FLOOD CHARACTERISTICS OF MISSISSIPPI STREAMS

By Mark N. Landers and K. Van Wilson, Jr.

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch (in.)	2.54	centimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
foot per mile (ft/mi)	0.018939	meter per kilometer
square mile (mi^2)	2.590	square kilometer
cubic foot per second (ft^3/s)	0.02832	cubic meter per second

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

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ABSTRACT

Flood magnitudes for selected recurrence intervals from 2 to 500 years were determined for 330 gaged sites in the study area where annual peak-flow records have been collected. The principal study area is Mississippi; however, selected data collected in adjoining States on streams draining into or from Mississippi are also included. Flood frequency at a gaged stream site is defined by fitting the Pearson Type III probability distribution to the log-transformed annual peaks. The accuracy of the flood frequency determined for a gaged site is determined primarily by the number of years of annual peak-flow record (the sample size). Greater accuracy is achieved in the current analysis than in previous analyses because of the additional years of annual peak-flow record. Flood-frequency and basin characteristics at gaged sites were used to develop regression equations for estimating flood frequency where annual peak-flow records are not available.

Flood frequency for ungaged stream sites in Mississippi may be estimated using basin characteristics in regression equations. Regression equations were computed using the generalized-least-squares procedure rather than the ordinary-least-squares procedure used in previous regional hydrologic analyses. The generalized-least-squares procedure considers the variable error of the gaging station flood frequencies and corrects for the cross-correlation of concurrent annual peaks. When the gaging stations in the sample for regression analysis have widely varying record lengths and concurrent peak flows, which are correlated between sites, the generalized-least-squares procedure provides more accurate estimates of the regression coefficients and model error than does the ordinary-least-squares procedure. These flood-frequency equations provide managers with improved tools for estimating flood frequencies for purposes of management and design.

INTRODUCTION

The magnitude and frequency of floods are key factors in the design of bridges, highway embankments, culverts, levees, dams, and other structures near streams. Effective flood-plain management and the determination of flood insurance rates also require information on the magnitude and frequency of floods.

The Mississippi State Highway Department and the Federal Highway Administration recognize the need for adequate flood-frequency information for the safe, efficient design of drainage structures and roadways in Mississippi. Because of this need, the U.S. Geological Survey, in cooperation with the Mississippi State Highway Department, conducted a study to update previous flood-frequency reports using data collected through the 1988 water year. A water year, which is the 12-month period from October 1 to September 30, is designated by the calendar year in which it ends. Thus, the 12-month period ending September 30, 1988, is called the "1988 water year."

Purpose and Scope

The purpose of this report is to provide techniques for estimating the magnitude of floods with selected recurrence intervals from 2 to 500 years for streams in Mississippi. This report supersedes an earlier one by Colson and Hudson (1976) because of additional available data and new analytical techniques.

The principal study area is Mississippi; however, selected data collected in adjoining States on streams draining into or from Mississippi are also included (fig. 1). Estimates of flood magnitude are presented for 330 streamflow gaging stations in the study area. Regional estimating equations were developed to provide flood-frequency information at ungaged locations. The regional flood-frequency equations were developed using a new procedure, generalized-least-squares regression (Stedinger and Tasker, 1985, 1986), which better addresses statistical problems of hydrologic variables in regional hydrologic analyses than does ordinary-least-squares regression. Flood-frequency equations were developed for streams in four subgroups; three defined by geographic region and one by drainage-area magnitude. Additional equations for urban areas are presented from "Flood Characteristics of Urban Watersheds in the United States" (Sauer and others, 1983).

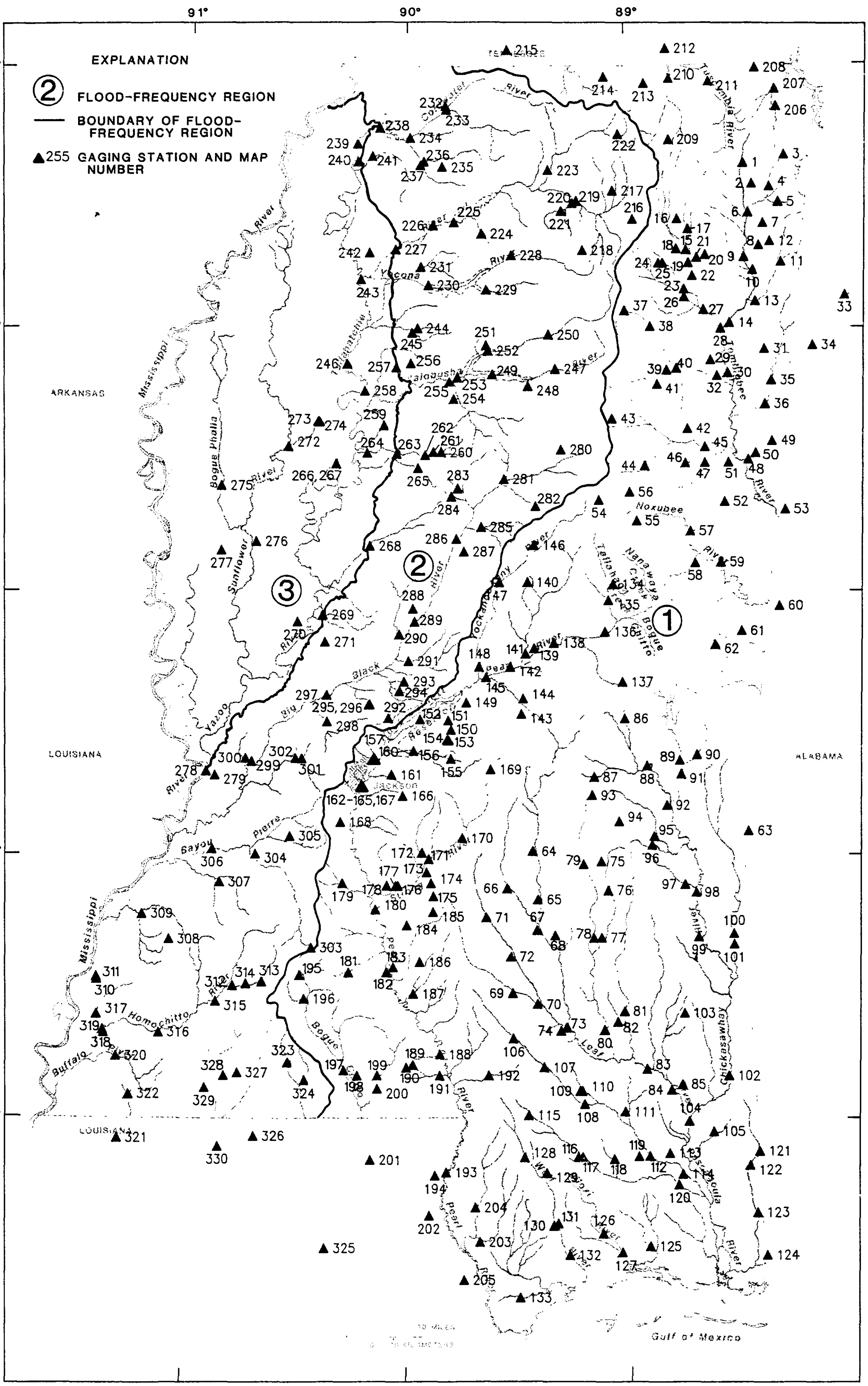


Figure 1.--Location of streamflow-gaging stations and flood-frequency regions.

General Description of Study Area

Mississippi is in the East Gulf Coastal Plain and includes parts of several physiographic districts, but the State generally may be divided into the coastal plain uplands and the lower Mississippi River Alluvial Plain, known locally as the "Delta." The transition between the coastal plain uplands and the Delta is an abrupt, dissected escarpment characterized by steep slopes and pronounced ridges rising 150 to 250 ft above the alluvial plain.

The Delta, in the northwestern part of the State, is a flat, lens-shaped basin having a maximum width of about 65 mi. The topography is a series of abandoned meander belts, oxbow lakes, and swamps. Regional drainage characteristics are broad, widely meandering stream courses trending to the southwest with low channel slopes and large amounts of depression and channel storage. Extensive levees protect all but the southern part of the alluvial plain from floodwaters of the Mississippi River.

The coastal plain uplands is composed of hilly uplands and gently undulating prairies. The maximum elevation in the State is located in the coastal plain uplands in the northeast corner of the State, where elevations reach about 806 ft above sea level.

The six major drainage basins in Mississippi are the Yazoo, Big Black, Homochitto, Tombigbee, Pascagoula, and Pearl. The Yazoo, Big Black, and Homochitto basins drain southwestward into the Mississippi River. The Tombigbee basin drains southward into the Mobile River. The Pascagoula and Pearl basins drain southward into the Gulf of Mexico.

The climate of Mississippi is controlled primarily by the proximity of the Gulf of Mexico and the prevailing southwesterly winds. These conditions contribute to a generally warm and humid climate, making Mississippi one of the two wettest States in the contiguous United States. The average annual precipitation ranges from 54 inches in the northern part of the State to about 60 inches in the southern part (Wax, 1982).

Acknowledgments

The U.S. Army Corps of Engineers and many State and local agencies are acknowledged for their cooperation in the collection of much of the data used in the study.

RECORDS OF FLOODING

Records of annual peak flow collected at streamflow-gaging stations provide the empirical basis for estimates of flood characteristics. In this study, the records were analyzed for 330 locations (fig. 1, table 1) on streams in and near Mississippi to provide a total of 8,470 years of systematic annual peak-flow records.

Systematic records represent a random sample of annual peak flows at a site, generally collected over a continuous period. The distribution of systematic peak-flow-record lengths used in the regional analyses is shown in figure 2. A minimum of 10 years of record was considered necessary for estimating flood characteristics for a gaged site.

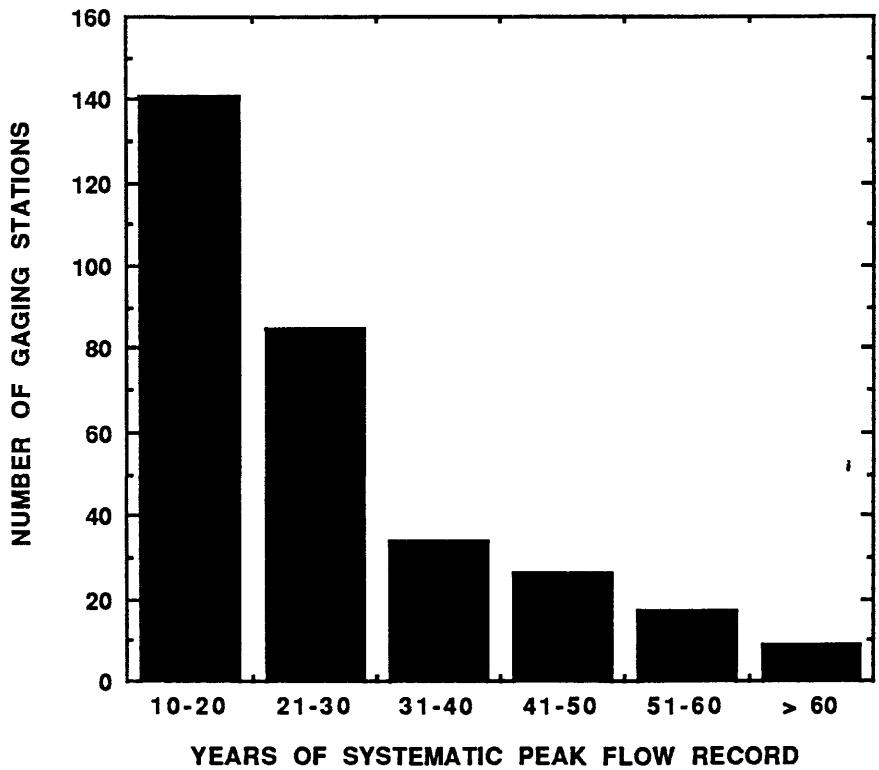


Figure 2.-- Distribution of systematic peak-flow record lengths.

Floods of unusually large magnitude often occur at a site when systematic records are not being obtained from a streamflow gage. In this study, evidence of the occurrence of unusually large floods was obtained from newspaper files, old records of stage, local historical records, diaries, and from individuals who remembered the flood or were informed by their ancestors. This flood information, referred to as historical record in this report, was used when available to extend the record of the largest floods at a site to a historical period much longer than that of the systematic record. Historical record is available for about 40 percent of the Mississippi sites having 10 or more years of systematic record.

Synthetic data (flood peaks generated from climatic records in a rainfall-runoff model) were used in the report by Colson and Hudson (1976) to extend the length of record at 89 gage sites, ranging in drainage area from 0.04 to 4.35 mi^2. Additional data have been collected since 1976, and 84 of these sites now have 10 or more years of systematic record. The synthetic and recorded flood-frequency discharges for these gages were compared using a paired Student's t-test, as described by Thomas (1987). The Student's t-tests, at the 5-percent level of significance for the 2-year to 100-year discharges, indicate that the synthetic data are statistically different from the systematic data for all except the 2-year and 5-year discharges. At the 1-percent level of significance, the difference was significant only at the 25-year and 100-year discharge. The bias of the synthetic data at the 5-percent level of significance was also reported by Colson (1986) and Thomas (1987). Therefore, the flood-frequency discharges based only on the systematic record were used in this study.

STATISTICAL CHARACTERISTICS OF ANNUAL PEAK FLOW

Statistical methods of analysis are well suited to the random nature of annual flooding. Statistical methods may be used to estimate flood frequency from a sample of recorded annual peak flows at a stream site using the assumption that the recorded sample represents the population of all the recorded and unrecorded annual peak flows. The Interagency Advisory Committee on Water Data (IACWD, 1982) recommends that the Pearson Type III distribution be used as the probability model for log-transformed annual peak-flow data. The Pearson Type III distribution requires estimates of the population mean, variance, and skew at a site. These population parameters are estimated by computing the corresponding sample parameters, based on the systematic record, as follows:

$$\overline{X} = \frac{1}{N}\sum_{i=1}^{N} X_i \qquad (1)$$

$$S^2 = \frac{1}{N-1}\sum_{i=1}^{N} (X_i - \overline{X})^2 \qquad (2)$$

$$G_s = \frac{N}{(N-1)\,(N-2)\,S^3}\sum_{i=1}^{N} (X_i - \overline{X})^3 \qquad (3)$$

where

- $\overline{X}$ is the sample mean;
- S is the sample standard deviation;
- S^2 is the sample variance;
- G_s is the sample skew;
- X_i is the log-transformed annual peak flow for year i; and
- N is the sample size, that is, the number of years of peak-flow record for the stream site.

Previous studies of the sampling distribution of sample skew (G_s) have shown that G_s is a biased estimator of the population skew and is subject to large sampling variances as compared with $\overline{X}$ and S^2. Empirical bias correction factors were computed by Wallis and others (1974) based on Monte Carlo experiments. A bias correction equation based on record length and described by Tasker and Stedinger (1986) was used by Landers (1989), and is defined as:

$$C_b = (1 + 6/N) \qquad (4)$$

where C_b is the bias correction coefficient and N is as defined previously. Sample skew coefficients were multiplied by this bias correction coefficient and used to develop unbiased regional skew coefficients.

Tasker and Stedinger (1986) showed only minor differences between bias correction coefficients from this equation and from the empirical results of Wallis and others (1974), when N is greater than 20 and the absolute value of G_s is less than 1.0.

Population skew estimates are improved when computed from the weighted average of the sample and unbiased regional skew estimates for a site, as recommended by the IACWD (1982). Sample skew (G_s) is weighted inversely to its mean square error (MSE_s), and regional skew (G_r) is weighted inversely to an estimate of its sampling variance (MSE_r). The IACWD (1982) uses mean square error (MSE_r) as an estimate of the sampling variance of regional skew. Population skew then is estimated by:

$$\hat{G} = \frac{(MSE_r * G_s) + (MSE_s * G_r)}{MSE_r + MSE_s} \qquad (5)$$

where

$\hat{G}$ is an estimate of the population skew coefficient, and G_r is assumed to be unbiased so that MSE_r is equal to the sampling variance of G_r.

Further improvements in estimated population skew are obtained by using weighted methods to estimate regional skew. Regional skew for Mississippi streams was studied in detail, and was described by Landers (1989) in a report that included a comparison of estimation techniques. The selected regional estimator is an unbiased, weighted-grid skew map. Regional skew coefficients for Mississippi are discussed in the Appendix.

FLOOD-FREQUENCY ESTIMATES FROM STREAMFLOW RECORDS

Flood-frequency estimates from records of annual peak flow at 330 gaging stations were computed by fitting the three-parameter Pearson Type III distribution to the sample of log-transformed annual peak flows, as recommended by the IACWD (1982). The regional unbiased map skew developed by Landers (1989) was used with the biased station skew to provide the Water Resources Council (WRC) weighted estimation of population skew. (The existing IACWD guidelines do not recommend the unbiasing of station skew.) Computations were made using U.S. Geological Survey computer program J407, "Annual Flood Frequency Analysis Using WRC Guidelines" (Lepkin and others, 1981).

Stream basins were reviewed to determine if the basins were affected by regulation or channelization, which may violate the stationary time series assumption and make the station unrepresentative of regional flood-frequency characteristics. Data from sites in basins that were regulated or channelized during the period of record were analyzed to determine the effect of regulation or channelization (noted in table 1) on annual peak-flow records. In several basins, gages were in place prior to significant regulation or channelization. For each of these gaging stations, the period of record prior to significant regulation or channelization was used to expand the natural, regional data base. However, flood-frequency information for these gages given in table 1 represents existing conditions. Station flood-frequency values are not weighted with regional values for regulated or channelized streams.

Weighted Flood-Frequency Estimates

If two independent estimates of flood frequency are weighted in inverse proportion to their error (variance), the error of the weighted average is less than that of either estimate (IACWD, 1982). The regional flood-frequency estimates developed in this investigation are assumed to be independent of the station flood-frequency estimates. The two estimates were weighted inversely proportional to their respective time-sampling and prediction errors to obtain a best estimate of flood-frequency at each gage in accordance with Appendix 8 of Bulletin 17B (IACWD, 1982). The estimates shown in table 1 for selected recurrence intervals from 2 to 500 years are weighted estimates unless otherwise noted.

Ungaged Sites on Gaged Streams

Flood-frequency estimates from a gaged stream site may be extrapolated to an ungaged site on the same stream using drainage area ratios raised to the

0.6 power. This procedure is suggested if the drainage area at an ungaged site is within 50 percent of the drainage area at the gaged site on the same stream. This extrapolated estimate and the regional regression estimate for the ungaged site are weighted in the following equation:

$$Q_{T(w)} = 4\left(\frac{\Delta A}{A_g}\right)^2 Q_r + \left[1-4\left(\frac{\Delta A}{A_g}\right)^2\right]\left(\frac{A_u}{A_g}\right)^{0.6} Q_g \qquad (6)$$

where

$Q_{T(w)}$ is the weighted discharge, in cubic feet per second, at the ungaged site for a recurrence interval of T years;

Q_g is the weighted gage discharge, in cubic feet per second, for the selected recurrence interval, from table 1;

Q_r is the regional regression discharge, in cubic feet per second, at the ungaged site for the selected recurrence interval;

A_u is the drainage area, in square miles, at the ungaged site;

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

ΔA is the difference between the drainage areas at the gaged and ungaged sites.

Where the drainage area at an ungaged site differs by more than 50 percent from that at the gaged site, the regional estimate should be used. If an ungaged site is between two gaged sites on the same stream, the suggested "50 percent rule" should be applied to determine which gaged site, if either, should be used to make an adjustment to the regional estimate at the ungaged site. If the drainage area at the ungaged site is within 50 percent of that at both gaged sites, the flood-frequency estimate for the ungaged site can be interpolated logarithmically, on the basis of drainage area, between the weighted gage discharges (Q_g) from each gaged site.

Accuracy of Flood-Frequency Estimates for Gaged Stream Sites

"Streamflow characteristics can only be estimated; their true value can never be determined because there is a time-sampling error in every record of streamflow and a model error in every analytical method" (Hardison, 1969). It is important to evaluate the error associated with a given flood estimate because of the large range of accuracy that may be obtained in flood estimates using different methods. A measure of the accuracy or error of a flood estimate is necessary to evaluate the confidence or factor of safety with which it should be used, to compare and select methods of estimation, and to serve as a basis for risk analysis. Accuracy may be indicated by the variance or standard error of estimate.

Flood estimates from peak-flow records may contain errors due to: (1) any systematic measurement or computational errors, (2) use of an unrepresentative population probability distribution, or (3) errors in estimation of the population parameters defining the frequency distribution (time-sampling errors). The first source of error is addressed by quality assurance procedures in the data collection, computation, and review process. These errors generally are small and, in fact, non-systematic. The second source of error exists because the population of floods defies consistent, precise representation by any frequency distribution. The third source of errors lies in the estimation of population frequency distribution parameters for the sample data. This time-sampling error is assumed to be large, compared to the other two sources of error discussed. Time-sampling error is the only error quantified in the standard error of a flood-magnitude estimate from station peak-flow records for a recurrence interval (T). The standard error of the T-year flood estimate is the sum of errors in the estimation of the mean, the standard deviation, and the skew of the Pearson Type III distribution from the logarithms of annual peak flow for a given site. The time-sampling error is a function of the slope of the frequency curve (sample standard deviation), the estimated skewness, the recurrence interval (T) being estimated, and the length of record as a measure of how representative the sample may be of the population of annual peaks. Methods of computing the standard (time-sampling) error have been presented by different authors [Bobee (1973), (Hardison (1971), and Kite (1988)]. This report uses the method described by Kite (1988) to compute the time-sampling errors for each station flood-frequency estimate. These time-sampling errors are combined with the error of prediction of the regional estimator to compute the standard error of the weighted estimate. The standard error, in percent, is shown in table 1 for the corresponding weighted or station flood-flow estimates.

The standard error of estimate is an indicator of the accuracy of a flood-frequency estimate. It is the square root of the variance of estimate about the unknown, true value being estimated. When errors are normally distributed, about two-thirds of the estimates are expected to lie within one standard error greater than or less than the true value. Ninety-five percent of the estimates are expected to be within two standard errors greater than or less than the true value. In this report, standard error is reported as a percentage of the true value being estimated. Thus, if a 10-year flood of magnitude 1,000 ft^3/s has a standard error of 30 percent, the true value would be expected to be between about 700 and 1,300 ft^3/s about two-thirds of the time.

Historical Record Evaluation

Evaluation of historical record in flood-frequency analyses is complex, and the most appropriate method is not certain at this time. In this investigation, historical records are included in the computation of Pearson Type III flood-frequency estimates using the adjusted-moment method recommended by IACWD (1982) and included in the J407 computer program (Lepkin and others, 1981). The effective record length obtained from the contribution of information from the historical record is required for computing the standard error of station flood-frequency estimates and for weighting station estimates with regional flood-frequency estimates. For a given recurrence interval, the effective record length is the number of years of systematic data that would produce the same standard error as a given combination of historical and systematic data (Stedinger and Cohn, 1986). Effective record length for stations having historical records was based on results of Monte Carlo simulations by Stedinger and Cohn (1986), which were provided in a sub-routine of the generalized-least-squares regression model by Tasker and Stedinger (1989). The effective record length computed in the generalized-least-squares regression model was used in the computation of standard error.

Flood-Frequency of the Pearl River Main Stem

The Pearl River is formed by the confluence of Tallahaga Creek, Nanawaya Creek, and Bogue Chitto about 85 miles northeast of Jackson, Miss., and flows southward through Jackson and into the Gulf of Mexico (fig. 1). Upstream of Jackson, the drainage basin is average- or fan-shaped; whereas, the basin is typically elongated downstream, except where major tributaries flow into the Pearl River causing the basin shape to fan out.

The Ross Barnett Reservoir, located about 10 miles northeast of Jackson (fig. 1), is designed primarily for water supply and recreation; however, it has been used successfully to provide some flood-peak reduction. The reservoir normally is operated so that the pool is maintained at a near-constant level, and the inflow is passed through without significant attenuation. Since completion of the reservoir, the largest and third largest floods of record on the Pearl River at Jackson occurred in April 1979 and in May 1983. These flood-peak discharges at the Jackson gage, located at U.S. Highway 80 in south Jackson, were compared with discharges at State Highway 43 (Meeks Bridge) near Canton (about 12 miles upstream from the dam). The comparison indicated the May 1983 flood peak was reduced about 20 percent by the regulation of the Ross Barnett reservoir discharge, and the April 1979 flood peak may have been reduced a lesser amount. Some natural flood-peak attenuation between the gages at Meeks Bridge and at Jackson was expected due to variation in basin shape, which was indicated by adjusting the peak discharges at Meeks Bridge and at the Jackson gage for basin shape.

A basin shape coefficient developed by Wilson and Trotter (1961) was used in this report to demonstrate the effect of basin shape on flood flows along the Pearl River main stem (fig. 3). This basin shape coefficient is inversely related to the ratio of the distance that flood waters must travel divided by average width of the basin. Wilson and Trotter (1961) reported shape coefficients ranging from 0.55 to 1.48 for corresponding length-to-width ratios ranging from 13.0 to 1.50 for Mississippi streams (excluding the Delta).

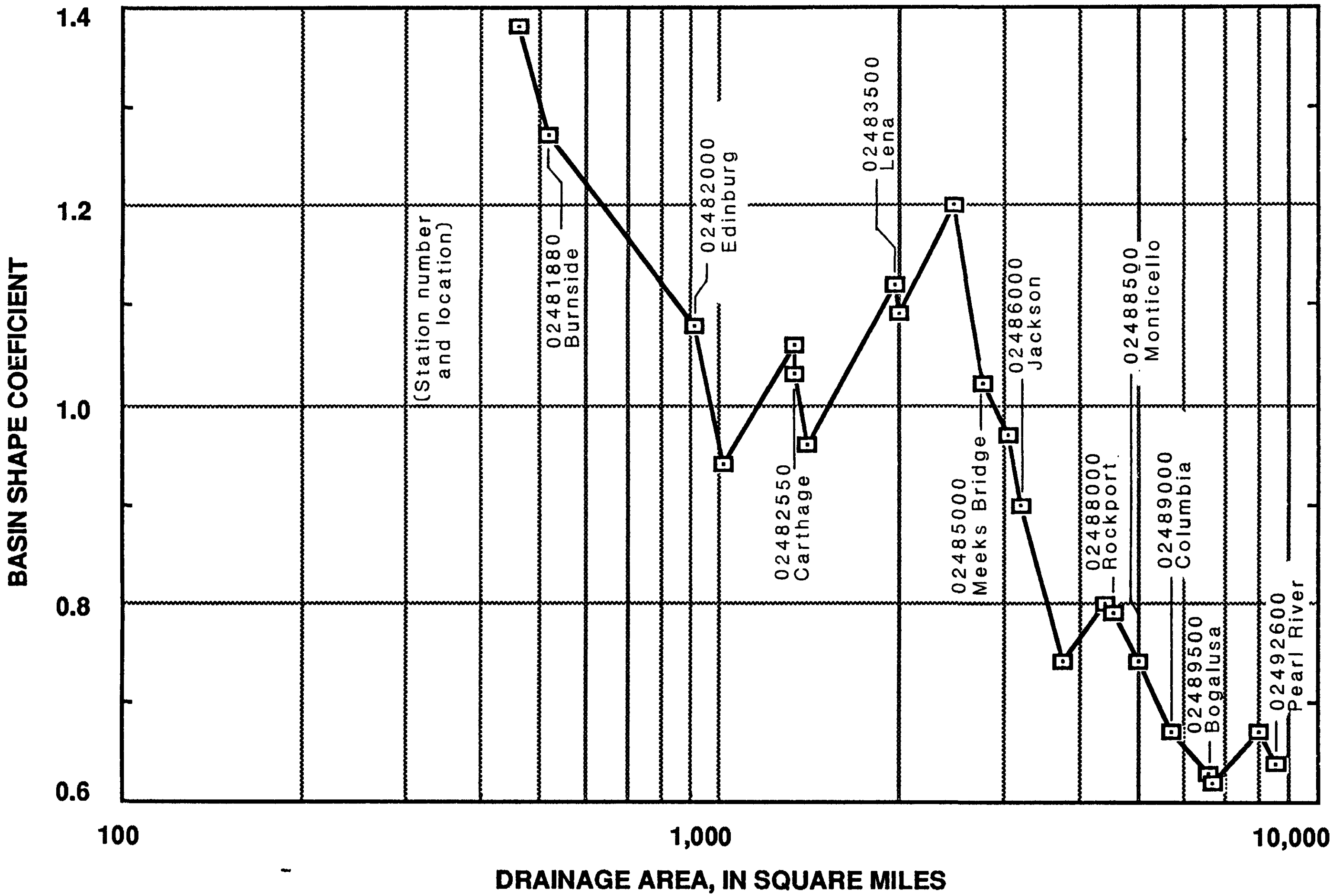


Figure 3.--Relation of basin shape coefficient to drainage area for the Pearl River main stem (method from: Wilson and Trotter, 1961).

