TECHNIQUES FOR ESTIMATING FLOOD-FLOW FREQUENCY FOR UNREGULATED STREAMS IN NEW MEXICO

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CONTENTS

FIGURES

TABLES

TABLES - Concluded

CONVERSION FACTORS

The inch-pound units in this report can be converted to the metric system of units as follows:

Multiply inch-pound unit	By	To obtain metric unit
inch	25.40	millimeter
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
cubic foot per second	0.0283	cubic meter per second
foot per mile	0.1894	meter per kilometer

Temperature in degrees Fahrenheit (°F) can be converted to degrees Celsius (°C) by the equation:

$$°C = 5/9\ (°F - 32)$$

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ABSTRACT

Equations for estimating flood discharges for exceedance probabilities of 0.50, 0.20, 0.10, 0.04, 0.02, and 0.01 at ungaged sites were developed and updated from streamflow-gaging station data through 1982. The 1984 data from selected stations in the southwestern part of the State also were used because of the high discharges that occurred. The State was divided into eight physiographic regions and equations were developed for each region. The logarithms of annual flood peaks for the respective exceedance probabilities were related to logarithms of basin and climatic characteristics. The average standard error of estimate of a flood peak for an exceedance probability of 0.01 ranged from 44 to 81 percent, a significant improvement over previous studies. New techniques for weighting independent estimates of flood discharges at gaging stations by each estimate's variance are presented. The variances are the squares of the standard errors. Standard errors of the estimated flood discharges for the exceedance probabilities are presented for all streamflow-gaging stations. Flood-frequency characteristics at 219 gaging stations are also included.

INTRODUCTION

Flood-frequency estimates are necessary for design of hydraulic structures, such as bridges, culverts, dams, levees, and channels. Methods for estimating flood-frequency characteristics have been presented for New Mexico or parts of New Mexico in 13 reports published by the U.S. Geological Survey (table 1). The reports provide flood-frequency information given the streamflow-gaging records and analytical procedures available at the time of the studies. The reports by Scott and Kunkler (1976) and Hejl (1984) present techniques that relate flood frequency to channel geometry. Channel-geometry data were available for 79 streamflow-gaging stations and were not tested for inclusion as a basin characteristic.

The purpose of this report is to present updated flood-frequency estimates based on additional streamflow-gaging station data and improved analytical procedures. Streamflow-gaging station data through 1982 were used for all stations. In addition, 1984 data were used for selected stations in the southwestern part of the State because of the high discharges that occurred there. The report presents updated techniques for estimating peak discharges for exceedance probabilities of 0.50, 0.20, 0.10, 0.04, 0.02, and 0.01 for unregulated streams in New Mexico.

The analyses are based on data for 219 streamflow-gaging stations that have 10 or more years of record. One hundred and ninety-seven of the stations are in New Mexico, 11 in Arizona, 8 in Colorado, and 3 in Oklahoma. The analysis originally was made on the same 277 stations that Thomas and Gold (1982) used for their analysis. However, the data base was reduced to 219 stations because some stations had less than 10 years of record and other stations violated the Hydrology Subcommitee for the Interagency Advisory Committee on Water Data (1982) specification for conditional probability adjustment. For example, a maximum number of no-flow years is allowed for a certain length of systematic record. Gaging-station numbers and locations of the 219 stations are shown in figure 1.

This report was prepared in cooperation with the New Mexico State Highway Department. The streamflow-gaging stations used in this study were supported by the U.S. Geological Survey and various other Federal, State, and local agencies.

DESCRIPTION OF THE AREA

New Mexico varies widely with physiographic regions that include mountains, plains, plateaus, valleys, and deserts. Climate influences the runoff and flood response of each region. Rainfall intensity is influenced by the Continental Divide. Storms that originate in the Pacific Ocean move over the mountains and produce intense thunderstorms on the plains. Isopluvials of the 100-year, 24-hour rainfall intensities indicate a pattern of increasing intensity in a easterly direction on the plains as shown by Miller, Frederick, and Tracey (1973). Storms also originate from the Gulf of Mexico during the summer months and affect the eastern half of New Mexico; the isopluvials indicate a decreasing rainfall intensity in a westerly direction. Generally, the mountainous regions have greater annual precipitation than the other regions. In the northern mountain region (fig. 1), floods generally are produced from snowmelt runoff.

Floods in the southwest and southeast mountain regions (fig. 1) are produced by snowmelt, rainfall, and rainfall on snowpacks. Those in the plains, plateaus, valleys, and deserts generally are produced by rainfall.

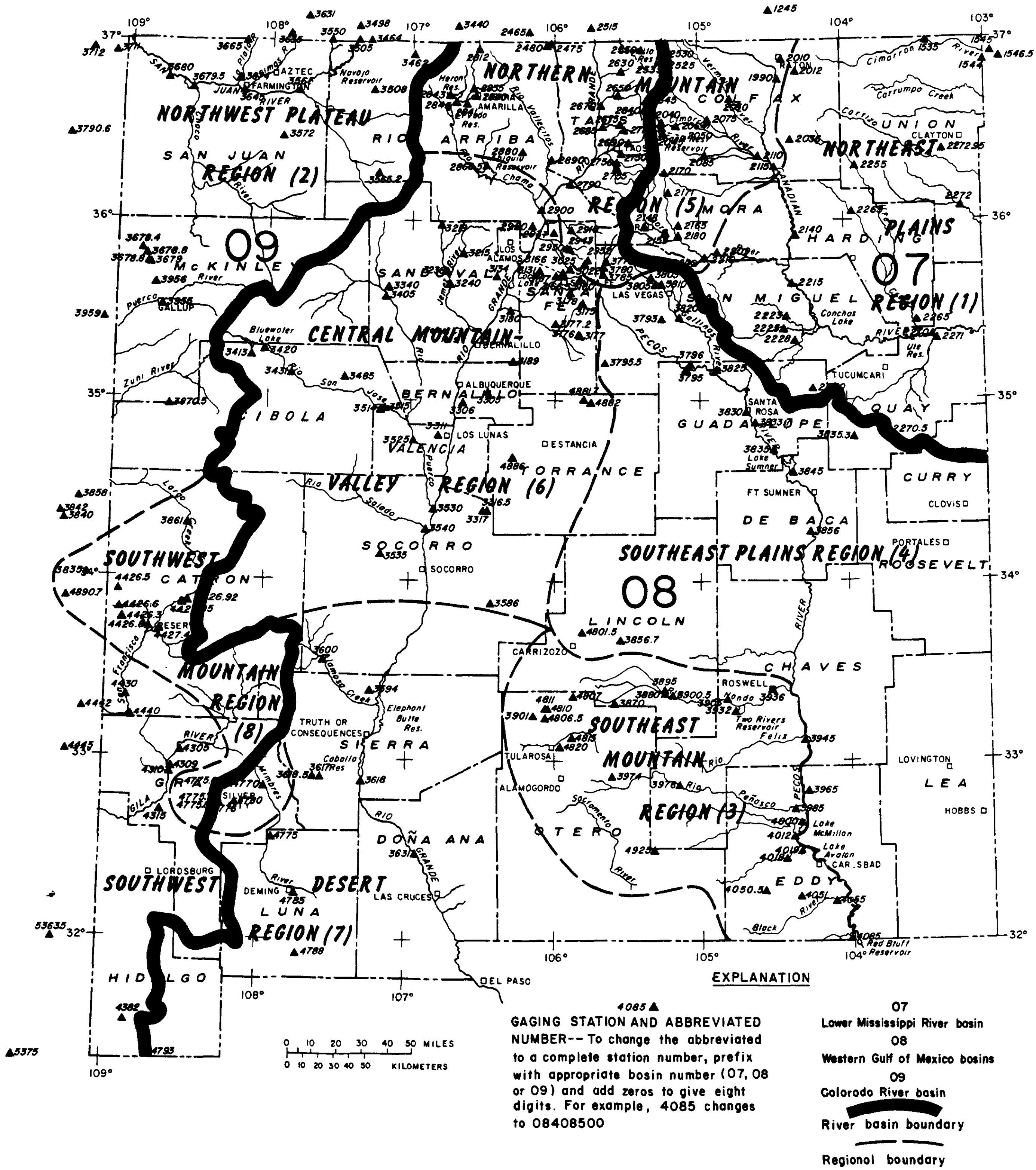


Figure 1.--Location of streamflow-gaging stations and physiographic regions.

METHOD OF ANALYSIS

Flood discharges are presented in terms of exceedance probability. Exceedance probability is the probability that a flood will exceed a given magnitude in any year. Recurrence interval, in years, is the reciprocal of the exceedance probability. For example, a flood with an exceedance probability of 0.01 has a recurrence interval of 100 years.

Flood discharges for selected exceedance probabilities were determined for each streamflow-gaging station. Logarithms of annual peak flows were fitted to a log-Pearson Type III probability distribution to develop flood-frequency curves according to techniques recommended by the Hydrology Subcommittee of the Interagency Advisory Committee on Water Data (1982). High and low outliers, zero-flow years, and historic adjustments were applied to station data where applicable. The skew coefficient used for each station was a combination of station skew and regional skew determined by weighting the two values in inverse proportion to their mean-square errors.

Coefficients of skewness for each station with 25 or more years of record were determined and used to define regional skew of each physiographic region. Generalized skew coefficients were determined for each streamflow-gaging station as recommended by the Hydrology Subcommittee of the Interagency Advisory Committee on Water Data (1982). The procedure included three recommended methods of analysis: (1) computer-generated skew isolines (CALCOMP, INC., 1971), (2) skew-prediction equations, and (3) the mean of station skew-coefficient data. The median skew-coefficient data were used in place of the recommended mean skew-coefficient data to provide a better estimate of the true population mean or central tendency. The mean of a positive or negative asymmetrical distribution may underestimate the central tendency of the true population or the mode may overestimate the true central tendency. The mean-square error also was provided from the regression analysis for the skew-prediction equations of method 2.

The mean-square error for method 1 was significantly larger than the variance of the station skew-coefficient data obtained from method 3. The mean-square error for method 2 was not significantly different from the variance of the station skew-coefficient data from method 3. The basin characteristics used were the same as for the regional equations. The median value of the skew coefficients for all stations in each region was thus used for the generalized skew coefficient, and the variance was used for the mean-square error of the generalized skew coefficient. The generalized skew coefficient and mean-square error for each region are listed in table 2. Flood-frequency data derived for each station used in the analysis are listed in table 3.

REGIONAL FLOOD-FREQUENCY RELATIONS

Physiographic regions in New Mexico vary greatly from mountains, plains, plateaus, valleys and deserts. Corresponding climatic differences influence the runoff and flood response. Only one previous study by Scott (1971) used 3 regions for explaining the runoff and flood response throughout New Mexico.

The mountain regions were differentiated from the plains, plateaus, valleys and deserts by elevation and timing of runoff. Flood discharges measured at streamflow-gaging stations above 7,500 feet generally are produced by snowmelt runoff and were classified as mountain regions; flood discharges measured at sites below 7,500 feet generally are produced by rainfall runoff (Jarret and Costa, 1982). The timing of runoff each year also was used for determining the type of region. Snowmelt runoff generally occurs the same time each year in late spring or early summer. The timing criterion was used when the 7,500-foot elevation criterion was subject to variability at regional boundaries.

Flood-frequency regression equations were developed for eight physiographic regions. Flood discharges for various exceedance probabilities determined for streamflow-gaging stations were related to basin and climatic characteristics using multiple-regression techniques to develop regional flood-frequency relations. Regression equations for the physiographic regions also were compared for flood-frequency estimates computed by two methods of estimating the generalized skew coefficients. The generalized skew coefficients (table 2) adopted by this analyses for flood-frequency estimates provided better regression equations in terms of standard error of estimate.

Basin and Climatic Characteristics

Basin and climatic characteristics evaluated for inclusion as independent variables in the regression equations included:

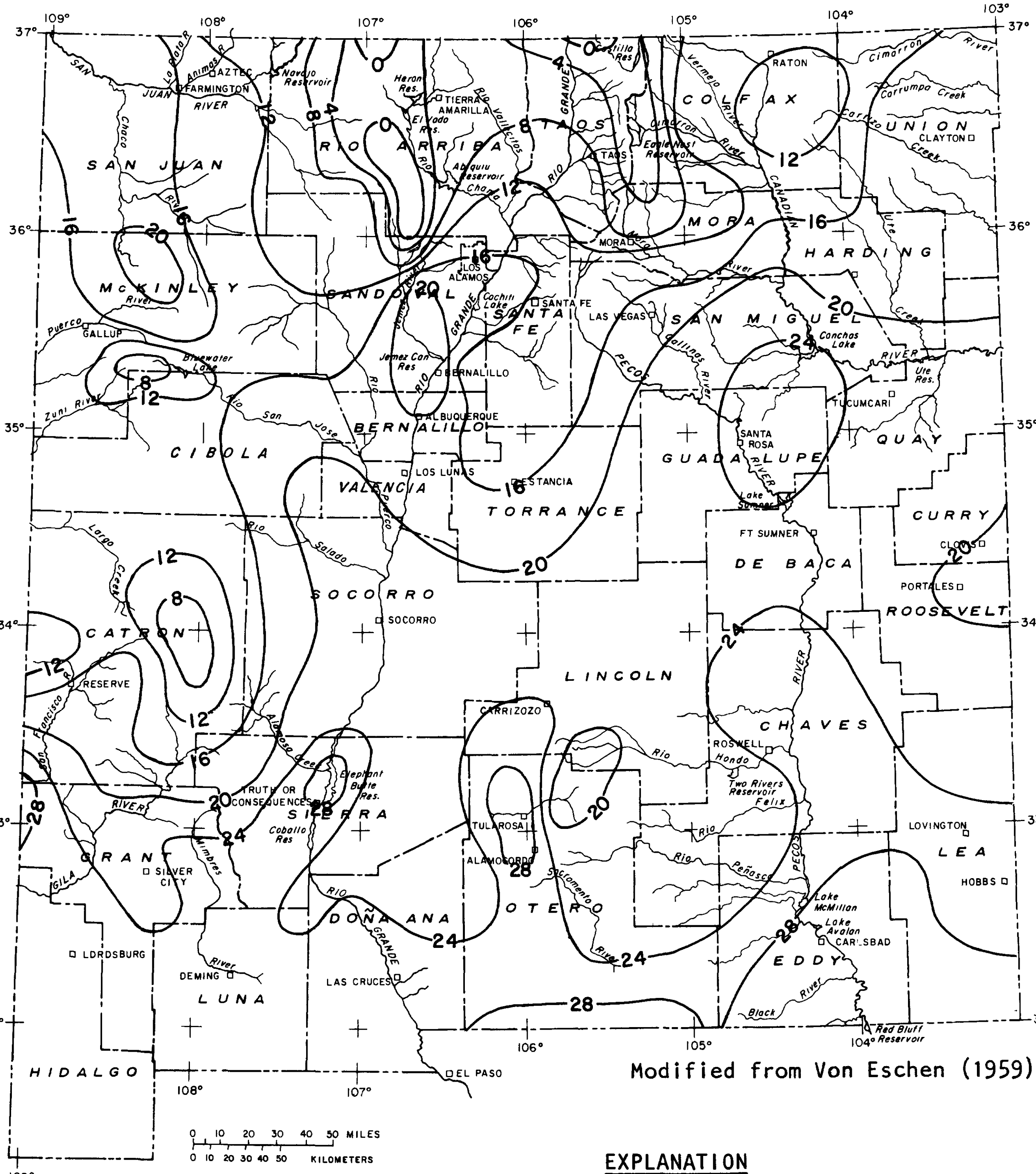
A	drainage area,
Ac	contributing drainage area,
S	main channel slope,
L	stream length of main channel from gaging station to basin divide,
E	mean basin elevation,
Ec	average of channel elevations at points 10 and 85 percent of stream length upstream from gaging station,
P	mean annual precipitation,
T	mean minimum January temperature,
I24,2	maximum precipitation intensity of a storm of 24 hours duration with an exceedance probability of 0.50,

