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U. S. DEPARTMENT OF AGRICULTURE
WEATHER BUREAU

MONTHLY WEATHER REVIEW

[Supplement No. 29]

THE FLOODS OF 1927 IN THE MISSISSIPPI BASIN

By H. C. FRANKENFIELD, Senior Meteorologist

With Reports contributed by the following Meteorologists:

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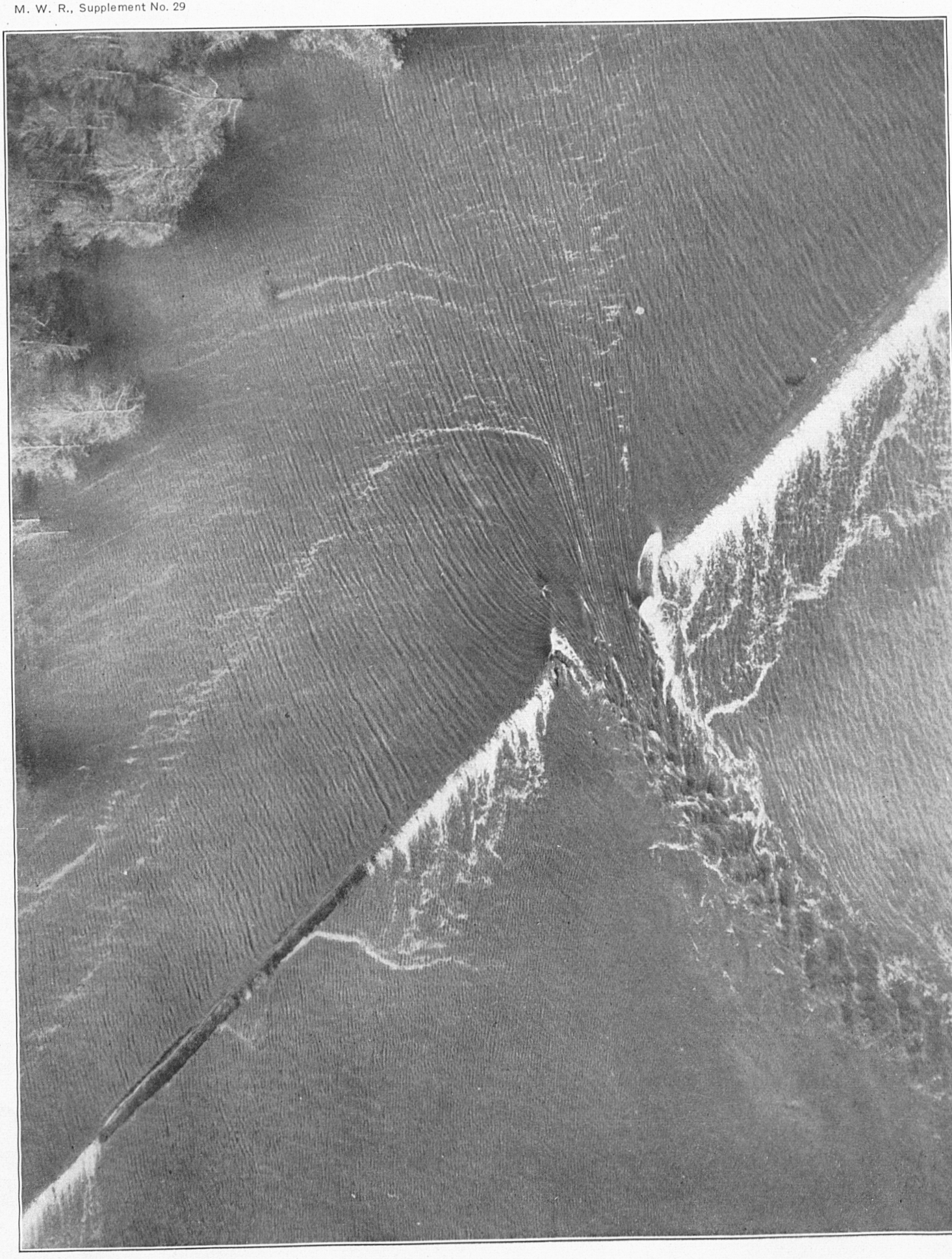

FRONTISPIECE.—Beginning of crevasse, Mississippi River, Mounds Landing, Miss., April 21, 1927. (Airplane photograph)

Title of Frontispiece should read as follows:
Beginning o[illegible] Mississippi River 7 miles
above New [illegible]. (Airplane Photograph.)

MONTHLY WEATHER REVIEW

[Supplement No. 29]

THE FLOODS OF 1927 IN THE MISSISSIPPI BASIN

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SUPPLEMENTS TO THE MONTHLY WEATHER REVIEW

During the summer of 1913 the issue of the system of publications of the Department of Agriculture was changed and simplified so as to eliminate numerous independent series of Bureau bulletins. In accordance with this plan, among other changes, the series of quarto bulletins—lettered from A to Z—and the octavo bulletins—numbered from 1 to 44—formerly issued by the U. S. Weather Bureau have come to their close.

Contributions to meteorology such as would have formed bulletins are authorized to appear hereafter as SUPPLEMENTS of the MONTHLY WEATHER REVIEW. (Memorandum from the office of the Assistant Secretary, May 18, 1914.)

These Supplements comprise those more voluminous studies which appear to form permanent contributions to the science of meteorology and of weather forecasting, as well as important communications relating to the other activities of the U. S. Weather Bureau. They appear at irregular intervals as occasion may demand and contain approximately 100 pages of text, charts, and other illustrations. Copies may be procured at the prices indicated below by addressing the Superintendent of Documents, Government Printing Office, Washington, D. C.

SUPPLEMENTS PUBLISHED [1]

No. 1. Types of storms of the United States and their average movements. By E. H. Bowie and R. H. Weightman. Washington, 1914. 37 p. 114 ch. Out of print. (W. B. No. 538.)

No. 2. I. Calendar of the leafing, etc., of the common trees of the eastern United States. By G. N. Lamb. 19 p. 4 figs. II. Phenological dates, etc., recorded by T. Mikesell at Wauseon, Ohio. By J. Warren Smith. 73 p. 2 figs. Washington, 1915. Out of print. (W. B. No. 558.)

No. 3. (*Aerology No. 1.*) Sounding balloon ascensions at Fort Omaha, Nebr., May 8, 1915, etc. By W. R. Blair and others. 67 p. 23 figs. Washington, 1916. Price 25 cents. (W. B. No. 592.)

No. 4. Types of anticyclones of the United Statse and their average movements. By E. H. Bowie and R. H. Weightman. Washington, 1917. 25 p. 7 figs. 73 ch. Price 25 cents. (W. B. No. 600.)

No. 5. (*Aerology No. 2.*) Free-air data at Drexel Aerological Station: January, February, and March, 1916. By W. R. Blair and others. Washington, 1917. 59 p. 6 figs. Price 25 cents. (W. B. No. 603.)

No. 6. Relative humidities and vapor pressures over the United States, including a discussion of data from recording hair hygrometers for a period of about 5 years. By P. C. Day. Washington, 1917. 61 p. 7 figs. 34 charts. Price 25 cents. (W. B. No. 609.)

No. 7. (*Aerology No. 3.*) Free-air data at Drexel Aerological Station: April, May, and June, 1916. By W. R. Blair and others. Washington, 1917. 51 p. 4 figs. Price 25 cents. (W. B. No. 619.)

No. 8. (*Aerology No. 4.*) Free-air data at Drexel Aerological Station: July, August, September, October, November, and December, 1916. By W. R. Gregg and others. Washington, 1918. 111 p. 12 figs. Price 25 cents. (W. B. No. 642.)

No. 9. Periodical events and Natural Law as guides to agricultural research and practice. By A. D. Hopkins. Washington, 1918. 42 p. 22 figs. Price 25 cents. (W. B. No. 643.)

No. 10. (*Aerology No. 5.*) Free-air data at Drexel Aerological Station: January, February, March, April, May, and June, 1917. By W. R. Gregg and others. Washington, 1918. 101 p. 11 figs. Price 25 cents. (W. B. No. 651.)

No. 11. (*Aerology No. 6*) Free-air data at Drexel Aerological Station: July, August, September, October, November, and December, 1917. By W. R. Gregg and others. Washington, 1918. 108 p. 11 figs. Price 25 cents. (W. B. No. 658.)

No. 12. (*Aerology No. 7.*) Free-air data at Drexel and Ellendale Aerological Stations: January, February, and March, 1918. By W. R. Gregg and others; Cold winter of 1917–18. By W. R. Gregg. Description of the Ellendale Aerological Station. By V. E. Jakl. Washington, 1918. 82 p. 10 figs. Price 25 cents. (W. B. No. 660.)

No. 13. (*Aerology No. 8.*) I. Free-air data at Drexel and Ellendale Aerological Stations: April, May, and June, 1918. By W. R. Gregg and others. II. Notes on kite flying. By V. E. Jakl. Washington, 1918. 81 p. 1 fig. Price 25 cents. (W. B. No. 663.)

No. 14. (*Aerology No. 9.*) I. Free-air data at Broken Arrow, Drexel, Ellendale, and Royal Center Aerological Stations: July, August, and September, 1918. By W. R. Gregg and others. II. Broken Arrow Aerological Station. By John A. Reihle. III. Royal Center Aerological Station. By Homer W. Ball. Washington, 1919. 132 p. 22 figs. Price 25 cents. (W. B. No. 672.)

No. 15. (*Aerology No. 10.*) I. Free-air data at Broken Arrow, Okla., Drexel, Nebr., Ellendale, N. Dak., Groesbeck, Tex., Leesburg, Ga., and Royal Center, Ind., Aerological Stations, October to December, 1918, inclusive. By W. R. Gregg and others. II. The Groesbeck Aerological Station. By T. J. Chancellor. III. The Leesburg Aerological Station. By F. T. Cole. Washington, 1919. 178 p. 19 figs. Price 25 cents. (W. B. No. 687.)

No. 16. Predicting minimum temperatures from hygrometric data. By J. Warren Smith and others. Washington, 1920. 76 p. 57 figs. Price 25 cents. (W. B. No. 701.)

No. 17. Streamflow experiment at Wagon Wheel Gap, Colo. By C. G. Bates and Alfred J. Henry. Washington, 1922. 55 p. 41 figs. Price 50 cents. (W. B. No. 757.)

No. 18. Bibliography of the climate of South America. By Margaret M. Welch. Washington, 1921. 42 p. Price 25 cents. (W. B. No. 749.)

No. 19. Thermal belts and fruit growing in North Carolina. Henry J. Cox. Appendix: Thermal belts from the horticultural viewpoint. W. N. Hutt. Washington, 1923. 106 pp. 79 figs. Price 50 cents. (W. B. No. 796.)

No. 20. An aerological survey of the United States. Part I. Results of observations by means of kites. W. R. Gregg. Washington, 1922. 78 pp. 25 figs. Price 25 cents. (W. B. No. 768.)

No. 21. The preparation and significance of free-air pressure maps for the Central and Eastern United States. C. Le Roy Meisinger. Washington, 1922. 77 pp. 31 figs. 22 charts. Price 25 cents. (W. B. No. 784.)

No. 22. The spring floods of 1922. H. C. Frankenfield and others. Washington, 1923. 29 pp. 5 figs. 15 charts. Price 25 cents. (W. B. No. 792.)

No. 23. The temperature of Mexico. Jesus Hernandez. Washington, 1923. 24 pp. 75 charts. Price 10 cents. (W. B. No. 813.)

No. 24. West Indian hurricanes and other tropical cyclones of the North Atlantic Ocean. Charles L. Mitchell. Washington, 1924. 47 pp. 95 figs. 8 charts. Price 25 cents. (W. B. No. 840.)

No. 25. Normals of daily temperature for the United States. Charles F. Marvin and P. C. Day. Washington, 1925. 87 pp. 13 figs. Price 20 cents. (W. B. No. 855.)

No. 26. An aerological survey of the United States. Part II. Results of observations by means of pilot balloons. Willis Ray Gregg. Washington, 1926. 60 pp. 14 figs. Price 20 cents. (W. B. No. 900.)

No. 27. Montezuma pyrheliometry. Charles G. Abbot. Washington, 1927. 15 pp. 1 fig. Price 20 cents. (W. B. No. 906.)

No. 28. Climatology of the tropical islands of the Pacific Ocean (Oceania). W. W. Reed. Washington, 1927. 22 pp. 8 figs. Price 10 cents. (W. B. No. 917.)

No 29. Floods of 1927 in the Mississippi Basin. H. C. Frankenfield. Washington, 1927. 49 pp. 21 figs. charts. Price 25 cents. (W. B. No. 936.)

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[1] All Supplements are quarto size.

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ILLUSTRATIONS

* In pocket at end of SUPPLEMENT.

FOREWORD

This report is a description of the destructive floods of the spring of 1927 over the central and southern portions of the great Mississippi Basin. The report is as brief as it could be made, if due regard was to be had as to the importance of the subject. In the interest of economy of printing, considerable matter of some importance at least has been omitted; but it is thought that the text covers all salient features.

Thanks are due to Mr. R. E. Spencer, Miss Mary K. Cummings, and Mrs. Rose I. Cullen, of the Weather Bureau, who performed very efficient service in connection with the compilation of the necessary data and the preparation of the report.

INTRODUCTION

The stages of water in the lower Mississippi River begin to increase annually about the first of the calendar year following precipitation over the central and lower basins of the Mississippi and its closely adjacent tributaries. The increasing flow thus occasioned passes off harmlessly or culminates in a great flood, according to a combination of circumstances, among which the dominant cause of floods is unusual precipitation over the central basin, as distinguished from the inflow from the distant headwaters of the great drainage system.

Meteorological evidence shows that a great flood in the lower Mississippi River does not occur without a preceding severe flood over the whole of the Ohio River, or at least, as in 1927, over that portion below the mouth of the Green and Wabash Rivers. However, unless of unprecedented or inconceivable magnitude, a flood in the Ohio River alone can not cause a great flood in the Mississippi River, although the flood of 1913, one of the most severe in history, was caused chiefly by an unprecedented spring flood in the Ohio River.

The great floods in the Mississippi have all occurred when a flood in the Ohio River has been augmented by subsequent rains over the contiguous areas of the central basins, which rains, favorably distributed and properly timed as to occurrence and duration, have delivered greater volumes of water than can be carried off by the artificial main channel which man has presumed to set up. The meteorologists find, therefore, that the Mississippi floods follow excessive rains over that portion of the basin below the mouth of the Wisconsin and Platte Rivers, and roughly east of the ninety-seventh meridian. This it will be noticed, leaves entirely out of consideration conditions and effects arising in the Rocky Mountain headwater system of great tributaries like the Missouri, Arkansas, and others. Under present climatic and meteorological conditions, neither precipitation nor melting snow in these mountainous and forested areas can reasonably add more than a very small fraction to a flood crest in the lower Mississippi. If favorably timed, the normal effect at the best which results from the unusual delivery of water to the Rocky Mountain and headwater tributaries is to delay the subsidence of a flood caused by rains in the central valleys. Even this unimportant effect, that is, slow subsidence, is predicated upon seemingly possible conditions, which, however, a detailed record of nearly 50 years show have not yet, and may never occur in any serious form.

It is therefore, heavy rains over the central and lower valleys of the Mississippi basin which both explain and fully determine the character of Mississippi floods. Their magnitude will depend upon, first, the amount of rain in individual storms; second, their duration, that is, the recurrence of a sequence of storms following each other; and third, the extent to which the rain storms synchronize in their distribution and time of occurrence with the downstream progress of the flood crests in the tributary and main rivers.

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In the report on the spring floods of 1922 in the Mississippi Drainage Basin[1], it was stated at the outset that the floods of the year 1922 in the Mississippi Drainage Basin established a new epoch in the history of that region in at least two particulars. First in the extremely general distribution of the floods, and second in the, (at that time) unprecedented high stages in the lower Mississippi River from the mouth of the Arkansas to the Passes, due to the enormous volumes of water from the Arkansas and White Rivers. It remained, however, for the greater flood of 1927 to mark a still more distinctive epoch in our history, for this flood because of its magnitude, protracted duration, far-reaching extent, and economic destructiveness, eventually assumed such vast proportions that it became a national calamity, a calamity the full extent of which cannot even now be properly realized, and one whose depressing effects will be felt for years to come.

[1] H. C. Frankenfield and others: The Spring Floods of 1922. Monthly Weather Review Supplement No. 22, Washington, D. C., 1923.

Drainage Basin of the Mississippi River.

A diagram of this basin is shown in Fig. 1. A detailed description will be found in Bulletin E, Weather Bureau 1897. The grand divisions which differ slightly from those given in Bulletin E are given in the following table.

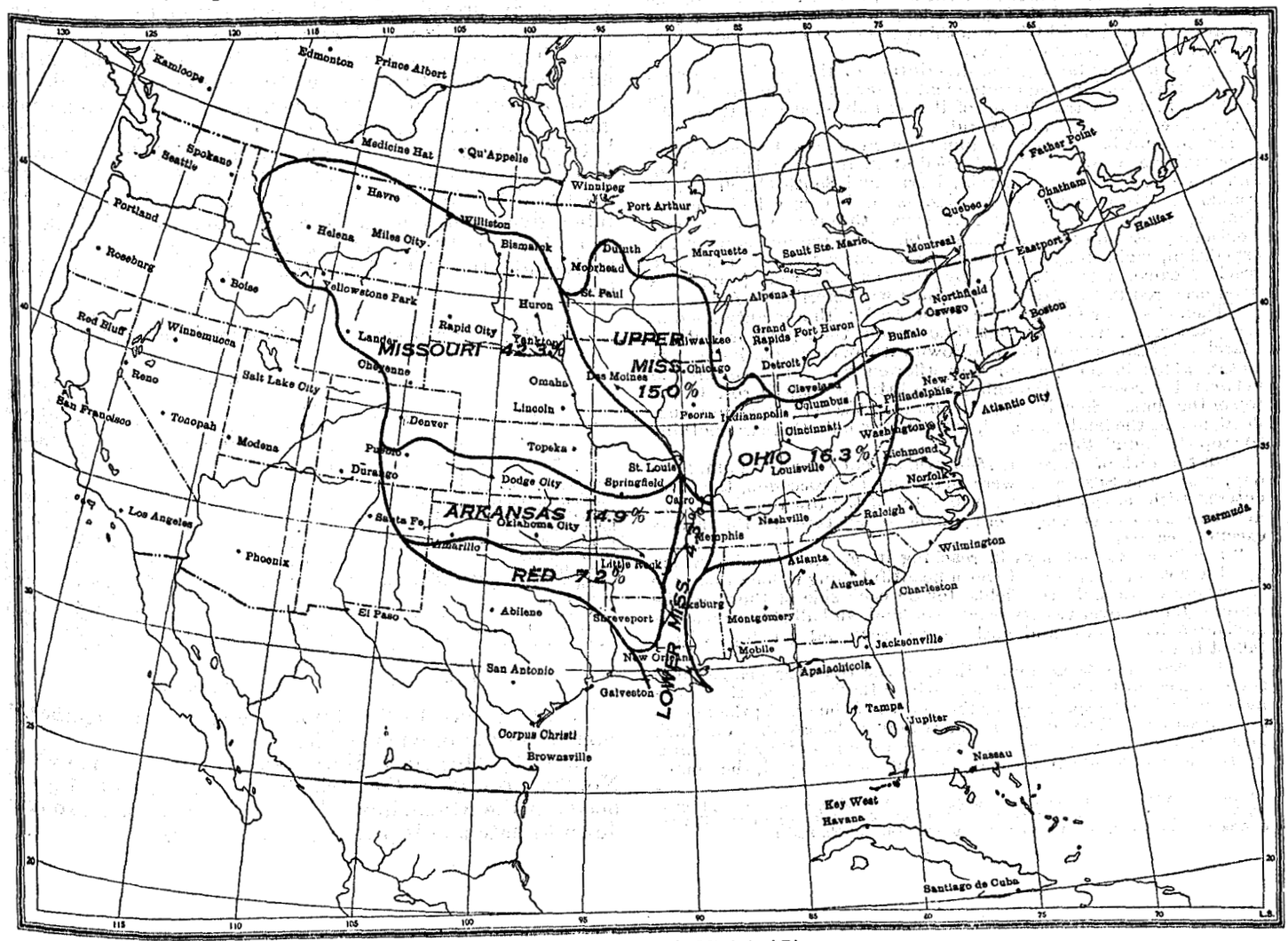

FIG. 1.—Drainage basin of the Mississippi River

TABLE 1.—*Grand Divisions of the Mississippi Basin*

Designation	Area in square miles	Ratio to whole basin
Ohio	203,900	0.163
Upper Mississippi Basin	187,850	.150
Missouri Basin	528,850	.423
Arkansas and White Basins	186,000	.149
Red Basin	90,000	.072
Lower Mississippi Basin	54,300	.043
Total	1,250,900	1.000

FLOOD FREQUENCY

Early floods.—As stated in Monthly Weather Review Supplement No. 22 (loc. cit.), page 1, river stage data since 1870 are quite complete for many places within the drainage basin of the Mississippi River, and a list of dates of severe floods is given on page 3 of that publication. A very interesting narrative record of a great flood in the Mississippi River in 1543 has recently come to light, and we have taken the liberty to reprint it from the Engineering News-Record of May 26, 1927:

MISSISSIPPI FLOODS NOT A DEVELOPMENT OF RECENT YEARS

A great flood which occured in the Mississippi River in 1543 was described by Garcilaso de la Vega in a history of De Soto's Expedition on the North American Continent, entitled "La Florida del Inca." It is a record that goes a long way toward proving that deforestation has had little or nothing to do with the floods which occur in the Mississippi Valley.