The ratio is computed using $r = L^2/A$, where r is the ratio, L is the valley length, and A is the drainage area. For a drainage area of 1.0 mi^2, L for shape coefficients of 0.55 and 1.48 are 3.61 and 1.22 mi, respectively. Therefore, a larger basin shape coefficient would suggest a more fan-shaped basin; whereas, the smaller coefficient would suggest a more elongated basin with the coefficient of 1.0 for an average-shaped basin. The elongated basin would tend to provide more channel storage and dissipation of flood flows primarily because of the longer flow length.

The basin shape coefficient was determined along the Pearl River main stem from Burnside (near the confluence of Tallahaga Creek, Nanawaya Creek, and Bogue Chitto) to Pearl River, La. In this river reach, the coefficient was determined at each gaging site and at the mouth of each major tributary (fig. 3).

Flood-frequency discharges for 11 sites on the Pearl River are shown in table 1 and are plotted with drainage area in figure 4. The discharges for seven of these sites were agreed upon in 1980 by the U.S. Geological Survey and the U.S. Army Corps of Engineers, Mobile District, following the April 1979 flood. These sites were re-analyzed to include record through the 1988 water year, but analyses indicated that no revisions were warranted. For the other four sites (Burnside, Lena, Meeks Bridge, and Rockport), the records were extended using correlations with the nearest long-term station in accordance with Appendix 7 of Bulletin 17B (IACWD, 1982). The flood-frequency discharges for each site were divided by the appropriate basin-shape coefficient (fig. 3) to determine the discharges for an average-shaped basin (fig. 5).

If an estimate of a discharge for a specific frequency is needed for an ungaged site on the Pearl River, it is necessary to: (1) determine the drainage area, (2) obtain the discharge for an average-shaped basin from figure 5, and (3) multiply by the appropriate basin shape coefficient from figure 3.

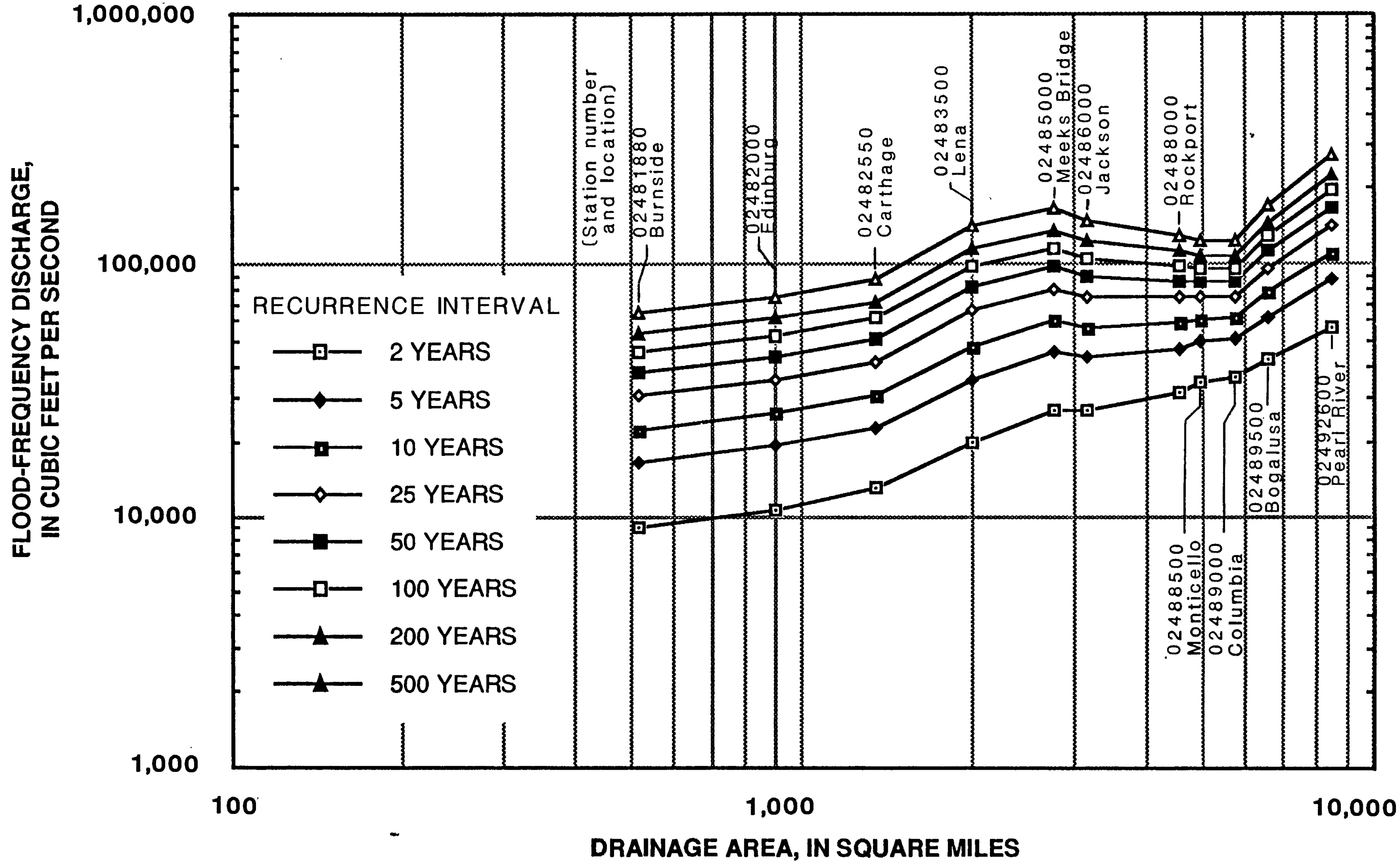


Figure 4.--Relation of flood-frequency discharge to drainage area for the Pearl River main stem.

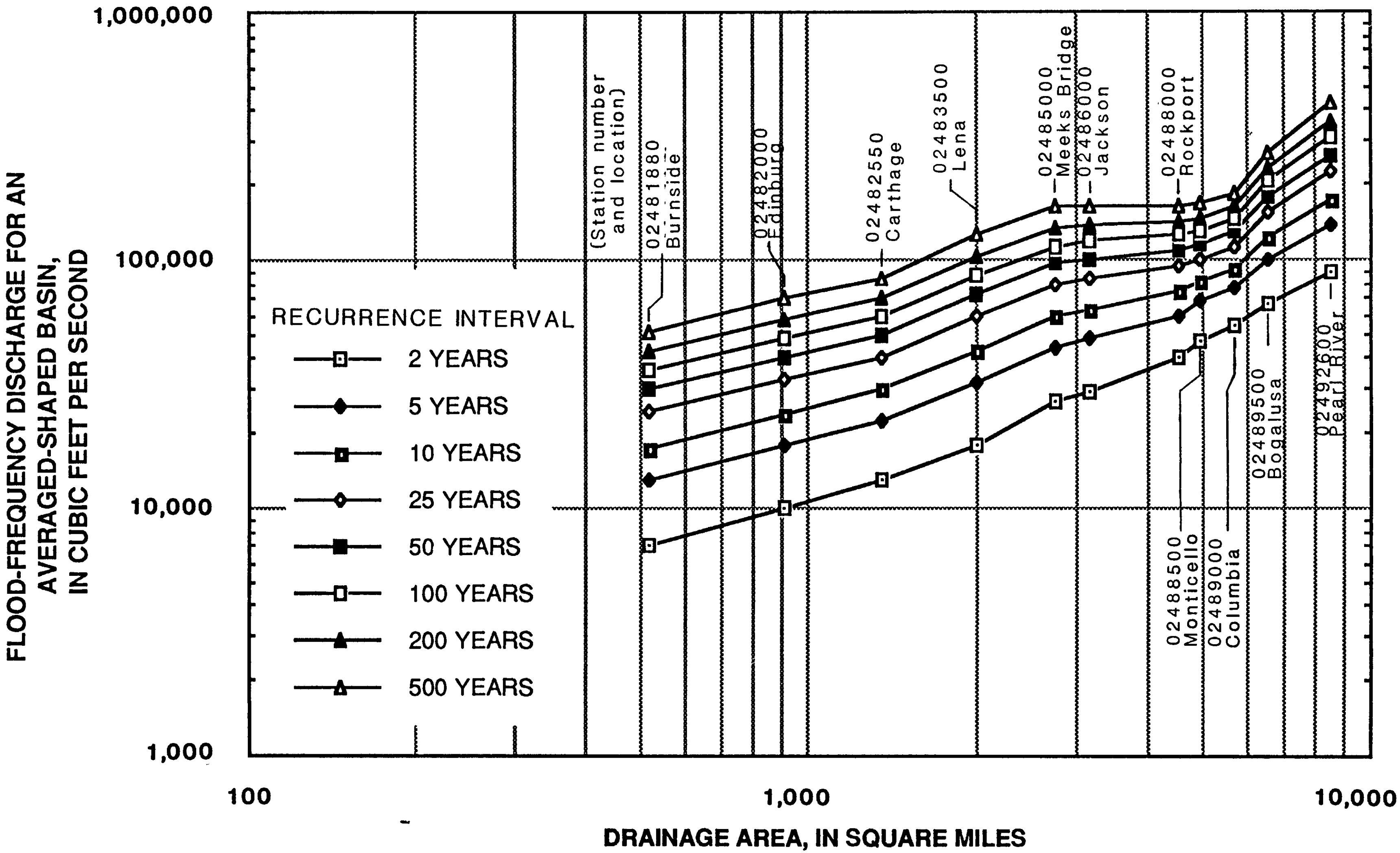


Figure 5.--Relation of flood-frequency discharge for an average-shaped basin to drainage area for the Pearl River main stem.

REGIONAL FLOOD-FREQUENCY ESTIMATES FOR RURAL STREAMS

Streamflow gaging records are available at only a small percentage of the stream sites where flood-frequency estimates are needed. Regionalization procedures are necessary to transfer flood-characteristic information from gaged to ungaged sites. Regional flood-frequency estimates also improve accuracy at a gaged site by weighting with station estimates, assuming that the station estimate is independent of the regional estimate. Regionalization procedures generally define relations between flood-frequency characteristics and explanatory drainage basin variables for gaged streams that are representative of similar streams in a specific class or region. Regionalization procedures have been the subject of much research through the years, and methods used by the U.S. Geological Survey have evolved as a result.

Graphical index-flood regionalization procedures were used by Wilson and Trotter (1961) for estimating flood magnitudes with recurrence intervals from 1.2 to 50 years for separate regions of the State. This detailed analysis included an adjustment factor for basin shape. Index-flood procedures were also presented by Patterson (1964) for streams in the lower Mississippi River basin and by Barnes and Golden (1966) for streams in the South Atlantic Slope and eastern Gulf of Mexico basins, Ogeechee River to the Pearl River, including parts of Mississippi. Continuing research by the U.S. Geological Survey led to the use of ordinary-least-squares (OLS) regression procedures to estimate T-year floods directly from drainage basin or climatic explanatory variables (Thomas and Benson, 1970). Regional T-year flood estimators for recurrence intervals from 2 to 100 years were determined using OLS procedures and were reported by Colson and Hudson (1976) for streams statewide, and by Landers (1985) for streams in the Lower Mississippi River Alluvial Plain. Recent developments in the regionalization of flood characteristics have centered on accounting for the deficiencies in the assumptions of OLS regression when applied to hydrologic variables.

Regional estimators of annual peak flood magnitude were computed in this study for recurrence intervals from 2 to 500 years. The maximum recurrence interval was 50 years in the report by Wilson and Trotter (1961) and 100 years in the report by Colson and Hudson (1976). Maximum recurrence interval is increased in this report because of changes in design standards requiring estimates of the 200-year and 500-year recurrence intervals and not because of an improvement in the confidence given to the accuracy or methods.

Generalized-Least-Squares Regression

Two significant assumptions of OLS that usually are violated when estimating T-year floods are: 1) the errors are statistically uniform (homoscedastic), and 2) the observations are statistically independent in the sample. The error of T-year flood estimates varies from stream to stream with the length of record used to make the estimates. Also, T-year flood estimates may be correlated between streams experiencing similar climatic conditions and having similar drainage basin characteristics.

A procedure for estimating regional flood frequencies recently has been proposed by Stedinger and Tasker (1985 and 1986) that uses a weighting matrix to account for the time-sampling error and the cross-correlation of flood characteristics between sites. This procedure is called generalized-least-squares regression (GLS).

Cross-correlation between observations is estimated as a function of distance between gaged sites. The correlation-distance function is estimated from gages having long, concurrent record periods and in this study, is estimated from station pairs having concurrent record periods in excess of 30 or 50 years, depending on the region within the State. GLS regression also requires matrices of the mean, standard deviation, and skew associated with the matrix of log-transformed station T-year flood estimates. The standard deviation and skew matrices should be independent of the residual errors of the regional estimators in order that the model error can be quantified from the total residual error. In this study, regional estimates of the mean and standard deviation were computed using OLS regression of station mean and standard deviation against log-transformed drainage area and slope. The independent matrix of skews was estimated by using the matrix of estimates of population skew coefficients at each station.

Because GLS procedures compute and account for the time-sampling error and cross correlation of the observed T-year values, the total error of prediction of the regression equation may be divided into time-sampling errors arising from data limitations and model error arising from model limitations. Stedinger and Tasker (1985) used Monte Carlo simulations to prove that, "In situations where the available streamflow records at gaged sites are of different and widely varying length and concurrent flows at different sites are cross-correlated, the GLS procedure provided more accurate parameter estimates, better estimates of the accuracy with which the regression model's parameters were being estimated, and almost unbiased estimates of the variance of the underlying regression model's residual errors," as compared with OLS or weighted-least-squares procedures.

Explanatory Variables

Regional flood-frequency estimators provide a means of extending the information gained at gaged locations to ungaged locations. Station T-year flood estimates were regressed on a range of potential explanatory variables including: drainage area, channel slope, channel length, mean basin elevation, basin shape factors, mean annual precipitation, and precipitation intensity. This testing was also performed on subgroups of the whole-sample group of sites, according to drainage area, region, and recurrence interval. Significant explanatory variables are drainage area, channel slope, and channel length. Logarithms of discharge have an approximately linear relation with logarithms of the selected basin characteristics, as shown in figure 6. The inverse relation of channel length, as a basin shape factor to discharge, is also illustrated in figure 6.

Regional Boundaries

An underlying assumption of regional flood-frequency relations is that the relation between T-year flood discharges and basin characteristics is similar for each stream and may be generalized for all streams represented in the data sample. This assumption was tested by comparing the regression residuals (observed value minus predicted value) between the whole-sample groups and selected subgroups. Tested subgroups were selected on the basis of major drainage basin boundaries, known regional variations in flood characteristics, and drainage area. Hypothesis tests were used to compute the probable equivalence between the whole-sample group and subgroups of the mean and median OLS regression residuals of the 10-year flood estimate.

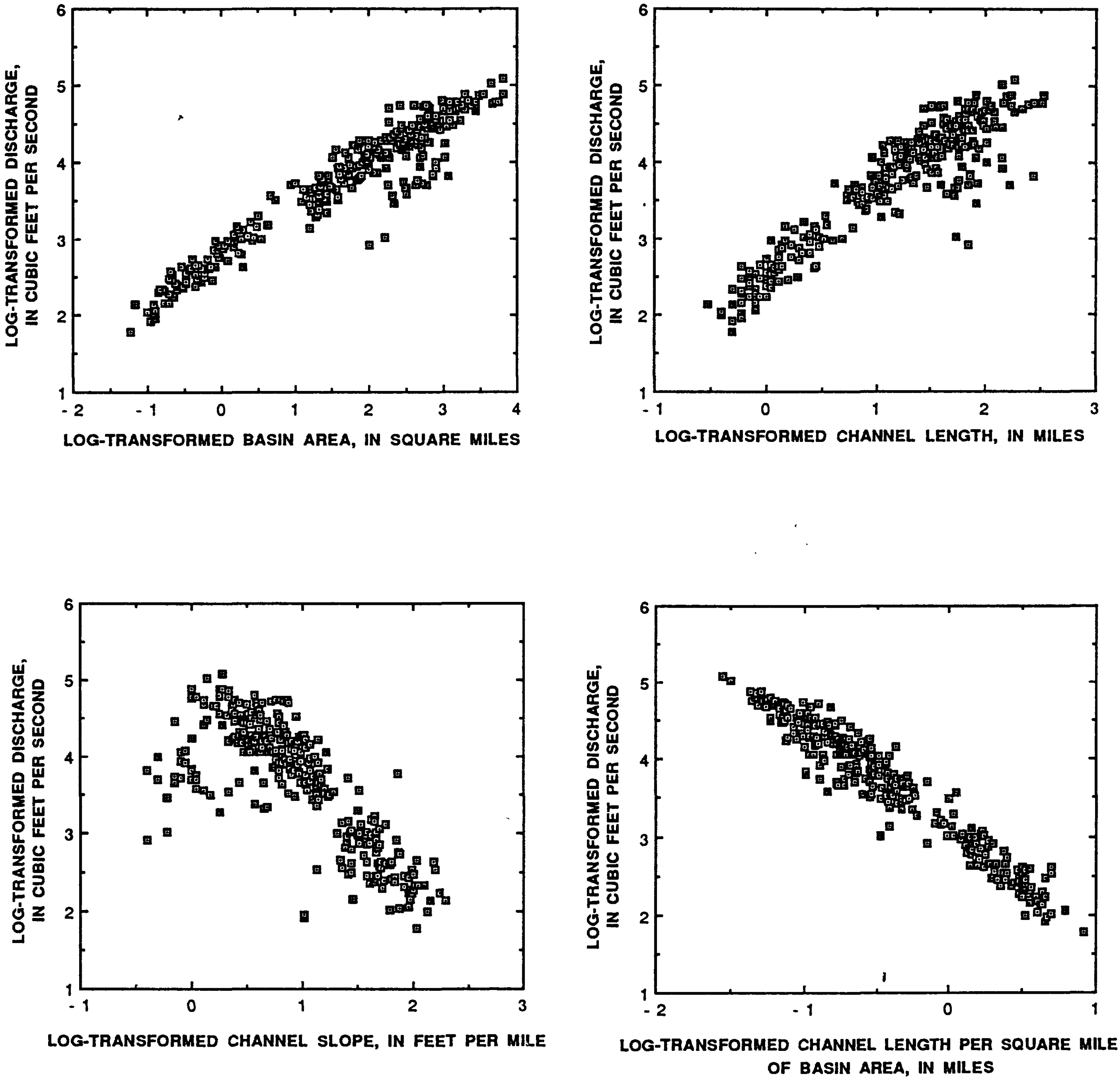


Figure 6.--Relation of the 10-year discharge to basin characteristics.

Figure 7 shows the characteristics of the OLS residuals for sites within the major drainage basin subgroups for an equation computed from the whole-sample group of sites outside the Delta region. These comparisons were also made using unweighted GLS residuals with similar results.

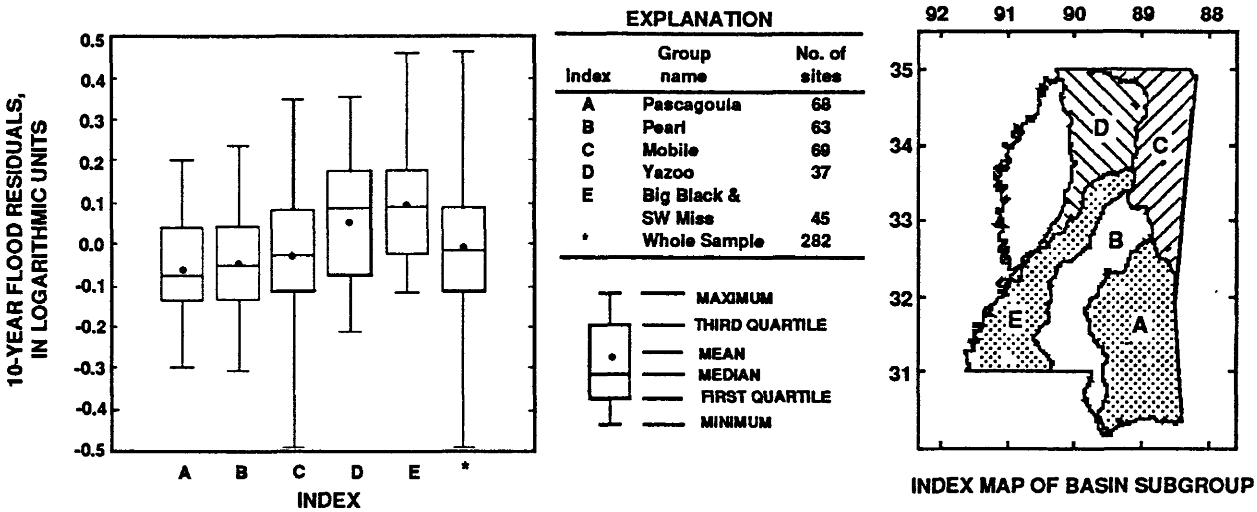


Figure 7. - - Characteristics of the 10-year flood residuals for the drainage basin subgroups and the whole-sample group of sites outside the Delta region.

Flood characteristics were determined to be non-homogeneous among four subgroups. Three of these subgroups are defined by geographic boundaries and one by drainage area magnitude. Regional flood-frequency equations were computed for each subgroup. Urbanized drainage basins were also analyzed separately.

Selection of the Appropriate Flood-Frequency Equation

Techniques for estimating the magnitude of floods with recurrence intervals from 2 to 500 years in Mississippi are provided in this report. If flood-frequency information is needed at a gaged site, it should be obtained from table 1. If the gage is not listed in table 1, the user must decide whether the appropriate estimate is obtained by weighting the station and regional estimates or from the unweighted station estimate (as when a stream is regulated or otherwise regionally unrepresentative.)

If flood-frequency information is needed at an ungaged site or if a regional estimate is needed to weight with a station estimate, then the appropriate regional flood-frequency equation must be selected. A user would select: (1) the Delta equations, if the stream is in the Delta; (2) the GT800 equations, if the stream is outside the Delta with drainage area greater than 800 square miles (GT800); or (3) the East or West equations, based on stream-site location (fig. 1). In figure 1, regions 1, 2, and 3 are the East, West, and Delta regions, respectively. The Delta and West boundary is crossed by stream basins sloping westward down the abrupt, dissected escarpment. For ungaged sites located in the Delta part of these basins, it is suggested that two discharges be estimated for each frequency by assuming all of the basin lies in each region and then averaging the discharges by areal weight. Drainage basins affected by urbanization should be estimated using the equations presented from the report by Sauer and others (1983), with the appropriate rural estimating equation.

The accuracy for each flood-frequency equation may be measured by using the standard error of prediction. The standard error of prediction for each equation is shown in table 2.

Table 2.--*Standard error of prediction for each flood-frequency regression equation*
[GT800, basins in the eastern or western regions with areas greater than 800 square miles]

Recurrence interval, in years	Standard error of prediction for each region, in percent			
	East	West	Delta	GT 800
2	34	35	34	22
5	27	31	34	19
10	26	30	36	17
25	27	31	38	16
50	29	32	38	15
100	31	34	40	15
200	34	36	42	16
500	38	39	45	17

Delta

The most significant flood-characteristic boundary in Mississippi is between the Delta and the remainder of the State. Wilson and Trotter (1961) and Landers (1985) presented this region of the State as a separate hydrologic area with a unique flood-frequency relation. Landers (1985) presented regional flood-frequency equations for recurrence intervals from 2 to 100 years, based on data from 30 gaging stations in this region in Mississippi, Louisiana, and Arkansas. Of these 30 sites, only 6 are located in Mississippi (table 1). Comparisons of the 10-year flood regression residuals of the subgroup of 30 Delta streams to the whole-sample (statewide) group of 312 streams confirm the uniqueness of the Delta region. The statistical characteristics of the residuals are shown in figure 8.

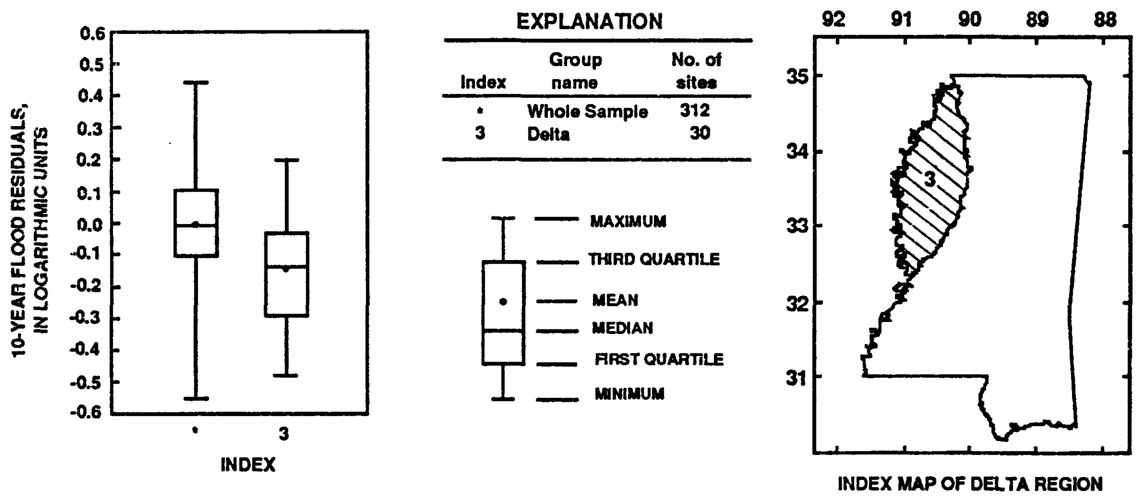


Figure 8. – Characteristics of the 10-year flood residuals for the whole-sample (statewide) group and for the Delta region.

The null hypothesis that the mean of the residuals is equal to the whole-sample mean (zero) was rejected at a 1-percent significance level, using the Student's t-test. Significant additional data have not been collected since 1985, because 19 of these 30 sites were discontinued. Therefore, the equations from Landers (1985) are repeated here without alteration. Those equations were computed using OLS regression procedures, and were checked in this analysis. The recurrence interval was extended to 500 years using OLS regression procedures. The equations are as follows:

$$Q_2 = 171\,(A)^{0.87}\,(S)^{0.25}\,(L)^{-0.52} \quad (7)$$

$$Q_5 = 192\,(A)^{0.93}\,(S)^{0.37}\,(L)^{-0.54} \quad (8)$$

$$Q_{10} = 205\,(A)^{0.96}\,(S)^{0.42}\,(L)^{-0.56} \quad (9)$$

$$Q_{25} = 224\,(A)^{0.99}\,(S)^{0.48}\,(L)^{-0.58} \quad (10)$$

$$Q_{50} = 232\,(A)^{1.00}\,(S)^{0.52}\,(L)^{-0.57} \quad (11)$$

$$Q_{100} = 236\,(A)^{1.00}\,(S)^{0.57}\,(L)^{-0.55} \quad (12)$$

$$Q_{200} = 243\,(A)^{1.00}\,(S)^{0.60}\,(L)^{-0.54} \quad (13)$$

$$Q_{500} = 249\,(A)^{1.00}\,(S)^{0.64}\,(L)^{-0.52} \quad (14)$$

where

Q_T is the estimated peak discharge, in cubic feet per second, for a recurrence interval of T years;

A is the contributing drainage area, in square miles;

S is the channel slope, in feet per mile, defined as the difference in altitude between points located at 10 and 85 percent of the main channel length divided by the channel length between the two points, as determined from topographic maps; and

L is the main-channel length, in miles, from the point of discharge to the drainage divide as measured in 0.1 mile increments on topographic maps. At a stream junction, the branch draining the largest area is considered the main channel.