I24,10	maximum precipitation intensity of a storm of 24 hours duration with an exceedance probability of 0.10,
I24,25	maximum precipitation intensity of a storm of 24 hours duration with an exceedance probability of 0.04,
I24,50	maximum precipitation intensity of a storm of 24 hours duration with an exceedance probability of 0.02,
I24,100	maximum precipitation intensity of a storm of 24 hours duration with an exceedance probability of 0.01,
E5000	percent of basin above elevation of 5000 feet,
E6000	percent of basin above elevation of 6000 feet,
Lake	percentage of basin covered by lakes and ponds, and
Forest	percentage of basin covered by forest.

Drainage area (A), in square miles, was determined by planimetering the delineated area on the largest scale topographic map available. Stream length of main channel (L), in miles, was determined by measuring along the main channel from the gaging station to the basin divide on the largest scale topographic map available. Average of channel elevation (Ec), in feet above sea level, was determined as the average of elevations at points 10 and 85 percent of stream length upstream from the gaging stations. Mean basin elevation (E), in feet above sea level, was determined by overlaying a transparent grid on a topographic map and averaging the elevations of the points at the grid intersections (generally 20 to 80 points per basin). Main channel slope (S), in feet per mile, was determined for the reach between points 10 and 85 percent of stream length upstream from the gaging station and the elevations of those points. Mean minimum January temperature (T), in degrees Fahrenheit, is the basin average determined similarly to mean basin elevation from a map prepared by Von Eschen (1959) and shown in figure 2. Maximum 24-hour 2-, 10-, 25-, 50-, 100-year precipitation intensities (I24,2; etc.), in inches, are the point samples of the maximum 24-hour rainfall having exceedance probabilities of 0.50, 0.10, 0.04, 0.02, 0.01, respectively. Intensities were determined at each gage by interpolation between isohyetal lines from precipitation-frequency maps for New Mexico prepared by Miller, Frederick, and Tracey (1973).

Basin and climatic characteristics are given in the streamflow basin characteristics section of WATSTORE user's guide by Dempster (1983). A description of techniques used to determine the characteristics is given in the national handbook of recommended methods for water-data acquisition (U.S. Geological Survey, 1977). Basin and climatic characteristic data used in the final regressions are listed in tables 4-11, and the range of values of each characteristic is listed in table 12.

Basin and climatic characteristics that were determined to be significant in one or more regions in the multiple-regression analyses were drainage area, stream length of main channel from gaging station to basin divide, average of channel elevations, mean basin elevation, main channel slope, mean minimum January temperature, and maximum 24-hour 2-, 10-, 25-, 50-, and 100-year precipitation.



EXPLANATION

—28— LINE OF EQUAL TEMPERATURE, IN DEGREES FAHRENHEIT

Figure 2.--Mean minimum January temperature.

Regression Analyses

Equations expressing flood frequency as a function of basin and climatic variables were developed by multiple-regression techniques. Independent variables were evaluated for statistical significance at the 5-percent level. The dependent and independent variables were transformed to logarithms (base 10).

The general form of the mathematical model used was:

$$\text{Log } Q_t = \log k + a \log x_1 + b \log x_2 + \ldots + n \log x_n \qquad (1)$$

or $$Q_t = K \; x_1^{\,a} \; x_2^{\,b} \; \ldots \; x_n^{\,n}$$

where

Q_t is flood discharge (instantaneous peak discharge), in cubic feet per second, for the exceedance probability t;

k is regression constant;

K is anti-log of regression constant;

$x_1, x_2, \ldots x_n$ are basin or climatic characteristics; and

a, b, ...n are regression coefficients.

Multiple-regression analyses were made using a computer program (SAS Institute, Inc., 1982) with a multiple-regression routine (STEPWISE) with stepwise selection for inclusion or exclusion of independent variables (basin and climatic characteristics) for exploratory and checking purposes. The multiple-regression routine (REG) was used for further exploration and for the final mathematical models. The procedure uses least-squares estimates to fit linear-regression models.

The following discussion is presented to illustrate the additional steps taken to test the delineation of the physiographic regions. The previous study of Thomas and Gold (1982) consisted of a multiple-regression analysis performed for the entire State; the analysis was repeated using the increased years of record available. The results were identical in terms of standard error of estimate and independent variables. The regression residuals (difference between the predicted Q_t and the measured Q_t) were plotted by a SAS procedure. The regression model produced more negative residuals (underestimation of flood discharges) than positive residuals (overestimation of flood discharges). The northern mountain region was the only region that showed a distinct pattern. The variance about the regression line was so large that any other residual patterns that may exist were not apparent.

The analysis of residuals showed no apparent trends, and the State was divided into eight physiographic regions (fig. 1) based on the diverse topography and climate. The boundaries of the regions generally conform to drainage-basin divides. Multiple regressions were evaluated for each of the eight regions using flood-frequency estimates at gaging stations from two methods: (1) Estimates using generalized skew coefficients by the Hydrology Subcommitte of the Interagency Advisory Committee on Water Data (1982); and (2) estimates using generalized skew coefficients developed for each of the eight physiographic regions (table 3). Multiple regressions using estimates from method 2 yielded better equations in terms of standard error of estimate. For example, the average standard error of estimate for floods with an exceedance probability of 0.01 ranged from 44 to 81 percent, except for the southwest mountain region where no suitable relation could be developed.

The final basin and climatic characteristics used in the mathematical models did not include ones that are highly intercorrelated (cross correlated). In all regions, drainage area and stream length were cross correlated. Except for regions 1, 2, 3 and 4, where drainage area was used by choice, the regression model with stream length as an independent variable was slightly more significant. However, the average standard error of estimate was only 6 percent better. In most regions, mean basin elevation was cross correlated with mean annual precipitation, but only the more significant variable was used. The final equations for the flood-frequency estimates for each region and the standard error of estimates are given in table 13.

Description of Flood Response for Each Region

The differences in flood-frequency relations among the physiographic regions are shown by superimposing the regression lines for each region (fig. 3). The slopes of the regression lines indicate varying flood response for each region. The regression equations were used to estimate the 1-percent flood for each region. Regression equations that were multiple were computed by the indicated range of basin and climatic characteristics in each region. The 1-percent flood discharges were plotted versus the corresponding range of drainage area in figure 3.

Drainage area is a common variable in the regression equations and is used to depict a two-dimensional graph of the regional relations. The regression lines developed for the physiographic regions exist largely within the bounds of ± one standard error of estimate of the regression line for the entire State (fig. 3). The error about each region's regression line practically exists within the bounds of the equation for the entire State. A single regression equation for the entire State does not adequately explain the flood response for all the diverse physiographic regions. The following discussion is a comparsion of flood responses of the different regions.

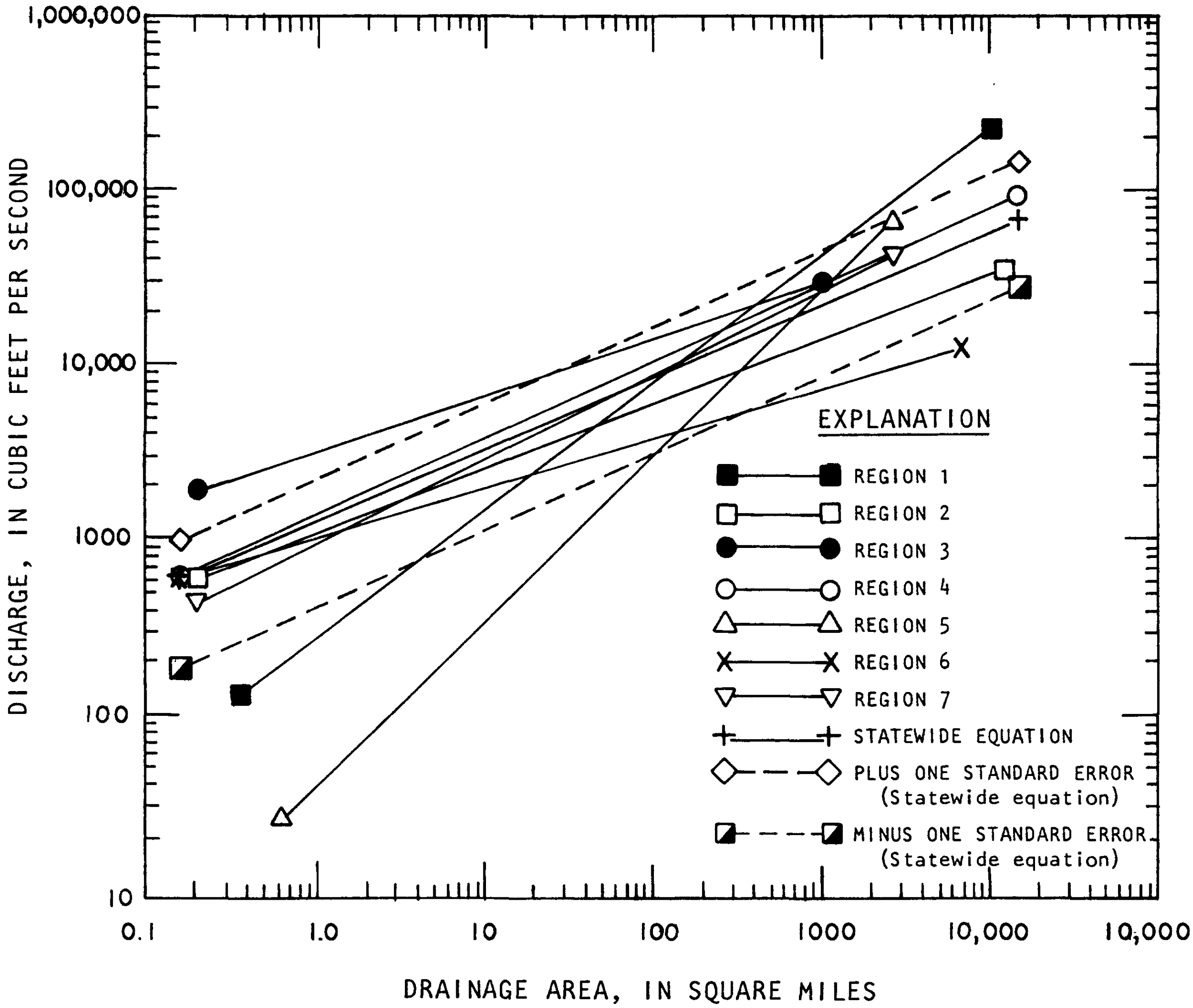


Figure 3.--Regression lines for the physiographic regions using regression equations for the 0.01 exceedance probability flood.

Major floods in the northeast plains region (region 1 in fig. 3) primarily are produced by rainfall; those in region 5 are produced by snowmelt. Floods in region 5 are smaller than floods in region 1. The regression line for region 2 indicates larger floods than those of region 1 for small drainage areas; however, region 2 has smaller floods than region 1 for larger drainage areas. The regression lines for regions 5 and 6 indicate a distinct difference between floods caused by rainfall and those caused by snowmelt; the slope of the regression line for region 6 is typical of regions that have summer thunderstorms on numerous small drainage areas.

The northwest plateau region (region 2 in fig. 3) floods generally are produced by rainfall runoff. Region 2 and region 6 have diverging flood responses, which demonstrate the need for regionalization. The slopes of the regression lines indicate larger floods for the regions in the eastern half of the State than in the western half. More intensive rainfall occurs on the eastern side of the State than on the western side. As thunderstorms develop over the Rocky Mountains and move onto the eastern plains, the precipitation intensity increases.

Floods generally are produced by rainfall runoff in the southeast mountain region (region 3 in fig. 3) and the southeast plains region (region 4 in fig. 3). Regions 3 and 4 have distinct regression lines that indicate different flood responses. The streams in region 3 have elongated drainage basins and steeper main channel slopes producing larger floods for smaller drainage areas than those in region 4, which has basins typical of the plains regions. Region 3 and 4 have similar floods for larger drainage areas.

The southwest desert region (7 in fig. 3) has floods that primarily are produced by rainfall runoff and has a flood response similar to region 4. Region 7 has similar but smaller floods than the adjacent region 3. Region 6 has a similar flood response to region 4 for small drainage areas but smaller floods for larger drainage areas.

The southwest mountain region (8) has floods that are produced primarily by snowmelt or rain-on-snow type runoff; however, no significant relation exists for the 1-percent floods in region 8.

