UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FLOODFLOW FREQUENCY OF STREAMS IN THE ALLUVIAL PLAIN OF THE LOWER MISSISSIPPI RIVER IN MISSISSIPPI, ARKANSAS, AND LOUISIANA

by

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U.S. Geological Survey
Water Resources Investigations Report 85-4150
Supplement to "Flood Frequency of Mississippi Streams"

Prepared in cooperation with the
MISSISSIPPI STATE HIGHWAY DEPARTMENT

Jackson, Mississippi

1985

UNITED STATES DEPARTMENT OF THE INTERIOR

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CONTENTS

ILLUSTRATIONS

TABLES

ABBREVIATIONS AND CONVERSION FACTORS

This report uses inch-pound units. The equivalent International System (SI) units may be obtained using the following factors.

Multiply	By	To obtain
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
foot per mile (ft/mi)	0.18939	meter per kilometer (m/km)

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ABSTRACT

Techniques have been developed for estimating the magnitude and frequency of floods on streams located in the alluvial plain of the lower Mississippi River. Flood records from 30 representative stream sites, 6 in Mississippi, 11 in Arkansas, and 13 in Louisiana, were analyzed in a log-Pearson Type III distribution to determine the probable flood frequency relation at each site. These relations were analyzed as a function of primary watershed characteristics for each stream in a standard linear regression analysis. Basin area, channel slope, channel length, and probable flood magnitude for the 2-, 5-, 10-, 25-, 50-, and 100-year floods are presented for the 30 stations analyzed. Regression equations developed for estimating regional flood-frequency as a function of basin area, channel slope, and channel length are presented.

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.

Flood information is of particular importance in the alluvial plain of the lower Mississippi River due to the hydrologic effects of the unique regional geography (fig. 1). The topographic features of the lower Mississippi region are primarily the result of aggradation and deposition from streamflow. The topography is a series of abandoned meander belts, oxbow lakes, swamps, and flat-sloped watersheds. Regional drainage characteristics are broad, widely meandering stream courses with low channel slopes, and large amounts of depression and channel storage. The topography and hydrology of the lower Mississippi region also lead to greater flood damage as waters cover a larger area for a greater length of time for a given magnitude flood than in surrounding regions. The hydrology of the lower Mississippi region differs significantly from that of surrounding regions, which suggests a separate analysis for this region. Wilson and Trotter (1961) presented this region within for the State of Mississippi as a separate hydrologic area with a unique flood-frequency relation, as did Patterson (1964) for the entire lower Missisippi River basin.

This report provides techniques for estimating the magnitude of floods with recurrence intervals from 2 to 100 years for streams in the lower Mississippi alluvial plain having drainage areas between 0.11 and 1,170 mi2. Statistical estimates of flood magnitude are presented for 30 streams in the region having at least 10 years of annual peak streamflow record. Results from a linear regression analysis of these data are presented for estimating flood-frequency relations on ungaged streams using watershed characteristics.

