	535	778	619
						43	113	194	347	507	718	
09489070	-	-	-	-	1	----	----	----	----	----	----	1,070
						318	486	598	741	848	951	
09489080	-	-	-	-	1	----	----	----	----	----	----	70
						25	42	54	70	82	94	
09489200	1	0	0	0	0	105	179	235	313	376	442	323
						105	181	239	320	385	451	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09490800	North Fork White River near Greer, Ariz.	1	34.014	109.642	13	40.20	9,520	34.2	42.6
09491000	North Fork White River near McNary, Ariz.	1	34.046	109.737	39	78.20	9,320	32.2	43.3
10011500	Bear River near Utah-Wyoming State Line	1	40.965	110.853	44	172.00	9,770	31.7	34.6
10012000	Mill Creek at Utah-Wyoming State Line	1	40.992	110.842	19	59.00	9,320	24.0	34.6
10153500	Provo River near Kamas, Utah	1	40.583	111.008	20	29.60	9,710	33.7	35.0
10154000	Shingle Creek near Kamas, Utah	1	40.612	111.116	10	8.40	9,280	30.2	35.0
10183900	East Fork Sevier River near Rubys Inn, Utah	1	37.576	112.265	25	71.60	8,640	21.7	38.7
10205100	Sheep Creek near Salina, Utah	1	38.778	111.680	12	0.30	9,670	23.0	39.8
10205200	West Fork Sheep Creek near Salina, Utah	1	38.789	111.688	12	0.43	8,690	23.0	39.8
10205300	Sheep Creek at Mouth near Salina, Utah	1	38.800	111.683	12	1.47	8,780	22.5	39.7
10241430	Red Creek near Paragonah, Utah	1	37.857	112.675	11	6.30	9,050	21.0	39.7
10284800	Inyo Creek near Lone Pine, Calif.	1	36.597	118.182	11	1.54	8,000	20.0	76.1
13011500	Pacific Creek at Moran, Wyo.	1	43.851	110.516	40	169.00	8,160	30.0	35.0
13011800	Blackrock Creek Tributary near Moran, Wyo.	1	43.786	110.142	11	0.80	9,240	27.0	32.7
13011900	Buffalo Fork above Lava Creek, near Moran, Wyo.	1	43.837	110.439	21	323.00	9,270	41.0	34.7
13012000	Buffalo Fork near Moran, Wyo.	1	43.836	110.508	16	378.00	8,850	31.5	35.0
13014500	Gros Ventre River at Kelly, Wyo.	1	43.622	110.625	14	622.00	8,850	38.0	34.6
13019210	Rim Draw near Bondurant, Wyo.	1	43.133	110.228	11	3.41	8,200	16.0	36.0
13019220	Sour Moose Creek near Bondurant, Wyo.	1	43.150	110.256	18	2.77	7,760	16.0	35.9
13019400	Cliff Creek near Bondurant, Wyo.	1	43.228	110.505	11	58.60	8,200	25.0	35.5
13021000	Cabin Creek near Jackson, Wyo.	1	43.249	110.778	12	8.71	7,300	25.0	35.0
13022550	Red Creek near Alpine, Wyo.	1	43.194	110.927	10	3.88	7,890	25.0	35.3
13023000	Greys River above Reservoir, near Alpine, Idaho	1	43.143	110.976	35	448.00	8,080	40.0	35.3
13023800	Fish Creek near Smoot, Wyo.	1	42.519	110.896	11	3.60	7,600	24.0	37.2
13038900	Targhee Creek near Macks Inn, Idaho	1	44.647	111.342	18	20.80	8,300	27.0	35.1
13050700	Mail Cabin Creek near Victor, Idaho	1	43.497	110.983	10	3.27	8,400	23.0	37.6
13117200	Main Fork near Goldburg, Idaho	1	44.402	113.405	10	15.60	8,730	38.0	30.3
13117300	Sawmill Creek near Goldburg, Idaho	1	44.311	113.339	13	74.30	8,390	35.0	35.6
13120000	Big Lost River at Wild Horse, near Chilly, Idaho	1	43.933	114.113	43	114.00	8,540	39.0	30.1
13120500	Big Lost River at Howell Ranch, near Chilly, Idaho	1	43.998	114.020	78	450.00	8,590	38.0	30.1
13128900	Lower Cedar Creek above diversions, near Mackay, Idaho	1	43.966	113.578	16	8.26	9,900	30.0	32.4

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09490800	-	-	-	-	1	----	----	----	----	----	----	510
						455	648	769	922	1,040	1,150	
09491000	0	0	0	0	0	404	740	1,030	1,480	1,890	2,350	2,310
						405	745	1,040	1,480	1,870	2,300	
10011500	0	0	0	0	0	1,880	2,410	2,720	3,080	3,340	3,580	3,230
						1,880	2,400	2,710	3,060	3,310	3,550	
10012000	0	0	0	0	0	387	543	646	776	872	967	690
						387	545	652	794	902	1,010	
10153500	1	0	0	0	0	503	633	711	804	868	930	825
						502	629	704	795	860	925	
10154000	0	0	0	0	0	178	203	218	235	247	258	238
						177	200	216	238	258	278	
10183900	0	0	0	0	0	112	196	267	377	475	588	448
						114	206	293	433	555	691	
10205100	0	0	0	0	0	4	9	13	19	25	33	17
						4	9	13	19	24	30	
10205200	0	0	0	0	0	3	8	13	20	27	34	12
						3	8	13	20	26	33	
10205300	0	0	0	0	0	12	23	33	47	59	72	32
						12	24	34	48	60	72	
10241430	1	1	0	0	0	15	24	31	42	52	62	48
						15	27	40	62	81	102	
10284800	0	0	0	0	0	7	21	36	63	90	123	42
						7	21	36	61	83	108	
13011500	1	1	0	0	0	2,480	3,130	3,540	4,050	4,420	4,780	5,350
						2,480	3,110	3,490	3,960	4,290	4,620	
13011800	0	0	0	0	0	42	63	78	100	118	137	110
						42	60	73	88	101	114	
13011900	0	0	0	0	0	4,260	5,080	5,600	6,240	6,710	7,170	6,540
						4,250	5,060	5,550	6,140	6,580	7,000	
13012000	0	1	0	0	0	4,060	4,650	5,000	5,420	5,710	5,980	5,960
						4,050	4,610	4,930	5,340	5,650	5,950	
13014500	0	1	0	0	0	3,200	3,980	4,510	5,200	5,730	6,270	6,960
						3,220	4,090	4,760	5,660	6,350	7,040	
13019210	1	0	0	1	0	14	16	17	18	19	20	18
						14	17	21	29	36	45	
13019220	1	0	0	0	0	15	20	24	28	31	34	26
						15	20	25	32	39	45	
13019400	0	0	0	0	0	600	832	994	1,210	1,370	1,550	1,150
						597	821	969	1,160	1,310	1,460	
13021000	0	0	1	0	0	127	163	184	208	224	239	167
						126	162	183	210	232	254	
13022550	-	-	-	-	1	----	----	----	----	----	----	44
						40	69	91	119	140	161	
13023000	1	0	0	0	0	3,420	4,520	5,230	6,130	6,790	7,450	7,230
						3,420	4,540	5,260	6,170	6,830	7,480	
13023800	-	-	-	-	1	----	----	----	----	----	----	81
						36	62	82	108	128	148	
13038900	0	0	0	0	0	256	326	370	424	462	499	458
						255	325	370	428	473	517	
13050700	0	1	0	0	0	37	51	60	73	83	93	81
						37	51	62	78	91	105	
13117200	1	0	0	0	0	137	193	230	278	313	349	273
						139	202	251	319	372	424	
13117300	1	0	0	0	0	374	522	619	741	832	922	651
						379	548	680	864	1,010	1,150	
13120000	0	0	1	0	0	753	1,020	1,200	1,410	1,570	1,720	1,440
						755	1,030	1,220	1,460	1,640	1,810	
13120500	0	0	1	0	0	2,170	3,010	3,500	4,070	4,460	4,810	4,420
						2,170	3,030	3,540	4,140	4,570	4,950	
13128900	1	0	0	0	0	181	227	257	294	321	349	310
						180	224	252	287	315	343	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
13135200	Prairie Creek near Ketchum, Idaho	1	43.817	114.597	10	18.00	8,420	43.0	30.1
13135800	Adams Gulch near Ketchum, Idaho	1	43.706	114.397	10	10.90	7,370	25.0	30.1
10313000	Starr Creek near Deeth, Nev.	2	41.017	115.267	11	50.60	6,750	16.0	40.1
10315000	Marys River near Deeth, Nev.	2	41.317	115.267	17	355.00	6,880	15.0	39.9
10315500	Marys River above Hot Spring Creek near Deeth, Nev.	2	41.253	115.256	43	415.00	6,220	10.0	39.9
10315800	Humboldt River Tributary near Halleck, Nev.	2	40.969	115.447	20	3.00	5,680	10.0	40.1
10353600	Secret Creek Tributary near Arthur, Nev.	2	40.867	115.261	13	3.00	6,950	14.0	40.0
10316500	Lamoille Creek near Lamoille, Nev.	2	40.691	115.476	49	25.00	9,090	21.0	40.0
10317400	North Fork Humboldt River near North Fork, Nev.	2	41.575	115.911	16	11.00	7,780	18.0	40.0
10317430	Jim Creek near Tuscarora, Nev.	2	41.297	115.787	16	22.90	6,560	16.0	40.0
10317500	North Fork Humboldt River at Devils Gate near Halleck, Nev.	2	41.181	115.493	46	830.00	7,000	14.0	40.0
10319000	South Fork Homboldt River near Lee, Nev.	2	40.567	115.550	11	500.00	8,610	22.0	40.0
10319470	Willow Creek Tributary near Jiggs, Nev.	2	40.513	115.662	22	0.82	5,600	10.0	40.1
10319500	Huntington Creek Tributary near Lee, Nev.	2	40.562	115.717	27	770.00	6,455	11.6	40.1
10320500	South Fork Humboldt River near Elko, Nev.	2	40.724	115.829	69	1,310.00	6,940	10.0	40.0
10322000	Maggie Creek at Carlin, Nev.	2	40.719	116.094	11	400.00	6,120	11.0	40.7
10322980	Cole Creek near Palisade, Nev.	2	40.585	116.149	24	11.40	5,990	11.0	41.8
10323000	Pine Creek near Palisade, Nev.	2	40.596	116.174	16	999.00	7,000	13.1	41.9
10323200	Bob Creek near Beowawe, Nev.	2	40.660	116.408	18	13.90	6,050	10.0	42.5
10323870	Willow Creek above Willow Creek Reservoir near Tuscarora, Nev.	2	41.217	116.467	11	81.00	6,140	12.0	40.1
10324500	Rock Creek near Battle Mountain, Nev.	2	40.825	116.579	48	875.00	5,930	10.0	42.3
10327600	Humboldt River Tributary near Golconda, Nev.	2	41.011	117.356	17	3.40	4,960	8.0	44.3
10328000	Pole Creek near Golconda, Nev.	2	40.914	117.531	14	10.70	6,760	13.4	44.2
10328240	Humboldt River Tributary near Bliss, Nev.	2	40.999	117.658	18	1.90	4,950	8.0	43.4
10329000	Little Humboldt River near Paradise Valley, Nev.	2	41.415	117.373	36	1,030.00	5,520	8.0	41.0
10329500	Martin Creek near Paradise Valley, Nev.	2	41.533	117.428	63	172.00	6,190	10.8	40.1
10330300	Mullinex Creek near Paradise Valley, Nev.	2	41.511	117.540	18	27.30	6,025	7.1	40.0
10332200	Raspberry Creek near Mill City, Nev.	2	40.787	117.998	19	9.38	4,970	7.9	41.7
10336030	Toulon Drain Tributary near Lovelock, Nev.	2	40.108	118.557	18	0.80	4,300	5.0	40.0
10336080	Humboldt Slough Tributary near Bradys Hot Spring, Nev.	2	39.851	118.928	22	11.00	4,600	6.0	39.1
10352500	McDermitt Creek near McDermitt, Nev.	2	41.967	117.834	38	225.00	5,875	11.0	40.0

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
13135200	0	0	0	0	0	167	244	296	362	412	462	293
						169	255	321	409	476	541	
13135800	0	0	1	0	0	39	83	125	194	259	337	124
						40	88	134	208	271	341	
10313000	0	0	0	0	0	181	307	403	535	641	753	391
						184	318	422	573	692	815	
10315000	0	0	0	0	0	283	454	571	721	832	944	616
						314	560	792	1,160	1,450	1,740	
10315500	1	1	0	0	0	422	738	1,020	1,490	1,930	2,460	4,210
						434	779	1,110	1,660	2,160	2,740	
10315800	1	0	0	0	0	13	32	50	78	104	134	99
						14	34	52	80	104	131	
10315950	-	-	-	-	1	----	----	----	----	----	----	42
						29	50	62	81	95	109	
10316500	0	0	0	0	0	421	563	660	786	883	982	829
						415	551	637	748	835	925	
10317400	0	0	0	0	0	94	134	160	191	214	236	170
						93	133	159	193	220	246	
10317430	1	1	0	0	0	43	88	133	214	296	401	541
						48	101	157	250	334	434	
10317500	1	1	0	0	0	624	1,350	2,030	3,170	4,240	5,510	10,400
						644	1,410	2,140	3,350	4,460	5,740	
10319000	0	0	0	0	0	596	760	861	981	1,070	1,150	935
						566	709	776	875	960	1,040	
10319470	-	-	-	-	1	----	----	----	----	----	----	15
						11	19	26	34	40	47	
10319500	0	0	0	0	0	299	711	1,100	1,720	2,270	2,920	2,160
						340	838	1,360	2,200	2,930	3,740	
10320500	1	0	0	0	0	1,010	1,410	1,680	2,050	2,340	2,630	2,830
						1,030	1,480	1,830	2,370	2,820	3,270	
10322000	0	0	0	0	0	138	376	643	1,150	1,690	2,400	2,440
						202	563	1,000	1,750	2,430	3,200	
10322980	0	1	0	0	0	9	54	136	361	670	1,160	1,090
						11	59	140	340	597	992	
10323000	1	0	1	0	0	137	545	1,130	2,460	4,080	6,440	3,140
						231	824	1,630	3,230	4,880	7,020	
10323200	1	0	0	0	0	34	66	94	135	172	212	130
						36	74	109	162	207	253	
10323870	1	0	0	0	0	325	562	746	1,010	1,230	1,460	820
						323	559	740	1,000	1,220	1,440	
10324500	0	0	0	0	0	462	1,320	2,240	3,880	5,490	7,470	4,800
						485	1,380	2,350	4,040	5,660	7,590	
10327600	-	-	-	-	1	----	----	----	----	----	----	1
						31	54	77	104	124	146	
10328000	0	1	0	1	0	66	226	458	1,020	1,770	2,960	4,000
						66	214	404	818	1,340	2,150	
10328240	-	-	-	-	1	----	----	----	----	----	----	113
						21	36	51	67	81	94	
10329000	1	1	0	1	0	116	308	534	988	1,500	2,200	2,380
						161	454	863	1,640	2,400	3,330	
10329500	1	0	0	0	0	423	1,100	1,890	3,420	5,110	7,390	9,000
						424	1,100	1,860	3,300	4,870	6,960	
10330300	1	0	1	0	0	248	585	899	1,400	1,840	2,350	1,320
						242	554	816	1,200	1,540	1,920	
10332200	-	-	-	-	1	----	----	----	----	----	----	25
						65	113	161	218	265	312	
10336030	-	-	-	-	1	----	----	----	----	----	----	350
						11	19	28	38	45	53	
10336080	-	-	-	-	1	----	----	----	----	----	----	710
						72	127	186	254	310	368	
10352500	0	0	0	0	0	564	1,340	2,060	3,220	4,260	5,460	3,970
						565	1,330	2,020	3,100	4,050	5,140	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10353000	East Fork Quinn River near McDermitt, Nev.	2	41.983	117.583	33	140.00	6,081	9.5	40.0
10353500	Quinn River near McDermitt, Nev.	2	41.775	117.804	35	1100.00	5,498	9.3	40.0
10353520	Eagle Creek near Orovada, Nev.	2	41.651	117.778	23	3.44	5,600	12.0	40.0
10353600	Kings River near Orovada, Nev.	2	41.907	118.308	16	20.50	6,400	19.8	40.0
10353700	Leonard Creek near Denio, Nev.	2	41.528	118.712	20	52.00	6,318	10.0	40.0
10353710	Black Rock Desert Tributary near Sulphur, Nev.	2	40.900	118.628	14	33.00	5,125	7.2	39.9
10353730	Dry Creek near Gerlach, Nev.	2	40.729	119.452	16	3.50	5,200	10.0	43.9
10353770	South Willow Creek near Gerlach, Nev.	2	41.017	119.350	23	31.00	5,941	8.8	45.1
10361700	Badger Creek Tributary near Vya, Nev.	2	41.722	119.372	17	7.70	6,156	10.0	41.9
10366000	Twentymile Creek near Adel, Oreg.	2	42.072	119.962	56	194.00	5,800	15.0	41.4
10370000	Camas Creek near Lakeview, Oreg.	2	42.216	120.101	25	63.00	6,210	20.0	40.2
10371000	Drake Creek near Adel, Oreg.	2	42.200	120.011	26	67.00	5,880	15.0	40.2
10371500	Deep Creek above Adel, Oreg.	2	42.189	120.001	57	249.00	6,110	17.0	40.2
10378500	Honey Creek near Plush, Oreg.	2	42.425	119.922	65	170.00	5,910	20.0	39.9
10384000	Chewaucan River near Paisley, Oreg.	2	42.685	120.569	72	275.00	6,050	18.0	40.0
10390400	Bridge Creek near Thompson Reservoir, Oreg.	2	43.025	121.200	16	10.60	6,170	25.0	38.9
10392300	Silvies River near Senaca, Oreg.	2	44.175	119.214	15	18.40	5,530	30.0	34.8
10392800	Crowsfoot Creek near Burns, Oreg.	2	43.899	119.497	14	8.50	5,790	25.0	35.0
10393500	Silvies River near Burns, Oreg.	2	43.715	119.176	79	934.00	5,200	19.0	35.0
10393900	Devine Canyon near Burns, Oreg.	2	43.772	119.004	17	4.96	5,410	15.0	34.8
10396000	Donner and Blitzen River near Frenchglen, Oreg.	2	42.791	118.867	60	200.00	6,160	14.0	44.0
10397000	Bridge Creek near Frenchglen, Oreg.	2	42.844	118.849	39	30.00	5,890	12.0	44.2
10403000	Silver Creek near Riley, Oreg.	2	43.692	119.658	29	228.00	5,180	20.0	36.1
10406500	Trout Creek near Denio, Nev.	2	42.156	118.458	65	88.00	5,920	14.0	41.0
13155200	Burns Gulch near Glenns Ferry, Idaho	2	43.195	115.333	12	0.76	6,160	15.0	39.3
13155300	Lower Canyon Creek at Stout, near Glenns Ferry, Idaho	2	43.154	115.309	18	14.20	5,960	15.0	40.0
13161100	Bruneau River near Charleston, Nev.	2	41.514	115.451	15	44.00	6,620	12.9	40.0
13161200	Seventy Six Creek near Charleston, Nev.	2	41.711	115.482	16	3.52	7,510	14.5	40.0
13161300	Meadow Creek near Rowland, Nev.	2	41.900	115.678	17	57.80	6,180	10.7	39.8
13161500	Bruneau River at Rowland, Nev.	2	41.933	115.674	31	382.00	6,790	10.6	39.7
13161600	McDonald Creek near Rowland, Nev.	2	41.919	115.772	16	10.80	7,030	14.0	39.8

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
10353000	1	0	1	0	0	425	658	828	1,060	1,240	1,440	1,270
						426	665	849	1,110	1,320	1,550	
10353500	1	0	1	0	0	255	686	1,100	1,740	2,310	2,940	1,580
						300	826	1,410	2,360	3,190	4,070	
10353520	-	-	-	-	1	----	----	----	----	----	----	10
						32	55	74	99	118	137	
10353600	0	1	0	0	0	46	122	212	394	597	878	770
						50	130	220	384	551	770	
10353700	0	0	0	0	0	79	194	312	521	727	985	612
						86	210	339	554	751	985	
10353710	-	-	-	-	1	----	----	----	----	----	----	3,940
						158	281	397	545	666	790	
10353730	-	-	-	-	1	----	----	----	----	----	----	736
						32	55	77	104	124	145	
10353770	1	0	0	0	0	40	207	489	1,230	2,240	3,860	1,730
						45	211	474	1,110	1,920	3,200	
10361700	1	0	0	0	0	14	54	108	226	366	566	230
						17	58	111	214	327	480	
10366000	1	0	1	0	0	1,460	3,020	4,470	6,840	9,050	11,700	3,670
						1,450	2,960	4,310	6,460	8,450	10,800	
10370000	0	1	0	0	0	472	821	1,130	1,640	2,110	2,670	3,190
						464	796	1,070	1,510	1,910	2,370	
10371000	0	0	0	0	0	482	1,270	2,140	3,780	5,490	7,710	6,210
						474	1,220	1,980	3,340	4,720	6,490	
10371500	0	0	0	0	0	1,280	2,570	3,700	5,460	7,010	8,780	9,420
						1,270	2,530	3,590	5,220	6,640	8,250	
10378500	0	0	1	0	0	465	1,200	1,950	3,280	4,590	6,190	11,000
						466	1,190	1,920	3,180	4,400	5,880	
10384000	1	1	0	0	0	955	1,580	2,110	2,910	3,620	4,430	6,490
						952	1,570	2,100	2,880	3,570	4,360	
10390400	0	0	0	0	0	66	110	147	205	256	316	218
						66	111	150	208	257	312	
10392300	1	0	0	0	0	72	105	127	156	178	201	152
						74	113	148	200	241	283	
10392800	0	0	1	0	0	49	72	87	106	120	134	88
						50	76	97	127	150	174	
10393500	1	0	0	0	0	1,340	2,220	2,910	3,880	4,680	5,550	4,960
						1,350	2,240	2,970	4,020	4,900	5,840	
10393900	-	-	-	-	1	----	----	----	----	----	----	28
						41	71	98	132	157	184	
10396000	0	0	1	0	0	1,380	2,170	2,690	3,330	3,780	4,230	4,270
						1,370	2,140	2,630	3,230	3,660	4,100	
10397000	1	0	0	0	0	108	174	221	281	327	373	301
						109	178	231	302	358	414	
10403000	1	0	1	0	0	611	1,020	1,310	1,690	1,980	2,270	1,810
						612	1,030	1,340	1,770	2,110	2,460	
10406500	1	0	0	0	0	119	193	253	342	420	507	470
						122	203	276	389	487	593	
13155200	0	0	0	0	0	6	12	18	27	36	46	22
						6	13	19	28	36	45	
13155300	0	1	0	0	0	93	161	221	315	401	502	500
						93	160	219	307	384	472	
13161100	1	1	0	0	0	26	125	297	780	1,490	2,690	1,890
						36	149	323	738	1,290	2,160	
13161200	0	0	0	0	0	22	49	71	105	133	165	89
						23	49	71	101	125	152	
13161300	0	0	0	0	0	198	432	639	959	1,240	1,550	940
						200	431	627	916	1,160	1,430	
13161500	1	0	1	0	0	784	1,290	1,670	2,180	2,580	3,000	2,140
						788	1,310	1,710	2,280	2,730	3,200	
13161600	0	0	0	0	0	43	63	76	93	105	118	85
						45	69	89	119	141	163	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
13162200	Jarbidge River at Jarbidge, Nev.	2	41.862	115.428	15	22.60	7,950	18.4	40.0
13162400	Buck Creek near Jarbidge, Nev.	2	41.979	115.432	16	20.20	6,990	13.2	40.0
13162500	East Fork Jarbidge River near Three Creek, Idaho	2	42.033	115.372	22	84.60	7,600	19.0	39.8
13162600	Columbet Creek near Jarbidge, Nev.	2	41.967	115.485	16	3.37	7,020	14.2	40.0
13169500	Big Jacks Creek near Bruneau, Idaho	2	42.785	115.983	33	253.00	5,150	13.0	39.3
13170000	Little Jacks Creek near Bruneau, Idaho	2	42.833	116.000	11	100.00	5,020	12.0	39.5
13170100	Sugar Creek Tributary near Grasmere, Idaho	2	42.564	115.907	19	4.50	4,860	12.0	40.0
13172200	Fossil Creek near Oreana, Idaho	2	43.094	116.449	17	19.70	3,920	12.0	43.0
13172666	West Fork Reynolds Creek near Reynolds, Idaho	2	43.070	116.760	14	0.20	6,880	41.0	43.0
13172668	East Fork Reynolds Creek near Reynolds, Idaho	2	43.070	116.750	16	0.16	6,800	41.0	43.0
13172680	Reynolds Creek at Tollgate Weir, near Reynolds, Idaho	2	43.100	116.770	13	21.00	5,940	31.0	43.1
13172720	Macks Creek near Reynolds, Idaho	2	43.230	116.790	15	12.30	4,860	19.0	43.7
13172735	Salmon Creek near Reynolds, Idaho	2	43.270	116.790	15	14.00	4,870	19.0	43.8
13172740	Reynolds Creek at outlet weir, near Reynolds, Idaho	2	43.180	116.760	16	90.00	5,000	20.0	43.5
13172800	L Squaw Creek Tributary near Marsing, Idaho	2	43.364	116.921	19	1.81	4,440	13.0	44.1
13175900	Reed Creek near Owyhee, Nev.	2	41.896	116.061	17	6.51	6,400	12.0	39.8
13176600	Taylor Canyon Tributary near Tuscarora, Nev.	2	41.236	116.036	13	1.20	6,600	16.0	40.0
13176900	Jack Creek below Schoonover Creek, near Tuscarora, Nev.	2	41.508	116.072	16	19.80	7,450	14.2	40.0
13177000	Jack Creek near Tuscarora, Nev.	2	41.500	116.100	13	31.00	6,890	12.0	40.0
13177200	South Fork Owyhee River at Spanish RA near Tuscarora, Nev.	2	41.428	116.178	16	330.00	6,170	12.0	40.0
13177800	South Fork Owyhee River near Whiterock, Nev.	2	41.800	116.483	26	1,080.00	6,060	9.4	40.0
13178000	Jordan Creek above LN Tree Creek, near Jordan Valley, Oreg.	2	42.874	116.953	24	440.00	5,780	15.0	42.1
13182100	Dago Gulch near Rockville, Oreg.	2	43.294	117.254	12	3.09	4,560	12.0	43.3
13182150	Long Gulch near Rockville, Oreg.	2	43.321	117.195	10	1.38	5,030	12.0	43.6
13184200	Roaring River near Rocky Bar, Idaho	2	43.706	115.464	17	23.30	7,200	43.0	29.4
13184800	Beaver Creek near Lowman, Idaho	2	43.972	115.608	10	9.30	5,860	45.0	30.0
13185000	Boise River near Twin Springs, Idaho	2	43.659	115.726	76	830.00	6,350	42.0	33.8
13185500	Cottonwood Creek at Arrowrock Reservoir, Idaho	2	43.632	115.824	11	20.90	5,180	23.0	36.4
13186000	South Fork Boise River near Featherville, Idaho	2	43.494	115.306	42	635.00	6,840	37.0	35.2
13186500	Lime Creek near Bennett, Idaho	2	43.417	115.267	11	131.00	6,140	23.0	35.7
13187000	Fall Creek near Anderson Ranch Dam, Idaho	2	43.433	115.386	12	55.30	6,070	26.0	35.4

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
13162200	0	0	0	0	0	306	477	597	756	878	1,000	700
						295	449	539	658	751	845	
13162400	1	0	0	0	0	85	164	234	344	443	558	380
						86	167	236	341	430	530	
13162500	0	0	0	0	0	449	623	732	864	958	1,050	798
						443	618	726	873	986	1,100	
13162600	0	0	0	0	0	12	24	34	50	63	79	46
						13	27	39	58	74	89	
13169500	1	0	1	0	0	230	493	749	1,190	1,610	2,130	2,100
						243	531	834	1,340	1,810	2,370	
13170000	0	0	0	0	0	143	423	739	1,330	1,940	2,720	908
						160	451	773	1,310	1,810	2,410	
13170100	-	-	-	-	1	----	----	----	----	----	----	105
						38	66	95	128	155	182	
13172200	1	1	0	0	0	43	196	456	1,170	2,190	3,920	2,860
						47	196	432	1,010	1,780	3,060	
13172666	1	0	0	0	0	5	9	11	15	18	21	14
						5	9	11	14	17	19	
13172668	1	0	0	0	0	5	6	8	10	11	13	11
						5	6	8	10	11	13	
13172680	1	0	0	0	0	201	273	320	380	424	468	404
						195	264	311	376	429	483	
13172720	0	1	0	0	0	97	264	451	801	1,160	1,640	1,200
						96	250	408	675	938	1,280	
13172735	0	1	0	0	0	81	213	355	617	887	1,230	1,007
						82	206	332	541	746	999	
13172740	0	0	0	0	0	438	1,090	1,780	3,030	4,280	5,880	3,801
						432	1,040	1,630	2,610	3,550	4,730	
13172800	1	0	1	0	0	13	32	52	87	121	163	93
						13	32	52	83	112	147	
13175900	0	0	0	0	0	23	49	73	109	140	176	95
						24	53	79	118	149	184	
13176600	1	0	0	0	0	4	7	10	14	17	20	12
						4	9	14	21	27	32	
13176900	0	0	0	0	0	168	239	286	345	390	434	325
						165	234	279	339	386	434	
13177000	0	0	0	0	0	200	299	371	468	545	626	465
						197	295	365	465	545	629	
13177200	0	1	0	0	0	615	1,310	1,950	2,970	3,900	4,990	4,130
						627	1,330	1,960	2,920	3,770	4,720	
13177800	1	0	1	0	0	1,540	2,460	3,100	3,950	4,610	5,270	3,830
						1,550	2,530	3,270	4,350	5,240	6,140	
13178000	0	1	0	0	0	1,940	3,010	3,790	4,870	5,740	6,650	7,530
						1,900	2,930	3,640	4,650	5,480	6,350	
13182100	-	-	-	-	1	----	----	----	----	----	----	46
						29	51	74	100	121	143	
13182150	-	-	-	-	1	----	----	----	----	----	----	18
						16	28	40	53	63	73	
13184200	0	0	0	0	0	330	453	529	620	684	745	575
						319	431	490	565	623	680	
13184800	0	0	0	0	0	102	149	181	223	256	288	195
						99	143	174	216	251	286	
13185000	1	1	0	0	0	6,760	9,310	11,000	13,200	14,900	16,600	18,800
						6,700	9,160	10,700	12,700	14,300	16,000	
13185500	0	0	0	0	0	91	191	284	436	577	745	330
						93	193	284	422	542	678	
13186000	1	0	0	0	0	4,620	5,970	6,800	7,770	8,460	9,120	7,960
						4,550	5,820	6,550	7,420	8,090	8,750	
13186500	0	0	0	0	0	659	964	1,170	1,420	1,610	1,800	1,180
						640	935	1,140	1,410	1,640	1,870	
13187000	0	0	0	0	0	509	706	849	1,040	1,200	1,360	1,150
						488	667	787	956	1,110	1,260	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
13191000	South Fork Boise River near Lenox, Idaho	2	43.500	115.683	35	1,090.00	6,270	31.0	32.6
13196500	Bannock Creek near Idaho City, Idaho	2	43.808	115.774	24	5.75	5,200	30.0	30.1
13200000	Mores Creek near Arrowrock Dam, Idaho	2	43.648	115.989	36	399.00	4,960	28.0	40.0
13200500	Robie Creek near Arrowrock Dam, Idaho	2	43.630	115.999	21	15.80	4,960	20.0	40.0
13207000	Spring Valley Creek near Eagle, Idaho	2	43.739	116.300	16	20.90	3,990	14.0	40.2
13207500	Dry Creek near Eagle, Idaho	2	43.732	116.304	14	59.40	4,050	13.0	40.4
13210300	Bryans Run near Boise, Idaho	2	43.451	116.069	19	7.94	3,540	12.0	42.4
13213900	Malheur River Tributary near Drewsey, Oreg.	2	43.780	118.358	17	2.28	3,820	10.0	40.1
13214000	Malheur River near Drewsey, Oreg.	2	43.785	118.331	61	910.00	4,900	16.3	40.0
13216500	Near Fork Malheur River above Beulah Reservoir, near Beulah, Oreg.	2	43.948	118.173	49	355.00	5,360	19.0	36.2
13227000	Bully Creek near Vale, Oreg.	2	43.958	117.342	26	570.00	4,150	17.8	42.7
13228300	Lytle Creek near Vale, Oreg.	2	43.957	117.226	13	6.46	2,700	10.0	43.1
14044000	Lost Valley Creek Tributary near Ironside, Oreg.	2	44.314	117.903	12	1.86	4,050	10.0	35.0
14036800	John Day River near Prairie City, Oreg.	2	44.319	118.557	14	17.40	6,320	28.0	34.9
14037500	Strawberry Creek above Slide Creek, near Prairie City, Oreg.	2	44.342	118.656	56	7.00	6,900	37.0	34.9
14038530	John Day River near John Day, Oreg.	2	44.419	118.903	18	386.00	4,900	25.0	35.0
14038550	East Fork Canyon Creek near Canyon City, Oreg.	2	44.246	118.911	15	24.80	5,780	25.0	35.0
14038600	Vance Creek near Canyon City, Oreg.	2	44.289	118.978	14	6.54	5,060	20.0	35.0
14038750	Beech Creek near Fox, Oreg.	2	44.568	119.108	12	1.94	5,190	20.0	35.7
14038900	Fields Creek near Mount Vernon, Oreg.	2	44.393	119.307	13	17.50	5,310	22.0	34.9
14039200	Venator Creek near Silvies, Oreg.	2	43.999	119.275	13	11.90	5,510	25.0	35.0
14040500	John Day River at Picture Gorge, near Dayville, Oreg.	2	44.521	119.625	59	1,680.00	4,580	22.0	34.9
14040700	Whisky Creek near Mitchell, Oreg.	2	44.522	119.922	11	2.22	4,270	24.0	35.2
14040900	Bruin Creek near Dale, Oreg.	2	44.897	118.793	12	4.63	5,220	25.0	35.1
14041500	North Fork John Day near Dale, Oreg.	2	44.999	118.940	29	5,200	5,450	27.0	34.7
14041900	Line Creek near Lehman Springs, Oreg.	2	45.169	118.711	15	2.40	4,580	20.0	35.1
14042000	Camas Creek near Lehman, Oreg.	2	45.171	118.731	20	60.70	4,680	24.0	35.1
14042500	Camas Creek near Ukiah, Oreg.	2	45.157	118.819	62	121.00	4,680	24.0	35.0
14043800	Bridge Creek near Prairie City, Oreg.	2	44.542	118.540	15	6.93	5,350	30.0	35.0
14043850	Cottonwood Creek near Galena, Oreg.	2	44.653	118.865	15	3.89	5,130	22.0	35.1
14043900	Granite Creek near Dale, Oreg.	2	44.894	119.014	11	1.90	4,130	20.0	34.9