The volume containing the description of the flood was found by Glenn W. Caulkins, superintendent of schools, Cashmere, Wash., while in Peru. A translation of it was published recently in the Wenatchee (Wash.), Daily World.

The account begins by describing how Fernando De Soto sailed from Habana, Cuba, in 1539, landed at what is now Tampa, Fla., and traversed Florida, Georgia, North and South Carolina, and Alabama. He crossed the Mississippi, which he called the Rio Grande, near Memphis, and traveled through Arkansas and Louisiana, returning to the Mississippi, where the remnants of the expedition, while preparing boats to go down the Mississippi to reach Mexico, were attacked by Indians. At that juncture a flood occurred in the Mississippi which was described as follows:

"Then God, our Lord, hindered the work with a mighty flood of the great river, which at that time—about the eighth or tenth of March [of 1543]—began to come down with an enormous increase of water, which in the beginning overflowed the wide level ground between the river and the cliffs; then little by little it rose to the top of the cliffs. Soon it began to flow over the fields in an immense flood, and as the land was level, without any hills, there was nothing to stop the inundation.

"On the 18th of March of 1543, which that year was Palm Sunday, when the Spaniards were marching in procession, the river entered with ferocity through the gates of the town of Aminoya,[1] and two days later they were unable to go through the streets except in canoes.

"The flood was 40 days in reaching its greatest height, which was the 20th of April, and it was a beautiful thing to look upon the sea where there had been fields, for on each side of the river the water extended over twenty leagues of land, and all of this area was navigated by canoes, and nothing was seen but the tops of the tallest trees.

"On account of these inundations of the river the people build their houses on the high land, and where there is none, they raise mounds by hand, especially for the houses of the chiefs; the houses are constructed three or four stages above the ground, on thick posts that serve as uprights and between uprights they lay beams for the floors, and above these floors which are of wood, they make a roof, with galleries around the four sides of the house where they store their food and other supplies, and here they take refuge from the great floods. The floods do not occur every year, but when in the regions where the rivers have their source there have been heavy snows the preceding winter with rains in the following spring; and thus the flood of that year of 1543 was very great on account of the heavy snow which had fallen the preceding winter. These floods occur every 14 years according to what an old Indian woman told us, which can be verified if the country is conquered, as I hope it will be.

* * * * * * *

"Towards the end of April the flood began to subside, as slowly as it had increased, so that even by the 20th of April [May ??] the Spaniards were unable to walk in the streets except by wading in the water.

* * * * * * *

"By the end of May the river had returned within its banks."

[1] Aminoya was a province or village, probably Siouan, situated on the left bank of the Mississippi River, a short distance below the mouth of the Arkansas River. Bureau. of American Ethnology, Smithsonian Institution. Bulletin 30, Part 1.

It will be noticed that the historian thus records the very early prevalence of the conviction that the great Mississippi floods were largely due to heavy snows of the preceding winters, a conviction that still holds many advocates, notwithstanding the increasing weight of evidence against it as later generations have come and gone. Note also the reference to a period of 14 years between the great floods which later records have entirely failed to substantiate. This question of periodicity was discussed briefly in SUPPLEMENT No. 22, Page 3, and a table given showing statistics of severe flood frequency from 1871 to 1922. This table has been revised so as to include the data from 1923 to 1927, and is given below:

TABLE 2.—*Summary of severe flood frequency, 1871–1927*

Station	River	Decade						Total	Average interval between floods (years)
		1871–1880	1881–1890	1891–1900	1901–1910	1911–1920	1921–1927		
Pittsburgh, Pa.	Ohio	0	3	4	8	5	3	23	2.48
Cincinnati, Ohio	do	1	6	5	5	7	1	25	2.28
Nashville, Tenn.	Cumberland	1	5	2	1	6	2	17	3.35
Johnsonville, Tenn.	Tennessee	----	[1]5	4	1	5	3	18	[2]2.39
Kansas City, Mo.	Missouri	0	0	0	3	2	0	5	11.40
St. Louis, Mo.	Mississippi	0	1	1	3	0	1	6	9.50
Cairo, Ill.	Ohio	4	8	5	2	5	2	26	2.19
Memphis, Tenn.	Mississippi	0	0	0	4	5	2	11	5.18
Little Rock, Ark.	Arkansas	4	2	2	1	0	1	10	5.70
Vicksburg, Miss.	Mississippi	1	3	5	2	5	2	18	3.17
Alexandria, La.	Red	0	0	0	1	0	1	2	28.50
New Orleans, La.	Mississippi	1	1	3	3	4	2	14	4.07

[1] Includes 1880. [2] 48 years only.

The data since 1922 did not necessitate any significant changes in the previous table.

Table 3, MONTHLY WEATHER REVIEW SUPPLEMENT No. 22, 1923, gives the crest stages and dates of 11 great floods in the Mississippi. That table has been brought down to date and is presented as Table 3.

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TABLE 3.—*Crest stages and dates during lower*

[Highest stages of record

Station	River	Flood stage	1882		1883		1893		1897	
			Stage	Date	Stage	Date	Stage	Date	Stage	Date
		Feet	*Feet*		*Feet*		*Feet*		*Feet*	
Cincinnati, Ohio	Ohio	52	58.6	Feb. 21	66.3	Feb. 15	50.6	May 2	50.1	Mar. 12
Do	do									
Do	do									
Do	do									
Mount Carmel, Ill	Wabash	16					24.5	May 8[1]	26.4	Mar. 13
Do	do									
Do	do									
Do	do									
Nashville, Tenn	Cumberland	40	38.3	Feb. 22	41.6	Feb. 14	19.9	May 9	48.7	Mar. 21
Do	do									
Do	do									
Do	do									
Do	do									
Johnsonville, Tenn	Tennessee	31	43.8	Jan. 31[1]	29.0	Feb. 2[1]	27.0	May 13	48.0	Mar. 24
Do	do									
Do	do									
Do	do									
Do	do									
Paducah, Ky	Ohio	43	49.9	Feb. 26	50.7	Feb. 25	44.2	May 13	50.9	[1] Mar. 24
Do	do									
Do	do									
Do	do									
Do	do									
Do	do									
Cairo, Ill	do	45	51.9	Feb. 26	52.2	Feb. 27	49.3	May 9[1]	51.6	[1] Mar. 25
Do	do									
Do	do									
Do	do									
Do	do									
Do	do									
Beardstown, Ill	Illinois	14	14.5	Feb. 28	21.8	Feb. 25	16.8	May 5[1]		
Do	do									
Do	do									
Do	do									
Hermann, Mo	Missouri	21	20.3	Feb. 21	20.5	Feb. 17	19.4	May 1		
Do	do									
Do	do									
Do	do									
Do	do									
St. Louis, Mo	Mississippi	30	28.2	Feb. 22	26.2	Feb. 26	31.5	May 3	23.2	[1] Mar. 28
Do	do									
Do	do									
Do	do									
New Madrid, Mo	do	34					38.1	May 9[1]	40.2	[1] Mar 26
Do	do									
Do	do									
Do	do									
Do	do									
Do	do									
Cottonwood Point, Mo	do	35	[2] 37.5	Feb. 28	[2] 37.8	Feb. 28	[2] 36.6	May 12[1]	[2] 39.4	[1] Mar. 22
Do	do									
Do	do									
Do	do									
Do	do									
Memphis, Tenn	do	35	35.2	Mar. 6[1]	34.8	Mar. 5[1]	35.2	May 15[1]	37.1	[1] Mar. 19
Do	do									
Do	do									
Do	do									
Do	do									
Helena, Ark	do	44	47.2	Mar. 9	46.9	Mar. 8[1]	48.0	May 25	51.8	Apr. 4
Do	do									
Do	do									
Do	do									
Little Rock, Ark	Arkansas	23	[2] 27.5	Feb. 25	25.2	Feb. 19	25.2	May 3	21.4	Mar. 21
Do	do									
Do	do									
Do	do									
Do	do									
Clarendon, Ark	White	30					33.9	May 11	31.9	Mar. 30
Do	do									
Do	do									
Do	do									
Do	do									
Arkansas City, Ark	Mississippi	48	47.0	Feb. 28	46.3	Mar. 11[1]	50.3	May 29	51.9	Mar. 29
Do	do									
Do	do									
Do	do									
Greenville, Miss	do	42	41.7	Feb. 27[1]	40.4	Mar. 10[1]	44.3	May 29	46.8	Mar. 29
Do	do									
Do	do									
Do	do									
Yazoo City, Miss	Yazoo	25					25.6	May 23[1]	31.5	[1] May 1
Do	do									
Do	do									
Vicksburg, Miss	Mississippi	45	44.8	Mar. 1[1]	43.1	Mar. 14[1]	48.3	May 22[1]	52.5	Apr. 16
Do	do									
Do	do									
Do	do									
Do	do									
Natchez, Miss	do	46	47.8	Mar. 28[1]	44.0	Apr. 7[1]	46.8	May 22[1]	49.8	[1] Apr. 29
Do	do									
Do	do									
Do	do									
Do	do									
Alexandria, La	Red	36					25.6	June 8	26.3	[1] Apr. 15
Do	do									
Do	do									
Do	do									

[1] And subsequently.

[2] Absolute crest probably on the 7th; nearly stationary from the 4th.

Mississippi floods from 1882 to 1927, inclusive

in bold-face type]

1903		1907		1912		1913		1916		1920		1922		1927	
Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date
Feet		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*	
53.2	Mar. 5	65.2	Jan. 21	51.7	Apr. 5[1]	69.9	Apr. 1	43.9	Feb. 4	54.6	Mar. 22	52.2	Mar. 18	59.1	Jan. 26
										52.6	Apr. 23	48.2	Apr. 19	46.8	Feb. 27
														46.0	Mar. 26
22.3	Mar. 12	24.5	Jan. 28	23.2	Apr. 7[1]	31.0	Mar. 30	26.7	Feb. 6	20.0	Mar. 22	24.1	Mar. 23	39.3	Apr. 13
										23.6	Apr. 28[1]	26.0	Apr. 23	19.6	Feb. 2
														24.3	Mar. 28
														20.7	Apr. 13
40.7	Mar. 9	28.2	Jan. 24	46.6	Apr. 7[1]	44.9	Apr. 2	20.9	Feb. 3	35.8	Mar. 16	45.1	Mar. 16	24.8	June 2
										24.0	Apr. 27	21.7	Apr. 21	56.2	Jan. 1
														40.0	Mar. 14
														30.4	Apr. 14
														12.4	May 14
33.7	Mar. 11	14.5	Jan. 27	35.4	Apr. 6	33.3	Mar. 29	25.0	Jan. 27	29.1	Mar. 17	36.4	Mar. 15	26.9	June 4
										24.9	Apr. 28	20.7	Apr. 23	41.0	[1]Jan. 3
														36.3	Mar. 13
														32.2	Apr. 17
														11.4	May 9
														15.8	June 7
47.6	Mar. 15[1]	45.7	Jan. 28	49.9	Apr. 8[1]	54.3	Apr. 7	45.0	Feb. 9	45.3	Mar. 28	48.9	Mar. 24	46.8	Jan. 6
										42.2	May 1	44.0	Apr. 25[1]	44.2	Feb. 6
														44.6	Mar. 24
														47.2	Apr. 18
														32.5	May 14
														39.9	June 8
50.6	Mar. 15[1]	50.4	Jan. 27	54.0	Apr. 6[1]	54.7	Apr. 4[2]	53.4	Feb. 4	51.4	Mar. 31	53.6	Mar. 25	48.9	Jan. 7
										49.5	May 1[1]	53.5	Apr. 25	48.9	[1]Feb. 6
														52.8	Mar. 25
														56.4	Apr. 20
														44.0	May 14
														49.7	June 9
17.0	Mar. 15[1]	18.3	Jan. 29[1]	18.8	Apr. 4[1]	21.8	Apr. 5[1]	20.6	Jan. 31	18.1	Mar. 31	25.1	Apr. 20	20.0	Feb. 15
										21.3	Apr. 27			20.5	[1]Mar. 28
														25.2	Apr. 26
														24.9	[1]June 8
18.0	Mar. 8	18.3	Jan. 20	22.5	Apr. 4	17.3	Mar. 25	19.6	Jan. 28	20.5	Mar. 30	17.9	Mar. 17	12.0	Feb. 2
										16.8	Apr. 22[1]	24.7	Apr. 18	18.6	Mar. 21
														26.8	Apr. 24
														21.3	May 10
														21.8	June 7
25.8	Mar. 11	26.3	Jan. 23	30.8	Apr. 5	25.8	Mar. 27	31.5	Jan. 31	27.8	Mar. 30	23.9	Mar. 17[1]	27.3	Mar. 21
										28.0	Apr. 24	34.0	Apr. 19	36.1	Apr. 26
														30.3	May 11
														33.0	June 8
39.5	Mar. 16[1]	39.3	Jan. 28[1]	44.0	Apr. 5[1]	44.5	Apr. 9[1]	41.9	Feb. 5[1]	40.2	Apr. 1	41.6	Mar. 27[1]	37.5	[1]Jan. 8
										38.6	May 3	41.7	Apr. 26[1]	37.6	Feb. 8
														40.4	[1]Mar. 25
														[3]43.5	[1]Apr. 21
														34.8	[1]May 14
														39.4	[1]June 10
[4]40.0	Mar. 20.	[4]38.4	Jan. 30[1]	[4]42.0	Apr. 11[1]	[4]42.3	Apr. 11[1]	[4]39.5	Feb. 7	[4]37.6	Apr. 3[1]	[4]38.5	Mar. 28[1]	35.3	Jan. 10
										[4]36.5	May 4[1]	[4]38.4	Apr. 28	35.1	[1]Feb. 9
														37.6	Mar. 27
														40.2	[1]Apr. 22
														36.2	June 12
40.1	Mar. 20	40.3	Feb. 3	45.3	Apr. 6	46.55	Apr. 10	43.5	Feb. 9	40.3	Apr. 5	42.6	Mar. 31[1]	37.7	Jan. 12
										38.7	May 7	42.3	Apr. 29[1]	37.8	[1]Feb. 12
														41.4	Mar. 30
														46.0	Apr. 23
														39.0	[1]June 14
51.0	Mar. 25[1]	50.4	Feb. 5[1]	54.4	Apr. 21	55.2	Apr. 22	53.4	Feb. 11	50.1	Apr. 8[1]	52.3	Apr. 3[1]	46.3	Jan. 15
										48.8	May 9[1]	53.1	May 3	47.3	Feb. 15
														56.75	[1]Apr. 26
														48.0	[1]June 10
23.3	Mar. 13	19.0	Jan. 25	22.3	Apr. 3	17.3	Apr. 13	27.3	Feb. 2	20.6	Mar. 30	14.8	Mar. 21	20.5	Jan. 26
										16.4	May 20	23.1	Apr. 14	17.5	Mar. 25
														33.0	Apr. 20
														17.0	May 12
														19.8	June 25
[4]32.6	Mar. 20	32.5	Jan. 9[1]	32.6	Apr. 14	30.4	Apr. 15[1]	38.5	Feb. 8	29.6	Apr. 8[1]	30.7	Apr. 11[1]	27.7	[1]Jan. 3
										29.2	May 19[1]			32.6	[1]Feb. 4
														28.9	[1]Apr. 1
														43.3	Apr. 23
														20.3	[1]June 15
53.0	Mar. 27[1]	52.1	Feb. 8	55.4	Apr. 12	55.1	Apr. 21[1]	56.4	Feb. 10[1]	54.0	Apr. 11[1]	58.0	Apr. 22[1]	48.7	Jan. 18
										52.4	May 13[1]	57.7	May 3[1]	51.8	[1]Feb. 17
														[3]60.5	Apr. 21
														45.4	[1]June 20
49.1	Mar. 27	47.3	Feb. 8[1]	50.6	Apr. 12	50.4	Apr. 21	50.8	Feb. 11[1]	47.0	Apr. 16	52.1	Apr. 25[1]	41.7	Jan. 19
										45.4	May 13	52.0	May 3[1]	44.8	[1]Feb. 17
														[3]54.7	Apr. 21
														38.6	[1]June 20
28.7	Apr. 5[1]	26.1	Feb. 14[1]	30.4	Apr. 17	29.8	May 2[1]	29.9	Feb. 18	30.8	Apr. 27[1]	31.9	Apr. 29[1]	30.4	Jan. 21
										31.0	May 19[1]			29.9	[1]Feb. 14
														37.4	May 5
51.8	Mar. 27[1]	49.7	Feb. 11	52.1	Apr. 12	52.3	Apr. 27[1]	53.9	Feb. 15	50.8	Apr. 19[1]	55.0	Apr. 28[1]	46.5	Jan. 21
										50.4	May 14[1]	54.7	May 7[1]	49.5	[1]Feb. 21
														[3]55.4	Apr. 22
														58.7	May 4
														48.6	[1]June 29
50.4	Mar. 28[1]	48.9	Feb. 13[1]	51.4	Apr. 14[1]	52.4	Apr. 26[1]	53.6	Feb. 15	51.5	Apr. 28	[3]55.3	Apr. 26	45.4	[1]Jan. 22
										51.2	May 18[1]	[3]52.8	May 9[1]	49.5	[1]Feb. 23
														[3]55.3	Apr. 24
														[3]56.5	[1]May 1
														47.9	June 26
36.2	Mar. 27[1]	22.8	Jan. 13[1]	33.6	Apr. 22	24.2	Apr. 6	36.8	Feb. 16[1]	27.6	Apr. 5	37.1	Apr. 18[1]	32.7	[1]Jan. 1
										37.1	June 2[1]	37.4	May 10	30.6	[1]Feb. 3
														34.6	[1]Mar. 17
														42.4	May 8
														21.4	[1]June 26

[3] Crevasse prevented further rise.

[4] Mississippi River Commission reading.

TABLE 3.—*Crest stages and dates during lower*

[Highest stages of record

Station	River	Flood stage	1882		1883		1893		1897	
			Stage	Date	Stage	Date	Stage	Date	Stage	Date
		Feet	*Feet*		*Feet*		*Feet*		*Feet*	
Baton Rouge, La.	Mississippi	35	36.0	Mar. 26	35.1	Apr. 9	38.4	June 23	40.6	[1] May 12
Do.	do.									
Do.	do.									
Donaldsonville, La.	do.	28					30.6	June 23	32.8	May 13
Do.	do.									
Do.	do.									
New Orleans, La.	do.	17	[2] 15.0	Mar. 27	[2] 15.4	Apr. 7 [1]	[2] 17.4	June 22 [1]	[2] 19.0	[1] May 12
Do.	do.									
Do.	do.									
Monroe, La.	Ouachita	40	49.7				38.6	June 21 [1]	37.9	[1] Apr. 9
Do.	do.									
Do.	do.									
Do.	do.									
Melville, La.	Atchafalaya	37					34.5	June 25 [1]	36.1	May 15
Do.	do.									
Do.	do.									