GT800

Streams outside the Delta were analyzed for flood characteristic homogeneity over the range of drainage areas (fig. 9). Comparisons of subgroups of OLS residuals indicate that flood estimates are over-predicted on stream basins larger than about 800 mi^2 and smaller than about 1 mi^2 (fig. 10). The subgroup of basins larger than 800 mi^2 was the most statistically different. When this subgroup of 33 sites was removed, the new whole sample (249 sites) was representative of the small drainage area sites (fig. 11). Equations for sites with drainage areas greater than 800 mi^2 (GT800) were computed using GLS procedures and are as follows:

$$Q_2 = 131\,(A)^{0.97}\,(S)^{0.21}\,(L)^{-0.47} \quad (15)$$

$$Q_5 = 382\,(A)^{0.90}\,(S)^{0.22}\,(L)^{-0.48} \quad (16)$$

$$Q_{10} = 668\,(A)^{0.87}\,(S)^{0.21}\,(L)^{-0.49} \quad (17)$$

$$Q_{25} = 1260\,(A)^{0.84}\,(S)^{0.18}\,(L)^{-0.52} \quad (18)$$

$$Q_{50} = 1950\,(A)^{0.83}\,(S)^{0.15}\,(L)^{-0.55} \quad (19)$$

$$Q_{100} = 2890\,(A)^{0.83}\,(S)^{0.12}\,(L)^{-0.59} \quad (20)$$

$$Q_{200} = 4050\,(A)^{0.82}\,(S)^{0.09}\,(L)^{-0.63} \quad (21)$$

$$Q_{500} = 6070\,(A)^{0.83}\,(S)^{0.06}\,(L)^{-0.68} \quad (22)$$

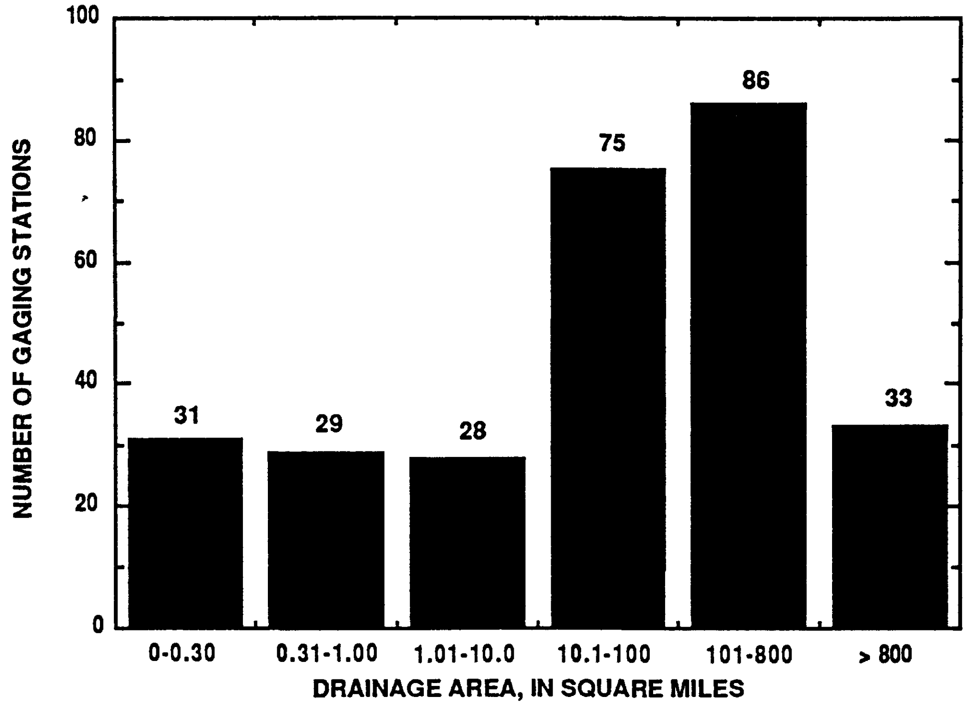
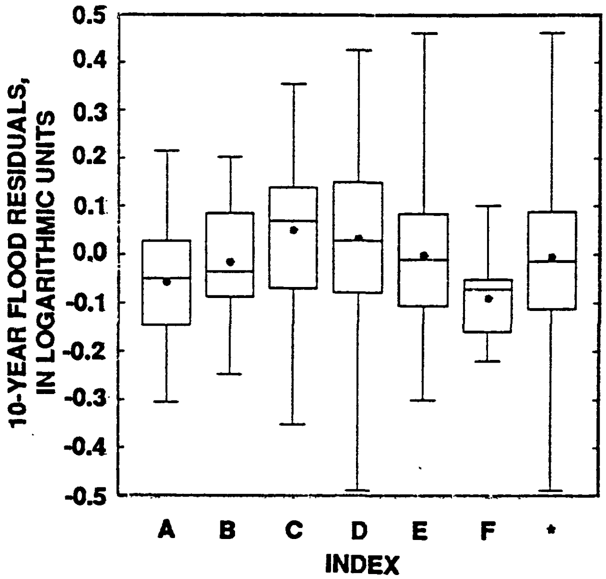


Figure 9.- Distribution of drainage area for 282 gaging stations outside the Delta region.



EXPLANATION

Index	Drainage area, in square miles	No. of sites
A	0 - 0.30	31
B	0.31 - 1.00	29
C	1.01 - 10.0	28
D	10.1 - 100	75
E	101 - 800	86
F	> 800	33
*	Whole Sample	282

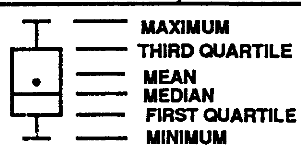
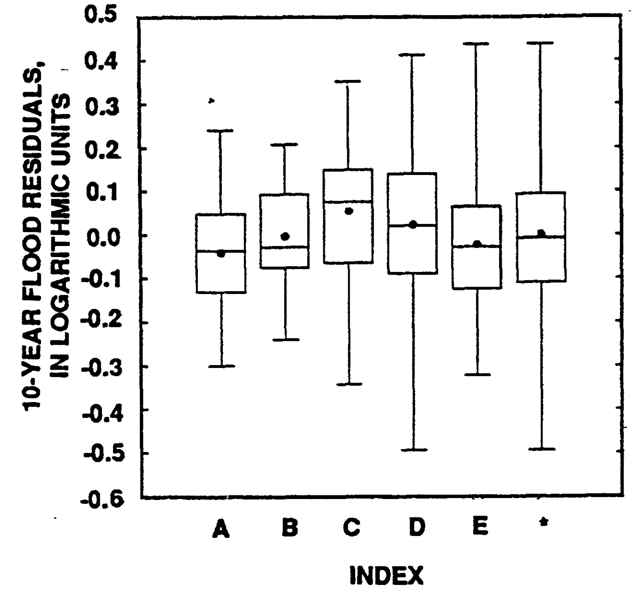


Figure 10.--Characteristics of the 10-year flood residuals for drainage area subgroups and the whole-sample group of sites outside the Delta region.



EXPLANATION

Index	Drainage area, in square miles	No. of sites
A	0 - 0.30	31
B	0.31 - 1.00	29
C	1.01 - 10.0	28
D	10.1 - 100	75
E	101 - 800	86
*	Whole Sample	249

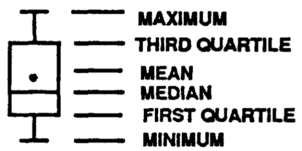


Figure 11.--Characteristics of the 10-year flood residuals for drainage area subgroups and the whole-sample group of sites outside the Delta region having drainage areas less than or equal to 800 square miles.

East

The whole sample of 249 sites for stream basins outside the Delta region and less than or equal to 800 mi^2 was also analyzed for flood-characteristic homogeneity. Residuals of the 10-year flood estimate were compared by major basin subgroup. The 10-year flood tended to be over-predicted in the Pearl, Pascagoula, and Mobile River basins (fig. 7). These basins were combined and are referred to as the East region (fig. 12). The small areas of the Hatchie and Tennessee River basins located in Mississippi were included in the East region. The null hypothesis that the mean of the residuals from the 174 sites in the East region is equal to the whole sample mean (zero) was rejected at a 1-percent significance level using the Student's t-test. Equations for the East region were computed using GLS procedures and are as follows:

$$Q_2 = 296\ (A)^{0.81}\ (S)^{0.03}\ (L)^{-0.36} \qquad (23)$$

$$Q_5 = 406\ (A)^{0.84}\ (S)^{0.07}\ (L)^{-0.35} \qquad (24)$$

$$Q_{10} = 482\ (A)^{0.85}\ (S)^{0.09}\ (L)^{-0.34} \qquad (25)$$

$$Q_{25} = 577\ (A)^{0.85}\ (S)^{0.10}\ (L)^{-0.32} \qquad (26)$$

$$Q_{50} = 648\ (A)^{0.85}\ (S)^{0.11}\ (L)^{-0.31} \qquad (27)$$

$$Q_{100} = 716\ (A)^{0.85}\ (S)^{0.11}\ (L)^{-0.30} \qquad (28)$$

$$Q_{200} = 786\ (A)^{0.85}\ (S)^{0.12}\ (L)^{-0.29} \qquad (29)$$

$$Q_{500} = 874\ (A)^{0.85}\ (S)^{0.12}\ (L)^{-0.28} \qquad (30)$$

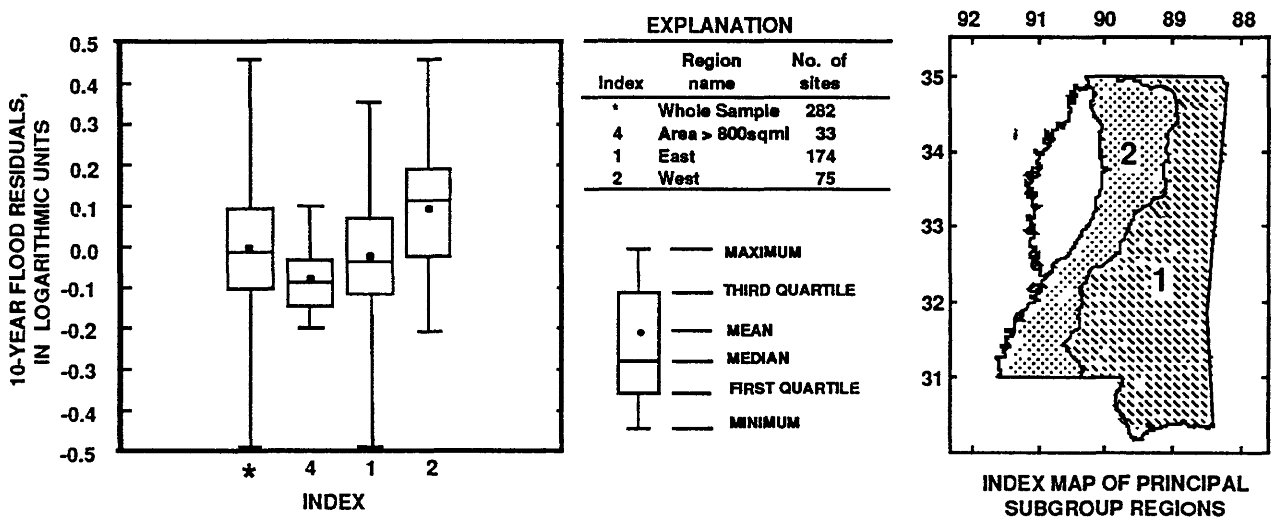


Figure 12.– Characteristics of the 10-year flood residuals for the whole-sample group of sites outside the Delta region and for the principal subgroup regions.

West

The 10-year flood tended to be under-predicted for streams in the Yazoo (upstream of the Delta), Big Black, and southwest Mississippi drainage basins when the whole-sample of 249 sites for stream basins outside the Delta region and less than or equal to 800 mi^2 was analyzed for flood-characteristic homogeneity (fig. 7). These basins were combined and are referred to as the West region of the State (fig. 12). The null hypothesis that the mean of the residuals from the 75 sites in the West region is equal to the whole-sample mean was rejected at a 1-percent significance level using the Student's t-test. Equations for streams in the West region were computed using GLS procedures and are as follows:

$$Q_2 = 66.2\,(A)^{0.88}\,(S)^{0.51}\,(L)^{-0.11} \quad (31)$$

$$Q_5 = 94.7\,(A)^{0.93}\,(S)^{0.51}\,(L)^{-0.15} \quad (32)$$

$$Q_{10} = 122\,(A)^{0.96}\,(S)^{0.49}\,(L)^{-0.19} \quad (33)$$

$$Q_{25} = 164\,(A)^{0.99}\,(S)^{0.47}\,(L)^{-0.24} \quad (34)$$

$$Q_{50} = 197\,(A)^{1.00}\,(S)^{0.45}\,(L)^{-0.26} \quad (35)$$

$$Q_{100} = 230\,(A)^{1.00}\,(S)^{0.44}\,(L)^{-0.25} \quad (36)$$

$$Q_{200} = 262\,(A)^{1.00}\,(S)^{0.42}\,(L)^{-0.25} \quad (37)$$

$$Q_{500} = 305\,(A)^{1.00}\,(S)^{0.41}\,(L)^{-0.25} \quad (38)$$

REGIONAL FLOOD-FREQUENCY ESTIMATES FOR URBANIZED STREAMS

Data have been collected in Mississippi on eight urban streams for which the period of actual flood data has been one of relatively constant urbanization. A preliminary analysis of the flood data on four of these streams in the Jackson area was reported by Wilson (1966). Due to the limited data, equations were not developed for this report, but a comparison was made between station frequency discharges (table 1) and discharges computed from the seven-parameter equations developed by Sauer and others in 1983. Those equations were developed using all available U.S. Geological Survey urban drainage basin data throughout the United States. Seven of the Mississippi urban sites were included in this nationwide analysis, which used flood data through the 1977 water year. The seven-parameter equations and definitions, excerpted from Sauer and others (1983), are as follows:

Equation	Average standard error of prediction, in percent	
$UQ_2 = 2.35A^{0.41}SL^{0.17}(RI2+3)^{2.04}(ST+8)^{-0.65}(13\text{-}BDF)^{-0.32}IA^{0.15}RQ_2^{0.47}$	±38	(39)
$UQ_5 = 2.70A^{0.35}SL^{0.16}(RI2+3)^{1.86}(ST+8)^{-0.59}(13\text{-}BDF)^{-0.31}IA^{0.11}RQ_5^{0.54}$	±37	(40)
$UQ_{10} = 2.99A^{0.32}SL^{0.15}(RI2+3)^{1.75}(ST+8)^{-0.57}(13\text{-}BDF)^{-0.30}IA^{0.09}RQ_{10}^{0.58}$	±38	(41)
$UQ_{25} = 2.78A^{0.31}SL^{0.15}(RI2+3)^{1.76}(ST+8)^{-0.55}(13\text{-}BDF)^{-0.29}IA^{0.07}RQ_{25}^{0.60}$	±40	(42)
$UQ_{50} = 2.67A^{0.29}SL^{0.15}(RI2+3)^{1.74}(ST+8)^{-0.53}(13\text{-}BDF)^{-0.28}IA^{0.06}RQ_{50}^{0.62}$	±42	(43)
$UQ_{100} = 2.50A^{0.29}SL^{0.15}(RI2+3)^{1.76}(ST+8)^{-0.52}(13\text{-}BDF)^{-0.28}IA^{0.06}RQ_{100}^{0.63}$	±44	(44)
$UQ_{500} = 2.27A^{0.29}SL^{0.16}(RI2+3)^{1.86}(ST+8)^{-0.54}(13\text{-}BDF)^{-0.27}IA^{0.05}RQ_{500}^{0.63}$	±49	(45)

where

UQ_T is the urban peak discharge, in cubic feet per second, for the recurrence interval of T years;

A is the contributing drainage area, in square miles;

SL is the main channel slope, in feet per mile, measured between points which are 10 percent and 85 percent of the main channel length upstream from the study site (for sites where **SL** is greater than 70, 70 is used in the equations);

RI2 is rainfall intensity, in inches, for the 2-hour 2-year occurrence (U.S. Weather Bureau, 1961).

ST is basin storage, the percentage of the drainage basin occupied by lakes, reservoirs, swamps, and wetlands (in-channel storage of a temporary nature, resulting from detention ponds or roadway embankments, is not included in the computation of **ST**);

BDF is the basin development factor;

IA is the percentage of the drainage basin occupied by impervious surfaces, such as houses, buildings, streets, and parking lots; and

$\mathbf{RQ_T}$ is the peak discharge, in cubic feet per second, for an equivalent rural drainage basin in the same hydrologic area as the urban basin, and for recurrence interval of **T** years.

The basin development factor (**BDF**) describes the conditions of the drainage system. The following description of the **BDF** and how it is computed is a quotation from Sauer and others (1983).

> The most significant index of urbanization that results from this study is a basin development factor (BDF), which provides a measure of the efficiency of the drainage system. This parameter, which proved to be highly significant in the regression equations, can be easily determined from drainage maps and field inspections of the drainage basin. The basin is first divided into thirds. Then, within each third, four aspects of the drainage system are evaluated and each assigned a code as follows:
>
> 1. Channel improvements.--If channel improvements such as straightening, enlarging, deepening, and clearing

are prevalent for the main drainage channels and principal tributaries (those that drain directly into the main channel), then a code of 1 is assigned. Any or all of these improvements would qualify for a code of 1. To be considered prevalent, at least 50 percent of the main drainage channels and principal tributaries must be improved to some degree over natural conditions. If channel improvements are not prevalent, then a code of zero is assigned.

2. Channel linings.--If more than 50 percent of the length of the main drainage channels and principal tributaries has been lined with an impervious material, such as concrete, then a code of 1 is assigned to this aspect. If less than 50 percent of these channels is lined, then a code of zero is assigned. The presence of channel linings would obviously indicate the presence of channel improvements as well. Therefore, this is an added factor and indicates a more highly developed drainage system.

3. Storm drains, or storm sewers.--Storm drains are defined as enclosed drainage structures (usually pipes), frequently used on the second tributaries where the drainage is received directly from streets or parking lots. Many of these drains empty into open channels; however, in some basins they empty into channels, enclosed as box or pipe culverts. When more than 50 percent of the secondary tributaries within a subarea (third) consists of storm drains, then a code of 1 is assigned to this aspect; if less than 50 percent of the secondary tributaries consists of storm drains, then a code of zero is assigned. It should be noted that if 50 percent or more of the main drainage channels and principal tributaries are enclosed, then the aspects of channel improvements and channel linings would also be assigned a code of 1.

4. Curb-and gutter streets.--If more than 50 percent of a subarea (third) is urbanized (covered by residential, commercial, and/or industrial development), and if more than 50 percent of the streets and highways in the subarea are constructed with curbs and gutters, then a code of 1 would be assigned to this aspect. Otherwise, it would receive a code of zero. Drainage from curb-and-gutter streets frequently empties into storm drains.

The above guidelines for determining the various drainage-system codes are not intended to be precise measurements. A certain amount of subjectivity will necessarily be involved. Field checking should be performed to obtain the best estimate. The basin development factor (**BDF**) is the sum of the assigned codes; therefore, with three subareas (thirds) per basin, and four drainage aspects to which codes are assigned in each subarea, the maximum value for a fully developed drainage system would be 12. Conversely, if the drainage system were totally undeveloped, then a **BDF** of zero would result. Such a condition does not necessarily mean that the basin is unaffected by urbanization. In fact, a basin could be partially urbanized, have some impervious area, have some improvement of secondary tributaries, and still have an assigned **BDF** of zero.

The **BDF** is fairly easy index to estimate for an existing urban basin. The 50-percent guideline will usually not be difficult to evaluate because many urban areas tend to use the same design criteria, and therefore have similar drainage aspects, throughout. Also, the **BDF** is convenient for projecting future development. Obviously, full development of the drainage system and maximum urban effects on peaks would occur when **BDF = 12**. Projections of full development or intermediate stages of development can usually be obtained from city engineers.

The nationwide equations were used to estimate the 2-year, 10-year, and 100-year floods for the eight Mississippi urban sites. Four additional basin characteristics needed in these equations are presented in table 3. The nationwide equation estimates are compared with the observed station estimates in figure 13. The comparison is also made on the basis of the root-mean-square error (RMS) of the estimating equation, computed as:

$$RMS = \sqrt{(\overline{X})^2 + S^2} \qquad (46)$$

where $\overline{X}$ is the average error and S is the standard deviation of the error. The root-mean-square error is considered an approximation of the standard error of prediction. Table 4 presents errors of prediction for the group of all eight sites and for the group of five sites in Jackson. For the Jackson sites, the minimum and maximum errors are significantly negative for the 2-year and both positive and negative for the 100-year recurrence interval. Average errors for the 10-year and 100-year recurrence intervals are similar to those reported for adjoining states by Sauer (1986).

Table 3.--*Additional basin characteristics for urban streams in Mississippi*

[BDF, basin development factor; RI2, rainfall intensity for the 2-hour 2-year occurrence; ST, basin storage; IA, impervious area]

Station number	Station name	BDF	RI2 (inches)	ST (percent)	IA (percent)
2473047	Gordon Creek at Hattiesburg	5	2.7	0	21
2485800	Eubanks Creek at Jackson	8	2.5	0	33
2485950	Town Creek at Jackson	7	2.5	0	29
2486100	Lynch Creek at Jackson	4	2.5	0	27
2486115	Three Mile Creek at Jackson	6	2.5	0	29
2486350	Caney Creek at Jackson	6	2.5	2	14
7289610	Bachelor Creek at Canton	2	2.4	0	10
7290910	Spanish Bayou at Natchez	4	2.6	0	27

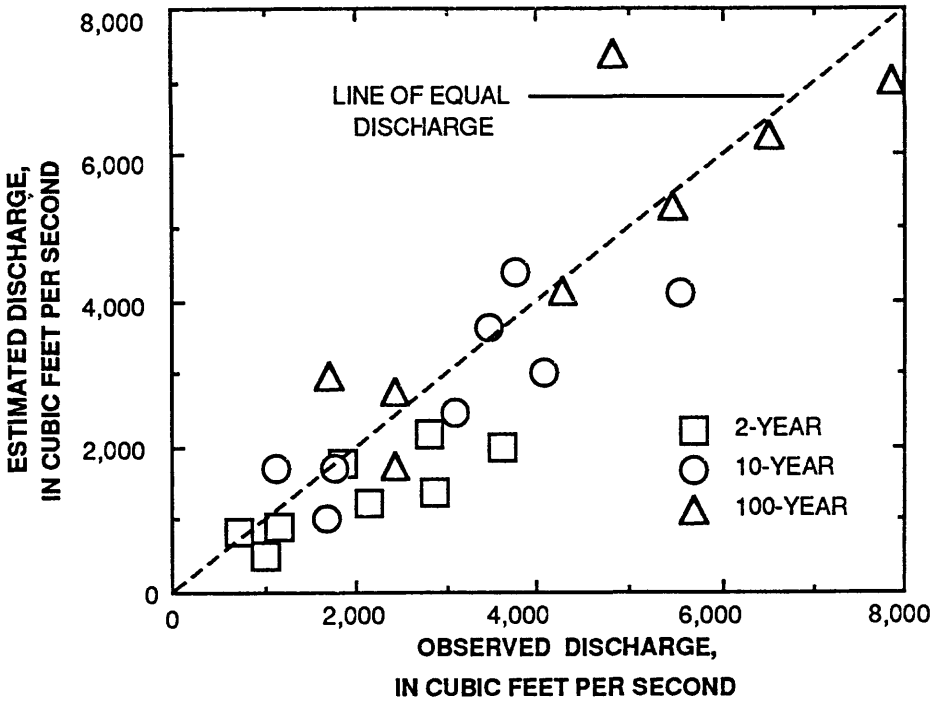


Figure 13.-- Relation of observed 2-year, 10-year, and 100-year urban peak discharge to peak discharge estimated from equation 39, 41, and 44.

Table 4.--*Errors of prediction using the seven-parameter nationwide equations for urbanized streams in Mississippi*

Sites	Recurrence interval, in years	Errors of prediction, in percent				
		Minimum	Maximum	Average	Standard deviation	Root-mean square error
All	2	-52	+14	-28	±24	±37
(8 sites)	10	-39	+50	-6	±29	±29
	100	-29	+73	+11	±34	±36
Jackson	2	-52	-23	-42	±12	±44
(5 sites)	10	-39	+16	-19	±21	±28
	100	-29	+54	+2	±31	±31

With the limited data, the Student's t-test, at the 1-percent level of significance, indicates that the negative error for the 2-year recurrence interval is statistically significant when considering only the Jackson sites. However, for all sites combined, no bias in using the seven-parameter equations is proven. The **RMS** error for the 2-, 10-, and 100-year discharges for all eight sites (table 4) is somewhat lower than ±38, ±38, and ±44 percent, respectively, as reported in the nationwide study (Sauer and others, 1983); however, when considering only the Jackson sites, the **RMS** is higher for the 2-year discharge.

The seven-parameter nationwide equations can be used to estimate flood frequencies for an ungaged urbanized stream in Mississippi. However, the limited data, especially in Jackson, indicate that the 2-year to 10-year discharges may be significantly underestimated using the nationwide equations. This emphasizes the need for more peak runoff data for urbanized areas in Jackson and throughout Mississippi.

LIMITATIONS OF REGIONAL FLOOD-FREQUENCY ESTIMATES

Limitations always exist for an estimate obtained from a regional flood-frequency equation. The most significant known limitations are listed in the following sections. To avoid introducing large errors in estimates, the user should become aware of possible basin projects which may alter flood flows.

Rural Streams

The following limitations should be observed when using the regional equations in this report for estimating flood-frequency discharges on a rural Mississippi stream because the equations:

- are not considered to be representative for basins outside the range of characteristics (explanatory variables) in the sample set for each region (table 5);

- should not to be used for sites where a significant part of the basin is affected by regulation and (or) channelization;

- do not apply to estuarine sites near the mouths of coastal streams at which unusual flood discharges result from hurricane tides flowing into or out of storage;

- should be used with caution near the mouths of streams draining into larger streams because the larger stream may cause critical stages and discharges at the recurrence interval in question; or

- may not be fully representative of the steep loess "bluff" hills, bordering parts of the Delta, and the flat coastal region of the State, extending roughly 20 mi inland from the Gulf of Mexico, due to the limited data in these areas.

Table 5.--*Characteristics of explanatory variables used in regression calculations for basins in the East and West regions with areas less than or equal to 800 square miles, basins in the Delta, and basins in the East or West regions with areas greater than 800 square miles (GT800)*

[Area, in square miles; Channel slope, in feet per mile; Channel length, in miles]

Region	Basin characteristic	Mean	Median	Minimum	Maximum
East					
	Area	146	40.3	0.10	799
	Channel slope	25.4	10.2	1.5	170
	Channel length	23.0	12.2	0.4	123
West					
	Area	131	35.3	0.06	654
	Channel slope	28.8	10.9	2.3	192
	Channel length	18.2	12.3	0.3	70.7
Delta					
	Area	389	300	0.11	1,170
	Channel slope	2.1	1.0	0.4	10.6
	Channel length	65.7	56.0	0.5	269
GT800					
	Area	2,368	1,650	831	6,590
	Channel slope	2.1	1.8	0.7	4.4
	Channel length	134	110	49.1	338

Urbanized Streams

The seven-parameter nationwide equations for estimating flood-frequency discharges on an urbanized Mississippi stream apply when the basin and climatic variables are within the following ranges:

- **A** -- 0.2 to 100 mi^2
- **SL** -- 3.0 to 70 ft/mi
- **RI2** -- 0.2 to 2.8 in
- **ST** -- 0 to 11 percent
- **BDF** -- 0 to 12
- **IA** -- 3 to 50 percent

The maximum value for **SL** for use in the equations is 70 ft/mi; although numerous drainage basins used in the development of the equations had **SL** values up to 500 ft/mi. If values for the variables are outside these ranges, the standard error may be considerably higher than for sites where all variables are within the specified range (Sauer and others, 1983).