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
13191000	0	1	0	0	0	4,900	7,540	9,520	12,300	14,600	17,000	9,550
						4,820	7,340	9,130	11,600	13,700	15,900	
13196500	0	0	0	1	0	13	24	34	47	59	72	46
						14	28	42	64	82	100	
13200000	1	0	0	0	0	1,820	2,900	3,700	4,770	5,610	6,490	5,440
						1,800	2,840	3,600	4,620	5,440	6,310	
13200500	0	0	0	0	0	61	103	137	186	227	272	274
						62	108	150	210	261	315	
13207000	0	0	0	0	0	52	129	206	335	457	601	244
						55	136	223	357	478	614	
13207500	0	0	0	0	0	94	237	383	636	880	1,180	373
						103	259	433	710	960	1,250	
13210300	1	0	0	0	0	74	164	248	381	502	642	420
						73	158	236	350	452	568	
13213900	-	-	-	-	1	----	----	----	----	----	----	100
						24	41	63	86	105	126	
13214000	1	0	0	0	0	2,080	3,890	5,400	7,680	9,640	11,800	12,000
						2,070	3,870	5,360	7,590	9,510	11,600	
13216500	1	0	0	0	0	939	1,490	1,910	2,500	2,980	3,500	3,970
						938	1,490	1,930	2,550	3,070	3,620	
13227000	0	0	0	0	0	835	2,330	3,880	6,540	9,050	12,000	8,980
						848	2,320	3,830	6,290	8,560	11,200	
13228300	0	0	0	0	0	101	191	269	388	494	615	497
						97	178	247	343	429	527	
13229400	-	-	-	-	1	----	----	----	----	----	----	41
						20	35	53	73	88	104	
14036800	0	0	1	0	0	73	115	144	181	208	235	155
						74	122	160	213	254	294	
14037500	1	1	0	0	0	90	134	167	216	258	304	354
						90	133	164	211	251	295	
14038530	1	0	0	0	0	1,730	2,800	3,650	4,900	5,960	7,140	5,830
						1,690	2,700	3,470	4,590	5,570	6,640	
14038550	-	-	-	-	1	----	----	----	----	----	----	285
						129	228	310	419	506	594	
14038600	0	0	0	0	0	18	28	35	45	53	61	39
						20	35	51	75	94	114	
14038750	-	-	-	-	1	----	----	----	----	----	----	28
						21	36	50	67	80	93	
14038900	-	-	-	-	1	----	----	----	----	----	----	240
						101	177	248	336	407	480	
14039200	1	1	0	0	0	56	73	84	98	109	120	108
						57	80	103	138	165	194	
14040500	0	0	1	0	0	2,820	4,580	5,880	7,650	9,060	10,500	8,170
						2,820	4,590	5,950	7,850	9,410	11,000	
14040700	0	0	1	0	0	33	75	115	179	239	308	143
						33	70	103	150	192	240	
14040900	1	0	0	0	0	34	44	51	60	67	73	57
						34	47	60	79	94	109	
14041500	0	0	0	0	0	3,080	4,500	5,410	6,530	7,340	8,120	8,170
						3,020	4,360	5,170	6,190	6,980	7,770	
14041900	-	-	-	-	1	----	----	----	----	----	----	90
						24	42	62	83	100	118	
14042000	0	0	0	0	0	632	993	1,280	1,690	2,040	2,430	1,880
						614	947	1,200	1,540	1,840	2,170	
14042500	0	0	0	0	0	1,060	1,600	2,010	2,560	3,010	3,480	3,840
						1,050	1,580	1,970	2,490	2,920	3,370	
14043800	0	0	0	0	0	39	59	73	91	105	121	98
						40	62	82	109	131	155	
14043850	0	0	0	0	0	47	68	82	100	114	128	98
						47	67	82	103	120	137	
14043900	-	-	-	-	1	----	----	----	----	----	----	66
						21	36	54	73	88	105	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
14044000	Middle Fork John Day River at Ritter, Oreg.	2	44.889	119.140	56	515.00	4,800	23.0	33.7
14044100	Paul Creek near Long Creek, Oreg.	2	44.724	119.132	11	3.50	4,490	18.0	34.7
14044500	Fox Creek at Gorge near Fox, Oreg.	2	44.619	119.262	28	90.20	4,830	21.0	35.4
14046250	Ives Canyon near Spray, Oreg.	2	44.860	119.714	12	2.73	3,460	18.0	34.7
14046300	Big Service Creek near Service Creek, Oreg.	2	44.894	120.070	11	5.56	3,880	18.0	34.7
14046400	Donnely Creek Tributary near Service Creek, Oreg.	2	44.772	120.003	18	1.85	2,880	16.0	34.8
14046900	John Day River Tributary near Clarno, Oreg.	2	44.906	120.568	21	1.36	3,730	15.0	35.1
14047350	Rock Creek Tributary near Hardman, Oreg.	2	45.078	119.569	14	6.25	4,100	20.0	34.9
14047450	West Fork Dry Creek near Gooseberry, Oreg.	2	45.286	119.964	13	0.81	2,540	15.0	34.7
14077500	North Fork Beaver Creek near Paulina, Oreg.	2	44.167	119.733	13	64.40	4,670	20.0	35.1
14077800	Wolf Creek Tributary near Paulina, Oreg.	2	44.277	119.817	15	2.15	5,150	18.0	35.1
14078000	Beaver Creek near Paulina, Oreg.	2	44.164	119.922	33	450.00	4,600	20.0	35.1
14078200	Lizard Gulch Tributary near Hampton, Oreg.	2	43.589	119.983	16	19.60	5,000	15.0	37.7
14078400	Lookout Creek near Post, Oreg.	2	44.311	120.240	14	7.53	5,670	25.0	34.0
14078500	North Fork Crooked River above Deep Creek, Oreg.	2	44.333	120.083	11	159.00	5,130	21.0	35.2
14081800	Ahalt Creek near Mitchell, Oreg.	2	44.433	120.351	22	2.28	5,130	25.0	34.5
14083000	Ochoco Creek above Mill Creek near Prineville, Oreg.	2	44.308	120.644	13	200.00	4,654	21.0	34.7
13044500	Warm River at Warm River, Idaho	3	44.114	111.324	18	178.00	6,830	27.0	37.7
13045500	Robinson Creek at Warm River, Idaho	3	44.116	111.319	18	129.00	6,450	27.0	37.6
13047500	Falls River near Squirrel, Idaho	3	44.069	111.240	74	326.00	7,520	46.0	37.6
13050800	Moose Creek near Victor, Idaho	3	43.563	111.067	10	21.40	8,300	24.0	38.2
13052200	Teton River above South Leigh Creek, near Driggs, Idaho	3	43.782	111.208	25	335.00	7,350	36.0	37.9
13054400	Milk Creek near Tetonia, Idaho	3	43.883	111.344	19	17.90	6,540	20.0	38.5
13055000	Teton River near St Anthony, Idaho	3	43.927	111.615	76	890.00	6,900	26.0	40.0
13058000	Willow Creek near Ririe, Idaho	3	43.593	111.769	25	627.00	6,390	16.0	40.0
13062700	Angus Creek near Henry, Idaho	3	42.829	111.338	16	13.90	7,000	18.0	35.4
13063000	Blackfoot River above reservoir, near Henry, Idaho	3	42.817	111.510	13	350.00	6,940	25.0	35.8
13063500	Little Blackfoot River at Henry, Idaho	3	42.908	111.529	12	38.80	6,600	18.0	36.3
13073700	Robbers Roost Creek near McCammon, Idaho	3	42.706	112.203	11	5.70	6,910	20.0	40.0
13074000	Birch Creek near Downey, Idaho	3	42.350	112.250	14	6.56	7,240	24.0	40.0
13075000	Marsh Creek near McCammon, Idaho	3	42.631	112.225	32	355.00	5,630	19.0	40.0

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
14044000	0	0	0	0	0	1,650	2,430	2,970	3,650	4,170	4,700	4,730
						1,640	2,420	2,970	3,700	4,280	4,870	
14044100	-	-	-	-	1	----	----	----	----	----	----	56
						32	55	81	110	134	158	
14044500	1	0	0	0	0	410	798	1,150	1,700	2,210	2,810	1,860
						407	785	1,120	1,630	2,090	2,620	
14046250	-	-	-	-	1	----	----	----	----	----	----	86
						27	46	75	103	127	153	
14046300	0	0	0	1	0	4	7	9	12	14	17	11
						7	17	33	58	77	97	
14046400	-	-	-	-	1	----	----	----	----	----	----	42
						20	35	60	84	104	127	
14046900	0	0	0	0	0	30	49	62	79	92	105	83
						30	47	60	76	88	101	
14047350	1	0	1	0	0	57	89	111	139	159	180	117
						56	88	114	148	175	203	
14047450	-	-	-	-	1	----	----	----	----	----	----	134
						11	19	34	48	60	73	
14077500	0	0	1	0	0	612	781	885	1,010	1,100	1,180	955
						587	741	844	989	1,120	1,240	
14077800	-	-	-	-	1	----	----	----	----	----	----	300
						23	39	54	73	87	101	
14078000	0	1	1	0	0	1,370	2,750	4,060	6,270	8,400	11,000	12,800
						1,360	2,700	3,950	5,980	7,910	10,200	
14078200	-	-	-	-	1	----	----	----	----	----	----	177
						109	193	275	375	457	542	
14078400	1	0	1	0	0	49	71	86	103	116	129	85
						49	74	94	121	142	164	
14078500	0	0	1	0	0	1,390	1,780	2,040	2,370	2,620	2,870	2,500
						1,320	1,650	1,870	2,180	2,460	2,770	
14081800	1	1	0	0	0	39	57	71	92	108	127	122
						38	56	70	89	105	122	
14083000	1	0	0	0	0	356	540	671	845	982	1,120	821
						371	600	834	1,190	1,490	1,790	
13044500	0	0	0	0	0	460	628	738	875	976	1,080	900
						462	635	753	910	1,030	1,160	
13045500	1	0	0	0	0	639	805	910	1,040	1,130	1,220	1,140
						636	803	910	1,050	1,150	1,260	
13047500	0	0	0	0	0	3,550	4,450	5,010	5,700	6,190	6,680	7,060
						3,540	4,440	4,990	5,660	6,140	6,620	
13050800	0	0	0	0	0	278	338	373	415	445	473	390
						274	332	365	407	440	474	
13052200	1	0	0	0	0	1,510	1,910	2,160	2,470	2,700	2,920	2,460
						1,510	1,910	2,160	2,480	2,730	2,970	
13054400	1	0	0	0	0	82	244	445	865	1,350	2,020	1,350
						82	242	435	828	1,270	1,870	
13055000	1	1	0	0	0	3,370	4,540	5,340	6,370	7,170	7,980	11,000
						3,360	4,530	5,320	6,330	7,120	7,910	
13058000	0	0	0	0	0	1,730	2,550	3,110	3,830	4,380	4,930	5,080
						1,720	2,520	3,060	3,750	4,270	4,780	
13062700	0	0	1	0	0	274	511	715	1,030	1,320	1,640	1,060
						270	499	689	971	1,220	1,500	
13063000	0	0	0	0	0	1,040	1,520	1,840	2,250	2,550	2,850	2,150
						1,040	1,510	1,830	2,230	2,540	2,840	
13063500	0	0	0	0	0	140	209	257	321	370	420	292
						140	210	259	327	382	439	
13073700	0	0	0	1	0	14	21	26	33	37	42	24
						15	23	31	42	52	63	
13074000	0	1	0	0	0	24	38	49	65	78	94	95
						25	40	52	73	90	110	
13075000	0	0	0	0	0	322	475	588	743	869	1,000	1,120
						324	482	603	776	920	1,070	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
13075600	North Fork Pocatello Creek near Pocatello, Idaho	3	42.886	112.396	11	14.00	5,800	10.0	40.0
13077700	George Creek near Yost, Utah	3	41.919	113.481	27	7.84	8,570	25.0	40.1
13078000	Raft River at Peterson Ranch, near Bridge, Idaho	3	42.068	113.449	26	412.00	6,150	24.0	40.0
13079000	Clear Creek near Naf, Idaho	3	41.967	113.286	28	19.00	7,870	28.0	40.0
13079200	Cassia Creek near Elba, Idaho	3	42.276	113.514	12	84.00	6,560	35.0	39.9
13079800	Heglar Canyon Tributary near Rockland, Idaho	3	42.474	113.146	17	7.72	5,300	15.0	40.0
13082500	Goose Creek above Trapper Creek, near Oakley, Idaho	3	42.125	113.939	73	633.00	6,030	22.0	40.0
13083000	Trapper Creek near Oakley, Idaho	3	42.169	113.972	73	53.70	6,360	18.0	40.0
13092000	Rock Creek near Rock Creek, Idaho	3	42.356	114.303	28	80.00	6,330	15.0	41.3
13105000	Salmon Falls Creek near San Jacinto, Nev.	3	41.944	114.687	74	1450.00	6,020	15.0	40.0
13108500	Camas Creek at 18-MI SHRG CRL, near Kilgore, Idaho	3	44.297	111.906	22	210.00	6,970	25.0	37.3
13112000	Camas Creek at Camas, Idaho	3	44.003	112.220	62	400.00	--	--	40.1
13112900	Huntley Canyon at Spencer, Idaho	3	44.364	112.183	10	4.00	6,800	17.0	36.8
13113000	Beaver Creek at Spencer, Idaho	3	44.356	112.178	28	120.00	7,110	25.0	37.0
13113500	Beaver Creek at Dubois, Idaho	3	44.186	112.236	56	220.00	7,260	22.0	39.7
13116000	Medicine Lodge Creek at Ellis Ranch near Argora, Idaho	3	44.292	112.501	29	165.00	7,520	25.0	36.6
13118700	Little Lost River below Wet Creek, near Howe, Idaho	3	44.139	113.244	26	440.00	--	--	35.0
13135500	Big Wood River near Ketchum, Idaho	3	43.786	114.424	24	137.00	8,120	41.0	30.1
13136500	Warm Springs Creek at Guyer Spring, near Ketchum, Idaho	3	43.683	114.415	18	96.00	7,560	37.0	30.1
13139500	Big Wood River at Hailey, Idaho	3	43.518	114.319	72	640.00	7,670	35.0	32.9
13141400	Deer Creek near Fairfield, Idaho	3	43.370	114.719	11	13.20	6,440	20.0	37.4
13141500	Camas Creek near Blaine, Idaho	3	43.333	114.541	62	648.00	5,600	18.0	40.4
13145700	Schooler Creek near Gooding, Idaho	3	43.192	114.657	19	2.22	5,640	12.0	40.5
13147900	Little Wood River above High 5 Creek, near Carey, Idaho	3	43.492	114.058	23	248.00	7,220	28.0	38.2
13148000	Little Wood River at Campbell RH, near Carey, Idaho	3	43.461	114.047	25	267.00	7,160	27.0	39.6
13154000	Clover Creek near Bliss, Idaho	3	43.025	115.006	28	140.00	4,700	10.0	44.4
09204500	East Fork at Newfork, Wyo.	4	42.700	109.717	13	348.00	8,380	18.0	37.6
09205000	New Fork River near Big Piney, Wyo.	4	42.567	109.929	22	1,230.00	8,370	17.0	40.1
09207650	Dry Basin Creek near Big Piney, Wyo.	4	42.424	110.110	11	47.20	7,280	12.0	40.0
09210500	Fontenelle Creek near Herschler Ranch, near Fontenelle, Wyo.	4	42.096	110.416	35	152.00	8,160	18.0	39.3
09213500	Big Sandy Creek near Farson, Wyo.	4	42.317	109.485	49	322.00	7,820	14.0	40.2

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
13075600	0	0	0	0	0	22	38	50	68	83	99	57
						23	39	53	74	92	112	
13077700	0	1	0	0	0	73	115	148	196	236	281	295
						73	115	148	196	235	280	
13078000	0	0	0	0	0	149	316	483	782	1,080	1,470	2,060
						157	335	518	845	1,170	1,580	
13079000	0	0	0	0	0	117	182	231	299	353	412	386
						117	183	232	302	357	418	
13079200	0	0	0	0	0	192	401	592	903	1,190	1,530	982
						199	413	609	922	1,200	1,520	
13079800	1	1	0	0	0	154	305	453	713	974	1,310	1,930
						152	298	437	673	904	1,200	
13082500	0	0	0	0	0	255	552	856	1,400	1,960	2,670	3,240
						258	559	869	1,420	1,990	2,700	
13083000	0	0	0	0	0	53	88	116	157	193	233	270
						54	89	119	162	201	244	
13092000	0	0	0	0	0	187	301	379	478	552	625	461
						187	301	379	480	557	634	
13105000	1	1	0	0	0	734	1,230	1,590	2,100	2,500	2,920	3,860
						736	1,230	1,600	2,120	2,530	2,960	
13108500	0	0	0	0	0	791	1,300	1,710	2,290	2,770	3,300	2,590
						788	1,290	1,690	2,250	2,700	3,200	
13112000	1	0	1	0	0	441	751	959	1,220	1,400	1,570	1,320
						----	----	----	----	----	----	
13112900	0	0	0	0	0	9	17	24	35	44	55	36
						10	19	27	41	53	67	
13113000	0	0	0	0	0	340	547	711	950	1,150	1,370	1,190
						341	549	714	954	1,160	1,370	
13113500	1	0	1	0	0	267	454	601	813	989	1,180	858
						268	457	607	825	1,010	1,200	
13116000	1	1	0	1	0	105	154	192	245	289	337	361
						109	164	213	287	352	425	
13118700	1	0	1	0	0	345	405	441	483	513	542	509
						----	----	----	----	----	----	
13135500	0	0	0	0	0	914	1,290	1,530	1,840	2,070	2,300	1,690
						912	1,290	1,530	1,830	2,070	2,300	
13136500	0	0	0	0	0	488	653	765	909	1,020	1,130	961
						489	657	775	932	1,060	1,180	
13139500	1	0	1	0	0	2,410	3,470	4,210	5,180	5,930	6,690	6,150
						2,410	3,460	4,200	5,160	5,900	6,650	
13141400	0	0	0	0	0	53	87	114	153	186	223	150
						53	88	117	159	195	236	
13141500	1	0	1	0	0	3,300	5,260	6,670	8,560	10,000	11,600	9,780
						3,290	5,230	6,610	8,440	9,820	11,300	
13145700	1	0	0	0	0	26	38	46	57	65	74	68
						26	38	46	56	65	74	
13147900	1	0	0	0	0	1,070	1,550	1,890	2,330	2,670	3,010	2,480
						1,070	1,540	1,880	2,300	2,640	2,970	
13148000	0	0	0	0	0	861	1,400	1,830	2,440	2,960	3,530	3,110
						860	1,400	1,820	2,410	2,910	3,460	
13154000	0	1	0	1	0	1,580	3,190	4,700	7,230	9,640	12,500	4,500
						1,570	3,140	4,580	6,950	9,160	11,700	
09204500	-	-	-	-	1	----	----	----	----	----	----	2,940
						1,190	1,740	2,130	2,590	3,000	3,350	
09205000	0	0	0	0	0	5,310	6,940	7,900	8,990	9,740	10,400	9,190
						5,270	6,820	7,680	8,630	9,320	9,930	
09207650	1	0	0	0	0	136	269	376	531	659	797	450
						138	274	385	540	667	796	
09210500	1	0	0	0	0	492	680	799	944	1,050	1,150	907
						493	687	816	983	1,110	1,240	
09213500	1	0	0	0	0	843	1,160	1,350	1,600	1,770	1,940	1,890
						844	1,170	1,370	1,640	1,840	2,030	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09215000	Pacific Creek near Farson, Wyo.	4	42.130	109.323	19	500.00	7,270	10.0	41.0
09216290	East Otterson Wash near Green River, Wyo.	4	41.784	109.734	16	16.60	6,410	7.0	45.3
09216350	Skunk Canyon Creek near Green River, Wyo.	4	41.732	109.511	11	15.70	6,940	8.0	48.5
09216537	Delaney Draw near Red Desert, Wyo.	4	41.639	108.129	24	32.80	7,040	7.0	45.6
09216550	Deadman Wash near Point Of Rocks, Wyo.	4	41.675	108.736	21	152.00	7,000	8.0	44.7
09216560	Bitter Creek near Point Of Rocks, Wyo.	4	41.678	108.786	15	758.00	7,010	7.5	44.6
09216600	Cutthroat Draw near Rock Springs, Wyo.	4	41.457	108.942	22	7.88	6,920	8.0	44.5
09216700	Salt Wells Creek near Rock Springs, Wyo.	4	41.483	108.967	18	515.00	7,340	9.5	44.6
09221680	Mud Spring Hollow near Church Butte near Lyman, Wyo.	4	41.385	110.187	20	8.83	6,800	9.0	41.7
09221700	Mud Spring Hollow near Lyman, Wyo.	4	41.383	110.183	13	10.20	6,770	9.0	41.7
09223500	Hams Fork near Frontier, Wyo.	4	41.857	110.562	27	298.00	8,130	9.2	39.3
09224000	Hams Fork at Diamondville, Wyo.	4	41.783	110.533	18	86.00	7,910	18.0	39.5
09224800	Meadow Springs Wash Tributary near Green River, Wyo.	4	41.544	109.760	18	5.22	6,370	8.0	46.7
09224810	Blacks Fork Tributary No 2 near Green River, Wyo.	4	41.460	109.622	18	12.00	6,650	8.5	49.0
09224820	Blacks Fork Tributary No 3 near Green River, Wyo.	4	41.425	109.615	20	3.59	6,570	9.0	48.5
09224840	Blacks Fork Tributary No 4 near Green River, Wyo.	4	41.411	109.601	18	1.26	6,570	9.0	48.4
09224980	Summers Dry Creek near Green River, Wyo.	4	41.374	109.644	16	423.00	6,880	12.0	47.2
09225200	Squaw Hollow near Burntfork, Wyo.	4	41.171	109.609	20	6.57	6,610	15.0	43.5
09225300	Green River Tributary No 2 near Burntfork, Wyo.	4	41.061	109.618	22	13.00	6,540	16.0	41.3
09229450	Henrys Fork Tributary near Manila, Utah	4	41.021	109.679	10	3.15	6,600	17.0	39.1
09266500	Ashely Creek near Vernal, Utah	4	40.577	109.621	74	101.00	9,440	23.0	35.6
09270000	Dry Fork below Springs near Dry Fork, Utah	4	40.569	109.697	22	97.40	9,360	27.5	35.3
09270500	Dry Fork at Mouth near Dry Fork, Utah	4	40.526	109.605	32	115.00	9,190	23.0	36.6
09271000	Ashley Creek, Sign of the Maine near Vernal, Utah	4	40.517	109.596	31	241.00	9,100	23.0	36.7
09273500	Hades Creek near Hanna, Utah	4	40.536	110.867	19	7.50	9,730	30.3	35.0
09275500	West Fork Duchesne River near Hanna, Utah	4	40.450	110.884	42	61.60	8,840	26.6	35.0
09277500	Duchesne River near Tabiona, Utah	4	40.134	110.602	35	356.00	8,770	25.6	36.9
09279000	Rock Creek near Mountain Home, Utah	4	40.493	110.577	49	147.00	10,000	31.6	35.0
09279500	Duchesne River at Duchesne, Utah	4	40.164	110.393	36	660.00	8,770	24.1	38.8
09287500	Water Hollow near Fruitland, Utah	4	40.242	110.980	26	13.80	8,380	22.1	35.0
09288000	Currant Creek near Fruitland, Utah	4	40.200	110.907	40	140.00	8,360	24.6	35.0

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09215000	0	0	1	0	0	259	556	805	1,170	1,470	1,800	972
						274	609	919	1,390	1,780	2,190	
09216290	1	1	0	0	0	161	350	535	852	1,160	1,540	791
						159	337	499	755	992	1,270	
09216350	0	1	0	0	0	15	43	81	174	295	487	600
						17	51	97	192	301	452	
09216537	1	1	0	0	0	91	267	482	923	1,420	2,100	1,260
						91	266	471	868	1,300	1,860	
09216550	0	0	0	0	0	397	728	996	1,390	1,710	2,070	1,320
						397	726	989	1,370	1,670	2,000	
09216560	1	0	1	0	0	466	956	1,380	2,040	2,620	3,270	1,650
						485	1,020	1,520	2,280	2,940	3,640	
09216600	-	-	-	-	1	----	----	----	----	----	----	700
						48	88	121	163	199	233	
09216700	1	0	0	0	0	1,120	2,180	3,020	4,190	5,140	6,140	3,750
						1,120	2,160	2,950	4,000	4,830	5,680	
09221680	1	0	0	0	0	63	194	342	619	903	1,260	557
						63	189	325	560	790	1,070	
09221700	1	0	0	0	0	94	178	251	366	469	589	406
						93	173	238	333	414	505	
09223500	0	0	0	0	0	1,150	1,620	1,910	2,250	2,500	2,730	2,450
						1,150	1,620	1,910	2,250	2,520	2,760	
09224000	1	0	0	0	0	1,550	2,140	2,550	3,080	3,490	3,910	3,250
						1,540	2,120	2,510	3,010	3,410	3,810	
09224800	-	-	-	-	1	----	----	----	----	----	----	170
						28	56	80	112	139	165	
09224810	-	-	-	-	1	----	----	----	----	----	----	180
						57	108	150	206	253	297	
09224820	1	0	0	0	0	23	73	138	278	445	687	245
						23	72	132	253	391	582	
09224840	-	-	-	-	1	----	----	----	----	----	----	47
						11	23	32	45	56	66	
09224980	0	1	0	0	0	624	1,640	2,650	4,370	5,980	7,880	13,900
						627	1,620	2,560	4,040	5,360	6,830	
09225200	-	-	-	-	1	----	----	----	----	----	----	620
						37	71	99	137	169	199	
09225300	-	-	-	-	1	----	----	----	----	----	----	3,360
						58	111	154	212	262	309	
09229450	-	-	-	-	1	----	----	----	----	----	----	588
						22	43	60	83	103	122	
09266500	1	0	0	0	0	1,070	1,560	1,910	2,380	2,750	3,140	3,500
						1,070	1,550	1,890	2,340	2,690	3,050	
09270000	1	0	0	0	0	521	761	922	1,130	1,280	1,430	974
						524	767	934	1,150	1,300	1,460	
09270500	1	0	0	0	0	547	900	1,170	1,540	1,850	2,180	1,920
						549	902	1,170	1,530	1,820	2,120	
09271000	1	1	0	0	0	1,400	2,000	2,430	3,010	3,460	3,930	4,110
						1,400	1,990	2,400	2,940	3,360	3,790	
09273500	1	0	0	0	0	81	105	121	142	157	173	156
						82	108	128	156	177	198	
09275500	1	0	0	0	0	486	607	677	756	809	858	758
						485	607	679	764	825	884	
09277500	1	0	0	0	0	1,400	1,800	2,050	2,340	2,550	2,750	5,260
						1,400	1,800	2,060	2,380	2,610	2,840	
09279000	1	0	0	0	0	1,640	2,050	2,310	2,630	2,870	3,110	2,920
						1,640	2,040	2,290	2,580	2,810	3,030	
09279500	1	0	0	0	0	2,780	3,410	3,800	4,250	4,570	4,880	4,420
						2,770	3,400	3,790	4,250	4,590	4,930	
09287500	0	0	1	0	0	28	60	90	141	188	245	133
						30	65	100	158	209	268	
09288000	1	1	0	0	0	323	496	634	838	1,010	1,100	1,260
						326	506	656	878	1,070	1,280	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09288150	West Fork Avintaquin near Fruitland, Utah	4	39.993	110.814	22	56.10	8,313	22.1	35.0
09288500	Strawberry River at Duchesne, Utah	4	40.161	110.411	57	950.00	7,660	23.7	38.6
09288900	Sowers Creek near Duchesne, Utah	4	39.989	110.459	22	40.60	8,118	17.4	37.9
09292500	Yellowstone River near Altonah, Utah	4	40.512	110.341	42	132.00	10,440	32.6	34.4
09297000	Uinta River near Neola, Utah	4	40.536	110.063	57	163.00	10,710	32.7	35.0
09298000	Farm Creek near Whiterocks, Utah	4	40.567	109.961	31	14.90	9,181	23.1	35.1
09299500	Whiterocks River near Whiterocks, Utah	4	40.565	109.927	67	113.00	10,370	32.1	35.0
09312500	White River near Soldier Summit, Utah	4	39.922	111.057	28	53.00	8,360	26.3	35.1
09312600	White River below Tabbyune Creek near Soldier Summit, Utah	4	39.876	111.037	19	75.60	8,150	25.4	35.3
09312700	Beaver Creek near Soldier Summit, Utah	4	39.831	110.969	26	26.10	8,750	21.0	35.5
09312800	Willow Creek near Castle Gate, Utah	4	39.777	110.792	24	62.80	8,120	14.0	36.2
10014000	Bear River above Sulphur Creek near Evanston, Wyo.	4	41.167	110.880	10	282.00	9,370	23.8	35.1
10015700	Sulphur Creek above Reservoir near Evanston, Wyo.	4	41.144	110.805	28	64.20	8,050	14.0	35.1
10016000	Sulphur Creek near Evanston, Wyo.	4	41.158	110.858	17	80.50	7,930	16.0	35.2
10019000	Bear River near Evanston, Wyo.	4	41.314	111.012	43	715.00	8,130	19.8	35.7
10019700	Whitney Canyon Creek near Evanston, Wyo.	4	41.428	110.972	17	8.93	7,300	12.0	36.7
10021000	Woodruff Creek near Woodruff, Utah	4	41.482	111.266	27	56.80	7,900	25.8	35.3
10023000	Big Creek near Randolph, Utah	4	41.610	111.253	26	52.20	7,370	19.9	35.4
10027000	Twin Creek at Sage, Wyo.	4	41.810	110.970	24	246.00	7,270	14.0	37.1
10032000	Smiths Fork near Border, Wyo.	4	42.281	110.868	45	165.00	8,270	32.1	37.4
10040000	Thomas Fork near Geneva, Idaho	4	42.392	110.983	12	45.30	7,170	19.0	36.9
10040500	Salt Creek near Geneva, Idaho	4	42.400	110.992	12	37.60	7,390	23.0	36.9
10041000	Thomas Fork near Wyoming-Idaho State line	4	42.403	111.025	37	113.00	7,290	29.0	36.8
10047500	Montpelier Creek at Weir, Montpelier, Idaho	4	42.330	111.237	30	49.50	7,370	26.7	35.9
10058600	Bloomington Creek at Bloomington, Idaho	4	42.185	111.425	26	24.00	7,860	31.0	35.1
10069000	Georgetown Creek near Georgetown, Idaho	4	42.496	111.314	19	22.20	7,830	30.3	35.6
10072800	Eightmile Creek near Soda Springs, Idaho	4	42.537	111.572	26	22.60	7,710	24.0	34.9
10084500	Cottonwood Creek near Cleveland, Idaho	4	42.332	111.774	48	61.70	6,650	22.8	36.4
10090800	Battle Creek Tributary near Treasurton, Idaho	4	42.278	111.814	19	4.50	5,810	19.0	36.5
10093000	Cub River near Preston, Idaho	4	42.141	111.689	44	31.60	6,890	24.1	35.4
10099000	High Creek near Richmond, Utah	4	41.978	111.744	19	16.20	7,700	40.4	35.7

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09288150	1	0	1	0	0	291	670	1,040	1,680	2,300	3,050	1,830
						292	663	1,010	1,570	2,090	2,690	
09288500	1	0	0	0	0	1,090	1,640	2,060	2,660	3,150	3,690	3,490
						1,100	1,660	2,110	2,750	3,290	3,870	
09288900	1	0	1	0	0	55	158	276	508	757	1,090	451
						59	167	291	518	748	1,040	
09292500	0	0	0	0	0	1,030	1,380	1,620	1,920	2,150	2,390	2,240
						1,030	1,380	1,620	1,910	2,140	2,360	
09297000	1	1	0	0	0	1,390	2,080	2,590	3,290	3,850	4,440	5,000
						1,390	2,070	2,570	3,230	3,750	4,290	
09298000	1	0	1	0	0	88	167	231	325	403	487	350
						89	169	234	328	403	482	
09299500	1	1	0	0	0	1,140	1,740	2,160	2,730	3,160	3,620	4,640
						1,140	1,730	2,140	2,680	3,080	3,510	
09312500	1	1	1	0	0	174	294	398	559	704	873	1,120
						176	300	410	576	723	886	
09312600	1	1	1	0	0	314	486	622	819	986	1,170	962
						315	490	631	831	998	1,170	
09312700	1	0	0	0	0	48	87	121	173	219	271	204
						51	96	139	205	264	325	
09312800	1	0	1	0	0	225	407	565	812	1,030	1,290	836
						227	411	570	810	1,020	1,250	
10014000	0	0	0	0	0	1,900	2,340	2,620	2,940	3,160	3,380	2,970
						1,880	2,300	2,560	2,860	3,090	3,320	
10015700	1	1	0	0	0	406	815	1,230	1,980	2,760	3,760	8,400
						405	805	1,200	1,870	2,540	3,380	
10016000	0	0	0	0	0	512	782	966	1,200	1,380	1,560	1,220
						509	771	943	1,160	1,320	1,490	
10019000	1	0	0	0	0	1,940	2,560	2,950	3,430	3,760	4,090	2,690
						1,940	2,560	2,960	3,470	3,840	4,210	
10019700	0	0	0	0	0	43	83	118	172	219	274	160
						44	85	120	175	221	272	
10021000	1	0	1	0	0	261	342	395	460	509	558	528
						261	346	406	486	552	617	
10023000	1	1	0	0	0	75	123	162	219	268	323	337
						77	132	182	261	330	404	
10027000	0	0	0	0	0	219	502	748	1,120	1,420	1,760	853
						225	522	788	1,190	1,510	1,860	
10032000	1	0	0	0	0	978	1,310	1,530	1,800	2,000	2,210	2,100
						975	1,300	1,520	1,780	1,980	2,190	
10040000	1	0	0	0	0	144	249	331	445	539	638	418
						145	254	342	466	569	673	
10040500	0	0	0	0	0	162	293	393	531	640	753	382
						162	293	392	525	631	736	
10041000	0	0	1	0	0	477	916	1,240	1,660	1,980	2,300	1,860
						476	908	1,220	1,610	1,910	2,200	
10047500	1	0	0	0	0	97	141	172	211	241	271	224
						98	147	188	247	296	346	
10058600	1	0	0	0	0	152	195	222	253	274	295	249
						152	197	228	268	300	332	
10069000	1	0	0	0	0	51	81	104	137	164	193	162
						53	88	120	170	213	256	
10072800	1	0	0	0	0	122	171	205	249	283	318	310
						122	173	211	262	305	347	
10084500	1	0	0	0	0	374	562	690	854	976	1,100	1,090
						372	558	682	840	959	1,080	
10090800	1	0	0	0	0	51	87	113	147	173	199	152
						50	85	109	139	163	187	
10093000	1	1	0	0	0	592	713	789	882	950	1,020	1,070
						588	703	770	852	913	978	
10099000	0	1	0	0	0	234	338	417	529	622	724	702
						231	330	401	498	577	662	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10102300	Summit Creek above diversions, near Smithfield, Utah	4	41.869	111.758	18	11.60	7,590	34.1	35.6
10104700	Little Bear River below Davenport Creek, near Avon, Utah	4	41.512	111.811	26	61.60	6,730	28.6	35.6
10104900	East Fork Little Bear River above Reservoir, near Avon, Utah	4	41.518	111.714	23	56.70	7,350	26.9	34.8
10105000	East Fork Little Bear River near Avon, Utah	4	41.517	111.750	13	49.70	7,370	27.4	35.0
10107800	Temple Fork near Logan, Utah	4	41.833	111.583	12	15.40	7,290	--	35.0
10109001	Logan River above State Dam near Logan, Utah	4	41.744	111.784	83	214.00	7,460	33.8	35.8
10113500	Blacksmith Fork above U P & L, Colorado Dam near Hyrum, Utah	4	41.622	111.739	72	268.00	7,150	25.1	35.4
10119000	Little Malad River above Elkhorn Reservoir, near Malad, Idaho	4	42.333	112.433	32	120.00	6,080	23.9	39.9
10128200	South Fork Weber River near Oakley, Utah	4	40.749	111.219	10	16.00	8,780	30.5	35.0
10128500	Weber River near Oakley, Utah	4	40.736	111.246	82	163.00	9,090	32.1	35.0
10129350	Crandall Creek near Peoa, Utah	4	40.775	111.364	10	12.00	7,700	24.0	35.0
10131000	Chalk Creek at Coalville, Utah	4	40.921	111.401	61	253.00	7,540	22.0	36.2
10132500	Lost Creek near Croydon, Utah	4	41.176	111.406	28	123.00	7,320	19.2	35.6
10133700	Threemile Creek near Park City, Utah	4	40.726	111.562	13	2.68	7,340	32.0	34.9
10135000	Hardscrabble Creek near Porterville, Utah	4	40.954	111.716	29	28.10	7,220	33.0	39.3
10137500	South Fork Ogden River near Huntsville, Utah	4	41.269	111.673	45	137.00	7,960	27.0	36.0
10137680	North Fork Ogden River near Eden, Utah	4	41.390	111.914	11	6.03	7,170	32.0	38.6
10137780	Middle Fork Ogden River above diversion, near Huntsville, Utah	4	41.333	111.734	11	31.30	7,250	27.4	34.9
10139300	Wheeler Creek near Huntsville, Utah	4	41.254	111.842	27	11.10	6,620	27.2	38.7
10141500	Holmes Creek near Kaysville, Utah	4	41.055	111.894	17	2.49	7,560	33.8	39.8
10142000	Farmington Creek above Diversions near Farmington, Utah	4	41.001	111.872	33	10.00	7,470	37.6	39.5
10142500	Ricks Creek above Diversions, near Centerville, Utah	4	40.940	111.867	17	2.35	7,360	31.2	40.1
10143000	Parrish Creek above Diversions, near Centerville, Utah	4	40.924	111.864	19	2.08	7,090	31.0	40.0
10143500	Centerville Creek above Diversions, near Centerville, Utah	4	40.916	111.862	30	3.15	6,940	30.1	39.9
10144000	Stone Creek above Diversions near Bountiful, Utah	4	40.894	111.844	16	4.48	7,050	31.0	39.5
10145000	Mill Creek at Mueller Park, near Bountiful, Utah	4	40.864	111.836	19	8.79	7,370	32.7	39.8
10146000	Salt Creek at Nephi, Utah	4	39.713	111.804	42	95.60	7,490	19.2	44.5
10146900	Utah Lake Tributary near Elberta, Utah	4	40.017	111.983	12	4.71	5,530	--	45.0
10147000	Summit Creek near Santaquin, Utah	4	39.922	111.753	19	14.60	8,400	26.4	43.5
10147500	Payson Creek above Diversions, near Payson, Utah	4	39.969	111.693	15	18.80	7,610	26.3	42.4
10148200	Tie Fork near Soldiers Summit, Utah	4	39.950	111.216	22	19.40	7,500	26.0	35.6