[1] And subsequently.

[2] Crevasse prevented further rise.

Mississippi floods from 1882 to 1927, inclusive—Continued

[In bold-face type]

1903		1907		1912		1913		1916		1920		1922		1927	
Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage	Date
Feet		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*	
40.0	Apr. 7[1]	37.3	Feb. 14[1]	43.8	May 11[1]	41.3	May 9	42.6	Mar. 1[1]	40.2	Apr. 30	[2]44.6	Apr. 27	34.8	Jan. 26
										41.5	May 22[1]	45.7	May 16	39.0	[1]Feb. 28
														47.8	May 15
32.2	Apr. 4[1]	30.1	Feb. 16[1]	34.8	May 11	32.7	May 8[1]	34.0	Mar. 1	31.6	May 1[1]	[2]35.8	Apr. 27[1]	27.7	Jan. 26
										32.6	May 18[1]	35.9	May 16	31.1	Mar. 1
														37.1	[1]May 15
[3]19.4	Mar. 29	[3]18.6	Feb. 16[1]	[3]21.0	May 11	[3]19.3	May 8	[3]20.0	Mar. 3[1]	[3]19.2	May 18	[2],[3]21.3	Apr. 25	16.6	[1]Jan. 24
														18.8	Mar. 1
														[2]21.0	Apr. 25
44.5	Mar. 26[1]	38.5	Jan. 23[1]	46.2	Apr. 22	36.9	Apr. 29[1]	40.6	Feb. 19[1]	41.0	June 5	42.3	May 9[1]	34.3	[1]Jan. 12
														35.2	[1]Feb. 20
														40.9	[1]Mar. 28
														48.2	May 4
38.7	Apr. 4[1]	37.7	Feb. 19[1]	41.7	May 6[1]	41.5	Apr. 24	43.0	Feb. 14	42.5	May 20[1]	45.9	May 14[1]	35.8	[1]Jan. 26
														39.0	[1]Feb. 28
														46.8	[1]May 14

[3] Mississippi River Commission reading.

CAUSES OF FLOODS OF 1927

During the second week of August, 1926, a period of general rains set in over the portion of the central drainage basin of the Mississippi River, extending from eastern Kansas and eastern Oklahoma east-northeastward throughout the Ohio Valley. By the end of August the soil over this extensive area was well saturated with moisture, and the continuance of the heavy rains through September and early October caused general floods except in the Ohio River where flood stages were not reached although the river was quite high. In portions of the Neosho Valley of Kansas and in the lower Illinois Valley the floods were the greatest and most disastrous of record, and it was not until November 20 that the entire Illinois River had fallen below the flood stage. The foundation was so well laid that there was needed neither a prophetic vision nor a vivid imagination to picture a great flood in the lower Mississippi River in the following spring, contingent only upon a rainfall substantially above the normal quantity during the winter months. October, November, and early December are normally the months of lowest water in the rivers of the United States, yet here in October and November nearly all of the main and tributary rivers below the mouths of the Platte and Des Moines Rivers were well above the normal stages for the season of the year, with the channels of many of the larger streams filled to at least 50 per cent of their natural capacity.

While there may have been some room for speculation even as late as December 15, the great flood in the Tennessee River and the record-breaking flood in the Cumberland River of late December and early January left no further opportunity for doubt. There *would* be a lower Mississippi flood and probably an Ohio flood, and its extent would be measured only by the quantity of winter rainfall and its distribution as to time. As the lower Mississippi flood of 1922 was at that time the highest of record from the mouth of the Arkansas River southward, the mean stages for October and November and the first 15 days of December 1912, 1921, and 1926 for a number of representative stations have been set forth in Table No. 4. The period was ended with December 15, as the first heavy rains set in a few days later. Even a merely cursory inspection of this table will show clearly that with winter rainfall in excess to only a moderate degree, a flood equaling or exceeding that of 1922 might reasonably be expected in the spring of 1927.

The figures for 1912 were included with the idea of affording further illumination in connection with the question of the possible maximum flood of the future, as the flood of 1913 was the greatest of record in the Mississippi River between Cairo, Ill., and Helena, Ark., and also in the Ohio River except in a few localities where it had been exceeded by the flood of February, 1884.

Note particularly the great excesses in 1926 in the Mississippi River below the mouth of the Missouri, and in the Illinois, lower Arkansas, and lower White Rivers, and the relatively large excesses in the Mississippi River at Hannibal, Mo., and in the Osage River at Tuscumbia, Mo. Note also at this time for later reference in connection with future flood possibilities that the excess in the Ohio River above Paducah was not very significant. Taken as a whole, however, the antecedent conditions in the autumn of 1926, by reason of the much higher stages over the major portion of the potential flood area, were at least suggestive of as great a flood in the spring of 1927 as in the spring of 1922. Their relative magnitude could be determined only by the amount and distribution of the winter rains over the great central valleys.

TABLE 4.—*Average river stages October 1 to December 15, 1912, 1921, and 1926*

Station	River	Flood stage	1926	1912	Excess, 1926 over 1912	1921	Excess, 1926 over 1921
		Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
Pittsburgh, Pa.	Ohio	[1] 25	14.6	6.3	8.3	11.4	3.2
Cincinnati, Ohio	do	52	24.9	12.2	12.7	20.8	4.1
Evansville, Ind.	do	35	22.0	14.3	7.7	17.3	4.7
Nashville, Tenn.	Cumberland	40	14.2	6.1	8.1	11.9	2.3
Johnsonville, Tenn.	Tennessee	31	5.0	1.9	3.1	4.8	0.2
Paducah, Ky.	Ohio	43	21.7	16.0	5.7	14.8	6.9
Cairo, Ill.	do	45	31.6	18.9	12.7	21.2	10.4
Hannibal, Mo.	Mississippi	13	9.0	5.5	3.5	4.0	5.0
Beardstown, Ill.	Illinois	14	20.3	-------	-------	10.4	9.9
Tuscumbia, Mo.	Osage	25	10.6	-------	-------	4.1	6.5
Hermann, Mo.	Missouri	21	10.8	4.5	6.3	5.4	5.4
St. Louis, Mo.	Mississippi	30	18.2	10.8	7.4	6.1	12.1
New Madrid, Mo.	do	34	24.3	16.6	7.7	15.2	9.1
Memphis, Tenn.	do	35	23.8	14.4	9.4	13.7	10.1
Helena, Ark.	do	42	30.0	20.8	9.2	16.9	13.1
Clarendon, Ark.	White	30	22.0	13.0	9.0	12.5	9.5
Pine Bluff, Ark.	Arkansas	25	14.4	7.9	6.5	5.7	8.7
Arkansas City, Ark.	Mississippi	48	35.1	23.9	11.2	18.9	16.2
Vicksburg, Miss.	do	45	32.8	24.3	8.5	16.6	16.2
Alexandria, La.	Red	36	12.1	11.6	0.5	3.9	8.2
Monroe, La.	Ouachita	40	13.9	11.2	2.7	5.1	8.8
Baton Rouge, La.	Mississippi	35	22.7	16.4	6.3	9.5	13.2
New Orleans, La.	do	17	9.6	7.4	2.2	3.3	6.3
Melville, La.	Atchafalaya	37	26.3	15.8	10.5	13.8	12.5

[1] On Mar. 1, 1926, the zero mark of the river gage at Pittsburgh, Pa., on the Ohio River was lowered from 697.2 to 694 feet above mean sea level in order that the recorded stages might show the actual height of the water above the bottom of the pool created by the fixed dam 6 miles downstream at Emsworth, Pa. This necessitated a correction of plus 3.2 feet to all gage records previous to Mar. 1, 1926, and this correction should be applied to all data for Pittsburgh previously published. The highest authenticated stage at Pittsburgh will therefore be 41.1 feet on Jan. 9, 1763, and the next 39.2 feet on Jan. 9, 1762. Flood stage at Pittsburgh is now 25 feet. On Feb. 10, 1832, the crest stage was 38.2 feet, and during this flood the Ohio River at Cincinnati reached a stage of 64.2 feet on Feb. 19, flood stage being at 52 feet.

Snow cover.—As in 1922, it appears that the influence of melted snow upon the floods of 1927 was negligible. During the Ohio River flood of the third week of January, 1927, there was melting of an average cover of perhaps 4 or 5 inches north of the Ohio River, but the total water contributed to the main streams could not have exceeded one-half inch, and by the end of February there was no remaining snow of consequence over any portion of the Mississippi drainage except over high mountain altitudes, and this condition prevailed quite generally during March.

Flood increments.—As the flood of 1927 below the mouth of the Yazoo River represented the total effect not only of the original great flood but also that of several other important, but less decided, rises, an attempt has been made to show in Table No. 5 the stages and dates of these secondary rises. The table shows also the lowest stages to which the rivers fell between rises.

TABLE 5.—*Flood crests, with dates, for 1927, in chronological order*

Station	River	Flood stage	Crest		Lowest between crests		Crest		Lowest between crests		Crest		Lowest between crests	
			Height	Date	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date
		Feet	*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*	
Cincinnati, Ohio	Ohio	52	46.3	Dec. 29	11.7	Jan. 15	59.1	Jan. 25	27.4	Feb. 17	46.8	Feb. 27	21.9	Mar. 9.
Nashville, Tenn	Cumberland	40	56.2	Jan. 1	8.8	Jan. 18	31.5	Feb. 4	16.5	Feb. 15	31.4	do	14.6	Mar. 7.
Johnsonville, Tenn	Tennessee	31	41.0	Jan. 3-4	6.9	Jan. 19-20	20.2	Feb. 7	15.8	Feb. 13-14	25.4	Mar. 4	20.4	Mar. 7.
Paducah, Ky	Ohio	43	46.8	Jan. 6	15.6	Jan. 18-19	44.2	Feb. 6	31.7	Feb. 24	37.0	Mar. 4-5	33.4	Mar. 11.
Cairo, Ill	do	45	48.9	Jan. 7	23.6	Jan. 18	48.9	Feb. 6-7	38.0	Feb. 25	41.7	Mar. 5-6	39.0	Mar. 11-12.
St. Louis, Mo	Mississippi	30					17.1	Feb. 10-11	11.0	Mar. 7				
New Madrid, Mo	do	34	37.5	Jan. 8-9	18.3	Jan. 19	37.6	Feb. 8	29.3	Feb. 26	32.1	Mar. 6-7	30.2	Mar. 12.
Memphis, Tenn	do	35	37.7	Jan. 12	20.9	Jan. 22	37.8	Feb. 12-13	30.3	Mar. 1-2	32.7	Mar. 9-10	32.4	Mar. 11.
Clarendon, Ark	White	30	27.7	Jan. 3-4	23.8	Jan. 20	32.6	Feb. 4-5	23.9	Mar. 7				
Helena, Ark	Mississippi	44	46.3	Jan. 15	31.0	Jan. 24	47.3	Feb. 15	39.5	Mar. 5-6				
Little Rock, Ark	Arkansas	23	20.5	Jan. 26					4.0	Feb. 28-Mar. 1.				
Arkansas City, Ark	Mississippi	48	48.7	Jan. 18	42.2	Jan. 26	51.8	Feb. 17-19	45.3	Mar. 8-10				
Greenville, Miss	do	42	41.7	Jan. 19	35.8	Jan. 27	44.8	Feb. 17-20	38.4	Mar. 8-11				
Yazoo City, Miss	Yazoo	25	30.4	Jan. 21	28.3	Feb. 10-11	29.9	Feb. 18	28.1	Mar. 7-8				
Vicksburg, Miss	Mississippi	45	46.5	do	43.3	Jan. 30-31	49.5	Feb. 21-24	45.9	Mar. 12				
Natchez, Miss	do	46	45.4	Jan. 22-24	43.4	Jan. 31-Feb. 2.	49.5	Feb. 23-27	46.7	Mar. 16-18				
Alexandria, La	Red	36	32.7	Jan. 1-2	18.4	Jan. 19	30.6	Feb. 3-4	20.3	Mar. 3				
Monroe, La	Ouachita	40	34.3	Jan. 12-14	32.0	Feb. 3-5	35.2	Feb. 20-22	32.6	Mar. 7	40.9	Mar. 28	40.1	Apr. 8.
Baton Rouge, La	Mississippi	35	34.8	Jan. 26	33.7	do	39.0	Feb. 28	37.2	Mar. 18-19				
Donaldsonville, La	do	28	27.7	do	26.5	Feb. 3-4	31.1	Mar. 1	29.4	Mar. 17-20				
New Orleans, La	do	17	16.6	Jan. 24-27	16.0	Feb. 3-6	18.8	do	17.7	Mar. 14-20				
Melville, La	Atchafalaya	37	35.8	Jan. 26-29	35.5	Feb. 1-5	39.0	Feb. 28-Mar. 2.	38.5	Mar. 12-13				

Station	River	Flood stage	Crest		Lowest between crests		Crest		Lowest between crests		Crest		Lowest between crests	
			Height	Date	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date
		Feet	*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*	
Cincinnati, Ohio	Ohio	52	33.1	Mar. 14			46.0	Mar. 26	27.3	Apr. 1	39.3	Apr. 13	22.3	Apr. 29.
Nashville, Tenn	Cumberland	40	40.0	do	11.6	Mar. 31					30.4	Apr. 14	10.5	May 5.
Johnsonville, Tenn	Tennessee	31	36.3	Mar. 16	12.5	Mar. 30-31					32.0	Apr. 17	15.4	Apr. 27.
Paducah, Ky	Ohio	43	44.6	Mar. 24	41.4	Mar. 31					47.2	Apr. 18	30.9	May 9.
Cairo, Ill	do	45	52.8	Mar. 25	49.2	do					56.4	Apr. 20	41.8	Do.
Kansas City, Mo	Missouri	22	11.4	Mar. 22	9.7	Mar. 26	15.0	Apr. 2	12.6	Apr. 7	24.8	Apr. 21	15.3	Apr. 29.
Hannibal, Mo	Mississippi	13					16.5	Apr. 4	13.8	Apr. 10	18.0	Apr. 22	10.7	May 9.
St. Louis, Mo	do	30	27.3	Mar. 21-22	20.3	Mar. 31	31.0	Apr. 5	28.2	do	30.1	Apr. 26	23.7	May 7.
New Madrid, Mo	do	34	40.4	Mar. 25-26	38.4	Apr. 1-2					43.5	Apr. 21-22	34.1	May 10.
Memphis, Tenn	do	35	41.4	Mar. 30	39.8	Apr. 5					46.0	Apr. 23		
Clarendon, Ark	White	30					28.9	Apr. 1-2	28.5	Apr. 7-8	43.3	do		
Helena, Ark	Mississippi	44	51.0	Apr. 1-2	50.5	Apr. 6-8					56.75	Apr. 26-27		
Little Rock, Ark	Arkansas	23					17.5	Mar. 25	7.5	Apr. 1-2	33.0	Apr. 20	13.0	May 9.
Arkansas City, Ark	Mississippi	48									60.5	Apr. 21		
Greenville, Miss	do	42									54.7	do		
Vicksburg, Miss	do	45									58.7	May 4		
Natchez, Miss	do	46									56.5	May 1 and 4		
Alexandria, La	Red	36					34.6	Mar. 17-19	23.9	Apr. 5	42.4	May 8		
Monroe, La	Ouachita	40									48.2	May 4		
Baton Rouge, La	Mississippi	35									47.8	May 15		
Donaldsonville, La	do	28									37.1	May 15-17		
New Orleans, La	do	17	21.0	Apr. 25	20.2	May 10					20.7	May 15		
Melville, La	Atchafalaya	37									46.8	May 14-16		

Station	River	Flood stage	Crest		Lowest between crests		Crest		Lowest between crests		Crest		Lowest between crests	
			Height	Date	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date
		Feet	*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*	
Cincinnati, Ohio	Ohio	52	32.9	May 5	17.0	May 17	35.0	May 24	25.0	May 29	31.3	June 2	16.3	June 15.
Nashville, Tenn	Cumberland	40									26.9	June 4	9.9	June 17.
Johnsonville, Tenn	Tennessee	31									15.8	June 7		
Paducah, Ky	Ohio	43	32.5	May 14	23.4	May 22					39.9	June 8		
Cairo, Ill	do	45	44.0	do	36.4	May 22-23					49.7	do		
Kansas City, Mo	Missouri	22	21.8	May 18	14.5	May 27-28								
Hannibal, Mo	Mississippi	13	15.7	May 26	13.9	June 2					17.0	June 6		
St. Louis, Mo	do	30	30.3	May 11	24.9	May 24								
New Madrid, Mo	do	34	34.8	May 14-15	29.4	do					39.4	June 10-11		
Memphis, Tenn	do	35			30.7	May 27					39.0	June 14-15		
Clarendon, Ark	White	30			28.0	May 25-26					29.3	June 15-16		
Helena, Ark	Mississippi	44			40.9	May 30-31					48.0	June 16-18		
Little Rock, Ark	Arkansas	23	17.0	May 12	9.8	May 20					19.8	June 25		
Arkansas City, Ark	Mississippi	48			43.4	June 3-4					45.4	June 20-22		
Greenville, Miss	do	42			36.9	June 1					38.6	June 20-21		
Yazoo City, Miss	Yazoo	25	37.4	June 5										
Vicksburg, Miss	Mississippi	45			47.4	June 12-14					48.7	June 25-28		
Natchez, Miss	do	46			47.6	June 16-21					47.0	June 26		
Alexandria, La	Red	36			16.1	June 20					21.4	June 26-27		

It happened that, owing to numerous crevasses, these supplementary rises did not result in increased crests in the lower river, yet they served to prolong the flood below and, what was much more unfortunate, to reinundate large areas from which the waters had receded and in much of which crops had been planted.

Rainfall and flood progress.—As the progress of a flood depends almost entirely upon the amount of precipitation, its distribution, as to location and extent of area covered, and the frequency and rate of fall, another table has been prepared showing the amount of precipitation by weeks over the entire drainage area, beginning with December 18, 1926, and ending with April 30, 1927. The last two weeks of December, 1926, are included on account of the excessive rains of that period over the immediate Ohio Valley and the tributary basin to the southward.

Attention is again invited to the fact that for more than three months previous to the late December rains the principal streams had been very much above their normal low stages for that season of the year, and were still comparatively high when the rains began.