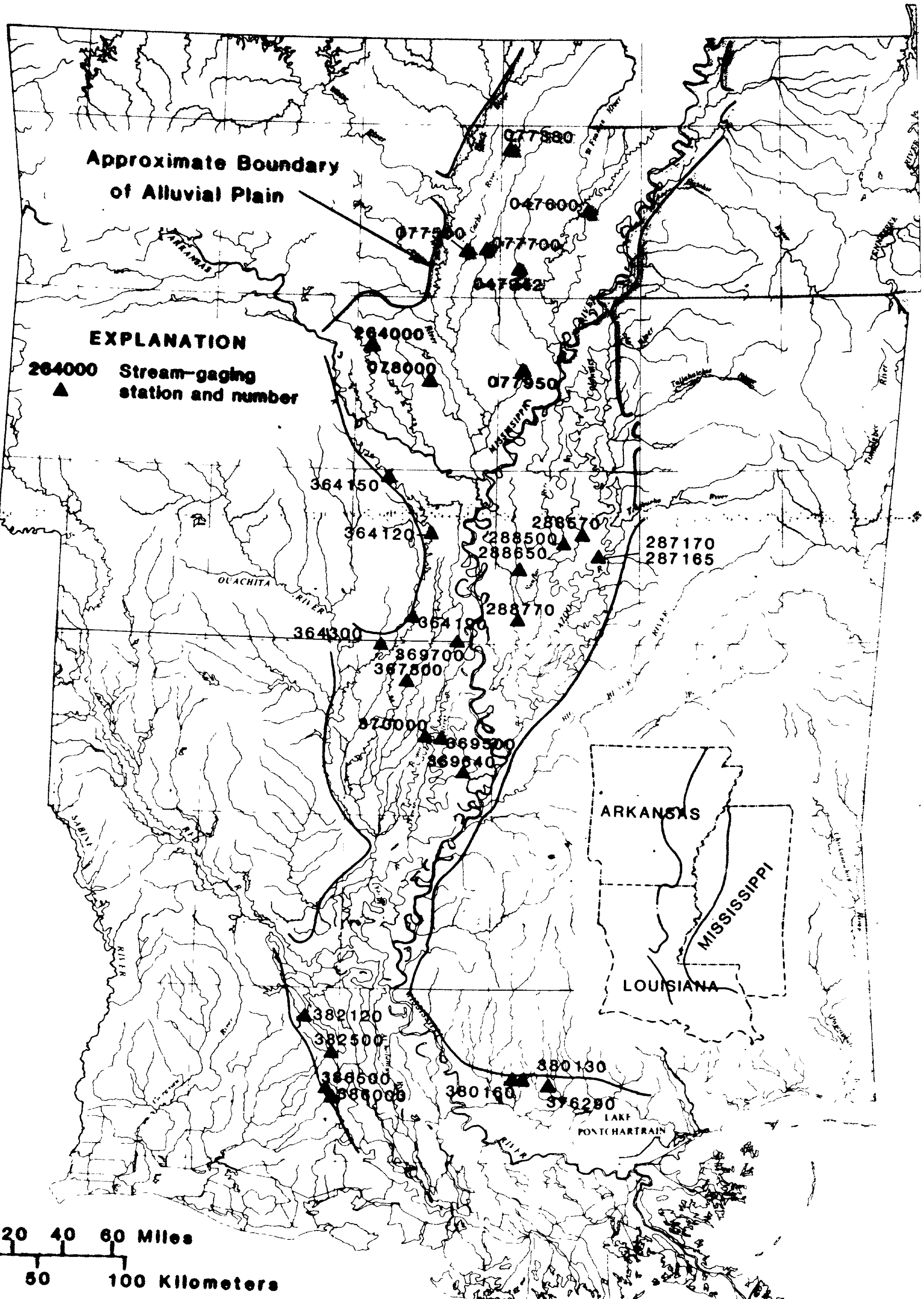

Figure 1.--Location of study area and stream stations in analysis.

This report supplements the 1976 report "Flood Frequency of Mississippi Streams" (Colson and Hudson), which is superseded by this report where it applies to the Mississippi River alluvial plain only. It is provided in response to an immediate need for a consistent and more accurate method of estimating magnitude and frequency of floods on ungaged streams in the Mississippi River alluvial plain area of Mississippi, Arkansas and Louisiana. This report is prepared in cooperation with the Mississippi State Highway Department.

FLOOD RECORDS

The conclusions in this report are based on analysis of flood records of annual peak discharge collected and published by the U.S. Geological Survey and the U.S. Army Corps of Engineers. Flood records were analyzed from 30 stream-gaging stations in the lower Mississippi alluvial plain, 6 in Mississippi, 11 in Arkansas, and 13 in Louisiana (fig. 1). District offices of the U.S. Geological Survey, Water Resources Division, collect systematic records of peak stage and discharge. Flood data are available in selected investigative and data reports, and in computer files of the Water Data Storage and Retrieval System (WATSTORE). Due to the time constraint imposed by the current need for the results of this analysis in Mississippi, stations used were generally limited to those for which flood and watershed data had been compiled on WATSTORE. Other constraints in the station selection process included a minimum of 10 years of flood record, that the watersheds be free from significant urbanization or manmade regulation, and that they be representative of lower Mississippi region streams. The selected streams have drainage areas ranging from 0.11 to 1,170 mi^2 (fig. 2), channel slopes from 0.4 to 10.6 feet per mile (table 1), and lengths ranging from 0.5 to 269 miles.

Stations are listed in order of their U.S. Geological Survey gaging station numbers in the form 07040100. The first two digits (07) represent Part 7, the lower Mississippi River basin. The following six digits are the station number, which increases in a downstream direction. The part numbers have been omitted in figure 1 to conserve space. Flood records of annual peak discharge were analyzed to determine flood frequency at gaging stations.

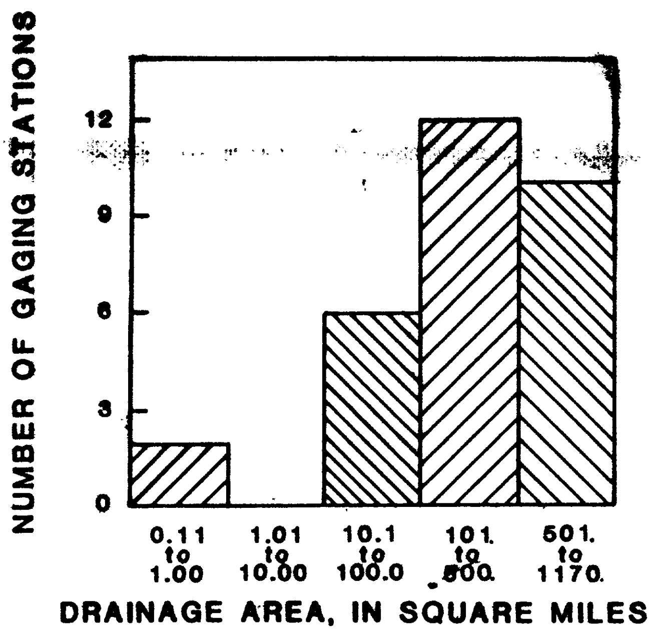

Figure 2.--Distribution of magnitude of drainage areas.

Table 1.--Basin characteristics and station, regional, and weighted T-year flood estimates

(Flood-frequency relationships for each gaging station are presented as follows.
Top line--log-Pearson Type III analysis, Middle line--regression equations, Bottom line--weighted T-year flood.)