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
10102300	1	0	0	0	0	148	210	251	301	337	374	302
						147	206	245	292	327	364	
10104700	0	0	0	0	0	499	798	1,020	1,330	1,580	1,850	1,540
						494	782	985	1,260	1,470	1,700	
10104900	1	0	0	0	0	496	681	810	978	1,110	1,240	1,110
						492	669	788	941	1,060	1,180	
10105000	0	0	0	0	0	315	523	681	904	1,090	1,280	960
						312	511	655	847	1,010	1,160	
10107800	0	0	0	0	0	60	96	121	155	182	210	124
						61	100	132	179	218	257	
10109001	1	0	0	0	0	1,100	1,450	1,680	1,960	2,180	2,390	2,480
						1,100	1,450	1,670	1,950	2,170	2,380	
10113500	1	0	0	0	0	529	848	1,080	1,400	1,640	1,900	1,650
						530	851	1,090	1,420	1,670	1,940	
10119000	0	0	0	0	0	107	241	388	668	971	1,380	1,450
						108	247	400	684	981	1,370	
10128200	0	0	0	0	0	197	226	242	261	273	284	259
						196	227	249	282	310	338	
10128500	1	0	0	0	0	1,850	2,400	2,760	3,230	3,590	3,950	4,170
						1,850	2,390	2,730	3,180	3,520	3,860	
10129350	1	0	0	0	0	90	123	144	170	188	205	134
						90	125	151	188	218	247	
10131000	1	0	0	0	0	553	821	1,010	1,270	1,470	1,680	1,570
						554	826	1,020	1,300	1,510	1,740	
10132500	0	0	0	0	0	227	399	537	734	899	1,080	770
						229	407	555	769	949	1,140	
10133700	0	0	0	1	0	10	15	18	23	27	31	24
						11	17	24	35	45	55	
10135000	1	0	0	0	0	254	349	409	482	533	584	464
						252	345	403	474	527	581	
10137500	1	0	1	0	0	804	1,220	1,490	1,820	2,060	2,300	1,890
						802	1,210	1,470	1,790	2,020	2,250	
10137680	0	0	0	0	0	90	119	138	162	179	196	156
						89	116	134	158	177	197	
10137780	1	0	0	0	0	453	560	628	712	774	834	744
						442	535	587	652	708	765	
10139300	1	0	1	0	0	130	254	364	542	704	895	600
						129	249	350	507	645	805	
10141500	0	0	1	0	0	17	28	36	46	53	60	36
						18	29	39	51	62	72	
10142000	0	0	0	0	0	148	235	297	380	444	510	366
						147	232	290	366	424	483	
10142500	1	1	0	0	0	22	31	37	45	51	57	51
						22	32	39	50	59	68	
10143000	1	0	0	1	0	14	21	25	30	34	38	30
						15	22	27	36	43	50	
10143500	1	0	0	1	0	15	22	27	34	39	44	35
						15	23	29	39	47	55	
10144000	0	0	0	0	0	24	49	72	107	138	173	82
						24	50	73	108	138	171	
10145000	0	0	0	0	0	40	72	96	128	155	182	140
						41	74	100	136	168	198	
10146000	1	0	0	0	0	213	365	491	682	849	1,040	832
						214	370	501	700	873	1,070	
10146900	-	-	-	-	1	----	----	----	----	----	----	2,210
						17	39	59	88	113	137	
10147000	1	0	0	0	0	77	120	150	191	224	257	215
						78	124	159	208	248	287	
10147500	0	0	0	0	0	137	257	355	498	619	750	465
						136	253	344	469	572	679	
10148200	1	0	1	0	0	33	92	164	316	492	742	1,200
						35	96	171	318	477	691	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10148300	Dairy Fork near Thistle, Utah	4	39.967	111.350	14	11.00	6,950	20.5	37.2
10148400	Nebo Creek near Thistle, Utah	4	39.872	111.569	10	36.70	7,540	21.4	41.1
10148500	Spanish Fork at Thistle, Utah	4	39.999	111.499	60	490.00	7,130	21.4	39.2
10152500	Hobble Creek near Springeville, Utah	4	40.158	111.527	43	105.00	7,110	26.9	38.5
10153200	Big Cove Wash near Lehi, Utah	4	40.233	111.883	13	0.44	5,190	--	43.3
10153800	North Fork Provo River near Kamas, Utah	4	40.597	111.097	23	25.00	9,550	33.0	35.0
10158500	Round Valley Creek near Wallsburg, Utah	4	40.408	111.475	12	71.90	6,960	--	35.0
10160000	Deer Creek near Wildwood, Utah	4	40.404	111.532	11	26.00	7,450	31.7	35.0
10160800	North Fork Provo River at Wildwood, Utah	4	40.371	111.566	10	12.30	8,100	36.6	34.9
10164500	American Fork above Powerplant, near American Fork, Utah	4	40.448	111.681	59	51.10	8,460	43.0	36.2
10165500	Dry Creek near Alpine, Utah	4	40.476	111.757	23	9.82	8,770	--	37.4
10166400	Tickville Gulch near Cedar Valley, Utah	4	40.383	112.000	14	15.60	5,740	--	43.5
10166430	West Canyon Creek near Cedar Fort, Utah	4	40.407	112.101	11	26.80	7,630	--	42.8
10167500	Little Cottonwood Creek near Salt Lake City, Utah	4	40.578	111.797	51	27.40	8,680	--	39.7
10172200	Red Butte Creek at Fort Douglas, near Salt Lake City, Utah	4	40.780	111.805	23	7.25	6,800	29.2	40.2
13018300	Cache Creek near Jackson, Wyo.	4	43.452	110.703	42	10.60	8,430	24.0	35.0
13019500	Hoback River near Jackson, Wyo.	4	43.299	110.669	14	564.00	8,000	24.0	34.9
13020000	Fall Creek near Jackson, Wyo.	4	43.316	110.738	12	46.80	7,500	25.0	35.1
13025000	Swift Creek near Afton, Wyo.	4	42.725	110.900	38	27.40	8,550	17.9	36.7
13027000	Strawberry Creek near Bedford, Wyo.	4	42.903	110.900	12	21.30	8,470	25.0	35.7
13027200	Bear Canyon near Freedom, Wyo.	4	42.977	111.196	11	3.30	7,200	27.0	35.5
13029500	McCoy Creek above Reservoir, near Alpine, Idaho	4	43.181	111.115	21	108.00	6,960	24.0	36.6
13030000	Indian Creek above Reservoir, near Alpine, Idaho	4	43.260	111.067	18	36.80	7,790	25.0	36.8
13030500	Elk Creek above Reservior, near Irwin, Idaho	4	43.324	111.111	18	59.20	7,670	32.0	37.7
13032000	Bear Creek above Reservoir, near Irwin, Idaho	4	43.283	111.221	22	77.10	7,130	25.0	38.3
10265200	Convict Creek near Mammoth Lakes, Calif.	5	37.607	118.848	38	18.20	10,000	27.0	40.0
10265700	Rock Creek at Little Round Valley near Bishop, Calif.	5	37.554	118.684	52	35.80	10,500	27.0	40.0
10266200	Paradise Creek near Paradise, Calif.	5	37.462	118.576	11	4.75	--	11.0	40.0
10267000	Pine Creek at Division Box near Bishop, Calif.	5	37.416	118.621	58	36.40	10,000	31.0	40.0
10268700	Silver Canyon Creek near Laws, Calif.	5	37.408	118.279	49	19.70	--	7.0	40.0
10276000	Big Pine Creek near Big Pine, Calif.	5	37.145	118.314	62	39.00	7,200	22.0	48.8

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
10148300	1	0	1	1	0	152	405	691	1,240	1,830	2,610	980
						150	386	631	1,060	1,490	2,030	
10148400	0	1	0	0	0	109	208	294	429	549	689	478
						112	216	309	447	565	690	
10148500	1	1	0	0	0	518	763	948	1,210	1,430	1,660	1,800
						521	776	980	1,280	1,540	1,810	
10152500	1	0	0	0	0	258	464	624	852	1,040	1,240	1,250
						259	466	628	858	1,050	1,250	
10153200	-	-	-	-	1	----	----	----	----	----	----	8
						3	7	11	17	22	27	
10153800	1	0	0	0	0	407	524	599	690	756	822	728
						405	518	588	671	733	794	
10158500	1	0	0	0	0	116	155	181	214	238	263	201
						120	173	227	315	393	472	
10160000	1	0	0	0	0	64	86	100	116	127	138	99
						66	98	128	176	218	259	
10160800	0	0	0	0	0	104	147	178	220	253	288	225
						104	149	183	231	270	310	
10164500	1	1	0	0	0	350	481	571	687	776	866	1,000
						350	481	572	689	780	872	
10165500	0	1	0	0	0	198	278	335	411	472	536	597
						197	274	326	393	446	501	
10166400	0	0	0	0	0	28	78	132	231	331	455	236
						28	79	133	226	315	420	
10166430	-	-	-	-	1	----	----	----	----	----	----	1,660
						150	248	324	417	497	568	
10167500	0	0	0	0	0	385	512	596	704	785	868	762
						384	509	590	692	770	849	
10172200	0	0	0	0	0	19	38	55	84	111	144	105
						20	40	59	92	122	156	
13018300	0	0	0	0	0	80	119	145	179	203	228	225
						80	120	147	184	211	239	
13019500	0	0	0	0	0	3,810	4,850	5,490	6,270	6,830	7,380	6,160
						3,750	4,680	5,180	5,760	6,200	6,650	
13020000	1	1	0	0	0	380	508	598	716	809	905	780
						375	496	580	691	784	878	
13025000	1	0	0	0	0	502	622	697	788	854	919	793
						499	615	684	766	827	888	
13027000	1	0	0	0	0	260	320	356	399	429	458	396
						257	316	353	401	440	479	
13027200	1	1	0	0	0	45	78	106	148	186	228	180
						45	76	101	137	168	200	
13029500	1	0	1	0	0	842	1,190	1,410	1,660	1,840	2,000	1,670
						832	1,160	1,360	1,570	1,730	1,880	
13030000	0	0	0	0	0	200	258	294	337	368	398	350
						200	261	305	364	414	463	
13030500	0	0	0	0	0	463	592	670	762	826	886	870
						459	584	660	755	829	902	
13032000	1	0	0	0	0	514	672	768	878	955	1,030	784
						510	663	755	866	952	1,040	
10265200	1	0	0	0	0	105	155	189	234	269	304	290
						105	152	192	238	274	310	
10265700	0	0	0	0	0	114	172	212	263	301	339	312
						115	170	219	273	314	354	
10266200	-	-	-	-	1	----	----	----	----	----	----	238
						----	7	80	----	----	----	
10267000	1	0	0	0	0	239	313	358	412	450	486	509
						239	310	360	415	455	492	
10268700	1	0	0	0	0	2	4	5	6	7	9	10
						----	4	13	----	----	----	
10276000	0	0	0	0	0	184	256	304	365	409	454	458
						184	253	306	376	432	491	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10276200	Deadman Creek near Big Pine, Calif.	5	37.144	118.121	10	2.48	--	10.0	39.5
10281800	Independence Creek below Pinyon Creek near Independence, Calif.	5	36.779	118.264	56	18.10	9,000	23.0	79.4
10282480	Mazourka Creek near Independence, Calif.	5	36.847	118.085	12	15.60	--	6.0	49.2
10286000	Cottonwood Creek near Olancha, Calif.	5	36.439	118.080	68	40.10	10,000	19.0	75.3
10287210	Bridgeport Creek near Bodie, Calif.	5	38.079	119.044	11	13.10	--	19.0	40.0
10289000	Virginia Creek near Bridgeport, Calif.	5	38.192	119.208	22	63.60	8,330	20.0	40.0
10291500	Buckeye Creek near Bridgeport, Calif.	5	38.239	119.325	26	44.10	8,960	35.0	40.0
10292000	Swager Creek near Bridgeport, Calif.	5	38.283	119.299	22	52.80	8,160	25.0	40.0
10292300	Bridgeport Reservoir Tributary near Bridgeport, Calif.	5	38.287	119.214	11	0.79	8,870	12.0	40.0
10295200	West Walker River at Leavitt Meadows near Coleville, Calif.	5	38.331	119.551	23	73.40	8,870	50.0	40.0
10295500	Little Walker River near Bridgeport, Calif.	5	38.361	119.444	42	63.10	8,510	35.0	40.0
10296000	West Walker below Lake Walker near Coleville, Calif.	5	38.380	119.449	49	181.00	8,720	35.0	40.0
10296500	West Walker River near Coleville, Calif.	5	38.515	119.454	61	250.00	8,240	25.0	44.4
10296800	Slinkard Creek Tributary near Topaz, Calif.	5	38.647	119.561	11	0.14	6,000	18.0	40.4
10299100	Desert Creek near Wellington, Nev.	5	38.649	119.325	15	50.40	8,320	14.0	50.5
10299120	O'Banion Canyon near Wellington, Nev.	5	38.635	119.264	17	5.05	7,140	12.0	48.5
10302010	Reese River Canyon near Schurz, Nev.	5	38.850	118.782	20	14.00	6,240	10.0	50.0
10304500	Silver Creek below Pen Creek near Markleeville, Calif.	5	38.600	119.775	27	19.60	8,470	40.0	39.9
10306000	Hot Springs Creek near Markleeville, Calif.	5	38.700	119.850	11	14.40	7,990	40.0	40.0
10308100	Milberry Creek at Markleeville, Calif.	5	38.700	119.783	11	5.10	7,010	25.0	40.0
10308200	East Fork Carson River below M'vlle Creek near Markleeville, Calif.	5	38.714	119.764	26	276.00	7,990	35.0	40.0
10308800	Bryant Creek near Gardenerville, Nev.	5	38.794	119.672	16	31.50	7,320	9.0	40.0
10309000	East Fork Carson River near Gardenerville, Nev.	5	38.847	119.703	67	356.00	7,410	17.6	40.1
10309005	Bodie Flat Tributary near Gardenerville, Nev.	5	38.835	119.631	14	0.46	6,490	10.0	40.0
10310000	West Fork Carson River at Woodfords, Calif.	5	38.769	119.832	71	65.40	8,050	16.0	40.0
10310400	Daggett Creek near Genoa, Nev.	5	38.965	119.849	18	3.82	7,180	20.0	41.2
10310500	Clear Creek near Carson Ctiy, Nev.	5	39.113	119.797	31	15.50	6,900	17.0	48.0
10311000	Carson River near Carson City, Nev.	5	39.108	119.711	48	886.00	7,100	12.0	51.1
10311100	Kings Can Creek near Carson City, Nev.	5	39.154	119.807	10	4.06	7,000	12.0	46.1
10311200	Ash Can Creek near Carson City, Nev.	5	39.176	119.804	10	5.20	7,500	12.0	45.3
10311450	Brunswick Canyon near New Empire, Nev.	5	39.172	119.686	20	12.70	5,770	10.0	50.2

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
10276200	-	-	-	-	1	----	----	----	----	----	----	4
						----	4	40	----	----	----	
10281800	0	0	0	0	0	53	86	108	137	157	177	169
						53	85	110	141	163	185	
10282480	-	-	-	-	1	----	----	----	----	----	----	1,300
						----	14	160	----	----	----	
10286000	1	0	0	0	0	120	208	275	368	444	525	520
						120	206	275	366	440	517	
10287210	0	0	0	0	0	8	33	68	147	238	367	115
						----	32	91	----	----	----	
10289000	0	0	0	0	0	101	261	449	827	1,250	1,840	1,300
						103	255	484	878	1,300	1,850	
10291500	0	0	0	0	0	390	577	707	877	1,010	1,140	947
						390	563	707	880	1,020	1,160	
10292000	0	0	0	0	0	86	207	332	558	785	1,070	585
						88	203	368	626	877	1,180	
10292300	0	0	0	1	0	4	28	75	208	396	702	98
						4	26	68	177	322	547	
10295200	0	0	0	0	0	1,180	1,580	1,850	2,210	2,490	2,780	2,810
						1,170	1,530	1,800	2,130	2,400	2,670	
10295500	0	0	0	0	0	336	568	756	1,030	1,270	1,540	1,510
						336	560	765	1,050	1,300	1,580	
10296000	0	0	0	0	0	1,850	2,830	3,560	4,550	5,340	6,180	6,220
						1,850	2,790	3,520	4,480	5,240	6,050	
10296500	0	0	0	0	0	1,800	2,620	3,180	3,900	4,450	5,000	6,500
						1,800	2,590	3,180	3,930	4,510	5,100	
10296800	-	-	-	-	1	----	----	----	----	----	----	640
						1	1	7	16	26	40	
10299100	0	0	0	0	0	66	130	186	272	350	438	262
						70	128	262	426	579	749	
10299120	-	-	-	-	1	----	----	----	----	----	----	336
						33	12	139	238	336	454	
10302010	1	1	0	0	0	34	145	320	768	1,370	2,330	1,870
						34	141	322	759	1,320	2,200	
10304500	0	0	1	0	0	425	749	1,040	1,520	1,960	2,500	2,220
						423	730	1,000	1,440	1,830	2,300	
10306000	0	1	0	0	0	409	684	917	1,280	1,600	1,970	1,740
						403	643	840	1,130	1,390	1,680	
10308100	0	0	0	0	0	25	159	393	993	1,770	2,930	291
						25	150	360	850	1,450	2,300	
10308200	0	0	0	0	0	2,890	5,800	8,400	12,500	16,200	20,500	15,100
						2,880	5,650	8,130	11,900	15,200	19,000	
10308800	0	0	0	0	0	76	219	385	709	1,060	1,520	975
						78	212	412	763	1,130	1,600	
10309000	0	0	0	0	0	2,610	4,730	6,630	9,710	12,600	16,000	17,600
						2,610	4,680	6,590	9,640	12,500	15,800	
10309005	-	-	-	-	1	----	----	----	----	----	----	3
						4	2	21	41	63	94	
10310000	1	0	0	0	0	858	1,440	1,960	2,830	3,650	4,640	4,890
						857	1,430	1,940	2,790	3,590	4,540	
10310400	1	1	0	1	0	17	27	35	47	58	70	63
						17	26	43	69	96	130	
10310500	0	0	0	0	0	29	67	103	162	217	282	170
						30	66	120	207	297	408	
10311000	0	0	0	0	0	2,630	5,780	9,050	15,000	21,200	29,100	30,000
						2,630	5,710	9,150	15,200	21,500	29,300	
10311100	0	0	0	0	0	20	52	86	147	208	285	48
						21	49	94	168	245	344	
10311200	-	-	-	-	1	----	----	----	----	----	----	584
						47	15	176	286	394	524	
10311450	0	0	1	0	0	6	47	128	350	649	1,100	90
						6	46	147	400	734	1,220	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10312012	Adrian Valley Tributary near Wabuska, Nev.	5	39.215	119.207	14	5.75	5,590	6.0	51.5
10312015	Adrian Valley Tributary near Weeks, Nev.	5	39.229	119.228	14	0.12	5,590	6.0	51.8
10312050	Lahontan Reservoir Tributary near Silver Spur, Nev.	5	39.378	119.317	23	4.39	5,025	6.0	49.0
10336600	Upper Truckee River near Myers, Calif.	5	38.843	120.024	26	33.10	7,900	40.0	40.0
10336635	Lake Tahoe Tributary near Meeks Bay, Calif.	5	39.017	120.126	11	0.64	6,240	50.0	40.0
10336660	Blackwood Creek near Tahoe City, Calif.	5	39.107	120.161	26	11.20	7,300	68.0	40.0
10336693	Wood Creek near Crystal Bay, Nev.	5	39.261	119.956	12	1.69	--	--	39.7
10336780	Trout Creek near Tahoe Valley, Calif.	5	38.920	119.971	25	36.70	8,000	25.0	40.0
10339400	Martis Creek near Truckee, Calif.	5	39.329	120.117	13	39.90	6,602	34.0	40.1
10339900	Alder Creek near Truckee, Calif.	5	39.369	120.182	14	7.47	6,656	37.0	40.1
10340500	Prosser Creek near Boca, Calif.	5	39.373	120.131	20	52.90	6,829	45.0	40.1
10342000	Little Truckee River near Hobart Mills, Calif.	5	39.501	120.276	26	36.50	6,601	56.0	40.0
10343500	Sagehen Creek near Truckee, Calif.	5	39.432	120.237	32	10.50	7,000	45.0	40.1
10348900	Galena Creek near Steamboat, Nev.	5	39.362	119.827	25	8.50	8,024	30.0	43.1
10350100	Long Valley Creek near Happy Valley, Nev.	5	39.482	119.619	12	82.60	5,861	8.0	46.2
09415480	White River Tributary near Preston, Nev.	6	38.892	115.194	20	26.0	6,560	10.0	43.5
09415560	White River Tributary near Sunnyside, Nev.	6	38.325	115.045	15	20.00	6,240	10.8	40.0
09415600	Pahragut Valley Tributary near Hiko, Nev.	6	37.489	115.336	18	17.00	5,750	10.0	54.8
09415800	Muddy River Tributary near Alamo, Nev.	6	37.033	114.981	18	2.00	3,340	6.0	57.6
09418100	Patterson Wash Tributary near Pioche, Nev.	6	38.150	114.586	18	5.00	6,250	10.2	43.3
09418150	Caselton Wash near Panaca, Nev.	6	37.763	114.429	19	70.20	5,830	6.9	52.4
09418450	Meadow Valley Wash Tributary near Caliente, Nev.	6	37.600	114.658	18	0.50	5,970	8.0	55.0
09418500	Meadow Valley Wash near Caliente, Nev.	6	37.556	114.564	32	1,670.00	6,180	7.5	55.0
10172700	Vernon Creek near Vernon, Utah	6	39.979	112.379	27	25.00	7,100	14.8	40.6
10172720	East Government Creek Tributary near Vernon, Utah	6	40.100	112.550	10	0.98	6,340	--	39.7
10172740	Rush Valley Tributary near Fairfield, Utah	6	40.250	112.200	11	0.26	5,850	--	43.6
10172760	Clover Creek near Clover, Utah	6	40.333	112.533	15	4.45	7,190	--	40.6
10172790	Settlement Canyon near Tooele, Utah	6	40.483	112.283	11	5.77	7,900	--	41.2
10172800	South Willow Creek near Grantsville, Utah	6	40.496	112.574	26	4.19	8,370	33.0	39.5
10172810	Mack Canyon near Grantsville, Utah	6	40.600	112.583	12	2.84	7,200	--	39.4
10172830	North Fork Muskrat Canyon near Timpie, Utah	6	40.633	112.633	11	1.78	7,080	--	40.0

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
10312012	-	-	-	-	1	----	----	----	----	----	----	1
						24	16	194	435	716	1,090	
10312015	-	-	-	-	1	----	----	----	----	----	----	1
						1	1	8	19	33	53	
10312050	-	-	-	-	1	----	----	----	----	----	----	920
						15	14	166	418	738	1,190	
10336600	0	0	0	0	0	698	1,240	1,670	2,300	2,830	3,410	2,550
						694	1,210	1,610	2,190	2,670	3,200	
10336635	0	0	0	0	0	8	16	24	38	50	66	43
						8	16	25	42	61	85	
10336660	0	0	1	0	0	497	1,060	1,600	2,500	3,350	4,390	2,100
						494	1,030	1,520	2,320	3,060	3,960	
10336693	0	0	0	0	0	16	30	40	53	63	73	40
						----	28	44	----	----	----	
10336780	0	0	0	0	0	154	280	384	539	672	820	535
						155	274	410	600	769	961	
10339400	0	0	0	0	0	392	833	1,230	1,880	2,460	3,150	1,880
						389	793	1,200	1,870	2,500	3,260	
10339900	1	0	0	0	0	87	231	397	727	1,090	1,580	730
						86	221	382	687	1,020	1,450	
10340500	0	0	0	0	0	622	1,310	2,000	3,250	4,520	6,150	4,560
						619	1,270	1,950	3,130	4,330	5,850	
10342000	0	0	1	0	0	966	2,310	3,830	6,800	10,000	14,500	7,910
						960	2,250	3,660	6,340	9,180	13,100	
10343500	0	0	0	0	0	116	259	396	622	833	1,080	765
						116	254	394	620	835	1,090	
10348900	0	1	0	0	0	96	290	559	1,200	2,020	3,320	4,730
						96	282	542	1,130	1,850	2,980	
10350100	1	0	0	0	0	45	412	1,270	4,130	8,710	16,900	2,560
						49	398	1,350	4,100	8,160	15,000	
09415480	-	-	-	-	1	----	----	----	----	----	----	219
						0	125	219	464	821	1,390	
09415560	-	-	-	-	1	----	----	----	----	----	----	600
						0	105	202	438	771	1,370	
09415600	-	-	-	-	1	----	----	----	----	----	----	162
						0	97	208	471	825	1,520	
09415800	-	-	-	-	1	----	----	----	----	----	----	77
						0	25	132	391	656	1,780	
09418100	-	-	-	-	1	----	----	----	----	----	----	49
						0	35	85	185	316	671	
09418150	1	0	1	0	0	256	814	1,450	2,610	3,790	5,240	1,710
						221	808	1,410	2,430	3,640	5,150	
09418450	0	0	0	0	0	0	2	5	15	31	63	26
						0	2	5	19	36	70	
09418500	0	0	1	0	0	490	1,270	2,010	3,210	4,280	5,500	2,400
						448	1,290	2,040	3,480	4,750	5,690	
10172700	0	1	1	0	0	26	91	175	355	561	848	825
						24	91	175	357	568	856	
10172720	-	-	-	-	1	----	----	----	----	----	----	6
						0	9	30	65	108	283	
10172740	-	-	-	-	1	----	----	----	----	----	----	49
						0	3	15	34	55	173	
10172760	0	0	0	0	1	14	35	56	92	125	166	87
						11	35	56	97	135	181	
10172790	-	-	-	-	1	----	----	----	----	----	----	155
						0	33	64	124	212	421	
10172800	1	0	1	0	0	37	59	75	97	115	133	92
						33	58	74	96	117	138	
10172810	-	-	-	-	1	----	----	----	----	----	----	2
						0	20	48	97	164	363	
10172830	-	-	-	-	1	----	----	----	----	----	----	1
						0	14	37	75	126	298	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10172835	Skull Valley Tributary near Delle, Utah	6	40.683	112.917	12	1.50	5,780	--	46.4
10172870	Trout Creek near Callao, Utah	6	39.744	113.889	28	8.80	9,100	20.7	44.9
10172885	Great Salt Lake Desert Tributary No. 2 near Dugway, Utah	6	39.867	113.117	12	5.48	5,570	--	54.1
10172890	Government Creek near Dugway, Utah	6	40.083	112.700	11	59.00	6,080	--	42.3
10172895	Deep Creek near Ibapah, Utah	6	40.250	113.983	10	460.00	6,100	--	58.7
10172900	Bar Creek near Ibapah, Utah	6	40.250	113.983	15	12.00	5,460	--	58.7
10172902	Dead Cedar Wash near Wendover, Utah	6	40.417	114.189	18	5.00	6,910	14.5	40.2
10172905	Great Salt Lake Desert Tributary near Delle, Utah	6	40.717	112.950	11	0.97	6,010	--	44.2
10172909	Burnt Creek near Shores, Nev.	6	41.560	114.493	17	10.50	7,320	11.7	40.0
10172913	Loray Wash Tributary near Cobre, Nev.	6	41.127	114.344	18	24.00	6,590	11.1	40.2
10172920	Cotton Creek near Grouse Creek, Utah	6	41.785	113.841	10	19.10	6,560	--	40.0
10172925	Great Salt Lake Desert Tributary No. 3 near Park Valley, Utah	6	41.433	113.767	12	10.10	6,120	--	57.5
10172940	Dove Creek near Park Valley, Utah	6	41.792	113.565	15	33.20	6,620	15.5	40.0
10172970	Rock Creek near Holbrook, Idaho	6	42.231	112.729	18	44.00	5,610	17.0	40.0
10172990	Blue Spring Creek near Snowville, Utah	6	41.850	112.450	14	78.00	5,300	--	40.0
10242420	Shoal Creek near Enterprise, Utah	6	37.621	113.987	13	19.00	6,158	13.0	48.6
10242460	Escalante Valley Tributary near Panaca, Nev.	6	37.736	114.139	18	7.90	6,790	9.1	50.1
10243240	Baker Creek at Narrows, near Baker, Nev.	6	38.990	114.210	23	16.40	9,500	16.5	39.8
10243660	Connors Pass Creek near Shoshone, Nev.	6	39.043	114.633	19	0.45	7,920	9.6	39.6
10243700	Cleve Creek near Ely, Nev.	6	39.216	114.529	29	31.80	8,770	14.2	40.0
10243950	Millick Canyon Tributary near Currie, Nev.	6	40.225	114.436	12	1.40	6,470	10.0	45.0
10244220	Maverick Canyon near Oasis, Nev.	6	41.076	114.587	11	3.02	7,150	12.0	43.6
10244240	Clover Valley Tributary near Arthur, Nev.	6	40.560	114.961	16	3.00	6,370	12.0	45.1
10244360	Dixie Valley Tributary near Eastgate, Nev.	6	39.294	117.986	26	11.00	5,550	9.2	40.0
10244460	Rawhide Flats Tributary near Schurz, Nev.	6	39.144	118.749	16	0.96	4,770	6.0	51.7
10244480	Gabbs Valley Tributary near Gabbs, Nev.	6	38.996	117.996	13	7.00	5,190	6.0	45.7
10244490	Finger Rock Wash near Gabbs, Nev.	6	38.689	118.017	11	207.00	5,150	6.0	49.9
10244620	Teels Marsh Tributary at Basalt, Nev.	6	38.002	118.280	16	1.07	6,450	12.0	40.0
10244720	Franklin River near Arthur, Nev.	6	40.824	115.136	19	10.30	8,300	16.2	39.9
10244745	Overland Creek near Ruby Valley, Nev.	6	40.458	115.392	22	9.00	8,400	17.0	40.0
10244950	Steptoe Creek near Ely, Nev.	6	39.201	114.687	20	11.10	8,940	17.4	42.3

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
10172835	-	-	-	-	1	----	----	----	----	----	----	20
						0	14	46	103	173	435	
10172870	1	0	0	0	0	50	89	119	163	199	238	177
						45	88	118	159	199	242	
10172885	-	-	-	-	1	----	----	----	----	----	----	1,720
						0	40	109	249	427	917	
10172890	-	-	-	-	1	----	----	----	----	----	----	370
						0	254	412	905	1,630	2,520	
10172895	-	-	-	-	1	----	----	----	----	----	----	1,250
						0	1,310	1,460	3,210	6,020	7,130	
10172900	1	1	0	0	0	73	368	850	2,060	3,650	6,070	2,690
						61	364	818	1,830	3,350	5,840	
10172902	-	-	-	-	1	----	----	----	----	----	----	752
						0	32	73	150	256	533	
10172905	-	-	-	-	1	----	----	----	----	----	----	80
						0	10	33	73	120	318	
10172909	-	-	-	-	1	----	----	----	----	----	----	35
						0	56	105	210	365	681	
10172913	-	-	-	-	1	----	----	----	----	----	----	220
						0	117	207	438	773	1,320	
10172920	-	-	-	-	1	----	----	----	----	----	----	91
						0	98	181	384	674	1,190	
10172925	-	-	-	-	1	----	----	----	----	----	----	420
						0	62	136	299	519	1,010	
10172940	-	-	-	-	1	----	----	----	----	----	----	275
						0	151	252	530	942	1,550	
10172970	0	0	0	0	0	182	610	1,160	2,340	3,680	5,570	1,580
						156	605	1,130	2,160	3,500	5,450	
10172990	1	1	0	0	0	110	350	661	1,330	2,120	3,240	1,820
						91	350	658	1,350	2,170	3,280	
10242420	0	0	0	0	0	40	108	185	335	497	713	390
						32	108	186	352	529	751	
10242460	1	0	0	0	0	32	96	167	300	434	604	250
						28	95	164	289	427	608	
10243240	0	1	0	0	0	70	129	177	247	306	370	400
						62	128	174	238	304	373	
10243660	-	-	-	-	1	----	----	----	----	----	----	2
						0	4	13	25	41	114	
10243700	0	1	0	0	0	45	88	130	201	270	356	440
						40	89	131	208	284	368	
10243950	-	-	-	-	1	----	----	----	----	----	----	83
						0	12	37	78	130	324	
10244220	-	-	-	-	1	----	----	----	----	----	----	0
						0	21	50	102	173	381	
10244240	1	0	0	0	0	6	18	30	52	73	99	43
						5	18	31	62	87	117	
10244360	1	0	1	0	0	10	81	245	815	1,800	3,690	1,480
						9	81	243	777	1,730	3,620	
10244460	-	-	-	-	1	----	----	----	----	----	----	52
						0	11	47	117	194	539	
10244480	-	-	-	-	1	----	----	----	----	----	----	860
						0	51	141	337	580	1,220	
10244490	-	-	-	-	1	----	----	----	----	----	----	2,430
						0	773	1,170	2,790	5,150	7,000	
10244620	-	-	-	-	1	----	----	----	----	----	----	110
						0	10	31	67	110	284	
10244720	1	0	0	0	0	105	142	167	198	221	243	197
						91	141	164	194	226	253	
10244745	1	0	0	0	0	109	149	175	208	233	259	225
						96	148	172	201	234	266	
10244950	0	0	1	0	0	24	42	57	79	97	117	85
						21	42	58	86	109	129	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10245080	Nelson Creek Tributary near Currie, Nev.	6	40.300	114.772	25	0.70	6,000	8.0	44.8
10245270	Drylake Valley Tributary near Caliente, Nev.	6	37.622	114.773	15	11.00	5,910	7.5	55.0
10245450	Illipah Creek Tributary near Hamilton, Nev.	6	39.360	115.351	25	5.47	7,100	12.0	52.4
10245800	Newark Valley Tributary near Hamilton, Nev.	6	39.417	115.631	25	157.00	6,920	10.3	49.6
10245950	Bean Flat Tributary near Austin, Nev.	6	39.492	116.533	21	1.10	6,400	10.0	38.7
10246000	Garden Pass Creek Tributary near Eureka, Nev.	6	39.817	116.164	25	2.12	7,010	10.0	39.9
10246010	Garden Pass Creek near Eureka, Nev.	6	39.779	116.106	15	19.20	6,510	10.1	39.8
10246845	Currant Creek Tributary near Currant, Nev.	6	38.819	115.326	20	3.13	6,970	10.0	52.7
10246846	Little Currant Creek near Currant, Nev.	6	38.847	115.367	20	12.90	8,280	13.5	55.3
10246847	Currant Creek below Little Currant near Currant, Nev.	6	38.820	115.345	15	30.00	7,850	13.7	54.1
10247010	Hot Creek Tributary near Warm Springs, Nev.	6	38.200	116.217	17	0.77	5,300	6.0	42.9
10247220	Black Rock Summit Tributary near Current, Nev.	6	38.507	115.889	15	6.35	6,300	10.1	40.0
10247230	Railroad Valley Tributary near Currant, Nev.	6	38.543	115.798	21	0.37	5,200	8.0	43.4
10247860	Penoyer Valley Tributary near Tempiute, Nev.	6	37.585	115.680	18	1.48	5,680	8.0	55.1
10248970	Stonewall Flat Tributary near Goldfield, Nev.	6	37.594	117.210	20	0.53	5,630	6.0	52.9
10248980	Lida Pass Tributary near Lida, Nev.	6	37.435	117.557	14	1.59	7,990	12.0	49.9
10249050	Sarcobatus Flat Tributary near Springdale, Nev.	6	37.222	117.126	21	37.10	5,140	7.7	55.1
10249135	San Antonio Wash Tributary near Tonopah, Nev.	6	38.327	117.124	19	3.42	6,920	8.9	39.0
10249140	Ralston Valley Tributary near Tonopah, Nev.	6	38.290	117.100	21	0.20	5,980	6.0	45.0
10249180	Saulsbury Wash near Tonopah, Nev.	6	38.125	116.808	21	56.00	6,810	12.0	41.4
10249300	South Twin River near Round Mountain, Nev.	6	38.887	117.244	22	20.00	9,130	15.4	40.0
10249411	Campbell Creek Tributary near Eastgate, Nev.	6	39.266	117.699	22	2.14	7,450	16.0	39.6
10249417	Smith Creek Valley Tributary near Austin, Nev.	6	39.539	117.474	15	0.63	6,440	10.0	40.0
10249620	Big Smokey Valley Tributary near Tonopah, Nev.	6	38.031	117.231	21	2.39	6,100	6.0	50.7
10249680	Big Smokey Valley Tributary near Blair Junction, Nev.	6	38.031	117.710	25	11.40	5,440	6.0	49.6
10249850	Palmetto Wash Tributary near Lida, Nev.	6	37.442	117.690	14	4.73	7,440	6.0	49.4
10249855	Palmetto Wash near Oasis, Calif.	6	37.457	117.769	13	0.24	6,090	8.0	47.5
10249900	Chiatovich Creek near Dyer, Nev.	6	37.833	118.203	22	37.30	9,960	17.5	38.8
10325500	Reese River near Ione, Nev.	6	38.850	117.467	30	53.00	8,800	19.0	40.0
10326400	Reese River Tributary near Austin, Nev.	6	39.475	117.319	14	8.27	6,590	12.0	40.0
10326650	Silver Creek near Austin, Nev.	6	39.719	117.168	19	25.00	7,120	14.0	40.3