SUMMARY

This report provides techniques for estimating the magnitude of floods with recurrence intervals from 2 to 500 years for streams in Mississippi. Estimates of flood magnitude are presented for 330 streamflow-gaging stations. Flood-frequency discharges for seven of the eleven streamflow-gaging stations on the Pearl River, which were agreed upon in 1980 by the U.S. Geological Survey and the U.S. Army Corps of Engineers, Mobile District, are included. A graphical relation of flood-frequency discharge to drainage area for the Pearl River main stem, with an adjustment for basin shape, is also presented.

Regression analyses were used to define relations between flood-frequency characteristics and explanatory drainage basin variables for 282 rural streamflow-gaging stations, which are representative of similar streams in a specific class or region. To improve accuracy of the regression equations, the State was divided into four subgroups, three defined by geographic boundaries and one by drainage area magnitude. Generalized-least-squares regression, which defines more accurate estimates of regression coefficients and model error than ordinary-least-squares regression, was used in the analyses of three subgroups. The Delta subgroup was analyzed using ordinary-least-squares regression, and because relatively little data have been collected since 1985, previously published equations are presented with extension to 500 years. The regression analyses indicated that size of drainage area, slope of the main channel, and length of the main channel were the most significant basin characteristics that affect the magnitude and frequency of floods for all four subgroups. Regression equations presented for the four subgroups may be used to estimate the magnitude and frequency of floods for ungaged rural stream sites in the State. If the drainage area at an ungaged site is within 50 percent of the drainage area at a gaged site on the same stream, the flood-frequency estimate can be extrapolated using the flood frequency at the gaged site weighted with the regional estimate at the ungaged site using equation 6.

Only eight sites were available for which the period of record was one of relatively constant urbanization. For these sites, a comparison was made between frequency discharges computed from the record and discharges computed from the seven-parameter nationwide equations described previously. When considering only the five sites in Jackson, the 2-year discharge appears to be under-estimated using the nationwide equations; however, for all sites combined, no bias in using the nationwide equations is proven. Therefore, the seven-parameter nationwide equations are presented and can be used to estimate the magnitude and frequency of floods for an ungaged urban stream in the State.

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Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations
[Notes are explained at end of table; sd, standard deviation; IACWD, Interagency Advisory Committee on Water Data; sqmi, square miles; ft/mi, feet per mile; mi, miles; region: (1) East, (2) West, (3) Delta, (4) GT800 , basins in the East or West regions with areas greater than 800 sqmi]