TABLE 6.—*Precipitation by weeks, from December 18, 1926, to April 29, 1927*

OHIO RIVER DRAINAGE BASIN

Station	River	Dec. 18-24	Dec. 25-31	Jan. 1-7	Jan. 8-14	Jan. 15-21	Jan. 22-28	Jan. 29-Feb. 4	Feb. 5-11	Feb. 12-18	Feb. 19-25	Feb. 26-Mar. 4	Mar. 5-11	Mar. 12-18	Mar. 19-25	Mar. 26-Apr. 1	Apr. 2-8	Apr. 9-15	Apr. 16-22	Apr. 23-29	Total
Warren, Pa.	Allegheny	0.14	1.01	0.61	0.09	0.59	0.32	0.48	0.26	1.08	1.14	0.74	0.60	0.47	2.32	0.37	1.86	0.00	0.80	1.46	14.34
Martin, Pa.	Monongahela	0.74	1.62	0.42	0.25	1.45	1.58	0.65	0.46	0.93	2.52	0.39	0.48	0.64	1.88	0.61	0.61	0.83	0.26	0.60	16.92
Pittsburgh, Pa.	Ohio	0.36	1.16	0.75	0.23	1.29	0.88	0.46	0.71	0.88	1.95	0.39	0.36	0.46	2.15	0.67	0.96	0.60	0.58	0.31	15.15
Parkersburg, W. Va.	do	0.90	1.19	0.16	0.41	1.77	1.06	0.70	0.79	1.15	0.97	0.34	0.50	0.96	1.61	1.07	0.21	0.97	0.61	0.49	15.86
Zanesville, Ohio	Muskingum	0.44	1.39	0.10	0.35	1.81	1.15	0.90	0.26	0.99	0.81	0.18	0.27	1.32	1.66	1.11	0.30	0.99	0.20	0.73	14.96
Hinton, W. Va.	Kanawha-New	2.43	2.17	0.43	0.49	0.08	0.25	0.62	0.96	1.02	3.11	0.37	0.62	0.42	0.28	1.61	1.01	2.06	1.30	0.28	19.51
Charleston, W. Va.	do	2.56	1.38	0.18	0.61	1.16	1.24	1.00	1.27	0.53	2.27	0.34	0.90	0.54	0.64	1.36	0.87	1.80	2.04	0.40	21.09
Point Pleasant, W. Va.	Ohio	1.68	1.63	0.08	0.60	2.18	2.21	0.78	0.67	0.99	1.64	0.30	1.20	1.12	1.15	0.92	0.55	1.46	0.91	0.78	20.85
Columbus, Ohio	Scioto	0.59	1.37	0.05	0.40	1.90	1.16	0.66	0.27	0.57	0.40	0.16	0.11	1.63	2.21	0.74	0.83	0.66	0.26	0.88	14.85
Chillicothe, Ohio	do	0.85	1.34	0.07	0.30	1.55	1.32	0.67	0.65	1.10	0.86	0.20	0.27	2.06	2.12	1.36	0.56	1.23	0.48	0.74	18.41
Portsmouth, Ohio	Ohio	1.42	1.49	0.02	0.67	2.63	2.10	0.54	0.91	0.87	1.56	0.16	0.36	0.92	0.78	1.28	0.43	1.30	1.27	0.17	18.88
Cincinnati, Ohio	do	0.69	1.29	T.	0.38	2.53	1.20	0.60	0.87	0.51	0.47	0.05	0.19	1.58	1.17	1.01	0.33	0.65	1.00	0.46	14.98
Dayton, Ohio	Miami	0.66	1.15	0.03	0.54	2.26	1.02	0.53	0.45	0.53	0.23	0.22	0.15	1.15	2.73	1.13	1.11	1.16	0.69	0.96	16.70
Madison, Ind.	Ohio	1.37	1.41	0.00	0.62	3.19	1.57	0.35	0.20	0.22	0.74	0.15	0.46	2.67	2.21	1.08	0.78	0.75	0.80	0.02	18.59
Frankfort, Ky.	Kentucky	2.18	1.55	T.	0.34	3.11	3.46	0.86	0.14	1.31	1.15	0.22	0.86	1.31	1.73	1.72	0.63	1.24	1.00	0.00	22.81
Louisville, Ky.	Ohio	1.81	1.47	T.	0.51	3.09	3.74	0.33	0.12	0.53	1.32	0.36	0.75	2.61	2.04	1.55	0.63	0.88	1.16	0.00	22.90
Bowling Green, Ky.	Barren	5.77	2.38	0.14	0.51	3.79	2.53	0.63	0.24	1.40	0.73	0.67	1.26	2.95	3.00	0.87	1.87	1.35	0.78	0.00	30.87
Woodbury, Ky.	Green	4.43	1.93	T.	0.53	3.42	2.49	0.88	0.25	1.68	0.38	0.57	0.93	2.93	2.62	1.09	1.44	1.19	1.41	0.00	28.17
Evansville, Ind.	Ohio	1.51	0.76	T.	0.51	2.98	2.45	0.21	0.03	0.21	0.46	0.27	0.67	3.54	1.70	2.05	0.64	2.68	1.39	0.00	22.06
Indianapolis, Ind.	White (W. Fork)	0.45	0.91	T.	1.19	1.50	0.41	0.05	0.73	1.12	0.28	0.23	0.44	2.08	3.25	1.02	1.63	1.13	1.35	0.40	18.17
Elliston, Ind.	do	0.44	0.66	T.	0.78	2.37	0.94	0.21	0.15	0.52	0.36	0.07	0.58	1.91	1.69	1.10	2.36	0.37	0.92	0.00	15.43
Terre Haute, Ind.	Wabash	0.66	0.62	T.	1.65	0.83	0.48	0.04	0.43	0.76	0.60	0.03	0.51	1.66	4.27	1.38	0.51	1.14	1.19	0.11	16.87
Mount Carmel, Ill.	do	1.07	0.70	0.00	0.95	2.41	1.63	0.67	0.15	0.42	0.20	0.20	0.37	2.96	1.12	1.62	2.17	2.34	1.54	0.04	20.56
Burnside, Ky.	Cumberland	5.36	3.48	T.	0.44	0.92	0.92	1.35	0.67	1.06	1.47	0.55	1.68	0.74	0.99	1.20	0.83	1.71	1.55	0.32	25.24
Nashville, Tenn.	do	7.03	3.35	T.	0.23	1.26	0.96	1.30	0.82	2.35	0.60	0.74	2.09	3.61	2.09	1.16	0.58	3.35	2.64	T.	34.16
Chattanooga, Tenn.	Tennessee	2.42	4.69	0.00	0.24	0.56	0.34	0.62	0.78	1.93	1.33	1.70	2.90	1.50	0.47	2.34	0.86	5.13	0.67	0.00	28.48
Decatur, Ala.	do	2.60	5.55	0.00	0.30	1.09	0.77	0.64	0.75	2.26	0.40	0.88	2.40	1.77	0.35	0.88	0.29	2.12	0.89	0.00	23.94
Johnsonville, Tenn.	do	8.92	2.86	0.00	0.32	2.40	1.50	1.22	0.90	1.76	0.52	0.50	3.12	4.98	2.66	2.09	0.66	5.82	3.00	0.00	43.23
Cairo Ill.	Ohio	2.25	1.11	T.	0.39	3.48	4.16	0.61	0.41	0.34	0.13	0.41	0.51	2.94	1.25	2.96	2.56	3.14	2.64	T.	29.29

UPPER MISSISSIPPI RIVER DRAINAGE BASIN

Fort Ripley, Minn.	Mississippi	0.07	0.00	0.00	0.05	0.25	0.00	T.	0.15	0.23	0.15	0.00	0.00	0.40	0.11	0.30	1.15	0.51	1.43	0.00	4.80
Mankato, Minn.	Minnesota	0.46	0.00	0.04	0.07	0.30	0.00	0.00	0.53	0.28	0.00	T	0.28	0.48	1.05	0.09	0.94	1.58	1.22	0.29	7.61
St. Paul, Minn.	Mississippi	0.70	T.	T.	0.30	0.25	0.11	0.02	0.15	0.13	T.	T.	0.22	1.03	0.40	0.42	0.68	0.17	0.90	0.41	5.89
Rhinelander, Wis.	Wisconsin	0.12	0.06	0.00	0.16	0.27	0.24	0.22	0.27	T.	0.00	0.12	0.36	0.84	0.41	0.27	0.41	0.00	0.91	0.45	5.11
Park Rapids, Minn.	Mississippi	0.12	0.02	0.00	0.23	0.35	T.	0.46	0.50	0.13	0.26	T.	T.	0.34	0.30	0.40	1.00	0.26	0.45	0.20	5.02
Medford, Wis.	Black	0.17	0.10	0.00	0.25	0.20	0.21	T.	0.10	0.08	0.00	0.14	0.15	1.35	0.44	0.40	0.60	0.15	0.21	0.43	4.98
Wisconsin Rapids, Wis.	Wisconsin											0.00	T.	1.07	0.37	1.10	0.35	T.	1.13	0.47	4.49
Portage, Wis.	do	0.13	0.06	0.07	0.31	0.25	0.13	0.00	0.05	0.02	0.00	T.	0.08	1.14	0.31	0.33	0.33	0.47	1.77	0.62	6.07
Dubuque, Iowa	Mississippi	0.03	T.	0.02	0.29	0.09	0.02	0.54	0.02	0.25	0.01	0.01	1.17	0.29	0.67	0.75	0.67	1.14	0.84	0.60	7.41
Davenport, Iowa	do	0.02	T.	0.05	0.53	0.19	T.	T.	1.68	0.50	0.18	T.	0.21	1.74	0.77	0.85	0.88	1.18	1.59	0.55	10.92
Des Moines, Iowa	Des Moines	0.35	0.03	T.	0.18	0.04	0.02	T.	0.56	0.41	0.22	0.05	0.37	0.64	0.64	2.51	0.64	2.00	1.03	0.44	10.13
Hannibal, Mo.	Mississippi	0.15	0.00	T.	1.13	0.01	0.42	T.	0.58	0.66	0.18	0.11	0.59	1.72	3.11	1.49	0.32	2.46	0.98	0.04	13.95
Peoria, Ill.	Illinois	0.27	0.00	0.03	1.42	0.11	0.19	0.01	1.05	0.61	1.19	T.	0.59	1.63	1.68	0.86	0.37	1.51	2.23	0.53	14.28
Beardstown, Ill.	do	0.37	0.00	0.02	0.88	0.00	0.18	0.00	0.53	0.45	0.48	0.06	0.46	1.90	3.50	1.22	1.39	2.97	1.25	0.03	15.69
St. Louis, Mo.	Mississippi	0.60	0.15	T.	2.42	0.64	0.60	T.	0.29	0.22	0.05	0.30	0.28	0.94	2.45	3.70	0.87	3.88	0.96	T.	18.35
Cape Girardeau, Mo.	do	2.04	0.98	0.00	0.42	2.78	3.93	0.52	0.06	0.44	0.03	0.42	0.62	3.78	1.16	2.68	1.78	3.40	2.07	0.02	27.13

MISSOURI RIVER DRAINAGE BASIN

Helena, Mont.	Missouri	T.	T.	0.03	0.29	0.43	0.04	0.05	0.03	0.14	0.25	0.02	0.07	0.37	0.01	0.30	0.02	0.06	0.15	0.03	2.29
Sheridan, Wyo.	Tongue	0.13	0.04	T.	0.26	0.40	0.04	0.00	0.10	0.19	0.05	0.06	0.40	0.27	0.16	0.16	0.12	3.04	1.13	0.02	6.57
Miles City, Mont.	Yellowstone	0.36	0.00	0.02	0.08	0.50	0.01	T.	0.05	0.05	T.	0.12	0.00	0.13	0.03	0.03	0.10	1.74	0.13	0.35	3.70
Havre, Mont.	Milk	0.21	0.00	0.24	0.01	0.31	0.00	0.17	0.23	0.13	T.	0.03	T.	0.19	0.15	0.17	0.33	0.45	0.40	0.03	3.05
Williston, N. Dak.	Missouri	0.43	0.01	0.33	0.07	0.16	T.	0.06	0.26	0.10	0.04	T.	0.13	0.01	0.10	0.14	0.02	0.47	0.46	0.11	2.90
Bismark, N. Dak.	do	T.	0.00	T.	0.02	0.16	T.	0.06	0.08	0.07	0.04	T.	0.44	T.	0.29	0.20	0.39	0.65	0.30	T.	2.70
Pierre, S. Dak.	do	0.00	0.00	0.00	0.03	0.23	0.03	0.01	T.	0.03	0.06	0.02	0.01	0.29	0.11	0.38	0.69	2.27	0.20	T.	4.36
Valentine, Nebr.	Niobrara	0.00	T.	0.01	0.27	0.24	0.03	0.00	T.	0.09	0.18	0.39	0.92	0.27	0.45	1.14	0.41	2.71	0.24	0.04	7.39
Yankton, S. Dak.	Missouri	0.03	T.	0.00	0.07	0.01	T.	0.43	0.04	0.41	0.01	0.05	1.13	0.44	0.60	1.50	0.84	4.04	0.60	T.	10.20
Cheyenne, Wyo.	South Platte	0.04	0.00	0.00	0.10	0.05	T.	T.	0.35	0.01	0.05	0.73	0.34	0.19	0.59	0.76	0.02	1.87	0.19	0.17	5.46
Denver, Colo.	do	0.31	0.00	0.00	0.14	0.04	0.00	0.00	0.10	0.01	0.00	0.24	0.85	0.38	0.59	0.44	T.	1.29	0.04	0.20	4.63
Fort Morgan, Colo.	do	0.10	0.00	0.00	0.00	0.01	T.	0.00	0.01	T.	0.00	0.46	0.28	0.07	0.22	0.33	0.00	1.33	0.39	0.34	3.54
North Platte, Nebr.	Platte	T.	0.00	0.00	0.04	0.06	T.	0.01	0.01	0.02	0.22	0.25	0.39	0.17	0.50	0.17	T.	2.96	0.20	0.06	5.06
Omaha, Nebr.	Missouri	0.56	0.10	T.	0.09	0.02	T.	0.21	0.05	0.58	T.	0.25	0.42	0.14	0.24	1.13	0.15	1.19	0.43	0.03	5.59
Beatrice, Nebr.	Blue	0.24	0.00	0.00	0.06	T.	0.00	0.25	0.00	0.70	0.00	0.55	0.75	T.	0.15	1.77	0.50	1.70	1.03	3.00	10.70
Concordia, Kans.	Republican	0.24	0.00	0.00	0.10	0.0,	0.03	0.15	0.08	0.93	0.00	0.25	0.79	T.	0.06	1.40	0.14	2.15	0.74	0.76	7.89
Beloit, Kans.	Solomon	0.14	0.00	0.00	0.06	0.03	T.	0.09	0.06	0.71	0.00	0.37	0.19	0.73	0.07	0.80	0.13	1.15	1.12	0.44	6.09
Ellsworth, Kans.	Smoky Hill	0.38	0.00	0.00	0.10	T.	0.20	0.40	0.30	1.00	0.00	0.25	1.63	0.00	T.	0.41	1.02	0.93	0.77	0.93	8.32
Abilene, Kans.	do	0.68	0.00	0.00	0.21	T.	0.02	0.18	0.09	0.52	0.00	0.16	0.40	T.	0.05	1.20	0.30	1.91	1.13	0.10	6.95
Manhattan, Kans.	Kansas	0.29	0.00	0.00	0.23	T.	0.10	0.52	0.07	0.80	0.00	0.20	0.73	T.	0.04	3.14	0.52	2.53	1.83	0.37	11.37
Alton, Kans.	Solomon	T.	0.00	0.00	0.10	T.	T.	0.15	0.15	0.75	0.00	0.70	1.95	0.03	0.20	0.75	0.05	1.41	0.91	0.57	7.72
Topeka, Kans.	Kansas	0.18	0.00	0.00	0.47	0.05	0.21	0.01	0.27	0.45	T.	0.23	0.50	1.40	0.32	3.06	0.36	2.04	2.16	0.37	12.08
Kansas City, Mo.	Missouri	0.13	T.	0.00	0.92	0.08	0.29	T.	0.17	0.63	T.	0.26	0.77	0.48	1.03	2.19	0.41	2.51	2.91	0.17	12.95
Boonville, Mo.	do	0.49	0.00	0.00	0.85	0.02	0.60	0.00	0.42	0.10	T.	0.20	0.62	0.40	3.83	2.86	0.84	3.67	0.40	0.25	15.55
Osceola, Mo.	Osage	1.21	0.00	0.00	1.21	0.08	1.08	0.00	1.02	0.10	0.00	0.75	0.40	0.49	3.43	3.45	1.19	4.83	1.28	0.00	20.52
Warsaw, Mo.	do	0.81	0.00	0.00	1.11	0.12	0.96	0.00	0.44	0.10	0.00	0.24	0.74	1.00	4.30	3.44	1.26	3.96	0.54	T.	19.02
Hermann, Mo.	Missouri	0.98	0.01	0.00	1.35	0.06	0.59	0.00	0.08	0.39	0.00	0.16	0.57	1.34	4.20	3.25	0.52	3.97	0.93	0.00	18.40

T indicates trace.

TABLE 6.—*Precipitation by weeks, from December 18, 1926, to April 29, 1927*

ARKANSAS-WHITE RIVERS DRAINAGE BASIN

Station	River	Dec. 18–24	Dec. 25–31	Jan. 1–7	Jan. 8–14	Jan. 15–21	Jan. 22–28	Jan. 29–Feb. 4	Feb. 5–11	Feb. 12–18	Feb. 19–25	Feb. 26–Mar. 4	Mar. 5–11	Mar. 12–18	Mar. 19–25	Mar. 26–Apr. 1	Apr. 2–8	Apr. 9–15	Apr. 16–22	Apr. 23–29	Total
Garfield, Colo	Little Ark	0.35	0.00	0.00	0.14	0.11	0.22	0.32	0.19	2.74	0.92	1.58	1.07	0.66	0.90	T.	0.00	0.64	0.28	T.	10.12
Pueblo, Colo	Arkansas	0.24	0.00	0.00	0.15	0.08	0.00	0.00	0.37	0.01	0.00	0.53	0.56	0.43	0.18	0.00	T.	0.01	T.	0.06	2.62
Trinidad, Colo	Purgatoire	0.33	0.00	0.00	0.10	0.00	0.00	0.00	0.01	0.09	0.00	0.00	1.29	0.00	0.15	0.08	0.00	0.70	0.28	0.00	3.03
Syracuse, Kans	Arkansas	0.25	0.00	0.00	T.	0.12	T.	0.00	0.00	0.00	0.00	0.34	0.35	0.05	0.20	0.20	0.05	0.75	1.15	T.	3.46
Ashland, Kans	Cimarron	0.22	0.00	0.00	0.00	T.	0.16	T.	0.05	0.27	0.00	0.75	0.88	0.00	T.	0.69	0.14	0.62	0.93	0.07	4.78
Emporia, Kans	Neosho	0.25	0.00	0.00	0.39	T.	0.27	0.20	0.00	0.25	0.00	0.18	1.52	0.00	0.90	2.36	1.03	1.94	2.90	0.55	12.74
Springer, N. Mex	Canadian	0.27	0.00	0.00	0.00	0.00	0.00	0.00	T.	0.00	0.00	0.13	0.21	0.00	0.04	0.06	0.00	0.44	0.10	0.00	1.19
Dalhart, Tex	do	0.14	0.00	0.00	T.	T.	0.00	0.10	0.00	0.00	0.00	0.23	0.20	0.00	0.00	0.09	0.00	0.88	0.02	0.00	1.66
Oswego, Kans	Neosho	0.10	0.00	0.00	0.92	0.00	1.02	0.10	0.32	0.07	0.00	0.35	0.60	0.36	1.23	3.60	0.90	5.70	1.36	0.60	17.23
Woodward, Okla	North Canadian	0.26	0.00	0.60	0.01	0.01	0.10	0.02	0.03	0.62	0.01	0.51	0.01	0.45	0.02	0.75	0.45	0.36	1.21	0.02	4.84
Oklahoma City, Okla	do	1.33	T.	0.00	0.86	T.	0.75	T.	0.20	0.24	0.00	0.66	0.54	0.02	0.13	1.51	1.09	2.93	0.03	0.54	10.83
Calvin, Okla	Canadian	1.75	0.02	0.00	0.96	0.49	0.47	0.16	0.70	0.00	0.00	1.05	0.10	1.94	0.80	0.43	1.70	2.35	2.10	0.46	15.48
Dodge City, Kans	Arkansas	0.01	0.00	0.00	T.	0.01	0.01	0.01	0.10	0.63	0.03	0.44	1.16	0.29	0.04	0.24	2.62	0.77	0.67	0.31	7.34
Wichita, Kans	do	0.33	0.00	0.00	0.30	0.02	0.23	T.	0.15	0.56	0.01	0.40	0.27	0.28	0.27	2.98	1.14	1.63	1.78	0.25	10.60
Okay, Okla	Verdigris	1.22	0.00	0.00	2.00	0.50	1.67	0.95	0.41	0.23	0.00	1.09	0.03	1.28	0.68	0.90	0.70	6.33	2.28	0.04	20.31
Fort Smith, Ark	Arkansas	1.84	0.15	0.00	0.79	0.45	3.36	0.14	0.41	0.53	0.03	1.04	0.16	1.73	0.29	0.75	0.25	6.02	3.33	0.07	21.34
Ozark Beach, Mo	White	0.88	0.12	0.00	1.35	0.49	1.30	0.28	0.15	0.20	0.03	0.00	0.37	1.81	0.81	0.93	0.78	6.15	3.70	0.06	19.41
Ozark, Ark	Arkansas	2.12	0.57	0.00	0.77	1.91	5.00	0.00	0.58	0.52	0.00	0.63	0.00	2.87	0.36	0.65	0.68	6.97	6.28	0.06	29.97
Subiaco, Ark	do	2.50	1.04	0.00	0.70	1.70	4.09	0.08	0.96	0.25	0.11	1.51	0.66	4.67	1.15	0.57	0.65	9.79	6.55	0.01	36.99
Lurton, Ark	White	2.52	0.84	0.00	1.27	2.41	4.79	0.27	0.51	0.89	0.00	0.60	1.39	2.35	0.51	2.26	0.71	10.26	6.17	0.11	37.86
Danville, Ark	Petit Jean	2.75	1.10	0.00	0.50	1.90	5.22	T.	1.17	0.12	T.	1.15	0.47	2.26	T.	1.00	0.30	15.65	5.93	T.	39.52
Morrillton, Ark	Arkansas	3.62	1.60	0.00	0.51	1.84	2.39	0.00	0.81	0.10	0.00	0.50	1.42	0.89	0.52	1.12	0.30	7.30	3.36	0.00	26.28
Little Rock, Ark	do	6.63	1.82	0.00	0.43	1.43	2.56	0.17	1.33	0.58	0.09	1.13	3.69	0.68	1.10	1.23	0.64	5.26	8.90	0.00	37.67
Pine Bluff, Ark	do	6.25	1.31	0.00	0.40	2.96	1.88	0.21	1.16	0.43	0.01	1.45	2.55	1.11	0.83	2.67	0.37	5.21	4.39	0.00	33.19
Poplar Bluff, Mo	Black	2.24	1.28	0.00	0.59	2.51	6.68	0.86	0.41	0.49	0.06	0.36	0.41	3.85	1.01	1.99	2.96	7.82	1.32	0.06	34.90
Corning, Ark	White	3.18	1.52	0.00	0.45	6.17	2.86	0.40	0.10	1.05	0.00	0.32	0.25	4.02	1.09	1.13	1.65	7.35	0.82	0.00	32.36
Black Rock, Ark	Black	4.20	1.18	0.00	0.36	3.66	2.96	0.58	0.31	1.04	0.10	0.43	0.33	4.48	1.51	1.71	2.56	7.15	1.41	T.	34.06
Gilbert, Ark	White	1.58	0.71	0.00	0.45	0.67	6.37	0.56	0.30	0.58	0.02	0.88	0.34	1.56	0.36	1.69	1.43	7.50	5.20	0.10	30.30
Batesville, Ark	do	5.15	1.57	0.00	0.60	3.72	4.45	0.45	0.34	1.60	0.02	0.76	0.77	4.55	1.87	0.93	1.46	7.23	2.67	0.12	38.26
Newport, Ark	do	3.45	1.47	0.00	0.43	2.56	2.07	0.37	0.39	1.12	0.06	0.41	0.89	2.98	1.57	0.90	0.68	6.92	2.36	0.05	28.68
Arlberg, Ark	do	3.57	0.86	0.00	0.52	3.27	5.89	0.20	0.40	0.80	0.00	0.68	1.90	3.97	0.37	1.05	0.88	9.70	3.50	0.30	37.86
Judsonia, Ark	Little Red	4.96	1.19	0.07	0.34	1.90	2.33	T.	0.89	0.62	0.36	0.77	2.01	0.64	1.66	1.01	0.48	9.63	2.59	0.27	31.72
Patterson, Ark	White	6.31	2.02	0.00	0.12	1.75	2.87	0.72	1.68	0.70	0.06	0.16	2.28	2.30	0.84	1.39	0.38	7.78	3.55	0.08	34.99
Clarendon, Ark	White	6.28	1.09	0.00	0.34	1.08	2.05	0.36	1.60	2.70	0.20	1.30	4.56	3.30	2.63	0.59	0.36	4.78	4.40	0.18	37.80