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
10245080	-	-	-	-	1	----	----	----	----	----	----	52
						0	7	27	60	98	271	
10245270	-	-	-	-	1	----	----	----	----	----	----	156
						0	67	152	339	589	1,140	
10245450	1	1	1	0	0	11	54	130	349	673	1,230	1,120
						10	54	128	331	646	1,210	
10245800	0	0	1	0	0	29	114	228	467	734	1,090	291
						26	118	239	540	838	1,150	
10245950	-	-	-	-	1	----	----	----	----	----	----	21
						0	10	32	69	114	294	
10246000	-	-	-	-	1	----	----	----	----	----	----	190
						0	16	42	85	144	333	
10246010	1	0	1	0	0	21	113	265	648	1,140	1,900	650
						18	113	261	611	1,090	1,870	
10246845	1	0	1	0	0	3	14	33	85	159	281	99
						2	14	34	88	161	286	
10246846	0	1	0	0	0	21	59	104	190	283	406	366
						18	59	104	189	286	412	
10246847	1	0	0	0	0	19	77	163	371	636	1,040	404
						16	78	164	368	634	1,040	
10247010	-	-	-	-	1	----	----	----	----	----	----	100
						0	9	35	82	135	378	
10247220	-	-	-	-	1	----	----	----	----	----	----	200
						0	42	98	211	363	745	
10247230	-	-	-	-	1	----	----	----	----	----	----	10
						0	5	23	54	88	272	
10247860	-	-	-	-	1	----	----	----	----	----	----	130
						0	14	47	106	177	450	
10248970	-	-	-	-	1	----	----	----	----	----	----	150
						0	6	25	57	94	272	
10248980	-	-	-	-	1	----	----	----	----	----	----	1
						0	12	28	54	91	213	
10249050	1	0	0	0	0	3	16	39	91	154	242	63
						2	18	51	185	274	339	
10249135	-	-	-	-	1	----	----	----	----	----	----	660
						0	24	57	118	200	438	
10249140	-	-	-	-	1	----	----	----	----	----	----	48
						0	3	12	28	44	144	
10249180	-	-	-	-	1	----	----	----	----	----	----	340
						0	226	332	691	1,240	1,890	
10249300	0	1	0	0	0	42	96	153	256	364	504	510
						37	96	152	250	363	506	
10249411	0	0	1	0	0	2	10	25	71	143	276	179
						2	10	25	71	142	277	
10249417	-	-	-	-	1	----	----	----	----	----	----	130
						0	6	23	48	79	218	
10249620	-	-	-	-	1	----	----	----	----	----	----	10
						0	19	56	123	208	487	
10249680	-	-	-	-	1	----	----	----	----	----	----	460
						0	73	177	413	718	1,410	
10249850	-	-	-	-	1	----	----	----	----	----	----	193
						0	29	62	124	212	437	
10249855	-	-	-	-	1	----	----	----	----	----	----	30
						0	3	14	30	48	151	
10249900	1	1	0	0	0	24	55	87	149	216	306	527
						22	55	89	159	232	318	
10325500	0	0	0	0	0	79	216	369	659	961	1,350	1,000
						71	216	365	638	947	1,340	
10326400	-	-	-	-	1	----	----	----	----	----	----	80
						0	50	107	226	391	768	
10326650	0	0	1	0	0	6	26	53	111	175	258	52
						5	27	58	143	217	293	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10326850	Reese River Tributary near Battle Mountain, Nev.	6	40.542	117.050	20	0.20	5,200	8.0	44.3
10351850	Pyramid Lake Tributary near Nixon, Nev.	6	39.858	119.476	18	1.94	5,000	7.0	44.0
10173450	Mammoth Creek above West Hatch Ditch near Hatch, Utah	7	37.622	112.519	22	105.00	8,996	24.2	40.0
10174500	Sevier River at Hatch, Utah	7	37.651	112.429	62	340.00	8,480	22.5	40.0
10174800	Red Canyon Tributary near Bryce Canyon, Utah	7	37.733	112.283	12	2.20	7,860	--	40.0
10185000	Antimony Creek near Antimony, Utah	7	38.101	111.882	21	50.30	9,560	21.6	43.7
10187300	Otter Creek near Koosharem, Utah	7	38.611	111.811	18	23.50	9,580	22.6	39.9
10194999	Clear Creek (composite) near Sevier, Utah	7	38.581	112.274	60	166.00	7,880	20.9	43.2
10205030	Salina Creek near Emery, Utah	7	38.912	111.530	23	51.80	8,720	25.3	40.0
10205070	Cottonwood Creek near Salina, Utah	7	38.917	111.700	10	7.80	7,470	--	40.5
10205700	Salina Creek above Diversion near Salina, Utah	7	38.933	111.817	16	280.00	7,950	--	42.4
10208500	Oak Creek near Fairview, Utah	7	39.674	111.408	22	11.80	7,560	24.0	39.8
10210000	Pleasant Creek near Mount Pleasant, Utah	7	39.543	111.383	21	16.40	8,830	28.0	40.1
10211000	Twin Creek near Mount Pleasant, Utah	7	39.492	111.407	12	5.90	8,900	30.0	40.1
10215700	Oak Creek near Spring City, Utah	7	39.448	111.425	17	8.00	9,140	29.0	40.0
10215900	Manti Creek below Dugway Creek, near Manti, Utah	7	39.259	111.579	18	26.40	9,080	26.1	39.9
10216300	Sixmile Creek near Sterling, Utah	7	39.200	111.667	16	29.00	8,703	32.4	40.5
10216400	Twelvemile Creek near Mayfield, Utah	7	39.101	111.646	21	59.40	8,570	26.1	40.1
10219200	Chicken Creek near Levan, Utah	7	39.552	111.829	24	27.90	7,480	20.6	45.1
10220300	Tintic Wash Tributary near Nephi, Utah	7	39.667	112.083	14	18.00	6,070	--	40.8
10224100	Oak Creek above Little Creek near Oak City, Utah	7	39.356	112.232	21	5.58	7,710	25.0	40.9
10232500	Chalk Creek near Fillmore, Utah	7	38.964	112.307	29	58.70	8,020	24.0	48.6
10233000	Meadow Creek near Meadow, Utah	7	38.891	112.327	11	11.60	8,380	24.0	46.3
10233500	Corn Creek near Kanosh, Utah	7	38.774	112.399	17	68.0	7,400	24.7	43.6
10234500	Beaver River near Beaver, Utah	7	38.281	112.574	73	91.00	9,280	27.7	41.1
10235000	South Creek near Beaver, Utah	7	38.190	112.552	12	15.00	8,730	--	40.3
10236000	North Fork North Creek near Beaver, Utah	7	38.346	112.551	18	14.10	8,340	25.5	40.2
10236500	South Fork North Creek near Beaver, Utah	7	38.339	112.387	11	23.00	9,370	26.0	39.7
10237500	Indian Creek near Beaver, Utah	7	38.431	112.587	13	18.50	8,370	24.0	40.0
10240600	Big Wash near Milford, Utah	7	38.483	113.117	10	51.00	6,120	--	59.1
10241300	Fremont Wash near Paragonah, Utah	7	38.083	112.683	16	120.00	7,240	--	39.9

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
10326850	0	0	0	0	0	1	6	13	31	54	89	26
						1	6	13	32	54	93	
10351850	-	-	-	-	1	----	----	----	----	----	----	950
						0	19	68	164	276	692	
10173450	1	0	0	0	0	451	573	651	748	819	889	838
						450	576	670	782	878	975	
10174500	1	0	0	0	0	629	900	1,090	1,330	1,510	1,700	3,000
						629	905	1,100	1,350	1,530	1,720	
10174800	-	-	-	-	1	----	----	----	----	----	----	365
						18	47	82	173	249	346	
10185000	1	0	0	0	0	250	383	481	615	722	834	669
						250	389	498	627	746	873	
10187300	1	0	0	1	0	58	77	89	104	115	127	117
						60	95	136	182	231	284	
10194999	1	0	0	0	0	236	385	497	654	782	918	769
						237	391	512	690	827	971	
10205030	1	0	0	0	0	193	355	490	691	865	1,060	621
						193	357	494	691	863	1,050	
10205070	1	1	0	0	0	27	101	208	459	776	1,260	457
						27	99	193	409	649	997	
10205700	1	1	0	0	0	556	930	1,250	1,730	2,160	2,650	2,300
						556	923	1,220	1,670	2,030	2,440	
10208500	1	1	0	0	0	166	306	435	648	850	1,100	1,190
						165	296	410	598	778	1,000	
10210000	0	1	0	0	0	158	332	510	836	1,170	1,610	2,060
						157	323	482	761	1,050	1,410	
10211000	0	1	0	0	0	67	132	194	300	402	529	488
						67	130	190	291	391	515	
10215700	0	0	0	0	0	115	177	221	281	328	377	300
						114	174	220	286	348	418	
10215900	1	0	0	0	0	367	465	531	617	681	747	682
						364	450	511	596	675	763	
10216300	0	0	1	0	0	220	428	617	921	1,200	1,530	1,050
						219	414	580	835	1,070	1,350	
10216400	0	1	1	0	0	264	469	648	931	1,190	1,490	1,350
						264	464	635	896	1,130	1,400	
10219200	0	0	1	0	0	69	176	285	472	653	872	390
						70	177	285	481	656	864	
10220300	1	1	0	0	0	63	160	262	445	630	864	545
						63	153	243	443	612	821	
10224100	1	0	0	0	0	26	54	78	116	149	187	120
						27	56	85	142	191	249	
10232500	0	1	0	0	0	237	425	587	838	1,060	1,320	1,850
						237	421	577	823	1,040	1,280	
10233000	1	1	0	0	0	59	99	131	178	218	263	198
						59	105	151	231	302	382	
10233500	1	0	0	0	0	145	352	571	974	1,390	1,920	1,350
						145	349	552	933	1,290	1,720	
10234500	0	0	1	0	0	376	634	811	1,030	1,200	1,350	1,080
						376	634	810	1,020	1,190	1,340	
10235000	0	0	0	0	0	31	78	130	228	330	464	200
						32	90	159	276	390	530	
10236000	1	0	0	0	0	39	75	106	156	200	252	198
						40	82	126	204	271	349	
10236500	0	0	0	0	0	164	460	801	1,470	2,190	3,150	1,550
						164	438	711	1,180	1,680	2,340	
10237500	1	1	0	0	0	28	69	115	203	298	426	311
						29	82	147	265	377	515	
10240600	1	0	0	0	0	168	331	468	671	844	1,030	520
						166	310	422	676	845	1,030	
10241300	1	0	1	0	0	105	200	276	384	472	567	282
						107	219	325	522	648	777	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10241400	Little Creek near Partagonah, Utah	7	37.906	112.708	21	15.80	7,470	21.0	43.9
10241470	Center Creek above Parowan Creek, near Parowan, Utah	7	37.793	112.815	22	11.60	8,450	22.0	41.5
09166500	Dolores River at Dolores, Colo.	8	37.472	108.497	72	5.00	99,800	30.0	46.1
09168100	Disappointment Creek near Dove Creek, Colo.	8	37.877	108.582	29	147.00	8,000	22.0	45.1
09172500	San Miguel River near Placerville, Colo.	8	38.035	108.121	49	308.00	10,200	25.0	42.1
09174500	Cottonwood Creek near Nuela, Colo.	8	38.274	108.362	10	38.80	7,700	17.0	44.5
09175500	San Miguel River at Naturita, Colo.	8	38.218	108.566	53	1,069.00	9,000	24.0	45.9
09175900	Dry Creek near Naturita, Colo.	8	38.092	108.621	12	78.60	7,400	18.0	45.2
09177000	San Miguel River at Uravan, Colo.	8	38.357	108.712	23	1,499.00	8,400	22.0	45.6
09181000	Onion Creek near Moab, Utah	8	38.725	109.344	13	18.80	5,702	12.3	50.6
09182000	Castle Creek above Diversions near Moab, Utah	8	38.593	109.265	24	7.58	9,480	24.7	45.9
09182600	Salt Wash near Thompson, Utah	8	38.953	109.658	15	3.90	5,508	10.1	40.0
09183000	Courthouse Wash near Moab, Utah	8	38.613	109.579	28	162.00	4,810	7.5	53.7
09184000	Mill Creek near Moab, Utah	8	38.562	109.513	40	74.90	7,170	16.7	55.7
09185200	Kane Springs Canyon near Moab, Utah	8	38.400	109.450	15	17.80	6,620	15.9	51.0
09185500	Hatch Wash near La Sal, Utah	8	38.243	109.439	22	378.00	6,550	13.1	51.9
09186500	Indian Creek above Cottonwood Creek near Monticello, Utah	8	37.975	109.518	22	31.20	8,590	21.2	46.3
09187000	Cottonwood Creek near Monticello, Utah	8	38.062	109.574	17	115.00	7,210	17.9	51.1
09313000	Price River near Heiner, Utah	8	39.719	110.865	37	415.00	8,160	19.8	37.3
09313500	Price River near Helper, Utah	8	39.651	110.857	28	530.00	7,920	19.4	45.0
09314200	Miller Creek near Price, Utah	8	39.505	110.675	13	62.00	7,040	14.8	40.0
09314280	Desert Seep Wash near Wellington, Utah	8	39.421	110.646	15	191.00	5,813	--	40.0
09314400	Coleman Wash near Woodside, Utah	8	39.383	110.400	10	3.60	5,540	7.8	40.0
09314500	Price River at Woodside, Utah	8	39.264	110.346	43	1,540.00	6,490	13.7	40.0
09315150	Saleratus Wash Tributary near Woodside, Utah	8	39.133	110.333	15	10.00	5,070	7.6	40.0
09315200	Saleratus Wash Tributary No. 2 near Woodside, Utah	8	39.100	110.317	15	4.40	5,030	7.7	40.0
09315400	Saleratus Wash above Creek Wash near Green River, Utah	8	39.017	110.300	10	120.00	5,430	7.9	40.0
09315500	Saleratus Wash at Green River, Utah	8	38.981	110.246	22	180.00	5,050	7.5	40.5
09315900	Browns Wash Tributary near Green River, Utah	8	38.983	110.100	15	3.89	4,300	6.9	40.0
09316000	Browns Wash near Green River, Utah	8	38.986	110.129	19	75.00	5,220	9.3	40.0
09318000	Huntington Creek near Huntington, Utah	8	39.371	111.063	71	190.00	9,000	22.7	40.0

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
10241400	1	0	1	0	0	37	134	261	531	839	1,270	351
						37	134	255	509	778	1,150	
10241470	0	0	0	0	0	55	137	225	391	565	791	353
						55	138	225	385	548	755	
09166500	1	0	0	0	0	3,400	5,100	6,270	7,790	8,950	10,100	10,000
						3,390	5,050	6,150	7,540	8,620	9,680	
09168100	0	0	0	0	0	1,180	2,570	3,900	6,120	8,220	10,800	8,140
						1,180	2,530	3,770	5,710	7,470	9,540	
09172500	0	1	0	0	0	1,370	1,950	2,330	2,810	3,160	3,520	10,000
						1,370	1,950	2,330	2,860	3,300	3,760	
09174500	0	0	0	1	0	123	236	327	458	564	678	321
						135	326	577	1,070	1,550	2,090	
09175500	1	0	1	0	0	2,770	4,450	5,620	7,160	8,320	9,500	7,100
						2,770	4,430	5,580	7,110	8,310	9,550	
09175900	-	-	-	-	1	----	----	----	----	----	----	5,660
						691	1,440	2,060	3,090	4,030	5,010	
09177000	0	0	0	0	0	3,710	5,670	7,000	8,700	9,970	11,200	8,910
						3,690	5,610	6,890	8,640	10,100	11,600	
09181000	1	1	0	0	0	935	1,280	1,520	1,840	2,100	2,360	2,100
						921	1,260	1,540	2,050	2,590	3,220	
09182000	1	0	1	1	0	10	18	26	36	45	55	27
						12	37	81	184	296	430	
09182600	0	0	0	0	0	275	723	1,190	2,000	2,780	3,740	1,380
						273	708	1,140	1,850	2,510	3,300	
09183000	0	0	1	0	0	2,200	4,670	7,060	11,100	15,000	19,800	12,300
						2,190	4,610	6,880	10,600	14,000	18,100	
09184000	0	0	0	0	0	694	1,830	3,080	5,410	7,840	11,000	5,110
						694	1,820	3,020	5,140	7,260	9,900	
09185200	1	0	0	0	0	540	829	1,040	1,330	1,550	1,790	1,290
						536	831	1,080	1,510	1,920	2,410	
09185500	1	0	0	0	0	503	1,200	1,920	3,250	4,600	6,340	4,650
						523	1,330	2,250	3,990	5,700	7,720	
09186500	0	1	0	0	0	134	381	683	1,310	2,020	3,020	2,330
						138	404	735	1,390	2,070	2,950	
09187000	0	0	1	0	0	390	1,270	2,330	4,410	6,640	9,570	2,200
						400	1,310	2,360	4,250	6,100	8,320	
09313000	0	1	0	0	0	1,140	2,170	3,140	4,750	6,290	8,170	9,340
						1,140	2,190	3,180	4,810	6,350	8,140	
09313500	0	0	0	0	0	1,880	3,990	5,950	9,160	12,100	15,600	12,000
						1,880	3,950	5,790	8,650	11,200	14,000	
09314200	0	0	0	0	0	1,430	3,410	5,230	8,100	10,600	13,500	5,000
						1,410	3,220	4,640	6,600	8,180	9,940	
09314280	1	1	0	1	0	534	860	1,130	1,530	1,870	2,270	2,060
						554	1,030	1,630	2,810	3,990	5,330	
09314400	0	0	0	0	0	256	608	944	1,500	2,010	2,610	1,040
						254	598	919	1,460	1,960	2,550	
09314500	1	0	1	0	0	4,540	6,480	7,750	9,320	10,500	11,600	9,720
						4,530	6,480	7,810	9,670	11,300	12,900	
09315150	0	0	1	0	0	805	2,240	3,820	6,700	9,630	13,300	5,340
						794	2,130	3,440	5,550	7,500	9,820	
09315200	1	0	1	0	0	1,060	2,420	3,630	5,490	7,110	8,910	3,720
						1,040	2,270	3,210	4,490	5,540	6,700	
09315400	-	-	-	-	1	----	----	----	----	----	----	19,500
						1,170	2,580	3,800	5,810	7,650	9,610	
09315500	1	1	0	0	0	2,490	4,560	6,390	9,320	12,000	15,200	14,200
						2,470	4,490	6,230	8,980	11,500	14,400	
09315900	1	0	0	0	0	205	612	1,090	2,010	2,990	4,290	1,470
						206	623	1,110	2,030	2,950	4,110	
09316000	0	0	1	0	0	1,790	3,750	5,460	8,090	10,400	12,900	5,620
						1,770	3,650	5,170	7,420	9,380	11,500	
09318000	0	0	0	0	0	812	1,300	1,640	2,070	2,400	2,720	2,500
						812	1,310	1,670	2,160	2,570	3,000	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09324500	Cottonwood Creek near Orangeville, Utah	8	39.267	111.129	52	208.00	8,940	21.2	39.9
09326500	Ferron Creek (upper station) near Ferron, Utah	8	39.104	111.213	51	138.00	8,800	22.7	39.9
09327600	Ferron Creek Tributary near Ferron, Utah	8	39.067	111.033	12	0.96	6,300	7.6	40.0
09328050	Dry Wash near Moore, Utah	8	38.933	111.067	15	14.00	6,320	7.4	40.0
09328300	Sids Draw near Castle Dale, Utah	8	38.983	110.667	15	17.60	6,380	9.1	39.6
09328500	San Rafael River near Green River, Utah	8	38.858	110.369	50	1,628.00	6,910	12.9	45.1
09328600	Georges Draw near Hanksville, Utah	8	38.817	110.700	14	6.63	7,010	11.0	39.0
09328700	Temple Wash near Hanksville, Utah	8	38.650	110.550	10	38.20	5,630	8.6	39.3
09328720	Old Woman Wash near Hanksville, Utah	8	38.683	110.533	10	17.60	5,450	8.2	39.2
09328900	Crescent Wash near Crescent Junction, Utah	8	38.942	109.821	10	23.30	6,180	12.7	39.9
09329900	Pine Creek near Bicknell, Utah	8	38.269	111.583	16	104.00	9,300	20.3	40.9
09330120	Sulphur Creek near Fruita, Utah	8	38.300	111.267	16	56.70	7,400	14.7	39.9
09330200	Pleasant Creek at Notom, Utah	8	38.233	111.117	14	80.60	7,980	17.0	39.6
09330300	Neilson Wash near Caineville, Utah	8	38.367	110.883	15	22.30	4,830	7.0	49.9
09330400	Fremont River near Hanksville, Utah	8	38.367	110.750	15	1,900.00	7,450	13.7	56.0
09330500	Muddy Creek near Emery, Utah	8	38.982	111.249	43	105.00	8,850	24.5	40.0
09331500	Ivie Creek above diversions near Emery, Utah	8	38.758	111.421	24	50.00	8,870	20.3	40.1
09333900	Butler Canyon near Hite, Utah	8	38.000	110.500	16	14.70	5,150	7.3	54.4
09334000	North Wash near Hanksville (Hite), Utah	8	37.899	110.449	21	136.00	5,400	10.0	55.2
09334400	Fry Canyon near Hite, Utah	8	37.617	110.133	15	20.90	6,250	13.0	50.2
09334500	White Canyon near Hanksville, Utah	8	37.799	110.376	20	276.00	6,090	13.0	55.4
09336400	Upper Valley Creek near Escalante, Utah	8	37.733	111.717	16	53.00	7,620	18.2	39.9
09337000	Pine Creek near Escalante, Utah	8	37.862	111.635	34	68.10	8,890	22.7	40.0
09337500	Escalante River near Escalante, Utah	8	37.778	111.574	31	320.00	8,030	18.4	39.7
09338900	Deer Creek near Boulder, Utah	8	37.850	111.350	16	63.00	7,680	15.4	39.9
09339200	Twentymile Wash near Escalante, Utah	8	37.567	111.367	10	140.00	6,170	13.5	47.3
09342500	San Juan River at Pagosa Springs, Colo.	8	37.266	107.010	56	298.00	9,700	36.0	41.2
09343500	Rito Blanco near Pagosa Springs, Colo.	8	37.194	106.905	18	23.30	9,400	34.0	41.6
09345500	Little Navajo River at Chromo, Colo.	8	37.046	106.842	17	21.90	8,900	26.0	38.4
09346000	Navajo River at Edith, Colo.	8	37.003	106.907	36	172.00	9,200	33.0	40.2
09346200	Rio Amargo at Dulce, N. Mex.	8	36.933	107.000	30	168.00	7,930	17.7	42.4

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09324500	0	1	0	0	0	1,290	2,080	2,670	3,490	4,150	4,850	7,220
						1,290	2,070	2,660	3,490	4,180	4,930	
09326500	0	0	0	0	0	903	1,500	1,980	2,660	3,230	3,850	4,180
						902	1,500	1,980	2,690	3,310	3,980	
09327600	0	0	0	0	0	111	342	607	1,110	1,630	2,290	600
						110	332	566	971	1,360	1,830	
09328050	1	0	1	0	0	324	643	938	1,420	1,880	2,430	1,630
						324	657	986	1,560	2,130	2,790	
09328300	1	0	1	0	0	459	1,200	1,940	3,180	4,340	5,700	2,150
						457	1,170	1,840	2,890	3,840	4,900	
09328500	1	0	1	0	0	2,220	3,980	5,550	8,110	10,500	13,300	12,000
						2,230	4,040	5,700	8,450	11,000	14,000	
09328600	1	0	0	0	0	210	592	1,030	1,860	2,740	3,890	1,650
						210	584	987	1,690	2,370	3,200	
09328700	-	-	-	-	1	----	----	----	----	----	----	1,880
						636	1,470	2,220	3,470	4,630	5,900	
09328720	1	0	0	0	0	286	860	1,520	2,750	4,030	5,660	2,650
						292	887	1,550	2,720	3,850	5,170	
09328900	1	1	0	0	0	448	1,110	1,840	3,270	4,800	6,860	4,160
						448	1,100	1,780	2,990	4,160	5,590	
09329900	0	0	1	0	0	74	232	422	799	1,210	1,750	707
						87	308	615	1,220	1,830	2,530	
09330120	0	0	0	0	0	524	1,220	1,880	2,960	3,950	5,100	2,600
						525	1,220	1,870	2,900	3,820	4,850	
09330200	0	0	0	0	0	256	815	1,460	2,680	3,930	5,520	2,040
						266	859	1,530	2,710	3,820	5,110	
09330300	1	1	0	0	0	1,130	2,280	3,290	4,850	6,230	7,800	5,450
						1,120	2,210	3,110	4,490	5,740	7,170	
09330400	0	0	0	0	0	4,300	7,330	9,650	12,900	15,500	18,300	15,300
						4,280	7,220	9,370	12,400	14,900	17,600	
09330500	1	0	0	0	0	575	1,200	1,740	2,590	3,340	4,190	3,340
						576	1,200	1,750	2,600	3,350	4,190	
09331500	1	0	0	0	0	190	395	583	887	1,170	1,490	1,240
						194	423	662	1,090	1,500	1,960	
09333900	1	1	0	0	0	409	748	1,030	1,450	1,810	2,210	1,950
						410	773	1,130	1,770	2,400	3,140	
09334000	0	0	0	0	0	1,180	3,070	5,020	8,420	11,700	15,800	8,900
						1,180	3,050	4,900	7,960	10,800	14,100	
09334400	1	1	0	0	0	634	1,290	1,940	3,060	4,170	5,560	3,500
						629	1,270	1,870	2,870	3,820	4,960	
09334500	0	0	0	0	0	2,190	4,250	5,990	8,610	10,900	13,400	7,390
						2,180	4,190	5,820	8,230	10,300	12,600	
09336400	0	1	0	0	0	718	1,580	2,440	3,950	5,450	7,340	5,560
						714	1,550	2,320	3,590	4,770	6,160	
09337000	1	0	1	0	0	169	370	568	910	1,240	1,660	1,010
						173	396	641	1,090	1,530	2,060	
09337500	1	0	0	0	0	782	1,740	2,590	3,900	5,040	6,320	3,450
						788	1,770	2,650	4,040	5,250	6,590	
09338900	1	0	0	0	0	361	1,180	2,170	4,160	6,320	9,200	3,820
						366	1,190	2,110	3,780	5,420	7,420	
09339200	1	0	0	0	0	1,750	2,940	3,880	5,230	6,350	7,580	4,620
						1,730	2,870	3,770	5,190	6,490	7,930	
09342500	0	1	0	0	0	2,660	4,480	6,130	8,840	11,400	14,500	25,000
						2,650	4,420	5,950	8,370	10,600	13,200	
09343500	0	0	0	0	0	190	313	403	524	619	717	475
						192	334	469	710	945	1,210	
09345500	0	0	0	0	0	145	253	335	451	545	645	399
						148	281	420	682	940	1,230	
09346000	0	0	0	0	0	850	1,310	1,660	2,170	2,590	3,060	2,840
						850	1,320	1,690	2,290	2,820	3,410	
09346200	0	0	0	0	0	1,010	1,560	1,940	2,460	2,860	3,270	2,860
						1,010	1,570	2,000	2,660	3,260	3,910	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09346400	San Juan River near Carracas, N. Mex.	8	37.014	107.312	25	1230.00	8,500	30.0	48.4
09349500	Piedra River near Piedra, Colo.	8	37.222	107.342	34	371.00	9,400	33.0	43.5
09349800	Piedra River near Arboles, Colo.	8	37.088	107.397	24	629.00	8,300	27.0	47.4
09350500	San Juan River at Rosa, N. Mex.	8	37.006	107.403	43	1,990.00	9,800	27.0	49.5
09350800	Vaqueros Canyon near Gobernador, N. Mex.	8	36.733	107.283	31	60.50	7,500	15.0	51.5
09355000	Spring Creek at La Boca, Colo.	8	37.011	107.596	36	58.00	7,300	12.0	50.7
09355700	Gobernador Canyon near Gobernador, N. Mex.	8	36.685	107.419	30	19.80	6,900	12.1	53.4
09356400	Manzanares Canyon near Turley, N. Mex.	8	36.737	107.704	30	3.20	7,000	10.6	55.1
09356520	Burro Canyon near Lindrith, N. Mex.	8	36.272	107.246	14	9.11	6,965	--	51.2
09357200	Gallegos Canyon Tributary near Nageezi, N. Mex.	8	36.467	107.917	35	0.20	6,750	11.1	54.6
09361000	Hermosa Creek near Hermosa, Colo.	8	37.422	107.844	50	172.00	9,600	34.0	40.2
09361500	Animas River at Durango, Colo.	8	37.279	107.880	63	692.00	10,200	30.0	43.0
09362000	Lightner Creek near Durango, Colo.	8	37.604	107.893	22	66.00	8,400	22.0	35.0
09363000	Florida River near Durango, Colo.	8	37.325	107.748	45	96.00	9,900	38.0	40.9
09363100	Salt Creek near Oxford, Colo.	8	37.140	107.753	23	17.70	6,800	18.0	48.9
09363500	Animas River near Cedar Hill, N. Mex.	8	37.038	107.874	52	1,090.00	9,300	30.0	51.6
09364500	Animas River at Farmington, N. Mex.	8	36.720	108.202	73	1,360.00	9,500	29.0	55.1
09366500	La Plata River at Colorado-New Mexico State line	8	37.000	108.188	66	331.00	7,712	35.0	52.5
09367400	La Plata River Tributary near Farmington, N. Mex.	8	36.786	108.225	17	1.03	5,380	--	54.9
09367530	Locke Arroyo near Kirtland, N. Mex.	8	36.733	108.300	35	2.96	5,500	8.0	55.3
09367840	Yazzie Wash near Mexican Springs, N. Mex.	8	35.844	108.883	37	2.10	7,400	16.0	50.0
09367860	Chusca Wash near Mexican Springs, N. Mex.	8	35.811	108.847	29	8.70	6,800	14.0	50.0
09367880	Catron Wash near Mexican Springs, N. Mex.	8	35.771	108.828	18	26.90	6,600	13.0	50.0
09367900	Black Springs Wash near Mexican Springs, N. Mex.	8	35.761	108.817	34	7.05	5,916	12.8	50.0
09368500	West Mancos River near Mancos, Colo.	8	37.382	108.257	16	39.40	9,300	30.0	43.0
09369000	East Mancos River near Mancos, Colo.	8	37.370	108.231	15	11.90	9,700	30.0	42.8
09371000	Mancos River near Towaoc, Colo.	8	37.027	108.741	53	526.00	7,200	16.0	55.6
09372000	McElmo Creek near Colorado-Utah State line	8	37.324	109.015	36	346.00	6,300	10.5	55.1
09372200	McElmo Creek near Bluff, Utah	8	37.217	109.183	13	720.00	6,200	10.3	59.8
09378630	Recapture Creek near Blanding, Utah	8	37.756	109.476	21	3.77	8,880	22.9	44.8
09378700	Cottonwood Wash near Blanding, Utah	8	37.561	109.578	28	205.00	6,820	16.4	47.3

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09346400	0	0	0	0	0	4,110	6,260	7,740	9,640	11,100	12,500	9,730
						4,090	6,150	7,500	9,280	10,700	12,200	
09349500	0	0	0	0	0	2,080	3,470	4,650	6,440	8,040	9,880	7,980
						2,070	3,420	4,510	6,110	7,510	9,080	
09349800	0	0	0	0	0	2,470	4,260	5,690	7,760	9,500	11,400	8,370
						2,460	4,200	5,540	7,440	9,050	10,800	
09350500	0	0	0	0	0	6,730	10,600	13,700	18,100	21,900	26,000	25,000
						6,700	10,400	13,200	16,900	20,000	23,300	
09350800	0	0	0	0	0	205	518	866	1,530	2,240	3,190	2,520
						210	549	946	1,710	2,500	3,480	
09355000	-	-	-	-	1	----	----	----	----	----	----	1,980
						602	1,270	1,850	2,790	3,650	4,570	
09355700	-	-	-	-	1	----	----	----	----	----	----	3,450
						372	845	1,260	1,970	2,620	3,330	
09356400	-	-	-	-	1	----	----	----	----	----	----	2,210
						147	366	571	924	1,260	1,640	
09356520	-	-	-	-	1	----	----	----	----	----	----	725
						250	589	897	1,420	1,910	2,450	
09357200	0	0	0	0	0	133	255	358	511	642	787	580
						132	250	345	485	609	750	
09361000	1	0	0	0	0	986	1,690	2,230	3,000	3,620	4,280	2,980
						985	1,680	2,220	2,990	3,630	4,310	
09361500	1	1	0	0	0	4,930	7,420	9,450	12,500	15,200	18,200	25,000
						4,910	7,320	9,180	11,900	14,200	16,700	
09362000	0	0	0	0	0	484	971	1,410	2,100	2,740	3,470	1,850
						485	980	1,430	2,160	2,830	3,580	
09363000	0	0	0	0	0	985	1,480	1,840	2,360	2,780	3,220	3,200
						982	1,470	1,820	2,340	2,780	3,250	
09363100	0	0	0	0	0	214	392	535	742	913	1,100	811
						216	416	612	968	1,320	1,720	
09363500	0	0	0	0	0	5,770	8,130	9,790	12,000	13,700	15,400	13,100
						5,740	8,010	9,520	11,500	13,000	14,500	
09364500	0	1	0	0	0	6,070	9,030	11,100	13,800	15,900	18,000	25,000
						6,050	8,930	10,900	13,300	15,200	17,100	
09366500	0	0	0	0	0	762	1,580	2,320	3,510	4,590	5,850	4,750
						765	1,600	2,370	3,640	4,800	6,120	
09367400	1	0	0	0	0	92	253	435	778	1,140	1,600	1,130
						92	257	446	799	1,160	1,610	
09367530	0	0	0	0	0	105	254	403	657	901	1,200	812
						106	262	431	741	1,050	1,440	
09367840	1	0	0	0	0	284	591	863	1,290	1,660	2,090	1,390
						282	580	833	1,220	1,550	1,930	
09367860	1	0	0	0	0	1,120	2,420	3,620	5,530	7,260	9,260	6,400
						1,110	2,340	3,380	4,880	6,170	7,620	
09367880	1	0	0	0	0	1,720	3,040	4,070	5,540	6,750	8,050	4,750
						1,700	2,900	3,720	4,810	5,700	6,680	
09367900	-	-	-	-	1	----	----	----	----	----	----	2,200
						260	647	1,010	1,630	2,220	2,880	
09368500	0	0	0	0	0	316	584	808	1,140	1,430	1,760	1,080
						318	600	855	1,270	1,660	2,100	
09369000	-	-	-	-	1	----	----	----	----	----	----	642
						204	435	632	965	1,270	1,600	
09371000	-	-	-	-	1	----	----	----	----	----	----	5,300
						1,840	3,490	4,800	6,920	8,810	10,700	
09372000	0	0	0	0	0	958	1,540	2,000	2,640	3,180	3,770	3,040
						966	1,610	2,210	3,230	4,210	5,320	
09372200	0	1	0	0	0	651	1,800	3,200	6,170	9,610	14,500	13,100
						702	2,090	3,850	7,250	10,700	14,800	
09378630	0	0	0	1	0	17	43	69	114	159	215	142
						19	58	113	233	361	515	
09378700	1	1	0	0	0	1,080	2,820	4,800	8,650	12,800	18,400	20,500
						1,080	2,800	4,680	8,080	11,500	15,900	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09378950	Comb Wash near Blanding, Utah	8	37.550	109.667	10	10.30	5,760	12.0	45.9
09379000	Comb Wash near Bluff, Utah	8	37.266	109.675	10	280.00	6,060	11.5	55.9
09379030	Black Mountain Wash near Chinle, Ariz.	8	36.333	109.624	15	80.70	5,920	10.9	55.1
09379060	Lukachukai Creek Tributary near Lukachukai, Ariz.	8	36.469	109.406	14	1.37	5,820	9.8	55.3
09379100	Long House Wash near Kayenta, Ariz.	8	36.567	110.488	15	1.38	6,920	12.0	54.7
09379300	Lime Creek near Mexican Hat, Utah	8	37.217	109.817	15	67.20	5,360	8.8	53.9
09379560	El Capitan Wash near Kayenta, Ariz.	8	36.859	110.265	14	5.88	5,699	9.0	54.9
09379800	Coyote Creek near Kanab, Utah	8	37.133	111.750	14	89.00	5,110	11.0	54.2
09379820	Buck Tank Draw near Kanab, Utah	8	37.083	111.700	10	5.25	5,030	10.2	56.5
09379980	Jack Bench Wash Tributary near Page, Ariz.	8	36.714	111.592	15	0.98	6,180	8.8	60.1
09381100	Henrieville Creek at Henrieville, Utah	8	37.567	111.983	16	34.00	7,120	16.0	39.7
09381500	Paria River near Cannonville, Utah	8	37.481	112.021	21	220.00	6,890	15.0	39.0
09381800	Paria River near Kanab, Utah	8	37.067	111.883	15	668.00	6,390	13.4	54.7
09382000	Paria River at Lees Ferry, Ariz.	8	36.872	111.594	63	1,410.00	6,150	12.0	62.5
09383020	House Rock Wash Tributary near Marble Canyon, Ariz.	8	36.701	111.929	13	3.54	5,290	9.6	57.7
09403000	Bright Angel Creek near Grand Canyon, Ariz.	8	36.100	112.093	50	101.00	7,390	19.8	55.0
09403500	Kanab Creek near Glendale, Utah	8	37.283	112.483	16	72.00	7,250	17.8	41.0
09403600	Kanab Creek near Kanab, Utah	8	37.101	112.547	18	198.00	6,670	16.2	53.7
09403700	Johnson Wash near Kanab, Utah	8	37.033	112.350	16	237.00	6,300	14.8	54.0
09403750	Sagebrush Draw near Fredonia, Ariz.	8	36.901	112.376	15	0.68	5,290	12.0	55.0
09403780	Kanab Creek near Fredonia, Ariz.	8	36.864	112.579	16	1,085.00	6,100	12.0	55.4
09403800	Bitter Seeps Wash Tributary near Fredonia, Ariz.	8	36.857	112.758	14	2.85	5,120	12.0	55.7
09404450	East Fork Virgin River near Glendale, Utah	8	37.339	112.604	20	69.20	7,300	18.9	39.5
09404500	Mineral Gulch near Mt. Carmel, Utah	8	37.233	112.733	14	7.60	6,110	16.5	46.0
09405420	North Fork Virgin River below Bullock Canyon, near Glendale, Utah	8	37.418	112.800	11	29.60	7,670	--	39.9
09405500	North Fork Virgin River near Springdale, Utah	8	37.210	112.978	63	344.00	7,350	25.2	53.2
09406000	Virgin River near Virgin, Utah	8	37.198	113.206	70	934.00	6,400	19.1	54.2
09406300	Kanarra Creek at Kanarraville, Utah	8	37.538	113.168	23	9.85	7,950	25.0	44.6
09406700	South Ash Creek below Mill Creek near Pintura, Utah	8	37.364	113.334	16	11.00	7,210	22.7	45.6
09406800	South Ash Creek near Pintura, Utah	8	37.331	113.281	14	14.00	6,720	20.2	55.9
09408000	Leeds Creek near Leeds, Utah	8	37.267	113.370	23	15.50	6,360	18.8	50.0