Station number Stream name location	Period of Record	Length of Record	Drainage Area (mi^2)	Slope (ft/mi)	Length (mi)	Magnitude of T-year flood in cubic feet per second					
						Q2	Q5	Q10	Q25	Q50	Q100
07047600											
TYRONZA RIVER NR TYRONZA AR	1949-74	26	290.	0.7	55.0	4,190	5,020	5,510	6,080	6,470	6,840
Standard Deviation = 0.0950						2,700	3,770	4,320	5,060	5,690	6,160
Log Mean = 3.6204 Skew = -0.093						4,080	4,890	5,390	5,940	6,370	6,750
07047942											
L'ANGUILLE RIVER NR COLT AR	1971-83	13	535.	.9	57.4	5,810	9,370	11,800	14,800	17,100	19,300
Standard Deviation = 0.2613						4,790	7,140	8,450	10,200	11,700	12,800
Log Mean = 3.7485 Skew = -0.369						5,670	8,950	11,200	13,700	15,800	17,800
07077380											
CACHE RIVER AT EGYPT AR	1938-40	34	701.	1.0	73.0	4,390	5,900	6,920	8,230	9,230	10,200
Standard Deviation = 0.1490	1953-83					5,490	8,390	10,000	12,200	14,100	15,600
Log Mean = 3.6465 Skew = 0.160						4,450	6,100	7,170	8,650	9,740	10,800
07077500											
CACHE RIVER AT PATTERSON AR	1921-31	52	1,040.	.8	139.	6,540	9,520	11,600	14,300	16,500	18,700
Standard Deviation = 0.1921	1937-77					5,220	7,850	9,250	11,100	12,900	14,300
Log Mean = 3.8173 Skew = 0.049						6,490	9,430	11,500	14,100	16,200	18,400
07077700											
BAYOU DE VIEW AT MORTON AR	1939-77	39	421.	1.0	69.8	3,250	4,320	4,950	5,690	6,200	6,670
Standard Deviation = 0.1532						3,610	5,350	6,290	7,560	8,680	9,620
Log Mean = 3.5043 Skew = -0.321						3,270	4,390	5,040	5,860	6,430	6,940
07077950											
BIG CREEK AT POPLAR GROVE AR	1971-83	13	448.	1.1	56.9	2,910	4,600	5,680	6,980	7,900	8,760
Standard Deviation = 0.2563						4,340	6,550	7,790	9,480	10,900	12,100
Log Mean = 3.4430 Skew = -0.507						3,100	4,970	6,080	7,570	8,610	9,540
07078000											
LAGRUE BAYOU NR STUTTGART AR	1936-54	19	176.	1.1	39.2	2,400	3,990	5,070	6,440	7,440	8,420
Standard Deviation = 0.2804						2,340	3,360	3,910	4,670	5,300	5,830
Log Mean = 3.3611 Skew = -0.423						2,390	3,900	4,910	6,130	7,070	7,970
07264000											
BAYOU METO NR LONOKE AR	1955-83	29	207.	1.3	52.4	2,150	3,040	3,620	4,370	4,920	5,470
Standard Deviation = 0.1799						2,410	3,560	4,170	5,020	5,760	6,430
Log Mean = 3.3301 Skew = -0.078						2,170	3,090	3,670	4,450	5,020	5,590
07287165											
MOSQ. LAKE TRIB.1 AT ITTA BENA MS	1966-81	16	.11	10.6	.5	56	72	83	98	109	120
Standard Deviation = 0.1265						64	85	97	116	129	145
Log Mean = 1.7542 Skew = 0.338						56	74	85	101	113	125

Table 1.--Basin characteristics and station, regional, and weighted T-year flood estimates--Continued

(Flood-frequency relationships for each gaging station are presented as follows,
Top line--log-Pearson Type III analysis, Middle line--regression equations, Bottom line--weighted T-year flood.)

Station number Stream name location	Period of Record	Length of Record	Drainage Area (mi^2)	Slope (ft/mi)	Length (mi)	Magnitude of T-year flood in cubic feet per second: Q2	Q5	Q10	Q25	Q50	Q100
07287170											
MOSQ. LAKE TRIB.2 AT ITTA BENA MS	1966-78	16	0.13	10.6	0.6	70	84	93	104	112	120
Standard Deviation = 0.0954	1981-83					68	90	103	124	137	156
Log Mean = 1.8449 Skew = 0.168						69	84	94	108	117	127
07288500											
SUNFLOWER RIVER AT SUNFLOWER MS	1936-80	45	767.	.5	104.	6,390	8,720	10,200	12,000	13,300	14,600
Standard Deviation = 0.1639						4,170	5,840	6,700	7,820	8,820	9,500
Log Mean = 3.8015 Skew = -0.155						6,300	8,540	9,980	11,700	12,900	14,200
07288570											
QUIVER RIVER NR DODDSVILLE MS	1938-60	23	292.	.7	55.2	2,610	3,760	4,580	5,670	6,520	7,400
Standard Deviation = 0.1858						2,710	3,780	4,340	5,080	5,720	6,190
Log Mean = 3.4200 Skew = 0.128						2,620	3,760	4,550	5,580	6,400	7,220
07288650											
BOGUE PHALIA NR LELAND MS	1946-58	13	484.	.8	61.8	6,080	7,700	8,620	9,640	10,300	10,900
Standard Deviation = 0.1307						4,100	5,990	7,010	8,370	9,530	10,400
Log Mean = 3.7749 Skew = -0.412						5,820	7,380	8,320	9,340	10,100	10,800
07288770											
DEER CREEK AT HOLLANDALE MS	1946-58	13	98.0	.4	69.8	572	729	827	945	1,030	1,110
Standard Deviation = 0.1251						807	982	1,060	1,150	1,260	1,330
Log Mean = 2.7572 Skew = -0.017						603	776	869	993	1,080	1,160
07364120											
BAYOU BARTHOLOMEW NR STAR CITY AR	1942-70	32	215.	.6	81.7	1,720	2,420	2,840	3,320	3,650	3,950
Standard Deviation = 0.1924	1978-80					1,630	2,180	2,440	2,780	3,110	3,370
Log Mean = 3.2198 Skew = -0.498						1,710	2,400	2,800	3,260	3,590	3,880
07364150											
BAYOU BARTHOLOMEW NR McGEHEE AR	1939-83	45	592.	.5	167.0	3,150	4,330	5,040	5,860	6,410	6,930
Standard Deviation = 0.1771						2,590	3,550	4,000	4,580	5,180	5,640
Log Mean = 3.4853 Skew = -0.432						3,130	4,280	4,970	5,760	6,310	6,820
07364190											
BAYOU BARTHOLOMEW AT WILMOT AR	1926-70	48	1,170.	.4	269.	4,750	5,980	6,700	7,530	8,110	8,650
Standard Deviation = 0.1223	1978-80					3,460	4,760	5,360	6,130	6,950	7,550
Log Mean = 3.6725 Skew = -0.222						4,700	5,910	6,620	7,420	8,020	8,560
07364300											
CHEMIN-A-HAUT BAYOU NR BEEKMAN LA	1956-79	24	271.	3.3	27.2	4,920	10,100	14,500	21,200	27,000	33,500
Standard Deviation = 0.3770						5,410	9,190	11,500	15,000	17,800	20,500
Log Mean = 3.6840 Skew = -0.131						4,960	10,000	14,200	20,300	25,700	31,600