RED RIVER DRAINAGE BASIN

Denison, Tex	Red	3.34	0.87	0.00	1.00	1.00	2.45	0.00	1.17	0.00	0.00	2.80	1.40	0.30	0.15	0.00	0.72	3.95	4.25	0.70	24.10
Arthur City, Tex	do	3.08	T.	0.00	0.13	0.18	2.99	0.00	1.77	0.14	0.00	2.79	1.75	0.74	0.20	0.39	0.98	3.96	1.40	0.52	21.02
Springbank, Ark	do	3.30	1.55	0.00	0.53	2.97	0.31	0.04	1.36	1.03	0.00	2.85	2.14	0.69	1.35	0.35	2.62	4.14	3.08	0.23	28.54
Fulton, Ark	do	4.87	1.20	0.00	0.48	2.07	0.78	0.00	2.49	0.33	0.00	3.93	2.31	1.03	1.20	0.60	4.23	6.63	1.63	0.28	34.06
Ringo Crossing, Tex	Sulphur	5.81	1.16	0.00	0.64	0.87	1.08	0.03	1.95	0.15	0.00	2.30	2.41	1.20	0.49	0.27	2.63	3.10	1.41	0.42	25.92
Jefferson, Tex	Cypress	6.54	0.47	0.00	1.24	1.23	0.41	0.00	3.03	0.49	0.09	0.42	2.10	0.59	2.05	0.00	2.18	3.14	2.22	0.26	26.46
Shreveport, La	Red	5.35	1.71	0.00	0.64	0.65	0.11	0.06	0.35	1.82	0.05	0.72	1.92	1.15	1.43	0.52	4.65	2.44	0.54	0.07	24.18
Alexandria, La	do	1.06	5.91	0.00	0.95	1.17	0.25	T.	T.	5.65	0.50	0.45	1.95	4.63	2.25	T.	2.83	6.40	1.92	0.00	35.92
Arkadelphia, Ark	Ouachita	5.56	1.47	0.00	0.45	2.39	2.56	0.08	1.08	0.40	0.00	2.56	2.90	0.48	0.70	1.10	0.23	5.93	5.45	0.11	33.45
Camden, Ark	do	4.31	1.29	0.00	0.44	2.89	0.52	0.13	1.93	0.94	0.00	2.03	1.38	0.97	0.96	1.51	1.34	4.45	2.48	0.13	27.70
Monroe, La	do	4.39	6.98	0.00	0.79	2.92	0.53	0.09	1.04	4.35	T.	1.62	4.52	4.11	1.71	0.74	2.07	2.60	6.27	0.00	44.73
Melville, La	Atchafalaya	0.20	3.31	0.00	1.00	0.35	0.00	0.00	0.60	9.50	0.25	1.70	1.00	1.20	2.00	0.25	0.06	3.00	0.25	0.00	24.67

LOWER MISSISSIPPI RIVER DRAINAGE BASIN

New Madrid, Mo	Mississippi	3.36	1.79	0.00	0.49	4.93	2.29	0.47	0.30	2.38	0.20	0.42	0.64	4.19	1.90	2.01	1.52	4.92	4.14	T.	35.95
Memphis, Tenn	do	6.44	1.68	0.00	0.30	1.52	1.54	0.44	1.22	0.93	0.09	0.54	3.32	6.18	2.28	0.96	0.11	3.22	9.44	0.01	40.22
Marked Tree, Ark	St. Francis	5.38	1.21	0.00	0.39	2.74	2.16	0.67	1.08	0.86	0.05	0.56	2.22	3.55	1.54	1.04	0.64	4.45	8.23	T.	36.77
Helena, Ark	Mississippi	4.76	2.36	0.00	0.36	1.20	1.96	0.70	0.58	0.86	0.16	1.14	2.20	7.92	1.32	1.04	0.96	2.96	6.48	0.24	37.20
Arkansas City, Ark	do	3.82	4.84	0.00	0.12	1.23	0.46	0.22	1.08	2.11	0.02	2.52	1.67	3.98	1.11	2.74	0.55	4.29	5.01	0.00	35.77
Greenville, Miss	do	6.20	6.60	0.00	0.48	1.47	0.30	0.16	1.05	2.39	0.00	1.86	2.23	3.35	2.11	1.78	0.59	3.90	8.94	0.00	43.11
Yazoo City, Miss	Yazoo	3.24	6.35	0.00	0.13	5.24	0.17	0.02	0.40	5.71	0.00	0.84	2.79	3.46	1.50	1.64	1.25	3.49	0.88	0.00	37.11
Vicksburg, Miss	Mississippi	1.33	6.65	0.00	0.48	3.66	0.13	0.03	0.05	9.45	0.04	1.22	2.42	3.77	1.15	0.95	1.17	2.96	0.61	0.00	36.07
Natchez, Miss	do	0.53	4.40	0.00	0.92	0.45	0.00	T.	0.10	5.46	1.46	0.59	1.72	2.20	1.93	0.00	0.87	3.54	0.79	0.00	24.96
Baton Rouge, La	do	1.95	0.75	0.00	0.87	1.35	0.00	0.00	0.27	5.19	0.42	1.74	0.20	1.60	3.57	0.10	0.02	0.50	0.61	0.00	19.14
Donaldsonville, La	do	0.67	1.14	0.00	1.07	0.22	T.	0.21	0.02	3.44	0.15	2.00	0.61	1.51	4.46	T.	0.00	0.24	4.01	0.00	19.75
New Orleans, La	do	0.12	0.80	0.00	0.55	0.06	T.	0.01	0.44	6.64	1.01	4.17	0.26	1.29	4.32	T.	0.81	T.	14.13	0.00	34.61

T indicates trace.