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09378950	1	1	0	0	0	743	1,450	2,110	3,210	4,250	5,500	3,430
						728	1,370	1,910	2,780	3,580	4,520	
09379000	1	1	0	0	0	1,750	3,200	4,490	6,590	8,540	10,900	8,390
						1,750	3,210	4,530	6,710	8,730	11,000	
09379030	1	0	0	0	0	843	1,650	2,320	3,290	4,100	4,990	3,100
						844	1,670	2,410	3,570	4,640	5,840	
09379060	1	0	0	1	0	18	47	80	144	213	306	227
						20	71	154	346	556	820	
09379100	-	-	-	-	1	----	----	----	----	----	----	2,060
						98	255	406	670	922	1,210	
09379300	-	-	-	-	1	----	----	----	----	----	----	6,600
						888	2,020	3,030	4,690	6,220	7,890	
09379560	0	0	0	0	0	469	951	1,390	2,110	2,780	3,570	2,340
						463	922	1,320	1,970	2,580	3,290	
09379800	1	0	0	0	0	1,400	2,760	3,880	5,540	6,950	8,490	4,590
						1,390	2,730	3,840	5,570	7,130	8,880	
09379820	-	-	-	-	1	----	----	----	----	----	----	680
						264	698	1,120	1,850	2,540	3,340	
09379980	-	-	-	-	1	----	----	----	----	----	----	200
						92	252	411	690	961	1,280	
09381100	0	0	0	0	0	864	2,060	3,340	5,670	8,070	11,200	7,360
						855	1,980	3,060	4,820	6,490	8,510	
09381500	0	0	0	0	0	2,770	4,860	6,600	9,230	11,500	14,100	11,600
						2,740	4,720	6,230	8,400	10,200	12,300	
09381800	0	0	0	0	0	2,480	5,290	7,960	12,400	16,700	21,800	15,400
						2,480	5,230	7,690	11,500	15,000	18,900	
09382000	1	0	0	0	0	3,880	6,990	9,540	13,300	16,600	20,100	16,100
						3,880	6,980	9,520	13,300	16,600	20,100	
09383020	1	1	0	0	0	25	82	161	343	573	922	1,610
						30	126	292	673	1,100	1,640	
09403000	1	0	0	0	0	435	1,010	1,600	2,650	3,690	5,010	4,400
						438	1,030	1,640	2,730	3,790	5,090	
09403500	1	0	1	0	0	701	1,380	1,920	2,680	3,290	3,920	2,100
						700	1,380	1,940	2,780	3,520	4,320	
09403600	0	0	1	0	0	610	1,330	1,990	3,060	4,040	5,190	3,030
						622	1,410	2,200	3,570	4,840	6,270	
09403700	1	0	1	0	0	1,230	1,770	2,140	2,640	3,030	3,420	2,750
						1,230	1,860	2,440	3,530	4,590	5,770	
09403750	-	-	-	-	1	----	----	----	----	----	----	150
						90	261	438	751	1,060	1,430	
09403780	1	0	0	0	0	875	1,760	2,610	4,050	5,440	7,150	4,630
						926	2,090	3,470	6,040	8,500	11,300	
09403800	0	0	0	0	0	127	575	1,240	2,790	4,660	7,360	1,950
						129	570	1,170	2,400	3,720	5,450	
09404450	0	0	1	0	0	132	293	453	729	999	1,330	640
						142	362	646	1,210	1,790	2,460	
09404500	1	0	0	0	0	313	952	1,710	3,180	4,770	6,860	3,210
						312	925	1,590	2,740	3,870	5,250	
09405420	-	-	-	-	1	----	----	----	----	----	----	1,740
						409	884	1,290	1,980	2,600	3,280	
09405500	0	0	0	0	0	1,810	3,260	4,430	6,130	7,570	9,140	9,150
						1,810	3,250	4,410	6,090	7,530	9,100	
09406000	0	0	0	0	0	3,820	7,180	10,100	14,500	18,400	22,900	22,800
						3,810	7,140	9,990	14,200	17,900	22,100	
09406300	0	0	0	0	0	141	367	608	1,050	1,490	2,050	1,000
						142	375	626	1,080	1,520	2,050	
09406700	1	1	0	0	0	218	531	859	1,450	2,050	2,820	1,910
						219	537	869	1,450	2,020	2,700	
09406800	0	0	0	0	0	194	469	739	1,190	1,630	2,140	938
						197	494	806	1,360	1,890	2,500	
09408000	1	0	0	0	0	361	1,030	1,750	3,040	4,300	5,850	2,980
						361	1,020	1,700	2,840	3,910	5,160	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09408150	Virgin River near Hurricane, Utah	8	37.162	113.395	20	1,499.00	6,350	18.7	57.3
09408200	Fort Pierce Wash near St. George, Utah	8	37.060	113.544	11	1,650.00	4,870	9.0	59.4
09408400	Santa Clara River near Pine Valley, Utah	8	37.383	113.482	27	18.70	8,720	27.3	43.8
09409500	Moody Wash near Veyo, Utah	8	37.433	113.742	15	33.00	6,070	13.7	45.2
09410000	Santa Clara River above Windsor Dam near Santa Clara, Utah	8	37.218	113.776	30	338.00	5,900	15.6	55.2
10242000	Coal Creek near Cedar City, Utah	8	37.672	113.034	56	80.90	8,640	28.8	43.7
10242100	Shirts Creek near Cedar City, Utah	8	37.617	113.117	16	12.80	8,032	25.3	45.3
10242440	Cottonwood Creek near Enterprise, Utah	8	37.567	113.700	11	6.00	6,110	11.0	57.4
09093500	Parachute Creek at Grand Valley, Colo.	9	39.453	108.059	21	198.00	7,500	16.0	40.8
09095000	Roan Creek near De Beque, Colo.	9	39.453	108.316	23	321.00	7,500	18.0	40.0
09128500	Smith Fork near Crawford, Colo.	9	38.728	107.506	50	42.80	9,200	23.0	40.1
09130500	East Muddy Creek near Bardine, Colo.	9	39.013	107.358	19	133.00	8,700	26.0	40.8
09132500	North Fork Gunnison River near Somerset, Colo.	9	38.929	107.448	52	526.00	8,900	25.0	40.2
09134500	Leroux Creek near Cedaredge, Colo.	9	38.927	107.793	29	34.50	9,700	33.0	40.0
09137800	Dirty George Creek near Grand Mesa, Colo.	9	38.945	108.027	12	10.60	9,700	24.0	39.3
09141200	Youngs Creek near Grand Mesa, Colo.	9	38.958	107.918	12	10.30	9,300	25.0	39.9
09238500	Walton Creek near Steamboat Springs, Colo.	9	40.408	106.786	19	42.40	9,300	49.0	38.9
09239500	Yampa River at Steamboat Springs, Colo.	9	40.484	106.832	79	604.00	8,800	25.0	40.8
09241000	Elk River at Clark, Colo.	9	40.717	106.915	58	216.00	9,000	37.0	39.1
09244100	Fish Creek near Milner, Colo.	9	40.334	107.139	18	34.50	8,200	23.0	40.0
09245000	Elkhead Creek near Elkhead, Colo.	9	40.670	107.285	34	64.20	8,400	26.0	40.0
09245500	North Fork Elkhead Creek near Elkhead, Colo.	9	40.681	107.287	15	21.00	8,600	41.0	40.0
09248600	East Fork of Williams Fork above Willow Creek, Colo.	9	40.261	107.294	16	108.00	9,600	29.0	40.0
09249000	East Fork of Williams Fork near Pagoda, Colo.	9	40.312	107.319	18	150.00	9,200	26.0	40.0
09249200	South Fork of Williams Fork near Pagoda, Colo.	9	40.212	107.442	13	46.70	9,200	32.0	40.0
09250000	Milk Creek near Thornburg, Colo.	9	40.194	107.732	34	65.00	7,800	18.0	40.0
09253000	Little Snake River near Slater, Colo.	9	40.999	107.143	40	285.00	8,600	31.0	40.0
09255000	Slater Fork near Slater, Colo.	9	40.982	107.383	55	161.00	8,400	22.0	41.1
09255500	Savery Creek at Upper Station, near Savery, Wyo.	9	41.218	107.372	23	200.00	7,790	21.0	41.9
09256000	Savery Creek near Savery, Wyo.	9	41.098	107.381	32	330.00	7,870	19.0	41.7
09257000	Little Snake River near Dixon, Wyo.	9	41.028	107.549	52	988.00	8,030	18.0	41.8

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09408150	1	0	0	0	0	5,940	10,400	13,900	19,100	23,500	28,400	20,100
						5,900	10,200	13,300	17,700	21,500	25,600	
09408200	1	0	0	0	0	2,340	4,500	6,360	9,240	11,800	14,700	8,760
						2,420	5,060	7,840	12,700	17,200	22,000	
09408400	0	1	0	0	0	75	163	250	406	561	758	776
						78	184	312	566	826	1,140	
09409500	1	0	1	0	0	267	868	1,560	2,830	4,110	5,700	1,810
						274	900	1,610	2,860	4,040	5,410	
09410000	0	0	0	0	0	940	2,380	3,850	6,400	8,850	11,800	6,190
						951	2,440	3,970	6,610	9,090	12,000	
10242000	1	0	0	0	0	785	1,660	2,490	3,870	5,170	6,730	4,620
						784	1,650	2,450	3,750	4,940	6,340	
10242100	0	0	0	0	0	269	495	684	969	1,220	1,490	1,070
						269	501	709	1,060	1,390	1,760	
10242440	1	1	0	0	0	145	398	684	1,240	1,820	2,600	1,470
						148	418	729	1,310	1,890	2,590	
09093500	0	0	0	0	0	429	886	1,290	1,920	2,490	3,130	2,600
						430	888	1,290	1,920	2,510	3,120	
09095000	0	0	0	0	0	567	1,110	1,530	2,120	2,590	3,090	2,020
						568	1,110	1,540	2,160	2,680	3,190	
09128500	1	0	0	0	0	375	578	734	956	1,140	1,340	1,410
						375	581	742	969	1,150	1,360	
09130500	0	0	0	0	0	914	1,310	1,590	1,970	2,270	2,590	2,190
						913	1,310	1,580	1,960	2,260	2,590	
09132500	1	0	0	0	0	3,590	5,060	6,060	7,350	8,320	9,300	9,220
						3,590	5,020	5,970	7,160	8,070	8,980	
09134500	1	0	0	0	0	697	922	1,070	1,250	1,380	1,520	1,310
						696	919	1,070	1,240	1,360	1,510	
09137800	0	0	0	1	0	44	68	84	104	118	132	86
						47	91	142	210	249	305	
09141200	0	0	0	1	0	55	72	81	92	99	106	86
						57	91	133	193	232	283	
09238500	0	0	0	0	0	1,380	1,830	2,110	2,460	2,710	2,960	2,800
						1,370	1,790	2,020	2,300	2,500	2,720	
09239500	0	0	0	0	0	3,700	4,650	5,190	5,800	6,210	6,580	6,820
						3,700	4,630	5,150	5,740	6,140	6,510	
09241000	1	0	0	0	0	2,670	3,360	3,780	4,260	4,590	4,900	4,910
						2,670	3,340	3,730	4,180	4,490	4,790	
09244100	0	0	0	0	0	159	245	303	373	424	473	342
						160	255	336	452	549	641	
09245000	1	0	0	0	0	1,020	1,460	1,770	2,180	2,490	2,810	2,850
						1,020	1,440	1,730	2,110	2,410	2,710	
09245500	0	0	0	0	0	402	652	838	1,100	1,300	1,520	1,100
						401	642	813	1,050	1,240	1,440	
09248600	0	0	0	0	0	1,010	1,290	1,460	1,650	1,790	1,930	1,570
						1,010	1,300	1,480	1,690	1,830	2,010	
09249000	0	0	0	0	0	923	1,240	1,450	1,710	1,910	2,100	1,620
						924	1,250	1,480	1,770	1,980	2,210	
09249200	1	0	0	0	0	628	766	850	950	1,020	1,090	910
						627	769	869	1,000	1,100	1,210	
09250000	1	0	0	0	0	355	623	842	1,170	1,440	1,750	1,580
						355	622	841	1,170	1,460	1,760	
09253000	0	0	0	0	0	2,250	3,050	3,550	4,140	4,550	4,960	4,780
						2,250	3,030	3,490	4,050	4,440	4,840	
09255000	1	0	0	0	0	857	1,210	1,460	1,780	2,020	2,270	2,250
						857	1,210	1,460	1,790	2,040	2,310	
09255500	0	0	0	0	0	459	837	1,140	1,600	1,980	2,400	1,680
						460	844	1,160	1,650	2,070	2,500	
09256000	1	0	0	0	0	1,200	1,660	1,940	2,290	2,530	2,770	2,670
						1,200	1,650	1,940	2,320	2,610	2,890	
09257000	1	0	0	0	0	4,680	6,160	7,070	8,170	8,960	9,710	13,000
						4,670	6,110	6,950	7,980	8,750	9,470	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09257500	Willow Creek near Baggs, Wyo.	9	40.877	107.464	10	5.00	9,000	20.0	40.7
09258000	Willow Creek near Dixon, Wyo.	9	40.916	107.521	32	24.00	8,200	19.0	41.1
09258200	Dry Cow Creek near Baggs, Wyo.	9	41.340	107.671	12	49.70	6,950	11.0	44.1
09258900	Muddy Creek above Baggs, Wyo.	9	41.132	107.646	14	1,178.00	7,000	12.0	42.7
09259500	Fourmile Creek near Baggs, Wyo.	9	40.841	107.514	11	4.00	8,600	20.0	40.7
09263700	Cliff Creek near Jensen, Utah	9	40.300	109.133	15	64.00	6,570	14.0	44.6
09263800	Cow Wash near Jensen, Utah	9	40.317	109.217	14	3.90	5,360	10.5	45.0
09271800	Halfway Hollow Tributary near Lapoint, Utah	9	40.417	109.750	15	5.60	6,547	10.8	38.5
09302800	North Fork White River near Buford, Colo.	9	40.036	107.520	17	220.00	9,734	31.5	40.0
09303000	North Fork White River at Buford, Colo.	9	39.987	107.614	35	260.00	9,529	30.9	40.0
09303500	South Fork White River near Buford, Colo.	9	39.922	107.551	27	152.00	10,060	33.6	40.0
09304000	South Fork White River at Buford, Colo.	9	39.974	107.625	35	177.00	9,800	36.3	40.0
09304200	White River above Coal Creek, near Meeker, Colo.	9	40.005	107.825	25	648.00	9,142	30.7	40.0
09304300	Coal Creek near Meeker, Colo.	9	40.091	107.769	11	25.10	7,956	28.4	40.0
09304500	White River near Meeker, Colo.	9	40.034	107.862	78	755.00	8,940	29.6	40.0
09304800	White River below Meeker, Colo.	9	40.013	108.092	24	1,024.00	8,449	27.5	40.0
09306007	Piceance Creek below Rio Blanco, Colo.	9	39.826	108.182	13	177.00	7,628	24.5	40.0
09306061	Piceance Creek above Hunter Creek near Rio Blanco, Colo.	9	39.851	108.258	13	309.00	7,552	21.2	40.0
09306200	Piceance Creek below Ryan Gulch near Rio Blanco, Colo.	9	39.921	108.297	22	506.00	7,415	20.8	40.0
09306222	Piceance Creek at White River, Colo.	9	40.088	108.243	18	652.00	7,269	20.0	40.0
09306235	Coal Gulch below Water Gulch near Rangely, Colo.	9	39.906	108.532	11	8.61	7,740	20.0	40.0
09306242	Coal Gulch near Rangely, Colo.	9	39.920	108.472	13	31.60	7,490	20.0	40.0
09306255	Yellow Creek near White River, Colo.	9	40.169	108.401	11	262.00	6,877	17.3	40.0
09306800	Bitter Creek near Bonanza, Utah	9	39.753	109.354	16	324.00	7,146	16.1	39.9
09307500	Willow Creek above diversions, near Ouray, Utah	9	39.566	109.587	27	297.00	7,650	16.8	39.4
09308000	Willow Creek near Ouray, Utah	9	39.939	109.648	26	897.00	7,080	13.7	45.2
09308200	Pleasant Valley Wash Tributary near Myton, Utah	9	40.117	110.133	11	15.00	6,110	10.3	41.1
09308500	Minnie Maud Creek near Myton, Utah	9	39.799	110.565	32	32.00	8,460	18.7	37.8
09309000	Minnie Maud Creek at Nutter Ranch near Myton, Utah	9	39.812	110.250	23	231.00	7,880	16.8	39.4
09309100	Gate Canyon near Myton, Utah	9	39.833	110.250	12	5.40	6,860	13.6	39.5
09404310	Yampai Canyon Tributary, near Peach Springs, Ariz.	10	35.552	113.388	13	0.20	5,360	12.2	71.6

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
09257500	1	0	0	1	0	89	102	109	117	122	127	115
						90	112	140	186	220	260	
09258000	1	0	0	0	0	161	260	329	419	486	554	476
						161	264	341	450	538	625	
09258200	-	-	-	-	1	----	----	----	----	----	----	853
						193	374	565	944	1,430	1,650	
09258900	0	0	0	0	0	647	1,330	1,920	2,800	3,560	4,400	2,650
						654	1,360	2,000	3,030	4,020	4,920	
09259500	0	0	0	0	0	81	131	167	214	250	286	168
						81	135	180	246	300	353	
09263700	1	0	0	0	0	183	754	1,500	2,990	4,590	6,640	1,360
						183	735	1,410	2,680	4,040	5,640	
09263800	1	1	0	1	0	311	770	1,270	2,210	3,200	4,490	2,950
						308	732	1,140	1,880	2,670	3,620	
09271800	1	0	0	0	0	93	288	510	926	1,350	1,890	702
						93	279	475	830	1,200	1,630	
09302800	1	0	0	0	0	1,330	1,610	1,780	1,980	2,120	2,250	1,950
						1,330	1,630	1,840	2,090	2,230	2,430	
09303000	1	1	0	0	0	1,390	1,860	2,170	2,570	2,870	3,180	3,550
						1,390	1,870	2,190	2,590	2,880	3,210	
09303500	1	0	0	0	0	1,870	2,380	2,710	3,110	3,410	3,700	3,620
						1,870	2,370	2,680	3,040	3,300	3,580	
09304000	1	0	0	0	0	1,940	2,380	2,650	2,970	3,200	3,430	3,150
						1,940	2,370	2,630	2,930	3,140	3,380	
09304200	1	0	0	0	0	3,300	4,290	4,900	5,640	6,180	6,700	5,740
						3,300	4,260	4,820	5,500	5,990	6,490	
09304300	0	0	0	1	0	49	80	102	131	153	176	102
						51	100	161	267	364	452	
09304500	1	0	0	0	0	3,270	4,260	4,900	5,710	6,300	6,890	6,950
						3,270	4,250	4,880	5,670	6,240	6,830	
09304800	1	0	0	0	0	3,400	4,540	5,280	6,180	6,840	7,490	6,590
						3,390	4,500	5,180	6,030	6,680	7,330	
09306007	1	0	0	0	0	201	359	485	668	820	986	520
						205	392	578	885	1,170	1,430	
09306061	0	0	0	0	0	200	403	576	835	1,060	1,300	612
						206	449	701	1,120	1,510	1,860	
09306200	0	0	0	1	0	141	268	381	561	726	919	550
						146	309	499	835	1,170	1,480	
09306222	0	0	0	1	0	238	429	578	789	961	1,140	625
						244	477	717	1,130	1,530	1,870	
09306235	0	0	0	0	0	15	97	256	717	1,390	2,530	272
						16	104	262	667	1,220	2,060	
09306242	0	0	0	0	0	64	312	717	1,750	3,100	5,210	1,780
						65	315	696	1,590	2,700	4,310	
09306255	-	-	-	-	1	----	----	----	----	----	----	6,800
						508	854	1,240	2,020	3,020	3,460	
09306800	0	0	0	0	0	125	546	1,160	2,540	4,200	6,540	1,790
						130	570	1,190	2,510	4,050	6,000	
09307500	1	1	0	0	0	242	470	689	1,070	1,440	1,900	2,240
						245	491	747	1,200	1,630	2,120	
09308000	1	1	0	0	0	663	1,740	2,980	5,400	8,020	11,600	11,000
						666	1,740	2,950	5,230	7,700	10,900	
09308200	-	-	-	-	1	----	----	----	----	----	----	2,590
						59	139	237	469	837	972	
09308500	0	0	0	0	0	107	365	676	1,280	1,910	2,720	1,370
						108	369	677	1,250	1,840	2,570	
09309000	1	0	0	0	0	538	818	1,030	1,320	1,560	1,810	1,380
						539	830	1,070	1,420	1,730	2,020	
09309100	1	0	0	0	0	282	625	928	1,390	1,800	2,250	1,000
						279	594	836	1,190	1,520	1,850	
09404310	-	-	-	-	1	----	----	----	----	----	----	177
						5	33	74	141	201	280	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09404350	Valentine Wash at Valentine, Ariz.	10	35.383	113.662	14	3.15	4,490	12.1	59.6
09415050	Big Bend Wash Tributary near Littlefield, Ariz.	10	36.862	113.968	13	7.27	2,240	7.6	59.6
09415100	Pulsipher Wash near Mesquite, Nev.	10	36.801	114.110	18	4.58	1,950	6.0	62.3
09417100	Dry Lake Tributary near Nellis Air Force Base, Nev.	10	36.354	114.909	12	10.00	2,690	6.0	64.5
09418990	Weiser Wash near Glendale, Nev.	10	36.668	114.536	16	43.00	2,480	6.0	64.3
09419590	Detrital Wash Tributary near Chloride, Ariz.	10	35.432	114.285	15	1.23	3,710	10.1	64.4
09419620	Mormon Wells Wash near Las Vegas, Nev.	10	36.446	115.253	25	115.00	6,500	6.0	54.5
09419630	Telephone Canyon near Charleston Park, Nev.	10	36.272	115.542	25	7.20	7,880	10.0	65.2
09419640	Kyle Canyon near Charleston Park, Nev.	10	36.278	115.469	26	35.90	8,020	10.1	65.3
09419647	Las Vegas Wash Tributary near Las Vegas, Nev.	10	36.303	115.139	24	62.00	3,790	6.0	60.2
09419650	Las Vegas Wash at North Las Vegas, Nev.	10	36.211	115.106	21	700.00	--	6.0	64.3
09419663	Las Vegas Wash Tributary south of Nellis Air Force Base, Nev.	10	36.194	115.025	23	1.20	2,510	4.0	67.8
09419670	Red Rock Wash near Blue Diamond, Nev.	10	36.158	115.496	25	8.09	6,030	7.0	67.0
09419675	Flamingo Wash at Las Vegas, Nev.	10	36.116	115.184	18	86.00	3,790	6.0	76.0
09419677	Flamingo Wash at Maryland Parkway at Las Vegas, Nev.	10	36.143	115.070	18	106.00	3,200	6.0	75.6
09419680	Cottonwood Valley near Blue Diamond, Nev.	10	36.010	115.431	26	18.30	5,400	8.3	70.1
09419690	Duck Creek at Whitney, Nev.	10	36.086	115.033	26	239.00	3,420	6.0	75.9
09419697	Las Vegas Wash Tributary near Henderson, Nev.	10	36.031	115.030	18	1.17	2,370	6.0	79.1
09421800	Ringbolt Wash near Hoover Dam, Ariz.	10	35.968	114.683	14	1.21	2,590	5.8	80.8
09423300	Piute Wash Tributary at Searchlight, Nev.	10	35.467	114.939	17	3.40	3,670	6.0	74.7
09423400	Tin Can Creek near Needles, Calif.	10	34.857	114.882	15	0.04	2,600	6.0	76.0
09423760	Little Meadow Creek near Oatman, Ariz.	10	35.030	114.308	12	8.47	3,400	12.0	71.8
09423820	Sacramento Wash near Yucca, Ariz.	10	34.811	114.161	12	787.00	3,400	10.1	73.0
09423900	Sacramento Wash Tributary near Topock, Ariz.	10	34.730	114.312	14	14.70	1,450	6.2	74.2
09424050	Chemehuevi Wash Tributary near Needles, Calif.	10	34.508	114.603	14	2.04	--	7.0	88.4
09427700	Monkeys Head Wash near Parker, Ariz.	10	34.278	114.129	14	1.84	1,130	5.5	74.9
09428530	Arch Creek near Earp, Calif.	10	34.165	114.372	14	1.52	840	6.0	79.3
09428560	Colorado River Tributary No 2 near Vidal, Calif.	10	33.986	114.496	14	0.42	880	5.0	74.7
09428570	Colorado River Tributary near Vidal, Calif.	10	33.980	114.506	14	1.12	--	5.0	74.5
09429150	Creosote Wash near Ehrenberg, Ariz.	10	33.621	114.495	12	1.98	509	5.5	89.0
09429240	Ogilby Wash near Palo Verde, Calif.	10	33.339	114.779	14	0.04	--	--	100.0

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09404350	-	-	-	-	1	----	----	----	----	----	----	3,800
						23	167	407	843	1,270	1,880	
09415050	-	-	-	-	1	----	----	----	----	----	----	250
						38	274	684	1,450	2,230	3,340	
09415100	-	-	-	-	1	----	----	----	----	----	----	1,880
						29	209	514	1,080	1,640	2,430	
09417100	-	-	-	-	1	----	----	----	----	----	----	180
						46	331	834	1,790	2,760	4,160	
09418990	-	-	-	-	1	----	----	----	----	----	----	584
						106	782	2,060	4,610	7,330	11,400	
09419590	-	-	-	-	1	----	----	----	----	----	----	470
						14	96	227	458	678	981	
09419620	0	0	0	0	0	12	71	171	432	773	1,300	480
						16	218	610	1,190	2,300	3,030	
09419630	-	-	-	-	1	----	----	----	----	----	----	2,500
						38	272	680	1,440	2,210	3,320	
09419640	-	-	-	-	1	----	----	----	----	----	----	1,660
						96	703	1,840	4,100	6,500	10,100	
09419647	1	0	1	0	0	46	304	825	2,410	4,850	9,120	5,130
						48	381	1,050	2,730	5,390	9,590	
09419650	0	1	0	0	0	254	1,200	2,730	6,580	11,700	19,500	12,010
						262	1,570	3,980	8,880	16,500	25,100	
09419663	-	-	-	-	1	----	----	----	----	----	----	296
						13	95	224	450	667	964	
09419670	-	-	-	-	1	----	----	----	----	----	----	7,470
						40	292	731	1,560	2,390	3,600	
09419675	1	0	1	0	0	199	714	1,370	2,720	4,220	6,230	3,910
						198	783	1,660	3,270	5,350	7,560	
09419677	0	0	0	0	0	264	1,210	2,650	6,090	10,400	16,800	4,700
						261	1,230	2,800	6,360	10,900	17,300	
09419680	-	-	-	-	1	----	----	----	----	----	----	1,100
						65	472	1,210	2,650	4,140	6,320	
09419690	1	1	0	0	0	337	698	1,060	1,700	2,350	3,170	3,570
						336	854	1,640	2,780	4,640	5,850	
09419697	-	-	-	-	1	----	----	----	----	----	----	1,950
						13	93	220	443	655	947	
09421800	-	-	-	-	1	----	----	----	----	----	----	310
						13	95	225	453	670	969	
09423300	1	0	0	0	0	69	173	275	445	605	793	400
						68	173	301	501	722	930	
09423400	-	-	-	-	1	----	----	----	----	----	----	98
						2	13	27	49	68	92	
09423760	-	-	-	-	1	----	----	----	----	----	----	869
						41	300	752	1,600	2,470	3,710	
09423820	-	-	-	-	1	----	----	----	----	----	----	13,000
						574	4,350	12,500	30,500	51,400	84,700	
09423900	-	-	-	-	1	----	----	----	----	----	----	1,030
						57	415	1,060	2,300	3,570	5,430	
09424050	-	-	-	-	1	----	----	----	----	----	----	114
						18	129	311	636	951	1,390	
09427700	0	0	0	0	0	18	100	236	572	1,000	1,640	320
						18	104	247	575	979	1,590	
09428530	0	0	0	0	0	25	193	526	1,460	2,750	4,780	7,160
						25	178	473	1,320	2,380	4,280	
09428560	-	-	-	-	1	----	----	----	----	----	----	400
						7	51	117	228	330	467	
09428570	-	-	-	-	1	----	----	----	----	----	----	460
						13	91	215	431	637	919	
09429150	0	0	0	0	0	96	240	388	651	910	1,230	580
						92	217	370	646	915	1,250	
09429240	0	0	0	0	0	6	15	26	45	64	88	39
						5	15	26	46	65	89	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09429250	Ogilby Wash No. 2 near Palo Verde, Calif.	10	33.340	114.779	14	0.01	--	--	100.0
09429400	Indian Wash Tributary near Yuma, Ariz.	10	33.109	114.295	15	2.56	1,190	5.5	68.7
09429510	Mittry Lake Tributary near Yuma, Ariz.	10	32.860	114.435	12	0.30	346	4.2	73.6
10248490	Indian Springs Valley Tributary near Indian Spring, Nev.	10	36.567	115.811	22	29.00	6,140	6.6	66.0
10248510	Eldorado Valley Tributary near Nelson, Nev.	10	35.810	114.885	18	1.41	2,900	6.0	80.1
10250600	Wildrose Creek near Wildrose Station, Nev.	10	36.265	117.178	15	23.70	6,400	8.0	75.0
10250720	Onyx Creek near Ballarat, Nev.	10	36.022	117.312	11	0.52	--	5.0	75.0
10251000	Big Dip Creek near Stovepipe Wells, Nev.	10	36.918	117.293	15	0.95	2,200	5.0	62.7
10251200	Spring Creek at Furnace Creek Inn, Nev.	10	36.444	116.837	15	0.21	--	2.0	75.1
10251220	Amargosa River near Beatty, Nev.	10	36.868	116.759	19	70.00	5,070	7.1	59.5
10251270	Amargosa River Tributary near Mercury, Nev.	10	36.561	116.100	22	110.00	4,060	6.0	75.2
10251271	Amargosa River Tributary No. 1 near Johnnie, Nev.	10	36.460	116.108	18	2.21	3,460	6.0	75.4
10251272	Amargosa River Tributary No. 2 near Johnnie, Nev.	10	36.436	116.074	17	2.49	4,640	6.8	75.0
10251350	Horse Thief Creek near Tecopa, Nev.	10	35.781	115.897	10	3.06	--	5.0	75.8
10251400	Ibex Creek near Tecopa, Nev	10	35.787	116.333	15	0.20	2,150	3.0	80.2
10251500	Yucca Creek near Yucca Grove, Calif.	10	35.408	115.772	15	0.03	--	--	75.0
10251600	Sal,sberry Creek near Shoshone, Calif.	10	35.919	116.435	15	0.01	--	--	80.1
10251980	Lovell Wash near Blue Diamond, Nev.	10	36.003	115.644	17	52.80	6,390	9.0	64.8
10252300	China Spring Creek near Mountain Pass, Calif.	10	35.468	115.508	15	0.94	--	7.0	74.9
10252550	Caruthers Creek near Ivanpah, Nev.	10	35.242	115.299	23	1.13	6,200	10.0	75.0
10253000	Gourd Creek near Ludlow, Calif.	10	34.676	116.022	22	0.30	1,800	3.0	80.0
10253250	Granite Wash near Rice, Calif.	10	34.047	115.218	14	0.01	--	--	100.0
10253255	Granite Wash No. 2 near Rice, Calif.	10	34.049	115.217	14	0.01	--	--	100.0
10253350	Fortynine Palms Creek near Twentynine Palms, Calif.	10	34.120	116.095	18	8.55	4,200	5.0	79.7
10253700	Palen Dry Lake Tributary near Desert Center, Calif.	10	33.696	115.479	14	0.04	--	--	90.8
10253750	Monument Wash near Desert Center, Calif.	10	33.708	115.364	14	4.29	--	4.0	93.8
10253800	Coxcomb Wash near Desert Center, Calif.	10	33.807	115.286	14	0.03	--	--	92.6
10254020	Betz Wash near Salton Beach, Calif.	10	33.498	115.904	14	5.95	--	3.0	73.6
10254475	Glamis Wash at Glamis, Calif.	10	32.998	115.069	15	0.60	400	3.0	80.0
10255200	Myer Creek Tributary near Jacumba, Calif.	10	32.674	116.081	14	0.11	2,000	4.0	61.8
10255230	Myer Creek Tributary No. 2 near Coyote Wells, Calif.	10	32.721	116.046	14	0.08	1,160	4.0	68.6

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
09429250	1	0	0	0	0	11	20	26	36	43	51	32
						11	17	23	33	40	49	
09429400	0	0	0	0	0	45	65	79	98	113	129	98
						44	79	131	189	289	322	
09429510	-	-	-	-	1	----	----	----	----	----	----	165
						6	42	95	183	263	370	
10248490	-	-	-	-	1	----	----	----	----	----	----	497
						85	620	1,610	3,570	5,630	8,680	
10248510	-	-	-	-	1	----	----	----	----	----	----	530
						15	104	247	500	743	1,080	
10250600	-	-	-	-	1	----	----	----	----	----	----	1,060
						75	550	1,420	3,130	4,920	7,550	
10250720	-	-	-	-	1	----	----	----	----	----	----	24
						8	58	133	261	381	541	
10251000	0	1	0	0	0	13	38	66	122	184	267	199
						13	45	90	160	252	338	
10251200	0	0	0	0	0	4	12	20	34	48	64	24
						4	16	31	50	76	93	
10251220	-	-	-	-	1	----	----	----	----	----	----	16,000
						426	3,210	9,070	21,800	36,400	59,300	
10251270	1	0	1	0	0	35	272	805	2,590	5,540	11,000	3,430
						39	408	1,200	3,190	6,590	12,000	
10251271	-	-	-	-	1	----	----	----	----	----	----	350
						19	136	327	670	1,000	1,470	
10251272	-	-	-	-	1	----	----	----	----	----	----	125
						20	146	352	724	1,090	1,600	
10251350	-	-	-	-	1	----	----	----	----	----	----	850
						23	164	400	828	1,250	1,840	
10251400	-	-	-	-	1	----	----	----	----	----	----	126
						5	33	74	141	201	280	
10251500	-	-	-	-	1	----	----	----	----	----	----	24
						2	11	23	41	56	76	
10251600	-	-	-	-	1	----	----	----	----	----	----	12
						1	6	12	20	27	35	
10251980	-	-	-	-	1	----	----	----	----	----	----	4,150
						120	883	2,340	5,270	8,410	13,100	
10252300	-	-	-	-	1	----	----	----	----	----	----	113
						12	82	192	384	566	814	
10252550	0	0	1	0	0	35	235	605	1,610	2,960	5,090	671
						35	218	554	1,500	2,680	4,720	
10253000	-	-	-	-	1	----	----	----	----	----	----	125
						6	42	95	183	263	370	
10253250	-	-	-	-	1	----	----	----	----	----	----	22
						1	6	12	20	27	35	
10253255	-	-	-	-	1	----	----	----	----	----	----	27
						1	6	12	20	27	35	
10253350	-	-	-	-	1	----	----	----	----	----	----	1,240
						42	301	757	1,610	2,490	3,740	
10253700	-	-	-	-	1	----	----	----	----	----	----	52
						2	13	27	49	68	92	
10253750	1	0	0	0	0	18	53	89	153	214	287	100
						19	80	169	286	467	565	
10253800	-	-	-	-	1	----	----	----	----	----	----	75
						2	11	23	41	56	76	
10254020	-	-	-	-	1	----	----	----	----	----	----	133
						34	243	604	1,280	1,950	2,910	
10254475	-	-	-	-	1	----	----	----	----	----	----	86
						9	63	146	287	419	598	
10255200	0	0	0	0	0	1	8	27	97	216	441	41
						1	11	32	96	201	406	
10255230	-	-	-	-	1	----	----	----	----	----	----	21
						3	19	42	77	109	149	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10255650	Chariot Creek near Julian, Calif.	10	33.066	116.552	12	7.95	4,000	27.0	60.9
10255700	San Felipe Creek near Julian, Calif.	10	33.119	116.434	25	89.20	3,400	10.0	59.8
10255730	Pinyon Wash near Borrego Springs Calif.	10	33.115	116.317	14	19.60	2,750	7.0	59.7
10255800	Coyote Creek near Borrego Springs, Calif.	10	33.374	116.427	36	144.00	4,300	6.0	59.9
10255820	Yaqui Pass Wash near Borrego, Calif.	10	33.147	116.350	14	0.03	--	--	60.0
10255825	Yaqui Pass Wash No. 2 near Borrego, Calif.	10	33.151	116.349	14	0.04	--	--	60.0
10255850	Vallecito Creek near Julian, Calif.	10	32.986	116.419	20	39.70	--	--	70.3
10255885	San Felipe Creek near Westmorland, Calif.	10	33.124	115.852	26	1693.00	--	--	65.4
10256000	Whitewater River at Whitewater, Calif.	10	33.947	116.640	30	57.50	5,600	26.0	60.6
10256400	San Gornonio River near Whitewater, Calif.	10	33.921	116.696	14	154.00	--	--	51.3
10256500	Snow Creek near Whitewater, Calif.	10	33.871	116.680	26	10.80	6,150	29.0	58.2
10257600	Mission Creek near Desert Hot Springs, Calif.	10	34.011	116.627	18	35.60	--	--	61.1
10258000	Tahquitz Creek near Palm Springs, Calif.	10	33.805	116.558	38	16.90	6,800	24.0	61.4
10258100	Palm Canyon Creek Tributary near Anza, Calif.	10	33.569	116.512	12	0.47	5,200	12.0	70.8
10258500	Palm Canyon Creek near Palm Springs, Calif.	10	33.745	116.535	52	93.10	4,500	10.0	65.2
10259000	Andreas Creek near Palm Springs, Calif.	10	33.760	116.549	37	8.65	4,500	14.0	63.9
10259200	Deep Creek near Palm Desert, Calif.	10	33.631	116.391	24	30.60	4,000	8.0	70.0
10259300	Whitewater River at Indio, Calif.	10	33.735	116.244	20	1,073.00	--	--	70.0
10259500	Thermal Canyon Tributary near Mecca, Calif.	10	33.680	115.990	14	0.18	1,700	4.0	80.5
10259600	Cottonwood Wash near Cottonwood Spring, Calif.	10	33.744	115.826	14	0.71	--	5.0	80.8
10260200	Pipes Creek near Yucca Valley, Calif.	10	34.172	116.546	21	15.10	--	9.0	79.8
10260400	Cushenbury Creek near Lucerne Valley, Calif.	10	34.364	116.845	20	6.36	--	12.0	69.6
10261000	West Fork Mohave River near Hesperia, Calif.	10	34.341	117.240	49	70.30	4,120	24.0	69.3
10261500	Mohave River at Lower Narrows, near Victorville, Calif.	10	34.573	117.320	39	513.00	4,500	5.0	80.3
10261800	Beacon Creek at Helendale, Calif.	10	34.750	117.315	17	0.72	2,700	4.0	80.3
10262600	Boom Creek near Barstow, Calif.	10	34.906	116.949	23	0.24	2,350	5.0	75.2
10263100	ZZYZX Creek near Baker, Calif	10	35.194	116.151	11	0.23	1,800	3.0	80.7
10263500	Big Rock Creek near Valyermo, Calif.	10	34.421	117.839	64	22.90	6,000	18.0	81.0
10263900	Buckhorn Creek near Valyermo, Calif.	10	34.343	117.920	20	0.48	7,600	25.0	79.5
10264000	Little Rock Creek near Little Rock, Calif.	10	34.463	118.018	47	49.00	5,600	21.0	84.0
10264520	Amargosa Creek Tributary near Palmdale, Calif.	10	34.631	118.326	15	0.05	3,440	9.0	84.6