Table 1.--Basin characteristics and station, regional, and weighted T-year flood estimates--Continued

(Flood-frequency relationships for each gaging station are presented as follows:
Top line--log-Pearson Type III analysis; Middle line--regression equations; Bottom line--weighted T-year flood.)

Station number Stream name location	Period of Record	Length of Record	Drainage Area (mi^2)	Slope (ft/mi)	Length (mi)	Magnitude of T-year flood in cubic feet per second Q2	Q5	Q10	Q25	Q50	Q100
07367800											
BOEUF RIVER NR OAK GROVE LA	1947-60	14	1,050.	1.0	78.8	10,400	14,500	17,300	21,000	23,900	26,800
Standard Deviation = 0.1693						7,520	11,700	14,200	17,500	20,300	22,500
Log Mean = 4.0188 Skew = 0.123						10,000	14,000	16,700	20,200	23,100	25,800
07369500											
TENSAS RIVER AT TENDAL LA	1936-83	48	309.	1.1	44.4	2,670	3,450	3,890	4,390	4,710	5,020
Standard Deviation = 0.1414						3,570	5,300	6,260	7,580	8,670	9,560
Log Mean = 3.4166 Skew = -0.432						2,710	3,560	4,030	4,640	5,010	5,370
07369640											
BAYOU VIDAL AT QUIMBY LA	1954-65	12	160.	.6	53.5	700	915	1,050	1,210	1,330	1,440
Standard Deviation = 0.1433						1,570	2,080	2,330	2,650	2,940	3,160
Log Mean = 2.8398 Skew = -0.135 (GEN)						824	1,150	1,300	1,570	1,730	1,870
07369700											
BAYOU MACON NR KILBOURNE LA	1958-68	12	504.	.8	85.0	2,830	4,220	5,150	6,320	7,190	8,060
Standard Deviation = 0.2121	1983					3,600	5,230	6,090	7,240	8,270	9,100
Log Mean = 3.4450 Skew = -0.205 (GEN)						2,940	4,420	5,340	6,550	7,460	8,320
07370000											
BAYOU MACON NR DELHI LA	1928-83	56	782.	.9	142.	4,900	6,850	8,150	9,820	11,100	12,300
Standard Deviation = 0.1729						4,160	6,230	7,320	8,790	10,200	11,400
Log Mean = 3.6898 Skew = -0.008						4,870	6,820	8,110	9,750	11,000	12,200
07376290											
BLOOD RIVER NR SPRINGFIELD LA	1964-69	19	26.6	4.9	14.8	1,330	1,870	2,230	2,700	3,060	3,430
Standard Deviation = 0.1759	1971-83					1,090	1,700	2,060	2,590	3,040	3,530
Log Mean = 3.1230 Skew = 0.020						1,310	1,850	2,210	2,680	3,060	3,450
07380130											
COLYELL CREEK AT LIVINGSTON LA	1951-68	18	20.7	3.8	8.1	960	1,730	2,350	3,270	4,060	4,930
Standard Deviation = 0.2987						1,120	1,700	2,040	2,540	2,920	3,310
Log Mean = 2.9869 Skew = 0.052 (GEN)						976	1,730	2,300	3,140	3,850	4,640
07380160											
MIDDLE COLYELL CREEK NR WALKER LA	1951-83	33	20.3	4.6	16.7	1,070	1,670	2,070	2,560	2,920	3,270
Standard Deviation = 0.2453						795	1,210	1,450	1,790	2,090	2,430
Log Mean = 3.0541 Skew = -0.308						1,050	1,630	2,020	2,480	2,830	3,180
07382120											
BAYOU COCODRIE AT ST. LANDRY LA	1947-58	12	307.	2.7	52.6	2,610	3,790	4,570	5,540	6,250	6,960
Standard Deviation = 0.1970						4,070	6,710	8,260	10,500	12,500	14,400
Log Mean = 3.4112 Skew = -0.190 (GEN)						2,820	4,370	5,310	6,780	7,800	8,830

Table 1.--Basin characteristics and station, regional, and weighted T-year flood estimates--Continued

(Flood-frequency relationships for each gaging station are presented as follows:
Top line--log-Pearson Type III analysis; Middle line--regression equations; Bottom line--weighted T-year flood.)