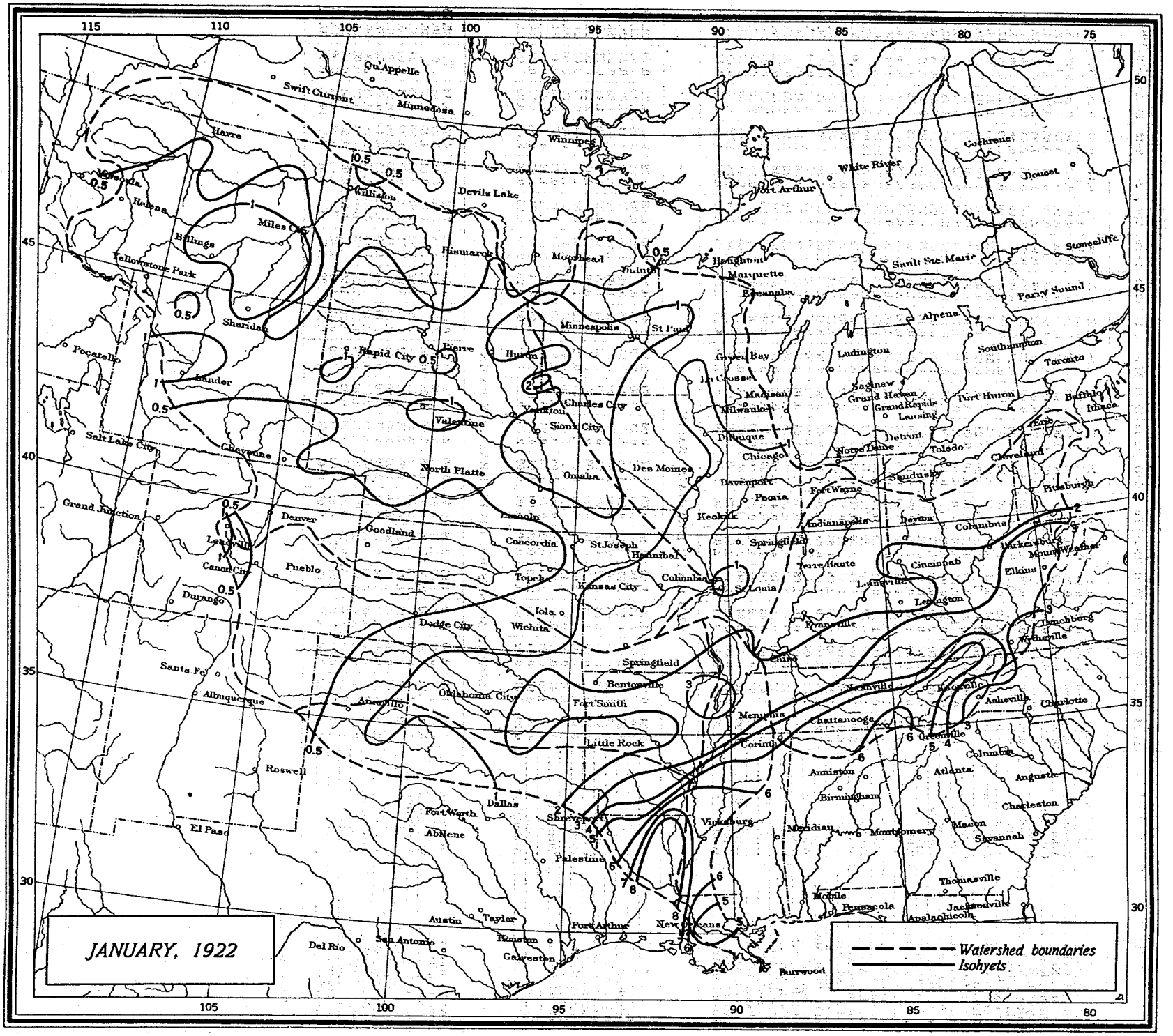

FIG. 3.—Precipitation for January, 1922

FIG. 4.—Precipitation for February, 1922

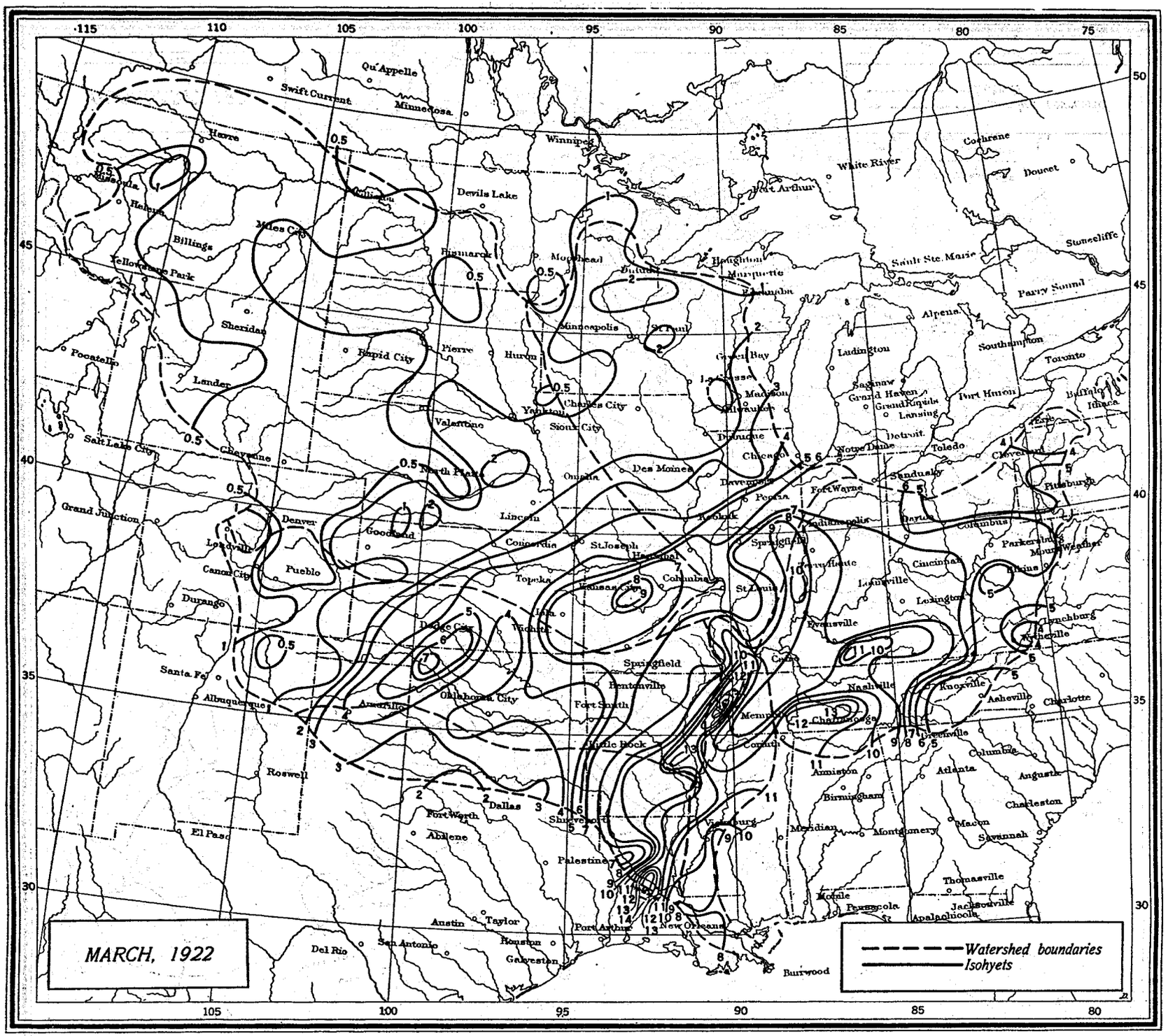

FIG. 5.—Precipitation for March, 1922

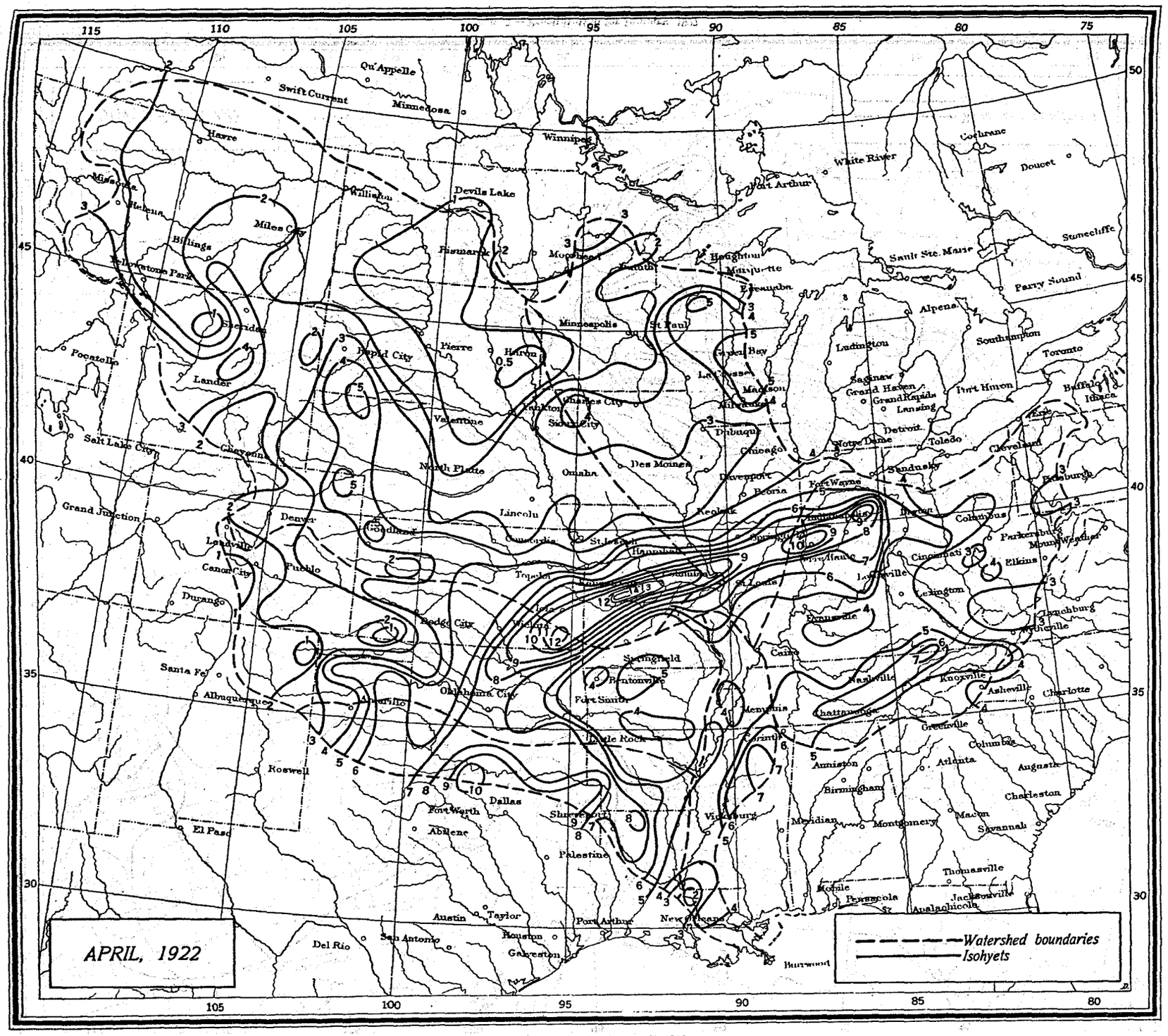

FIG. 6.—Precipitation for April, 1922

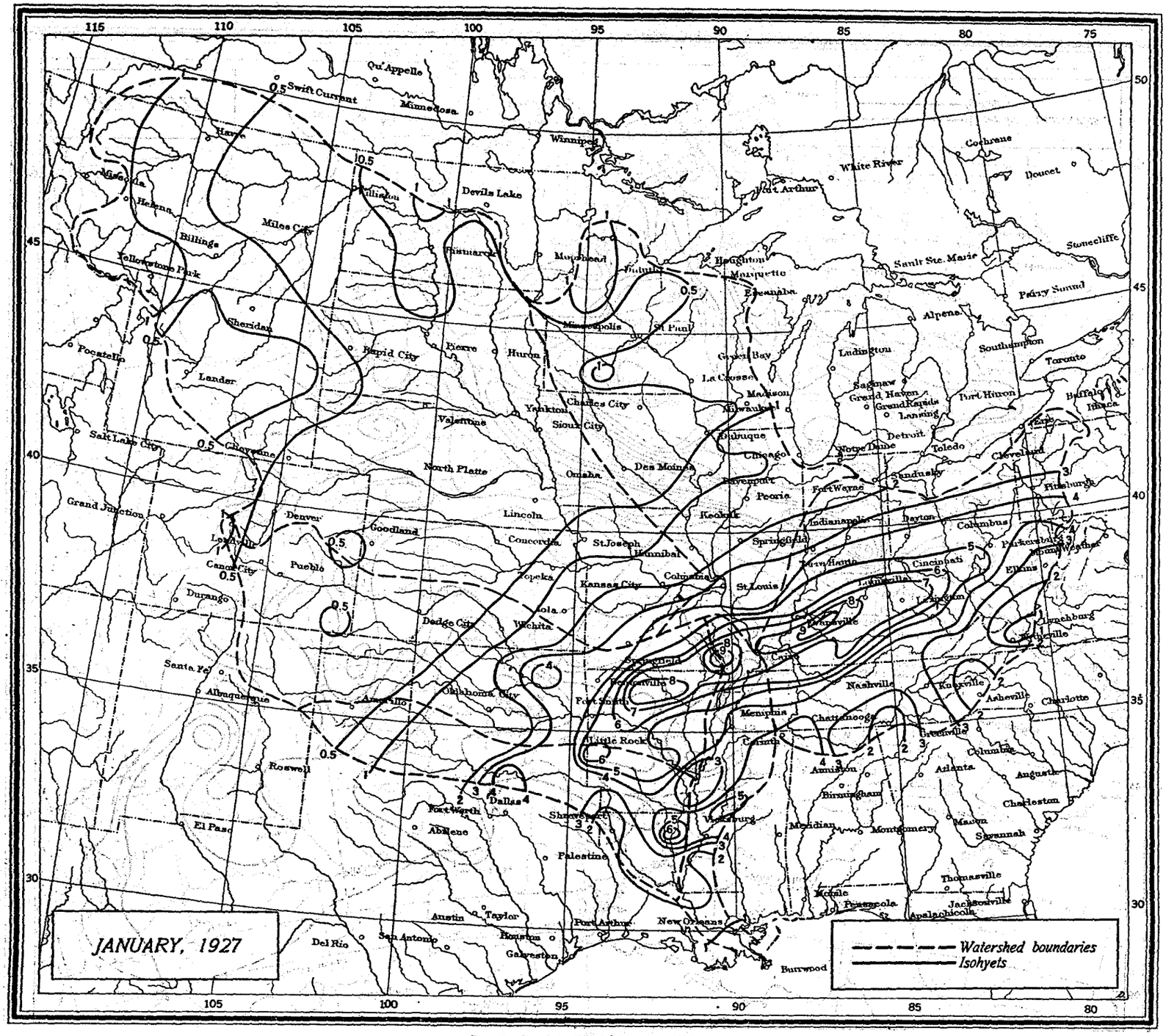

FIG. 7.—Precipitation for January, 1927

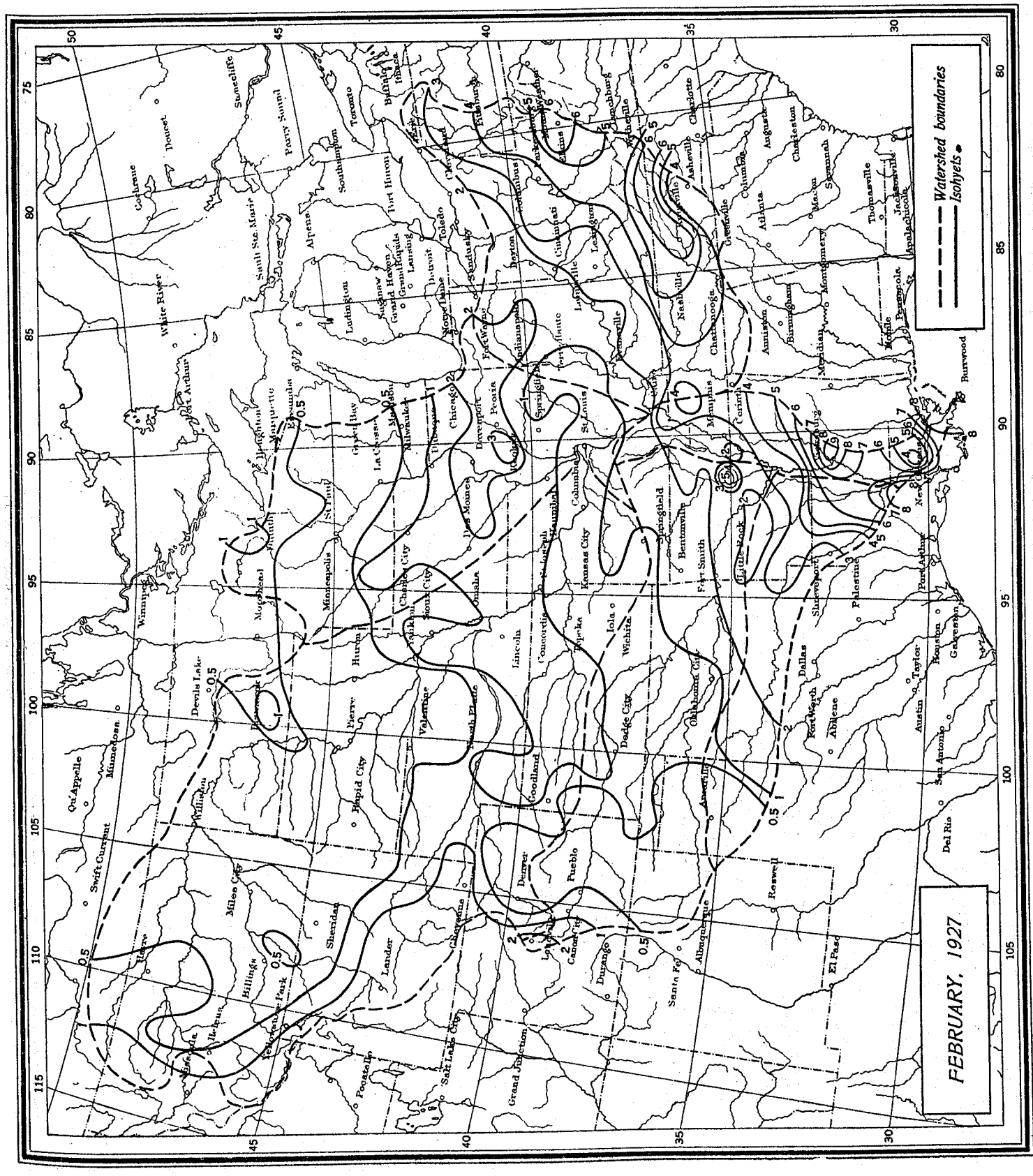

FIG. 8.—Precipitation for February, 1927

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FIG. 9.—Precipitation for March, 1927

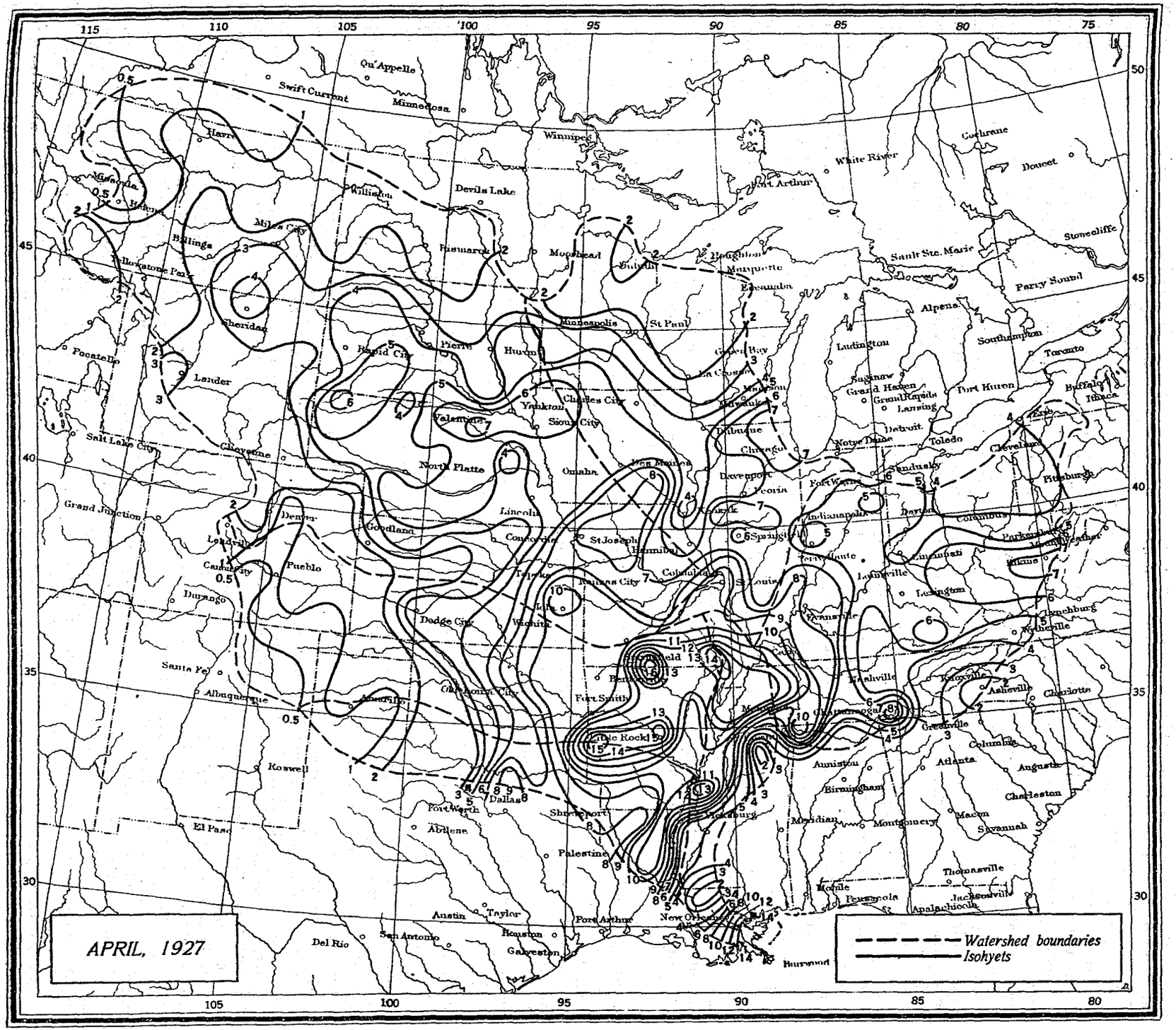


FIG. 10.—Precipitation for April, 1927

The December rains were especially heavy over Kentucky and Tennessee, averaging 9.25 inches over the drainage basin of the Cumberland River and somewhat less over the Tennessee Basin. The result was the greatest flood of record in the Cumberland River, a nearly great flood in the Tennessee and Green Rivers, and a decided rise in the Ohio River with stages from 4 to 6 feet above the flood stages below the mouth of Green River, the crest passing Cairo, Ill., on January 7, 1927.

There had also been abnormal rains during the last two weeks of December over Mississippi and Arkansas, but not over Louisiana, so that, with no support below Cairo, except moderately from the White and Ouachita Rivers, the flood finally passed New Orleans between January 24 and 27 without having exceeded the actual flood stages below Arkansas City, Ark., except and slightly only, at Vicksburg, Miss.

After the end of December there were no rains of much consequence until the third and fourth weeks of January when there was a moderate to heavy fall over the Ohio Valley, the rains being accompanied by high temperatures that also brought out the water from the accumulated snows. At Pittsburgh, Pa., there was a flood crest of 29.7 feet on January 23, and at Cincinnati, Ohio, one of 59.1 feet on January 25. This flood received considerable support from the northern tributaries, but not so much from the southern ones, and the crest of 48.9 feet at Cairo on February 6 and 7 was exactly the same as that of January 7, while the crest of 44.2 feet at Paducah, Ky., was 2.6 feet lower than that of January 6. Below Cairo there was a considerable measure of support received from the Arkansas, lower Red, and Ouachita Rivers, although without heavy February rains, and the crests in the main streams, except at New Orleans, were from 3 to 4 feet higher than during the January flood. At New Orleans the crest was 18.8 feet, or 1.8 feet above the flood stage, on March 1. This flood crest required 38 days to travel from Pittsburgh to New Orleans, while the January crest required but 29 days. The season was advancing, and between the two rises there was sufficient rain to hold the water at the comparatively high stages that are normal to the winter season in the lower Mississippi River. Considerable assistance was rendered in this respect by heavy rains over the Ohio and Red Basins during the week February 12–19. Over the Ohio Basin there was sufficient rise to bring the river at Cairo to a crest of 41.7 feet on March 5–6 from a low point of 38 feet on February 25.

Up to about March 15 there had naturally been no action in the Missouri Basin, but little in the Mississippi Basin above the mouth of the Ohio except in the Illinois, and little, if any, more in the Arkansas Basin, while the Ohio between crests was holding at quite high stage, as were also the Yazoo, Ouachita, and Red, including the Atchafalaya which at Melville, La., had not been below 35 feet since January 19. During the last half of March rain much in excess of the normal amount fell over the Mississippi Basin between the mouth of the Des Moines and the mouth of the Ohio, and during the last week over the Missouri Basin below Omaha, Nebr., especially over the Kansas and Osage subbasins. There was also a 14-day period of heavy rains over the Ohio Basin from March 12–25, heaviest over western Kentucky, western Tennessee, southern Indiana and Illinois; a seven day period, March 12–18, over the lower Mississippi Basin, and fair rains during the last half of the month over the Arkansas and Red Basins. The rivers were too high to be materially influenced by the March 12–18 rains, but those of the following week supplied the necessary stimulus, and a general rise set in below the mouth of the Missouri River. The Osage River was also in flood for a few days of the fourth week of the month. Owing to irregular rainfall distribution, the rise in the Ohio River was not a harmonious one above the mouth of Green River, but the Green and lower Tennessee were both in good flood, and the flood stages were once more passed below the mouth of Green River, the crests occurring nearly at the same time throughout this reach of the river. At Cairo the crest stage of 52.8 feet on March 25 apparently received some assistance from the upper Mississippi River, as St. Louis reported a crest of 27.3 feet on March 21–22. This rise did not extend down the Mississippi River much below Helena, Ark., where there was a crest of 51 feet on April 1–2. However, from the mouth of the Arkansas southward the river had been rising steadily, beginning with March 11 at Arkansas City, and the rise from above was too small to affect it other than perhaps to increase the rate of rise somewhat and to prolong the flood wave.

The month of April showed a general excess of rain over the entire drainage area, the major portion occurring during the first three weeks. Over the upper Mississippi Basin the excess was not large, but over the Missouri Basin it was quite pronounced, especially during the week April 9–15. Below the mouth of the Ohio the rains were heaviest during the 14 days April 9–22, with very heavy falls over the Arkansas Basin. Over the Red Basin the heaviest fall occurred during the week April 9–15, and a week later over the lower Mississippi Basin. As these rains fell, it became apparent that the real flood was yet to come and that it would certainly prove to be the greatest of all floods from Cairo southward.

For the sake of comparison, the monthly precipitation January to April, 1922, is presented in Figures 3 to 6, inclusive. The precipitation January to April, 1927, follows in Figures 7 to 10, inclusive.

While the Ohio River above the mouth of the Green did not again go into flood, there was a decided rise, the Green and Wabash Rivers were well above the flood stages, the upper Mississippi below the mouth of the Des Moines was in moderate flood, with another and greater one to follow, the Missouri from Kansas City, Mo., eastward was high, the St. Francis, Black and White were in marked flood, and the Arkansas finally in great flood, the greatest since 1833. Farther down and a little later the Ouachita, Black, and lower Red Rivers were well above flood stage and still rising at the end of April. The resulting stages are a matter of record elsewhere in this report, and only the occurrence of the great crevasses in Arkansas and Mississippi and Louisiana prevented still higher stages from the mouth of the Arkansas southward. How much higher will be discussed later. It should be stated that the rise at New Orleans was brought to a summary conclusion on April 25 through the dynamiting of the levee at Caernarvon, 14 miles below, and within the two weeks following the river fell 0.5 foot, after which there was a final crest of 20.7 feet on May 15. This latter crest began at Vicksburg on May 4, when the flow of water from the Mounds Landing, Miss., crevasse through the Yazoo Basin was at its peak, and was simply a delayed rise that would have been still greater had the levees above remained intact.

During the months of May, June, and July there was a very slow but general recession that was interrupted, however, by more heavy rains early in May over the Missouri and upper Mississippi Basins that again raised the Mississippi above the flood stage from Hannibal to Cairo and materially checked the fall below. There was

a more decided rise in June with the Ohio as a further contributing factor, with the result that stages from 4 to 5 feet above the flood stage were experienced from Cairo, Ill., to Helena, Ark., and somewhat less from Vicksburg to Natchez, Miss. These latter rises, while not very great, were most unfortunate in that they reoverflowed much land from which the earlier flood had receded and on which crops had again been planted. The latest flood stage recorded was at Baton Rouge, La., where the river did not pass below the flood stage until July 14, while the last overflow water did not pass into the Gulf of Mexico until some time after August 1, 1927. This was over extreme southern Louisiana.

Table 7 shows the number of days the rivers were above flood stages during the flood of 1927.