WEIGHTING OF INDEPENDENT ESTIMATES

Flood-frequency estimates for gaged sites with short record lengths can be adjusted to reflect flood experience from sites with longer record lengths in nearby hydrologically similar watersheds. The regional regression relations of the physiographic regions are representative of hydrologically similar watersheds. The Hydrology Subcommitte of the Interagency Advisory Committe on Water Data (1982) has suggested that by weighting two independent estimates inversely proportional to their variances, the variance of the weighted estimate is less than the variance of either estimate. The weighted estimates are considered to be the best estimate at the gaged sites. The weighted flood-frequency estimate, Q_w, is determined by:

$$Q_w = \frac{Q_{Rg}\ (SE_s)^2 + Q_s\ (SE_R)^2}{(SE_s)^2 + (SE_R)^2} \qquad (2)$$

where

Q_{Rg} is the flood-frequency estimate at the gaged site from the regional equation, in cubic feet per second;

Q_s is the flood-frequency estimate from the streamflow-gaging station data, in cubic feet per second;

$(SE_R)^2$ is the variance of regional flood-frequency estimating equation or the mean square error (MSE), in log units; and

$(SE_s)^2$ is the variance of the log-Pearson type III distribution for the indicated exceedance probability, in log units, from the streamflow-gaging station data.

According to equation 2, the estimate from the station data, Q_s, is given more weight when the mean square error from the regional regression equation $(SE_R)^2$ is large, and Q_s is given less weight when the variance of the station data $(SE_s)^2$ is large. The standard error (SE_s) of the log-Pearson Type III distribution for streamflow-gaging stations was determined from the method of moments. The first three moments explain the variance of the distribution for the indicated exceedance probability. The SE_s for the station data when squared is equivalent to the variance.

The standard error of the log-Pearson Type III distribution for each indicated exceedance probability, $SE_s\ (X_p)$, was computed by the following equation adapted from Kite (1977):

$$SE_s(X_p) = \frac{S}{\sqrt{N}}\left[1 + KG + \frac{K^2}{2}\left(\frac{3G^2}{4} + 1\right) + 3K\,\frac{\partial K}{\partial G}\left(G + \frac{G^3}{4}\right) + 3\left(\frac{\partial K}{\partial G}\right)^2\left(2 + 3G^2 + \frac{5G^4}{8}\right)\right]^{0.5} \quad (3)$$

where

X_p is the indicated exceedance probability;

S is the standard deviation of logarithms, base 10, of annual peak discharges after outlier and historic-peak adjustments, in log units;

N is the number of years of systematic annual peak discharge record;

G is the coefficient of skewness of logarithms, base 10, of annual peak discharges after outlier and historic-peak adjustments and generalized skewness weighting, dimensionless; and

K is the log-Pearson Type III deviate from Hydrology Subcommitte of the Interagency Advisory Committe on Water Data (1982), dimensionless.

From equation 3, the partial derivative of K with respect to G is approximated by the following equation adapted from Kite (1977):

$$\frac{\partial K}{\partial G} \approx \frac{T^2-1}{6} + \frac{4(T^3-6T)}{6^3}G - \frac{3(T^2-1)}{6^3}G^2 + \frac{4T}{6^4}G^3 - \frac{10}{6^6}G^4 \quad (4)$$

where

T is the log-Pearson Type III deviate from Hydrology Subcommitte of the Interagency Advisory Committee on Water Data (1982) for coefficient of skewness equal to zero, dimensionless; and

G and K are as defined in equation 3.

A parameter for use in determining the standard error of the log-Pearson Type III distribution was adapted from Kite (1977) for positive coefficients of skewness. Parameter values for the 0.04 exceedance probability and for negative coefficients of skewness were computed for the log-Pearson Type III distribution, which involves both positive and negative coefficients of skewness. The parameter values in table 14 for each indicated exceedance probability were used in the following equation reduced from equation 3:

$$SE_s(X_p) = \frac{S}{\sqrt{N}} \gamma \tag{5}$$

where

γ is the parameter value determined from expression in the brackets raised to the 0.5 power in equation 3, dimensionless.

The variance of the station data $(SE_S)^2$ can be obtained from the standard error data in table 15.

The weighted flood-frequency estimate for an ungaged site near a gaged site on the same stream is recommended if the drainage area of the ungaged site is within 50 percent of the drainage area of the gaged site. The estimate can be computed by the following equation initially presented by Sauer (1974):

$$Q_z = Q_{Ru} \left[\frac{Q_w}{Q_{Rg}} - \frac{\Delta A \left[\frac{Q_w}{Q_{Rg}} - 1.00 \right]}{0.5\ A_g} \right] \tag{6}$$

where

Q_z is the weighted flood-frequency estimate at the ungaged site, in cubic feet per second;

Q_{Ru} is the flood-frequency estimate at the ungaged site from the regional equation, in cubic feet per second;

Q_{Rg} is the flood-frequency estimate at the gaged site from the regional equation, in cubic feet per second;

Q_w is the weighted flood-frequency estimate at the gaged site determined from equation 2, in cubic feet per second;

ΔA is the difference between drainage area of the gaged and ungaged sites, in square miles; and

A_g is the drainage area of the gaged site, in square miles.

ILLUSTRATIVE EXAMPLES

Procedures for estimating flood-frequency on unregulated and ungaged sites are demonstrated by the following examples:

Example 1. Estimating flood discharges using the regression equations

Estimate the flood discharge for an exceedance probability of 0.01 (recurrence interval of 100 years) for an ungaged site in the southeast mountain region that has a drainage area of 947 square miles and a mean basin elevation of 7,410 feet. Descriptions of methods to calculate the basin characteristics are given in the "Basin and Climatic Characteristics" section of the report.

Using the equation for the southeast mountain region (table 13), the flood discharge for a 0.01 exceedance probability is:

$$
\begin{aligned}
Q_{0.01} &= 2.57 \times 10^{5} A^{0.65} (E/1{,}000)^{-3.02} \\
&= (2.57 \times 10^{5}) (947)^{0.65} (7{,}410/1{,}000)^{-3.02} \\
&= 52{,}200 \text{ cubic feet per second.}
\end{aligned}
$$

Example 2. Estimating flood discharges with regression equations when the drainage area is in two regions

Estimate flood discharge for an exceedance probability of 0.04 (recurrence interval of 25 years) for an ungaged site where 59.9 square miles of the drainage area is in the southeast mountain region and 60.1 square miles is in the southeast plains region. The mean basin elevation of the drainage area is 8,150 feet, and the total drainage area is 120 square miles.

Using the equation from the southeast mountain region (table 13), the flood discharge for a 0.04 exceedance probability is:

$$
\begin{aligned}
Q_{0.04} &= 8.64 \times 10^{4} A^{0.63} (E/1{,}000)^{-2.77} \\
&= (8.64 \times 10^{4}) (59.9)^{0.63} (8{,}150/1{,}000)^{-2.77} \\
&= 3{,}410 \text{ cubic feet per second.}
\end{aligned}
$$

Using the equation from the southeast plains region (table 13), the flood discharge for a 0.04 exceedance probability is:

$$
\begin{aligned}
Q_{0.04} &= 4.13 \times 10 \; A^{0.47} (E/1{,}000)^{1.45} \\
&= (4.13 \times 10) (60.1)^{0.47} (8{,}150/1{,}000)^{1.45} \\
&= 5{,}930 \text{ cubic feet per second.}
\end{aligned}
$$

The flood discharge weighted on drainage area is:

$$Q_{0.04} = 3{,}410 \frac{(59.9)}{(120)} + 5{,}930 \frac{(60.1)}{(120)}$$

$$= 4{,}670 \text{ cubic feet per second.}$$

Example 3. Estimating flood discharge at an ungaged site near a gaged site on the same stream

Estimate flood discharge for an exceedance probability of 0.02 (recurrence interval of 50 years) for an ungaged site on the Pecos River in the southeast plains region that has a drainage area of 750 square miles and the mean basin elevation of the ungaged site is 7,990 feet. The drainage area of the ungaged site is within 50 percent of the gaged site (08379500). The the mean basin elevation of the gaged site is 7,920 feet (table 7), and the drainage area is 1,050 square miles.

Using the equation for the southeast plains region (table 13), the flood discharge at the gaged site and at the ungaged site for an exceedance probability of 0.02 is:

$$Q_{0.02} = (1.08 \times 10^2) \quad A^{0.45} \quad (E/1{,}000)^{1.18}$$

$$= (1.08 \times 10^2) \quad (1{,}050)^{0.45} \quad (7{,}920/1{,}000)^{1.18} \quad \text{gaged site}$$

$$= (1.08 \times 10^2) \quad (750)^{0.45} \quad (7{,}990/1{,}000)^{1.18} \quad \text{ungaged site}$$

$$Q_{0.02} = Q_{Rg} = 28{,}400 \text{ cubic feet per second}$$

$$= Q_{Ru} = 24{,}700 \text{ cubic feet per second.}$$

The standard error of estimate from the regression equation (SE_R) used is 0.180 in log units (table 13). The flood discharge for an exceedance probability of 0.02 for the gaged site (08379500) based on the gaging station data (Q_s) is 31,900 cubic feet per second (table 3). Standard error (SE_s) of the log-Pearson Type III distribution for an exceedance probability of 0.02 for the streamflow-gaging station (08379500) is 0.100 in log units (table 15). The standard error for the station data (SE_s) and for the regression equation (SE_R) both are squared to obtain the variance.

From equation 2, the weighted flood discharge for an exceedance probability of 0.02 is:

$$Q_w = \frac{Q_{Rg} \ (SE_s)^2 + Q_s \ (SE_R)^2}{(SE_s)^2 + (SE_R)^2}$$

$$= \frac{(28{,}400) \ (0.100)^2 + (31{,}900) \ (0.180)^2}{(0.100)^2 + (0.180)^2}$$

$$= 31{,}100 \text{ cubic feet per second.}$$

Now, equation 6 can be used to calculate the flood discharge at the ungaged site. The difference in drainage area between the gaged and ungaged site, ΔA, is 300 square miles. The final estimate of flood discharge for the ungaged site for an exceedance probability of 0.02 is:

$$Q_{0.02} = Q_{Ru} \left[\frac{Qw}{Q_{Rg}} - \frac{\Delta A \left[\frac{Qw}{Q_{Rg}} - 1.00 \right]}{0.5 \ A_g} \right]$$

$$= (24{,}700) \left[\frac{(31{,}100)}{(28{,}400)} - \frac{(+300) \left[\frac{(31{,}100)}{(28{,}400)} - 1.00 \right]}{(0.5) \ (1{,}050)} \right]$$

$$= 25{,}700 \text{ cubic feet per second.}$$

ACCURACY AND LIMITATIONS

The accuracy of a simple- or multiple-regression equation usually is measured by the standard error of estimate (SE_R). The standard error of estimate is expressed as a percentage in this report, and it is the standard deviation of the distribution (normal) of residuals about the regression line. If the standard error of estimate of a regression equation is 38 percent, about 67 percent of all values used to develop the regression equations will be within 38 percent of the estimated values and about 95 percent of all values will be within 76 percent of the estimated values or two standard errors of estimate.

The average standard error of estimate for an exceedance probability of 0.02 for the regional regression equations ranged from 42-78 percent (table 13). Thomas and Gold (1982) reported a standard error of estimate for the statewide $Q_{0.02}$ equation of 99 percent. Scott (1971) reported that the standard error of estimate for three regional $Q_{0.02}$ equations ranged from 74 to 124 percent. Borland (1970) reported a standard error of estimate for the statewide $Q_{0.02}$ equation of 102 percent.

The regression equations were developed from streamflow-gaging station data for essentially unregulated streams. The equations are intended to provide the best estimate of a flood discharge for selected exceedance probabilities for ungaged sites on unregulated streams in New Mexico. The equations also are intended for use in making estimates at ungaged sites near gaged sites on the same stream.

The regression equations will not be valid where unique localized physiographic features affect floods. Some regions, in particular the southeast plains region (4) and the central mountain-valley region (6), lack streamflow-gaging stations in certain parts of the region. For example, limited data exist east of the Pecos River in region 4 and essentially no data exist in the Sandia Mountains of region 6.

The recommended use of the regional equations is limited to the range of basin and climatic characteristics given in table 12. The use of the regional equations is not intended to preclude any hydrologic judgement that may provide a better estimate. It needs to be emphasized that the equations are only a means to estimate flood discharges. Increased knowledge of the hydrology in a specific area may provide an estimate different from the results of the regional equations in this report. The "Weighting of Independent Estimates" section of this report presents a rationale for evaluating the variance in the regional equations with the variance of the log-Pearson Type III distribution of flood peaks at any gaged site. The weighted estimates are considered to be the best estimate at gaged sites.

SUMMARY

Flood-frequency data at gaging stations and various basin and climatic characteristics were used to develop multiple- and simple-regression equations for flood discharges with exceedance probabilities of 0.50, 0.20, 0.10, 0.04, 0.02 and 0.01 for eight regions in New Mexico. The following basin and climatic characteristics were found to be significant in the regional regression relations. Drainage area was found significant in all regions. Mean basin elevation or the average of channel elevations also was found to be significant in some regions. Mean minimum January temperature was only significant in the southwest mountain region. Maximum precipitation intensity for 24-hour storms was significant in some regions. The maximum number of significant basin and climatic characteristics in the regression equations for three regions was three and the least was one for three regions. The average standard error of estimate for floods with an exceedance probability of 0.01 ranged from 44 to 81 percent although no suitable relation could be developed for the southwest mountain region. The standard error of estimate for all exceedance probabilities was improved considerably compared to previous studies.

The method recommended by the Hydrology Subcommittee of the Interagency Advisory Committee on Water Data (1982) for weighting independent flood-frequency estimates based on measured and predicted values is presented. The measured flood-frequency data at streamflow-gaging stations, regression equations for predicting flood-frequency estimates and the associated standard error of estimates, and the variance of the measured streamflow-gaging station data are presented for computing weighted independent estimates. The weighted estimates are considered by the Hydrology Subcommittee of the Interagency Advisory Committee on Water Data (1982) to be the best estimates at gaging stations. A method is presented for transferring data from a gaged site to an ungaged site on the same stream using the weighted flood-frequency estimate. Updated or additional flood-frequency curve computations need to be calculated using the generalized skew coefficients and mean square error of the generalized skew coefficients (table 2) as computed for this analysis.