Station number Stream name location	Period of Record	Length of Record	Drainage Area (mi^2)	Slope (ft/mi)	Length (mi)	Magnitude of T-year flood in cubic feet per second Q2	Q5	Q10	Q25	Q50	Q100
07382500											
BAYOU COURTABLEAU AT WASHINGTON LA	1947-83	37	715.	1.0	73.0	4,700	5,760	6,460	7,330	7,980	8,630
Standard Deviation = 0.1009						5,590	8,540	10,200	12,500	14,400	15,900
Log Mean = 3.6778 Skew = 0.323						4,740	5,970	6,740	7,830	8,600	9,340
07386000											
BAYOU CARENCRO NR SUNSET LA	1944-61	20	37.1	2.2	10.8	2,270	3,040	3,540	4,170	4,630	5,080
Standard Deviation = 0.1517	1963-64					1,400	2,050	2,420	2,940	3,340	3,710
Log Mean = 3.3553 Skew = -0.019						2,190	2,910	3,390	3,960	4,420	4,850
07386500											
BAYOU BOURBEAU AT SHUTESTON LA	1943-70	28	19.0	1.8	11.3	1,170	1,600	1,880	2,250	2,520	2,800
Standard Deviation = 0.1584						727	996	1,140	1,340	1,500	1,650
Log Mean = 3.0711 Skew = 0.059						1,140	1,540	1,810	2,140	2,390	2,660

FLOOD-FREQUENCY RELATIONS AT GAGING STATIONS

Floods at a site are a succession of natural occurrences which form a rather intractable series. A stationary time series is assumed for the purpose of analysis. The WRC (1981 U.S. Water Resources Council) recommends the Pearson Type III statistical distribution with log transformation of the data (log-Pearson Type III) as the base method for analyzing annual peak flow data. The log-Pearson Type III distribution is defined by the mean, the standard deviation, and the skew of the data set. The WRC weighted skew was used for the stations in this analysis, except as noted where the generalized skew was more appropriate. The WRC skew was computed from the generalized and systematic record (excluding outliers) skew, inversely weighted by their mean square errors.

The log-Pearson Type III distribution was fitted to the logarithms of the annual peaks by the equation:

$$\text{Log } Q = \bar{X} + KS \qquad (1)$$

where:

Q = discharge, in cubic feet per second, for selected probability of exceedance

$\bar{X}$ = mean logarithm

K = a coefficient related to the skew coefficient and the probability of exceedance

S = standard deviation of logarithms

Probability of exceedance is the chance that a given flood magnitude will be equaled or exceeded as the annual peak discharge in any 1-year interval. Recurrence interval is the reciprocal of the probability of exceedance and is the probable average time in years between exceedances of the corresponding flood magnitude, over a long period of time. Flood magnitudes with their corresponding recurrence intervals for a stream station form a flood-frequency relation for that station. Log-Pearson Type III estimated flood-frequency relations for each of the analyzed gaging stations are listed in table 1. These relations were analyzed to develop regional flood-frequency regression equations.

REGIONAL FLOOD-FREQUENCY RELATIONS

Flood-frequency relations for natural watersheds in the lower Mississippi region can be estimated using the regional regression equations presented and basin characteristics. The observed flood magnitude for recurrence intervals of 2-, 5-, 10-, 25-, 50-, and 100-years was related to selected basin and climatic characteristics for 30 stations in this report. The logarithms of both the discharge and basin characteristics provide an approximately linear relation which was analyzed in a linear regression analysis (fig. 3). The most significant characteristics were found to be drainage area, stream slope, and channel length. In figure 3 the inverse relation of channel length as a basin shape factor, to flood magnitude is seen when channel length per square mile is plotted against flood magnitude. None of the other characteristics were found significant except for mean basin elevation, which reduced the standard error of the estimates by about 1 percent. Mean basin elevation probably represents an intraregional factor.

The application of the regression equations from this analysis is recommended only to natural watersheds in and generally characteristic of the lower Mississippi region, in Arkansas, Louisiana, and Mississippi with areas of 0.11 to 1,170 mi^2, lengths of 0.5 to 269 miles, and channel slopes of 0.4 to 10.6 feet per mile. Combining a small drainage area with a very low slope, such as might exist for some highly uncharacteristic watersheds in this region, will cause these equations to give unrealistic results.