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
1	2429900	Big Brown Creek near Booneville, MS	1953-88	1,940	3,070	3,850	4,870	5,680	6,460	7,330	8,370
	note: *	mean= 3.270; sd= 0.245; skew= -0.400		10	9	10	12	14	17	20	23
	region 1	area= 27.1sqmi; slope= 15.7ft/mi; length= 10.1mi									
2	2429949	Little Brown Creek near New Site, MS	1974-85	2,260	4,390	6,080	8,160	9,750	11,200	12,900	14,900
	note: *	mean= 3.318; sd= 0.366; skew= 0.027		20	19	20	23	25	28	30	34
	region 1	area= 42.2sqmi; slope= 9.6ft/mi; length= 12.4mi									
3	2429980	Pollard Mill Branch at Paden, MS	1967-87	212	399	567	812	1,020	1,200	1,420	1,670
	note: *	mean= 2.269; sd= 0.290; skew= 0.068		14	14	16	19	22	24	27	31
	region 1	area= 2.01sqmi; slope= 38.1ft/mi; length= 2.8mi									
4	2430000	Mackeys Creek near Dennis, MS	1939-79	--	--	--	--	--	--	--	--
	note: *bi	mean= 3.377; sd= 0.294; skew= 0.140		--	--	--	--	--	--	--	--
	region 1	area= 66.9sqmi; slope= 8.2ft/mi; length= 17.5mi									
5	2430085	Red Bud Creek near Moores Mill, MS	1975-88	840	1,380	1,850	2,590	3,230	3,870	4,590	5,450
	note: *	mean= 2.878; sd= 0.203; skew= 0.005		13	13	14	17	20	23	25	29
	region 1	area= 15.7sqmi; slope= 22.7ft/mi; length= 6.1mi									
6	2430500	Tombigbee River near Marietta, MS	1938-51	12,000	20,000	27,300	41,000	52,500	64,500	--	100,000
	note: *abgj	mean= 4.015; sd= 0.210; skew= 0.261	1968-77	--	--	--	--	--	--	--	--
	region 1	area= 308 sqmi; slope= 6.1ft/mi; length= 24.1mi	1955								
7	2430615	Mud Creek near Fairview, MS	1976-88	614	821	975	1,210	1,420	1,640	1,880	2,170
	note: c	mean= 2.759; sd= 0.123; skew= -0.196		8	8	9	11	14	16	18	22
	region 1	area= 11.1sqmi; slope= 17.7ft/mi; length= 3.6mi									
8	2430880	Cummings Creek near Fulton, MS	1975-88	761	1,430	2,110	3,170	4,030	4,840	5,740	6,780
	note: c	mean= 2.795; sd= 0.226; skew= 0.359		15	16	18	21	24	27	30	34
	region 1	area= 19.1sqmi; slope= 8.5ft/mi; length= 7.0mi									
9	2431000	Tombigbee River near Fulton, MS	1929-88	19,900	30,300	38,900	52,500	64,000	78,000	--	122,000
	note: *abgj	mean= 4.260; sd= 0.249; skew= -0.021		--	--	--	--	--	--	--	--
	region 1	area= 612 sqmi; slope= 3.5ft/mi; length= 42.2mi									
10	2431500	Tombigbee River at Beans Ferry near Fulton, MS	1938-47	21,200	31,900	41,300	56,000	68,400	83,500	--	130,000
	note: *abgj	mean= 4.236; sd= 0.189; skew= 0.050	1927	--	--	--	--	--	--	--	--
	region 1	area= 706 sqmi; slope= 2.9ft/mi; length= 49.7mi									
11	2432500	Bull Mountain Creek at Tremont, MS	1941-64	5,060	9,000	12,100	16,200	19,300	22,400	26,000	30,300
	note: *	mean= 3.710; sd= 0.301; skew= -0.003	1973-83	14	14	16	18	21	24	27	31
	region 1	area= 136 sqmi; slope= 8.2ft/mi; length= 33.6mi									
12	2432900	Red Boot Creek near Fulton, MS	1955-75	65	96	121	154	181	206	236	269
	note: *	mean= 1.812; sd= 0.194; skew= 0.149		10	11	13	16	18	21	24	28
	region 1	area= 0.13sqmi; slope= 89.3ft/mi; length= 0.8mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
13	2433000	Bull Mountain Creek near Smithville, MS	1941-88	10,100	18,100	24,100	31,700	37,300	42,900	49,100	57,100
	note: *	mean= 4.016; sd= 0.325; skew= -0.073	1927	11	11	12	15	18	20	23	27
	region 1	area= 336 sqmi; slope= 1.9ft/mi; length= 69.9mi									
14	2433500	Tombigbee River at Bigbee, MS	1937-58	30,000	43,000	58,000	80,000	99,000	121,000	--	183,000
	note: *abgj	mean= 4.473; sd= 0.234; skew= 0.080	1964-88	--	--	--	--	--	--	--	--
	region 4	area= 1,230 sqmi; slope= 1.8ft/mi; length= 79.0mi	1927,62								
15	2434000	Town Creek at Tupelo, MS	1939-46	8,030	12,000	14,900	18,500	21,300	24,200	27,400	31,500
	note: *	mean= 3.918; sd= 0.210; skew= 0.061	1949-88	7	8	9	12	14	16	19	22
	region 1	area= 111 sqmi; slope= 8.2ft/mi; length= 20.2mi									
16	2434250	Tishomingo Creek near Saltillo, MS	1950-63	2,810	3,910	4,700	5,730	6,570	7,390	8,380	9,550
	note: *	mean= 3.474; sd= 0.166; skew= 0.084		11	11	13	16	19	21	24	28
	region 1	area= 30.1sqmi; slope= 11.8ft/mi; length= 16.0mi									
17	2434500	Euclautubba Creek at Saltillo, MS	1949-75	2,690	3,680	4,350	5,180	5,840	6,480	7,220	8,140
	note: *	mean= 3.447; sd= 0.162; skew= 0.091		8	9	10	13	15	18	20	24
	region 1	area= 19.1sqmi; slope= 9.7ft/mi; length= 9.2mi									
18	2435012	Truck Stop Ditch near Tupelo, MS	1955-72	159	224	268	319	359	395	438	486
	note: *	mean= 2.218; sd= 0.187; skew= -0.011		10	11	12	15	18	20	23	27
	region 1	area= 0.22sqmi; slope= 46.2ft/mi; length= 0.7mi									
19	2435020	Town Creek at Eason Boulevard at Tupelo, MS	1971-88	11,800	18,500	23,200	29,000	33,500	37,800	42,700	48,800
	note: *	mean= 4.094; sd= 0.237; skew= -0.197		13	13	14	16	19	22	24	28
	region 1	area= 233 sqmi; slope= 6.9ft/mi; length= 24.6mi									
20	2435300	Cow Pike Pass near Tupelo, MS	1955-83	122	163	190	225	253	278	308	344
	note: *	mean= 2.103; sd= 0.147; skew= 0.298		8	9	10	13	16	19	21	25
	region 1	area= 0.14sqmi; slope= 52.9ft/mi; length= 0.6mi									
21	2435400	Clear Branch near Tupelo, MS	1955-83	161	249	320	422	508	590	686	799
	note: *	mean= 2.201; sd= 0.203; skew= 0.145		9	10	12	15	17	20	23	26
	region 1	area= 0.75sqmi; slope= 47.5ft/mi; length= 1.6mi									
22	2435500	Town Creek near Verona, MS	1941-61	13,000	20,700	26,400	33,600	39,200	44,600	51,100	59,000
	note: *	mean= 4.152; sd= 0.244; skew= 0.275		12	13	15	19	21	24	27	31
	region 1	area= 271 sqmi; slope= 6.2ft/mi; length= 27.6mi									
23	2435800	Coonewah Creek at Shannon, MS	1952-85	4,930	7,650	9,520	11,800	13,500	15,100	17,100	19,500
	note: *	mean= 3.732; sd= 0.244; skew= 0.193	1939	11	12	13	17	19	22	25	29
	region 1	area= 53.1sqmi; slope= 9.7ft/mi; length= 20.8mi									
24	2435920	Cotton Gin Branch near Tupelo,MS	1955-76	120	183	229	287	334	375	425	481
	note: *	mean= 2.075; sd= 0.221; skew= -0.092		11	11	13	15	18	20	23	27
	region 1	area= 0.30sqmi; slope= 40.7ft/mi; length= 1.1mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
25	2435930	Shell Creek near Tupelo, MS	1955-84	78	120	154	203	243	279	322	371
	note: *	mean= 1.900; sd= 0.203; skew= 0.478		9	10	12	16	19	22	25	29
	region 1	area= 0.20sqmi; slope= 28.3ft/mi; length= 0.8mi									
26	2436000	Chiwapa Creek at Shannon, MS	1950-88	13,100	19,100	23,200	28,600	32,800	37,100	41,600	47,700
	note: *abg	mean= 4.188; sd= 0.192; skew= 0.027		7	7	9	12	14	17	20	24
	region 1	area= 145 sqmi; slope= 7.4ft/mi; length= 24.0mi									
27	2436500	Town Creek near Nettleton, MS	1940-88	26,200	39,200	49,300	63,100	74,200	85,500	98,500	116,000
	note: *	mean= 4.451; sd= 0.197; skew= 0.615	1927	7	8	10	14	17	20	23	27
	region 1	area= 620 sqmi; slope= 6.9ft/mi; length= 38.2mi									
28	2437000	Tombigbee River near Amory, MS	1938-88	38,600	62,900	83,000	113,000	140,000	170,000	--	260,000
	note: *abgj	mean= 4.568; sd= 0.238; skew= 0.281	1927	--	--	--	--	--	--	--	--
	region 4	area= 1,930 sqmi; slope= 1.8ft/mi; length= 83.0mi	1892								
29	2437300	Mattubby Creek near Aberdeen, MS	1952-88	7,020	10,200	12,200	14,400	16,000	17,500	19,100	21,100
	note: *	mean= 3.845; sd= 0.206; skew= -0.500	1937	8	8	8	10	12	15	17	20
	region 1	area= 92.2sqmi; slope= 6.6ft/mi; length= 20.1mi									
30	2437500	Tombigbee River at Aberdeen, MS	1909-82	33,000	53,700	70,000	96,900	120,000	145,000	--	220,000
	note: *abgj	mean= 4.465; sd= 0.264; skew= 0.180	1983	--	--	--	--	--	--	--	--
	region 4	area= 2,170 sqmi; slope= 1.8ft/mi; length= 101.0mi	1892								
31	2437550	Nichols Creek tributary near Quincy, MS	1966-88	154	238	305	399	478	550	638	736
	note: *	mean= 2.178; sd= 0.208; skew= 0.090		11	11	13	16	19	21	24	28
	region 1	area= 0.54sqmi; slope= 90.4ft/mi; length= 1.3mi									
32	2437600	James Creek at Aberdeen, MS	1963-88	3,250	4,850	6,010	7,510	8,730	9,880	11,300	12,900
	note: *	mean= 3.524; sd= 0.205; skew= -0.062	1961	10	10	11	14	16	19	21	25
	region 1	area= 28.4sqmi; slope= 71.8ft/mi; length= 9.4mi	1948								
33	2438000	Buttahatchee River below Hamilton, AL	1951-88	15,200	22,100	26,700	32,000	35,900	39,800	43,900	49,200
	note: *	mean= 4.192; sd= 0.203; skew= -0.270		8	8	9	11	13	15	18	21
	region 1	area= 277 sqmi; slope= 6.2ft/mi; length= 44.8mi									
34	2439000	Buttahatchee River near Sulligent, AL	1929-85	14,000	22,600	28,400	35,600	40,800	46,000	51,600	58,500
	note: *	mean= 4.135; sd= 0.266; skew= -0.453		9	8	8	11	13	15	18	21
	region 1	area= 472 sqmi; slope= 4.8ft/mi; length= 64.0mi									
35	2439400	Buttahatchee River near Aberdeen, MS	1967-88	18,800	30,800	39,000	49,300	57,000	64,700	73,500	84,300
	note: *	mean= 4.279; sd= 0.266; skew= -0.439		13	12	13	15	18	21	24	28
	region 1	area= 799 sqmi; slope= 4.1ft/mi; length= 83.6mi									
36	2439500	Buttahatchee River near Caledonia, MS	1929-32	15,100	25,900	34,100	44,100	52,900	62,500	66,200	80,700
	note: *	mean= 4.189; sd= 0.283; skew= -0.178	1938-51	13	13	13	13	13	14	15	16
	region 4	area= 831 sqmi; slope= 3.9ft/mi; length= 93.1mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
37	2439800	Cowbell Creek near Houlka, MS	1955-76	169	252	311	388	449	506	570	646
	note: *	mean= 2.222; sd= 0.203; skew= -0.088		10	10	12	14	17	19	22	26
	region 1	area= 0.46sqmi; slope= 25.7ft/mi; length= 0.9mi									
38	2439980	Chuquatonchee Creek near Okalona, MS	1964-88	3,850	6,500	8,710	11,700	14,000	16,200	18,800	21,800
	note: *	mean= 3.604; sd= 0.252; skew= 0.425	1951,53	13	14	16	20	22	25	28	32
	region 1	area= 68.5sqmi; slope= 8.8ft/mi; length= 13.4mi									
39	2439997	Chuquatonchee Creek tributary near Trebloc, MS	1966-84	317	397	448	512	562	609	662	726
	note: *	mean= 2.504; sd= 0.114; skew= -0.118		6	7	8	9	11	13	15	18
	region 1	area= 0.74sqmi; slope= 50.0ft/mi; length= 1.4mi									
40	2440000	Chuquatonchee Creek near Egypt, MS	1950-88	9,040	14,900	19,000	24,300	28,200	32,000	36,300	41,700
	note: *	mean= 3.971; sd= 0.269; skew= -0.104		10	11	12	14	17	19	22	26
	region 1	area= 167 sqmi; slope= 6.1ft/mi; length= 27.2mi									
41	2440400	Houlka Creek near McCondy, MS	1963-88	9,240	14,900	19,100	24,500	28,600	32,700	37,400	43,300
	note: *	mean= 3.990; sd= 0.250; skew= 0.130		11	12	14	17	20	22	25	29
	region 1	area= 189 sqmi; slope= 5.1ft/mi; length= 25.8mi									
42	2440500	Chuquatonchee Creek near West Point, MS	1941-88	16,500	26,800	34,100	43,700	51,000	58,300	66,200	76,500
	note: *	mean= 4.225; sd= 0.258; skew= -0.090		9	9	10	13	15	18	20	24
	region 1	area= 505 sqmi; slope= 1.8ft/mi; length= 44.8mi									
43	2440600	Line Creek near Maben, MS	1952-88	1,470	2,310	2,850	3,420	3,850	4,220	4,710	5,270
	note: *	mean= 3.216; sd= 0.267; skew= 0.159		11	11	13	16	19	22	24	28
	region 1	area= 4.76sqmi; slope= 32.2ft/mi; length= 5.3mi									
44	2440800	Trim Cane Creek near Starkville, MS	1952-88	4,960	6,960	8,170	9,550	10,500	11,500	12,500	13,700
	note: *	mean= 3.696; sd= 0.186; skew= -0.462	1940	8	7	8	9	11	14	16	19
	region 1	area= 44.9sqmi; slope= 13.8ft/mi; length= 13.8mi									
45	2441000	Tibbee Creek near Tibbee, MS	1940-88	29,100	47,600	59,100	71,300	81,600	94,100	101,000	123,000
	note: *	mean= 4.469; sd= 0.276; skew= -0.611	1929-30	9	8	8	9	11	12	13	15
	region 4	area= 926 sqmi; slope= 3.8ft/mi; length= 54.8mi	1927								
46	2441220	Sand Creek tributary near Mayhew, MS	1966-88	177	269	329	400	453	500	553	614
	note: *	mean= 2.242; sd= 0.233; skew= -0.357		11	11	12	14	17	19	22	26
	region 1	area= 0.44sqmi; slope= 13.4ft/mi; length= 1.1mi									
47	2441300	Catalpa Creek at Mayhew, MS	1963-87	6,850	11,200	14,200	17,900	20,700	23,400	26,600	30,400
	note: *	mean= 3.860; sd= 0.267; skew= -0.077		13	13	14	17	19	22	25	29
	region 1	area= 98.0sqmi; slope= 9.1ft/mi; length= 17.2mi									
48	2441500	Tombigbee River at Columbus, MS	1892-99	58,100	94,200	124,000	168,000	207,000	279,000	--	400,000
	note: *abgj	mean= 4.699; sd= 0.243; skew= 0.214	1900-88	--	--	--	--	--	--	--	--
	region 4	area= 4,460 sqmi; slope= 1.4ft/mi; length= 143.0mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
49	2443000	Luxapallila Creek at Steens, MS	1940-88	7,030	10,200	12,600	15,800	18,500	21,300	24,300	28,400
	note: *	mean= 3.845; sd= 0.185; skew= -0.019		6	7	8	10	12	14	16	19
	region 1	area= 309 sqmi; slope= 5.8ft/mi; length= 56.9mi									
50	2443500	Luxapallila Creek near Columbus, MS	1973-88	17,100	26,800	33,200	41,200	47,700	54,100	61,300	70,100
	note: *	mean= 4.218; sd= 0.243; skew= -0.585	1968-69	11	9	10	12	15	18	20	24
	region 1	area= 715 sqmi; slope= 9.0ft/mi; length= 65.2mi	1961-65								
51	2443605	Mayo Slough tributary near Columbus, MS	1965-75	158	215	253	300	337	370	410	454
	note: *	mean= 2.211; sd= 0.164; skew= -0.138		12	12	13	15	18	21	23	27
	region 1	area= 0.24sqmi; slope= 46.0ft/mi; length= 0.7mi									
52	2443700	Cedar Creek near Brooksville, MS	1965-84	321	395	440	493	533	572	614	665
	note: *	mean= 2.513; sd= 0.107; skew= -0.055		6	6	7	9	11	13	15	18
	region 1	area= 0.49sqmi; slope= 21.9ft/mi; length= 0.9mi									
53	2444000	Coal Fire Creek near Pickensville, AL	1955-80	2,800	5,710	8,340	12,100	15,000	17,900	21,100	25,100
	note: *	mean= 3.410; sd= 0.342; skew= 0.181		15	15	17	20	23	26	29	33
	region 1	area= 126 sqmi; slope= 5.5ft/mi; length= 36.4mi									
54	2447220	Bogue Fallah tributary near Ackerman, MS	1966-84	128	214	276	351	410	460	522	588
	note: *	mean= 2.085; sd= 0.288; skew= -0.326		15	14	15	17	20	23	26	30
	region 1	area= 0.34sqmi; slope= 67.5ft/mi; length= 1.1mi									
55	2447280	Lawson Branch near Betheden, MS	1965-77	292	501	649	818	945	1,050	1,190	1,330
	note: *	mean= 2.467; sd= 0.328; skew= -0.219		19	18	18	21	23	26	29	33
	region 1	area= 1.09sqmi; slope= 32.0ft/mi; length= 2.0mi									
56	2447340	Cypress Creek tributary at Bradley, MS	1966-77	148	253	330	426	501	564	644	727
	note: *	mean= 2.127; sd= 0.306; skew= -0.280		18	17	18	20	23	26	29	33
	region 1	area= 0.60sqmi; slope= 27.9ft/mi; length= 1.9mi									
57	2447500	Noxubee River near Brooksville, MS	1940-73	9,380	18,300	25,500	35,000	42,100	49,300	57,300	67,400
	note: *	mean= 3.968; sd= 0.361; skew= -0.047	1979	14	14	15	18	21	23	26	30
	region 1	area= 446 sqmi; slope= 3.4ft/mi; length= 65.5mi									
58	2447800	Hashuqua Creek near Macon, MS	1951-70	3,320	6,640	9,440	13,100	15,900	18,500	21,700	25,300
	note: *	mean= 3.511; sd= 0.358; skew= 0.218	1976,79	17	17	19	22	24	27	30	34
	region 1	area= 96.2sqmi; slope= 11.9ft/mi; length= 28.0mi									
59	2448000	Noxubee River near Macon, MS	1929-32	13,200	25,000	34,700	48,200	58,700	69,500	81,400	97,100
	note: *	mean= 4.123; sd= 0.334; skew= 0.035	1939-88	11	11	13	15	18	21	23	27
	region 1	area= 768 sqmi; slope= 2.5ft/mi; length= 90.6mi	1892,1927								
60	2448500	Noxubee River near Geiger, AL	1929-88	11,900	20,200	27,000	35,800	43,900	53,100	58,300	73,500
	note: *	mean= 4.102; sd= 0.271; skew= 0.446		8	9	11	12	13	13	14	16
	region 4	area= 1,100 sqmi; slope= 0.7ft/mi; length= 140.0mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent)							
61	2448620	Flat Scooba Creek tributary near Scooba, MS	1967-88	130	201	260	345	416	481	559	646
	note: *	mean= 2.117; sd= 0.194; skew= 0.387		10	11	13	17	20	22	25	30
	region 1	area= 0.44sqmi; slope= 44.0ft/mi; length= 1.0mi									
62	2467100	Hamilton Branch near Dekalb, MS	1965-77	339	475	573	698	800	892	1,010	1,130
	note: *	mean= 2.543; sd= 0.171; skew= 0.018		11	12	13	16	19	21	24	28
	region 1	area= 0.97sqmi; slope= 45.8ft/mi; length= 1.7mi									
63	2469672	Little Okatubba Creek near Quitman, MS	1966-84	804	1,210	1,520	1,910	2,230	2,530	2,890	3,300
	note: *	mean= 2.913; sd= 0.207; skew= -0.003		11	12	13	16	18	21	24	28
	region 1	area= 4.35sqmi; slope= 41.2ft/mi; length= 3.5mi									
64	2471100	Leaf River near Raleigh, MS	1940-43	4,700	8,490	11,400	15,200	18,200	21,100	24,300	28,300
	note: *	mean= 3.667; sd= 0.319; skew= -0.123	1957-88	12	12	13	16	19	21	24	28
	region 1	area= 143 sqmi; slope= 3.3ft/mi; length= 39.8mi	1856,1900								
65	2471250	Leaf River near Taylorsville, MS	1968-88	9,380	13,800	18,000	24,700	30,600	36,700	43,600	52,400
	note: *	mean= 3.989; sd= 0.167; skew= 0.706	1961	8	10	12	16	20	23	26	30
	region 1	area= 459 sqmi; slope= 3.3ft/mi; length= 57.4mi	1856,1900								
66	2471500	Oakohay Creek at Mize, MS	1942-49	5,380	9,180	12,200	16,600	20,000	23,500	27,400	32,300
	note: *	mean= 3.728; sd= 0.265; skew= 0.055	1968-88	12	12	14	17	19	22	25	29
	region 1	area= 185 sqmi; slope= 4.3ft/mi; length= 36.1mi	1961								
67	2472000	Leaf River near Collins, MS	1939-88	14,000	23,400	31,200	42,700	52,100	62,000	73,000	87,700
	note: *	mean= 4.160; sd= 0.247; skew= 0.307	1900	8	9	11	14	17	20	23	26
	region 1	area= 743 sqmi; slope= 3.0ft/mi; length= 68.7mi	1856								
68	2472160	Big Creek tributary near Laurel, MS	1966-84	128	175	207	247	279	308	343	382
	note: *	mean= 2.117; sd= 0.163; skew= -0.003		9	9	11	13	16	18	21	24
	region 1	area= 0.17sqmi; slope= 82.0ft/mi; length= 0.6mi									
69	2472420	Bouie Creek near Sanford, MS	1968-88	7,190	13,800	19,500	26,600	32,000	37,000	43,100	50,300
	note: *	mean= 3.878; sd= 0.329; skew= 0.518	1961	16	17	19	22	25	28	31	35
	region 1	area= 262 sqmi; slope= 7.1ft/mi; length= 40.4mi									
70	2472500	Bouie Creek near Hattiesburg, MS	1939-88	5,960	11,700	17,200	25,500	32,100	38,500	45,900	55,000
	note: *	mean= 3.795; sd= 0.313; skew= 0.651	1900	11	12	15	19	22	25	28	32
	region 1	area= 304 sqmi; slope= 6.5ft/mi; length= 51.0mi									
71	2472700	Okatoma Creek tributary at Mt. Olive, MS	1965-77	112	200	270	353	419	470	540	608
	note: *	mean= 2.038; sd= 0.293; skew= 0.403		17	18	20	23	25	28	31	35
	region 1	area= 0.33sqmi; slope= 63.0ft/mi; length= 1.0mi									
72	2472810	Okatoma Creek tributary no.2 near Collins, MS	1967-84	128	201	255	317	367	406	461	515
	note: *	mean= 2.136; sd= 0.245; skew= 0.391		13	14	17	20	23	26	29	33
	region 1	area= 0.21sqmi; slope= 82.0ft/mi; length= 0.7mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent)							
73	2473000	Leaf River at Hattiesburg, MS	1905-88	25,000	40,900	54,000	71,600	86,500	103,000	111,000	137,000
	note: *	mean= 4.418; sd= 0.240; skew= 0.444	1900	6	7	9	10	11	12	13	15
	region 4	area= 1,750 sqmi; slope= 2.5ft/mi; length= 111.0mi									
74	2473047	Gordon Creek at Hattiesburg, MS	1969-88	1,840	2,740	3,470	4,540	5,460	6,500	7,660	9,430
	note: dg	mean= 3.282; sd= 0.195; skew= 0.556		9	11	14	20	26	32	39	49
	region 1	area= 8.83sqmi; slope= 21.9ft/mi; length= 7.3mi									
75	2473460	Tallahala Creek at Waldrup, MS	1969-88	4,820	8,070	10,500	13,700	16,100	18,500	21,200	24,500
	note: *	mean= 3.702; sd= 0.271; skew= 0.129	1961	13	14	16	19	22	24	27	31
	region 1	area= 102 sqmi; slope= 4.1ft/mi; length= 24.6mi									
76	2473480	Tallahattah Creek near Waldrup, MS	1965-88	1,710	3,280	4,560	6,220	7,500	8,670	10,100	11,700
	note: *	mean= 3.217; sd= 0.343; skew= 0.098		16	16	17	20	23	26	29	33
	region 1	area= 30.4sqmi; slope= 11.0ft/mi; length= 13.0mi									
77	2473500	Tallahala Creek at Laurel, MS	1938-88	5,740	10,900	15,100	20,800	25,300	29,800	34,700	41,100
	note: *	mean= 3.751; sd= 0.343; skew= -0.078	1900,20	11	11	13	15	18	20	23	27
	region 1	area= 238 sqmi; slope= 3.2ft/mi; length= 56.6mi									
78	2473610	Tallahala Creek tributary no.2 at Laurel, MS	1974-84	480	670	802	974	1,110	1,240	1,380	1,580
	note: *d	mean= 2.684; sd= 0.170; skew= 0.115		13	14	17	23	28	35	41	51
	region 1	area= 1.52sqmi; slope= 24.8ft/mi; length= 3.0mi									
79	2473850	Tallahoma Creek tributary at Lake Como, MS	1964-88	1,060	1,490	1,780	2,100	2,360	2,580	2,870	3,200
	note: *	mean= 3.050; sd= 0.186; skew= -0.001		9	10	11	14	16	18	21	25
	region 1	area= 3.21sqmi; slope= 31.5ft/mi; length= 3.4mi									
80	2474500	Tallahala Creek near Runnelstown, MS	1940-88	8,100	14,100	19,400	27,600	34,500	41,900	50,100	61,100
	note: *	mean= 3.915; sd= 0.259; skew= 0.355	1900,20	9	10	12	15	18	21	24	28
	region 1	area= 612 sqmi; slope= 2.5ft/mi; length= 102.0mi									
81	2474600	Bogue Homo near Richton, MS	1971-88	7,590	12,700	17,000	23,100	28,100	33,100	38,800	45,900
	note: *	mean= 3.891; sd= 0.240; skew= 0.307	1941-43	12	14	16	19	22	24	27	32
	region 1	area= 344 sqmi; slope= 3.7ft/mi; length= 64.9mi									
82	2474650	Buck Creek near Runnelstown, MS	1951-88	2,290	3,340	4,080	5,040	5,800	6,530	7,380	8,430
	note: *	mean= 3.371; sd= 0.195; skew= 0.046		8	8	10	12	15	17	19	23
	region 1	area= 20.8sqmi; slope= 13.5ft/mi; length= 11.8mi									
83	2474740	Leaf River at Beaumont, MS	1941-61	34,600	54,800	71,300	90,700	108,000	128,000	134,000	164,000
	note: *	mean= 4.556; sd= 0.225; skew= 0.480	1972-76	11	12	13	13	14	14	15	17
	region 4	area= 3,010 sqmi; slope= 2.2ft/mi; length= 153.0mi	1900								
84	2475000	Leaf River near McLain, MS	1940-88	36,700	57,900	74,800	96,200	115,000	135,000	143,000	176,000
	note: *	mean= 4.577; sd= 0.226; skew= 0.345	1900,38	8	8	10	11	12	13	14	16
	region 4	area= 3,500 sqmi; slope= 1.9ft/mi; length= 169.0mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent)							
85	2475050	Waterfall Branch near McLain, MS	1955-88	277	424	534	679	796	901	1,030	1,180
	note: *	mean= 2.457; sd= 0.215; skew= 0.253		9	10	12	15	17	20	23	27
	region 1	area= 0.65sqmi; slope= 73.3ft/mi; length= 1.0mi									
86	2475220	Little Rock Creek tributary near Little Rock, MS	1965-84	64.0	141	210	294	360	409	478	541
	note: *	mean= 1.707; sd= 0.402; skew= 0.305		19	19	20	23	25	28	31	35
	region 1	area= 0.22sqmi; slope= 170 ft/mi; length= 0.7mi									
87	2475350	Tarlow Creek near Newton, MS	1953-70	1,800	2,390	2,800	3,380	3,850	4,330	4,850	5,520
	note: *	mean= 3.262; sd= 0.135; skew= 0.099	1979	8	8	10	12	14	17	19	23
	region 1	area= 16.1sqmi; slope= 12.5ft/mi; length= 7.0mi									
88	2475500	Chunky River near Chunky, MS	1939-88	8,570	16,300	22,900	32,300	40,000	47,500	56,200	67,200
	note: *	mean= 3.934; sd= 0.321; skew= 0.158		11	12	13	16	19	22	25	29
	region 1	area= 369 sqmi; slope= 5.3ft/mi; length= 39.8mi									
89	2476000	Okatibbee Creek near Meridian, MS	1938-72	--	--	--	--	--	--	--	--
	note: *bi	mean= 3.680; sd= 0.380; skew= 0.163		--	--	--	--	--	--	--	--
	region 1	area= 235 sqmi; slope= 3.5ft/mi; length= 46.1mi									
90	2476500	Sowashee Creek at Meridian, MS	1936-45	2,750	4,960	6,820	9,420	11,500	13,600	16,000	19,000
	note: *	mean= 3.437; sd= 0.294; skew= 0.128	1949-88	10	11	13	16	18	21	24	28
	region 1	area= 52.1sqmi; slope= 12.0ft/mi; length= 11.2mi									
91	2476600	Okatibbee Creek at Arundel, MS	1969-88	5,430	9,330	12,600	17,600	22,000	27,100	32,900	41,800
	note: ag	mean= 3.749; sd= 0.269; skew= 0.300	1961	15	18	22	30	38	47	57	72
	region 1	area= 342 sqmi; slope= 3.5ft/mi; length= 51.3mi									
92	2477000	Chickasawhay River at Enterprise, MS	1905-88	15,500	27,500	37,700	52,800	66,600	82,000	91,500	115,000
	note: *	mean= 4.179; sd= 0.285; skew= 0.011	1900	7	8	8	10	11	12	13	15
	region 4	area= 918 sqmi; slope= 4.4ft/mi; length= 58.0mi	1871								
93	2477050	Souenlovie Creek near Baxter, MS	1964-88	485	674	804	968	1,100	1,220	1,370	1,540
	note: *	mean= 2.706; sd= 0.170; skew= 0.231		8	9	11	14	16	19	22	25
	region 1	area= 1.14sqmi; slope= 46.5ft/mi; length= 1.7mi									
94	2477090	Powers Creek near Rose Hill, MS	1964-84	260	360	431	521	596	663	748	842
	note: *	mean= 2.436; sd= 0.168; skew= 0.307		9	10	12	15	18	21	23	27
	region 1	area= 0.45sqmi; slope= 107 ft/mi; length= 1.1mi									
95	2477100	Souenlovie Creek near Pachuta, MS	1956-70	5,340	10,900	15,100	20,200	23,900	27,400	31,500	36,500
	note: *	mean= 3.713; sd= 0.437; skew= -0.015	1938,49	20	19	20	23	25	28	31	35
	region 1	area= 174 sqmi; slope= 4.6ft/mi; length= 35.1mi	1900								
96	2477150	Pachuta Creek at Pachuta, MS	1952-70	1,800	3,450	4,660	6,050	7,110	8,030	9,200	10,500
	note: *	mean= 3.266; sd= 0.407; skew= -0.039	1938,49	19	19	20	22	25	27	30	34
	region 1	area= 23.2sqmi; slope= 14.5ft/mi; length= 11.9mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
97	2477330	Shubuta Creek near Shubuta, MS	1963-88	3,290	6,150	8,360	11,200	13,200	15,200	17,600	20,400
	note: *	mean= 3.526; sd= 0.344; skew= 0.033		16	16	17	20	22	25	28	32
	region 1	area= 75.5sqmi; slope= 7.1ft/mi; length= 28.1mi									
98	2477350	Chickasawhay River at Shubuta, MS	1905-64	19,200	34,600	47,600	64,200	78,400	93,800	101,000	126,000
	note: *	mean= 4.286; sd= 0.299; skew= 0.257	1972-88	9	10	11	12	13	13	14	16
	region 4	area= 1,460 sqmi; slope= 2.4ft/mi; length= 99.6mi	1900								
99	2477500	Chickasawhay River near Waynesboro, MS	1937-88	16,600	28,300	39,000	54,700	68,800	84,100	91,100	114,000
	note: *	mean= 4.217; sd= 0.245; skew= 0.374	1900	9	9	11	12	13	13	14	16
	region 4	area= 1,650 sqmi; slope= 2.1ft/mi; length= 120.0mi									
100	2477990	Buckatunna Creek near Denham, MS	1972-88	6,500	10,700	14,500	20,400	25,400	30,600	36,500	44,000
	note: *	mean= 3.795; sd= 0.209; skew= 0.179		12	13	14	18	20	23	26	30
	region 1	area= 492 sqmi; slope= 3.0ft/mi; length= 82.8mi									
101	2478000	Buckatunna Creek at Denham, MS	1938-49	7,890	12,900	17,700	25,300	31,500	37,800	44,900	53,700
	note: *	mean= 3.907; sd= 0.204; skew= 0.641	1900,20	12	13	16	20	23	26	29	33
	region 1	area= 505 sqmi; slope= 2.9ft/mi; length= 87.8mi	1951,61,79								
102	2478500	Chickasawhay River at Leakesville, MS	1938-88	23,100	36,500	48,400	65,300	80,500	96,800	104,000	128,000
	note: *	mean= 4.374; sd= 0.216; skew= 0.519	1900,16	7	8	10	11	12	13	14	16
	region 4	area= 2,690 sqmi; slope= 1.6ft/mi; length= 184.0mi									
103	2478600	Granny Branch at Piave, MS	1967-84	236	346	423	521	602	676	762	860
	note: *	mean= 2.369; sd= 0.193; skew= -0.165		11	11	12	14	17	19	22	26
	region 1	area= 0.69sqmi; slope= 47.8ft/mi; length= 1.2mi									
104	2479000	Pascagoula River at Merrill, MS	1905-88	62,800	97,000	123,000	157,000	186,000	218,000	233,000	283,000
	note: *	mean= 4.806; sd= 0.218; skew= 0.249	1900	6	6	7	9	10	11	12	14
	region 4	area= 6,590 sqmi; slope= 1.9ft/mi; length= 184.0mi									
105	2479040	Big Creek near Lucedale, MS	1952-70	1,290	2,780	4,130	5,840	7,140	8,270	9,660	11,200
	note: *	mean= 2.978; sd= 0.429; skew= 0.117		20	19	20	23	25	28	31	35
	region 1	area= 21.2sqmi; slope= 22.0ft/mi; length= 6.0mi									
106	2479094	Blown Pine Creek near Hattiesburg, MS	1966-77	337	628	843	1,090	1,280	1,430	1,650	1,860
	note: *	mean= 2.532; sd= 0.362; skew= 0.353	1955,83	20	20	21	24	26	29	31	36
	region 1	area= 1.92sqmi; slope= 31.9ft/mi; length= 3.3mi									
107	2479100	Black Creek near Purvis, MS	1957-70	3,650	7,550	11,200	16,200	20,000	23,600	27,700	32,500
	note: *	mean= 3.511; sd= 0.315; skew= 0.497	1974	18	19	20	23	26	28	31	35
	region 1	area= 171 sqmi; slope= 6.2ft/mi; length= 35.6mi									
108	2479130	Black Creek near Brooklyn, MS	1971-88	8,440	14,200	19,400	26,800	32,700	38,300	44,900	52,700
	note: *	mean= 3.957; sd= 0.230; skew= 0.815	1961	13	14	17	21	24	27	30	34
	region 1	area= 355 sqmi; slope= 4.7ft/mi; length= 56.3mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
109	2479138	Walls Creek tributary near Brooklyn, MS	1966-77	146	245	316	395	459	508	580	648
	note: *	mean= 2.197; sd= 0.298; skew= 0.429	1983	18	18	20	23	25	28	31	35
	region 1	area= 0.37sqmi; slope= 61.2ft/mi; length= 1.3mi									
110	2479140	Walls Creek near Brooklyn, MS	1951-70	1,280	2,830	4,050	5,430	6,450	7,340	8,480	9,710
	note: *	mean= 3.050; sd= 0.480; skew= 0.345		21	21	22	24	27	29	32	36
	region 1	area= 22.6sqmi; slope= 12.0ft/mi; length= 11.0mi									
111	2479155	Cypress Creek near Janice, MS	1967-88	3,200	5,620	7,650	10,200	12,200	14,000	16,100	18,600
	note: *	mean= 3.537; sd= 0.273; skew= 0.693	1959	13	15	17	21	24	27	30	34
	region 1	area= 52.6sqmi; slope= 9.1ft/mi; length= 12.1mi									
112	2479160	Black Creek near Wiggins, MS	1972-88	12,900	21,100	28,400	38,800	46,900	55,100	64,500	76,000
	note: *	mean= 4.146; sd= 0.226; skew= 0.792	1959,61	12	14	17	21	24	27	30	34
	region 1	area= 701 sqmi; slope= 3.0ft/mi; length= 103.0mi	1916								
113	2479165	Mosquito Branch at Benndale, MS	1955-77	74	135	185	250	303	347	403	461
	note: *	mean= 1.859; sd= 0.291; skew= 0.288		14	15	17	20	23	25	28	32
	region 1	area= 0.22sqmi; slope= 96.7ft/mi; length= 1.0mi									
114	2479170	Black Creek near Benndale, MS	1959-70	11,700	21,000	28,600	38,700	46,600	54,400	63,400	74,700
	note: *	mean= 4.081; sd= 0.291; skew= 0.198	1949	17	17	19	22	24	27	30	34
	region 1	area= 753 sqmi; slope= 2.5ft/mi; length= 123.0mi									
115	2479180	Red Creek at Lumberton, MS	1951-70	993	2,070	3,020	4,200	5,090	5,860	6,810	7,840
	note: *	mean= 2.961; sd= 0.363; skew= 0.458		18	18	20	23	25	28	31	35
	region 1	area= 15.7sqmi; slope= 13.9ft/mi; length= 7.4mi									
116	2479187	Red Creek tributary near Wiggins, MS	1966-84	114	187	237	294	338	372	421	470
	note: *	mean= 2.089; sd= 0.287; skew= 0.366		15	16	18	21	24	26	29	34
	region 1	area= 0.22sqmi; slope= 48.0ft/mi; length= 1.0mi									
117	2479190	Red Creek near Wiggins, MS	1952-70	4,980	9,000	12,600	17,600	21,500	25,200	29,600	34,800
	note: *	mean= 3.704; sd= 0.273; skew= 0.474	1916,28	13	15	17	20	23	26	29	33
	region 1	area= 177 sqmi; slope= 5.0ft/mi; length= 32.0mi	1948								
118	2479200	Flint Creek near Wiggins, MS	1957-68	--	--	--	--	--	--	--	--
	note: *bi	mean= 3.125; sd= 0.279; skew= 0.403	1948,53	--	--	--	--	--	--	--	--
	region 1	area= 24.9sqmi; slope= 13.4ft/mi; length= 8.3mi	1954								
119	2479260	Bluff Creek tributary near Whites Crossing, MS	1966-77	368	576	711	856	970	1,060	1,190	1,320
	note: *	mean= 2.616; sd= 0.275; skew= 0.111	1955	17	17	18	21	24	26	29	33
	region 1	area= 0.82sqmi; slope= 31.7ft/mi; length= 1.1mi									
120	2479300	Red Creek at Vestry, MS	1959-88	8,690	14,500	19,500	27,100	33,200	39,400	46,400	55,300
	note: *	mean= 3.962; sd= 0.233; skew= 0.614		10	12	14	18	21	24	27	32
	region 1	area= 441 sqmi; slope= 2.9ft/mi; length= 76.1mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second); bottom line-- Standard error of T-year flood estimate (percent)							
121	2479500	Escatawpa River near Wilmer, AL	1946-75	9,440	15,700	21,200	29,800	36,800	44,100	52,200	62,600
	note: *	mean= 3.985; sd= 0.227; skew= 0.488		10	11	14	17	20	23	26	30
	region 1	area= 511 sqmi; slope= 2.7ft/mi; length= 55.0mi									
122	2479560	Escatawpa River near Agricola, MS	1974-86	11,100	17,600	23,400	32,200	39,400	46,600	54,700	64,800
	note: *	mean= 4.061; sd= 0.190; skew= 0.570		12	14	16	20	23	26	29	33
	region 1	area= 562 sqmi; slope= 2.7ft/mi; length= 61.1mi									
123	2479600	Escatawpa River near Hurley, MS	1958-70	9,850	16,100	21,700	30,300	37,300	44,400	52,400	62,500
	note: *	mean= 3.987; sd= 0.205; skew= 0.291		13	14	16	19	22	25	28	32
	region 1	area= 646 sqmi; slope= 2.5ft/mi; length= 77.7mi									
124	2480150	Franklin Creek near Grand Bay, AL	1959-79	983	1,910	2,710	3,820	4,690	5,490	6,430	7,500
	note: *	mean= 2.944; sd= 0.321; skew= 0.094		16	16	17	20	23	26	29	33
	region 1	area= 16.7sqmi; slope= 13.5ft/mi; length= 7.8mi									
125	2480500	Tuxachanie Creek near Biloxi, MS	1953-88	4,770	7,660	10,100	13,400	15,900	18,300	21,200	24,700
	note: *	mean= 3.719; sd= 0.230; skew= 0.833	1906,48	9	11	14	18	21	24	28	32
	region 1	area= 92.4sqmi; slope= 6.8ft/mi; length= 26.1mi									
126	2481000	Biloxi River at Wortham, MS	1953-88	4,910	6,740	8,050	9,840	11,200	12,800	14,400	16,600
	note: *	mean= 3.699; sd= 0.156; skew= 0.138	1948	6	7	8	11	13	15	17	20
	region 1	area= 96.2sqmi; slope= 7.3ft/mi; length= 29.6mi									
127	2481130	Biloxi River near Lyman, MS	1964-88	10,700	16,000	20,200	25,900	30,600	35,200	40,700	47,400
	note: *	mean= 4.068; sd= 0.193; skew= 0.662	1957	9	11	14	18	21	24	27	31
	region 1	area= 251 sqmi; slope= 6.0ft/mi; length= 38.2mi									
128	2481400	Wolf River near Poplarville, MS	1952-71	2,310	4,690	6,980	10,000	12,300	14,300	16,700	19,400
	note: *	mean= 3.364; sd= 0.312; skew= 0.867		16	17	19	23	26	28	31	36
	region 1	area= 71.0sqmi; slope= 8.1ft/mi; length= 20.6mi									
129	2481450	Murder Creek near Poplarville, MS	1952-70	1,340	2,340	3,310	4,710	5,780	6,720	7,860	9,110
	note: *	mean= 3.157; sd= 0.238; skew= 1.082	1916,48	12	14	17	22	25	28	31	35
	region 1	area= 21.6sqmi; slope= 16.8ft/mi; length= 10.9mi	1836,76								
130	2481500	Wolf River at Lyman, MS	1945-48	7,310	12,500	16,900	22,600	27,000	31,200	36,300	42,200
	note: *	mean= 3.902; sd= 0.252; skew= 0.674	1965-70	17	18	20	23	26	28	31	36
	region 1	area= 253 sqmi; slope= 5.4ft/mi; length= 47.6mi	1961								
131	2481505	Mill Creek tributary near Lizana, MS	1967-77	527	815	1,050	1,350	1,600	1,800	2,080	2,350
	note: *	mean= 2.748; sd= 0.205; skew= 0.542		14	16	18	21	24	27	30	34
	region 1	area= 2.29sqmi; slope= 46.1ft/mi; length= 2.2mi									
132	2481510	Wolf River near Landon, MS	1971-88	9,470	13,400	16,500	20,900	24,600	28,500	32,900	38,500
	note: *	mean= 3.993; sd= 0.163; skew= 0.283		9	10	12	15	18	21	23	27
	region 1	area= 308 sqmi; slope= 4.9ft/mi; length= 60.4mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
133	2481670	Bayou La Croix near Clermont Harbor, MS	1960-70	1,800	2,930	3,920	5,330	6,410	7,460	8,580	9,980
	note: *	mean= 3.239; sd= 0.203; skew= 0.424		15	16	18	21	24	27	30	34
	region 1	area= 38.0sqmi; slope= 1.5ft/mi; length= 10.9mi									
134	2481810	Talahaga Creek near Noxapater, MS	1953-70	2,950	5,520	7,490	9,900	11,700	13,400	15,500	17,800
	note: *	mean= 3.478; sd= 0.348; skew= 0.148	1974,79	17	17	19	22	24	27	30	34
	region 1	area= 58.6sqmi; slope= 6.7ft/mi; length= 19.0mi									
135	2481840	Noxapater Creek near Noxapater, MS	1952-70	1,800	3,320	4,600	6,300	7,590	8,790	10,200	11,900
	note: *	mean= 3.252; sd= 0.299; skew= 0.363	1979	15	16	18	21	24	27	30	34
	region 1	area= 35.3sqmi; slope= 6.7ft/mi; length= 14.1mi									
136	2481880	Pearl River at Burnside, MS	1981-88	9,040	16,500	22,400	30,900	37,900	45,500	53,800	65,600
	note: fg	mean= 3.951; sd= 0.314; skew= -0.100	1935,38	9	9	11	14	17	20	24	29
	region 1	area= 520 sqmi; slope= 1.9ft/mi; length= 47.6mi	1939,62,79								
137	2481900	Coonshuck Creek tributary near House, MS	1965-77	97	157	201	257	303	341	390	439
	note: *	mean= 1.963; sd= 0.251; skew= -0.173	1979	15	15	16	18	21	24	27	30
	region 1	area= 0.20sqmi; slope= 97.8ft/mi; length= 0.6mi									
138	2482000	Pearl River at Edinburg, MS	1909-88	10,700	19,300	26,100	35,800	43,800	52,500	61,800	75,200
	note: *g	mean= 4.023; sd= 0.309; skew= -0.100	1902	9	9	10	14	17	20	24	29
	region 4	area= 904 sqmi; slope= 1.3ft/mi; length= 76.3mi	1878								
139	2482100	Indian Branch near Edinburg, MS	1965-84	313	521	680	892	1,070	1,220	1,410	1,620
	note: *	mean= 2.468; sd= 0.259; skew= -0.177		13	13	14	17	19	22	25	29
	region 1	area= 1.91sqmi; slope= 27.1ft/mi; length= 2.5mi									
140	2482310	Lobutcha Creek tributary at Wamba, MS	1964-84	359	549	680	839	964	1,070	1,210	1,350
	note: *	mean= 2.566; sd= 0.229; skew= -0.092		12	12	13	16	18	21	24	28
	region 1	area= 0.94sqmi; slope= 38.3ft/mi; length= 1.3mi									
141	2482500	Lobutcha Creek near Carthage, MS	1938-70	6,210	11,800	16,200	22,200	26,800	31,400	36,500	42,900
	note: *	mean= 3.767; sd= 0.345; skew= -0.209	1979	14	13	14	17	19	22	25	29
	region 1	area= 309 sqmi; slope= 2.2ft/mi; length= 57.7mi									
142	2482550	Pearl River near Carthage, MS	1962-88	13,200	23,100	30,900	42,100	51,300	61,300	72,000	87,500
	note: *fg	mean= 4.117; sd= 0.293; skew= -0.050	1932,38-39	14	15	17	22	27	33	39	48
	region 4	area= 1,350 sqmi; slope= 1.4ft/mi; length= 97.5mi	1874,1900,02								
143	2482900	Tallabogue Creek tributary near Harpersville, MS	1965-77	52	93	126	170	206	236	273	310
	note: *	mean= 1.617; sd= 0.299; skew= -0.228		18	17	17	20	23	25	28	32
	region 1	area= 0.12sqmi; slope= 131 ft/mi; length= 0.4mi									
144	2483000	Tuscolameta Creek at Walnut Grove, MS	1939-88	10,400	17,300	22,600	29,700	35,300	41,000	47,200	55,100
	note: *	mean= 4.000; sd= 0.271; skew= -0.238	1900,02	9	9	10	12	15	17	19	23
	region 1	area= 411 sqmi; slope= 4.1ft/mi; length= 35.4mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent)							
145	2483500	Pearl River near Lena, MS	1937-53	20,000	35,600	48,100	66,200	81,400	98,000	116,000	143,000
	note: *fg	mean= 4.302; sd= 0.296; skew= 0.000	1962,74	16	17	20	27	33	40	47	59
	region 4	area= 1,980 sqmi; slope= 1.3ft/mi; length= 110.0mi	1902								
146	2483890	Yockanookany River tributary near McCool, MS	1965-88	142	252	330	421	490	546	618	692
	note: *	mean= 2.147; sd= 0.333; skew= -0.179		15	15	16	18	21	24	27	31
	region 1	area= 0.34sqmi; slope= 51.3ft/mi; length= 1.0mi									
147	2484000	Yockanookany River near Kosciusko, MS	1938-88	6,930	12,200	16,600	22,900	28,100	33,400	39,300	47,100
	note: *	mean= 3.837; sd= 0.280; skew= 0.090	1933	9	10	11	14	17	19	22	26
	region 1	area= 303 sqmi; slope= 3.3ft/mi; length= 37.1mi									
148	2484500	Yockanookany River near Ofahoma, MS	1938-88	7,540	12,900	17,200	23,600	28,800	34,300	40,200	48,200
	note: *	mean= 3.871; sd= 0.267; skew= 0.021		9	9	11	14	16	18	21	25
	region 1	area= 469 sqmi; slope= 2.2ft/mi; length= 73.9mi									
149	2484600	Coffee Bogue near Ludlow, MS	1971-87	3,570	5,400	6,760	8,620	10,100	11,600	13,300	15,300
	note: *	mean= 3.555; sd= 0.203; skew= -0.054		12	12	13	16	19	21	24	28
	region 1	area= 77.0sqmi; slope= 3.8ft/mi; length= 23.5mi									
150	2484750	Red Cane Creek tributary near Pisgah, MS	1965-88	61	91	113	142	166	187	212	240
	note: *	mean= 1.779; sd= 0.201; skew= -0.064		10	10	11	14	16	19	22	25
	region 1	area= 0.10sqmi; slope= 73.3ft/mi; length= 0.4mi									
151	2484760	Fannesgusha Creek near Sand Hill, MS	1971-88	3,140	5,310	7,000	9,230	11,000	12,600	14,500	16,800
	note: *	mean= 3.499; sd= 0.265; skew= 0.040		14	14	16	19	21	24	27	31
	region 1	area= 52.3sqmi; slope= 7.8ft/mi; length= 12.2mi									
152	2485000	Pearl River at Meeks Bridge near Canton, MS	1938-63	27,100	45,600	60,000	80,700	97,700	116,000	136,000	166,000
	note: *fg	mean= 4.435; sd= 0.267; skew= 0.050	1979,83	13	14	16	22	27	32	39	47
	region 4	area= 2,760 sqmi; slope= 1.1ft/mi; length= 144.0mi	1933								
153	2485380	Hollybush Creek tributary no.1 near Pisgah, MS	1965-84	227	308	362	431	486	538	597	666
	note: *	mean= 2.357; sd= 0.155; skew= -0.100		8	9	10	12	14	17	19	22
	region 1	area= 0.59sqmi; slope= 23.0ft/mi; length= 1.2mi									
154	2485385	Hollybush Creek tributary no.2 near Pisgah, MS	1965-77	149	209	250	302	343	380	425	474
	note: *	mean= 2.183; sd= 0.175; skew= -0.078		11	12	13	16	18	21	24	27
	region 1	area= 0.25sqmi; slope= 53.6ft/mi; length= 0.7mi									
155	2485392	Clear Creek tributary near Pelahatchie, MS	1965-84	84	116	138	167	191	213	238	267
	note: *	mean= 1.921; sd= 0.165; skew= -0.092		9	9	10	13	15	17	20	23
	region 1	area= 0.12sqmi; slope= 141 ft/mi; length= 0.5mi									
156	2485500	Pelahatchie Creek near Fannin, MS	1938-39	6,790	12,600	17,000	22,300	26,200	30,000	34,300	39,500
	note: *	mean= 3.825; sd= 0.359; skew= -0.222	1950-65	19	17	18	21	23	26	29	33
	region 1	area= 206 sqmi; slope= 3.5ft/mi; length= 32.6mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
157	2485650	Purple Creek near Jackson, MS	1952-88	1,160	1,670	2,010	2,460	2,800	3,140	3,490	3,970
	note: dg	mean= 3.066; sd= 0.186; skew= -0.003		8	9	10	13	16	20	23	28
	region 1	area= 6.12sqmi; slope= 16.2ft/mi; length= 6.5mi									
158	2485690	Hanging Moss Creek tributary near Tougaloo, MS	1952-68	480	782	1,020	1,340	1,590	1,820	2,100	2,420
	note: *	mean= 2.680; sd= 0.241; skew= 0.103		13	14	16	19	21	24	27	31
	region 1	area= 3.56sqmi; slope= 20.9ft/mi; length= 4.9mi									
159	2485700	Hanging Moss Creek at Jackson, MS	1953-88	2,430	3,330	3,930	4,690	5,260	5,830	6,410	7,190
	note: *bdg	mean= 3.386; sd= 0.162; skew= 0.022		7	8	9	12	14	17	20	25
	region 1	area= 16.8sqmi; slope= 12.6ft/mi; length= 7.4mi									
160	2485800	Eubanks Creek at Jackson, MS	1953-88	2,140	2,710	3,090	3,560	3,910	4,260	4,620	5,090
	note: dg	mean= 3.333; sd= 0.121; skew= 0.182		5	6	7	9	12	14	17	20
	region 1	area= 5.19sqmi; slope= 23.9ft/mi; length= 3.4mi									
161	2485900	Neely Creek near Brandon, MS	1964-84	303	533	710	920	1,080	1,220	1,390	1,570
	note: *	mean= 2.492; sd= 0.301; skew= 0.301		15	16	17	21	23	26	29	33
	region 1	area= 1.09sqmi; slope= 40.1ft/mi; length= 1.4mi									
162	2485950	Town Creek at Jackson, MS	1953-84	2,790	3,380	3,750	4,190	4,510	4,820	5,120	5,520
	note: dg	mean= 3.447; sd= 0.098; skew= 0.104	1914,21	4	5	6	8	9	11	13	16
	region 1	area= 11.4sqmi; slope= 14.2ft/mi; length= 6.7mi	1885								
163	2486000	Pearl River at Jackson, MS	1900-88	26,800	43,800	56,800	75,000	90,000	106,000	123,000	148,000
	note: ag	mean= 4.430; sd= 0.252; skew= 0.050	1874,81	6	7	8	11	13	16	19	23
	region 4	area= 3,170 sqmi; slope= 1.0ft/mi; length= 177.0mi									
164	2486100	Lynch Creek at Jackson, MS	1953-88	3,620	4,790	5,550	6,490	7,180	7,860	8,540	9,450
	note: dg	mean= 3.558; sd= 0.145; skew= 0.000		6	7	8	10	12	15	17	21
	region 1	area= 12.1sqmi; slope= 15.5ft/mi; length= 6.5mi									
165	2486115	Three Mile Creek at Jackson, MS	1962-78	1,020	1,420	1,680	1,990	2,210	2,420	2,620	2,890
	note: dg	mean= 2.999; sd= 0.181; skew= -0.271	1981-88	9	9	10	13	16	19	23	27
	region 1	area= 1.05sqmi; slope= 44.4ft/mi; length= 1.8mi									
166	2486240	Richland Creek tributary near Brandon, MS	1966-77	55	90	117	151	179	202	232	262
	note: *	mean= 1.692; sd= 0.257; skew= -0.187		16	16	17	19	22	25	27	31
	region 1	area= 0.12sqmi; slope= 60.5ft/mi; length= 0.6mi									
167	2486350	Cany Creek at Jackson, MS	1961-77	2,870	3,620	4,080	4,650	5,050	5,450	5,830	6,340
	note: dg	mean= 3.459; sd= 0.119; skew= 0.012		9	10	11	15	18	22	26	32
	region 1	area= 8.38sqmi; slope= 19.8ft/mi; length= 5.4mi									
168	2486690	Rhodes Creek near Terry, MS	1948-69	1,660	2,760	3,570	4,620	5,440	6,210	7,110	8,180
	note: *	mean= 3.220; sd= 0.269; skew= -0.133	1973	13	13	14	17	20	22	25	29
	region 1	area= 21.0sqmi; slope= 11.1ft/mi; length= 12.0mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
169	2487230 note: * region 1	Strong River near Morton, MS mean= 3.321; sd= 0.245; skew= 0.118 area= 16.2sqmi; slope= 10.7ft/mi; length= 5.6mi	1959-69 1974-75	1,970 15	3,120 15	3,970 17	5,000 20	5,810 23	6,550 25	7,440 28	8,460 32
170	2487300 note: * region 1	Strong River near Puckett, MS mean= 3.780; sd= 0.307; skew= 0.232 area= 248 sqmi; slope= 2.6ft/mi; length= 44.1mi	1955-88 1950	5,990 12	11,000 13	15,400 15	21,300 18	25,900 21	30,400 24	35,600 27	42,100 31
171	2487500 note: * region 1	Strong River at D'Lo, MS mean= 3.923; sd= 0.239; skew= 0.200 area= 425 sqmi; slope= 2.4ft/mi; length= 61.7mi	1929-88 1900	8,280 7	13,500 8	17,800 10	24,000 13	29,200 15	34,700 18	40,800 20	49,100 24
172	2487600 note: * region 1	Dabbs Creek near D'Lo, MS mean= 3.326; sd= 0.245; skew= 0.551 area= 57.2sqmi; slope= 4.5ft/mi; length= 29.3mi	1948-69 1980	2,060 12	3,520 14	4,830 16	6,710 20	8,190 23	9,640 26	11,300 29	13,300 33
173	2487620 note: * region 1	Riles Creek near Mendenhall, MS mean= 3.310; sd= 0.341; skew= 0.222 area= 25.5sqmi; slope= 13.9ft/mi; length= 12.0mi	1949-50 1954-70 1974	1,930 17	3,560 17	4,810 19	6,290 22	7,410 24	8,430 27	9,710 30	11,100 34
174	2487670 note: * region 1	Boggans Ditch near Mendenhall, MS mean= 2.340; sd= 0.337; skew= -0.072 area= 0.91sqmi; slope= 71.1ft/mi; length= 1.3mi	1955-84	231 14	432 14	591 15	795 18	953 21	1,090 23	1,260 26	1,440 30
175	2487690 note: * region 1	Baking Powder Draw near Prentiss, MS mean= 2.053; sd= 0.467; skew= -0.316 area= 0.82sqmi; slope= 63.9ft/mi; length= 1.3mi	1955-77	159 20	339 18	486 19	671 21	814 24	928 26	1,070 29	1,220 33
176	2487710 note: * region 1	Barrets Branch near Pinola, MS mean= 2.388; sd= 0.334; skew= 0.039 area= 0.88sqmi; slope= 47.1ft/mi; length= 2.1mi	1955-77	240 16	429 16	569 17	732 20	860 23	964 25	1,100 28	1,240 32
177	2487750 note: * region 1	Big Creek near Pinola, MS mean= 3.356; sd= 0.278; skew= 0.300 area= 45.9sqmi; slope= 6.2ft/mi; length= 22.0mi	1948-69	2,210 14	3,860 15	5,200 16	6,990 20	8,380 23	9,720 25	11,300 28	13,100 32
178	2487770 note: * region 1	Bradleys Ditch near Pinola, MS mean= 2.335; sd= 0.222; skew= -0.037 area= 0.54sqmi; slope= 27.5ft/mi; length= 2.7mi	1955-77 1983	207 11	309 11	377 12	459 15	522 18	578 20	647 23	726 27
179	2487900 note: * region 1	Copiah Creek near Hazlehurst, MS mean= 3.680; sd= 0.338; skew= 0.284 area= 47.4sqmi; slope= 10.7ft/mi; length= 12.1mi	1955-88 1950,53	4,290 13	7,710 14	10,100 16	12,900 20	14,900 22	16,700 25	19,100 28	21,700 32
180	2488000 note: *fg region 4	Pearl River at Rockport, MS mean= 4.506; sd= 0.203; skew= 0.100 area= 4,560 sqmi; slope= 1.0ft/mi; length= 242.0mi	1938-51 1985-88 1900,79,83 1874	31,800 11	47,400 13	58,700 15	73,900 20	85,900 25	98,600 30	112,000 36	131,000 44