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Table 1. Studies by the U.S. Geological Survey relating to flood frequency

Study title	Date	Author	Type of study: Index flood	Type of study: Multiple regression	Part of New Mexico covered in study	Number of stations: Entire study	Number of stations: New Mexico only	Form of release
The Rio Grande of New Mexico, magnitude and frequency of floods	1952	H. H. Hudson	x	--	Main stem Rio Grande	12	12	Unpublished data
Floods in north-central New Mexico, frequency and magnitude	1953	H. H. Hudson	x	--	North-central New Mexico	32	32	Unpublished data
Magnitude and frequency of summer floods in western New Mexico and eastern Arizona	1954	F. W. Kennon	x	--	Distinct areas in north-central and in southwest New Mexico	51	27	Unpublished data
Floods in New Mexico, magnitude and frequency	1962	L. A. Wiard	x	--	All of New Mexico	120	102	Published report
Magnitude and frequency of floods in the United States, part 7, lower Mississippi River basin	1964	J. L. Patterson	x	--	Eastern New Mexico	393	17	Published report
Magnitude and frequency of floods in the United States, part 8, western Gulf of Mexico basins	1965	J. L. Patterson	x	--	Central New Mexico	298	79	Published report
Magnitude and frequency of floods in the United States, part 9, Colorado River basin	1966	J. L. Patterson and W. P. Sommers	x	--	Western New Mexico	342	14	Published report

Table 1. Studies by the U.S. Geological Survey relating to flood frequency - Concluded

Study title	Date	Author	Type of study		Part of New Mexico covered in study	Number of stations		Form of release
			Index flood	Multiple regression		Entire study	New Mexico only	
A proposed streamflow-data program for New Mexico	1970	J. P. Borland	—	x	All of New Mexico	163	163	Published report
Preliminary flood-frequency relations and summary of maximum discharges in New Mexico	1971	A. G. Scott	—	x	All of New Mexico	163	163	Published report
Flood discharges of streams in New Mexico as related to channel geometry	1976	A. G. Scott and J. L. Kunkler	—	x	All of New Mexico	79	79	Published report
Small streams flood-frequency relations for the central Rio Grande Valley of New Mexico	1980	R. P. Thomas and J. P. Borland	—	x	Central Rio Grande Valley	15	15	Unpublished data
Techniques for estimating flood discharges for unregulated streams in New Mexico	1982	R. P. Thomas and R. L. Gold	—	x	All of New Mexico	277	246	Published report
Use of selected basin characteristics to estimate mean annual runoff and peak discharges for ungaged streams in drainage basins containing strippable coal resources, northwestern New Mexico	1984	H. R. Hejl, Jr.	—	x	Northwestern New Mexico	9	9	Published report

Table 2. Coefficients of skewness and variance for stations with 25 or more years of record

Region	Number of stations	Coefficient of skewness: Mean	Coefficient of skewness: Median 1/	Variance 2/ (log units)
Northeast plains region (1)	12	-0.149	-0.220	0.391
Northwest plateau region (2)	16	.075	.055	.172
Southeast mountain region (3)	13	-.061	-.062	.254
Southeast plains region (4)	10	.124	-.166	.068
Northern mountain region (5)	37	-.002	-.032	.220
Central mountain-valley region (6)	22	-.064	-.039	.211
Southwest desert region (7)	13	.034	.025	.283
Southwest mountain region (8)	7	.266	.297	.279

1/ Used for generalized (G) skew coefficient in flood-frequency computations.
2/ Used for mean square error (MSE) of generalized skew coefficient in flood-frequency computations.

Table 3. Flood-frequency characteristics for streamflow-gaging stations

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities					
		0.50	0.20	0.10	0.04	0.02	0.01
		Northeast plains region (1)					
07153500	33	2,860	6,800	10,900	18,100	25,400	34,500
07154400	30	2,020	5,820	10,000	17,800	25,700	35,600
07154500	30	6,390	16,200	26,200	43,300	59,700	79,500
07154650	17	1,710	4,450	7,250	12,100	16,700	22,400
07201200	12	80	288	569	1,190	1,910	2,950
07203600	12	119	310	509	859	1,200	1,630
07214000	30	9,740	25,900	44,100	78,700	115,000	164,000
07220900	29	1,060	2,570	4,060	6,570	8,930	11,800
07221500	48	8,380	22,000	37,000	64,800	93,600	131,000
07222300	24	2,040	5,260	8,570	14,400	20,000	26,900
07222500	46	3,500	8,410	13,700	23,500	33,600	46,900
07222800	10	1,010	3,540	6,810	13,700	21,400	32,100
07225000	28	907	2,160	3,340	5,260	7,000	9,010
07225500	12	6,160	9,280	11,500	14,600	17,000	19,500
07226300	27	325	663	957	1,410	1,810	2,260
07226500	42	6,790	17,300	27,600	44,700	60,400	78,700
07227000	19	43,000	89,400	133,000	205,000	272,000	353,000
07227050	30	174	331	467	681	873	1,090
07227100	23	5,880	11,900	17,300	25,900	33,800	43,000
07227200	17	850	5,450	14,000	37,800	70,800	124,000
07227295	27	50	143	249	446	650	912
		Northwest plateau region (2)					
09344000	41	651	898	1,060	1,280	1,440	1,610
09346200	26	954	1,490	1,880	2,430	2,860	3,320
09346400	21	3,710	5,730	7,210	9,230	10,800	12,500
09349800	20	2,340	4,230	5,800	8,160	10,200	12,500
09350500	43	6,830	10,700	13,600	17,600	20,800	24,300
09350800	27	231	588	967	1,660	2,350	3,240
09355000	32	343	622	857	1,220	1,530	1,880
09356500	27	9,240	15,000	19,400	25,500	30,500	35,800
09356520	12	64	213	403	800	1,250	1,870
09357200	31	125	249	359	532	686	864

Table 3. **Flood-frequency characteristics for streamflow-gaging stations - Continued**

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities					
		0.50	0.20	0.10	0.04	0.02	0.01
		Northwest plateau region (2) - Concluded					
09363100	22	215	402	559	794	997	1,220
09363500	48	5,700	8,080	9,730	11,900	13,600	15,300
09364500	69	5,940	8,950	11,100	14,000	16,300	18,700
09366500	63	775	1,630	2,410	3,670	4,820	6,170
09367400	13	62	208	396	791	1,240	1,870
09367840	33	252	592	924	1,480	2,010	2,650
09367860	29	1,080	2,430	3,720	5,860	7,880	10,300
09367880	18	1,700	3,030	4,100	5,690	7,030	8,510
09367900	31	430	1,060	1,700	2,830	3,940	5,310
09367950	18	2,840	5,550	7,890	11,500	14,600	18,200
09368000	35	14,900	25,700	34,500	47,300	58,300	70,400
09371100	10	555	841	1,050	1,330	1,550	1,780
09379060	14	13	52	108	236	392	617
09387050	26	110	265	420	688	946	1260
09395500	31	2,240	5,590	8,980	14,800	20,500	27,400
09395600	24	69	177	288	485	679	920
09395900	18	2,510	4,530	6,160	8,570	10,600	12,900
		Southeast mountain region (3)					
08387000	29	234	482	707	1,070	1,400	1,780
08388000	40	976	2,930	5,200	9,590	14,300	20,400
08389500	38	1,990	5,360	8,870	15,000	21,000	28,300
08390050	12	36	146	298	634	1,030	1,580
08390100	14	2,450	7,300	13,000	24,100	36,200	52,100
08390500	43	2,900	8,320	14,500	26,500	39,300	56,000
08393200	18	658	2,450	4,790	9,700	15,200	22,700
08394500	51	3,310	15,800	31,900	61,800	90,900	125,000
08397400	16	19	72	140	282	438	646
08397600	29	1,480	5,190	10,100	20,900	33,600	51,700
08398500	31	2,270	6,840	12,000	21,800	31,900	44,700
08400000	31	381	3,660	11,300	35,700	73,400	138,000
08401200	19	1,190	7,500	19,100	50,700	94,300	164,000
08401800	14	4,740	16,900	32,500	64,800	101,000	149,000
08401900	19	3,100	15,900	34,000	71,500	111,000	162,000

Table 3. Flood-frequency characteristics for streamflow-gaging stations - Continued

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities 0.50	0.20	0.10	0.04	0.02	0.01
		Southeast mountain region (3) - Concluded					
08405050	24	102	241	372	586	782	1,010
08405100	13	2,880	4,950	6,600	8,980	11,000	13,200
08405500	37	2,630	10,500	21,300	44,800	71,800	109,000
08408500	45	4,040	11,800	21,300	40,800	62,900	93,600
08480650	23	964	1,920	2,750	4,060	5,220	6,550
08480700	25	123	366	636	1,130	1,630	2,260
08481000	22	2,080	4,990	7,810	12,500	16,800	21,900
08481100	25	257	941	1,810	3,570	5,480	8,020
08481500	35	722	1,760	2,790	4,530	6,180	8,170
08482000	11	2,230	4,900	7,340	11,300	14,800	18,900
		Southeast plains region (4)					
08379300	28	1,590	3,820	6,130	10,300	14,500	19,700
08379500	62	6,610	12,300	17,300	25,000	31,900	39,900
08379550	11	185	558	1,020	1,950	3,000	4,450
08379600	31	17	61	123	263	433	683
08380300	23	103	431	939	2,200	3,850	6,420
08380500	66	621	1,660	2,820	5,040	7,380	10,500
08381000	57	467	1,190	1,970	3,420	4,910	6,840
08382000	12	2,730	4,100	5,100	6,490	7,600	8,790
08382500	31	3,440	7,060	10,400	15,900	20,900	27,000
08383000	55	8,510	18,100	27,100	42,200	56,400	73,600
08383500	44	9,400	16,500	22,300	31,000	38,600	47,200
08384500	22	8,630	15,000	20,300	28,200	35,100	42,700
08385530	20	31	139	314	763	1,370	2,350
08385600	31	1,560	3,680	5,860	9,750	13,600	18,500
08385670	20	420	807	1,150	1,690	2,170	2,740
08393600	24	12	71	186	532	1,060	2,000
08396500	27	10,300	21,100	31,200	47,800	63,200	81,700
08480150	22	1,280	2,460	3,250	5,190	6,710	8,490

Table 3. **Flood-frequency characteristics for streamflow-gaging stations - Continued**

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities					
		0.50	0.20	0.10	0.04	0.02	0.01
		Northern mountain region (5)					
07124500	62	6,550	12,800	17,900	25,600	32,100	39,200
07199000	35	2,910	6,800	10,700	17,400	23,900	32,000
07201000	27	434	1,090	1,780	2,990	4,200	5,690
07203000	54	1,740	3,320	4,690	6,800	8,660	10,800
07204000	45	62	129	186	270	341	417
07205000	49	28	55	79	116	148	184
07206400	20	18	38	57	88	116	148
07207500	38	469	1,230	2,060	3,580	5,140	7,130
07208500	60	153	363	588	1,010	1,450	2,020
07211000	52	819	2,590	4,670	8,710	13,000	18,500
07211500	43	5,800	13,800	22,300	38,000	54,300	75,400
07214500	24	569	1,640	2,840	5,070	7,360	10,300
07214800	14	203	457	697	1,090	1,460	1,890
07215500	50	592	951	1,210	1,550	1,810	2,080
07216500	57	808	1,700	2,550	3,980	5,350	7,000
07217000	12	46	180	368	786	1,280	1,990
07217100	17	123	340	578	1,020	1,460	2,030
07218000	54	616	1,360	2,060	3,200	4,250	5,500
07220000	17	2,460	4,200	5,570	7,540	9,190	11,000
07221000	65	2,410	5,790	9,010	14,300	19,100	24,800
08246500	43	2,700	3,690	4,360	5,210	5,850	6,490
08247500	58	471	819	1,080	1,430	1,700	1,980
08248000	64	1,280	1,900	2,320	2,840	3,220	3,600
08252500	44	60	136	212	343	471	630
08253000	46	59	99	129	168	200	232
08253500	45	8	12	16	20	23	26
08255000	10	31	71	108	168	221	281
08263000	32	48	77	99	129	153	178
08264000	24	107	166	208	263	305	348
08264500	10	95	159	207	272	323	377

Table 3. Flood-frequency characteristics for streamflow-gaging stations - Continued

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities 0.50	0.20	0.10	0.04	0.02	0.01
		Northern mountain region (5) - Concluded					
08265000	53	244	434	583	795	969	1160
08267000	28	312	473	584	729	839	950
08267500	48	155	260	339	449	537	630
08268500	48	153	318	466	698	907	1,150
08269000	48	158	343	509	770	1,000	1,270
08271000	54	114	186	238	306	358	412
08275000	19	53	122	186	289	382	488
08275500	30	121	265	392	587	757	947
08275600	24	72	156	231	350	457	578
08279000	46	911	1,820	2,560	3,620	4,490	5,410
08281200	13	575	929	1,190	1,550	1,840	2,150
08283500	33	4,030	5,780	6,950	8,450	9,570	10,700
08284100	27	3,580	6,070	7,960	10,600	12,700	14,900
08284300	20	137	387	661	1,170	1,680	2,330
08284500	34	1,170	1,880	2,400	3,120	3,690	4,290
08288000	33	227	412	562	785	975	1,180
08289000	51	1,010	1,700	2,210	2,890	3,420	3,970
08291000	52	300	608	881	1,310	1,700	2,140
08294300	13	102	233	360	572	772	1,010
08295000	33	205	639	1,150	2,140	3,180	4,530
08295200	18	7	13	17	23	28	34
08302200	11	9	15	20	27	32	38
08377900	19	214	374	499	678	825	984
08378500	59	592	1,090	1,490	2,070	2,560	3,080
		Central mountain-valley region (6)					
08286650	14	969	1,540	1,970	2,550	3,010	3,490
08290000	17	5,150	7,830	9,750	12,300	14,300	16,400
08292000	25	110	248	382	607	820	1,080
08293700	11	99	229	355	566	764	1,000
08313100	31	12	74	186	487	897	1,540

Table 3. Flood-frequency characteristics for streamflow-gaging stations - Continued