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
10255650	0	0	0	0	0	12	77	201	569	1,120	2,070	340
						14	121	318	736	1,380	2,300	
10255700	0	1	0	0	0	17	123	370	1,280	2,960	6,460	6,150
						21	243	718	1,840	3,990	7,470	
10255730	-	-	-	-	1	----	----	----	----	----	----	19,200
						67	492	1,270	2,770	4,330	6,620	
10255800	0	0	1	0	0	308	1,350	2,740	5,560	8,590	12,500	3,890
						306	1,370	2,880	5,860	9,240	13,300	
10255820	0	0	0	0	0	2	11	27	68	121	199	38
						2	11	27	64	109	182	
10255825	0	0	0	0	0	2	10	21	45	73	111	25
						2	10	22	46	72	108	
10255850	1	0	0	0	0	48	241	533	1,190	1,960	3,030	1,160
						49	309	743	1,540	2,650	3,800	
10255885	0	1	0	0	0	2,870	8,790	16,400	32,700	52,000	79,700	100,000
						2,820	8,580	16,800	34,200	55,700	84,700	
10256000	1	0	0	0	0	465	1,930	4,460	11,700	22,700	42,500	42,000
						458	1,840	4,250	11,200	21,400	40,500	
10256400	0	0	0	0	0	396	1,790	3,880	8,760	14,700	23,400	7,250
						389	1,770	4,010	9,030	15,200	24,000	
10256500	0	0	0	0	0	357	1,270	2,590	5,720	9,720	15,900	13,000
						350	1,170	2,390	5,380	8,970	15,000	
10257600	0	0	0	0	0	40	377	1,210	4,160	9,200	18,800	1,750
						42	425	1,310	4,150	8,780	17,800	
10258000	0	0	0	0	0	91	429	983	2,420	4,370	7,470	2,900
						91	431	997	2,430	4,340	7,390	
10258100	1	0	0	0	0	5	14	22	37	50	66	28
						6	22	45	72	115	134	
10258500	1	0	0	0	0	375	1,360	2,650	5,350	8,400	12,600	7,000
						373	1,350	2,690	5,450	8,630	12,900	
10259000	1	0	0	0	0	76	251	490	1,030	1,700	2,700	1,960
						75	255	513	1,070	1,760	2,760	
10259200	1	0	0	0	0	352	1,320	2,610	5,400	8,600	13,100	7,100
						345	1,240	2,490	5,240	8,270	12,800	
10259300	0	0	1	0	0	478	4,400	13,100	39,800	79,500	145,000	14,100
						484	4,510	13,400	39,500	77,300	141,000	
10259500	-	-	-	-	1	----	----	----	----	----	----	128
						4	31	69	131	187	260	
10259600	-	-	-	-	1	----	----	----	----	----	----	34
						10	69	162	320	469	671	
10260200	-	-	-	-	1	----	----	----	----	----	----	640
						58	422	1,080	2,340	3,640	5,530	
10260400	-	-	-	-	1	----	----	----	----	----	----	530
						35	253	630	1,330	2,040	3,050	
10261000	0	0	1	0	0	1,920	6,860	13,400	27,600	44,100	67,300	26,100
						1,900	6,510	12,700	26,600	42,000	65,100	
10261500	1	0	1	0	0	1,310	7,610	18,900	49,300	91,400	159,000	70,600
						1,300	7,300	18,100	47,700	87,400	154,000	
10261800	1	0	0	0	0	13	44	85	176	286	447	360
						13	48	98	195	316	474	
10262600	1	0	0	0	0	24	49	70	103	132	165	125
						24	47	72	108	144	178	
10263100	-	-	-	-	1	----	----	----	----	----	----	46
						5	36	80	154	220	308	
10263500	0	0	0	0	0	183	740	1,530	3,340	5,520	8,670	8,300
						182	731	1,520	3,330	5,490	8,630	
10263900	0	0	0	0	0	18	64	123	244	380	564	169
						18	63	124	244	377	559	
10264000	1	0	0	0	0	520	1,890	3,640	7,210	11,100	16,300	17,000
						515	1,830	3,540	7,100	10,900	16,100	
10264520	1	0	0	0	0	5	9	13	18	23	29	19
						5	10	16	24	33	39	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
10264530	Pine Creek near Palmdale, Calif.	10	34.602	118.247	24	1.37	--	13.0	85.2
10264560	Spencer Canyon Creek near Fairmont, Calif.	10	34.776	118.569	21	3.60	3,300	10.0	59.3
10264605	Joshua Creek near Mohave, Calif.	10	35.012	118.344	15	3.83	4,300	12.0	54.7
10264680	Mescal Creek Tributary at Big Pines, Calif.	10	34.374	117.700	12	0.05	7,400	9.0	77.6
10264700	Peewee Creek near Randsburg, Calif.	10	35.461	117.656	15	0.14	--	--	80.5
10264750	Pine Tree Creek near Mohave, Calif.	10	35.231	118.085	20	33.50	--	--	71.2
10264840	Sand Creek near Inyokern, Calif.	10	35.624	117.890	15	1.02	3,400	6.0	75.0
10264878	Ninemile Creek near Brown, Calif.	10	35.843	117.926	15	10.40	5,000	7.0	71.8
10264900	Salt Wells Creek near Westend, Calif.	10	35.656	117.447	15	61.60	--	--	75.0
10264915	Crust Creek near Westend, Calf.	10	35.690	117.381	14	0.13	1,700	5.0	75.0
09383500	Nutrioso Creek above Nelson Reservoir near Springerville, Ariz.	11	34.032	109.186	17	83.40	8,550	20.0	44.4
09384000	Little Colorado River above Lyman Lake near St. Johns, Ariz.	11	34.314	109.362	46	747.00	7,760	20.0	51.8
09384200	Lyman Reservation Tributary near St. Johns, Ariz.	11	34.392	109.380	14	0.24	6,100	11.6	52.1
09385800	Little Colorado River Tributary near St. Johns, Ariz.	11	34.451	109.256	14	0.35	6,350	11.1	52.3
09386100	Largo Creek near Quemado, N. Mex.	11	34.324	108.528	32	151.00	8,270	15.6	48.7
09387050	Galestena Canyon Tributary near Black Rock, N. Mex.	11	34.979	108.667	30	19.00	7,100	12.8	50.4
09390500	Show Low Creek near Lakeside, Ariz.	11	34.179	109.987	33	68.60	7,320	23.7	49.0
09392800	Long Lake Tributary near Show Low, Ariz.	11	34.261	109.995	12	5.18	6,700	13.5	51.3
09393500	Silver Creek near Snowflake, Ariz.	11	34.667	110.042	56	886.00	6,400	16.7	55.7
09395100	Carr Lake Tributary near Holbrook, Ariz.	11	34.835	109.933	13	1.19	5,420	7.8	55.3
09395400	Milk Rock Canyon near Ft Wingate, N. Mex.	11	35.432	108.558	35	14.00	8,300	15.5	49.7
09395500	Puerco River at Gallup, N. Mex.	11	35.529	108.745	34	558.00	7,900	12.9	50.0
09395600	Wagon Trail Wash near Gamerco, N. Mex.	11	35.650	108.783	24	0.38	6,500	11.5	50.0
09395900	Black Creek near Lupton, Ariz.	11	35.452	109.126	19	500.00	7,500	15.8	49.9
09396400	Dead Wash Tributary near Holbrook, Ariz.	11	35.075	109.750	13	1.00	5,740	7.9	54.0
09397200	Penzance Wash near Joseph City, Ariz.	11	34.919	110.254	14	0.17	5,150	7.8	55.0
09397500	Chevelon Creek below Wildcat Canyon, near Winslow, Ariz.	11	34.636	110.714	28	275.00	7,030	24.0	54.3
09397800	Brookbank Canyon near Heber, Ariz.	11	34.472	110.647	13	27.60	6,950	22.1	52.3
09398000	Chevelon Creek near Winslow, Ariz.	11	34.926	110.531	48	794.00	6,440	18.4	55.6
09398500	Clear Creek below Willow Creek, near Winslow, Ariz.	11	34.667	111.007	39	321.00	7,100	25.8	52.3
09399000	Clear Creek near Winslow, Ariz.	11	34.969	110.644	52	607.00	6,500	18.7	55.6

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
10264530	0	0	0	0	0	5	26	57	126	207	318	69
						6	35	80	160	269	381	
10264560	-	-	-	-	1	----	----	----	----	----	----	430
						25	181	443	920	1,390	2,060	
10264605	0	1	0	0	0	6	70	256	1,060	2,730	6,470	2,540
						7	90	294	1,050	2,500	5,910	
10264680	-	-	-	-	1	----	----	----	----	----	----	21
						2	15	31	57	79	108	
10264700	-	-	-	-	1	----	----	----	----	----	----	1
						4	27	59	111	158	219	
10264750	0	0	0	0	0	42	442	1,570	6,260	15,600	35,800	30,000
						44	474	1,600	6,000	14,300	33,200	
10264840	-	-	-	-	1	----	----	----	----	----	----	22
						12	86	202	405	598	862	
10264878	0	0	0	0	0	19	102	243	613	1,110	1,900	437
						20	143	357	787	1,420	2,210	
10264900	0	0	0	0	0	42	184	383	818	1,320	2,000	612
						46	319	793	1,530	2,740	3,620	
10264915	0	0	0	0	0	1	3	6	11	17	24	9
						1	7	16	26	42	49	
09383500	1	0	0	0	0	107	257	411	681	946	1,280	700
						114	439	744	2,020	2,430	1,690	
09384000	0	1	0	0	0	845	2,030	3,260	5,470	7,670	10,500	16,000
						852	2,220	3,730	7,850	10,200	11,100	
09384200	1	1	0	0	0	42	62	75	92	106	119	101
						42	61	89	162	183	136	
09385800	0	0	0	0	0	51	127	208	358	512	712	326
						50	118	196	309	457	685	
09386100	0	0	0	0	0	299	517	702	988	1,240	1,540	1,320
						303	649	1,020	2,550	2,870	1,940	
09387050	0	0	0	0	0	109	250	382	598	796	1,030	660
						110	286	488	1,110	1,310	1,150	
09390500	1	0	0	0	0	470	1,630	3,090	6,040	9,250	13,500	5,550
						469	1,610	2,980	5,240	8,470	13,300	
09392800	0	0	0	0	0	22	194	544	1,520	2,840	4,850	530
						24	219	565	1,250	2,270	4,550	
09393500	1	1	1	0	0	3,000	5,690	7,990	11,500	14,500	18,000	25,000
						2,990	5,700	8,190	13,000	16,600	18,600	
09395100	-	-	-	-	1	----	----	----	----	----	----	140
						29	143	335	569	806	914	
09395400	-	-	-	-	1	----	----	----	----	----	----	1,360
						134	570	973	1,650	2,460	3,080	
09395500	0	0	0	0	0	2,050	5,380	8,450	13,200	17,100	21,500	12,000
						2,040	5,310	8,240	12,600	17,300	21,700	
09395600	1	0	0	0	0	78	172	259	401	530	682	437
						77	162	242	341	482	667	
09395900	1	0	0	0	0	2,550	4,440	5,890	7,910	9,9540	11,300	7,680
						2,520	4,410	5,970	9,250	12,000	12,200	
09396400	1	0	0	0	0	197	373	524	754	956	1,190	743
						192	330	463	607	850	1,150	
09397200	-	-	-	-	1	----	----	----	----	----	----	120
						9	48	120	205	279	292	
09397500	0	0	1	0	0	2,750	7,500	12,500	21,300	29,800	40,300	19,900
						2,720	7,090	11,500	16,800	26,100	39,400	
09397800	1	0	0	0	0	145	314	464	697	901	1,130	666
						147	406	746	1,790	2,160	1,490	
09398000	0	0	1	0	0	2,420	6,270	10,700	19,400	29,000	41,900	33,600
						2,410	6,230	10,600	18,700	28,700	41,900	
09398500	1	0	1	0	0	2,950	7,170	11,200	17,900	24,000	31,100	19,700
						2,930	6,910	10,600	15,300	22,300	30,800	
09399000	1	0	0	0	0	2,600	7,510	13,600	26,500	41,500	62,900	50,000
						2,590	7,370	13,200	23,600	38,800	62,200	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09399250	Jacks Canyon Tributary No. 2 near Winslow, Ariz.	11	34.765	111.012	14	31.80	6,530	19.2	53.8
09400100	Ganado Wash Tributary near Ganado, Ariz.	11	35.711	109.497	14	11.10	6,770	11.8	51.4
09400200	Steamboat Wash Tributary near Ganado, Ariz.	11	35.764	109.800	12	0.32	6,750	12.1	53.8
09400290	Teshbito Wash Tributary near Holbrook, Ariz.	11	35.481	110.087	14	16.40	6,420	8.2	54.0
09400300	Teshbito Wash near Holbrook, Ariz.	11	35.449	110.068	14	57.40	6,280	9.2	53.7
09400530	Cow Canyon near Winslow, Ariz.	11	35.100	110.987	15	3.53	--	10.0	55.5
09400560	Oraibi Wash Tributary near Oraibi, Ariz.	11	35.872	110.556	14	1.78	6,020	10.2	54.9
09400565	Polacca Wash Tributary near Chinle, Ariz.	11	36.047	110.081	13	6.17	6,890	12.3	55.0
09400580	Castle Butte Wash near Winslow, Ariz.	11	35.325	110.422	13	5.53	5,820	8.6	55.0
09400590	Rio de Flag at Hidden Hollow Road at Flagstaff, Ariz.	11	35.242	111.684	13	31.50	8,130	25.4	44.2
09400595	Schultz Canyon at Flagstaff, Ariz.	11	35.227	111.658	11	6.09	8,060	21.9	44.1
09400600	Rio de Flag at Flagstaff, Ariz.	11	35.222	111.657	18	51.00	8,050	25.3	44.1
09400650	Sinclair Wash at Flagstaff, Ariz.	11	35.164	111.680	11	8.16	7,200	22.5	44.2
09400655	Rio de Flag at 140 at Flagstaff, Ariz.	11	35.184	111.632	13	82.40	7,840	20.0	44.1
09400680	Switzer Canyon at Flagstaff, Ariz.	11	35.212	111.639	12	1.87	7,130	19.9	44.1
09400730	Lockett Fanning Diversion at Flagstaff, Ariz.	11	35.222	111.599	12	1.05	8,020	20.0	44.1
09400910	Fay Canyon near Flagstaff, Ariz.	11	35.135	111.630	16	2.76	7,000	19.6	44.2
09401210	Slate Mountain Wash near Flagstaff, Ariz.	11	35.515	111.835	14	5.43	7,350	19.7	51.0
09401220	Cedar Wash near Cameron, Ariz.	11	35.859	111.442	10	556.00	6,430	13.7	55.3
09401245	Klethla Valley Tributary near Kayenta, Ariz.	11	36.498	110.621	15	0.77	6,730	10.2	54.4
09401300	Hamblin Wash Tributary near Cedar Ridge, Ariz.	11	36.349	111.504	14	0.10	5,860	7.6	55.0
09401370	Hamblin Wash Tributary No. 2 near Tuba City, Ariz.	11	36.055	111.393	13	2.16	4,670	6.0	55.0
09402100	Forest Boundary Wash near Cameron, Ariz.	11	35.924	111.737	14	0.72	6,810	11.9	55.3
09403930	West Cataract Creek near Williams, Ariz.	11	35.248	112.224	13	3.18	7,190	23.5	49.6
09404050	Spring Valley Wash Tributary, near Williams, Ariz.	11	35.574	112.153	14	3.93	6,750	12.2	52.2
09424200	Cottonwood Wash No.1 near Kingman, Ariz.	12	35.181	113.469	15	143.00	5,350	14.0	53.9
09424407	McGarrys Wash near Kingman, Ariz.	12	35.117	113.650	12	13.50	4,610	12.0	60.5
09424410	Big Sandy River Tributary near Kingman, Ariz.	12	35.092	113.658	16	1.99	3,700	12.0	61.0
09424430	Kaiser Spring Canyon Tributary near Wikieup, Ariz.	12	34.572	113.478	16	1.70	3,520	11.2	60.9
09424470	Kirkland Creek near Kirkland, Ariz.	12	34.394	112.722	10	109.00	--	--	54.6
09424480	Ash Creek near Kirkland, Ariz.	12	34.453	112.796	16	6.95	4,680	10.4	54.7

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09399250	-	-	-	-	1	----	----	----	----	----	----	9,330
						222	902	1,750	2,970	4,490	5,810	
09400100	1	1	0	0	0	238	533	820	1,310	1,780	2,350	1,680
						234	528	846	1,450	2,000	2,400	
09400200	-	-	-	-	1	----	----	----	----	----	----	383
						13	69	160	272	375	403	
09400290	0	0	1	0	0	369	873	1,310	1,970	2,510	3,090	890
						362	831	1,290	2,050	2,770	3,170	
09400300	1	0	1	0	0	652	1,050	1,340	1,730	2,040	2,350	1,580
						642	1,080	1,600	2,990	3,680	2,850	
09400530	1	0	0	0	0	64	128	182	261	327	400	253
						64	149	279	660	758	507	
09400560	-	-	-	-	1	----	----	----	----	----	----	383
						37	180	407	692	989	1,140	
09400565	1	0	1	0	0	361	708	995	1,410	1,770	2,150	1,130
						352	647	939	1,360	1,840	2,170	
09400580	1	0	0	0	0	85	288	540	1,040	1,590	2,320	860
						85	297	591	1,160	1,690	2,310	
09400590	-	-	-	-	1	----	----	----	----	----	----	153
						221	897	1,170	2,000	3,020	3,900	
09400595	-	-	-	-	1	----	----	----	----	----	----	48
						80	358	497	845	1,240	1,500	
09400600	0	0	0	0	0	17	74	158	349	580	910	240
						24	222	433	1,420	1,700	1,200	
09400650	1	0	0	0	0	73	167	261	424	583	780	401
						74	218	356	768	981	887	
09400655	-	-	-	-	1	----	----	----	----	----	----	421
						401	1,540	1,930	3,280	5,060	6,780	
09400680	0	0	1	0	0	38	96	152	245	331	430	135
						38	112	185	370	471	462	
09400730	-	-	-	-	1	----	----	----	----	----	----	85
						27	134	199	338	478	539	
09400910	0	0	0	0	0	9	26	47	88	132	190	87
						10	57	111	333	380	248	
09401210	-	-	-	-	1	----	----	----	----	----	----	88
						74	335	628	1,070	1,560	1,880	
09401220	1	0	0	0	0	1,500	4,550	8,070	14,800	21,900	31,000	10,400
						1,490	4,540	8,110	14,200	22,100	31,100	
09401245	1	0	0	0	0	121	193	244	313	366	421	290
						118	180	247	380	461	442	
09401300	-	-	-	-	1	----	----	----	----	----	----	110
						6	36	91	155	209	214	
09401370	-	-	-	-	1	----	----	----	----	----	----	350
						42	200	452	768	1,100	1,280	
09402100	-	-	-	-	1	----	----	----	----	----	----	115
						21	108	258	438	614	682	
09403930	0	0	1	0	0	26	96	183	350	524	744	151
						27	123	253	584	763	795	
09404050	1	0	0	0	0	18	61	114	217	326	465	190
						19	97	224	618	741	565	
09424200	1	0	1	0	0	3,680	5,860	7,320	9,140	10,500	11,800	7,000
						3,640	5,650	7,090	10,300	14,800	20,200	
09424407	-	-	-	-	1	----	----	----	----	----	----	1,000
						211	823	1,460	2,700	4,810	7,380	
09424410	1	0	0	0	0	18	80	174	399	686	1,120	353
						19	97	251	653	1,170	1,880	
09424430	-	-	-	-	1	----	----	----	----	----	----	1,310
						57	218	412	813	1,330	2,050	
09424470	-	-	-	-	1	----	----	----	----	----	----	1,000
						786	----	----	----	----	----	
09424480	0	0	0	0	0	132	457	887	1,820	2,900	4,430	4,000
						132	464	900	1,790	3,040	4,700	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09424700	Iron Spring Wash Tributary near Bagdad, Ariz.	12	34.522	113.112	15	0.64	3,470	12.1	54.8
09424900	Santa Maria River near Bagdad, Ariz.	12	34.306	113.346	19	1,210.00	4,010	14.0	62.6
09425500	Santa Maria River near Alamo, Ariz.	12	34.300	113.517	28	1,520.00	3,650	14.4	63.3
09468300	Sevenmile Wash Tributary near Globe, Ariz.	12	33.586	110.650	16	0.83	4,410	19.0	53.1
09468500	San Carlos River near Peridot, Ariz.	12	33.296	110.451	57	1,027.00	4,480	17.2	58.2
09489100	Black River near Maverick, Ariz.	12	33.707	109.447	20	315.00	8,700	27.2	40.4
09489499	Black River above Willow Creek Diversion near Point of Pines, Ariz.	12	33.481	109.752	33	560.00	8,000	25.3	44.1
09489700	Big Bonito Creek near Fort Apache, Ariz.	12	33.667	109.846	24	119.00	7,920	27.9	44.4
09490500	Black River near Fort Apache, Ariz.	12	33.713	110.211	30	1,232.00	7,200	23.4	47.9
09492400	East Fork White River near Fort Apache, Ariz.	12	33.822	109.814	28	38.80	8,580	31.2	40.7
09494000	White River near Fort Apache, Ariz.	12	33.736	110.166	29	632.00	7,400	25.4	47.3
09494300	Carrizo Creek above Corduroy Creek near Show Low, Ariz.	12	34.000	110.289	14	225.00	6,370	22.5	44.7
09496000	Corduroy Creek near mouth near Show Low, Ariz.	12	34.018	110.242	24	203.00	6,370	21.7	44.0
09496500	Carrizo Creek near Show Low, Ariz.	12	33.985	110.280	36	439.00	6,320	22.0	44.7
09496600	Cibecue 1 Tributary to Carrizo Creek near Show Low, Ariz.	12	33.991	110.324	14	0.10	5,390	18.0	44.6
09496700	Cibecue 2 Tributary to Carrizo Creek near Show Low, Ariz.	12	33.988	110.311	14	0.06	5,240	18.0	44.7
09496800	Carrizo Creek Tributary near Show Low, Ariz.	12	33.954	110.331	14	2.55	5,810	20.0	44.6
09497800	Cibecue Creek near Chrysotile, Ariz.	12	33.843	110.557	28	295.00	5,700	20.7	45.7
09497900	Cherry Creek near Young, Ariz.	12	34.083	110.924	16	62.10	6,030	24.8	44.5
09497980	Cherry Creek near Globe, Ariz.	12	33.828	110.856	21	200.00	5,600	24.0	47.5
09498600	Cristopher Creek Tributary near Kohl's Ranch, Ariz.	12	34.322	111.067	11	0.66	6,080	29.0	45.0
09498800	Tonto Creek near Gisela, Ariz.	12	34.129	111.255	11	430.00	5,810	24.7	46.2
09498870	Rye Creek near Gisela, Ariz.	12	34.033	111.292	20	122.00	4,390	24.2	54.5
09498900	Gold Creek near Payson, Ariz.	12	34.003	111.358	15	6.44	4,590	21.0	57.1
09499000	Tonto Creek above Gun Creek, near Roosevelt, Ariz.	12	33.980	111.303	46	675.00	5,020	23.9	57.3
09501300	Tortilla Creek at Tortilla Flat, Ariz.	12	33.527	111.387	18	24.30	2,690	15.0	65.0
09502700	Crookton Wash near Seligman, Ariz.	12	35.287	112.732	17	6.00	5,970	15.5	52.7
09502800	Williamson Valley Wash near Paulden, Ariz.	12	34.867	112.612	21	255.00	5,120	17.3	52.2
09503000	Granite Creek near Prescott, Ariz.	12	34.567	112.450	16	39.60	5,900	22.1	54.0
09503720	Hell Canyon near Williams, Ariz.	12	35.160	112.210	13	14.90	7,110	24.1	46.9
09503740	Hell Canyon Tributary near Ash Fork, Ariz.	12	35.084	112.408	10	0.75	5,180	17.2	50.4

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09424700	0	0	0	0	0	12	63	147	357	629	1,040	180
						13	69	168	403	631	975	
09424900	1	0	1	0	0	7,310	13,800	18,800	25,600	31,100	36,700	23,100
						7,270	14,300	21,600	36,600	44,600	55,600	
09425500	1	0	1	0	0	3,250	9,860	17,600	32,900	49,200	70,800	33,600
						3,260	10,700	21,000	42,600	55,500	73,400	
09468300	1	0	0	0	0	27	134	299	686	1,150	1,820	640
						27	133	281	575	864	1,310	
09468500	1	0	0	0	0	7,440	15,200	22,300	33,700	44,100	56,200	40,600
						7,420	15,200	22,600	35,600	45,300	57,500	
09489100	0	0	1	0	0	1,600	3,840	6,260	10,800	15,500	21,700	14,000
						1,600	4,000	6,930	13,000	18,500	25,300	
09489499	0	0	0	0	0	2,210	5,390	8,700	14,600	20,600	28,100	17,900
						2,210	5,570	9,500	17,500	24,000	32,100	
09489700	0	0	0	0	0	622	1,430	2,220	3,550	4,820	6,340	4,510
						624	1,550	2,780	5,730	9,280	13,300	
09490500	0	0	1	0	0	6,860	19,800	33,500	57,800	81,500	110,000	50,000
						6,840	19,500	31,900	50,900	62,600	79,800	
09492400	0	1	0	1	0	274	508	720	1,070	1,390	1,790	2,700
						275	562	1,010	2,270	4,110	6,260	
09494000	0	0	0	0	0	3,400	6,100	8,390	11,900	15,000	18,600	14,00
						3,390	6,330	9,620	17,100	22,700	29,500	
09494300	-	-	-	-	1	----	----	----	----	----	----	10,000
						1,240	5,070	8,220	14,100	20,100	27,400	
09496000	1	0	1	0	0	1,050	3,630	7,060	14,500	23,300	35,800	10,900
						1,050	3,710	7,190	13,900	21,000	30,300	
09496500	1	0	0	0	0	3,190	7,430	11,900	20,000	28,400	39,100	23,000
						3,180	7,460	12,000	20,500	28,200	37,900	
09496600	0	0	0	0	0	44	92	134	200	259	326	165
						43	84	109	152	157	193	
09496700	1	0	0	0	0	43	69	89	118	142	168	120
						42	63	74	102	95	112	
09496800	0	0	0	0	0	283	657	1030	1,670	2,290	3,050	1,260
						280	607	849	1,220	1,720	2,460	
09497800	1	1	0	0	0	4,360	8,010	11,000	15,200	18,800	22,700	22,200
						4,340	7,900	10,900	16,100	21,400	27,900	
09497900	0	0	0	0	0	1,380	3,110	4,710	7,290	9,620	12,300	7,290
						1,370	3,010	4,400	6,810	10,200	14,300	
09497980	1	0	0	0	0	2,190	5,320	8,520	14,200	19,800	26,800	15,700
						2,180	5,290	8,400	14,000	19,900	27,300	
09498600	0	1	0	0	0	30	69	111	188	269	374	265
						30	73	135	296	438	655	
09498800	0	0	0	0	0	4,810	11,300	18,300	31,600	45,700	64,400	38,000
						4,750	10,800	16,400	25,600	33,500	44,500	
09498870	0	1	0	0	0	2,980	6,250	9,570	15,500	21,500	29,300	44,400
						2,960	6,040	8,810	13,400	19,100	26,400	
09498900	1	0	0	0	0	310	792	1,300	2,230	3,160	4,330	2,800
						307	759	1,180	1,940	3,050	4,540	
09499000	0	0	1	0	0	11,400	26,400	40,100	62,000	81,600	104,000	61,400
						11,400	25,800	37,500	53,300	65,100	81,100	
09501300	1	0	1	0	0	1,940	4,290	6,290	9,270	11,800	14,500	7,500
						1,920	4,020	5,360	7,050	9,940	13,700	
09502700	1	0	0	0	0	7	86	313	1,240	3,020	6,700	480
						9	120	435	1,360	2,730	4,890	
09502800	0	0	0	0	0	1,300	4,070	7,400	14,000	21,000	30,300	14,800
						1,300	4,230	7,940	15,200	22,400	31,300	
09503000	1	1	0	0	0	837	1,850	2,790	4,350	5,780	7,470	6,660
						831	1,820	2,760	4,610	7,310	10,600	
09503720	-	-	-	-	1	----	----	----	----	----	----	1,080
						225	754	1,310	2,440	4,220	6,430	
09503740	0	0	0	1	0	10	32	58	108	161	231	84
						11	44	115	307	483	740	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09503750	Limestone Canyon near Paulden, Ariz.	12	34.980	112.401	11	14.50	5,310	15.5	50.6
09503800	Volunteer Wash near Bellemont, Ariz.	12	35.151	111.898	14	131.00	7,620	25.7	44.0
09504100	Hull Canyon near Jerome, Ariz.	12	34.739	112.143	18	0.91	7,050	22.0	52.4
09504400	Munds Canyon Tributary near Sedona, Ariz.	12	34.922	111.644	16	1.19	6,880	26.0	44.2
09504500	Oak Creek near Cornville, Ariz.	12	34.766	111.890	45	357.0	6,200	22.6	51.9
09504800	Oak Creek Tributary near Cornville, Ariz.	12	34.712	111.881	15	0.04	3,570	12.4	52.8
09505200	Wet Beaver Creek near Rimrock, Ariz.	12	34.675	111.671	25	111.00	6,410	24.8	50.4
09505220	Rocky Gulch near Stoneman Lake, Ariz. (USFS)	12	34.747	111.494	24	1.40	7,190	25.0	44.3
09505250	Red Tank Draw near Rimrock, Ariz.	12	34.695	111.714	21	49.40	5,910	21.6	50.6
09505300	Rattlesnake Canyon near Rimrock, Ariz.	12	34.767	111.673	23	24.60	6,560	22.8	46.6
09505350	Dry Beaver Creek near Rimrock, Ariz.	12	34.729	111.775	26	142.00	6,220	23.1	51.3
09505600	Dirty Neck Canyon near Clints Well, Ariz.	12	34.512	111.358	12	3.42	7,140	26.0	44.0
09505800	West Clear Creek near Camp Verde, Ariz.	12	34.539	111.693	21	241.00	6,680	23.4	51.8
09505900	Cottonwood Wash near Camp Verde, Ariz.	12	34.506	111.753	14	0.64	3,540	14.5	53.1
09507600	East Verde River near Pine, Ariz.	12	34.392	111.268	13	6.65	6,430	30.0	44.6
09507700	Webber Creek above West Fork Webber Creek, near Pine, Ariz.	12	34.411	111.372	16	4.92	6,980	27.5	44.0
09507980	East Verde River near Childs, Ariz.	12	34.283	111.647	25	328.00	5,140	24.7	54.5
09508300	Wet Bottom Creek near Childs, Ariz.	12	34.161	111.692	19	36.40	4,810	25.0	57.8
09510070	West Fork Sycamore Creek above McFarland Creek, near Sunflower, Ariz.	12	33.961	111.487	14	4.58	5,430	24.5	58.0
09510080	West Fork Sycamore Creek near Sunflower, Ariz.	12	33.946	111.485	15	9.80	5,260	24.5	58.3
09510100	East Fork Sycamore Creek near Sunflower, Ariz.	12	33.949	111.461	23	4.49	5,760	24.5	58.2
09510150	Sycamore Creek near Sunflower, Ariz.	12	33.851	111.452	15	52.30	4,260	23.5	60.0
09510170	Camp Creek near Sunflower, Ariz.	12	33.760	111.496	17	2.60	3,520	20.0	63.1
09510180	Rock Creek near Sunflower, Ariz.	12	33.730	111.508	10	15.20	3,680	16.0	64.1
09510200	Sycamore Creek near Fort McDowell, Ariz.	12	33.694	111.541	27	164.00	3,820	21.2	65.0
09512100	Indian Bend Wash near Scottsdale, Ariz.	12	33.539	111.916	10	139.00	1,780	10.9	65.6
09512200	Salt River Tributary in South Mt. Park, at Phoenix, Ariz.	12	33.347	112.084	26	1.75	1,730	9.0	65.6
09512300	Cave Creek near Cave Creek, Ariz.	12	33.783	112.007	28	121.00	3,470	15.7	62.2
09512420	Lynx Creek Tributary near Prescott, Ariz.	12	34.547	112.399	10	0.95	5,900	16.0	54.2
09512500	Agua Fria River near Mayer, Ariz.	12	34.315	112.063	47	588.00	5,000	16.7	60.9
09512700	Agua Fria River Tributary No 2 near Rock Springs, Ariz.	12	34.033	112.145	18	1.11	2,140	16.2	60.2