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
181	2488340 note: * region 1	Small Pine Ditch near Monticello, MS mean= 2.072; sd= 0.201; skew= -0.011 area= 0.16sqmi; slope= 126 ft/mi; length= 0.5mi	1955-77 1980-84	116 9	172 10	211 11	261 14	299 16	335 19	377 21	424 25
182	2488500 note: *g region 4	Pearl River near Monticello, MS mean= 4.547; sd= 0.183; skew= 0.100 area= 4,990 sqmi; slope= 1.0ft/mi; length= 273.0mi	1924-88 1900,02 1874	35,000 6	50,200 6	60,800 7	74,900 10	85,800 12	97,100 15	109,000 17	125,000 21
183	2488510 note: * region 1	Roadside Park Ditch near Monticello, MS mean= 2.077; sd= 0.203; skew= 0.199 area= 0.25sqmi; slope= 103 ft/mi; length= 0.8mi	1955-77 1983	118 10	178 11	224 13	287 16	339 18	385 21	442 24	505 28
184	2488540 note: * region 1	New Hebron Gulley at New Hebron, MS mean= 2.684; sd= 0.414; skew= 0.129 area= 2.50sqmi; slope= 44.7ft/mi; length= 2.2mi	1965-77 1957,83	493 21	952 20	1,290 21	1,650 23	1,940 26	2,170 28	2,480 31	2,790 35
185	2488550 note: * region 1	Goines Draw near Prentiss, MS mean= 1.904; sd= 0.487; skew= 0.113 area= 0.34sqmi; slope= 96.4ft/mi; length= 0.8mi	1955-84	99 19	224 19	324 20	440 23	529 25	595 28	687 31	775 35
186	2488680 note: * region 1	Plum Ditch near Prentiss, MS mean= 1.876; sd= 0.284; skew= 0.158 area= 0.23sqmi; slope= 90.9ft/mi; length= 0.9mi	1955-76 1983	79 14	139 14	189 16	256 19	310 22	356 24	414 27	474 31
187	2488700 note: * region 1	Whitesand Creek near Oak Vale, MS mean= 3.628; sd= 0.407; skew= 0.080 area= 130 sqmi; slope= 8.7ft/mi; length= 30.8mi	1966-88	4,350 18	8,940 18	12,600 19	17,200 22	20,600 24	23,800 27	27,700 30	32,200 34
188	2489000 note: *g region 4	Pearl River near Columbia, MS mean= 4.564; sd= 0.174; skew= 0.150 area= 5,720 sqmi; slope= 1.0ft/mi; length= 326.0mi	1905-86 1874,1900	36,300 5	51,100 6	61,500 7	75,300 9	86,000 11	97,100 13	109,000 16	125,000 19
189	2489030 note: * region 1	Elmers Draw near Columbia, MS mean= 2.571; sd= 0.269; skew= 0.165 area= 0.91sqmi; slope= 68.6ft/mi; length= 1.4mi	1955-88	355 11	585 12	754 13	959 17	1,120 19	1,260 22	1,430 25	1,630 29
190	2489160 note: * region 1	Kokomo Draw at Kokomo, MS mean= 2.560; sd= 0.317; skew= 0.185 area= 1.26sqmi; slope= 42.2ft/mi; length= 1.5mi	1955-77 1983	353 15	629 15	835 17	1,080 20	1,270 23	1,420 25	1,620 28	1,840 32
191	2489200 note: * region 1	Ten Mile Creek near Columbia, MS mean= 3.298; sd= 0.419; skew= 0.114 area= 38.5sqmi; slope= 16.8ft/mi; length= 13.8mi	1953-70	2,110 20	4,340 19	6,090 21	8,190 23	9,790 25	11,200 28	13,000 31	14,900 35
192	2489240 note: * region 1	Lower Little Creek near Baxterville, MS mean= 3.492; sd= 0.395; skew= -0.079 area= 81.5sqmi; slope= 13.1ft/mi; length= 11.2mi	1961-70	3,810 23	7,690 21	10,800 21	14,600 24	17,500 26	20,100 28	23,300 31	26,700 35