TABLE 7.—*Number of days rivers were above flood stages during spring floods of 1927*

River	Station	Flood stage	Duration and dates: Number of days	Total days	Dates
Pittsburgh, Pa	Ohio	25	3	3	Jan. 22-24.
Zanesville, Ohio	Muskingum	25	2	2	Jan. 23-24.
Cincinnati, Ohio	Ohio	52	7	7	Jan. 24 30.
Frankfort, Ky	Kentucky	31	3	3	Jan. 22-24.
Louisville, Ky	Ohio	28	9	9	Jan. 24-Feb. 1.
Lock No. 2, Rumsey, Ky.	Green	34	22		Jan. 22-Feb. 12.
Do	do		25	47	Mar. 13-Apr. 6.
Evansville, Ind	Ohio	35	18		Jan. 23-Feb. 9.
Do	do		8		Feb. 26-Mar. 5.
Do	do		18	44	Mar. 20-Apr. 6.
Mount Carmel, Ill	Wabash	16	27		Jan. 23-Feb. 18.
Do	do		41		Mar. 19-Apr. 28.
Do	do		22	90	May 22-June 12.
Clarksville, Tenn	Cumberland	46	19		Dec. 22, 1926-Jan. 9, 1927.
Do	do		5	24	Mar. 13-17.
Johnsonville, Tenn	Tennessee	31	17		Dec. 26, 1926-Jan. 11, 1927.
Do	do		8		Mar. 14-21.
Do	do		4	29	Apr. 15-18.
Paducah, Ky	Ohio	43	11		Jan. 1-11.
Do	do		6		Feb. 3-8.
Do	do		8		Mar. 20-27.
Do	do		12	37	Apr. 13-24.
Cairo, Ill	do	45	12		Jan. 1-12.
Do	do		13		Feb. 1-13.
Do	do		50		Mar. 17-May 5.
Do	do		13	88	June 2-14.
Keokuk, Iowa	Mississippi	14	5	5	Apr. 20-24.
Hannibal, Mo	do	13	29		Mar. 31-Apr. 28.
Do	do		2		May 20-21.
Do	do		16	47	May 25-June 9.
Beardstown, Ill	Illinois	14	31		Dec. 1-31, 1926.
Do	do		155	186	Feb. 4-July 8.
Grafton, Ill	Mississippi	18	4		Mar. 21-24.
Do	do		33		Apr. 2-May 4.
Do	do		4		May 10-13.
Do	do		25	66	May 25-June 18.
Omaha, Nebr	Missouri	19	3	3	May 14-16.
Kansas City, Mo	do	22	4	4	Apr. 19-22.
Chillicothe, Mo	Grand	18	4		Apr. 2-5.
Do	do		15		Apr. 10-24.
Do	do		3	22	June 4-6.
Tuscumbia, Mo	Osage	25	8		Mar. 20-27.
Do	do		8		Apr. 1-8.
Do	do		19		Apr. 11-29.
Do	do		2	37	June 24-25.
Hermann, Mo	Missouri	21	17		Apr. 12-28.
Do	do		1		May 10.
Do	do		3	21	June 5-7.
St. Louis, Mo	Mississippi	30	4		Apr. 4-7.
Do	do		19		Apr. 13-May 1.
Do	do		1		May 11.
Do	do		8	32	June 4-11.
Cape Girardeau, Mo	Mississippi	30	7		Mar. 22-28.
Do	do		35		Apr. 2-May 6.
Do	do		6		May 10-15.
Do	do		26	74	May 26-June 20.
New Madrid, Mo	do	34	13		Jan. 1-13.
Do	do		16		Feb. 1-16.
Do	do		61		Mar. 17-May 16.
Do	do		18	108	June 1-18.
Memphis, Tenn	do	35	12		Jan. 5-16.
Do	do		16		Feb. 5-20.
Do	do		62		Mar. 19-May 19.
Do	do		17	107	June 6-22.
Marked Tree, Ark	St. Francis	17	20		Feb. 1-20.
Do	do		71	91	Apr. 9-June 18.
Helena, Ark	Mississippi	44	10		Jan. 9-18.
Do	do		18		Feb. 7-24.
Do	do		65		Mar. 20-May 23.
Do	do		18	111	June 8-25.
Oswego, Kans	Neosho	17	3		Mar. 20-22.
Do	do		4		Apr. 2-5.
Do	do		19		Apr. 9-27.
Do	do		3	29	May 8-10.
Fort Smith, Ark	Arkansas	22	17	17	Apr. 12-28.
Little Rock, Ark	do	23	16	16	Apr. 15-30.
Pine Bluff, Ark	do	25	19	19	Apr. 15-May 3.
Black Rock, Ark	Black	14	25		Jan. 21-Feb. 14.
Do	do		104	129	Mar. 18-June 29.
Clarendon, Ark	White	30	14		Jan. 31-Feb. 13.
Do	do		27	41	Apr. 16-May 12.
Arkansas City, Ark	Mississippi	48	7		Jan. 14-20.
Do	do		24		Feb. 6-Mar. 1.
Do	do		50	81	Mar. 22-May 10.
Greenville, Miss	do	42	21		Feb. 8-28.
Do	do		48	69	Mar. 24-May 10.
Greenwood, Miss	Yazoo	36	11	11	Dec. 31, 1926-Jan. 10, 27.
Yazoo City, Miss	do	25	185	185	Jan. 9-July 12.
Vicksburg, Miss	Mississippi	45	10		Jan. 16-25.
Do	do		156	166	Feb. 6-July 11.
Natchez, Miss	do	46	149	149	Feb. 12-July 10.
Alexandria, La	Red	36	29	29	Apr. 20-May 18.
Camden, Ark	Ouachita	30	10		Dec. 24, 1926-Jan. 2, 27.
Do	do		9		Jan. 25-Feb. 2.
Do	do		8		Mar. 10-17.
Do	do		15	42	Apr. 16-30.
Monroe, La	do	40	90	90	Mar. 20-June 17.
Baton Rouge, La	Mississippi	35	153	153	Feb. 12-July 14.
Donaldsonville, La	do	28	147	147	Feb 12-July 8.
New Orleans, La	do	17	120	120	Feb. 13-June 12.
Melville, La	Atchafalaya	37	120	120	Feb. 14-June 13.
Morgan City, La	do	8	31	31	May 26-June 25.

Analysis of rainfall.—In order to present the rainfall data with greater precision than can be accomplished by the ordinary systems of averages, recourse was had to the general plan adopted in 1922, and a description thereof is as follows: The rainfall for each drainage basin was computed according to a method suggested by Prof. C. F. Marvin. The method follows: Monthly data for a large number of stations were charted and isohyetal lines carefully drawn. These lines were then traced upon sheets of cross-section paper together with the outlines of the six drainage areas.

The isohyets divide the drainage basins into various irregular, small subareas, over which the precipitation may be assumed to be uniform and of an amount represented by the mean between the two adjacent isohyetals. Therefore the number of squares in each subarea was counted. This number was then multiplied by the average precipitation for the subarea in question and the product divided by the sum of the counts for all the

subareas, which latter, of course, is the number of squares in the whole drainage basin being studied. Finally, the sum of the quotients found in the above manner gives the depth of precipitation, which, spread uniformly over the whole basin, would represent the same amount of water as fell in the irregularly distributed precipitation.

In Monthly Weather Review Supplement No. 22 the entire drainage area of 1,250,900 square miles was not used, the extreme upper Arkansas, the upper Missouri, and the extreme upper Mississippi Valleys having been eliminated for the reason that their precipitation in winter and spring being small and mostly in the form of snow, usually contributed little or nothing to flood conditions. About 30 per cent of the total area was thus eliminated, but owing to the substantial amounts of precipitation over these upper areas in 1927 it became necessary to compute the depth of water over the entire area, and equally necessary for purposes of proper comparison to recompute on the same basis the data for 1882, 1903, 1912, 1913, and 1922. The results of the computations are as given in Table 8, and with them are also the departures from the normal values.

Table 8.—*Precipitation for six floods in terms of inches of water over entire drainage area, and normal departures for same*

[Departures plus when without sign]

Subarea	Drainage (square miles)	1882								1903							
		January		February		March		Total		January		February		March		Total	
		Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure
Upper Mississippi	187,850	0.17	−0.04	0.49	0.29	0.44	0.14	1.10	0.39	0.10	−0.11	0.24	0.04	0.33	0.03	0.67	−0.04
Missouri	528,850	0.20	−0.10	0.55	0.22	0.44	−0.06	1.19	0.06	0.23	−0.07	0.53	0.20	0.47	−0.02	1.23	0.11
Ohio	203,900	0.94	0.29	0.92	0.39	0.73	0.02	2.59	0.70	0.33	−0.32	0.86	0.33	0.59	−0.12	1.78	−0.11
Arkansas-White	186,000	0.24	0.03	0.47	0.25	0.31	−0.01	1.02	0.27	0.11	−0.10	0.50	0.28	0.27	−0.05	0.88	0.13
Red	90,000	0.35	0.17	0.29	0.12	0.20	−0.03	0.84	0.26	0.13	−0.05	0.41	0.24	0.26	0.03	0.80	0.22
Lower Mississippi	54,300	0.37	0.16	0.31	0.12	0.26	0.04	0.94	0.32	0.17	−0.04	0.33	0.14	0.25	0.03	0.75	0.13
Total	1,250,900	2.27	0.51	3.03	1.39	2.38	0.10	7.68	2.00	1.07	−0.69	2.87	1.23	2.17	−0.10	6.11	0.44

Subarea	Drainage (square miles)	1912								1913							
		February		March		April		Total		January		February		March		Total	
		Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure
Upper Mississippi	187,850	0.16	−0.04	0.30	0.00	0.50	0.08	0.96	0.04	0.24	0.03	0.20	0.00	0.48	0.18	0.92	0.21
Missouri	528,850	0.45	0.12	0.87	0.38	1.12	0.27	2.44	0.77	0.35	0.05	0.44	0.11	0.68	0.19	1.47	0.35
Ohio	203,900	0.37	−0.16	0.83	0.13	0.83	0.21	2.03	0.18	0.98	0.33	0.37	−0.16	0.58	−0.13	1.93	0.04
Arkansas-White	186,000	0.31	0.09	0.43	0.11	0.50	0.05	1.24	0.25	0.31	0.10	0.24	0.02	0.23	−0.09	0.78	0.03
Red	90,000	0.13	−0.04	0.35	0.12	0.29	−0.02	0.77	0.06	0.22	0.04	0.20	0.03	0.15	−0.08	0.57	−0.01
Lower Mississippi	54,300	0.12	−0.07	0.34	0.12	0.34	0.12	0.80	0.17	0.34	0.13	0.21	0.02	0.22	0.00	0.77	0.15
Total	1,250,900	1.54	−0.10	3.12	0.86	3.58	0.71	8.24	1.47	2.44	0.68	1.66	0.02	2.34	0.07	6.44	0.77

Subarea	Drainage (square miles)	1922										1927										Dec. 18-31, 1926		1927 total, including Dec. 18-31, 1926	
		January		February		March		April		Total		January		February		March		April		Total					
		Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure	Amount	Departure
Upper Mississippi	187,850	0.16	−0.05	0.31	0.11	0.35	0.05	0.53	0.11	1.35	0.22	0.15	−0.06	0.15	−0.05	0.40	0.10	0.64	0.22	1.34	0.21	0.08	−0.01	1.42	0.20
Missouri	528,850	0.29	−0.01	0.44	0.11	0.89	0.39	1.48	0.63	3.10	1.12	0.25	−0.05	0.28	−0.05	0.63	0.14	1.59	0.74	2.75	0.78	0.07	−0.07	2.82	0.71
Ohio	203,900	0.44	−0.21	0.41	−0.12	0.92	0.21	0.66	0.04	2.43	−0.08	0.67	0.02	0.54	0.01	0.82	0.11	0.95	0.33	2.98	0.47	0.70	0.43	3.68	0.90
Arkansas-White	186,000	0.18	−0.03	0.21	−0.01	0.60	0.28	0.62	0.17	1.61	0.41	0.30	0.09	0.16	−0.06	0.48	0.16	0.69	0.24	1.63	0.43	0.22	−0.11	1.85	0.32
Red	90,000	0.19	0.01	0.22	0.05	0.40	0.17	0.36	0.05	1.17	0.23	0.17	−0.01	0.17	0.00	0.29	0.06	0.42	0.11	1.05	0.16	0.25	−0.15	1.30	0.01
Lower Mississippi	54,300	0.19	−0.02	0.21	0.02	0.36	0.14	0.16	−0.06	0.92	0.08	0.16	−0.05	0.18	−0.01	0.37	0.15	0.33	0.11	1.04	0.20	0.27	−0.17	1.31	0.03
Total	1,250,900	1.45	−0.31	1.80	0.16	3.52	1.24	3.81	0.04	10.58	2.03	1.70	−0.06	1.48	−0.16	2.99	0.72	4.62	1.75	10.79	2.25	1.59	−0.08	12.38	2.17

The time of occurrence and the spatial distribution of the precipitation govern the magnitude of the spring floods of the central and lower Mississippi River and its tributaries. Hitherto it has been considered an indisputable fact, and the previous records certainly sustain this conviction, that there can be no great flood in the Mississippi River below Cairo unless it should be preceded by a great and general Ohio River flood. But the flood of 1927 has apparently shattered this conviction so far as the section from the mouth of the Arkansas River southward is concerned. In the absence of definite figures the estimated discharge of the Arkansas and White Rivers, had the levees remained intact, certainly lend tentative support to this conclusion, and the primary reason therefor goes back to the almost saturated soil that had not been afforded an opportunity to dispose of the excess water received from the rains of the autumn of 1926.

The inclusion of the entire drainage area in Table 8 did not cause any material change in the relative order of flood magnitude as given in Table 10, Monthly Weather Review Supplement No. 22 (loc. cit.). The

flood of 1912 apparently displaced that of 1882 by a margin of 0.56 inch of water over the entire basin. Otherwise the order would be the same, but of course with the flood of 1927 at the head. There can be no proper comparison between the floods of 1882 and 1912 from Cairo southward, as in 1882 the general levee system was virtually in its infancy, while in 1912 it was approaching completion. However, the excess precipitation over the upper Mississippi and Missouri Basins easily decides the question of magnitude. In both floods the Ohio Basin was as usual, the decisive factor, but in 1882, when the flood was an early one, the precipitation was not unusual above Cairo, while in 1912 it was considerably over the normal amount from the extreme lower Missouri Basin eastward over the adjacent Mississippi Basin. Below Cairo conditions were much the same during both years, although of course the 1912 stages were higher.

When we come to compare the floods of 1922 and 1927, Table 8 does not disclose any significant differences, the totals being 10.58 inches for 1922 and 10.79 inches for 1927, excluding from the latter 1.59 inches that fell during the last two weeks of December, 1926. This 1.59 inches, of which nearly one-half came from the Ohio drainage, accounts for much of the superiority of the flood of 1927, although the torrential rains of April over the lower Arkansas Valley played an equally important part.

It therefore appears that, measured by the comparative depths of water precipitated over the entire drainage basin of the Mississippi River, the relative order of magnitude of six of the great floods of the last 45 years will be as follows: 1927, 1922, 1912, 1882, 1913, and 1903. But it must be remembered that precipitation figures are not the only important governing factors in flood causation. The spatial distribution of the precipitation and its amount in point of time are at least of equal importance.

Run-off.—In SUPPLEMENT No. 22 (loc. cit.) (The Spring Floods of 1922), pages 7 and 8, there were exhibited the rainfall (uniform cover) and the total discharge over the abridged drainage area described on pages 8 and 9. The discharge figures were based upon the average ratio of discharge to precipitation as assumed by Humphreys and Abbott and by Greenleaf and were as follows:

Ratio of discharge to precipitation

Basin:	Ratio
Ohio	0.30
Upper Mississippi	.28
Missouri	.15
Arkansas	.16
Red	.22
Lower Mississippi	.52
Entire basin	.25

In Bulletin E, Floods of the Mississippi River, Weather Bureau, 1897, Morrill computed the normal annual discharge of the entire Mississippi Basin to be 785,190,000,000 cubic yards, using as a basis certain deductions made by Humphreys and Abbott.[1] In 1926 and 1927, Messrs. M. W. Hayes and W. J. Moxom, of the St. Louis Weather Bureau Office, computed the normal annual precipitation of the basin in terms of the weighted monthly means of the individual subbasins multiplied by the ratios between the subbasin areas and the area of the entire basin. They found the normal annual precipitation to be 30.11 inches. Using 0.25 as the ratio of discharge to precipitation we obtain as the present total annual discharge 810,174,940,640 cubic yards, which differs from the figures obtained by Morrill by only 3 per cent, a remarkable agreement when we take into consideration the limited data available during the last century.

No discharge figures for 1927 are available, and therefore the above procedure was followed except that on account of the important part played in 1927 by the Missouri and upper Mississippi Valleys the entire drainage area was used, and the discharge data for the floods of 1882, 1903, 1912, 1913, and 1922 recomputed on that basis. While the results, of course, are only the product of average conditions, they may nevertheless afford some comparative idea of the amount of water that actually entered the streams at some point or other. Attention is invited to the fact that much of the winter precipitation over that portion of the drainage basin of the Mississippi River above the mouth of the Missouri and that of the Missouri River above the mouth of the Platte is in the form of snow of which very little is contributed to the actual run-off. Therefore, the winter figures for the districts mentioned are probably in excess to a fair amount. Data for the six floods are given in Table 9 following:

[1] Section on Hydrology in Report on the Water Power of the Mississippi River, Tenth Census.

TABLE 9.—*Approximate discharge, for six floods, in millions of cubic yards*

Subarea	1882				1903				1912				1913			
	January	February	March	Total	January	February	March	Total	February	March	April	Total	January	February	March	Total
Upper Mississippi	5,123	14,767	13,260	33,150	3,014	7,232	9,945	20,191	4,822	9,041	15,068	28,931	7,233	6,027	14,465	27,725
Missouri	3,229	8,879	7,104	19,212	3,713	8,556	7,588	19,857	7,265	14,046	18,082	39,393	5,651	7,103	10,978	23,732
Ohio	30,351	29,706	23,570	83,627	10,656	27,768	19,051	57,474	11,947	26,800	26,800	65,547	31,643	11,947	18,727	62,317
Arkansas-White	4,133	8,094	5,338	17,565	1,894	8,610	4,650	15,154	5,338	7,405	8,610	21,353	5,338	4,133	3,961	13,432
Red	8,287	6,867	4,736	19,890	3,078	9,708	6,156	18,942	3,078	8,287	6,867	18,232	5,209	4,736	3,552	13,497
Lower Mississippi	20,708	17,350	14,551	52,609	9,514	18,469	13,992	41,975	6,717	19,029	19,029	44,775	19,029	11,753	12,312	43,094
Total	71,831	85,663	68,559	226,053	31,868	80,343	61,382	173,593	39,167	84,608	94,456	218,231	74,103	45,699	63,995	183,797

Subarea	1922					1927					Dec. 18–31, 1926	Total, including Dec. 18 to 31, 1926
	January	February	March	April	Total	January	February	March	April	Total		
Upper Mississippi	4,822	9,342	10,548	15,972	40,684	4,520	4,520	12,055	19,287	40,382	2,411	42,793
Missouri	4,682	7,103	14,368	23,894	50,047	4,036	4,520	10,171	25,669	44,396	1,130	45,526
Ohio	14,207	13,238	29,706	21,310	78,461	21,633	17,436	26,477	30,674	96,220	22,602	118,822
Arkansas-White	3,100	3,616	10,332	10,677	27,725	5,166	2,755	8,266	11,882	28,069	3,788	31,857
Red	4,499	5,209	9,471	8,524	27,703	4,025	4,025	6,867	9,945	24,862	5,919	30,781
Lower Mississippi	10,634	11,753	20,148	8,955	51,490	8,955	10,074	20,708	18,469	58,206	15,111	73,317
Total	41,944	50,261	94,573	89,332	276,110	48,335	43,330	84,544	115,926	292,135	50,961	343,096

The figures in the above table although of course only close approximations show clearly the supremacy of the floods of 1927 and 1922 above all others, as well as the outstanding supremacy of the flood of 1927. Moreover the great excess discharge in April, 1927, affords a sufficient explanation of the increased magnitude of the flood of 1927. It is noted also that the greater portion of the excess of 1927 came from the Ohio and lower Mississippi drainage, especially the Ohio. It also appears further that the total discharge for January and February for the two floods, 1922 and 1927, did not differ materially, March and April, 1927, virtually supplying the entire excess over 1922.