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities 0.50	0.20	0.10	0.04	0.02	0.01
		Central mountain-valley region (6) - Concluded					
08316000	13	96	234	374	619	859	1,160
08316600	13	140	243	323	437	531	631
08317500	26	860	1,300	1,600	2,000	2,310	2,620
08317600	28	1,610	3,660	5,550	8,580	11,300	14,400
08317700	28	381	858	1,300	2,020	2,670	3,430
08317720	13	131	315	500	818	1,130	1,500
08318000	26	6,380	11,200	15,000	20,500	25,000	29,900
08318900	29	905	2,080	3,200	5,020	6,710	8,680
08321500	20	489	923	1,280	1,800	2,240	2,730
08321900	26	236	391	508	668	796	931
08323000	33	385	779	1,130	1,680	2,170	2,740
08324000	38	1,390	2,540	3,470	4,830	5,960	7,210
08330500	30	991	2,380	3,770	6,130	8,390	11,100
08330600	28	856	1,370	1,750	2,280	2,690	3,140
08331100	28	163	323	456	654	821	1,000
08331650	21	422	1,230	2,160	3,950	5,830	8,270
08331700	26	90	150	196	263	317	377
08334000	31	1,870	3,490	4,780	6,630	8,160	9,800
08340500	39	4,280	7,470	9,920	13,300	16,100	19,000
08341300	25	162	411	668	1,120	1,560	2,100
08342000	13	1,030	2,030	2,890	4,200	5,340	6,620
08343100	20	284	683	1,070	1,730	2,350	3,090
08351500	39	1,750	3,540	5,130	7,620	9,850	12,400
08352500	43	7,100	12,600	17,000	23,400	28,800	34,700
08353000	43	3,940	7,100	9,660	13,400	16,500	19,900
08353500	26	1,820	3,810	5,530	8,150	10,400	12,900
08354000	35	6,940	15,900	23,100	33,100	40,900	48,800
08358600	22	102	310	544	977	1,410	1,960
08488170	15	42	129	233	436	653	939
08488200	22	264	644	1,020	1,670	2,280	3,030
08488600	14	330	823	1,320	2,170	2,990	3,980

Table 3. **Flood-frequency characteristics for streamflow-gaging stations - Continued**

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities					
		0.50	0.20	0.10	0.04	0.02	0.01
		Southwest desert region (7)					
08359400	24	174	339	477	686	865	1,060
08360000	36	2,070	4,320	6,320	9,420	12,200	15,300
08361650	30	557	1,010	1,400	2,000	2,540	3,160
08361700	25	991	2,160	3,330	5,380	7,400	9,930
08361800	24	1,170	3,270	5,580	9,830	14,200	19,600
08363100	27	125	210	272	356	422	491
08477500	30	2,940	6,710	10,200	15,800	20,900	26,700
08478800	15	61	145	228	369	506	671
08479300	24	23	518	777	1,200	1,590	2,050
09384000	42	852	2,220	3,790	6,840	10,200	14,600
09384200	14	21	72	139	286	457	701
09430500	56	1,740	4,720	8,230	15,300	23,200	34,000
09430900	27	3,570	5,620	7,130	9,230	10,900	12,700
09431000	29	5,510	10,000	13,800	19,500	24,400	29,900
09431500	50	6,040	12,200	18,100	28,200	38,000	50,100
09438200	24	706	1,370	1,920	2,740	3,430	4,190
09443000	20	5,160	13,200	22,600	41,300	62,000	90,600
09444000	56	2,530	5,500	8,480	13,700	18,900	25,400
09444200	16	4,690	12,000	20,200	36,300	53,700	77,200
09444500	72	7,170	18,500	31,000	54,500	79,200	112,000
09536350	14	43	112	179	288	387	501
09537500	58	1,760	2,860	3,630	4,630	5,380	6,140
		Southwest mountain region (8)					
08477000	42	501	947	1,350	1,990	2,580	3,270
08477560	24	499	638	731	853	945	1,040
08477570	17	428	938	1,430	2,270	3,070	4,050
08477580	25	634	1,470	2,290	3,700	5,050	6,700
08477600	12	1,930	3,080	4,010	5,380	6,550	7,860

Table 3. Flood-frequency characteristics for streamflow-gaging stations - Concluded

Station number	Years of record	Discharge, in cubic feet per second, for indicated exceedance probabilities					
		0.50	0.20	0.10	0.04	0.02	0.01
Southwest mountain region (8) - Concluded							
08478000	29	457	1,010	1,560	2,500	3,410	4,530
09383500	15	102	222	342	550	754	1,010
09386100	29	294	513	704	1,000	1,280	1,590
09442630	13	42	98	157	261	365	497
09442650	19	53	136	229	410	606	870
09442660	30	148	494	970	2,060	3,430	5,480
09442680	25	848	2,280	4,020	7,650	11,800	17,800
09442692	17	90	227	378	661	958	1,350
09442695	23	180	527	966	1,910	3,010	4,610
09442740	28	338	786	1,260	2,150	3,070	4,270
09489070	13	227	582	963	1,670	2,390	3,320

Table 4. Basin characteristics for streamflow-gaging stations in northeast plains region (1)

Station number	Station name	Drainage area (A) (square miles)
07153500	Dry Cimmarron River near Guy, New Mexico	545
07154400	Carrizozo Creek near Kenton, Oklahoma	111
07154500	Cimmarron River near Kenton, Oklahoma	1,110
07154650	Tesequite Creek near Kenton, Oklahoma	25.4
07201200	Chicorico Creek tributary near Raton, New Mexico	5.20
07203600	Rio Del Plano tributary near Taylor Springs, New Mexico	6.70
07214000	Canadian River near Roy, New Mexico	4,070
07220900	Dog Creek near Shoemaker, New Mexico	18.4
07221500	Canadian River near Sanchez, New Mexico	6,020
07222300	Trementina Creek at Trementina, New Mexico	65.0
07222500	Conchas River at Variadero, New Mexico	523
07222800	Garita Creek tributary near Variadero, New Mexico	12.0
07225000	Pajarito Creek at Newkirk, New Mexico	55.0
07225500	Ute Creek near Gladstone, New Mexico	256
07226300	Carrizo Creek near Roy, New Mexico	68.0
07226500	Ute Creek near Logan, New Mexico	2,060
07227000	Canadian River at Logan, New Mexico	11,100
07227050	Plaza Largo Creek tributary near Ragland, New Mexico	.40
07227100	Revuelto Creek near Logan, New Mexico	786
07227200	Tramperos Creek near Stead, New Mexico	556
07227295	Sandy Arroyo tributary near Clayton, New Mexico	1.30

Table 5. Basin characteristics for streamflow-gaging stations in northwest plateau region (2)

Station number	Station name	Drainage area (A) (square miles)
09344000	Navajo River at Banded Peak Ranch, near Chromo, Colorado	69.8
09346200	Rio Amargo at Dulce, New Mexico	168
09346400	San Juan River near Carracas, New Mexico	1,230
09349800	Piedra River near Arboles, Colorado	629
09350500	San Juan River at Rosa, New Mexico	1,990
09350800	Vaqueros Canyon near Gobernador, New Mexico	60.5
09355000	Spring Creek at La Boca, Colorado	58.0
09356500	San Juan River near Blanco, New Mexico	3,560
09356520	Burro Canyon near Lindrith, New Mexico	9.10
09357200	Gallegos Canyon tributary near Nageezi, New Mexico	.20
09363100	Salt Creek near Oxford, Colorado	16.7
09363500	Animas River near Cedar Hill, New Mexico	1,090
09364500	Animas River at Farmington, New Mexico	1,360
09366500	La Plata River at Colorado-New Mexico State line	331
09367400	La Plata River tributary, near Farmington, New Mexico	1.00
09367840	Yazzie Wash near Mexican Springs, New Mexico	2.10
09367860	Chusca Wash near Mexican Springs, New Mexico	8.70
09367880	Catron Wash near Mexican Springs, New Mexico	26.9
09367900	Black Springs Wash near Mexican Springs, New Mexico	7.00
09367950	Chaco River near Waterflow, New Mexico	4,350
09368000	San Juan River at Shiprock, New Mexico	12,900
09371100	Teec Nos Pos Wash near Teec Nos Pos, Arizona	16.0
09379060	Lukachukai Creek tributary near Lukachukai, Arizona	1.40
09387050	Galestena Canyon tributary near Black Rock, New Mexico	19.0
09395500	Puerco River at Gallup, New Mexico	558
09395600	Wagon Trail Wash near Gamerco, New Mexico	.40
09395900	Black Creek near Lupton, Arizona	500

Table 6. Basin and climatic characteristics for streamflow-gaging stations in southeast mountain region (3)

Station number	Station name	Drainage area (A) (square miles)	Mean basin elev-ation (E) (feet)	Maximum 24-hour precipitation intensity for 2-year recurrence interval (I24,2) (inches)
08387000	Rio Ruidoso at Hollywood, New Mexico	120	9,060	1.80
08388000	Rio Ruidoso at Hondo, New Mexico	290	7,760	1.90
08389500	Rio Bonito at Hondo, New Mexico	295	7,900	1.90
08390050	Rio Hondo tributary at Tinnie, New Mexico	.23	5,150	1.90
08390100	Rio Hondo at Picacho, New Mexico	715	7,740	1.50
08390500	Rio Hondo at Diamond A Ranch near Roswell New Mexico	947	7,400	1.96
08393200	Rocky Arroyo above Two Rivers reservoirs near Roswell, New Mexico	31.0	4,550	1.98
08394500	Rio Felix at old highway bridge, near Carlsbad, New Mexico	932	7,070	1.95
08397400	Hyatt Canyon near Cloudcroft, New Mexico	3.08	8,320	2.20
08397600	Rio Penasco near Dunken, New Mexico	583	8,000	2.00
08398500	Rio Penasco at Dayton, New Mexico	1,060	7,000	2.00
08400000	Fourmile Draw near Lakewood, New Mexico	265	4,690	2.00
08401200	South Seven Rivers near Lakewood, New Mexico	220	4,020	2.00
08401800	Rocky Arroyo near Carlsbad, New Mexico	254	4,890	2.00
08401900	Rocky Arroyo at highway bridge near Carlsbad, New Mexico	285	4,630	2.00
08405050	Last Chance Canyon tributary near Carlsbad Caverns, New Mexico	.20	4,180	2.00
08405100	Mosley Canyon near White City, New Mexico	14.6	3,630	2.00
08405500	Black River above Malaga, New Mexico	343	4,540	2.00

Table 6. Basin and climatic characteristics for streamflow-gaging stations in southeast mountain region (3) - Concluded

Station number	Station name	Drainage area (A) (square miles)	Mean basin elev-ation (E) (feet)	Maximum 24-hour precipitation intensity for 2-year recurrence interval (I24,2) (inches)
08408500	Delaware River near Red Bluff, New Mexico	689	4,160	2.00
08480650	Minie Hall Draw near Three Rivers, New Mexico	9.70	5,440	1.55
08480700	Indian Creek near Three Rivers, New Mexico	6.80	7,900	1.70
08481000	Three Rivers at Three Rivers, New Mexico	96.0	6,430	1.55
08481100	Tularosa Basin tributary near Three Rivers, New Mexico	13.8	5,590	1.55
08481500	Rio Tularosa near Bent, New Mexico	120	7,580	1.70
08482000	Rio Tularosa near Tularosa, New Mexico	140	7,400	1.60

Table 7. Basin and climatic characteristics for streamflow-gaging stations in southeast plains region (4)

Station number	Station name	Drainage area (A) (square miles)	Mean basin elev-ation (E) (feet)	Maximum 24-hour precipitation intensity for 100-year recurrence interval (I24,100) (inches)
08379300	Tecolote Creek at Tecolote, New Mexico	122	7,390	4.22
08379500	Pecos River near Anton Chico, New Mexico	1,050	7,920	3.98
08379550	Canon Blanco near Leyba, New Mexico	11.2	6,660	3.57
08379600	Pecos River tributary near Dilia, New Mexico	.20	5,450	4.04
08380300	Sandoval Canyon at Gallinas, New Mexico	7.60	7,600	5.03
08380500	Gallinas Creek near Montezuma, New Mexico	84.0	7,810	5.03
08381000	Gallinas Creek at Montezuma, New Mexico	87.0	7,800	5.00
08382000	Gallinas River near Lourdes, New Mexico	313	7,500	4.33
08382500	Gallinas River near Colonias, New Mexico	610	5,920	4.19
08383000	Pecos River at Santa Rosa, New Mexico	2,650	7,110	4.37
08383500	Pecos River near Puerto De Luna, New Mexico	3,970	6,680	4.75
08384500	Pecos River below Alamogordo Dam, New Mexico	4,390	6,250	4.88
08385530	Alamosa Creek tributary near Jordan, New Mexico	9.70	4,950	5.54
08385600	Yeso Creek near Fort Sumner, New Mexico	242	4,720	5.19
08385670	Aragon Creek tributary near Encinoso, New Mexico	6.10	6,780	4.25
08393600	North Spring River at Roswell, New Mexico	19.5	3,600	5.00
08396500	Pecos River near Artesia, New Mexico	15,300	6,500	5.00
08480150	White Oaks Canyon near Carrizozo, New Mexico	31.0	5,450	4.00

Table 8. Basin and climatic characteristics for streamflow-gaging stations in northern mountain region (5)