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
193	2489500	Pearl River near Bogalusa, LA	1938-88	42,500	62,600	77,200	97,000	113,000	129,000	147,000	172,000
	note: *g	mean= 4.634; sd= 0.196; skew= 0.150		7	8	9	13	16	19	22	27
	region 4	area= 6,570 sqmi; slope= 1.0ft/mi; length= 338.0mi									
194	2490105	Bogue Lusa Creek at Bogalusa, LA	1964-85	2,450	4,900	6,980	9,820	12,000	14,200	16,600	19,500
	note: *	mean= 3.345; sd= 0.351; skew= 0.001		16	16	18	20	23	26	28	32
	region 1	area= 72.7sqmi; slope= 9.6ft/mi; length= 21.4mi									
195	2490250	Bogue Chitto near Brookhaven, MS	1953-70	2,260	4,050	5,330	6,810	7,900	8,920	10,100	11,600
	note: *	mean= 3.380; sd= 0.346; skew= 0.074		18	18	19	22	24	27	30	34
	region 1	area= 28.3sqmi; slope= 6.3ft/mi; length= 10.6mi									
196	2490300	Big Creek at Bogue Chitto, MS	1952-70	3,300	5,900	7,820	10,100	11,900	13,500	15,400	17,600
	note: *	mean= 3.532; sd= 0.331; skew= -0.062		16	16	17	20	23	25	28	32
	region 1	area= 55.1sqmi; slope= 5.8ft/mi; length= 16.2mi									
197	2490500	Bogue Chitto near Tylertown, MS	1945-88	13,300	24,700	33,300	43,900	51,600	59,100	67,400	77,700
	note: *	mean= 4.120; sd= 0.349; skew= -0.313	1936	12	12	12	15	18	20	23	27
	region 1	area= 492 sqmi; slope= 3.3ft/mi; length= 59.2mi									
198	2490550	Middle Fork Hickory Flat near Tylertown, MS	1953-84	466	746	944	1,180	1,370	1,530	1,730	1,950
	note: *	mean= 2.694; sd= 0.258; skew= 0.160		11	12	14	17	19	22	25	29
	region 1	area= 1.46sqmi; slope= 38.3ft/mi; length= 2.4mi									
199	2490700	Union Creek near Tylertown, MS	1953-69	985	2,040	2,880	3,870	4,630	5,270	6,080	6,960
	note: *	mean= 2.934; sd= 0.429; skew= 0.083	1900	21	20	21	23	25	28	31	35
	region 1	area= 12.4sqmi; slope= 16.8ft/mi; length= 6.6mi									
200	2490750	McGees Creek at Tylertown, MS	1952-74	4,360	8,500	11,900	16,400	19,900	23,300	27,200	31,800
	note: *	mean= 3.617; sd= 0.353; skew= -0.052	1980,83	15	15	16	19	22	24	27	31
	region 1	area= 152 sqmi; slope= 5.3ft/mi; length= 32.8mi	1900,43								
201	2491500	Bogue Chitto at Franklinton, LA	1922-88	20,800	37,500	50,000	65,500	78,200	92,200	99,800	122,000
	note: *	mean= 4.307; sd= 0.322; skew= -0.281	1900	9	9	9	10	11	12	13	15
	region 4	area= 985 sqmi; slope= 4.4ft/mi; length= 65.3mi									
202	2492000	Bogue Chitto near Bush, LA	1938-88	19,100	34,000	45,700	60,500	72,900	86,300	92,400	113,000
	note: *	mean= 4.267; sd= 0.307; skew= -0.154		10	10	10	11	12	13	14	15
	region 4	area= 1,210 sqmi; slope= 4.0ft/mi; length= 92.4mi									
203	2492350	East Hobolochitto Creek at Picayune, MS	1957-66	4,000	6,160	8,110	11,000	13,500	15,900	18,600	22,000
	note: *	mean= 3.618; sd= 0.188; skew= 0.596	1969-71	11	13	15	19	22	25	28	32
	region 1	area= 114 sqmi; slope= 5.7ft/mi; length= 32.7mi	1916,28,74								
204	2492360	West Hobolochitto Creek near McNeill, MS	1966-88	6,010	9,970	13,100	17,300	20,700	24,100	27,900	32,600
	note: *	mean= 3.784; sd= 0.253; skew= 0.053		12	13	14	17	20	23	25	29
	region 1	area= 175 sqmi; slope= 5.2ft/mi; length= 33.9mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
205	2492600	Pearl River at Pearl River, LA	1900-88	56,500	87,400	111,000	143,000	169,000	198,000	228,000	272,000
	note: gh	mean= 4.757; sd= 0.221; skew= 0.150	1874	5	6	7	10	12	15	18	21
	region 4	area= 8,590 sqmi; slope= -- ; length= --									
206	3592718	Little Yellow Creek near Burnsville, MS	1974-88	1,790	3,370	4,620	6,170	7,370	8,440	9,750	11,200
	note: *	mean= 3.217; sd= 0.343; skew= -0.093		18	18	19	21	24	26	29	33
	region 1	area= 24.7sqmi; slope= 13.9ft/mi; length= 7.4mi									
207	3592800	Yellow Creek near Doskie, MS	1938-61	4,930	9,010	12,400	17,100	20,900	24,500	28,700	33,700
	note: *	mean= 3.675; sd= 0.301; skew= 0.004	1973-78	12	13	14	17	20	23	25	29
	region 1	area= 143 sqmi; slope= 5.5ft/mi; length= 16.8mi	1902								
208	3593010	Chambers Creek near Kendrick, MS	1940-61	2,140	3,910	5,160	6,570	7,580	8,480	9,590	10,800
	note: *	mean= 3.350; sd= 0.368; skew= -0.220		17	16	17	20	22	25	28	32
	region 1	area= 21.1sqmi; slope= 11.8ft/mi; length= 8.8mi									
209	7029252	Pool Branch near Ripley, MS	1965-77	316	453	553	686	796	897	1,020	1,160
	note: *	mean= 2.499; sd= 0.175; skew= -0.089		12	12	13	16	19	21	24	28
	region 1	area= 1.24sqmi; slope= 36.0ft/mi; length= 2.0mi									
210	7029270	Hatchie River near Walnut, MS	1947-80	7,230	12,500	16,600	22,300	27,000	31,700	36,900	43,600
	note: *	mean= 3.849; sd= 0.271; skew= -0.058		11	11	13	15	18	20	23	27
	region 1	area= 272 sqmi; slope= 4.4ft/mi; length= 32.4mi									
211	7029300	Tuscumbia River Canal near Corinth, MS	1950-80	8,550	14,500	19,200	25,800	31,000	36,300	42,100	49,600
	note: *	mean= 3.930; sd= 0.260; skew= 0.046		11	12	13	16	19	21	24	28
	region 1	area= 278 sqmi; slope= 3.9ft/mi; length= 25.1mi									
212	7029400	Hatchie River at Pocahontas, TN	1942-77	15,300	25,900	35,300	49,400	63,200	79,100	88,600	114,000
	note: *	mean= 4.175; sd= 0.250; skew= 0.071		10	10	11	12	12	13	14	16
	region 4	area= 837 sqmi; slope= 2.5ft/mi; length= 49.1mi									
213	7029412	Hurricane Creek near Walnut, MS	1953-70	1,440	1,590	1,690	1,780	1,860	1,930	2,000	2,090
	note: c	mean= 3.156; sd= 0.051; skew= -0.351		3	3	3	4	5	6	7	9
	region 1	area= 20.2sqmi; slope= 17.1ft/mi; length= 8.0mi									
214	7030365	Wesley Branch near Walnut, MS	1966-77	256	476	680	971	1,210	1,420	1,680	1,950
	note: c	mean= 2.322; sd= 0.261; skew= 0.093		17	17	18	21	24	26	29	33
	region 1	area= 2.17sqmi; slope= 63.5ft/mi; length= 2.4mi									
215	7030500	Wolf River at Rossville, TN	1930-71	9,850	16,600	21,400	27,700	32,700	37,600	43,100	49,900
	note: *	mean= 3.966; sd= 0.285; skew= -0.480		11	10	10	13	15	18	20	24
	region 1	area= 503 sqmi; slope= 3.0ft/mi; length= 58.9mi									
216	7266000	Cane Creek near New Albany, MS	1939-41	3,020	4,540	5,570	6,920	7,890	8,990	9,920	11,300
	note: *	mean= 3.478; sd= 0.213; skew= -0.107	1950-74	10	10	11	14	16	19	21	25
	region 2	area= 22.2sqmi; slope= 12.8ft/mi; length= 9.7mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent)							
217	7267000	Hell Creek near New Albany, MS	1939-42	4,220	5,680	6,630	7,800	8,660	9,510	10,400	11,500
	note: *abg	mean= 3.624; sd= 0.155; skew= -0.055	1952-88	9	10	11	15	18	22	26	31
	region 2	area= 26.8sqmi; slope= 8.6ft/mi; length= 12.7mi									
218	7267200	Cracker Ditch near Pontotoc, MS	1955-58	124	169	198	239	270	303	330	372
	note: *	mean= 2.076; sd= 0.157; skew= -0.113	1962-75	9	9	10	13	15	18	20	24
	region 2	area= 0.23sqmi; slope= 91.6ft/mi; length= 0.8mi									
219	7268000	Little Tallahatchie River at Etta, MS	1937-88	27,800	43,100	54,000	68,600	79,800	92,200	104,000	120,000
	note: *	mean= 4.439; sd= 0.229; skew= -0.152		8	8	9	11	13	16	18	21
	region 2	area= 526 sqmi; slope= 5.3ft/mi; length= 32.0mi									
220	7268200	Fice Creek at Etta, MS	1952-70	1,620	2,910	3,740	4,620	5,070	5,700	6,100	6,780
	note: *	mean= 3.228; sd= 0.374; skew= 0.052		18	19	20	24	26	28	31	34
	region 2	area= 8.78sqmi; slope= 15.1ft/mi; length= 6.2mi									
221	7268500	Cypress Creek near Etta, MS	1939-42	4,850	7,790	9,870	12,600	14,600	16,700	18,800	21,700
	note: ag	mean= 3.675; sd= 0.254; skew= -0.233	1952-88	11	11	13	16	20	24	28	34
	region 2	area= 28.5sqmi; slope= 9.4ft/mi; length= 8.8mi									
222	7269000	North Tippah Creek near Ripley, MS	1939-42	4,050	5,530	6,460	7,590	8,400	9,190	9,960	11,000
	note: *abg	mean= 3.602; sd= 0.165; skew= -0.190	1952-80	9	10	11	14	17	21	25	30
	region 2	area= 19.3sqmi; slope= 16.1ft/mi; length= 7.7mi	1983-88,1948								
223	7269990	Tippah Creek near Potts Camp, MS	1943-83	11,400	16,600	20,300	25,600	29,900	35,000	39,800	46,500
	note: *	mean= 4.038; sd= 0.192; skew= -0.239		10	10	11	14	16	19	21	25
	region 2	area= 355 sqmi; slope= 3.4ft/mi; length= 43.4mi									
224	7271000	Clear Creek near Oxford, MS	1939-41	2,910	4,200	5,060	6,110	6,840	7,620	8,280	9,240
	note: *	mean= 3.466; sd= 0.195; skew= -0.153	1950-74	9	9	10	13	15	17	20	23
	region 2	area= 10.4sqmi; slope= 25.4ft/mi; length= 4.2mi									
225	7272500	Little Tallahatchie River at Sardis Dam, MS	1940-83	--	--	--	--	--	--	--	--
	note: ak	mean= 3.692; sd= -- ; skew= --		--	--	--	--	--	--	--	--
	region 4	area= 1,540 sqmi; slope= 2.9ft/mi; length= 70.3mi									
226	7273000	Tallahatchie River near Sardis, MS	1929-60	--	--	--	--	--	--	--	--
	note: *abk	mean= 3.825; sd= -- ; skew= --		--	--	--	--	--	--	--	--
	region 4	area= 1,600 sqmi; slope= 2.7ft/mi; length= 77.9mi									
227	7273550	Little Tallahatchie River(Panola-Quitman Floodway) near Batesville, MS	1942-63	12,200	17,300	21,000	26,100	30,300	34,800	39,600	46,600
	note: ag	mean= 4.098; sd= 0.169; skew= 0.400		10	12	15	20	26	32	38	48
	region 4	area= 1,770 sqmi; slope= 2.3ft/mi; length= 94.8mi	1937,40								
228	7274000	Yocona River near Oxford, MS	1947-88	9,800	17,300	23,400	32,000	38,700	46,600	53,500	63,200
	note: *	mean= 3.987; sd= 0.289; skew= 0.111		11	11	13	17	19	22	25	28
	region 2	area= 254 sqmi; slope= 4.1ft/mi; length= 34.8mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
229	7274250	Otoucalofa Creek at Water Valley, MS	1952-88	4,470	7,340	9,740	13,400	16,300	19,700	22,700	27,100
	note: *	mean= 3.643; sd= 0.239; skew= 0.251		10	11	13	16	19	22	25	28
	region 2	area= 84.1sqmi; slope= 7.9ft/mi; length= 19.1mi									
230	7275000	Yocona River at Enid Dam near Enid, MS	1927-83	--	--	--	--	--	--	--	--
	note: *abk	mean= 3.384; sd= -- ; skew= --		--	--	--	--	--	--	--	--
	region 2	area= 606 sqmi; slope= 3.2ft/mi; length= 63.5mi									
231	7275500	Long Creek at Courtland, MS	1940-43	8,410	13,000	16,400	20,900	24,000	27,700	30,700	35,200
	note: *	mean= 3.932; sd= 0.226; skew= 0.075	1952-88	9	10	12	15	17	20	22	26
	region 2	area= 62.3sqmi; slope= 13.8ft/mi; length= 11.6mi	1948								
232	7276000	Coldwater River near Lewisburg, MS	1940-58	10,400	17,300	21,900	27,200	30,700	35,300	38,900	44,100
	note: *	mean= 3.995; sd= 0.295; skew= -0.570		15	14	14	18	20	23	26	30
	region 2	area= 213 sqmi; slope= 4.2ft/mi; length= 49.9mi									
233	7277000	Pigeon Roost Creek near Lewisburg, MS	1940-58	7,380	11,800	15,400	20,700	25,300	30,400	36,200	45,000
	note: ag	mean= 3.882; sd= 0.232; skew= 0.360		13	16	20	28	35	43	52	66
	region 2	area= 229 sqmi; slope= 8.7ft/mi; length= 26.8mi									
234	7277500	Coldwater River near Coldwater, MS	1929-42	19,300	35,700	48,000	63,900	74,600	88,800	99,500	115,000
	note: *	mean= 4.243; sd= 0.355; skew= -0.249		20	19	20	23	25	28	31	34
	region 2	area= 634 sqmi; slope= 3.2ft/mi; length= 70.0mi									
235	7277550	James Wolf Creek tributary near Looxahoma, MS	1965-77	242	372	455	563	630	701	743	823
	note: *	mean= 2.345; sd= 0.245; skew= -0.309		16	15	16	19	22	25	27	31
	region 2	area= 0.29sqmi; slope= 149 ft/mi; length= 0.6mi									
236	7277700	Hickahala Creek near Senatobia, MS	1943-58	9,650	15,100	19,200	24,800	29,000	34,000	38,000	43,800
	note: *	mean= 3.977; sd= 0.226; skew= -0.027		13	14	15	18	21	24	27	30
	region 2	area= 122 sqmi; slope= 9.9ft/mi; length= 19.6mi									
237	7277730	Senatobia Creek near Senatobia, MS	1943-58	14,100	17,000	18,600	20,500	21,700	23,000	24,300	26,000
	note: *	mean= 4.155; sd= 0.096; skew= -0.330		6	6	6	8	10	11	13	16
	region 2	area= 82.0sqmi; slope= 10.3ft/mi; length= 15.8mi									
238	7278500	Coldwater River at Arkabutla Dam, MS	1938-83	--	--	--	--	--	--	--	--
	note: ak	mean= 3.659; sd= -- ; skew= --		--	--	--	--	--	--	--	--
	region 4	area= 1,000 sqmi; slope= 2.9ft/mi; length= 80.6mi									
239	7279300	Coldwater River at Prichard, MS	1946-58	5,980	6,750	7,140	7,550	7,810	8,040	8,240	8,480
	note: afg	mean= 3.772; sd= 0.067; skew= -0.450		5	4	5	6	8	9	11	13
	region 4	area= 1,210 sqmi; slope= -- ; length= --									
240	7279500	Coldwater River at Savage, MS	1909-12	--	--	--	--	--	--	--	--
	note: *bi	mean= 4.072; sd= 0.377; skew= -0.262	1936-42	--	--	--	--	--	--	--	--
	region 4	area= 1,230 sqmi; slope= 2.8ft/mi; length= 94.9mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent)							
241	7279600	Arkabutla Creek near Arkabutla, MS	1947-58	11,000	13,800	15,400	17,300	18,700	20,400	21,900	24,100
	note: *	mean= 4.045; sd= 0.115; skew= -0.342		8	8	9	11	13	15	17	20
	region 2	area= 98.1sqmi; slope= 7.5ft/mi; length= 21.0mi									
242	7279970	Bobo Bayou at Bobo, MS	1946-58	1,710	1,830	1,890	1,940	1,970	2,000	2,020	2,040
	note: gh	mean= 3.228; sd= 0.041; skew= -0.722		3	2	3	3	5	6	7	8
	region 3	area= 92.0sqmi; slope= 7.1ft/mi; length= 19.6mi									
243	7280000	Tallahatchie River near Lambert, MS	1936-83	11,200	13,300	14,400	15,700	16,500	17,300	18,000	18,900
	note: ag	mean= 4.046; sd= 0.092; skew= -0.300		4	4	4	5	6	7	9	10
	region 3	area= 1,980 sqmi; slope= 2.0ft/mi; length= 135.2mi									
244	7280270	Tillatoba Creek below Oakland, MS	1975-84	5,210	7,180	8,430	10,000	11,200	12,600	13,700	15,500
	note: *	mean= 3.725; sd= 0.163; skew= -0.190		12	12	13	16	19	21	24	28
	region 2	area= 37.1sqmi; slope= 11.7ft/mi; length= 12.3mi									
245	7280340	South Fork Tillatoba Creek near Charleston, MS	1976-88	6,020	9,090	11,100	13,700	15,500	17,600	19,300	21,800
	note: *	mean= 3.784; sd= 0.219; skew= -0.208		14	14	15	18	21	23	26	30
	region 2	area= 53.9sqmi; slope= 9.7ft/mi; length= 15.2mi									
246	7281000	Tallahatchie River at Swan Lake, MS	1930-83	17,900	23,300	26,900	31,700	35,300	39,100	42,900	48,300
	note: ag	mean= 4.258; sd= 0.131; skew= 0.300		6	7	8	11	14	17	21	25
	region 3	area= 5,130 sqmi; slope= 1.8ft/mi; length= 133.6mi									
247	7282000	Yalobusha River at Calhoun City, MS	1949-88	25,400	41,000	52,000	66,100	76,800	87,500	98,300	113,000
	note: *abg	mean= 4.393; sd= 0.258; skew= -0.273		14	14	16	20	25	30	36	44
	region 2	area= 305 sqmi; slope= 3.0ft/mi; length= 30.2mi									
248	7282300	Sabougla Creek tributary at Sabougla, MS	1967-77	180	258	314	395	454	519	568	647
	note: *	mean= 2.240; sd= 0.178; skew= 0.102		12	13	15	19	21	24	27	30
	region 2	area= 0.50sqmi; slope= 38.2ft/mi; length= 1.0mi									
249	7282500	Yalobusha River at Graysport, MS	1940-49	18,300	30,900	40,400	53,100	62,300	74,400	83,900	97,300
	note: *	mean= 4.259; sd= 0.275; skew= -0.066		18	18	20	23	25	28	31	34
	region 2	area= 607 sqmi; slope= 2.3ft/mi; length= 56.9mi									
250	7283000	Skuna River at Bruce, MS	1948-88	18,300	29,400	37,100	47,100	54,500	62,000	69,500	79,500
	note: *abg	mean= 4.252; sd= 0.255; skew= -0.277		13	13	15	19	23	28	34	41
	region 2	area= 254 sqmi; slope= 3.6ft/mi; length= 31.2mi									
251	7283490	Caney Creek near Coffeeville, Ms	1955-84	876	1,140	1,290	1,470	1,600	1,720	1,840	1,990
	note: *	mean= 2.942; sd= 0.139; skew= -0.246		7	7	7	9	11	13	15	18
	region 2	area= 1.97sqmi; slope= 33.5ft/mi; length= 2.8mi									
252	7283500	Skuna River near Coffeeville, MS	1940-49	--	--	--	--	--	--	--	--
	note: *bi	mean= 4.182; sd= 0.208; skew= 0.218		--	--	--	--	--	--	--	--
	region 2	area= 435 sqmi; slope= 2.9ft/mi; length= 52.0mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
253	7285000	Yalobusha River at Grenada Dam near Grenada, MS	1954-83	--	--	--	--	--	--	--	--
	note: ak	mean= 3.620; sd= -- ; skew= --		--	--	--	--	--	--	--	--
	region 4	area= 1,320 sqmi; slope= 2.2ft/mi; length= 66.1mi									
254	7285100	Tie Plant Branch near Grenada, MS	1966-77	97	133	158	194	221	251	275	313
	note: *	mean= 1.967; sd= 0.153; skew= 0.028	1955	10	11	12	15	18	21	23	27
	region 2	area= 0.17sqmi; slope= 93.7ft/mi; length= 0.6mi									
255	7285500	Yalobusha River at Grenada, MS	1909-11	10,300	14,000	--	--	--	--	--	--
	note: *abeg	mean= 4.036; sd= 0.147; skew= 0.950	1927-58	18	22	--	--	--	--	--	--
	region 4	area= 1,550 sqmi; slope= 2.2ft/mi; length= 69.3mi									
256	7285700	Long Creek near Cascilla, MS	1965-88	886	1,220	1,430	1,700	1,890	2,080	2,240	2,480
	note: *	mean= 2.955; sd= 0.166; skew= 0.007		8	9	10	13	15	18	20	23
	region 2	area= 1.64sqmi; slope= 45.1ft/mi; length= 1.5mi									
257	7286010	Brushy Creek tributary near Oxberry, MS	1965-77	702	988	1,180	1,450	1,640	1,850	2,000	2,260
	note: c	mean= 2.844; sd= 0.169; skew= 0.096		11	12	14	17	20	22	25	29
	region 2	area= 1.49sqmi; slope= 70.1ft/mi; length= 1.7mi									
258	7286047	Tippo Bayou tributary at Phillip, MS	1967-77	18	22	26	29	32	35	38	42
	note: gh	mean= 1.256; sd= 0.115; skew= 0.273		9	10	12	17	21	26	31	38
	region 3	area= 0.04sqmi; slope= 31.7ft/mi; length= 0.3mi									
259	7286200	Yalobusha River at Whaley, MS	1938-59	8,510	10,500	11,900	--	--	--	--	--
	note: aeg	mean= 3.938; sd= 0.105; skew= 0.450		11	14	18	--	--	--	--	--
	region 4	area= 1,960 sqmi; slope= 2.0ft/mi; length= 102.9mi									
260	7286500	Thompson Creek at McCarley, MS	1950-66	2,500	3,080	3,470	3,990	4,390	4,850	5,270	5,890
	note: *	mean= 3.399; sd= 0.102; skew= 0.097		6	7	8	10	12	14	17	20
	region 2	area= 14.4sqmi; slope= 19.5ft/mi; length= 8.4mi									
261	7286520	Big Sand Creek trib. near North Carrollton, MS	1965-84	48	56	61	66	71	75	79	85
	note: *	mean= 1.674; sd= 0.081; skew= -0.122		4	5	5	7	8	10	11	14
	region 2	area= 0.06sqmi; slope= 106 ft/mi; length= 0.5mi									
262	7286700	Big Sand Creek at Carrollton, MS	1952-70	8,910	14,200	17,900	22,400	25,300	28,900	31,500	35,500
	note: *	mean= 3.960; sd= 0.256; skew= -0.174		14	14	15	18	21	24	26	30
	region 2	area= 74.1sqmi; slope= 10.6ft/mi; length= 13.6mi									
263	7286800	Big Sand Creek at Valley Hill, MS	1947-58	16,700	21,900	24,900	28,400	30,600	33,600	36,000	39,600
	note: c	mean= 4.254; sd= 0.142; skew= 0.012		10	10	12	15	17	20	23	26
	region 2	area= 110 sqmi; slope= 6.8ft/mi; length= 23.0mi									
264	7287000	Yazoo River at Greenwood, MS	1908-12	22,900	28,600	32,100	36,400	39,500	42,600	45,600	49,500
	note: ag	mean= 4.361; sd= 0.114; skew= 0.050	1928-83	5	6	7	9	11	13	15	19
	region 3	area= 7,450 sqmi; slope= 1.3ft/mi; length= 187.3mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
265	7287050	Palucia Creek tributary near Carrollton, MS	1964-77	89	158	220	319	391	470	525	613
	note: c	mean= 1.841; sd= 0.253; skew= 0.242		15	16	19	22	25	28	30	34
	region 2	area= 0.43sqmi; slope= 75.2ft/mi; length= 1.7mi									
266	7287165	Mosquito Lake tributary no.1 at Itta Bena, MS	1966-84	56	73	84	101	113	127	141	159
	note: *	mean= 1.754; sd= 0.126; skew= 0.338		8	9	11	15	18	21	24	28
	region 3	area= 0.11sqmi; slope= 10.6ft/mi; length= 0.5mi									
267	7287170	Mosquito Lake tributary no.2 at Itta Bena, MS	1966-84	70.0	84.0	94.0	106	115	125	135	149
	note: *	mean= 1.845; sd= 0.095; skew= 0.168		6	7	8	10	13	15	17	21
	region 3	area= 0.13sqmi; slope= 10.6ft/mi; length= 0.6mi									
268	7287350	Fannesgusha Creek near Tchula, MS	1951-88	9,180	14,400	18,000	22,700	25,900	29,800	33,100	37,800
	note: *	mean= 3.976; sd= 0.232; skew= 0.124		9	10	12	15	17	20	23	26
	region 2	area= 100 sqmi; slope= 6.9ft/mi; length= 28.2mi	1947								
269	7287480	Piney Creek near Yazoo City, MS	1953-70	7,290	11,200	13,700	16,800	18,800	21,300	23,200	26,100
	note: *	mean= 3.861; sd= 0.236; skew= -0.355		13	12	13	16	18	21	24	28
	region 2	area= 70.3sqmi; slope= 9.0ft/mi; length= 20.4mi	1951								
270	7287505	Broad Lake tributary no.1 near Yazoo City, MS	1966-77	19	23	26	28	30	32	33	36
	note: gh	mean= 1.278; sd= 0.102; skew= -0.171		8	8	9	12	14	17	20	24
	region 3	area= 0.11sqmi; slope= 10.6ft/mi; length= 0.4mi									
271	7287520	Short Creek tributary near Yazoo City, MS	1964-73	756	1,010	1,140	1,310	1,410	1,530	1,620	1,770
	note: *	mean= 2.880; sd= 0.155; skew= -0.426		12	11	12	14	17	20	22	26
	region 2	area= 1.49sqmi; slope= 48.7ft/mi; length= 2.5mi									
272	7288500	Big Sunflower River at Sunflower, MS	1936-83	6,310	8,610	10,000	11,700	12,900	14,000	14,900	16,200
	note: *	mean= 3.802; sd= 0.164; skew= -0.155		6	6	7	9	10	12	14	17
	region 3	area= 767 sqmi; slope= 0.5ft/mi; length= 103.5mi									
273	7288568	Quiver River tributary near Schlater, MS	1967-79	34	38	42	46	50	54	58	64
	note: c	mean= 1.516; sd= 0.065; skew= 0.022		5	5	6	8	10	12	13	16
	region 3	area= 0.18sqmi; slope= 10.0ft/mi; length= 0.5mi									
274	7288570	Quiver River near Doddsville, MS	1938-60	2,620	3,760	4,550	5,560	6,310	7,020	7,650	8,510
	note: *	mean= 3.420; sd= 0.186; skew= 0.128		9	10	12	16	19	22	25	28
	region 3	area= 292 sqmi; slope= 0.7ft/mi; length= 55.2mi									
275	7288650	Bogue Phalia near Leland, MS	1946-58	5,910	7,580	8,500	9,510	10,200	10,800	11,400	12,200
	note: *	mean= 3.775; sd= 0.131; skew= -0.412		9	8	9	11	14	16	19	22
	region 3	area= 484 sqmi; slope= 0.8ft/mi; length= 61.8mi									
276	7288680	Big Sunflower River at Little Callao Landing, MS	1948-58	15,100	17,700	19,300	21,000	22,200	23,300	24,400	25,700
	note: gh	mean= 4.176; sd= 0.086; skew= -0.140		6	7	8	10	12	15	17	21
	region 3	area= 2,290 sqmi; slope= 0.4ft/mi; length= 157.0mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent)							
277	7288770	Deer Creek near Hollandale, MS	1946-58	585	745	845	970	1,070	1,160	1,250	1,360
	note: *	mean= 2.757; sd= 0.125; skew= -0.017		8	9	10	13	16	19	21	25
	region 3	area= 98.0sqmi; slope= 0.4ft/mi; length= 69.8mi									
278	7289000	Mississippi River at Vicksburg, MS	1927-86	1,390	1,660	1,810	1,960	2,050	2,130	2,200	2,290
	note: ghl	mean= 6.132; sd= 0.104; skew= -0.583	1897-99	3	2	3	3	4	5	6	8
		area= 1,140,400sqmi; slope= -- ; length= --	1900-22								
			1858,85								
279	7289010	Durden Creek at Vicksburg, MS	1941-46	1,520	2,240	2,670	3,160	3,440	3,820	4,070	4,510
	note: *	mean= 3.213; sd= 0.217; skew= 0.090	1953-58	13	14	16	20	22	25	28	31
	region 2	area= 5.50sqmi; slope= 17.6ft/mi; length= 5.4mi	1935,49								
280	7289100	Big Black River tributary near Eupora, MS	1965-77	726	953	1,100	1,290	1,420	1,570	1,700	1,890
	note: *	mean= 2.861; sd= 0.140; skew= -0.116		9	10	11	14	16	18	21	24
	region 2	area= 2.29sqmi; slope= 27.8ft/mi; length= 2.8mi									
281	7289180	Big Black River near Kilmichael, MS	1937-58	16,200	26,700	34,800	46,700	56,400	67,900	78,100	92,700
	note: *f	mean= 4.183; sd= 0.252; skew= -0.160	1962,73	12	12	14	17	19	22	25	28
	region 2	area= 564 sqmi; slope= 3.5ft/mi; length= 41.7mi	1979,83								
282	7289225	Downing Branch near French Camp, MS	1965-77	498	612	681	769	836	909	973	1,070
	note: *	mean= 2.693; sd= 0.107; skew= -0.236		7	7	8	10	12	14	16	19
	region 2	area= 1.74sqmi; slope= 24.5ft/mi; length= 2.5mi									
283	7289265	Hays Creek tributary no.1 near Vaiden, MS	1960-88	1,950	2,900	3,550	4,420	5,080	5,820	6,460	7,390
	note: *	mean= 3.277; sd= 0.207; skew= -0.205		9	9	11	13	15	18	20	24
	region 2	area= 14.6sqmi; slope= 15.5ft/mi; length= 6.0mi									
284	7289268	Hurricane Creek tributary near Vaiden, MS	1966-77	337	448	514	596	646	704	745	816
	note: *	mean= 2.540; sd= 0.150; skew= 0.051		10	11	13	16	18	21	24	27
	region 2	area= 0.40sqmi; slope= 71.8ft/mi; length= 1.0mi									
285	7289330	Zilpha Creek near Kosciusko, MS	1953-70	4,710	9,010	12,500	17,100	20,200	24,100	26,900	31,000
	note: *	mean= 3.633; sd= 0.349; skew= 0.124		17	18	20	23	26	28	31	34
	region 2	area= 86.6sqmi; slope= 6.8ft/mi; length= 19.1mi	1979								
286	7289350	Big Black River at West, MS	1937-88	22,100	34,500	43,400	55,000	65,400	77,500	84,800	104,000
	note: *	mean= 4.357; sd= 0.230; skew= -0.047		7	8	8	10	11	12	13	14
	region 4	area= 1,030 sqmi; slope= 2.3ft/mi; length= 76.8mi	1927,30								
287	7289395	Sharkey Creek tributary near West, MS	1967-79	164	215	247	290	320	354	382	425
	note: *	mean= 2.214; sd= 0.137; skew= -0.007	1982-84	8	9	10	13	15	18	20	23
	region 2	area= 0.30sqmi; slope= 50.6ft/mi; length= 1.0mi									
288	7289470	Tacketts Creek tributary near Pickens, MS	1965-84	144	193	223	258	282	306	325	354
	note: *	mean= 2.146; sd= 0.164; skew= -0.417		9	9	10	12	14	17	19	22
	region 2	area= 0.15sqmi; slope= 110 ft/mi; length= 0.5mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	top line-- Peak T-year flood magnitude (cubic feet per second) bottom line-- Standard error of T-year flood estimate (percent) 2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
289	7289500	Big Black River at Pickens, MS	1937-73	18,600	33,000	43,800	56,800	68,100	80,800	86,600	107,000
	note: *f	mean= 4.256; sd= 0.323; skew= -0.257	1979,83	11	11	11	12	12	13	14	16
	region 4	area= 1,490 sqmi; slope= 1.7ft/mi; length= 120.0mi	1892,1927,30								
290	7289505	Big Cypress Creek near Vaughn, MS	1960-70	6,520	8,940	10,500	12,600	14,000	16,000	17,700	20,100
	note: *	mean= 3.843; sd= 0.161; skew= 0.229		11	13	15	18	21	24	27	30
	region 2	area= 86.6sqmi; slope= 3.4ft/mi; length= 28.7mi	1979								
291	7289530	Doaks Creek near Canton, MS	1948-70	6,350	10,700	14,500	19,900	24,100	29,200	33,400	39,500
	note: *	mean= 3.795; sd= 0.254; skew= 0.283	1973	12	13	16	20	22	25	28	32
	region 2	area= 164 sqmi; slope= 4.4ft/mi; length= 31.4mi	1979								
292	7289560	Bear Creek near Madison, MS	1948-58	1,820	2,890	3,770	5,070	6,050	7,210	8,120	9,460
	note: *	mean= 3.238; sd= 0.218; skew= 0.237		15	16	18	22	25	27	30	33
	region 2	area= 24.4sqmi; slope= 7.5ft/mi; length= 9.1mi	1979								
293	7289600	Tilda Bogue near Canton, MS	1948-88	2,710	4,460	5,680	7,270	8,400	9,650	10,700	12,200
	note: *	mean= 3.417; sd= 0.271; skew= -0.280		10	10	11	14	16	19	21	25
	region 2	area= 24.8sqmi; slope= 10.9ft/mi; length= 9.4mi									
294	7289610	Bachelor Creek at Canton, MS	1953-70	734	972	1,140	1,360	1,530	1,710	1,890	2,150
	note: dg	mean= 2.874; sd= 0.139; skew= 0.350	1979	7	8	10	14	18	22	26	32
	region 2	area= 3.85sqmi; slope= 14.7ft/mi; length= 3.0mi	1973,75								
295	7289640	Panther Creek near Flora, MS	1965-77	186	222	242	266	284	303	319	343
	note: *	mean= 2.267; sd= 0.091; skew= -0.261	1979	6	6	7	8	10	12	14	16
	region 2	area= 0.26sqmi; slope= 67.9ft/mi; length= 0.7mi									
296	7289641	Panther Creek tributary near Flora, MS	1964-85	99	125	139	154	166	176	185	198
	note: *	mean= 1.984; sd= 0.129; skew= -0.570		7	6	6	8	10	12	15	17
	region 2	area= 0.07sqmi; slope= 192 ft/mi; length= 0.3mi									
297	7289730	Big Black River near Bentonia, MS	1929-58	26,800	41,500	52,100	65,000	76,900	90,400	96,300	118,000
	note: *f	mean= 4.439; sd= 0.232; skew= -0.076	1962	9	9	10	11	12	13	14	15
	region 4	area= 2,340 sqmi; slope= 1.3ft/mi; length= 172.0mi	1973,79,83								
298	7289850	Bogue Chitto near Flora, MS	1953-70	5,590	10,200	13,700	18,300	21,500	25,400	28,400	32,700
	note: *	mean= 3.690; sd= 0.356; skew= -0.411		17	16	17	20	23	26	28	32
	region 2	area= 126 sqmi; slope= 4.2ft/mi; length= 22.0mi	1979,80								
299	7290000	Big Black River near Bovina, MS	1936-88	24,600	39,400	50,500	64,500	76,800	90,200	96,400	117,000
	note: *	mean= 4.391; sd= 0.244; skew= -0.017		8	8	9	10	11	12	13	15
	region 4	area= 2,770 sqmi; slope= 1.3ft/mi; length= 216.0mi									
300	7290005	Clear Creek near Bovina, MS	1953-88	5,560	9,240	11,900	15,200	17,300	19,800	21,700	24,400
	note: *	mean= 3.763; sd= 0.269; skew= 0.172		11	12	14	17	20	23	26	29
	region 2	area= 32.0sqmi; slope= 16.6ft/mi; length= 9.3mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second) / bottom line-- Standard error of T-year flood estimate (percent)							
301	7290110	Fleetwood Creek near Bolton, MS	1960-69	2,110	3,370	4,210	5,230	5,870	6,660	7,200	8,080
	note: *	mean= 3.312; sd= 0.273; skew= -0.349		18	17	18	21	23	26	29	32
	region 2	area= 13.0sqmi; slope= 15.1ft/mi; length= 6.5mi	1979								
302	7290115	Unnamed Creek near Bolton, MS	1960-70	773	1,180	1,440	1,790	2,020	2,280	2,480	2,790
	note: *	mean= 2.863; sd= 0.236; skew= -0.368		15	15	16	19	21	24	27	30
	region 2	area= 3.10sqmi; slope= 26.0ft/mi; length= 2.7mi	1979								
303	7290220	Dry Draw near Brookhaven, MS	1966-77	166	240	291	356	396	440	467	519
	note: *	mean= 2.225; sd= 0.190; skew= 0.340		12	14	16	20	23	26	29	32
	region 2	area= 0.20sqmi; slope= 100 ft/mi; length= 0.6mi	1955								
304	7290500	Bayou Pierre near Carpenter, MS	1945-71	17,500	25,600	30,600	36,600	41,000	46,200	50,700	57,000
	note: *	mean= 4.223; sd= 0.214; skew= -0.598	1940,75	9	8	9	11	14	16	19	22
	region 2	area= 375 sqmi; slope= 4.3ft/mi; length= 54.7mi	1910,28,32								
305	7290525	Whiteoak Creek tributary near Utica, MS	1965-84	575	761	877	1,020	1,110	1,220	1,310	1,440
	note: *	mean= 2.771; sd= 0.145; skew= 0.069		8	9	10	13	15	18	20	23
	region 2	area= 1.36sqmi; slope= 25.0ft/mi; length= 2.5mi									
306	7290650	Bayou Pierre near Willows, MS	1959-88	25,500	39,400	50,000	64,900	76,300	90,300	103,000	120,000
	note: *	mean= 4.413; sd= 0.216; skew= 0.174		9	10	12	16	18	21	24	27
	region 2	area= 654 sqmi; slope= 3.9ft/mi; length= 70.7mi									
307	7290690	Clarks Creek near Pattison, MS	1962-88	8,500	13,200	16,700	20,900	23,700	27,200	29,900	34,000
	note: *	mean= 3.951; sd= 0.231; skew= 0.264		11	12	14	18	20	23	26	30
	region 2	area= 75.0sqmi; slope= 9.5ft/mi; length= 21.0mi									
308	7290830	Little Creek near Fayette, MS	1967-88	792	1,120	1,330	1,600	1,790	1,990	2,160	2,400
	note: *	mean= 2.897; sd= 0.179; skew= -0.099		9	10	11	13	16	18	21	24
	region 2	area= 1.71sqmi; slope= 54.8ft/mi; length= 1.8mi									
309	7290870	Coles Creek near Fayette, MS	1961-88	31,000	43,300	51,300	61,000	67,600	75,400	82,100	91,700
	note: *	mean= 4.508; sd= 0.175; skew= 0.027		8	9	10	13	15	18	20	23
	region 2	area= 260 sqmi; slope= 7.3ft/mi; length= 32.6mi									
310	7290900	St. Catherine Creek near Natchez, MS	1950-60	8,890	14,400	17,400	20,400	21,900	24,500	25,900	28,700
	note: c	mean= 4.056; sd= 0.324; skew= -0.074		21	21	22	25	27	30	32	35
	region 2	area= 54.3sqmi; slope= 12.4ft/mi; length= 15.7mi									
311	7290910	Spanish Bayou at Natchez, MS	1966-77	1,150	1,520	1,750	2,030	2,240	2,430	2,630	2,880
	note: dg	mean= 3.060; sd= 0.144; skew= -0.087		10	11	13	17	20	24	29	35
	region 2	area= 2.46sqmi; slope= 27.9ft/mi; length= 3.7mi									
312	7291000	Homochitto River at Eddiceton, MS	1939-88	16,500	25,400	31,400	38,500	43,300	48,500	53,100	59,300
	note: *	mean= 4.215; sd= 0.237; skew= -0.309		8	8	9	11	13	15	18	21
	region 2	area= 181 sqmi; slope= 6.2ft/mi; length= 32.6mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second); bottom line-- Standard error of T-year flood estimate (percent)							
313	7291250	McCall Creek near Lucien, MS	1955-88	7,720	12,400	15,700	19,800	22,700	25,900	28,500	32,300
	note: *	mean= 3.897; sd= 0.252; skew= -0.019		10	11	13	16	18	21	23	27
	region 2	area= 60.8sqmi; slope= 10.9ft/mi; length= 14.8mi	1953								
314	7291260	Beaver Run near McCall Creek, MS	1955-77	471	813	1,070	1,430	1,680	1,970	2,180	2,500
	note: *	mean= 2.607; sd= 0.298; skew= -0.193		14	14	16	19	21	24	27	30
	region 2	area= 2.65sqmi; slope= 37.0ft/mi; length= 4.0mi									
315	7291500	Homochitto River near Bude, MS	1942-50	30,100	43,500	52,900	65,400	74,300	85,900	95,100	109,000
	note: *	mean= 4.506; sd= 0.183; skew= 0.263	1972-74	12	13	15	19	22	24	27	31
	region 2	area= 407 sqmi; slope= 5.8ft/mi; length= 39.7mi	1961,65								
316	7292500	Homochitto River at Rosetta, MS	1952-88	52,700	94,800	125,000	164,000	194,000	223,000	252,000	290,000
	note: ag	mean= 4.698; sd= 0.326; skew= -0.447		14	13	14	18	22	27	32	40
	region 2	area= 787 sqmi; slope= 5.0ft/mi; length= 64.4mi									
317	7294000	Second Creek at Sibley, MS	1952-59	9,980	16,400	21,100	27,400	--	--	--	--
	note: aeg	mean= 3.991; sd= 0.264; skew= -0.176		24	24	28	36	--	--	--	--
	region 2	area= 55.3sqmi; slope= 9.2ft/mi; length= 23.3mi									
318	7294400	Observer's Draw near Doloroso, MS	1954-77	194	280	338	412	460	514	550	613
	note: *	mean= 2.290; sd= 0.185; skew= 0.232		9	11	13	16	19	22	24	28
	region 2	area= 0.22sqmi; slope= 153 ft/mi; length= 1.1mi									
319	7294500	Homochitto River near Doloroso, MS	1940-58	52,600	86,500	110,000	142,000	166,000	190,000	215,000	248,000
	note: afg	mean= 4.710; sd= 0.266; skew= -0.255	1972-78	12	12	13	17	21	26	30	37
	region 4	area= 1,140 sqmi; slope= 4.0ft/mi; length= 85.3mi	1938,61,65 1969,83								
320	7295000	Buffalo River near Woodville, MS	1942-88	24,200	38,200	46,700	55,600	60,500	65,900	70,000	75,800
	note: *	mean= 4.382; sd= 0.258; skew= -0.572		9	8	9	11	13	16	19	22
	region 2	area= 180 sqmi; slope= 7.5ft/mi; length= 27.1mi									
321	7373500	West Fork Thompson Creek near Wakefield, LA	1950-70	5,860	9,660	12,100	14,600	15,900	17,600	18,800	20,600
	note: *	mean= 3.792; sd= 0.293; skew= -0.276		15	14	15	18	21	24	26	30
	region 2	area= 35.3sqmi; slope= 11.8ft/mi; length= 15.1mi									
322	7373550	Moores Branch near Woodville, MS	1955-88	210	300	353	411	443	475	498	534
	note: *	mean= 2.323; sd= 0.203; skew= -0.371		9	8	9	11	13	16	18	21
	region 2	area= 0.21sqmi; slope= 49.0ft/mi; length= 0.7mi									
323	7375235	Tangipahoa River tributary near McComb, MS	1966-84	579	881	1,090	1,370	1,580	1,810	2,000	2,280
	note: *	mean= 2.735; sd= 0.225; skew= -0.244		12	12	13	16	18	21	24	27
	region 2	area= 2.82sqmi; slope= 26.3ft/mi; length= 3.0mi									
324	7375250	Little Tangipahoa River at Magnolia, MS	1960-73	3,330	6,130	8,130	10,600	12,000	13,900	15,200	17,200
	note: *	mean= 3.437; sd= 0.405; skew= -0.347		22	21	22	24	27	29	32	35
	region 2	area= 39.8sqmi; slope= 9.7ft/mi; length= 14.6mi									