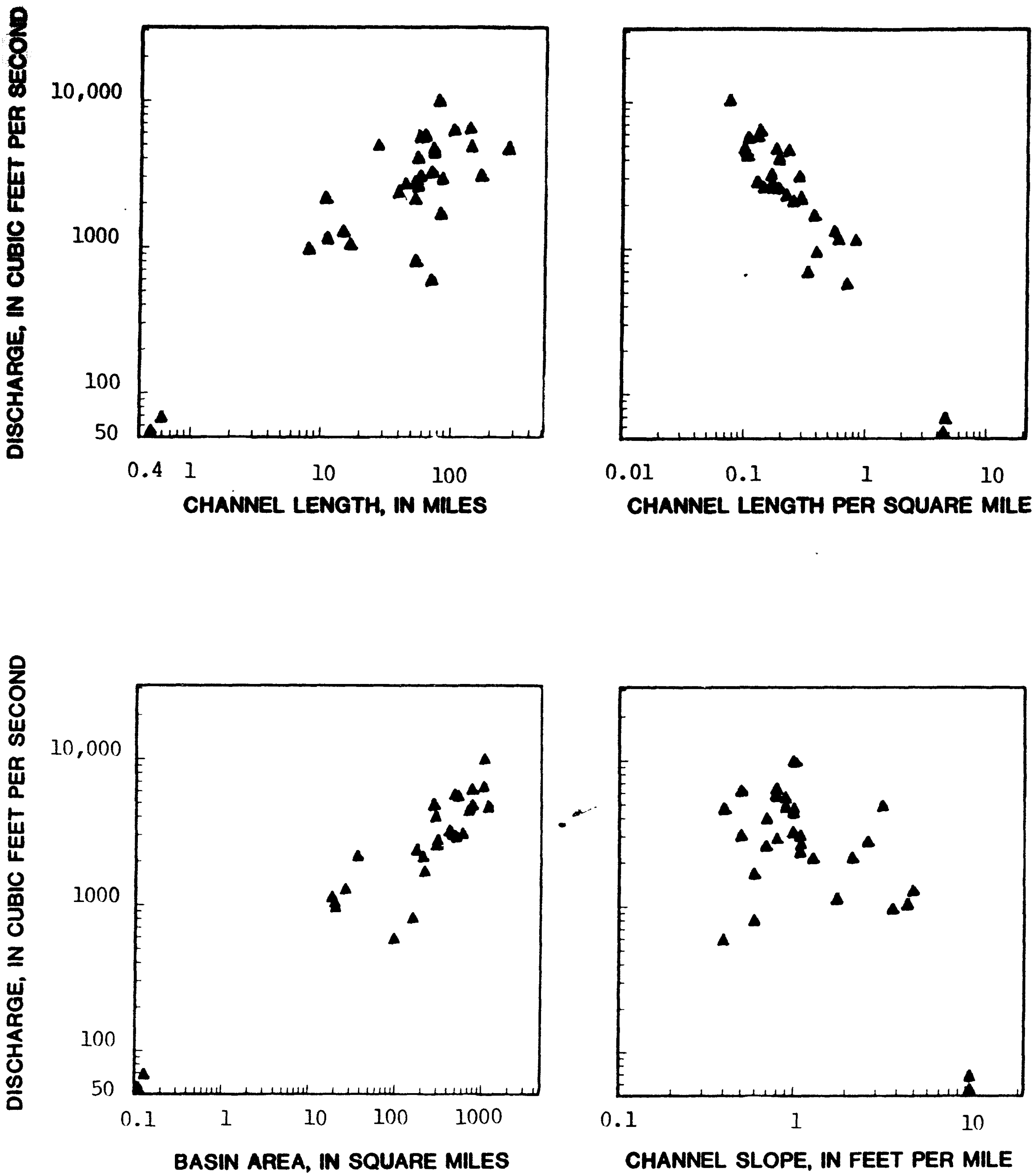

Figure 3.-- Basin characteristics plotted against 2-year flood magnitude.

Floodflow Frequency Regression Equations

Regression equations from this analysis for computing estimated flood magnitude for the 2-, 5-, 10-, 25-, 50-, and 100-year floods for lower Mississippi watersheds are presented below:

$$Q_2 = 171\ A^{0.87}\ S^{0.25}\ L^{-0.52} \qquad (2)$$

$$Q_5 = 192\ A^{0.93}\ S^{0.37}\ L^{-0.54} \qquad (3)$$

$$Q_{10} = 205\ A^{0.96}\ S^{0.42}\ L^{-0.56} \qquad (4)$$

$$Q_{25} = 224\ A^{0.99}\ S^{0.48}\ L^{-0.58} \qquad (5)$$

$$Q_{50} = 232\ A^{1.00}\ S^{0.52}\ L^{-0.57} \qquad (6)$$

$$Q_{100} = 236\ A^{1.00}\ S^{0.57}\ L^{-0.55} \qquad (7)$$

The variables are defined as follows:

Q_t The estimated peak discharge, in cubic feet per second, for a recurrence interval of t years.

A The basin drainage area, in square miles.

S 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.

L 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 stream junctions, the branch draining the largest area is considered the main channel.

Standard error of regression can be defined as the range of error to be expected about two-thirds of the time from the observed data (table 2). The standard error is computed from the differences between the observed flood discharge from log-Pearson Type III analysis of station data and the predicted flood discharge from the regional regression equation. It is an index of the accuracy of the regression relation but is not a true indication of the accuracy of the estimate of ungaged sites.

WEIGHTED FLOOD-FREQUENCY ESTIMATES

Independent estimates of flood frequency for a site may be weighted inversely proportional to their variance (or variance converted to equivalent years) to provide a weighted average with a variance less than that of either estimate (U.S. Water Resources Council, 1981). The regional regression estimates are considered independent from the log-Pearson Type III station estimates in this report.

Equivalent years of record has been defined as an estimate of the number of years of actual streamflow record required at a site to achieve an accuracy equivalent to the regional flood estimate from a regression equation (Thomas, 1982). It is used in this report to evaluate the relative worth of the station log-Pearson Type III, and the regional regression flood-frequency estimate. Thomas (1980) demonstrated equivalent years of record to be a useful weighting procedure, and equal to the average variance procedure. Both standard error of estimate and standard error of prediction, used in computing equivalent years, produced the same results in integer years.

Table 2.--Standard error and equivalent years of record for regional T-year flood estimates

Recurrence Interval in Years	Standard Error of Regression in Percent	Equivalent Years of Record
2	34	2
5	34	3
10	36	3
25	38	4
50	38	4
100	40	4

The flood-frequency estimates are weighted using the equation:

$$Q_w = \frac{Q_S(N_S) + Q_r\ (N_r)}{N_S + N_r} \qquad (8)$$

where:

Q_w is the weighted average discharge

Q_S is the station log-Pearson Type III estimate

Q_r is the regional regression estimate

N_S is the number of annual peak records used to determine Q_S

N_r is the equivalent years of record for the regression estimate for the selected recurrence interval from table 2.