Station number	Station name	Drainage area (A) (square miles)	Mean basin elevation (E) (feet)	Maximum 24-hour precipitation intensity for indicated recurrence interval in years 10 (I24,10) (inches)	25 (I24,25)	50 (I24,50)	100 (I24,100)
07124500	Purgatoire River at Trinidad, Colorado	795	8,000	2.99	3.40	3.80	4.20
07199000	Canadian River near Hebron, New Mexico	229	8,300	3.56	4.34	4.90	5.39
07201000	Raton Creek at Raton, New Mexico	14.4	8,100	3.64	4.45	5.00	5.50
07203000	Vermejo River near Dawson, New Mexico	301	9,350	3.61	4.41	5.00	5.50
07204000	Moreno Creek at Eagle Nest, New Mexico	73.8	10,200	2.00	2.49	2.70	3.00
07205000	Sixmile Creek near Eagle Nest, New Mexico	10.5	9,500	2.00	2.39	2.60	2.90
07206400	Clear Creek near Ute Park, New Mexico	7.44	9,770	3.45	4.24	4.60	5.12
07207500	Ponil Creek near Cimarron, New Mexico	171	9,350	3.48	4.19	4.80	5.51
07208500	Rayado Creek at Sauble Ranch near Cimarron, New Mexico	65.0	10,400	3.36	4.05	4.52	5.11
07211000	Cimarron River at Springer, New Mexico	1,032	9,160	3.20	3.99	4.40	5.00
07211500	Canadian River near Taylor Springs, New Mexico	2,850	8,640	3.20	3.98	4.40	5.00
07214500	Mora River near Holman, New Mexico	57.0	10,000	2.55	3.78	3.32	3.71
07214800	Rio La Casa near Cleveland, New Mexico	23.0	9,000	3.52	3.98	4.53	5.20
07215500	Mora River at La Cueva, New Mexico	173	9,540	3.19	3.96	4.42	5.18
07216500	Mora River near Golondrinas, New Mexico	267	9,400	3.38	3.92	4.52	5.14
07217000	Coyote Creek below Black Lake, New Mexico	48.0	9,300	2.80	3.32	3.82	3.88
07217100	Coyote Creek above Guadalupita, New Mexico	71.0	9,420	3.38	3.84	4.42	5.04
07218000	Coyote Creek near Golondrinas, New Mexico	215	8,760	3.35	4.10	4.52	5.15

Table 8. Basin and climatic characteristics for streamflow-gaging stations in northern mountain region (5) - Continued

Station number	Station name	Drainage area (A) (square miles)	Mean basin elevation (E) (feet)	Maximum 24-hour precipitation intensity for indicated recurrence interval in years (inches) 10 (I24,10)	25 (I24,25)	50 (I24,50)	100 (I24,100)
07220000	Sapello River at Sapello, New Mexico	132	7,950	3.30	4.08	4.51	5.09
07221000	Mora River near Shoemaker, New Mexico	1,100	9,020	3.28	4.03	4.50	5.09
08246500	Conejos River near Mogote, Colorado	282	10,300	1.92	2.32	2.60	3.00
08247500	San Antonio River at Ortiz, Colorado	110	9,500	1.87	2.20	2.47	2.98
08248000	Los Pinos River near Ortiz, Colorado	167	9,900	1.93	2.30	2.52	2.86
08252500	Costilla Creek above Costilla Dam, New Mexico	25.1	11,430	3.19	4.00	4.20	4.80
08253000	Casias Creek near Costilla; New Mexico	16.6	11,100	3.20	3.60	4.00	4.50
08253500	Santistevan Creek near Costilla, New Mexico	2.15	10,500	2.92	3.60	3.80	4.20
08255000	Ute Creek near Amalia, New Mexico	12.0	10,700	2.69	3.39	3.80	3.93
08263000	Latir Creek near Cerro, New Mexico	10.5	11,500	2.01	2.43	2.60	2.90
08264000	Red River near Red River, New Mexico	19.1	10,790	2.49	2.85	3.30	3.48
08264500	Red River below Zwergle damsite near Red River, New Mexico	25.7	10,530	2.40	2.83	3.30	3.35
08265000	Red River near Questa, New Mexico	113	9,930	1.80	2.39	2.60	2.93
08267000	Red River at mouth near Questa, New Mexico	190	9,500	1.79	2.00	2.39	2.60
08267500	Rio Hondo near Valdez, New Mexico	36.2	10,100	2.20	2.60	3.00	3.15
08268500	Arroyo Hondo at Arroyo Hondo, New Mexico	65.6	9,730	1.79	2.00	2.38	2.60
08269000	Rio Pueblo de Taos near Taos, New Mexico	66.6	9,500	2.28	2.84	3.20	3.40

Table 8. Basin and climatic characteristics for streamflow-gaging stations in northern mountain region (5) - Concluded

Station number	Station name	Drainage area (A) (square miles)	Mean basin elev-ation (E) (feet)	Maximum 24-hour precipitation intensity for indicated recurrence interval in years (inches) 10 (I24,10)	25 (I24,25)	50 (I24,50)	100 (I24,100)
08271000	Rio Lucero near Arroyo Seco, New Mexico	16.6	10,790	2.27	2.68	3.00	3.10
08275000	Rio Fernando de Taos near Taos, New Mexico	71.7	8,870	1.82	2.25	2.42	2.81
08275500	Rio Grande del Rancho near Talpa, New Mexico	83.0	9,400	1.91	2.32	2.53	2.81
08275600	Rio Chiquito near Talpa, New Mexico	37.0	9,350	1.84	2.28	2.40	2.74
08279000	Embudo Creek at Dixon, New Mexico	305	8,980	1.78	2.00	2.24	2.60
08281200	Wolf Creek near Chama, New Mexico	27.7	9,600	2.21	2.80	3.00	3.49
08283500	Rio Chama at Park View, New Mexico	405	9,270	1.80	2.19	2.47	2.73
08284100	Rio Chama near La Puente, New Mexico	480	9,000	1.80	2.19	2.39	2.74
08284300	Horse Lake Creek above Heron Reservoir near Park View, New Mexico	45.0	7,970	2.00	2.42	2.75	3.00
08284500	Willow Creek near Park View, New Mexico	193	8,000	1.85	2.29	2.56	2.93
08288000	El Rito near El Rito, New Mexico	50.5	8,700	1.86	2.30	2.65	2.93
08289000	Rio Ojo Caliente at La Madera, New Mexico	419	8,640	1.83	2.21	2.60	2.83
08291000	Santa Cruz River at Cundiyo, New Mexico	86.0	9,190	1.99	2.44	2.60	2.87
08294300	Rio Nambe at Nambe Falls near Nambe, New Mexico	25.1	9,380	2.00	2.50	2.77	2.97
08295000	Rio Nambe near Nambe, New Mexico	38.2	9,100	1.98	2.40	2.72	2.96
08295200	Rio en Medio near Santa Fe, New Mexico	.63	11,300	3.40	3.98	4.28	5.00
08302200	North Fork Tesuque Creek near Santa Fe, New Mexico	1.60	11,000	3.00	3.48	3.80	4.60
08377900	Rio Mora near Terrero, New Mexico	53.2	10,260	2.82	3.41	4.00	4.55
08378500	Pecos River near Pecos, New Mexico	189	9,910	2.49	2.90	3.39	3.65

Table 9. Basin and climatic characteristics for streamflow-gaging stations in central mountain-valley region (6)

Station number	Station name	Drainage area (A) (square miles)	Average of channel elev-ations (Ec) (feet)	Maximum 24-hour precipitation intensity for 10-year recurrence interval (I24,10) (inches)
08286650	Canjilon Creek above Abiquiu Reservoir, New Mexico	144	7,340	1.78
08290000	Rio Chama near Chamita, New Mexico	3,144	6,840	1.60
08292000	Santa Clara Creek near Espanola, New Mexico	34.5	7,680	2.04
08293700	Arroyo Seco tributary near Pojoaque, New Mexico	.72	5,920	1.90
08313100	Canada Ancha tributary near Santa Fe, New Mexico	1.23	6,610	1.98
08316000	Santa Fe River near Santa Fe, New Mexico	18.2	9,120	2.80
08316600	North Frijoles Arroyo near Santa Fe, New Mexico	.33	7,250	2.00
08317500	Galisteo Creek at Canoncito, New Mexico	11.3	7,600	2.55
08317600	San Cristobal Arroyo near Galisteo, New Mexico	116	6,800	2.39
08317700	Tarhole Canyon near Galisteo, New Mexico	2.15	6,520	2.40
08317720	Canda de la Cueva near Galisteo, New Mexico	1.79	6,230	2.20
08318000	Galisteo Creek at Domingo, New Mexico	640	6,010	1.99
08318900	San Pedro Creek near Golden, New Mexico	45.2	6,590	2.17
08321500	Jemez River below EF near Jemez Springs, New Mexico	173	8,180	2.76
08321900	Rio de las Vacas near Senorita, New Mexico	26.8	9,280	3.00
08323000	Rio Guadalupe at Box Canyon near Jemez, New Mexico	235	8,200	2.48
08324000	Jemez River near Jemez, New Mexico	470	7,750	2.23
08330500	Tijeras Arroyo at Albuquerque, New Mexico	75.3	6,380	2.34
08330600	Tijeras Arroyo near Albuquerque, New Mexico	133	5,930	1.78
08331100	Belen Highline Canal tributary near Los Lunas, New Mexico	.16	5,310	1.78

Table 9. Basin and climatic characteristics for streamflow-gaging stations in central mountain-valley region (6) - Concluded

Station number	Station name	Drainage area (A) (square miles)	Average of channel elev- ations (Ec) (feet)	Maximum 24-hour precipitation intensity for 10-year recurrence interval (I24,10) (inches)
08331650	Canada Montoso near Scholle, New Mexico	35.0	6,150	2.32
08331700	Abo Arroyo tributary near Scholle, New Mexico	.23	6,030	2.24
08334000	Rio Puerco above Arroyo Chico near Guadalupe, New Mexico	420	6,540	2.10
08340500	Arroyo Chico near Guadalupe, New Mexico	1,390	6,620	2.20
08341300	Bluewater Creek above Bluewater Dam near Bluewater, New Mexico	75.0	7,820	2.04
08342000	Bluewater Creek near Bluewater, New Mexico	209	8,050	1.98
08343100	Grants Canyon at Grants, New Mexico	13.0	6,800	2.00
08351500	Rio San Jose at Correo, New Mexico	3,660	6,580	1.78
08352500	Rio Puerco at Rio Puerco, New Mexico	6,590	5,880	1.87
08353000	Rio Puerco near Bernardo, New Mexico	7,350	5,800	1.84
08353500	La Jencia Creek near Magdalena, New Mexico	195	6,880	2.18
08354000	Rio Salado near San Acacia, New Mexico	1,380	5,950	1.96
08358600	Chupadera Wash tributary at Bingham, New Mexico	1.29	5,530	2.08
08488170	Chavez Draw tributary near Clines Corners, New Mexico	2.73	6,670	1.19
08488200	Osita Draw near Clines Corners, New Mexico	10.0	6,760	2.23
08488600	Arroyo del Cuervo near Torreon, New Mexico	11.8	7,460	2.61

Table 10. Basin characteristics for streamflow-gaging stations in southwest desert region (7)

Station number	Station name	Drainage area (A) (square miles)
08359400	Lumber Canyon tributary near Monticello, New Mexico	0.90
08360000	Alamosa Creek near Monticello, New Mexico	403
08361650	Percha Creek near Kingston, New Mexico	21.5
08361700	Percha Creek near Hillsboro, New Mexico	35.4
08361800	Percha Creek at Caballo Dam near Arrey, New Mexico	119
08363100	Rio Grande tributary near Radium Springs, New Mexico	.40
08477500	Mimbres River near Faywood, New Mexico	440
08478800	Seventysix Draw tributary near Waterloo, New Mexico	.20
08479300	Deer Creek tributary near Antelope Wells, New Mexico	4.30
09384000	Little Colorado River above Lyman Reservoir near St. Johns, Arizona	747
09384200	Lyman Reservoir tributary near St. Johns, Arizona	.24
09430500	Gila River near Gila, New Mexico	1,860
09430900	Duck Creek at Cliff, New Mexico	228
09431000	Gila River near Cliff, New Mexico	2,438
09431500	Gila River near Redrock, New Mexico	2,829
09438200	Animas Creek near Cloverdale, New Mexico	157
09443000	San Francisco River near Alma, New Mexico	1,546
09444000	San Francisco River near Glenwood, New Mexico	1,653
09444200	Blue River near Clifton, Arizona	506
09444500	San Francisco River at Clifton, Arizona	2,766
09536350	Surprise Canyon near Dos Cabezas, Arizona	.65
09537500	Whitewater Draw near Douglas, Arizona	1,023

Table 11. Basin and climatic characteristics for streamflow-gaging stations in southwest mountain region (8)

Station number	Station name	Drainage area (A) (square miles)	Mean minimum January temperature (T) (degrees Fahrenheit)
08477000	Mimbres River near Mimbres, New Mexico	152	28.0
08477560	Little Walnut Creek near Silver City, New Mexico	5.10	23.0
08477570	Silva Creek tributary at Silver City, New Mexico	2.12	23.0
08477580	Silva Creek at Silver City, New Mexico	10.0	23.0
08477600	San Vicente Arroyo at Silver City, New Mexico	26.5	24.0
08478000	Cameron Creek at Central, New Mexico	18.8	24.0
09383500	Nutrioso Creek above Nelson Reservoir near Springerville, Arizona	83.4	8.0
09386100	Largo Creek near Quemado, New Mexico	151	12.0
09442630	Mail Hollow near Luna, New Mexico	4.20	11.5
09442650	Romero Creek near Arizona State line near Luna, New Mexico	10.8	11.0
09442660	Trout Creek at Luna, New Mexico	31.9	12.0
09442680	San Francisco River near Reserve, New Mexico	350	12.0
09442692	Tularosa River above Aragon, New Mexico	94	14.0
09442695	Negro Canyon at Aragon, New Mexico	9.62	14.0
09442740	Tularosa River near Reserve, New Mexico	426	15.0
09489070	North Fork of East Fork Black River near Alpine, Arizona	38.1	8.0

Table 12. Range of basin and climatic characteristics used in the regression equations

	Drainage area (A) (square miles)	Average of channel elevations (E_c) (feet)	Mean basin elevation (E) (feet)	Main channel slope (S) (feet per mile)	Mean minimum January temperature (T) (degrees Fahrenheit)	Maximum 24-hour precipitation intensity for indicated recurrence interval, in years (inches)				
						2 ($I_{24,2}$)	10 ($I_{24,10}$)	25 ($I_{24,25}$)	50 ($I_{24,50}$)	100 ($I_{24,100}$)
Northeast plains region (1)	0.36-11,100	--	--	--	--	--	--	--	--	--
Northwest plateau region (2)	0.20-12,900	--	--	--	--	--	--	--	--	--
Southeast mountain region (3)	0.20-1,060	--	3,630-9,060	--	--	1.50-2.20	--	--	--	--
Southeast plains region (4)	0.16-15,300	--	3,600-7,920	--	--	--	--	--	--	3.57-5.54
Northern mountain region (5)	0.63-2,850	--	7,950-11,500	--	--	--	1.78-3.64	2.00-4.45	2.24-5.00	2.60-5.51
Central mountain-valley region (6)	0.16-7,350	5,310-9,280	--	--	--	--	1.19-3.00	--	--	--
Southwest desert region (7)	0.20-2,829	--	--	--	--	--	--	--	--	--
Southwest mountain region (8)	2.12-426	--	--	--	8.0-28.0	--	--	--	--	--