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09503750	1	0	1	0	0	273	901	1,710	3,420	5,400	8,170	4,100
						272	889	1,610	2,960	4,920	7,460	
09503800	0	0	0	0	0	353	1,160	2,060	3,700	5,310	7,260	2,300
						362	1,410	3,080	6,860	11,100	16,000	
09504100	1	1	0	0	0	2	23	67	189	351	597	500
						3	32	103	304	507	801	
09504400	0	0	0	0	0	73	232	413	749	1,090	1,510	705
						73	222	367	619	879	1,270	
09504500	0	0	1	0	0	5,000	12,000	18,300	28,300	36,900	46,600	26,400
						4,980	11,800	17,400	25,700	32,600	41,300	
09504800	-	-	-	-	1	----	----	----	----	----	----	53
						5	17	34	76	53	61	
09505200	1	0	0	0	0	3,280	6,450	8,820	12,000	14,400	16,800	10,900
						3,260	6,210	8,090	10,700	14,200	18,500	
09505220	0	1	0	0	0	45	152	297	629	1,040	1,640	1,550
						45	152	292	594	933	1,430	
09505250	1	1	0	0	0	717	1,850	3,110	5,520	8,080	11,500	10,500
						714	1,850	3,110	5,540	8,770	12,800	
09505300	1	0	0	0	0	865	1,880	2,760	4,100	5,240	6,510	4,000
						859	1,820	2,570	3,820	5,620	7,910	
09505350	1	0	0	0	0	4,850	10,500	15,700	23,700	30,900	39,000	26,600
						4,820	10,000	13,800	18,400	23,300	29,900	
09505600	-	-	-	-	1	----	----	----	----	----	----	210
						89	274	494	963	1,600	2,470	
09505800	1	0	0	0	0	4,850	9,830	14,000	20,400	25,800	31,700	22,400
						4,810	9,450	12,700	17,700	22,700	29,200	
09505900	0	0	0	0	0	23	75	142	282	441	663	250
						23	80	165	369	564	853	
09507600	0	0	0	0	0	282	948	1,830	3,760	6,060	9,360	2,820
						279	884	1,500	2,470	3,740	5,590	
09507700	0	0	0	0	0	88	289	549	1,110	1,750	2,670	1,220
						89	296	573	1,170	1,960	3,030	
09507980	0	0	0	0	0	3,200	9,330	16,300	29,600	43,600	61,500	23,500
						3,190	9,170	15,300	25,300	34,700	46,900	
09508300	1	0	1	0	0	1,730	4,650	7,530	12,300	16,600	21,600	6,830
						1,710	4,370	6,350	8,750	11,800	16,000	
09510070	0	0	0	0	0	35	267	717	1,950	3,630	6,210	1,700
						36	279	702	1,580	2,690	4,270	
09510080	1	0	0	0	0	99	516	1,210	3,000	5,350	9,000	3,480
						100	529	1,180	2,510	4,290	6,760	
09510100	0	0	0	0	0	37	188	446	1,140	2,100	3,660	1,940
						38	201	488	1,180	2,110	3,450	
09510150	0	0	0	0	0	1,030	4,020	8,270	18,000	29,800	47,000	16,100
						1,020	3,810	6,920	11,800	17,700	26,100	
09510170	0	0	0	0	0	116	261	394	603	790	1,000	402
						115	264	435	838	1,420	2,180	
09510180	0	0	1	0	0	497	1,340	2,170	3,550	4,820	6,280	1,900
						491	1,280	2,000	3,310	5,480	8,180	
09510200	0	0	0	0	0	2,270	7,590	14,000	26,700	40,200	57,800	24,200
						2,260	7,410	12,900	21,700	30,700	42,700	
09512100	1	0	0	0	0	375	1,440	2,960	6,500	10,900	17,400	21,000
						387	2,130	5,640	13,200	23,100	34,100	
09512200	0	0	0	0	0	19	184	531	1,500	2,790	4,740	670
						19	191	536	1,330	2,310	3,720	
09512300	1	0	0	0	0	1,730	4,310	6,910	11,400	15,600	20,700	12,400
						1,720	4,300	6,920	11,600	17,300	24,200	
09512420	-	-	-	-	1	----	----	----	----	----	----	820
						40	122	228	462	682	1,030	
09512500	1	0	0	0	0	5,850	10,200	13,900	19,300	24,000	29,300	33,100
						5,830	10,200	14,300	21,800	28,200	36,000	
09512700	1	0	1	0	0	307	564	785	1130	1,430	1,790	1,200
						304	529	681	942	1,290	1,830	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09512800	Agua Fria River near Rock Springs, Ariz.	12	34.014	112.167	17	1,130.00	4,770	16.6	60.5
09513780	New River near Rock Springs, Ariz.	12	33.974	112.098	25	67.30	3,970	20.0	60.4
09513800	New River at New River, Ariz.	12	33.911	112.141	22	83.30	3,600	19.5	60.7
09513820	Deadman Wash near New River, Ariz.	12	33.842	112.144	20	11.10	1,980	11.0	62.3
09513835	New River at Bell Road, near Peoria, Ariz.	12	33.638	112.239	21	187.00	2,700	15.6	65.2
09513860	Skunk Creek near Phoenix, Ariz.	12	33.729	112.120	26	64.60	2,180	12.2	65.2
09513890	New River at Peoria, Ariz.	12	33.595	112.262	12	317.00	2,320	13.3	65.2
09513910	New River near Glendale, Ariz.	12	33.537	112.281	21	323.00	2,130	13.8	65.3
09513970	Agua Fria River at Avondale, Ariz.	12	33.435	112.333	23	633.00	--	16.3	65.3
09515500	Hassayampa River at Box Damsite near Wickenburg, Ariz.	12	34.045	112.709	38	417.00	4,750	19.3	58.6
09515800	Hartman Wash near Wickenburg, Ariz.	12	33.963	112.828	16	5.57	2,690	11.0	60.5
09516500	Hassayampa River near Morristown, Ariz.	12	33.885	112.661	30	774.00	3,190	16.9	60.8
09516600	Ox Wash near Morristown, Ariz.	12	33.883	112.650	17	6.31	2,290	12.2	60.7
09516800	Jack Rabbit Wash near Tonopah, Ariz.	12	33.659	112.828	16	137.00	2,260	9.2	61.4
09428545	Cunningham Wash Tributary near Wenden, Ariz.	13	34.007	113.578	13	0.77	2,330	8.1	65.2
09428550	Bouse Wash Tributary near Bouse, Ariz.	13	33.901	113.974	14	14.60	1,230	6.5	65.7
09428800	Tyson Wash Tributary near Quartzsite, Ariz.	13	33.512	114.217	14	13.70	1,520	6.0	75.1
09470500	San Pedro River at Palominas, Ariz.	13	31.380	110.111	48	741.00	4,950	17.9	65.2
09470900	San Pedro River Tributary near Bisbee, Ariz.	13	31.570	110.027	16	5.25	--	16.0	65.0
09471000	San Pedro River at Charleston, Ariz.	13	31.626	110.174	71	1,219.00	4,840	16.5	65.4
09471080	Walnut Gulch 63.010 near Tombstone, Ariz.: USDA	13	31.720	110.025	15	6.42	4,970	14.0	64.9
09471087	Walnut Gulch 63.111 near Tombstone, Ariz.: USDA	13	31.734	109.948	20	0.22	5,020	14.0	64.7
09471090	Walnut Gulch 63.009 near Tombstone, Ariz.: USDA	13	31.718	110.024	15	9.11	4,840	14.0	64.9
09471120	Walnut Gulch 63.011 near Tombstone, Ariz.: USDA	13	31.741	109.994	19	3.18	4,880	14.0	64.8
09471140	Walnut Gulch 63.006 near Tombstone, Ariz.: USDA	13	31.724	110.055	20	36.70	4,790	14.0	65.0
09471170	Agricultural Research Service Watershed W-IV near Tombstone, Ariz.	13	31.739	110.044	24	0.87	4,550	14.0	64.9
09471185	Walnut Gulch 63.103 near Tombstone, Ariz.: USDA	13	31.742	110.054	19	0.01	4,500	14.0	64.9
09471195	Walnut Gulch 63.007 near Tombstone, Ariz.: USDA	13	31.733	110.097	16	5.22	4,480	14.0	65.0
09471200	Walnut Gulch near Fairbank, Ariz.	13	31.729	110.153	25	57.70	4,700	14.0	65.1
09471550	San Pedro River near Tombstone, Ariz.	13	31.751	110.201	20	1,740.00	4,820	16.2	65.5
09471600	Canary Wash near Benson, Ariz.	13	31.876	110.342	14	0.79	5,240	15.0	62.8

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09512800	0	0	1	0	0	7,440	22,800	42,200	83,300	131,000	199,000	59,500
						7,390	22,200	38,100	62,900	80,000	108,000	
09513780	1	0	0	0	0	2,380	6,580	11,100	19,100	27,100	36,900	18,600
						2,360	6,300	9,780	14,400	19,800	26,900	
09513800	1	0	0	0	0	3,120	7,860	12,700	21,100	29,200	39,100	19,500
						3,100	7,490	11,100	15,800	21,500	29,100	
09513820	-	-	-	-	1	----	----	----	----	----	----	1,850
						187	974	1,790	3,300	6,160	9,610	
09513835	1	0	1	0	0	1,900	6,500	11,900	21,800	31,800	44,100	14,600
						1,890	6,460	11,500	19,800	28,900	40,000	
09513860	1	0	1	0	0	916	3,510	7,040	14,800	23,800	36,500	11,500
						913	3,490	6,750	12,700	20,200	30,000	
09513890	1	0	0	0	0	2,800	9,300	16,000	23,000	29,000	35,000	20,000
						2,780	9,290	15,800	24,600	34,600	46,100	
09513910	1	0	1	0	0	1,400	8,200	15,000	23,000	30,000	37,000	38,000
						1,400	8,320	15,300	24,800	35,000	46,500	
09513970	-	-	-	-	1	----	----	----	----	----	----	29,300
						2,376	----	----	----	----	----	
09515500	0	0	0	0	0	3,170	8,480	14,000	23,500	32,600	43,700	58,000
						3,160	8,490	14,000	23,400	31,900	42,400	
09515800	1	0	0	0	0	216	794	1,570	3,230	5,150	7,820	2,600
						215	767	1,410	2,530	4,070	6,190	
09516500	1	0	0	0	0	2,800	7,500	12,700	22,300	32,200	45,000	47,500
						2,800	7,960	14,700	28,900	40,200	54,100	
09516600	1	0	0	0	0	192	661	1,250	2,460	3,790	5,570	2,900
						191	658	1,230	2,320	3,930	6,040	
09516800	-	-	-	-	1	----	----	----	----	----	----	6,840
						907	5,220	8,950	15,300	24,600	35,000	
09428545	1	0	0	0	0	52	101	141	199	247	300	173
						68	150	254	420	553	717	
09428550	1	0	0	0	0	344	998	1,730	3,070	4,440	6,170	2,920
						398	1,090	1,860	3,170	4,410	5,990	
09428800	-	-	-	-	1	----	----	----	----	----	----	1,950
						517	1,250	1,970	3,160	4,250	5,650	
09470500	1	0	0	0	0	5,920	9,330	12,000	15,700	18,900	22,300	22,000
						5,630	9,030	11,700	15,800	19,400	23,400	
09470900	1	0	0	0	0	451	903	1,260	1,780	2,190	2,620	1,460
						415	863	1,240	1,850	2,390	3,030	
09471000	1	1	0	0	0	6,760	12,100	17,300	26,100	34,800	45,700	98,000
						6,540	11,800	16,600	24,800	32,900	42,900	
09471080	1	0	0	0	0	364	771	1,150	1,790	2,380	3,080	2,220
						360	793	1,230	1,970	2,640	3,470	
09471087	1	0	0	0	0	112	223	321	474	610	766	541
						98	196	266	380	483	609	
09471090	1	0	0	0	0	590	1,570	2,550	4,190	5,710	7,490	2,640
						544	1,410	2,150	3,380	4,550	6,000	
09471120	0	0	0	0	0	530	1,690	2,880	4,820	6,550	8,470	4,390
						464	1,420	2,150	3,340	4,450	5,770	
09471140	1	0	0	0	0	1,460	2,660	3,670	5,200	6,530	8,030	6,590
						1,320	2,500	3,480	5,120	6,620	8,420	
09471170	0	0	0	0	0	70	242	457	895	1,370	2,020	1,270
						78	248	445	805	1,170	1,670	
09471185	1	0	0	0	0	9	16	20	27	32	38	31
						9	15	19	25	29	33	
09471195	0	0	0	0	0	263	1,090	2,250	4,780	7,710	11,800	2,590
						276	997	1,820	3,400	5,150	7,600	
09471200	1	0	0	0	0	1,740	3,680	5,450	8,320	11,000	14,000	11,500
						1,610	3,430	4,950	7,500	9,900	12,700	
09471550	1	0	0	0	0	7,430	11,900	15,400	20,400	24,600	29,200	24,200
						6,760	11,200	14,800	20,600	25,600	31,300	
09471600	-	-	-	-	1	----	----	----	----	----	----	84
						107	255	394	622	817	1,070	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09471700	Fenner Wash near Benson, Ariz.	13	31.980	110.216	16	2.71	4,180	12.3	65.1
09472100	Peck Canyon Tributary near Redington, Ariz.	13	32.487	110.500	14	8.02	3,680	11.7	64.7
09472400	Mammoth Wash near Mammoth, Ariz.	13	32.676	110.685	14	2.40	3,700	13.8	70.6
09473000	Aravaipa Creek near Mammoth, Ariz.	13	32.844	110.619	36	541.00	4,530	16.2	65.0
09473200	Green Lantern Wash near Winkelman, Ariz.	13	32.925	110.726	13	3.63	2,590	14.0	64.5
09473600	Tam O'Shanter Wash near Hayden, Ariz.	13	33.029	110.873	15	4.37	3,050	15.6	64.0
09478200	Durham Wash near Florence, Ariz.	13	32.722	111.108	19	15.60	3,670	12.1	64.9
09478500	Queen Creek at Whitlow Damsite near Superior, Ariz.	13	33.299	111.274	17	144.00	3,180	17.9	65.0
09478600	Queen Creek Tributary No 3 at Whitlow Dam, Ariz.	13	33.292	111.281	14	0.37	2,320	12.0	65.0
09479200	Queen Creek Tributary at Apache Junction, Ariz.	13	33.404	111.541	19	0.51	1,760	10.5	65.0
09480000	Santa Cruz River near Lochiel, Ariz.	13	31.355	110.589	38	82.20	5,150	18.2	60.3
09480500	Santa Cruz River near Nogales, Ariz.	13	31.344	110.851	56	533.00	4,850	18.7	61.0
09481500	Sonoita Creek near Patagonia, Ariz.	13	31.500	110.817	43	209.00	4,800	19.3	61.0
09481700	Calabasas Canyon near Nogales, Ariz.	13	31.457	110.986	14	10.30	4,360	15.8	63.1
09481750	Sopori Wash at Amado, Ariz.	13	31.724	111.061	19	176.00	3,840	15.5	65.0
09481800	Demetrie Wash Tributary near Continental, Ariz.	13	31.871	111.087	14	0.15	3,620	14.5	65.0
09481900	Ocotillo Wash near Continental, Ariz.	13	31.833	111.000	10	3.60	3,280	14.1	65.0
09482330	Pumping Wash near Vail, Ariz.	13	32.069	110.806	16	0.54	--	11.2	61.9
09482420	Julian Wash at Tucson, Ariz.	13	32.171	110.940	12	26.50	2,900	11.0	64.8
09482480	Big Wash at Tucson, Ariz.	13	32.186	111.002	17	2.75	2,850	11.0	65.0
09483030	Anklam Wash at Tucson, Ariz.	13	32.225	111.031	17	2.11	2,700	11.8	65.2
09483040	West Speedway Wash near Tucson, Ariz.	13	32.239	111.045	17	0.46	2,750	11.8	64.8
09483100	Tanque Verde Creek near Tucson, Ariz.	13	32.247	110.679	26	43.00	4,780	17.0	59.2
09483200	Agua Caliente Wash Tributary near Tucson, Ariz.	13	32.269	110.737	16	2.04	3,300	14.0	59.4
09484000	Sabino Creek near Tucson, Ariz.	13	32.317	110.810	55	35.50	6,300	22.6	59.7
09484200	Bear Creek near Tucson, Ariz.	13	32.306	110.801	15	16.30	5,860	20.6	59.7
09484500	Tanque Verde Creek at Tucson, Ariz.	13	32.265	110.841	22	219.00	4,340	16.7	60.1
09484510	Ventana Canyon Wash near Tucson, Ariz.	13	32.310	110.839	17	6.46	4,600	13.0	60.1
09484560	Cienega Creek near Pantano, Ariz.	13	31.986	110.566	14	289.00	4,890	16.6	59.8
09484570	Mescal Arroyo near Pantano, Ariz.	13	31.990	110.564	17	38.40	4,260	15.0	59.8
09484580	Barrel Canyon near Sonoita, Ariz.	13	31.862	110.690	15	14.10	5,000	16.0	65.2

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09471700	0	0	0	0	0	192	498	809	1,340	1,860	2,470	950
						199	507	818	1,340	1,820	2,420	
09472100	-	-	-	-	1	----	----	----	----	----	----	4,340
						392	950	1,500	2,410	3,240	4,320	
09472400	0	0	0	0	0	162	750	1,580	3,350	5,320	7,950	3,200
						174	671	1,220	2,260	3,370	4,870	
09473000	0	0	0	0	0	4,100	8,190	11,800	17,400	22,300	28,000	70,800
						3,920	7,870	11,200	16,500	21,200	26,800	
09473200	1	0	0	0	0	499	1,370	2,320	4,070	5,870	8,140	3,700
						426	1,130	1,700	2,730	3,800	5,190	
09473600	1	1	0	0	0	365	584	762	1,030	1,260	1,520	1,570
						343	615	899	1,390	1,810	2,340	
09478200	1	1	0	0	0	554	1,320	2,070	3,350	4,560	6,030	3,500
						554	1,320	2,080	3,360	4,540	6,030	
09478500	0	0	0	0	0	3,610	8,830	14,300	24,300	34,400	47,200	42,900
						3,100	7,420	10,900	17,100	23,500	31,700	
09478600	-	-	-	-	1	----	----	----	----	----	----	280
						67	157	238	371	479	621	
09479200	-	-	-	-	1	----	----	----	----	----	----	262
						82	194	296	464	604	788	
09480000	1	0	0	0	0	1,550	3,090	4,490	6,760	8,860	11,300	12,000
						1,510	3,060	4,480	6,860	9,030	11,600	
09480500	0	0	0	0	0	4,200	7,780	10,900	15,700	20,000	24,900	31,000
						4,070	7,600	10,600	15,400	19,700	24,700	
09481500	1	0	0	0	0	3,110	5,340	7,210	10,100	12,600	15,400	16,000
						2,960	5,190	7,060	10,100	12,800	16,000	
09481700	1	0	0	0	0	305	688	1,040	1,610	2,120	2,700	1,200
						346	809	1,330	2,200	2,950	3,880	
09481750	0	1	0	0	0	2,210	4,600	6,820	10,400	13,800	17,800	16,000
						2,100	4,430	6,550	10,000	13,300	17,200	
09481800	0	0	0	0	0	25	57	86	134	178	229	110
						29	65	103	163	211	269	
09481900	1	0	0	0	0	62	338	843	2,290	4,420	8,050	1,840
						132	446	912	1,850	2,990	4,800	
09482330	-	-	-	-	1	----	----	----	----	----	----	337
						85	201	307	482	629	821	
09482420	0	0	0	0	0	421	814	1,140	1,620	2,030	2,470	1,270
						515	1,120	1,890	3,130	4,180	5,470	
09482480	1	1	0	0	0	67	365	803	1,730	2,750	4,060	3,000
						105	410	816	1,550	2,290	3,240	
09483030	-	-	-	-	1	----	----	----	----	----	----	2,420
						190	459	718	1,150	1,530	2,030	
09483040	0	0	1	0	0	91	201	296	435	551	675	240
						87	196	288	434	556	702	
09483100	1	0	0	0	0	1,510	3,110	4,650	7,280	9,840	13,000	8,600
						1,400	2,920	4,270	6,590	8,840	11,700	
09483200	1	0	0	0	0	97	207	311	486	650	849	430
						120	275	472	795	1,070	1,420	
09484000	1	0	0	0	0	1,150	2,640	4,040	6,310	8,380	10,800	7,730
						1,120	2,570	3,880	6,020	7,990	10,300	
09484200	1	0	0	0	0	366	673	923	1,290	1,600	1,940	1,400
						420	874	1,440	2,370	3,150	4,120	
09484500	1	0	0	0	0	1,920	5,390	9,150	15,900	22,700	31,000	12,700
						1,910	5,140	8,300	13,700	18,900	25,500	
09484510	1	0	0	1	0	146	201	236	279	309	339	260
						197	375	672	1,160	1,560	2,050	
09484560	0	1	0	0	0	1,850	3,990	6,190	10,200	14,400	19,800	20,000
						1,930	4,220	6,700	10,900	14,800	19,700	
09484570	1	1	0	0	0	743	2,050	3,640	6,960	10,800	16,300	27,000
						771	2,050	3,470	6,100	8,890	12,800	
09484580	-	-	-	-	1	----	----	----	----	----	----	1,900
						525	1,260	2,000	3,210	4,310	5,730	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09484590	Davidson Canyon Wash near Vail, Ariz.	13	31.994	110.644	14	50.50	4,340	14.9	63.1
09484600	Pantano Wash near Vail, Ariz.	13	32.036	110.677	28	457.00	4,500	15.4	61.7
09485000	Rincon Creek near Tucson, Ariz.	13	32.129	110.626	34	44.80	4,850	19.2	59.3
09485100	Saguaro Corners Wash near Tucson, Ariz.	13	32.170	110.737	10	0.17	3,040	12.0	58.6
09485500	Pantano Wash at Tucson, Ariz.	13	32.250	110.850	16	602.00	4,560	17.1	60.0
09485900	Pima Wash near Tucson, Ariz.	13	32.337	110.960	18	4.93	4,430	16.0	63.5
09485950	Geronimo Wash near Tucson, Ariz.	13	32.332	110.944	18	2.08	3,600	15.0	63.1
09486000	Rillito Creek near Tucson, Ariz.	13	32.295	110.984	67	918.00	4,400	15.5	64.5
09486300	Canada del Oro near Tucson, Ariz.	13	32.374	111.009	17	250.00	4,000	16.4	64.9
09486800	Altar Wash near Three Points, Ariz.	13	31.836	111.403	14	463.00	3,920	15.6	65.0
09487000	Brawley Wash near Three Points, Ariz.	13	32.076	111.337	15	776.00	3,710	14.6	65.0
09487100	Little Brawley Wash near Three Points, Ariz.	13	32.124	111.329	14	11.90	2,800	13.0	65.0
09487140	San Joaquin Wash near Tucson, Ariz.	13	32.169	111.133	13	0.45	2,530	11.0	65.5
09487250	Los Robles Wash near Marana, Ariz.	13	32.438	111.304	13	1,170.00	3,350	11.8	65.0
09487400	Quijotoa Wash Tributary near Quijotoa, Ariz.	13	32.174	112.108	13	2.44	2,800	10.1	65.0
09488500	Santa Rosa Wash near Vaiva Vo, Ariz.	13	32.667	111.927	19	1,782.00	2,340	10.2	65.0
09488600	Silver Reef Wash near Casa Grande, Ariz.	13	32.682	111.834	13	12.80	1,620	8.5	65.0
09514200	Waterman Wash near Buckeye, Ariz.	13	33.330	112.509	22	403.00	1,570	9.2	65.0
09517000	Hassayampa River near Arlington, Ariz.	13	33.347	112.725	23	1,470.00	3,010	15.9	64.4
09517200	Centennial Wash Tributary near Wenden, Ariz.	13	33.844	113.450	17	2.79	2,480	8.0	65.0
09517280	Tiger Wash near Aguila, Ariz.	13	33.742	113.279	17	85.20	2,590	9.6	64.0
09517400	Winters Wash near Tonopah, Ariz.	13	33.489	112.918	18	47.80	1,630	9.1	61.9
09519600	Rainbow Wash Tributary near Buckeye, Ariz.	13	33.243	112.637	17	2.43	--	7.6	65.9
09519750	Bender Wash near Gila Bend, Ariz.	13	32.907	112.551	17	68.80	1,900	8.5	69.8
09519760	Sauceda Wash near Gila Bend, Ariz.	13	32.871	112.758	17	126.00	1,980	8.2	75.9
09519780	Windmill Wash near Gila Bend, Ariz.	13	33.048	112.838	15	12.90	1,050	6.1	74.8
09520100	Military Wash near Sentinel, Ariz.	13	32.845	113.279	17	8.70	674	5.0	75.0
09520110	Hot Shot Arroyo near Ajo, Ariz.	13	32.347	112.809	16	0.44	1,760	8.1	64.1
09520130	Darby Arroyo near Ajo, Ariz.	13	32.355	112.825	16	4.72	1,920	8.1	64.2
09520160	Gibson Arroyo at Ajo, Ariz.	13	32.380	112.861	14	2.18	2,100	8.1	64.8
09520170	Rio Cornez near Ajo, Ariz.	13	32.499	112.881	14	243.00	1,950	8.4	68.2

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09484590	-	-	-	-	1	----	----	----	----	----	----	6,860
						976	2,300	3,620	5,780	7,720	10,200	
09484600	0	1	1	0	0	3,120	7,800	12,400	20,300	27,600	36,400	38,000
						3,030	7,410	11,400	18,000	24,000	31,500	
09485000	0	0	0	0	0	956	2,760	4,830	8,860	13,100	18,800	9,660
						951	2,670	4,490	7,830	11,300	15,900	
09485100	-	-	-	-	1	----	----	----	----	----	----	49
						41	92	137	209	265	336	
09485500	0	0	0	0	0	1,710	4,610	7,600	12,800	17,700	23,700	20,000
						2,010	5,070	8,420	13,800	18,600	24,300	
09485900	1	1	0	1	0	73	177	272	423	555	703	460
						128	321	610	1,080	1,460	1,940	
09485950	1	0	0	0	0	116	270	418	665	895	1,170	705
						133	318	530	880	1,190	1,570	
09486000	1	0	0	0	0	5,090	9,520	13,200	18,600	23,200	28,300	29,700
						4,960	9,330	12,900	18,300	23,000	28,300	
09486300	0	0	0	0	0	2,620	6,130	9,430	14,700	19,600	25,200	17,000
						2,470	5,690	8,460	12,900	17,100	22,100	
09486800	0	0	0	0	0	4,280	7,910	11,000	15,600	19,600	24,100	22,000
						3,790	7,220	10,000	14,600	18,700	23,500	
09487000	0	0	0	0	0	3,640	6,390	8,770	12,500	16,000	20,000	19,100
						3,510	6,530	9,500	14,400	18,600	23,600	
09487100	0	0	0	0	0	777	1,450	2,010	2,870	3,610	4,450	13,800
						692	1,360	1,930	2,910	3,800	4,890	
09487140	-	-	-	-	1	----	----	----	----	----	----	520
						76	179	272	426	552	719	
09487250	0	1	0	0	0	1,130	3,090	4,930	7,790	10,200	12,900	32,000
						1,920	4,660	8,210	13,600	17,800	22,600	
09487400	1	0	0	0	0	167	369	547	819	1,050	1,320	715
						179	411	655	1,050	1,390	1,820	
09488500	1	0	0	0	0	805	3,160	6,270	12,800	20,000	29,600	53,100
						1,620	4,640	9,050	16,500	23,200	31,700	
09488600	0	0	0	0	0	265	660	1,070	1,820	2,570	3,500	1,400
						336	837	1,450	2,480	3,420	4,590	
09514200	1	0	0	0	0	1,430	2,730	3,870	5,660	7,280	9,140	6,300
						1,640	3,320	5,360	8,640	11,400	14,600	
09517000	1	0	0	0	0	3,110	8,390	14,400	25,800	37,900	53,900	39,000
						3,300	8,430	13,900	23,500	32,900	45,100	
09517200	0	0	0	0	0	131	312	480	747	986	1,260	720
						154	373	624	1,030	1,380	1,820	
09517280	1	0	0	0	0	1,010	2,120	3,070	4,480	5,680	7,000	4,550
						1,070	2,330	3,650	5,760	7,570	9,720	
09517400	1	0	0	0	0	854	1,540	2,120	3,000	3,770	4,640	3,640
						877	1,720	2,660	4,200	5,540	7,150	
09519600	1	0	0	0	0	482	747	947	1,230	1,450	1,700	1,430
						413	680	881	1,240	1,550	1,950	
09519750	-	-	-	-	1	----	----	----	----	----	----	2,670
						1,130	2,630	4,130	6,590	8,790	11,600	
09519760	1	0	1	0	0	583	1,870	3,310	5,910	8,450	11,500	3,150
						806	2,280	4,100	7,090	9,770	13,000	
09519780	-	-	-	-	1	----	----	----	----	----	----	4,430
						501	1,210	1,910	3,070	4,120	5,490	
09520100	0	0	0	0	0	125	468	945	2,020	3,310	5,180	1,530
						196	609	1,190	2,250	3,340	4,850	
09520110	1	0	0	0	0	136	191	226	267	297	325	240
						120	187	243	341	420	517	
09520130	1	0	0	0	0	551	922	1,210	1,630	1,980	2,370	1,670
						485	865	1,180	1,720	2,210	2,810	
09520160	0	1	0	0	0	239	463	661	974	1,260	1,580	1,800
						226	464	692	1,080	1,420	1,840	
09520170	0	0	0	0	0	3,000	4,850	6,270	8,300	9,960	11,800	8,030
						2,710	4,720	6,540	9,610	12,300	15,400	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09520200	Black Gap Wash near Ajo, Ariz.	13	32.706	112.845	18	12.10	1,280	6.7	75.4
09520230	Crater Range Wash near Ajo, Ariz.	13	32.562	112.877	17	1.49	1,280	6.6	70.4
09520300	Alamo Wash Tributary near Ajo, Ariz.	13	32.100	112.771	22	0.90	2,040	9.7	64.4
09520350	Mohawk Pass Wash at Mohawk, Ariz.	13	32.729	113.742	15	0.09	601	4.9	75.0
09520400	Ligurta Wash at Ligurta, Ariz.	13	32.676	114.294	15	1.99	395	4.0	75.2
09535100	San Simon Wash near Pisinimo, Ariz.	13	32.045	112.370	15	569.00	2,250	10.0	65.0
09535300	Vamori Wash at Kom Vo, Ariz.	13	31.948	112.343	15	1,250.00	2,699	12.5	65.0
09536100	Pitchfork Canyon Tributary near Ft Grant, Ariz.	13	32.589	109.911	14	0.81	5,210	15.0	65.0
09536350	Surprise Canyon near Dos Cabezas, Ariz.	13	32.011	109.353	14	0.65	6,280	18.0	69.0
09537200	Leslie Creek near McNeal, Ariz.	13	31.590	109.508	13	79.10	5,360	18.0	69.2
09537500	Whitewater Draw near Douglas, Ariz.	13	31.352	109.584	62	1,023.00	4,740	14.8	70.7
09430500	Gila River near Gila, N. Mex.	14	33.061	108.537	59	1,864.00	8,100	18.0	44.9
09430900	Duck Creek at Cliff, N. Mex.	14	32.967	108.600	29	228.00	6,560	16.8	51.5
09438200	Animas Creek near Cloverdale, N. Mex.	14	31.571	108.875	28	157.00	6,200	15.3	74.1
09442630	Mail Hollow near Luna, N. Mex.	14	33.794	108.950	16	4.20	7,084	--	40.7
09442660	Trout Creek at Luna, N. Mex.	14	33.850	108.967	32	31.90	8,950	19.5	40.0
09442680	San Francisco River near Reserve, N. Mex.	14	33.737	108.771	28	350.00	8,540	17.0	44.2
09442690	Tularosa River near Aragon, N. Mex.	14	33.904	108.504	12	89.00	7,800	14.3	44.8
09442692	Tularosa River above Aragon, N. Mex.	14	33.891	108.515	20	94.00	7,720	13.0	44.8
09442695	Negro Canyon at Aragon, N. Mex.	14	33.883	108.550	27	9.62	7,900	12.0	44.8
09442700	Apache Creek near Apache Creek, N. Mex.	14	33.931	108.662	17	94.60	7,740	14.5	44.6
09442740	Tularosa River near Reserve, N. Mex.	14	33.733	108.703	28	426.00	8,200	14.4	44.9
09443000	San Francisco River near Alma, N. Mex.	14	33.368	108.910	23	1546.00	8,120	17.6	45.1
09444000	San Francisco River near Glenwood, N. Mex.	14	33.247	108.880	20	1653.00	7,780	17.6	45.1
09444200	Blue River near Clifton, Ariz.	14	33.291	109.196	20	506.00	6,910	20.7	46.2
09444400	Chase Creek near Clifton, Ariz.	14	33.172	109.369	14	1.37	6,840	20.0	48.4
09445500	Willow Creek near Point Of Pines near Morenci, Ariz.	14	33.379	109.650	23	102.00	6,340	19.8	44.2
09446000	Willow Creek near Double Circle Ranch near Morenci, Ariz.	14	33.354	109.525	24	149.00	6,310	19.2	44.0
09446500	Eagle Creek near Double Circle Ranch near Morenci, Ariz.	14	33.300	109.492	24	377.00	6,410	20.0	44.8
09447000	Eagle Creek above pumping plant near Morenci, Ariz.	14	33.070	109.451	43	613.00	6,060	19.2	48.7
09451800	Tollgate Wash Tributary near Clifton, Ariz.	14	32.850	109.337	14	0.12	4,800	13.5	55.0

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09520200	1	0	0	0	0	392	672	868	1,120	1,300	1,480	940
						414	801	1,240	1,960	2,560	3,290	
09520230	0	0	1	0	0	103	329	586	1,060	1,530	2,100	590
						116	341	585	999	1,390	1,870	
09520300	1	0	0	0	0	151	268	362	500	615	741	510
						144	270	384	572	731	923	
09520350	0	0	0	0	0	20	52	85	142	197	263	117
						22	54	85	134	176	228	
09520400	1	0	0	0	0	185	551	971	1,770	2,610	3,680	1,590
						185	520	853	1,440	2,030	2,790	
09535100	1	0	1	0	0	1,250	3,020	5,010	8,850	13,000	18,700	12,500
						1,670	3,930	6,880	11,800	16,100	21,700	
09535300	0	1	0	1	0	778	1,710	2,700	4,520	6,420	8,920	10,400
						1,610	3,590	6,790	11,700	15,700	20,400	
09536100	1	0	0	0	0	142	246	326	437	526	621	375
						132	250	359	538	688	873	
09536350	0	0	0	0	0	44	112	176	275	362	457	191
						59	147	252	415	550	714	
09537200	1	0	0	0	0	438	1,350	2,480	4,810	7,430	11,100	4,600
						668	1,820	3,360	5,980	8,460	11,700	
09537500	0	0	1	1	0	1,710	2,770	3,510	4,470	5,190	5,910	5,060
						1,860	3,210	4,730	7,060	8,820	10,700	
09430500	0	0	0	0	0	1,880	5,320	9,480	18,000	27,600	40,900	35,200
						1,920	5,440	9,670	18,100	27,300	39,600	
09430900	0	0	0	0	0	3,660	5,510	6,700	8,170	9,220	10,200	6,900
						3,530	5,220	6,380	7,950	9,310	10,800	
09438200	1	0	0	0	0	739	1,290	1,770	2,500	3,150	3,910	3,400
						757	1,420	2,070	3,260	4,410	5,790	
09442630	1	0	0	1	0	54	106	151	219	278	344	264
						59	147	281	515	742	1,010	
09442660	0	0	0	0	0	151	489	939	1,940	3,140	4,910	2,790
						156	522	1,050	2,120	3,310	4,940	
09442680	0	0	0	0	0	871	2,270	3,930	7,340	11,200	16,700	9,830
						885	2,350	4,160	7,640	11,300	16,300	
09442690	-	-	-	-	1	----	----	----	----	----	----	181
						565	1,540	2,900	4,620	6,200	8,070	
09442692	1	0	0	1	0	83	203	321	524	716	947	660
						122	413	847	1,700	2,550	3,580	
09442695	1	1	0	0	0	211	532	907	1,670	2,520	3,720	5,200
						207	526	926	1,670	2,440	3,470	
09442700	0	0	0	0	0	290	962	1,770	3,370	5,070	7,280	2,900
						317	1,070	2,040	3,800	5,540	7,690	
09442740	0	0	0	0	0	341	789	1,260	2,110	2,990	4,110	3,020
						397	1,080	1,970	3,720	5,500	7,700	
09443000	1	0	0	0	0	5,110	13,000	22,000	39,400	58,100	83,400	56,600
						4,960	12,200	20,000	33,800	47,800	66,000	
09444000	0	1	0	0	0	3,930	8,690	13,500	22,100	30,800	41,800	37,100
						3,870	8,460	13,100	20,900	28,600	38,000	
09444200	1	0	0	0	0	4,170	10,500	17,500	30,600	44,400	62,400	30,000
						3,990	9,550	15,300	24,900	34,500	46,500	
09444400	-	-	-	-	1	----	----	----	----	----	----	600
						58	190	418	672	901	1,170	
09445500	1	0	0	0	0	671	1,360	1,980	2,960	3,840	4,860	3,710
						680	1,430	2,180	3,460	4,660	6,080	
09446000	1	0	0	0	0	1,410	2,900	4,230	6,340	8,250	10,500	7,500
						1,380	2,830	4,140	6,220	8,140	10,400	
09446500	1	0	0	0	0	2,490	5,680	8,810	14,200	19,400	25,700	30,000
						2,440	5,430	8,270	12,900	17,300	22,500	
09447000	0	0	0	0	0	2,740	7,370	12,200	20,500	28,500	38,300	36,400
						2,730	7,190	11,700	19,100	26,000	34,500	
09451800	-	-	-	-	1	----	----	----	----	----	----	63
						22	68	135	218	292	378	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
09451900	Agricultural Research Service Watershed W-I near Safford, Ariz.	14	32.841	109.521	31	0.81	3,350	8.0	54.6
09455800	Steins Creek at Steins, N. Mex.	14	32.230	109.000	54	1.26	4,431	--	70.0
09456000	San Simon River near San Simon, Ariz.	14	32.225	109.175	11	814.00	4,830	14.9	68.5
09456400	Gold Gulch near Bowie, Ariz.	14	32.348	109.603	14	15.00	5,170	10.9	65.0
09456680	Agricultural Research Service Watershed W-V near Safford, Ariz.	14	32.422	109.657	30	1.13	4,550	10.0	65.0
09456820	Agricultural Research Service Watershed W-V near Safford, Ariz.	14	32.625	109.600	29	1.19	3,650	9.0	65.4
09460150	Frye Creek near Thatcher, Ariz.	14	32.744	109.837	11	3.91	8,400	25.0	64.7
09462200	Agricultural Reserch Service Watershed W-II near Safford, Ariz.	14	32.836	109.994	31	1.07	3,800	12.0	64.2
09467120	Salt Creek near Peridot, Ariz.	14	33.271	110.304	12	30.30	3,490	16.0	55.3
08265000	Red River near Questa, N. Mex.	15	36.703	105.568	57	113.00	9,930	21.0	46.8
08267000	Red River at mouth, near Questa, N. Mex.	15	36.648	105.693	28	190.00	9,500	22.0	50.0
08268500	Arroyo Hondo at Arroyo Hondo, N. Mex.	15	36.532	105.685	51	65.60	9,730	20.0	51.1
08269000	Rio Pueblo de Taos near Taos, N. Mex.	15	36.439	105.503	52	66.60	9,500	25.0	46.6
08275000	Rio Fernando de Taos near Taos, N. Mex.	15	36.375	105.549	19	71.70	8,870	20.0	49.0
08275500	Rio Grande del Rancho near Talpa, N. Mex.	15	36.298	105.582	33	83.00	9,400	22.0	49.8
08275600	Rio Chiquito near Talpa, N. Mex.	15	36.332	105.578	24	37.00	9,350	22.0	50.1
08279000	Embudo Creek at Dixon, N. Mex.	15	36.211	105.913	44	305.00	8,980	21.0	55.4
08283500	Rio Chama at Park View, N. Mex.	15	36.737	106.578	33	405.00	9,270	22.0	39.7
08284100	Rio Chama near La Puente, N. Mex.	15	36.662	106.632	31	480.00	9,000	24.0	40.2
08284300	Horse Lake Creek above Heron Reservoir near Park View, N. Mex.	15	36.707	106.745	24	45.00	7,970	18.0	40.2
08284500	Willow Creek near Park View, N. Mex.	15	36.668	106.704	34	193.00	8,000	18.0	40.5
08286650	Canjilon Creek above Abiquiu Reservoir, N. Mex.	15	36.315	106.485	17	144.00	6,300	--	47.0
08288000	El Rito near El Rito, N. Mex.	15	36.392	106.239	33	50.50	8,700	22.0	45.9
08289000	Rio Ojo Caliente at La Madera, N. Mex.	15	36.350	106.044	55	419.00	8,640	16.0	50.0
08291000	Santa Cruz River at Cundiyo, N. Mex.	15	35.965	105.904	56	86.00	9,190	20.0	55.3
08292000	Santa Clara Creek near Espanola, N. Mex.	15	35.978	106.172	27	34.50	7,230	20.4	51.6
08293700	Arroyo Seco Tributary near Pojoaque, N. Mex.	15	35.942	106.020	15	0.72	5,845	--	55.5
08294300	Rio Nambe at Nambe Falls near Nambe, N. Mex.	15	35.846	105.908	13	25.10	9,380	27.0	55.1
08295000	Rio Nambe near Nambe, N. Mex.	15	35.860	105.935	33	38.20	9,100	22.0	55.3
07199000	Canadian River near Hebron, N. Mex.	16	36.787	104.462	40	229.00	8,300	18.0	50.7
07201000	Raton Creek at Raton, N. Mex.	16	36.927	104.439	30	14.40	8,100	17.8	48.5