Table 1.--Flood quantiles, standard error of estimate, and other information for gaging stations--Continued

Map no.	Station no.	Station name and description	Period of record	2-year	5-year	10-year	25-year	50-year	100-year	200-year	500-year
				top line-- Peak T-year flood magnitude (cubic feet per second); bottom line-- Standard error of T-year flood estimate (percent)							
325	7375500	Tangipahoa River at Robert, LA	1939-88	15,300	29,100	40,600	58,200	72,600	89,500	105,000	127,000
	note: *	mean= 4.138; sd= 0.334; skew= -0.139		11	11	13	16	18	21	23	27
	region 2	area= 646 sqmi; slope= 6.0ft/mi; length= 66.0mi									
326	7375800	Tickfaw River at Liverpool, LA	1956-88	4,210	9,080	13,400	19,600	23,900	28,900	32,700	38,100
	note: *	mean= 3.556; sd= 0.413; skew= 0.077		16	17	19	22	24	27	30	33
	region 2	area= 89.7sqmi; slope= 8.7ft/mi; length= 16.9mi									
327	7376665	Stock Pond Draw near Liberty, MS	1965-77	217	323	390	470	517	574	609	674
	note: *	mean= 2.336; sd= 0.223; skew= -0.018		15	15	17	20	23	25	28	32
	region 2	area= 0.38sqmi; slope= 56.3ft/mi; length= 1.2mi	1955								
328	7376720	Tanyard Creek at Liberty, MS	1953-70	1,330	2,710	3,600	4,530	4,980	5,640	6,010	6,690
	note: c	mean= 2.980; sd= 0.678; skew= -0.228		27	25	26	28	29	31	34	37
	region 2	area= 9.92sqmi; slope= 14.7ft/mi; length= 7.0mi	1973								
329	7376760	CRS Draw near Liberty, MS	1965-84	492	626	709	809	879	952	1,020	1,110
	note: *	mean= 2.694; sd= 0.127; skew= -0.105		7	7	8	10	12	14	16	19
	region 2	area= 0.80sqmi; slope= 48.5ft/mi; length= 1.3mi	1955								
330	7377000	Amite River near Darlington, LA	1949-88	21,500	41,900	58,000	80,600	97,200	116,000	132,000	154,000
	note: *	mean= 4.281; sd= 0.375; skew= -0.346		14	13	14	17	20	22	25	29
	region 2	area= 580 sqmi; slope= 6.4ft/mi; length= 41.6mi									

* The station was used in the computation of regional flood-frequency equations.

a The station is affected by regulation or channelization. The estimates may have more uncertainty than is indicated by the standard error of estimate. If station is affected by channelization, the slope and length may not be fully representative of existing conditions.

b The station is affected by regulation, channelization, or urbanization. Record collected prior to basin changes was used to contribute to the regional analysis. The flood magnitudes, if shown, are estimates for current conditions.

c The station was not used in regional analyses because of regionally uncharacteristic flood frequency or other sample problems. Flood magnitudes are weighted estimates.

d The drainage basin is significantly urbanized. The flood magnitudes are unweighted stations estimates.

e The period of record is insufficient for station estimates of large recurrence interval floods.

f The logarithmic mean and standard deviation of the station record were adjusted by correlation with long-term records on the same stream using procedures described in Bulletin 17B (Interagency Advisory Committee on Water Data, 1982).

g The flood magnitudes are unweighted station estimates.

h The drainage basin characteristics are outside the limitations of the regional equations.

i The post-regulation or post-channelization period of record is insufficient for flood-frequency analysis. The statistics of logarithms of annual peak flow are for natural conditions.

j The unweighted flood-flow estimates are for existing project conditions and represent combined flow in the natural and regulated channels. The flood-flow values were obtained from the U.S. Army Corps of Engineers, Mobile District (written commun., April 1990). The statistics of logarithms of annual peak flow are for natural conditions.

k The logarithmic mean of annual peak flow is for regulated conditions. The flood magnitudes and the logarithmic standard deviation and skew of annual peak flow are not presented in this report. For additional information, contact the U.S. Army Corps of Engineers, Vicksburg District.

l Peak T-year flood magnitude is in thousands of cubic feet per second.

APPENDIX

REGIONAL SKEW COEFFICIENTS

REGIONAL SKEW COEFFICIENTS

Regional skew coefficients are typically estimated from the sample skews of long-term annual peak-flow record stations in the study area using regression, mapping, or simple averaging methods. The IACWD (1982) provides a skew contour map of the United States for regional skew estimates; however, due to its limited accuracy and subsequent improvements in estimating methods, the Committee suggests that separate regional skew analyses be made. Ordinary mean, contour mapping, and least-squares methods assume that the sampling distribution has uniform sampling variance; that is, skew coefficients computed from log-transformed annual peak-flow records of different gaging stations are all assumed to have equal accuracy. However, previous studies have shown the sample variance of skew to vary with record length. Therefore, methods which include a weighting function to account for nonuniform sampling variance estimate regional skew with greater accuracy. Tasker and Stedinger (1986) used weighted-least-squares procedures to estimate regional skew coefficients and showed improved results over ordinary least-squares procedures. The weighted-mapping procedure used in this report positions contour lines according to weighted grid-node values.

Skew Weighting Functions

The sampling variance (V_S) of skew varies with the length of record (N) and must be estimated to define a weighting function. Because the exact form of the probability distribution of sample skew (G_S) is unknown, estimates of the sampling variance require either an assumed distribution for G_S or a nonparametric approach. Sampling variances of G_S assuming a log-Pearson distribution and based on Monte Carlo experiments may be obtained from Wallis and others (1974). Where a normal distribution is assumed for G_S, several parametric equations have been used to estimate the sample variance of skew coefficients. This investigation uses the parametric method of Fisher (1931) and Tasker and Stedinger (1986), corrected for bias and defined as:

$$V_S = \frac{6N(N-1)\,[1+(6/N)]^2}{(N-2)\,(N+1)\,(N+3)} \qquad (47)$$

Comparisons of skew sample variance estimating methods by Tung and Mays (1981) indicate nonparametric approaches provide greater accuracy than parametric ones; however, the improvements shown over Fisher's method did not warrant the greater computational requirements of nonparametric procedures in this investigation. Sample skew is weighted inversely proportional to its estimated sample variance, so the weighting function is defined by:

$$W = 1/V_S \tag{48}$$

where W is the weight given to G_S.

This weighting function was applied to mapping methods used to estimate regional skew coefficients.

Weighted Mapping of Skew

The spatial variability of skew suggests description by regionalization and contour mapping. Automatic mapping techniques have been developed to eliminate the subjectivity of hand-drawn contour maps. Automatic mapping generally requires initially gridding the study area. Gridding consists of estimating the value of the study variable at each node of a regular grid over the study area. Contour lines are then drawn based on the grid node values by a cubic spline or similar fitting process. Grid node values may be estimated by a two-step procedure. First, a spatial search is made to select the subset of sample data points to be used in estimating each node. Various search procedures may be used, the simplest being to select the nearest data points for each grid node. Second, the grid node estimate is computed from the selected data point values by a distance-weighted mean, where the weights are a function of distance from the grid node and uniform sampling variance is assumed. Nonuniform variance of sample data point values may be accounted for by using a weighting function in the grid node estimator. In this analysis, grid node estimates were weighted for error of sample skew and for sample point distance from the grid node by the following equation:

$$Z_i = \frac{\sum_{j=1}^{n_i} G_{s_j} (W_j)(1/d_j)}{\sum_{j=1}^{n_i} (W_j)(1/d_j)} \qquad (49)$$

where

Z_i is the estimated skew at grid node i;

G_{s_j} is the unbiased skew of station j;

n is the number of sample points selected to estimate Z_i;

d_j is the distance from the grid node to the centroid of the basin whose records define G_{s_j}; and

W_j is the weight given to G_s at station j, as determined from equation 48.

Weighting for sampling error increases the accuracy of the contour map by eliminating the assumption of uniform sampling error. This weighted mapping method assumes sample skews to be independent. Weighted-grid map methods are used to estimate regional skew coefficients for Mississippi streams.

Regional skew coefficients for flood-frequency analysis of Mississippi streams were determined using sample skews from 171 long-term streamflow-gaging stations (table 6). The sample skews were computed by equation 3 and corrected for bias using equation 4 from systematic-record periods through 1986. The systematic-record periods for the skew data average more than 30 years, and there are more than 10 years for every gaging station. Skew characteristics were tested for heterogeneity between distinct regions, and particularly, between large basins. The boxplots and boundaries of the three homogeneous skew coefficient regions are shown in figure 14.

Table 6. - Gaging stations used in skew coefficient analysis

Station Number	Region	Unbiased Skew	Station Number	Region	Unbiased Skew	Station Number	Region	Unbiased Skew
2430000	S3	0.166	2479000	S1	0.253	7077920	S2	-0.959
2430500	S3	0.534	2479165	S1	0.139	7077940	S2	-1.366
2431000	S3	-0.134	2479180	S1	0.204	7077950	S2	-1.424
2432900	S3	0.271	2479190	S1	0.530	7078000	S2	-0.750
2433000	S3	0.014	2479300	S1	0.658	7078170	S2	-1.841
2433500	S3	0.080	2479500	S1	0.708	7263860	S2	-1.523
2434000	S3	0.202	2480150	S1	-0.246	7264000	S2	0.092
2434500	S3	0.040	2480500	S1	0.826	7264100	S2	-1.233
2435300	S3	0.547	2481130	S1	0.826	7266000	S3	-0.298
2435400	S3	0.165	2481400	S1	1.273	7268000	S3	-0.250
2435500	S3	0.390	2481450	S1	1.732	7269990	S3	-0.398
2435800	S3	0.235	2482000	S3	-0.429	7271000	S3	-0.250
2435920	S3	-0.573	2482100	S3	-0.367	7275000	S3	0.105
2435930	S3	0.991	2482310	S3	-0.105	7275500	S3	0.033
2436500	S3	0.852	2482500	S3	-0.340	7282000	S3	-0.614
2437000	S3	0.355	2483890	S3	-0.442	7283490	S3	-0.511
2437300	S3	-0.023	2484000	S3	0.113	7285700	S3	0.076
2437500	S3	0.187	2484500	S3	-0.003	7286000	S2	-0.748
2437550	S3	0.038	2484750	S3	-0.136	7286047	S2	0.757
2437600	S3	0.050	2485380	S3	-0.234	7286520	S3	-0.198
2439800	S3	-0.316	2485392	S3	-0.300	7287165	S2	1.219
2439980	S3	0.753	2485900	S3	0.885	7287170	S2	0.590
2440400	S3	0.488	2486000	S3	-0.450	7287480	S3	-0.648
2440600	S3	0.459	2486690	S3	-0.295	7288500	S2	-0.138
2440800	S3	-0.396	2487300	S3	0.362	7288570	S2	0.456
2441000	S3	-0.926	2487500	S3	0.263	7288650	S2	-1.067
2441220	S3	-0.455	2487620	S3	0.459	7288770	S2	-1.083
2441300	S3	-0.246	2487670	S3	-0.242	7289350	S3	0.021
2441500	S3	0.256	2487710	S3	-0.006	7289530	S3	0.835
2443000	S3	0.099	2487770	S3	-0.145	7289600	S3	-0.508
2443700	S3	0.046	2488340	S3	-0.037	7289641	S3	-1.349
2444000	S3	0.332	2488500	S3	0.105	7290000	S3	0.056
2447500	S3	-0.035	2488510	S3	0.377	7290005	S3	0.424
2447800	S3	0.332	2488680	S3	0.342	7290525	S3	0.289
2448000	S3	0.156	2488700	S3	0.069	7290650	S3	0.255
2467500	S3	0.702	2489000	S3	0.404	7290690	S3	-0.045
2471100	S1	-0.166	2489030	S3	0.235	7290870	S3	-0.393
2471500	S1	-0.103	2489160	S3	0.339	7291000	S3	-0.634
2472000	S1	0.339	2490000	S3	-0.816	7291250	S3	0.498
2472500	S1	0.829	2490105	S3	0.154	7291260	S3	-0.337
2473000	S1	0.502	2490500	S3	-0.515	7294400	S3	-0.713
2473480	S1	-0.084	2490550	S3	0.425	7295000	S3	-0.990
2473500	S1	-0.198	2491500	S3	-0.399	7364120	S2	-0.771
2473850	S1	-0.640	2492360	S3	-0.027	7364150	S2	-0.597
2474500	S1	0.405	3592800	S3	0.001	7364190	S2	-0.170
2474740	S1	0.699	3593010	S3	-0.481	7367740	S2	-0.496
2475000	S1	0.384	7029270	S3	0.111	7367800	S2	0.799
2475050	S1	-0.007	7029300	S3	0.109	7369250	S2	1.140
2475220	S1	0.602	7029400	S3	0.138	7369500	S2	-0.640
2475500	S1	0.105	7030500	S3	-0.730	7369700	S2	-1.722
2476500	S1	0.085	7047200	S2	-0.451	7370000	S2	0.017
2477000	S1	-0.059	7047600	S2	-0.078	7373500	S3	-0.418
2477050	S1	0.298	7047924	S2	0.255	7373550	S3	-0.197
2477090	S1	0.638	7047942	S2	-0.791	7375800	S3	0.152
2477350	S1	0.307	7077500	S2	0.196	7376760	S3	0.001
2477500	S1	0.497	7077700	S2	-0.294	7377000	S3	-0.499
2478500	S1	0.696	7077860	S2	-1.371	7377400	S3	-0.115

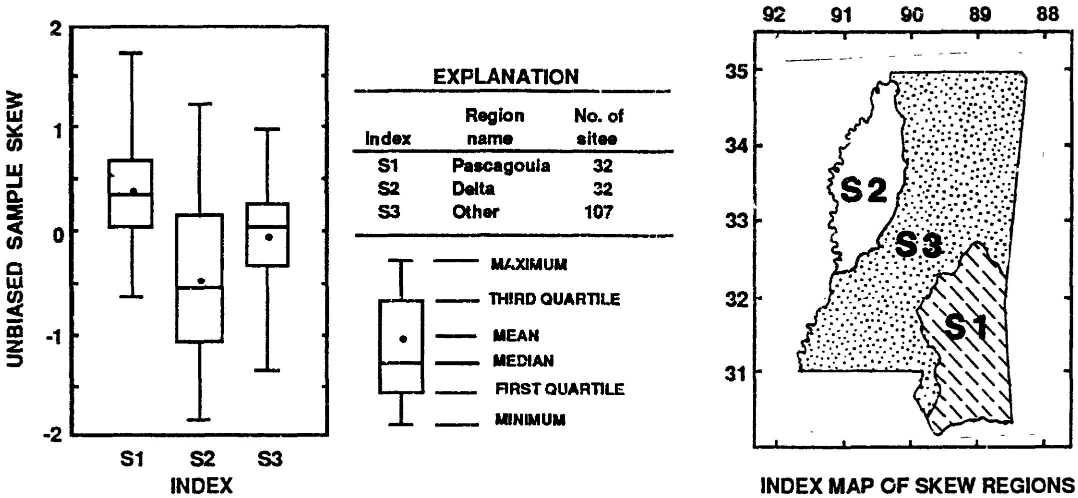

Figure 14.- – Skew coefficient characteristics and boundaries of homogeneous skew regions in Mississippi

The null hypothesis that the mean of the subgroup is equal to the mean of the whole-sample group was rejected for regions **S1** and **S2** using the two-sample t-test at p-values of 0.0001 and 0.011, respectively. The hydrologic significance of the skew regions is described by Landers (1989). The significance of skew as a function of some hydrologic characteristics can be reasoned and observed. Large variations in skew between similar regions may not be attributable to apparent hydrologic factors. The sharp transition in skew along parts of the boundary between region **S1** and **S3** represents skew values from long-term gages in this area. However, the authors are not convinced that this transition has hydrologic significance. The magnitude of variation between the station skews in this region is reduced on the skew map by the regionalization method used. Given the somewhat limited understanding of skew in many instances, the authors decided not to disqualify the results of the technique that had been carefully developed and worked well elsewhere in the State.

The best weighted-grid contour map for each region was selected based on least-mean-square residual and judgement. Mapping variables include the grid definition, the search procedure used around each grid node, and the degree of smoothing applied. Greater smoothing generally will produce larger errors of estimate; however, greater smoothing may increase the accuracy of the map in estimating regional skew coefficients. Regional skew coefficients may be taken from the the weighted-grid contour map shown in figure 15. Contour lines are shown within State boundaries only. Regional skew coefficients for basins located in both regions **S2** and **S3** would be selected using judgement, and taking into consideration the flood-flow storage characteristics of the Mississippi River Alluvial Plain, which may be more related to the local slope and drainage boundaries than to the regional percentage of basin drainage area.

An estimate of population skew is required to calculate flood-frequencies using the Pearson Type III distribution. The IACWD (1982) recommends that population skew be estimated as the weighted average of the sample skew and regional skew. The IACWD (1982) uses mean square error as an estimate of sampling variance ($\mathbf{MSE_r}$) to weight regional skew in equation 5. An alternative estimate of the sampling variance of the regional skew coefficient is the mean sum of squared prediction errors, or **MPRESS** statistic. The **MPRESS** statistic has the advantage, as compared with mean square error, of not requiring an estimate of the degrees of freedom, which may be unknown for a map estimator. The **MPRESS** statistic is calculated by splitting the original sample of **m** points into two sets: a calibration set of size **m-1**, and a validation set of size one. The estimator is then computed from the calibration set and used to estimate $\hat{Y}_{vi}$ for the validation point (Y_{vi}). The predictive discrepancy is computed by $(Yvi - \hat{Y}vi)$. This is done for each observation in the original sample so the mean sum of squared prediction errors is simply:

$$\text{MPRESS} = \sum_{i=1}^{m} \frac{(Y_{vi} - \hat{Y}_{vi})^2}{m} \tag{50}$$

The **MPRESS** statistic for the weighted-grid contour map for each region is shown in figure 16. This estimate of sampling variance was used in equation 5 to estimate population skew when computing flood-frequency using the Pearson Type III distribution.

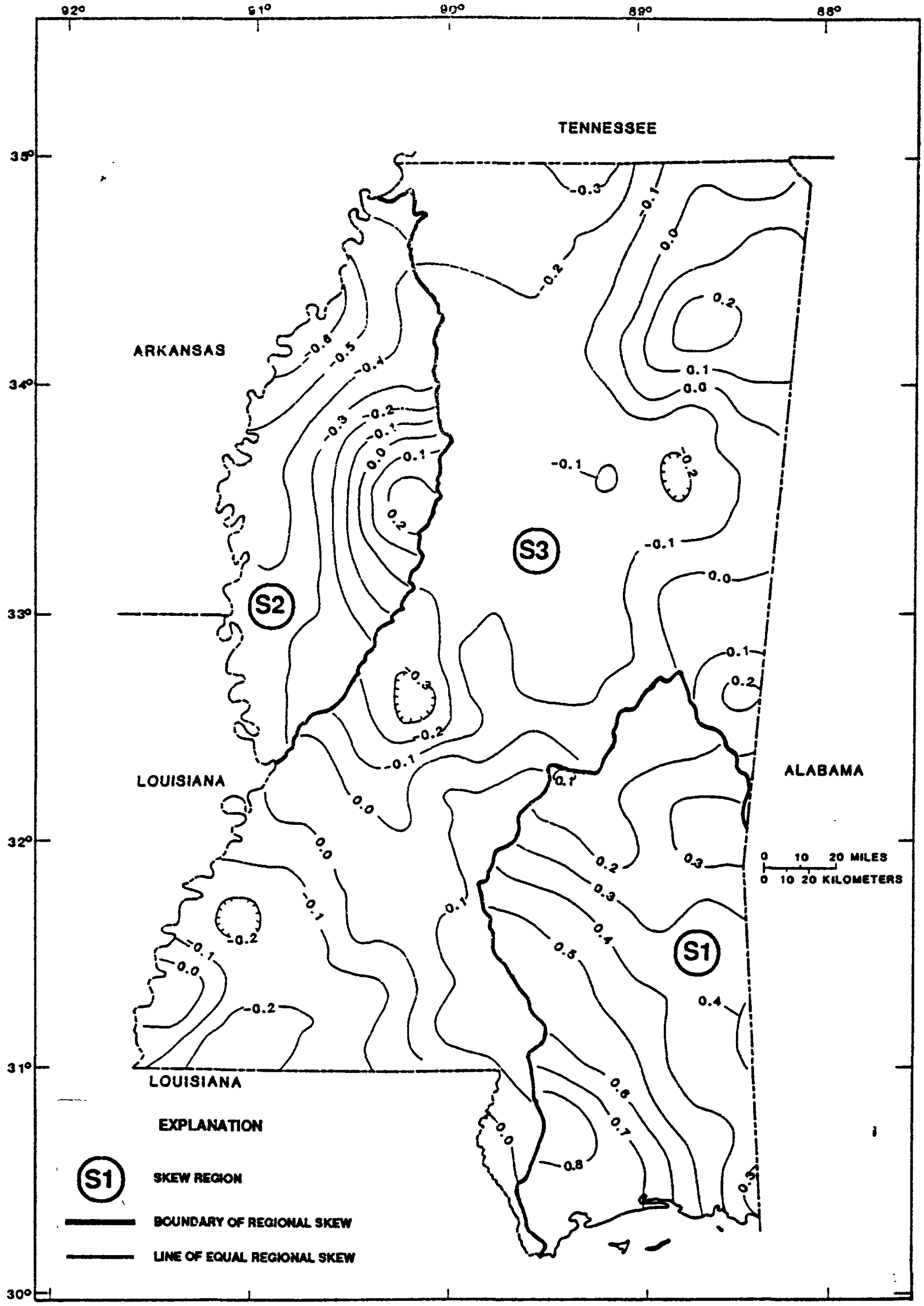

Figure 15.--Weighted-grid unbiased regional skew of log-transformed annual peak flow.

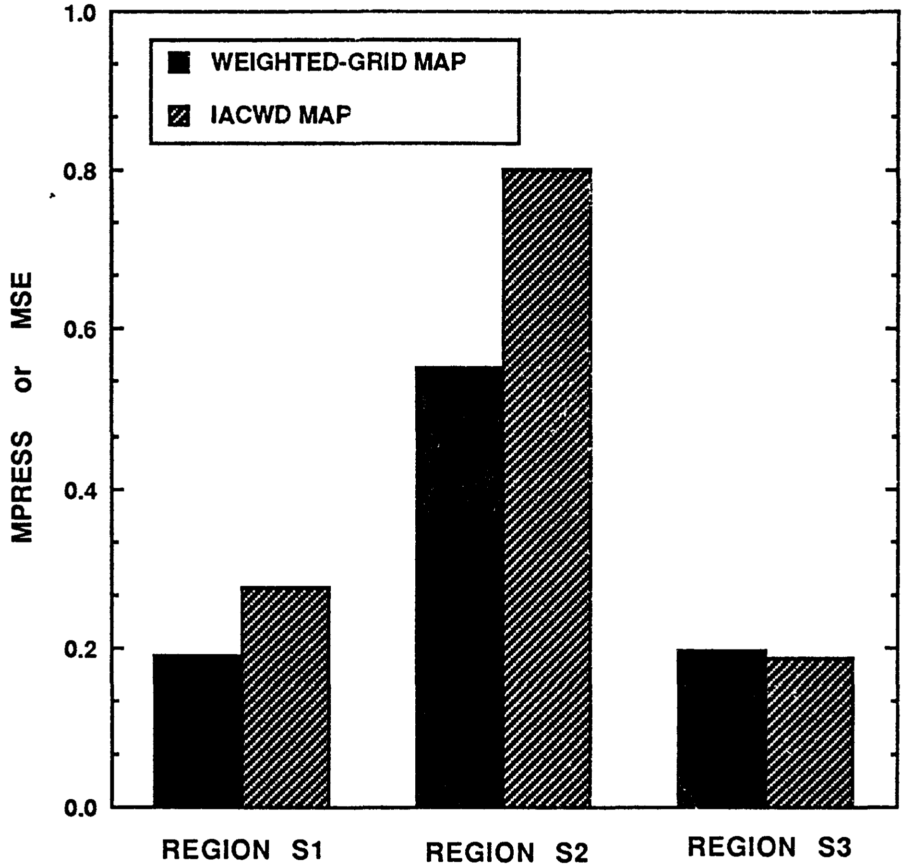

Figure 16.-- Error of regional skew from weighted-grid and Interagency Advisory Committee on Water Data(IACWD) contour maps, where error of weighted-grid map is measured as the mean sum of squared prediction errors (MPRESS) and error of IACWD map is measured as mean square error(MSE).

The estimated mean square error (MSE) of the IACWD skew map (1982) was determined (assuming **m-2** degrees of freedom) for the stations in each region and is also shown in figure 16. The MSE of the IACWD skew map is larger than the MPRESS of the weighted methods in regions S1 and S2, and is smaller than the MPRESS of the weighted methods in region S3. Regional skew coefficients are weighted with sample skew to provide a better estimate of the population skew coefficient of log-transformed annual peak flow. The accuracy of flood-frequency estimates from records of annual peak flow is improved by correcting for bias in sample skew coefficients and by using weighted regional skew estimating methods.