Table 13. Regional flood-frequency equations

Equations	Recurrence interval (years)	Standard error of estimate: Log units	Percentage: Maximum	Percentage: Minimum	Percentage: Average
Northeast plains region (1)					
$Q_{0.50} = 1.10 \times 10^2 \ A^{0.56}$	2	0.348	+123	-55	89
$Q_{0.20} = 2.82 \times 10^2 \ A^{0.55}$	5	.305	+102	-50	76
$Q_{0.10} = 4.46 \times 10^2 \ A^{0.55}$	10	.299	+ 99	-50	74
$Q_{0.04} = 7.14 \times 10^2 \ A^{0.55}$	25	.304	+101	-50	76
$Q_{0.02} = 9.56 \times 10^2 \ A^{0.55}$	50	.312	+105	-51	78
$Q_{0.01} = 1.23 \times 10^3 \ A^{0.56}$	100	.322	+110	-52	81
Northwest plateau region (2)					
$Q_{0.50} = 8.03 \times 10 \ A^{0.52}$	2	0.377	+138	-58	98
$Q_{0.20} = 2.05 \times 10^2 \ A^{0.47}$	5	.326	+112	-53	82
$Q_{0.10} = 3.36 \times 10^2 \ A^{0.44}$	10	.309	+104	-51	78
$Q_{0.04} = 5.70 \times 10^2 \ A^{0.41}$	25	.298	+ 99	-50	74
$Q_{0.02} = 8.03 \times 10^2 \ A^{0.39}$	50	.297	+ 98	-50	74
$Q_{0.01} = 1.09 \times 10^3 \ A^{0.37}$	100	.300	+ 99	-50	74
Southeast mountain region (3)					
$Q_{0.50} = 3.54 \times 10^4 \ A^{0.56} \ (E/1,000)^{-2.32} \ I24,2^{-3.25}$	2	0.315	+106	-52	79
$Q_{0.20} = 1.41 \times 10^4 \ A^{0.59} \ (E/1,000)^{-2.34}$	5	.245	+ 76	-43	60
$Q_{0.10} = 3.45 \times 10^4 \ A^{0.61} \ (E/1,000)^{-2.55}$	10	.221	+ 66	-40	53
$Q_{0.04} = 8.64 \times 10^4 \ A^{0.63} \ (E/1,000)^{-2.77}$	25	.218	+ 65	-40	52
$Q_{0.02} = 1.54 \times 10^5 \ A^{0.64} \ (E/1,000)^{-2.90}$	50	.228	+ 69	-41	55
$Q_{0.01} = 2.57 \times 10^5 \ A^{0.65} \ (E/1,000)^{-3.02}$	100	.243	+ 75	-43	59
Southeast plains region (4)					
$Q_{0.50} = 4.63 \times 10^2 \ A^{0.66} \ (E/1,000)^{2.12} \ I24,100^{-4.31}$	2	0.324	+ 111	-53	82
$Q_{0.20} = 6.76 \times 10^2 \ A^{0.58} \ (E/1,000)^{1.65} \ I24,100^{-3.13}$	5	.242	+ 75	-43	59
$Q_{0.10} = 8.40 \times 10^2 \ A^{0.54} \ (E/1,000)^{1.40} \ I24,100^{-2.50}$	10	.206	+ 61	-38	50
$Q_{0.04} = 4.13 \times 10 \ A^{0.47} \ (E/1,000)^{1.45}$	25	.196	+ 57	-36	46
$Q_{0.02} = 1.08 \times 10^2 \ A^{0.45} \ (E/1,000)^{1.18}$	50	.180	+ 51	-34	42
$Q_{0.01} = 1.37 \times 10^3 \ A^{0.44}$	100	.189	+ 54	-35	44

Table 13. Regional flood-frequency equations - Concluded

Equations	Recurrence interval (years)	Standard error of estimate: Log units	Percentage: Maximum	Percentage: Minimum	Percentage: Average
Northern mountain region (5)					
$Q_{0.50} = 1.79 \times 10^{4} A^{0.80} (E/1,000)^{-3.37}$	2	0.336	+117	-54	86
$Q_{0.20} = 5.85 \times 10^{4} A^{0.79} (E/1,000)^{-4.00} I24,100^{0.75}$	5	.279	+ 90	-47	68
$Q_{0.10} = 1.62 \times 10^{5} A^{0.78} (E/1,000)^{-4.35} I24,100^{0.86}$	10	.260	+ 82	-45	64
$Q_{0.04} = 7.75 \times 10^{5} A^{0.78} (E/1,000)^{4.79} I24,10^{1.03}$	25	.248	+ 71	-44	58
$Q_{0.02} = 1.12 \times 10^{6} A^{0.78} (E/1,000)^{-4.97} I24,25^{1.12}$	50	.246	+ 76	-43	60
$Q_{0.01} = 1.85 \times 10^{6} A^{0.77} (E/1,000)^{-5.18} I24,50^{1.21}$	100	.248	+ 71	-44	58
Central mountain-valley region (6)					
$Q_{0.50} = 5.52 \times 10^{4} A^{0.47} (Ec/1,000)^{-4.05} I24,10^{1.79}$	2	0.318	+108	-52	80
$Q_{0.20} = 1.70 \times 10^{5} A^{0.44} (Ec/1,000)^{-4.13} I24,10^{1.67}$	5	.252	+ 79	-44	62
$Q_{0.10} = 2.89 \times 10^{5} A^{0.42} (Ec/1,000)^{-4.14} I24,10^{1.59}$	10	.229	+ 69	-41	55
$Q_{0.04} = 4.97 \times 10^{5} A^{0.40} (Ec/1,000)^{-4.13} I24,10^{1.51}$	25	.217	+ 65	-39	52
$Q_{0.02} = 6.85 \times 10^{5} A^{0.39} (Ec/1,000)^{-4.11} I24,10^{1.45}$	50	.217	+ 65	-39	52
$Q_{0.01} = 8.96 \times 10^{5} A^{0.38} (Ec/1,000)^{-4.09} I24,10^{1.40}$	100	.221	+ 66	-40	53
Southwest desert region (7)					
$Q_{0.50} = 1.07 \times 10^{2} A^{0.48}$	2	0.250	+ 78	-44	61
$Q_{0.20} = 2.36 \times 10^{2} A^{0.48}$	5	.226	+ 68	-41	54
$Q_{0.10} = 3.55 \times 10^{2} A^{0.48}$	10	.226	+ 68	-41	54
$Q_{0.04} = 5.48 \times 10^{2} A^{0.48}$	25	.238	+ 73	-42	58
$Q_{0.02} = 7.25 \times 10^{2} A^{0.48}$	50	.250	+ 78	-44	61
$Q_{0.01} = 9.32 \times 10^{2} A^{0.48}$	100	.265	+ 84	-46	65
Southwest mountain region (8)					
$Q_{0.50} = 0.72 \times A^{0.24} T^{1.87}$	2	0.330	+114	-53	84
$Q_{0.20} = 4.28 \times A^{0.24} T^{1.52}$	5	.327	+112	-53	82
$Q_{0.10} = 1.13 \times 10 A^{0.24} T^{1.33}$	10	.336	+117	-54	86
$Q_{0.04}$ = No relation	25				
$Q_{0.02}$ = No relation	50				
$Q_{0.01}$ = No relation	100				

Table 14. Parameter for determining standard error in the log-Pearson Type III distribution

Coefficient of skewness	Parameter, in log units, for indicated exceedance probabilities					
	0.50	0.20	0.10	0.04	0.02	0.01
0.0	1.0801	1.1698	1.3748	1.8009	2.1988	2.6363
.1	1.0808	1.2006	1.4367	1.9087	2.3425	2.8168
.2	1.0830	1.2309	1.4989	2.0223	2.4986	3.0175
.3	1.0866	1.2609	1.5610	2.1408	2.6656	3.2365
.4	1.0918	1.2905	1.6227	2.2634	2.8423	3.4724
.5	1.0987	1.3199	1.6838	2.3893	3.0277	3.7238
.6	1.1073	1.3492	1.7441	2.5179	3.2209	3.9895
.7	1.1179	1.3785	1.8032	2.6486	3.4208	4.2684
.8	1.1304	1.4082	1.8609	2.7807	3.6266	4.5595
.9	1.1449	1.4385	1.9170	2.9134	3.8374	4.8618
1.0	1.1614	1.4699	1.9714	3.0462	4.0522	5.1741
1.1	1.1799	1.5030	2.0244	3.1782	4.2699	5.4952
1.2	1.2003	1.5382	2.0747	3.3088	4.4896	5.8240
1.3	1.2223	1.5764	2.1237	3.4373	4.7100	6.1592
1.4	1.2457	1.6181	2.1711	3.5629	4.9301	6.4992
1.5	1.2701	1.6643	2.2173	3.6850	5.1486	6.8427
1.6	1.2952	1.7157	2.2627	3.8029	5.3644	7.1881
1.7	1.3204	1.7732	2.3081	3.9161	5.5761	7.5339
1.8	1.3452	1.8374	2.3541	4.0241	5.7827	7.8783
1.9	1.3690	1.9091	2.4018	4.1265	5.9829	8.2196
2.0	1.3913	1.9888	2.4525	4.2231	6.1755	8.5562
-.1	1.0808	1.1385	1.3134	1.6999	2.0691	2.4783
-.2	1.0830	1.1067	1.2529	1.6071	1.9556	2.3452
-.3	1.0866	1.0744	1.1937	1.5242	1.8606	2.2395
-.4	1.0918	1.0416	1.1366	1.4531	1.7866	2.1638
-.5	1.0987	1.0081	1.0821	1.3961	1.7361	2.1200
-.6	1.1073	0.9740	1.0314	1.3557	1.7112	2.1090
-.7	1.1179	0.9392	0.9858	1.3344	1.7132	2.1301
-.8	1.1304	0.9037	0.9471	1.3340	1.7422	2.1814
-.9	1.1449	0.8675	0.9172	1.3559	1.7970	2.2594
-1.0	1.1614	0.8310	0.8987	1.4000	1.8752	2.3598
-1.1	1.1799	0.7943	0.8939	1.4656	1.9736	2.4776
-1.2	1.2003	0.7582	0.9049	1.5506	2.0886	2.6078
-1.3	1.2223	0.7236	0.9333	1.6524	2.2160	2.7450
-1.4	1.2457	0.6920	0.9796	1.7682	2.3519	2.8838
-1.5	1.2701	0.6652	1.0432	1.8949	2.4920	3.0189
-1.6	1.2951	0.6458	1.1231	2.0293	2.6321	3.1449
-1.7	1.3202	0.6368	1.2173	2.1683	2.7680	3.2562
-1.8	1.3450	0.6413	1.3240	2.3084	2.8953	3.3469
-1.9	1.3687	0.6617	1.4409	2.4464	3.0093	3.4109
-2.0	1.3907	0.6995	1.5660	2.5787	3.1052	3.4418

Table 15. Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities					
			0.50	0.20	0.10	0.04	0.02	0.01
Northeast plains region (1)								
07153500	0.437	0.1	0.082	0.091	0.109	0.145	0.178	0.214
07154400	.554	-.3	.110	.109	.121	.154	.188	.227
07154500	.474	-.3	.094	.093	.103	.132	.161	.194
07154650	.499	-.4	.132	.126	.138	.176	.216	.262
07201200	.656	-.1	.205	.216	.249	.322	.392	.469
07203600	.496	-.3	.156	.154	.171	.218	.266	.321
07214000	.494	.1	.097	.108	.130	.172	.211	.254
07220900	.464	-.3	.094	.093	.103	.131	.160	.193
07221500	.491	.0	.077	.083	.097	.128	.156	.187
07222300	.494	-.3	.110	.108	.120	.154	.188	.226
07222500	.437	.3	.070	.081	.101	.138	.172	.209
07222800	.650	-.3	.223	.221	.245	.313	.382	.460
07225000	.460	-.5	.096	.088	.094	.121	.151	.184
07225500	.210	-.1	.066	.069	.080	.103	.125	.150
07226300	.372	-.3	.078	.077	.085	.109	.133	.160
07226500	.500	-.5	.085	.078	.083	.108	.134	.164
07227000	.369	.1	.091	.102	.122	.162	.198	.238
07227050	.326	.0	.064	.070	.082	.107	.131	.157
07227100	.357	.0	.080	.087	.102	.134	.164	.196
07227200	.977	-.4	.259	.247	.269	.344	.423	.513
07227295	.547	-.2	.114	.117	.132	.169	.206	.247
Northwest plateau region (2)								
09344000	0.164	0.1	0.028	0.031	0.037	0.049	0.060	0.072
09346200	.228	.1	.048	.054	.064	.085	.105	.126
09346400	.223	.1	.053	.058	.070	.093	.114	.137
09349800	.303	.1	.073	.081	.097	.129	.159	.191
09350500	.226	.1	.037	.041	.050	.066	.081	.097