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
09451900	0	0	1	0	0	73	182	287	464	629	824	434
						75	188	293	477	647	848	
09455800	-	-	-	-	1	----	----	----	----	----	----	317
						96	246	402	646	867	1,120	
09456000	1	1	1	0	0	2,890	4,520	5,620	7,000	8,020	9,020	5,350
						3,020	5,090	6,390	9,420	12,300	15,800	
09456400	0	0	0	0	0	518	1,180	1,810	2,860	3,840	5,010	2,550
						499	1,110	1,670	2,560	3,380	4,360	
09456680	1	0	0	0	0	84	210	335	549	751	992	671
						84	212	342	562	769	1,010	
09456820	0	0	0	0	0	68	148	222	344	456	587	508
						71	162	247	404	553	728	
09460150	-	-	-	-	1	----	----	----	----	----	----	96
						82	285	680	1,090	1,460	1,900	
09462200	1	0	1	0	0	247	650	1,010	1,560	2,020	2,510	997
						240	609	922	1,370	1,730	2,120	
09467120	0	0	0	0	0	794	1,910	2,940	4,560	5,970	7,560	3,200
						801	1,830	2,600	3,870	4,990	6,280	
08265000	0	0	0	0	0	253	442	587	791	956	1,130	886
						253	442	590	799	971	1,150	
08267000	0	0	0	0	0	311	472	585	731	843	957	730
						312	479	608	789	936	1,090	
08268500	0	0	0	0	0	154	319	470	717	946	1,220	1,060
						154	320	472	722	953	1,230	
08269000	1	0	1	0	0	174	363	533	802	1,040	1,320	1,050
						174	363	534	803	1,040	1,320	
08275000	-	-	-	-	1	----	----	----	----	----	----	219
						252	470	703	1,030	1,300	1,640	
08275500	1	0	1	0	0	153	269	357	478	574	676	497
						153	272	369	508	624	752	
08275600	0	0	1	0	0	71	155	232	355	466	593	309
						71	158	242	378	503	651	
08279000	1	1	0	0	0	1,080	1,610	2,030	2,640	3,150	3,710	4,200
						1,080	1,610	2,030	2,630	3,140	3,690	
08283500	0	0	0	0	0	4,010	5,770	6,980	8,560	9,760	11,000	10,000
						4,000	5,700	6,820	8,260	9,350	10,400	
08284100	0	0	0	0	0	4,040	7,050	9,340	12,500	15,100	17,800	11,200
						4,030	6,960	9,100	12,000	14,300	16,700	
08284300	-	-	-	-	1	----	----	----	----	----	----	3,960
						389	729	1,070	1,570	1,970	2,570	
08284500	1	1	1	0	0	1,190	1,830	2,350	3,140	3,840	4,620	4,500
						1,190	1,830	2,350	3,150	3,850	4,630	
08286650	1	0	0	0	0	866	1,410	1,830	2,430	2,920	3,470	2,450
						872	1,460	1,930	2,640	3,240	3,960	
08288000	1	0	0	0	0	225	406	568	831	1,080	1,370	1,240
						225	408	576	850	1,110	1,410	
08289000	0	0	1	0	0	1,040	1,710	2,160	2,740	3,170	3,600	3,140
						1,040	1,710	2,170	2,760	3,210	3,650	
08291000	1	0	0	0	0	297	624	927	1,420	1,880	2,430	2,420
						297	623	925	1,410	1,860	2,400	
08292000	1	0	0	0	0	94	229	373	642	921	1,280	970
						95	239	398	693	994	1,390	
08293700	1	0	0	0	0	102	216	325	505	677	883	508
						101	211	312	476	632	843	
08294300	0	1	0	0	0	95	227	373	653	953	1,360	1,090
						95	227	374	646	925	1,300	
08295000	0	1	0	0	0	200	635	1,170	2,260	3,460	5,090	5,580
						200	629	1,150	2,180	3,280	4,770	
07199000	1	1	0	0	0	3,090	6,900	10,800	17,900	25,100	34,200	62,400
						3,070	6,580	9,350	17,200	23,500	32,700	
07201000	0	0	0	0	0	420	1,040	1,670	2,770	3,830	5,140	3,990
						418	1,010	1,530	2,700	3,670	5,060	

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
07201200	Chicorico Creek Tributary near Raton, N. Mex.	16	36.828	104.333	16	5.18	6,480	--	50.2
07201450	Green Mountain Arroyo near Raton, N. Mex.	16	36.783	104.262	12	18.20	6,499	--	50.9
07203000	Vermejo River near Dawson, N. Mex.	16	36.681	104.786	58	301.00	9,350	19.0	51.3
07203600	Rio del Plano Tributary near Taylor Springs, N. Mex.	16	36.450	104.376	13	6.71	6,148	--	55.1
07207500	Ponil Creek near Cimarron, N. Mex.	16	36.574	104.946	42	171.00	9,350	18.0	47.3
07208500	Rayado Creek at Sauble Ranch near Cimarron, N. Mex.	16	36.372	104.969	64	65.00	10,400	21.0	50.5
07211000	Cimmaron River at Springer, N. Mex.	16	36.360	104.598	57	1,032.00	9,160	17.9	55.3
07215500	Mora River at La Cueva, N. Mex.	16	35.941	105.250	55	173.00	9,540	21.0	48.2
07216500	Mora River near Golondrinas, N. Mex.	16	35.891	105.163	61	267.00	9,400	20.5	51.2
07218000	Coyote Creek near Golondrinas, N. Mex.	16	35.917	105.164	58	215.00	8,760	19.0	51.0
07220000	Sapello River at Sapello, N. Mex.	16	35.770	105.251	17	132.00	7,950	23.0	50.4
07220900	Dog Creek near Shoemaker, N. Mex.	16	35.826	104.891	31	18.40	7,200	17.0	53.0
07221000	Mora River near Shoemaker, N. Mex.	16	35.800	104.783	69	1,033.00	9,020	19.0	53.8
08080510	Guest-Flowers Draw near Aspermont, Tex. (Disc.)	16	33.124	100.137	10	3.02	--	23.0	66.6
08080540	McDonald Creek near Post, Tex. (Disc.)	16	33.351	101.227	13	79.20	--	--	69.9
08080600	Running Water Draw near Clovis, N. Mex.	16	34.532	103.201	32	95.00	4,520	15.8	69.5
08080700	Running Water Draw at Plainview, Tex. (Disc.)	16	34.179	101.702	39	382.00	--	19.5	71.0
08081200	Croton Creek near Jayton, Tex.	16	33.288	100.431	27	290.00	--	21.0	67.4
08081500	Salt Croton Creek near Aspermont, Tex.	16	33.401	100.408	21	64.30	1,897	21.5	67.3
08082100	Stinking Creek near Aspermont, Tex. (Disc.)	16	33.233	100.213	18	88.80	--	--	66.8
08082180	North Croton Creek near Knox City, Tex.	16	33.383	100.081	21	251.00	--	23.5	66.3
08120500	Deep Creek near Dunn, Tex.	16	32.574	100.907	34	188.00	2,449	19.0	69.7
08123650	Beals Creek above Big Springs, Tex. (Disc.)	16	32.250	101.491	21	1,505.00	--	--	71.6
08313100	Canada Ancha Tributary near Santa Fe, N. Mex.	16	35.735	106.117	31	1.23	6,600	11.0	55.6
08313400	Bland Canyon near Cochiti, N. Mex.	16	35.703	106.416	23	7.57	8,900	17.0	50.2
08316600	near Frijoles Arroyo near Santa Fe, N. Mex.	16	35.719	105.958	13	0.33	7,150	13.0	55.6
08316650	Arroyo de los Frijoles near Santa Fe, N. Mex.	16	35.704	105.972	14	1.30	7,100	13.0	55.7
08316700	Arroyo de los Frijoles near Santa Fe, N. Mex.	16	35.701	106.008	14	2.92	6,900	12.0	55.5
08317100	Arroyo Yupa Tributary near Cerrillos, N. Mex.	16	35.533	106.146	20	0.47	6,017	10.5	55.2
08317500	Galisteo Creek at Canoncito, N. Mex.	16	35.551	105.822	29	11.30	8,000	17.1	49.5
08317600	San Cristobal Arroyo near Galisteo, N. Mex.	16	35.382	105.851	32	116.00	7,110	13.7	50.1

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
07201200	-	-	-	-	1	----	----	----	----	----	----	1,340
						160	508	788	1,320	1,880	2,910	
07201450	-	-	-	-	1	----	----	----	----	----	----	5,030
						309	947	1,460	2,480	3,480	5,570	
07203000	0	0	0	0	0	1,660	3,250	4,600	6,640	8,410	10,400	12,600
						1,660	3,280	4,770	6,800	8,820	11,300	
07203600	0	0	0	0	0	106	295	487	813	1,120	1,470	724
						109	379	761	1,010	1,550	2,080	
07207500	0	0	1	0	0	452	1,190	2,000	3,540	5,150	7,250	5,630
						456	1,290	2,380	3,730	5,520	8,000	
07208500	1	0	0	0	0	155	350	572	1,010	1,510	2,210	9,000
						158	427	908	1,180	1,880	2,750	
07211000	1	0	0	0	0	785	2,090	3,610	6,650	10,000	14,600	29,500
						799	2,430	4,980	7,370	11,500	17,000	
07215500	1	0	1	0	0	574	890	1,120	1,440	1,680	1,950	1,530
						576	996	1,620	1,720	2,320	2,990	
07216500	0	1	0	0	0	771	1,620	2,450	3,910	5,340	7,130	14,000
						774	1,730	2,920	4,170	5,920	8,130	
07218000	1	0	1	0	0	594	1,270	1,920	3,020	4,080	5,370	4,050
						598	1,380	2,410	3,290	4,680	6,380	
07220000	1	0	1	0	0	2,460	4,200	5,560	7,510	9,120	10,900	6,420
						2,420	3,880	4,740	7,320	9,000	11,700	
07220900	1	0	0	0	0	1,020	2,340	3,610	5,750	7,760	10,200	7,180
						1,010	2,200	3,020	5,460	7,180	9,660	
07221000	0	0	0	0	0	2,220	5,400	8,390	13,200	17,500	22,400	15,200
						2,220	5,490	8,750	13,500	18,100	23,800	
08080510	-	-	-	-	1	----	----	----	----	----	----	410
						173	586	939	1,640	2,440	3,190	
08080540	0	1	0	0	0	970	2,630	4,610	8,660	13,200	19,700	15,300
						970	2,710	4,620	8,610	12,900	19,000	
08080600	-	-	-	-	1	----	----	----	----	----	----	8,000
						1,050	3,230	5,020	9,110	13,100	18,700	
08080700	-	-	-	-	1	----	----	----	----	----	----	12000
						2,180	6,450	9,890	18,300	26,000	38,200	
08081200	0	0	0	0	0	2,730	6,030	8,760	12,700	15,800	19,100	10,600
						2,720	5,940	8,570	12,900	16,700	20,900	
08081500	0	0	0	0	0	2,750	7,470	12,800	23,100	34,100	48,700	29,900
						2,710	6,730	9,500	21,000	29,300	42,700	
08082100	0	0	0	0	0	589	1,300	1,990	3,150	4,250	5,580	3,260
						598	1,590	3,070	3,930	6,030	7,950	
08082180	0	0	0	0	0	1,270	4,210	8,130	16,800	27,300	42,500	32,100
						1,280	4,310	7,880	16,400	25,700	40,100	
08120500	1	1	0	0	0	2,330	4,710	7,220	11,900	16,800	23,400	36,400
						2,320	4,690	7,140	12,000	17,000	23,700	
08123650	-	-	-	-	1	----	----	----	----	----	----	255
						4,420	12,600	19,100	35,700	50,200	76,500	
08313100	-	-	-	-	1	----	----	----	----	----	----	298
						89	300	477	803	1,180	1,650	
08313400	1	0	0	0	0	37	75	108	160	206	259	174
						40	150	403	334	591	795	
08316600	1	0	0	0	0	140	243	322	433	523	619	360
						137	224	290	432	556	681	
08316650	1	0	0	0	0	508	1,020	1,470	2,140	2,730	3,400	1,900
						496	869	1,010	1,900	2,310	2,980	
08316700	0	0	0	0	0	417	1,650	3,330	6,980	11,200	17,100	5,340
						409	1,400	2,090	5,910	8,580	13,500	
08317100	-	-	-	-	1	----	----	----	----	----	----	568
						54	186	299	498	738	1,010	
08317500	0	0	0	0	0	885	1,310	1,600	1,970	2,250	2,530	2,000
						876	1,240	1,450	1,960	2,310	2,750	
08317600	1	0	0	0	0	1,600	3,270	4,670	6,750	8,510	10,400	9,500
						1,590	3,160	4,300	6,670	8,440	10,800	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
08317700	Tarhole Canyon near Galisteo, N. Mex.	16	35.365	105.844	34	2.15	6.700	13.0	50.0
08317720	Canada de la Cueva near Galisteo, N. Mex.	16	35.437	106.012	16	1.79	6,120	--	52.6
08317800	Canada de las Minas Tributary near Santa Fe, N. Mex.	16	35.607	105.912	29	0.56	7,195	15.0	53.8
08318000	Galisteo Creek at Domingo, N. Mex.	16	35.512	106.317	26	640.00	6,000	13.0	55.6
08318900	San Pedro Creek near Golden, N. Mex.	16	35.229	106.300	33	45.20	6,860	12.3	49.2
08321500	Jemez River below East Fork near Jemez Springs, N. Mex.	16	35.827	106.647	24	173.00	9,070	25.0	42.9
08323000	Rio Guadalupe at Box Canyon near Jemez, N. Mex.	16	35.731	106.762	37	235.00	8,250	22.0	48.9
08324000	Jemez River near Jemez, N. Mex.	16	35.662	106.743	42	470.00	8,400	23.0	49.9
08329000	Jemez River below Jemez Canyon Dam, N. Mex.	16	35.390	106.534	13	1,038.00	7,000	17.0	55.4
08330500	Tijeras Arroyo at Albuquerque, N. Mex.	16	35.061	106.478	34	75.30	7,020	15.5	56.6
08330600	Tijeras Arroyo near Albuquerque, N. Mex.	16	35.001	106.655	32	133.00	6,800	14.8	60.3
08331650	Canada Montoso near Scholle, N. Mex.	16	34.400	106.483	25	35.00	6,260	12.5	52.4
08331700	Abo Arroyo Tributary near Scholle, N. Mex.	16	34.403	106.510	32	0.23	6,080	13.0	53.5
08334000	Rio Puerco above Arroyo Chico near Guadalupe, N. Mex.	16	35.636	107.166	35	420.00	7,550	16.0	50.0
08340500	Arroyo Chico near Guadalupe, N. Mex.	16	35.592	107.189	43	1,390.00	6,900	14.0	50.1
08341300	Bluewater Creek above Bluewater Dam near Bluewater, N. Mex.	16	35.267	108.114	24	75.00	8,200	16.3	49.3
08343100	Grants Canyon at Grants, N. Mex.	16	35.161	107.837	25	13.00	7,000	11.0	49.3
08348500	Encinal Creek near Casa Blanca, N. Mex.	16	35.143	107.465	26	6.19	7,784	11.9	50.2
08353500	La Jencia Creek near Magdalena, N. Mex.	16	34.162	107.210	30	195.00	7,180	12.5	50.5
08354000	Rio Salado near San Acacia, N. Mex.	16	34.297	106.900	37	1,380.00	6,500	12.0	60.0
08358600	Chupadera Wash Tributary at Bingham, N. Mex.	16	33.900	106.333	26	1.29	5,440	--	54.8
08359400	Lumber Canyon Tributary near Monticello, N. Mex.	16	33.400	107.267	24	0.90	5,130	9.0	59.8
08360000	Alamosa Creek near Monticello, N. Mex.	16	33.569	107.592	40	403.00	7,530	16.0	47.7
08361650	Percha Creek near Kingston, N. Mex.	16	32.918	107.649	34	21.50	7,070	18.4	53.3
08361700	Percha Creek near Hillsboro, N. Mex.	16	32.915	107.601	27	35.40	6,800	17.5	56.2
08361800	Percha Creek at Caballo Dam, near Arrey, N. Mex.	16	32.900	107.317	24	119.00	6,100	14.6	73.7
08363100	Rio Grande Tributary near Radium Springs, N. Mex.	16	32.501	106.951	31	0.40	4,450	10.0	72.8
08363200	Aleman Draw at Aleman, N. Mex.	16	33.000	107.006	25	25.50	5,000	10.0	69.2
08365600	McKelligon Canyon at El Paso, Tex. (Disc.)	16	31.822	106.469	20	2.30	--	--	73.0
08374000	Alamito Creek near Presidio, Tex.	16	29.521	104.294	52	1,504.00	4,626	9.5	71.4
08374500	Terlingua Creek near Terlingua, Tex.	16	29.200	103.604	52	1,070.00	3,936	10.0	71.1

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
08317700	0	0	0	0	0	330	745	1,130	1,770	2,340	3,020	2,440
						327	704	964	1,690	2,190	2,880	
08317720	0	0	0	0	0	104	267	447	787	1,140	1,610	919
						104	279	479	801	1,170	1,660	
08317800	-	-	-	-	1	----	----	----	----	----	----	652
						57	195	312	519	764	1,070	
08318000	0	0	0	0	0	6,380	11,200	15,000	20,500	25,000	29,900	22,800
						6,310	10,500	13,000	20,000	24,500	31,100	
08318900	1	1	0	0	0	926	1,790	2,630	4,090	5,550	7,400	10,800
						920	1,750	2,480	4,050	5,470	7,510	
08321500	1	0	0	0	0	589	956	1,230	1,590	1,880	2,190	1,700
						591	1,100	1,810	1,980	2,680	3,700	
08323000	1	0	1	0	0	425	840	1,210	1,780	2,300	2,890	3,190
						432	1,040	2,050	2,260	3,350	4,620	
08324000	0	0	0	0	0	1,440	2,610	3,560	4,930	6,070	7,320	5,900
						1,440	2,750	4,230	5,380	7,120	9,280	
08329000	1	0	0	0	0	4,220	8,580	12,400	18,200	23,300	29,100	23,100
						4,180	8,350	11,800	18,600	24,600	33,900	
08330500	1	0	0	0	0	830	2,130	3,490	5,910	8,310	11,300	6,500
						829	2,140	3,460	5,910	8,330	11,500	
08330600	1	0	0	0	0	785	1,270	1,650	2,200	2,660	3,170	2,530
						789	1,470	2,560	2,790	4,050	5,140	
08331650	1	0	1	0	0	384	1,170	2,130	4,040	6,140	8,980	4,700
						385	1,200	2,120	3,990	5,950	8,850	
08331700	0	0	0	0	0	85	144	192	266	331	406	301
						85	142	195	272	355	440	
08334000	1	0	0	0	0	2,120	3,190	3,950	4,940	5,710	6,500	6,940
						2,110	3,280	4,540	5,430	6,900	8,740	
08340500	1	0	1	0	0	4,030	6,820	9,080	12,400	15,300	18,500	15,200
						4,020	6,870	9,480	12,900	16,500	21,300	
08341300	-	-	-	-	1	----	----	----	----	----	----	3,570
						607	1,770	2,670	4,580	6,290	10,700	
08343100	1	0	0	0	0	253	549	844	1,360	1,880	2,530	1,550
						253	577	954	1,430	2,040	2,830	
08348500	0	1	1	0	0	119	374	717	1,490	2,450	3,880	4,330
						120	397	763	1,480	2,380	3,780	
08353500	-	-	-	-	1	----	----	----	----	----	----	4,830
						1,020	2,920	4,370	7,610	10,400	18,000	
08354000	0	0	1	0	0	6,820	15,700	23,000	33,300	41,400	49,800	36,200
						6,780	15,100	20,800	32,800	40,800	51,000	
08358600	-	-	-	-	1	----	----	----	----	----	----	620
						89	300	476	799	1,170	1,660	
08359400	0	0	0	0	0	174	339	479	691	876	1,080	778
						172	332	472	701	928	1,160	
08360000	1	0	0	0	0	2,080	4,420	6,450	9,550	12,200	15,200	10,800
						2,070	4,360	6,230	9,550	12,300	16,000	
08361650	1	1	0	0	0	530	942	1,310	1,920	2,480	3,160	3,740
						528	959	1,420	2,010	2,710	3,560	
08361700	0	1	0	0	0	1,020	2,230	3,490	5,800	8,190	11,300	12,200
						1,010	2,140	3,130	5,620	7,800	11,000	
08361800	0	0	0	0	0	1,160	3,260	5,610	10,000	14,600	20,400	15,400
						1,160	3,340	5,740	10,100	14,800	20,700	
08363100	0	0	0	0	0	124	204	262	338	396	455	332
						123	209	304	372	496	559	
08363200	1	0	0	0	0	1,630	4,150	6,770	11,400	16000	21,600	16,400
						1,610	3,830	5,400	10,700	14,400	19,800	
08365600	-	-	-	-	1	----	----	----	----	----	----	3,060
						165	572	925	1,630	2,450	3,040	
08374000	0	1	0	0	0	7,530	12,800	17,200	23,900	29,800	36,600	56,400
						7,510	12,800	17,500	24,600	31,700	39,800	
08374500	1	0	0	0	0	13,400	20,400	25,100	31,100	35,600	40,100	34,900
						13,300	19,700	23,300	31,000	36,200	42,000	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
08379300	Tecolote Creek at Tecolote, N. Mex.	16	35.456	105.282	31	122.00	7,390	19.6	52.5
08379500	Pecos River near Anton Chico, N. Mex.	16	35.179	105.108	66	1,050.00	7,920	18.0	56.3
08379550	Canon Blanco near Leyba, N. Mex.	16	35.221	105.670	12	11.20	6,659	--	49.7
08379600	Pecos River Tributary near Dilia, N. Mex.	16	35.214	105.081	33	0.16	5,450	14.0	56.4
08380300	Sandoval Canyon at Gallinas, N. Mex.	16	35.689	105.355	26	7.60	7,600	22.6	48.6
08380500	Gallinas Creek near Montezuma, N. Mex.	16	35.652	105.318	70	84.00	7,810	22.0	50.1
08381000	Gallinas Creek at Montezuma, N. Mex.	16	35.654	105.275	57	87.00	7,800	21.5	50.7
08382000	Gallinas River near Lourdes, N. Mex.	16	35.471	105.160	12	313.00	7,500	19.0	53.2
08382500	Gallinas River near Colonias, N. Mex.	16	35.182	104.900	35	610.00	5,920	17.0	59.8
08382900	Pecos River Tributary near Pintada, N. Mex.	16	34.979	105.094	23	16.00	--	--	58.0
08383200	Pintada Arroyo Tributary near Clines Corners, N. Mex.	16	34.844	105.585	24	29.20	7,065	16.0	50.7
08383210	Pintada Arroyo Tributary near Encino, N. Mex.	16	34.811	105.567	23	0.55	6,459	--	50.7
08383300	Pintada Arroyo near Santa Rosa, N. Mex.	16	34.889	104.731	27	896.00	6,210	13.5	63.0
08383370	Pecos River Tributary near Puerto de Luna, N. Mex.	16	34.876	104.637	26	0.37	4,600	13.0	63.6
08385530	Alamosa Creek Tributary near Jordan, N. Mex.	16	34.800	103.967	23	9.71	4,950	15.5	69.4
08385600	Yeso Creek near Fort Sumner, N. Mex.	16	34.267	104.283	35	242.00	4,720	13.0	75.0
08385670	Aragon Creek Tributary near Encinoso, N. Mex.	16	33.683	105.567	24	6.07	6,780	19.0	54.4
08385690	Bonita Canyon Tributary near Corona, N. Mex.	16	34.233	105.617	24	0.60	6,735	15.4	51.3
08385700	Cloud Canyon near Gallinas, N. Mex.	16	34.133	105.667	30	1.85	--	16.0	51.9
08387000	Rio Ruidoso at Hollywood, N. Mex.	16	33.327	105.627	33	120.00	9,060	25.0	50.3
08388000	Rio Ruidoso at Hondo, N. Mex.	16	33.383	105.275	40	290.00	7,760	21.0	54.6
08389000	Rio Bonito near Ft. Stanton, N. Mex.	16	33.518	105.486	31	85.0	8,650	21.0	52.5
08389060	Rio Bonito Tributary near Ft. Stanton, N. Mex.	16	33.521	105.468	29	0.72	--	16.0	52.5
08389500	Rio Bonito at Hondo, N. Mex.	16	33.389	105.275	38	295.00	7,900	19.0	54.6
08390050	Rio Hondo Tributary at Tinnie, N. Mex.	16	33.371	105.217	14	0.23	5,150	--	55.7
08390100	Rio Hondo at Picacho, N. Mex.	16	33.357	105.157	14	715.00	7,740	20.0	58.0
08390150	Gallo Canyon near Picacho, N. Mex.	16	33.290	105.180	24	1.32	--	--	57.8
08390500	Rio Hondo at Diamond A Ranch near Roswell, N. Mex.	16	33.349	104.851	47	947.00	7,400	18.0	65.6
08393200	Rocky Arroyo above Two R Reservoir near Roswell, N. Mex.	16	33.285	104.796	18	31.00	4,550	13.4	66.9
08393600	North Spring River at Roswell, N. Mex.	16	33.396	104.548	28	19.50	3,600	12.0	72.7
08393900	Eight Mile Draw near Roswell, N. Mex.	16	33.417	104.650	35	397.00	3,740	14.3	70.4

Station number	Relation characteristic L	H	D	O	U	Peak discharge (cubic feet per second) for indicated recurrence interval (years) 2	5	10	25	50	100	Maximum peak discharge of record (cubic feet per second)
08379300	0	0	0	0	0	1,360	3,500	5,850	10,300	14,900	21,000	20,000
						1,350	3,390	5,250	9,950	14,000	20,300	
08379500	1	0	0	0	0	6,440	11,500	16,100	23,600	30,600	38,900	73,000
						6,420	11,300	15,400	23,500	30,500	39,600	
08379550	-	-	-	-	1	----	----	----	----	----	----	1,440
						233	722	1,110	1,870	2,630	4,200	
08379600	-	-	-	-	1	----	----	----	----	----	----	184
						32	115	187	309	464	608	
08380300	0	0	0	0	0	91	371	812	1,950	3,500	6,010	2,530
						92	397	836	1,900	3,260	5,610	
08380500	1	0	1	0	0	618	1,610	2,660	4,570	6,490	8,910	7,120
						618	1,630	2,700	4,590	6,520	9,080	
08381000	0	0	0	0	0	480	1,200	1,940	3,230	4,500	6,060	11,600
						481	1,250	2,140	3,340	4,740	6,510	
08382000	0	0	0	0	0	2,780	4,120	5,040	6,240	7,140	8,070	6,680
						2,740	4,090	5,520	7,150	9,440	12,700	
08382500	1	0	0	0	0	3,410	6,450	9,090	13,200	16,900	21,200	26,700
						3,400	6,460	9,290	13,600	18,000	23,400	
08382900	-	-	-	-	1	----	----	----	----	----	----	6,600
						346	1,090	1,700	2,950	4,260	6,300	
08383200	0	0	0	0	0	90	163	224	314	391	477	305
						95	301	768	640	1,110	1,520	
08383210	-	-	-	-	1	----	----	----	----	----	----	145
						52	176	280	460	668	965	
08383300	1	0	0	0	0	1,940	3,270	4,180	5,300	6,110	6,880	4,300
						1,960	3,900	6,880	7,200	10,500	13,400	
08383370	1	1	0	0	0	97	225	361	619	892	1,250	1,450
						97	222	351	612	884	1,220	
08385530	-	-	-	-	1	----	----	----	----	----	----	2,850
						327	1,080	1,710	3,040	4,490	5,960	
08385600	1	0	0	0	0	1,430	3,510	5,700	9,690	13,800	18,900	14,800
						1,440	3,710	6,450	10,200	15,000	20,400	
08385670	1	0	0	0	0	478	791	1,040	1,410	1,720	2,060	1,610
						473	768	1,020	1,440	1,840	2,300	
08385690	-	-	-	-	1	----	----	----	----	----	----	112
						55	187	297	490	714	1,030	
08385700	-	-	-	-	1	----	----	----	----	----	----	706
						99	327	514	858	1,240	1,830	
08387000	1	0	0	0	0	255	563	892	1,510	2,160	3,020	2,120
						262	741	1,600	1,910	3,010	4,350	
08388000	1	0	0	0	0	944	2,440	4,270	8,150	12,700	19,400	42,700
						949	2,580	4,700	8,340	13,000	19,900	
08389000	0	0	0	0	0	600	1,580	2,550	4,070	5,380	6,810	4,100
						601	1,640	2,730	4,210	5,720	7,560	
08389060	-	-	-	-	1	----	----	----	----	----	----	512
						62	212	337	559	818	1,170	
08389500	0	0	0	0	0	1,990	5,060	8,020	12,800	17,100	22,100	28,200
						1,980	4,970	7,540	12,600	16,800	22,400	
08390050	-	-	-	-	1	----	----	----	----	----	----	420
						38	134	217	360	537	716	
08390100	-	-	-	-	1	----	----	----	----	----	----	115,000
						2,400	6,760	10,100	18,300	25,400	42,100	
08390150	-	-	-	-	1	----	----	----	----	----	----	2,400
						96	328	524	887	1,310	1,800	
08390500	0	0	0	0	0	3,090	9,680	18,200	36,800	58,800	90,500	54,800
						3,090	9,640	17,300	36,100	56,400	87,400	
08393200	0	0	0	0	0	664	2,450	4,760	9,520	14,800	21,800	12,000
						662	2,340	3,960	8,840	13,100	19,500	
08393600	1	0	0	0	0	13	71	162	380	646	1,030	387
						20	251	893	805	1,610	2,120	
08393900	-	-	-	-	1	----	----	----	----	----	----	22,200
						2,200	6,520	9,980	18,400	26,200	38,700	

BASIN, CLIMATIC, AND FLOOD CHARACTERISTICS FOR STREAMFLOW-GAGING STATIONS IN THE SOUTHWESTERN UNITED STATES--Continued

Station number	Station name	Flood region	Latitude, in decimal degrees	Longitude, in decimal degrees	Systematic years of record	Drainage area, in square miles	Mean basin elevation, in feet	Mean annual precipitation, in inches	Mean annual evaporation, in inches
08394500	Rio Felix at Old Hwy. Bridge, near Hagerman, N. Mex.	16	33.125	104.344	56	932.00	7,070	16.0	77.6
08397600	Rio Penasco near Dunken, N. Mex.	16	32.882	105.178	33	583.00	8,000	21.0	55.8
08398500	Rio Penasco at Dayton, N. Mex.	16	32.743	104.414	35	1,060.00	7,000	18.0	75.9
08400000	Fourmile Draw near Lakewood, N. Mex.	16	32.672	104.369	34	265.00	4,685	14.0	76.8
08401200	South Seven Rivers near Lakewood, N. Mex.	16	32.589	104.421	24	220.00	4,020	14.0	75.0
08401800	Rocky Arroyo near Carlsbad, N. Mex.	16	32.467	104.467	14	254.00	4,890	13.2	72.3
08401900	Rocky Arroyo at Hwy. Bridge near Carlsbad, N. Mex.	16	32.506	104.374	23	285.00	4,630	14.5	76.2
08405050	Last Change Canyon Tributary near Carlsbad Caverns, N. Mex.	16	32.292	104.606	28	0.20	4,180	13.9	65.5
08405100	Mosley Canyon near White City, N. Mex.	16	32.250	104.333	28	14.60	3,625	--	74.6
08405500	Black River above Malaga, N. Mex.	16	32.229	104.151	41	343.00	4,540	15.0	80.2
08408500	Delaware River near Red Bluff, N. Mex.	16	32.023	104.054	49	689.00	4,160	14.0	80.1
08411500	Salt Screwbean Draw near Orla, Tex. (Disc.)	16	31.878	103.947	15	464.00	3,679	9.5	80.0
08424500	Madera Canyon near Toyahvale, Tex. (Disc.)	16	30.868	103.969	17	53.80	5,984	12.0	67.4
08431700	Limpia Creek above Ft. Davis, Tex.	16	30.613	104.001	20	52.40	--	--	67.7
08431800	Limpia Creek below Ft. Davis, Tex. (Disc.)	16	30.681	103.792	16	227.00	5,546	18.0	67.4
08435800	Coyanosa Draw near Ft. Stockton, Tex. (Disc.)	16	31.041	103.137	15	1,180.00	--	--	76.0
08444400	Three Mile Mesa Creek near Ft. Stockton, Tex. (Disc.)	16	30.838	102.841	10	1.04	--	--	75.4
08447020	Independence Creek near Sheffield, Tex.	16	30.452	101.733	11	763.00	--	--	75.1
08478500	Mimbres River at Deming, N. Mex	16	32.283	107.760	28	170.00	6,500	14.0	64.0
08480650	Minnie Hall Draw near Three Rivers, N. Mex.	16	33.417	106.083	24	9.70	5,440	16.0	60.8
08480700	Indian Creek near Three Rivers, N. Mex.	16	33.369	105.890	31	6.80	7,900	26.6	55.1
08481000	Three Rivers at Three Rivers, N. Mex.	16	33.303	106.072	22	96.00	6,430	21.2	60.7
08481100	Tularosa Basin Tributary near Three Rivers, N. Mex.	16	33.300	106.083	25	13.80	5,587	15.6	60.8
08481500	Rio Tularosa near Bent, N. Mex.	16	33.145	105.897	41	120.00	7,580	21.0	56.3
08482000	Rio Tularosa near Tularosa, N. Mex.	16	33.093	105.976	11	140.00	7,400	20.0	61.3

Station number	Relation characteristic					Peak discharge (cubic feet per second) for indicated recurrence interval (years)						Maximum peak discharge of record (cubic feet per second)
	L	H	D	O	U	2	5	10	25	50	100	
08394500	-	-	-	-	1	----	----	----	----	----	----	74,000
						3,740	10,900	16,700	31,500	44,700	64,700	
08397600	1	0	0	0	0	1,330	4,420	8,320	16,400	25,400	37,800	70,000
						1,340	4,560	8,420	16,300	24,800	37,600	
08398500	1	0	0	0	0	2,520	7,540	13,500	25,300	38,000	55,000	29,800
						2,540	7,910	14,500	25,900	39,100	56,400	
08400000	1	1	0	0	0	800	3,350	7,130	16,100	27,300	44,000	29,300
						814	3,610	7,680	16,200	26,900	42,800	
08401200	-	-	-	-	1	----	----	----	----	----	----	20,100
						1,740	5,270	8,160	15,100	21,700	30,500	
08401800	-	-	-	-	1	----	----	----	----	----	----	63,300
						1,800	5,420	8,360	15,400	22,100	31,700	
08401900	-	-	-	-	1	----	----	----	----	----	----	31,600
						2,010	6,070	9,380	17,400	25,000	35,200	
08405050	1	0	0	0	0	141	288	416	610	779	967	683
						140	272	366	592	760	945	
08405100	1	0	0	0	0	1,870	3,610	5,200	7,800	10,200	13,100	16,400
						1,850	3,350	4,290	7,420	9,530	12,400	
08405500	0	1	0	0	0	2,550	9,510	18,200	35,300	53,200	76,300	74,600
						2,550	9,300	16,500	34,200	50,400	72,700	
08408500	0	1	0	0	0	3,790	10,600	18,800	35,400	54,100	80,000	81,400
						3,790	10,500	18,000	35,000	52,700	78,100	
08411500	-	-	-	-	1	----	----	----	----	----	----	40,600
						2,700	8,080	12,500	23,400	33,500	46,800	
08424500	-	-	-	-	1	----	----	----	----	----	----	5,120
						760	2,370	3,690	6,640	9,600	13,600	
08431700	-	-	-	-	1	----	----	----	----	----	----	8,610
						754	2,350	3,670	6,600	9,550	13,500	
08431800	1	0	0	0	0	1,930	3,010	3,820	4,970	5,900	6,910	5,520
						1,920	3,340	5,340	6,350	9,170	11,600	
08435800	-	-	-	-	1	----	----	----	----	----	----	12,600
						4,140	12,000	18,200	34,400	48,600	71,500	
08444400	-	-	-	-	1	----	----	----	----	----	----	350
						114	405	662	1,160	1,760	2,110	
08447020	1	1	0	0	0	2,260	8,770	18,900	44,600	79,900	137,000	78,100
						2,300	8,980	16,600	40,700	66,500	114,000	
08478500	1	0	1	0	0	666	1,220	1,660	2,280	2,780	3,310	2,370
						710	2,320	6,050	5,040	8,880	12,000	
08480650	1	0	0	0	0	902	1,850	2,740	4,200	5,580	7,240	4,970
						892	1,720	2,290	4,000	5,230	6,910	
08480700	-	-	-	-	1	----	----	----	----	----	----	990
						209	672	1,050	1,800	2,590	3,840	
08481000	0	0	0	0	0	2,100	5,000	7,760	12,300	16,400	21,100	15,000
						2,080	4,670	6,470	11,700	15,300	20,300	
08481100	1	0	1	0	0	267	948	1,760	3,280	4,820	6,750	2,340
						268	966	1,740	3,240	4,730	6,660	
08481500	-	-	-	-	1	----	----	----	----	----	----	4,280
						930	2,750	4,180	7,380	10,400	16,600	
08482000	-	-	-	-	1	----	----	----	----	----	----	9,640
						1,120	3,330	5,100	9,130	13,000	19,900	

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