The log-Pearson Type III, regional regression, and weighted average discharge estimates for the selected recurrence intervals are shown in table 1 for the stations analyzed. The weighted average discharge is recommended as the best estimate.

The weighted discharges were computed using discharge in cubic feet per second which gives an answer equal to or greater than that using discharge in log units.

Comparison of Log-Pearson and Regression Estimates

In figures 4 and 5, for the 2- and 50-year floods, respectively, graphical comparisons are made for the log-Pearson and the regression estimates for the data set. Sites in the lower Mississippi alluvial plain in the state of Mississippi are uniquely identified in these figures.

EXTRAPOLATED FLOOD-FREQUENCY ESTIMATES

Flood frequency estimates for a stream station may be extrapolated to an ungaged site on the same stream using drainage area ratios. This extrapolated estimate and the regional regression estimate for the ungaged site are weighted in the following equation. The weighted flood frequency estimated is suggested where an ungaged site has a drainage area within 50 percent of the drainage area of a gaged site on the same stream. The equation follows,

$$Q_{t(\omega)} = 4 \left(\frac{\Delta A}{A_g}\right)^2 Q_r + \left(1 - 4 \left(\frac{\Delta A}{A_g}\right)^2\right) \left(\frac{A_u}{A_g}\right)^{0.6} Q_g \qquad (9)$$

where,

$Q_{t(\omega)}$ is the weighted discharge at the ungaged site for the selected recurrence interval;

Q_g is the weighted gage estimate for the selected recurrence interval, from table 1;

Q_r is the regional regression estimate at the ungaged site for the selected recurrence interval;

A_u is the drainage area at the ungaged site;

A_g is the drainage area at the gaged site; and

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

Where the drainage area at an ungaged site on a gaged stream differs by more than 50 percent from that at the gaged site, the regression equation results should be used.

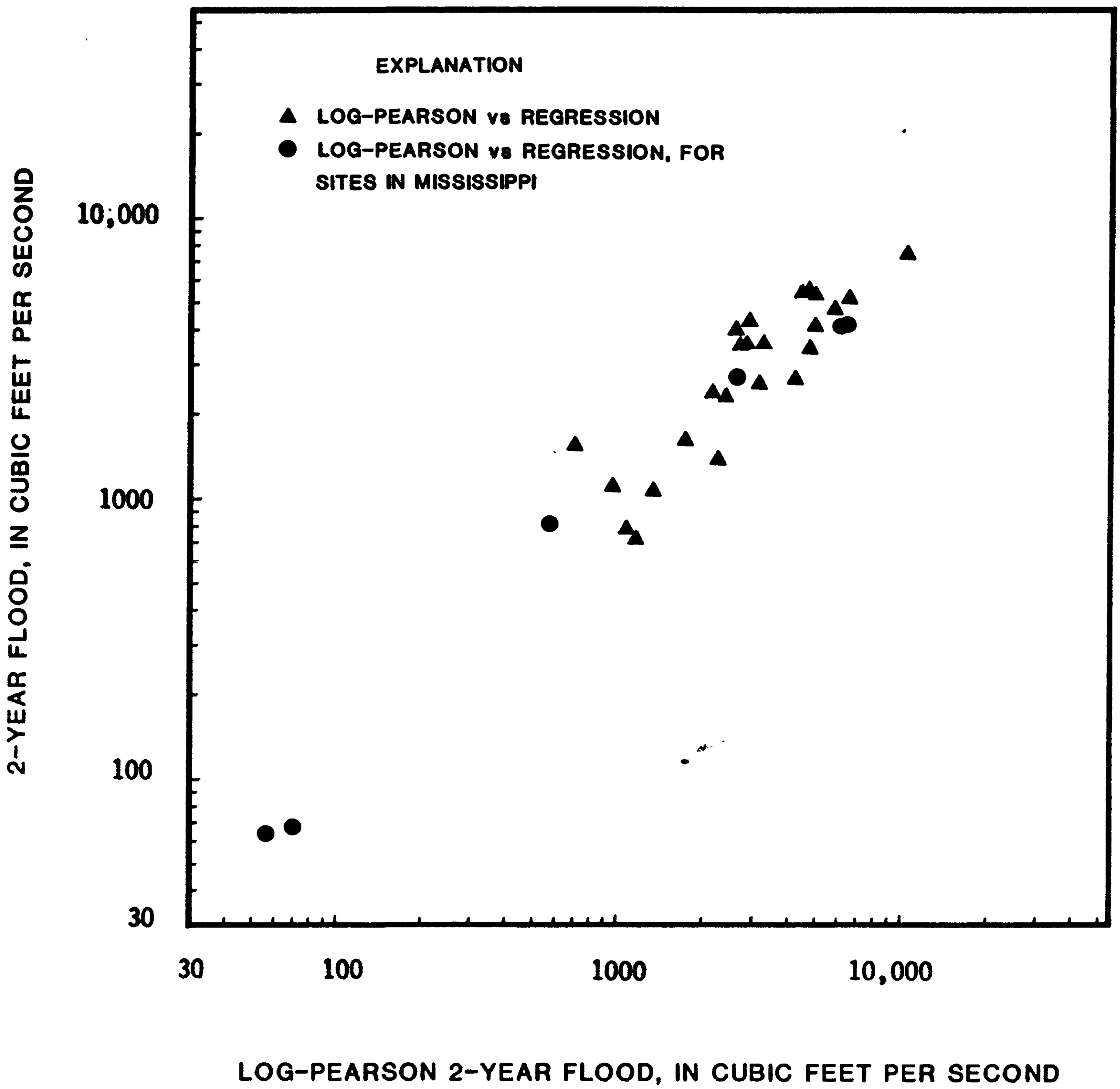

Figure 4.--Comparison of 2-year flood-frequency estimates.