Table 15. Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations - Continued

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities					
			0.50	0.20	0.10	0.04	0.02	0.01
		Northwest plateau region (2) - Concluded						
09350800	0.477	0.1	0.099	0.110	0.132	0.175	0.215	0.259
09355000	.301	.1	.058	.064	.076	.102	.125	.150
09356500	.248	.1	.052	.057	.069	.091	.112	.134
09356520	.619	.0	.193	.209	.246	.322	.393	.471
09357200	.355	.0	.069	.075	.088	.115	.140	.168
09363100	.322	.0	.074	.080	.094	.124	.151	.181
09363500	.178	.1	.028	.031	.037	.049	.060	.072
09364500	.210	.0	.027	.030	.035	.046	.056	.067
09366500	.381	.0	.052	.056	.066	.086	.106	.127
09367400	.620	.1	.186	.206	.247	.328	.403	.484
09367840	.441	.0	.083	.090	.106	.138	.169	.202
09367860	.417	.0	.084	.091	.106	.139	.170	.204
09367880	.297	.0	.076	.082	.096	.126	.154	.185
09367900	.463	.0	.090	.097	.114	.150	.183	.219
09367950	.347	.0	.088	.096	.112	.147	.180	.216
09368000	.278	.1	.051	.056	.068	.090	.110	.132
09371100	.213	.1	.073	.081	.097	.129	.158	.190
09379060	.722	.0	.208	.226	.265	.348	.424	.509
09387050	.452	.0	.096	.104	.122	.160	.195	.234
09395500	.474	.0	.092	.100	.117	.153	.187	.224
09395600	.483	.0	.106	.115	.136	.178	.217	.260
09395900	.302	.0	.077	.083	.098	.128	.157	.188
		Southeast mountain region (3)						
08387000	0.370	0.1	0.074	0.082	0.099	0.131	0.161	0.194
08388000	.566	.0	.097	.105	.123	.161	.197	.236
08389500	.521	-.1	.091	.096	.111	.144	.175	.209
08390050	.726	-.1	.227	.239	.275	.356	.434	.519
08390100	.558	.1	.161	.179	.214	.285	.349	.420

Table 15. Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations - Continued

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities 0.50	0.20	0.10	0.04	0.02	0.01
		Southeast mountain region (3)- Concluded						
08390500	0.538	0.1	0.089	0.099	0.118	0.157	0.192	0.231
08393200	.687	-.1	.175	.184	.213	.275	.335	.401
08394500	.904	-.6	.140	.123	.131	.172	.217	.267
08397400	.715	-.2	.194	.198	.224	.287	.350	.419
08397600	.639	.1	.128	.142	.170	.226	.278	.334
08398500	.577	-.1	.112	.118	.136	.176	.214	.257
08400000	1.211	-.2	.236	.241	.273	.350	.425	.510
08401200	.969	-.1	.240	.253	.292	.378	.460	.551
08401800	.664	-.1	.192	.202	.233	.302	.367	.440
08401900	.918	-.5	.231	.212	.228	.294	.366	.446
08405050	.451	-.1	.099	.105	.121	.156	.190	.228
08405100	.277	.1	.083	.092	.110	.147	.180	.216
08405500	.726	-.1	.129	.136	.157	.203	.247	.296
08408500	.537	.2	.087	.099	.120	.162	.200	.242
08480650	.353	.0	.080	.086	.101	.133	.162	.194
08480700	.573	-.1	.124	.130	.151	.195	.237	.284
08481000	.459	-.1	.106	.111	.129	.166	.202	.243
08481100	.686	-.2	.149	.152	.172	.220	.268	.322
08481500	.464	-.1	.085	.089	.103	.133	.162	.194
08482000	.409	-.1	.133	.140	.162	.210	.255	.306
		Southeast plains region (4)						
08379300	0.440	0.2	0.090	0.102	0.125	0.168	0.208	0.251
08379500	.315	.2	.043	.049	.060	.081	.100	.121
08379550	.559	.2	.183	.207	.253	.341	.421	.509
08379600	.651	.2	.127	.144	.175	.236	.292	.353
08380300	.724	.2	.163	.186	.226	.305	.377	.456
08380500	.496	.2	.066	.075	.092	.123	.153	.184
08381000	.472	.2	.068	.077	.094	.126	.156	.189
08382000	.206	.2	.064	.073	.089	.120	.149	.179
08382500	.364	.1	.071	.078	.094	.125	.153	.184
08383000	.381	.1	.056	.062	.074	.098	.120	.145

Table 15. Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations - Continued

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities 0.50	0.20	0.10	0.04	0.02	0.01
			Southeast plains region (4) - Concluded					
08383500	0.283	0.2	0.046	0.053	0.064	0.086	0.107	0.129
08384500	.280	.2	.065	.073	.089	.121	.149	.180
08385530	.757	.2	.183	.208	.254	.342	.423	.511
08385600	.433	.2	.084	.096	.117	.157	.194	.235
08385670	.330	.2	.080	.091	.111	.149	.184	.223
08393600	.902	.2	.199	.227	.276	.372	.460	.556
08396500	.363	.2	.076	.086	.105	.141	.175	.211
08480150	.332	.2	.077	.087	.106	.143	.177	.214
			Northern mountain region (5)					
07124500	0.351	-0.1	0.048	0.051	0.059	0.076	0.092	0.110
07199000	.433	.0	.079	.086	.101	.132	.161	.193
07201000	.476	.0	.099	.107	.126	.165	.201	.242
07203000	.331	.0	.049	.053	.062	.081	.099	.119
07204000	.396	-.2	.064	.065	.074	.095	.115	.138
07205000	.357	.0	.055	.060	.070	.092	.112	.134
07206400	.405	.0	.098	.106	.125	.163	.199	.239
07207500	.492	.0	.086	.093	.110	.144	.175	.210
07208500	.428	.2	.060	.068	.083	.112	.138	.167
07211000	.600	-.1	.090	.095	.109	.141	.172	.206
07211500	.432	.1	.071	.079	.095	.126	.154	.186
07214500	.550	.0	.130	.140	.165	.216	.264	.316
07214800	.421	.0	.122	.132	.155	.203	.247	.297
07215500	.250	-.2	.038	.039	.044	.057	.069	.083
07216500	.374	.1	.054	.059	.071	.095	.116	.140
07217000	.712	.0	.222	.240	.283	.370	.452	.542
07217100	.523	.1	.137	.152	.182	.242	.297	.357
07218000	.408	.0	.060	.065	.076	.100	.122	.146
07220000	.275	.0	.072	.078	.092	.120	.147	.176
07221000	.463	-.2	.062	.064	.072	.092	.112	.135

Table 15. Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations - Continued

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities					
			0.50	0.20	0.10	0.04	0.02	0.01
		Northern mountain region (5) - Continued						
08246500	0.160	0.1	0.026	0.029	0.035	0.047	0.057	0.069
08247500	.292	-.2	.041	.042	.047	.061	.074	.088
08248000	.210	-.2	.028	.029	.032	.042	.051	.061
08252500	.412	.2	.067	.076	.093	.126	.155	.187
08253000	.273	-.1	.044	.046	.053	.068	.083	.100
08253500	.231	-.1	.037	.039	.045	.059	.071	.085
08255000	.444	-.1	.152	.160	.184	.239	.291	.348
08263000	.251	.0	.048	.052	.061	.080	.098	.117
08264000	.233	-.1	.051	.054	.062	.081	.098	.118
08264500	.274	-.1	.094	.099	.114	.147	.179	.215
08265000	.301	.0	.045	.048	.057	.074	.091	.109
08267000	.218	-.1	.045	.047	.054	.070	.085	.102
08267500	.268	.0	.042	.045	.053	.070	.085	.102
08268500	.377	.0	.059	.064	.075	.098	.120	.143
08269000	.406	-.1	.063	.067	.077	.100	.121	.145
08271000	.264	-.2	.039	.040	.045	.058	.070	.084
08275000	.444	-.1	.110	.116	.134	.173	.211	.252
08275500	.415	-.1	.082	.086	.100	.129	.157	.188
08275600	.408	.0	.090	.097	.114	.150	.183	.220
08279000	.375	-.2	.060	.061	.069	.089	.108	.130
08281200	.248	.0	.074	.080	.095	.124	.151	.181
08283500	.188	.0	.035	.038	.045	.059	.072	.086
08284100	.278	.0	.058	.063	.074	.096	.118	.141
08284300	.540	.0	.130	.141	.166	.217	.265	.318
08284500	.243	.0	.045	.049	.057	.075	.092	.110
08288000	.306	.1	.058	.064	.077	.102	.125	.150
08289000	.279	-.1	.042	.044	.051	.066	.081	.097
08291000	.363	.1	.054	.060	.072	.096	.118	.142
08294300	.429	.1	.129	.143	.171	.227	.279	.335
08295000	.592	.0	.111	.121	.142	.186	.227	.272

Table 15. Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations - Continued

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities					
			0.50	0.20	0.10	0.04	0.02	0.01
		Northern mountain region (5) - Concluded						
08295200	0.308	-0.1	0.078	0.083	0.095	0.123	0.150	0.180
08302200	.269	.0	.088	.095	.112	.146	.178	.214
08377900	.289	.0	.072	.078	.091	.119	.146	.175
08378500	.321	-.1	.045	.048	.055	.071	.086	.104
		Central mountain-valley region (6)						
08286650	0.241	0.0	0.070	0.075	0.089	0.116	0.142	0.170
08290000	.216	.0	.057	.061	.072	.094	.115	.138
08292000	.417	.1	.090	.100	.120	.159	.195	.235
08293700	.433	.0	.141	.153	.179	.235	.287	.344
08313100	.951	.1	.185	.205	.245	.326	.400	.481
08316000	.456	.0	.137	.148	.174	.228	.278	.333
08316600	.288	.1	.086	.096	.115	.152	.187	.225
08317500	.214	.1	.045	.050	.060	.080	.098	.118
08317600	.432	.1	.088	.098	.117	.156	.191	.230
08317700	.423	.1	.086	.096	.115	.153	.187	.225
08317720	.453	.0	.136	.147	.173	.226	.276	.331
08318000	.293	.0	.062	.067	.079	.103	.126	.151
08318900	.435	.1	.087	.097	.116	.154	.189	.228
08321500	.332	.1	.080	.089	.107	.142	.174	.209
08321900	.264	.1	.056	.062	.074	.099	.121	.146
08323000	.363	.0	.068	.074	.087	.114	.139	.167
08324000	.313	.0	.055	.059	.070	.091	.112	.134
08330500	.454	.0	.090	.097	.114	.149	.182	.219
08330600	.244	.0	.050	.054	.063	.083	.101	.122
08331100	.361	.2	.074	.084	.102	.138	.170	.206
08331650	.552	.0	.130	.141	.166	.217	.265	.318
08331700	.261	.1	.055	.061	.074	.098	.120	.144
08334000	.329	.2	.064	.073	.089	.119	.148	.178
08340500	.293	.1	.051	.056	.067	.090	.110	.132
08341300	.483	.0	.104	.113	.133	.174	.212	.255

Table 15. Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations - Continued

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities					
			0.50	0.20	0.10	0.04	0.02	0.01
Central mountain-valley region (6) - Concluded								
08342000	0.352	0.0	0.105	0.114	0.134	0.176	0.215	0.257
08343100	.459	.1	.111	.123	.147	.196	.240	.289
08351500	.363	.0	.063	.068	.080	.105	.128	.153
08352500	.295	.0	.049	.053	.062	.081	.099	.119
08353000	.306	.0	.050	.055	.064	.084	.103	.123
08353500	.390	.2	.083	.094	.115	.155	.191	.231
08354000	.472	.6	.088	.108	.139	.201	.257	.318
08358600	.585	.1	.135	.150	.179	.238	.292	.351
08488170	.585	.0	.163	.177	.208	.272	.332	.398
08488200	.464	.0	.107	.116	.136	.178	.218	.261
08488600	.475	.1	.137	.152	.182	.242	.297	.358
Southwest desert region (7)								
08359400	0.346	0.0	0.076	0.083	0.097	0.127	0.155	0.186
08360000	.383	.0	.069	.075	.088	.115	.140	.168
08361650	.297	.2	.059	.067	.081	.110	.135	.164
08361700	.390	.2	.084	.096	.117	.158	.195	.235
08361800	.532	.0	.117	.127	.149	.196	.239	.286
08363100	.273	-.1	.057	.060	.069	.089	.109	.130
08477500	.435	.0	.086	.093	.109	.143	.175	.209
08478800	.351	.0	.098	.106	.125	.163	.199	.239
08479300	.398	.1	.088	.098	.117	.155	.190	.229
09384000	.466	.1	.075	.083	.100	.133	.163	.196
09384200	.628	-.1	.181	.191	.220	.285	.347	.416
09430500	.491	.2	.070	.080	.097	.132	.162	.196
09430900	.231	-.1	.048	.051	.058	.076	.092	.110
09431000	.306	-.1	.061	.065	.075	.097	.118	.141
09431500	.344	.2	.052	.059	.072	.097	.120	.145

Table 15. **Standard deviation, coefficient of skewness, and standard error for indicated exceedance probabilities for streamflow-gaging stations - Concluded**

Station number	Standard deviation (log units)	Coefficient of skewness	Standard error, in log units, for indicated exceedance probabilities 0.50	0.20	0.10	0.04	0.02	0.01
Southwest desert region (7) - Concluded								
09438200	0.348	0.0	0.077	0.083	0.098	0.128	0.156	0.187
09443000	.450	.2	.106	.121	.147	.199	.245	.296
09444000	.383	.1	.055	.061	.073	.097	.119	.143
09444200	.455	.2	.116	.132	.161	.217	.268	.324
09444500	.464	.1	.058	.065	.077	.103	.126	.152
09536350	.517	-.1	.149	.157	.181	.235	.286	.342
09537500	.262	-.1	.037	.039	.045	.058	.071	.085
Southwest mountain region (8)								
08477000	0.318	0.2	0.053	0.060	0.074	0.099	0.123	0.148
08477560	.121	.3	.027	.031	.039	.053	.066	.080
08477570	.397	.1	.104	.116	.138	.184	.226	.271
08477580	.429	.0	.093	.100	.118	.155	.189	.226
08477600	.232	.3	.073	.084	.105	.143	.179	.217
08478000	.400	.2	.080	.091	.111	.150	.186	.224
09383500	.509	.1	.133	.148	.177	.236	.289	.348
09386100	.275	.4	.056	.066	.083	.116	.145	.177
09442630	.433	.2	.130	.148	.180	.243	.300	.362
09442650	.462	.3	.115	.134	.165	.227	.283	.343
09442660	.594	.3	.118	.137	.169	.232	.289	.351
09442680	.509	.4	.109	.129	.162	.226	.284	.347
09442692	.455	.2	.116	.132	.161	.217	.268	.324
09442695	.531	.3	.120	.140	.173	.237	.295	.358
09442740	.417	.3	.086	.099	.123	.169	.210	.255
09489070	.477	.1	.143	.159	.190	.253	.310	.373

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