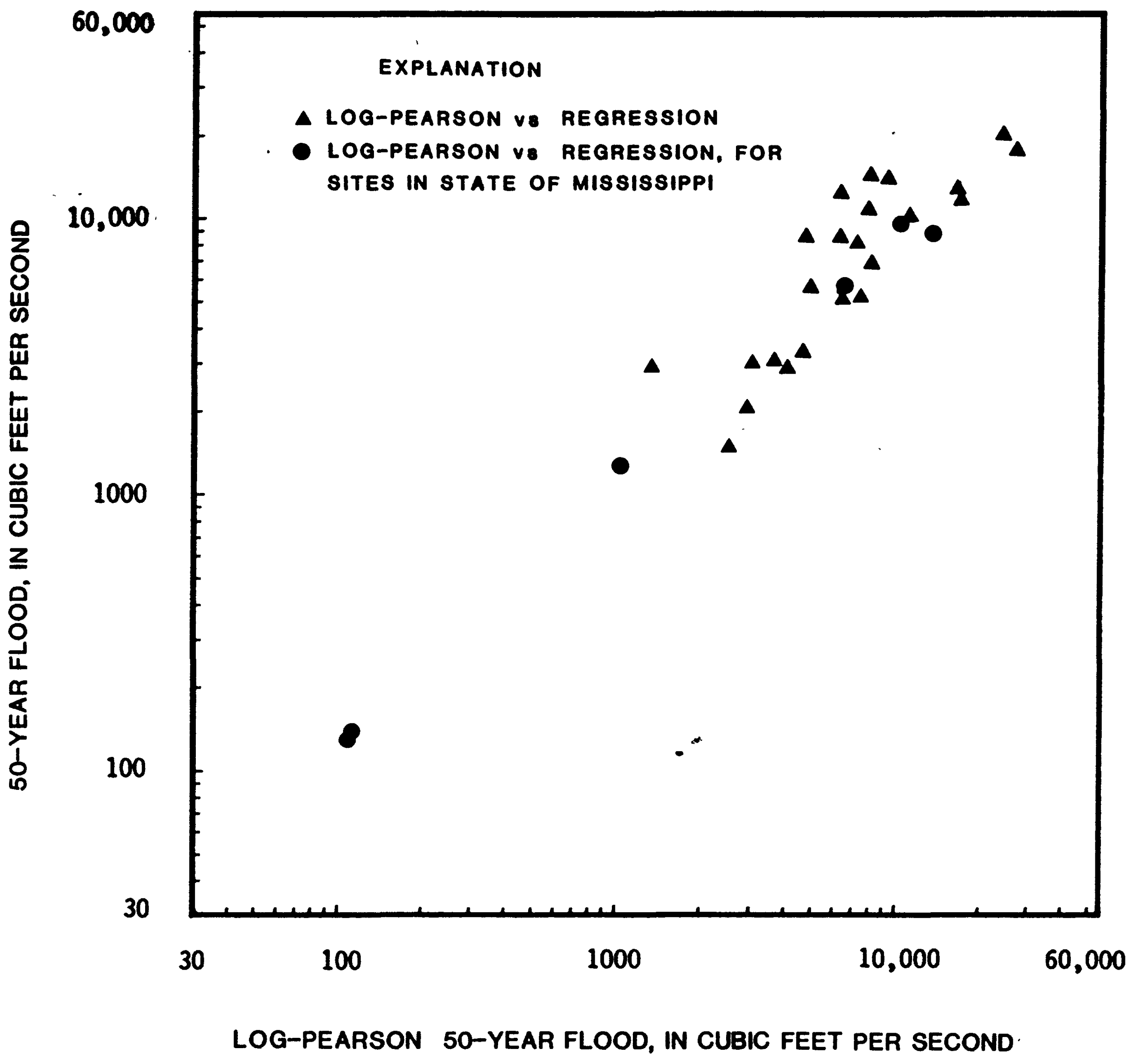

Figure 5.--Comparison of 50-year flood-frequency estimates.

SUMMARY

The hydrology of the lower Mississippi region warrants a separate flood-frequency analysis. Flood records from 30 stream stations in the lower Mississippi, which have drainage areas ranging from 0.11 to 1,770 mi^2 and channel slopes from 0.4 to 10.6 feet per mile, were analyzed using a log-Pearson Type III probability distribution to determine the probable maximum 2-, 5-, 10-, 25-, 50-, and 100-year discharges. These values were analyzed as a function of basin characteristics for the streams in a standard multiple linear regression analysis. The resulting regression equations can be used to estimate the flood-frequency relation on ungaged streams for recurrence intervals of 2, 5, 10, 25, 50, and 100 years. The application of the equations is appropriate only for streams in the lower Mississippi River alluvial plain that are free of significant regulation or diversion, that have drainage areas between 0.11 to 1,770 mi^2 and channel slopes less than 10.6 feet per mile. This report supersedes the 1976 report, "Flood Frequency of Mississippi Streams" (Colson and Hudson), where it applies to the lower Mississippi River alluvial plain. Techniques are presented for combining a log-Pearson Type III estimate and a regression estimate to compute weighted average discharge, and for transferring probable flood values to ungaged sites on gaged streams, where drainage area varies by less than 50 percent of the gaged site.

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