The total volume of water supplied by the rain in 1927 was 244.4 cubic miles for the period from December 18,1926, to April 30, 1927, and 213 cubic miles for the period from January 1 to April 30, 1927. The total discharge for 1927 computed on a basis of 27 per cent of the water over the area was 66 cubic miles for the long period, and on a basis of 26 per cent, 55. 4 cubic miles for the short period. The total movement of water of the Gulf Stream through the Straits of Florida in one day of 24 hours is 240.7 cubic miles,[1] or 3.7 cubic miles less than that that fell in the form of rain over the drainage basin of the Mississippi River from December 18, 1926, to April 30, 1927.

Probability of greater floods.—What would have been the actual crest stages in 1927 from Paducah to New New Orleans had all levees remained intact and the amount and distribution of precipitation been the same? This question does not appear to be difficult to answer within reasonable limits of correctness for the section between Cairo and Helena, but below Helena there must be a certain measure of speculation owing to the ifficulty of accurate determination as to the volume of water diverted through the crevasses from the main channels. This is particularly true for Arkansas City, Ark., for it is believed that the discharge data computed by the United States Engineer Corps will show the greatest run-off ever recorded in the lower Arkansas and lower White Rivers. The flood crest in the lower Arkansas as measured by the gage heights at Little Rock was only 1.6 feet lower than that of June, 1833, at which time there could not have been any levees of consequence, leaving the fair inference that the discharge at Arkansas City would have been greater in 1927 had the levees held. The situation at Arkansas City was further complicated by the great crevasse at Mounds Landing, Miss., almost directly opposite Arkansas City. This crevasse occurred almost simultaneously with the maximum stage of 60.5 feet at Arkansas City on the morning of April 21.

Table 10 below gives for Paducah, Ky., and Cairo, Ill., on the Ohio River and various places on the Mississippi River from St. Louis to New Orleans the estimated stages that would have been reached in 1927, had all levees remained intact, and without intervening heavy rains other than those that occurred after the crest had passed Cairo. The table also gives the estimated greatest possible stages that could occur in the future under the most favorable conditions of flood causation. Before this table was prepared the opinions of the officials in charge of some of the Weather Bureau stations within the district were invited, and due regard was had to these. It is admitted that the normal progress of meteorological conditions across the country makes the occurrence of such a superflood very remote, yet it is not absolutely beyond the limits of possibility.

[1] Findlay, Alex. Geo., Ocean Meteorology, 1887. Page 67.

TABLE 10.—*Possible crest stages during flood of 1927 with all levees intact; also estimated stages of maximum flood that could occur*

Station	Possible 1927 stages	Maximum possible stages	Station	Possible 1927 stages	Maximum possible stages
Paducah, Ky.	48.0	65.0–65.5	Arkansas City, Ark.	68.5–69.0	72.5–73.0
Cairo, Ill.	57.7–58.0	65.5–66.0	Greenville, Miss.	61.5–62.0	65.5–66.0
St. Louis, Mo.	36.1	45.4–46.4	Lake Providence, La.	59.0–59.5	63.0–63.5
Cape Girardeau, Mo.	41.5	51.4–52.4	Vicksburg, Miss.	64.5–65.0	68.5–69.0
New Madrid, Mo.	45.0–45.3	51.0–51.5	Natchez, Miss.	64.5–65.0	68.5–69.0
Cottonwood Point, Mo.	43.0–43.3	46.5–47.0	Baton Rouge, La.	54.5–55.0	58.5–59.0
Memphis, Tenn.	47.2–47.5	54.5–55.0	Donaldsonville, La.	44.5–45.0	48.5–49.0
Helena, Ark.	58.2–58.5	66.0–66.5	New Orleans, La.	27.2–27.7	29.5–30.0

As the problem is one of much importance in connection with the subject of future flood control, we will now discuss at some length the reasoning that led to the evolution of the figures given in Table 10.

STAGES FOR 1927

Cairo, Ill.—The actual crest stage was 56.4 on April 20. The crevasse at Dorena, Mo., 30 miles below Cairo, occurred at 4 a. m. April 16, and after that time the river at Cairo rose only 0.7 foot, notwithstanding the fact that the Mississippi at St. Louis was rising steadily and continued to do so for nearly a week after. The Ohio at Paducah also continued to rise for a few days after the crevasse. The rises at St. Louis and Paducah after the Dorena crevasse were about 2 feet and 0.9 foot, respectively, with an increase of only 0.7 foot on the Cairo gage. It is apparent then, if the Dorena crevasse had not occurred, the crest stage at Cairo would have been 57.7 to 58 feet about but not after the end of April. With a flood in the upper Ohio equal to that of 1913 the crest at Cairo would probably have been approximately 62 feet.

Paducah, Ky.—As the stages at Paducah under existing conditions were partly due to backwater from the mouth of the river, some of the additional rise allowed for Cairo would be reflected on the Paducah gage, and, allowing for a difference of about 9.5 feet between Paducah and Cairo with a one-day interval, the highest stage at Paducah would have been very close to 48 feet. The actual crest was 47.2 feet on April 18.

St. Louis, Mo.—There is nothing to indicate that there would have been any change in the crest at St. Louis, except possibly two or three-tenths of a foot. The actual crest was 36.1 feet on April 26, six days after the crest occurred at Cairo.

Cape Girardeau, Mo.—Damming effect from Cairo is also pronounced at Cape Girardeau, and this combined with the additional rise of 2 feet coming from St. Louis would have added about 1.5 feet to the recorded crest of 40 feet on April 20, making a probable crest of 41.5 feet.

New Madrid, Mo., Cottonwood Point, Mo., and Memphis, Tenn.—For these places the problem becomes the much simpler one of applying the normal differences between them and the estimated crest for Cairo. Doing this we would have—

Cairo	New Madrid		Cottonwood Point		Memphis	
	Difference	Crest	Difference	Crest	Difference	Crest
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
57.7–58 feet	−12.7	45–45.3	−14.7	43–43.3	−10.5	47.2–47.5

Helena, Ark.—Here the problem is complicated through the influence of the stages at Arkansas City, Ark., upon those at Helena. In 1927 the stage at Arkansas City would have been so high that it would have exercised a slight damming effect and increased the stage at Helena accordingly. Making due allowance of about 0.5 foot for this, the Helena crest, based upon Cairo, would have been from 58.2 to 58.5 feet.

Arkansas City, Ark.—The situation here was a very complex one on account of the enormous volume of water from the Arkansas and White Rivers and the great crevasses along those rivers and at Mounds Landing, Miss., almost directly opposite Arkansas City. With Cairo at 56.4 feet on April 20, the crest stage at Arkansas City without crevasses and without abnormal increment from the Arkansas and White Rivers would have been approximately 60.5 feet about the end of April, whereas this stage was reached on April 21, the excess coming from the Arkansas and White waters. Without this great excess from the Arkansas Basin the stage on April 21 would have been between 57.6 and 58 feet instead of 60.5 feet. Therefore the probable crest at Arkansas City in 1927 with levees intact would have been 57.5 to 58+4 additional rise to come from Cairo plus about 7 from the Arkansas and White, or about 68.5 to 69 feet. Incidentally the crest stage at Little Rock would have been higher than the 33 feet reached on April 20, and the lower White would also have been higher.

Greenville, Miss.—By applying the normal difference of about 6 feet that actually prevailed between Arkansas City and Greenville, and −1 foot for banking effect at Arkansas City, we would have had for Greenville in 1927 under the conditions assumed, 68.5 to 69 feet for Arkansas City −7=61.5 to 62 feet. At Lake Providence, La., the crest would have been about 2.5 feet lower than at Greenville; that is, 59 to 59.5 feet.

Vicksburg, Miss.—Applying the normal difference of 3 feet between Arkansas City and Vicksburg, and minus about 1 foot for banking effect at Arkansas City, we have for Vicksburg 68.5 to 69−4=64.5 to 65 feet.

Natchez, Miss.—Assuming Vicksburg and Natchez crests to be approximately the same at very high stages, we obtain Natchez probable crest as 64.5 to 65 feet.

Baton Rouge, La.—With unbroken levees the normal difference between Natchez and Baton Rouge will be about 11 feet, but with the Red also very high, as it was in 1927, the difference would have been reduced to at least 10 feet and the crest at Baton Rouge would therefore have been 64.5 to 65−10=54.5 to 55 feet.

Donaldsonville, La.—At very high stages the difference between Baton Rouge and Donaldsonville is approximately 10 feet. Assuming these figures to be correct, the unimpeded crest at Donaldsonville in 1927 would have been 54.5 to 55−10=44.5 to 45 feet.

New Orleans, La.—Forecasts of flood stages at New Orleans must always take into consideration the possible effect of tides and wind direction and velocity. While these factors are of great importance at times, they must be disregarded in any computation of gage relations, and therefore a liberal allowance must be made as a factor of safety. It appears that with a stage of 34 feet on the Donaldsonville gage, the difference between the Donaldsonville and New Orleans crests will be approximately 14 feet, increasing gradually at the rate of 0.3 per foot as the Donaldsonville crests increase, so that with Donaldsonville at 45 feet, the difference between Donaldsonville and New Orleans (Carrollton gage), would be about 17.3 feet. Applying this difference we have 44.5 to 45−17.3=27.2 to 27.7 feet for New Orleans. These figures for New Orleans appear to be very high, and possibly the increase in the difference between Donaldsonville and New Orleans at very high stages may be a little more than 0.3 foot for each foot of rise at Donaldsonville.

MAXIMUM FLOOD POSSIBILITIES

Again the counsel of several officials of the Weather Bureau was invited, and the conclusions given below, while they are largely speculative, represent the combined judgment of those in the Weather Bureau who have given attention to the problem. Let us begin again with Paducah and Cairo. On February 14, 1884, the crest stage of the Ohio River at Cincinnati was 71.1 feet, and on April 1, 1913, 69.9 feet. The corresponding crests at Paducah were 54.2 and 54.3, and at Cairo 52 and 54.7 feet. The Mississippi at St. Louis was below 15 feet in 1884 and between 21 and 25 feet in 1913, while the stages in the tributaries of the Ohio were only moderately high in 1884 and exceptionally high in 1913. The Ohio flood of 1884 was largely a high temperature and snow flood with only moderately heavy rains. It is not difficult to conceive of heavier rains under the same conditions with a maximum stage of at least 75 feet at Cincinnati. Under normal conditions of precipitation distribution and resultant streamflow, and without high water in the Mississippi River the crest at Paducah with 75 feet at Cincinnati would be about 57 feet and at Cairo 57.5 feet. Add to these 6 feet for a possible crest of 45 feet at St. Louis, and also about 2.5 feet additional for an excess in the Cumberland and Tennessee, not present in 1884 and 1913, and we obtain for Paducah 57+6+2.5=65.5, and for Cairo 57.5+6+2.5=66 feet. These calculations are based upon the Mississippi, Cumberland, and Tennessee Rivers contributing their tides at just the proper time to insure the greatest effect at Paducah and Cairo, an improbable occurrence, it is admitted, but nevertheless a remotely possible one.

St. Louis, Mo.—Flood heights in St. Louis have been raised since 1903 by the protective works at East St. Louis, Ill., how much is not known exactly, but possibly as much as 2 feet, which in 1844 would have made the flood 41.4+2=43.4 feet on the St. Louis gage. There is no record of a very great flood in 1844 in the Mississippi River as far north as Hannibal, Mo., where the highest water of record was 22.5 feet in June, 1903, nor in the northern tributaries of the Missouri River within the State of Missouri. It would be fair to allow an additional 2, or possibly 3, feet against a future flood of 22.5 feet or higher at Hannibal, and greater floods in the northern Missouri tributaries. Then we would have 43.4+2 to 3=45.4 to 46.4 feet as a possible stage for St. Louis.

Cape Girardeau, New Madrid, and Cottonwood Point, Mo., Memphis, Tenn., and Helena, Ark.—The maximum possible stages given in Table 10 were determined by coordinate plot from Cairo, except that at Helena an additional allowance of +0.5 foot was made for damming effect from Arkansas City, Ark.

Arkansas City, Ark.—Assuming a normal relation between Cairo and Arkansas City, and Arkansas and White River floods as great or a little greater than in 1927, we obtain for the maximum flood at Arkansas City 65.5 to 66+4 for Cairo difference, +3 for additional Arkansas and White River water =72.5 to 73 feet, alarming figures, yet they appear to be reasonable in the rather improbable event that antecedent conditions proved to

be most favorable. Let us remember also that a Canadian River flood, which did not occur in 1927 could easily add a foot or two to a lower Arkansas flood.

Greenville, Miss., Lake Providence, La., Vicksburg, and Natchez, Miss.—These stages were determined by coordinate plot from Arkansas City, except that an additional allowance of −1 foot was made for banking effect at Arkansas City.

Baton Rouge, La.—As stated before, with Red River in very great flood, the normal difference of about 11 feet between Natchez and Baton Rouge would be reduced at least 1 foot, and we would therefore have as the maximum for Baton Rouge 68.5 to 69 −10 =58.5 to 59 feet.

Donaldsonville, La.—Applying the normal difference of about 10 feet between Baton Rouge and Donaldsonville, we obtain as the maximum for Baton Rouge, 58.5 to 59 −10 =48.5 to 49 feet.

New Orleans, La.—Again a very indeterminate quantity, but if we assume the original possiblility of 27.2 to 27.7 feet in 1927, or even a little lower stage, it is probably not unreasonable to place the maximum possible stage at 29.5 to 30.5 feet.

We again emphasize that while the figures given in Table 10 represent only a very remote probability, they are not entirely beyond the bounds of ultimate possibility. According to Cline, the flood of 1927 surpassed any previous overflow below Vicksburg in something like 200 years, and a second 200 years, or even more, might and probably would elapse before the appearance of a flood that would be as great or greater. Time alone can determine, but it must not be forgotten that the two greatest floods of history in the lower Mississippi River occurred in 1922 and 1927, an interval of only 5 years.

CREVASSES

During recent years the history of floods in the lower Mississippi Basin and its great tributaries is the history of the loss and damage caused by the breaking of protection levees and the flow of water through the crevasses thus formed. These crevasses and their effects will be treated later in the summaries of the flood reports made by the officials of the Weather Bureau who are in charge of the various river districts directly concerned. However for purposes of ready reference the table (11) of the more important crevasses so far as reported was prepared. They are presented by rivers but without any reference whatever to their importance and effect. Although all important crevasses are mentioned in the table, the list is not by any means complete. The public press stated that there were in all 226 crevasses, but it is thought that about three-fourths of these were of comparatively little consequence.

In addition to those given in Table 11 all right-bank levees along the Arkansas River from Fourche levee, above Little Rock, to Fort Smith were broken. The major and most disastrous crevasses were those at Dorena, Mo., Mounds Landing, Miss., the lower Arkansas and lower White, Bayou des Glaises, La., Melville, La., and McCrea, La.

Extent of overflow.—The chart in the pocket at the end of this report shows the extent of overflowed areas in the lower Mississippi Basin during the flood of 1927. Permission for the use of this map was given through the courtesy of Hon. Herbert Hoover, Secretary of Commerce and Hon. E. Lester Jones, Director of the United States Coast and Geodetic Survey. This chart is listed as Figure 2 of this report.

TABLE 11.—*List of crevasses*

Place	River	Bank	Date
North Alexander district, Illinois	Mississippi	Left	Apr. 8.
Union County Levee, Ill.	do	do	Apr. 16.
Ware, Ill.	do	do	Do.
Wolf Lake, Ill.	do	do	Do.
McClure, Ill.	do	do	Do.
Dorena, Mo.	do	Right	Do.
Whitehall, Ark.	do	do	Apr. 15.
Knowlton, Ark.	do	do	Apr. 20.
Laconia Circle, Ark.	do	do	Mar. 29.
Mounds Landing, Miss.	do	Left	Apr. 21.
Greenville, Miss.	Back levee		
Cabin Teele, La.	Mississippi	Right	May 3.
Winter Quarters, La.	do	do	May 1.
Vidalia, La.	do	do	May 11 (protection).
Glasscock, La.	do	do	Apr. 30.
Bougere, La. (4)	do	do	May 1.
Caernarvon, La.	do	Left	Apr. 29 (emergency).
Junior, La.	do	Right	Apr. 23 (caused by steamship).
Erie, Kans.	Neosho		
St. Paul, Kans.	do		
LeRoy, Kans.	do		Private levee.
Fort Gibson, Okla.	do		
Sebastian County Levee, Ark.	Arkansas		
Crawford County Levee, Ark.	do		
Pope County Levee, Ark.	do		
Yell County Levee, Ark.	do		
Perry County Levee, Ark.	do		
Conway County Levee, Ark.	do		
Faulkner County Levee, Ark.	do		
Pulaski County Levee, Ark.	do		
Plum Bayou, Ark.	do		
Pine Bluff, Ark.	do		
Old French Levee, Ark.	do		
Pendleton, Ark.	do	Right	
Jackson County Levee, Ark.	White		
White County Levee, Ark.	do		
Woodruff County Levee, Ark.	do		
Clarendon, Ark.	do		
Big Lake, Ark.	St. Francis		
Index, Ark.	Red		
Fulton, Ark.	do		
Lewisville, Ark.	do		Above and below.
Crichton, La.	do		
Vick, La.	do	Left	May 2.
Cottonport, La.	Bayou Rouge		May 12.
Kleinwood, La.	Bayou des Glaises		May 14.
Bordelonville, La.	do		Do.
Willard Station, La.	do		Do.
Moreauville, La.	do		Do.
Hamburg, La.	do		May 14–15.
Melville, La.	Atchafalaya	Right	May 17.
McCrea, La.	do	Left	May 24.

The total area of lands overflowed by the flood water of 1927, as obtained by officials of the Weather Bureau, was 18,286,780 acres, or 28,573 square miles. As the river districts of the bureau are necessarily arranged without regard to State boundaries, it is impossible to accurately allocate to the States concerned their proper proportions of the total acreage overflowed. However, a few individual State totals which are not absolutely correct, were as follows:

	Acres
Tennessee	505, 000
Mississippi	5, 032, 000
Arkansas	4, 224, 000
Kansas	77, 100
Oklahoma	265, 000
Texas	6, 000
Total	10, 109, 100

The distribution of overflowed areas by Weather Bureau river districts, which are outlined in the district reports, was as follows:

	Acres
St. Louis, Mo.	86, 400
Cairo, Ill.	630, 880
Memphis, Tenn.	1, 935, 000
Vicksburg, Miss.	5, 032, 320
New Orleans, La.	6, 382, 080
Nashville, Tenn.	23, 000
Little Rock, Ark.	3, 648, 000
Shreveport, La.	157, 000
Fort Smith, Ark.	265, 000
Topeka, Kans.	77, 100
Missouri River above Kansas City, Mo.	50, 000
Total	18, 286, 780

An estimate of the total area of crop lands flooded was prepared by the Bureau of Agricultural Economics of the United States Department of Agriculture, and the figures obtained were as follows:

	Acres
Arkansas	1,839,400
Louisiana	1,112,200
Mississippi	861,900
Missouri	359,000
Tennessee	195,000
Kentucky	50,000
Total	4,417,500

Of the total of 4,417,500 acres of overflowed crop lands, there were in 1926, according to the Bureau of Agricultural Economics, about 2,600,000 acres in cotton, 1,100,000 acres in corn, 360,000 acres in hay, and about 357,500 acres in other crops. Of course much of the overflowed land was afterwards replanted, but how much is not now known. However, large acreages were reoverflowed after replanting, especially in southeastern Arkansas where there were really five overflows.

The acreage of crop lands overflowed was a little more than 24 per cent of the total overflowed area, which is perhaps a little less than the usual ratio between cultivated and uncultivated lands. However, the figures for crop lands did not include the overflowed areas in Kansas, Oklahoma and some scattered acreages. Over these the total overflow on lands of every description was 415,100 acres. Deducting this amount from the total of 18,286,780 acres, there remain 17,871,680 acres, making the percentage of crop lands overflowed 24.7, about the usual ratio.

Some further details as to overflowed lands will be found in the district reports that will follow later.

LOSS OF LIFE IN THE FLOOD

Until the year 1927 loss of human life in lower Mississippi floods for the last 60 years at least, has been so small as to be virtually negligible. The relatively distant origin of the floods and their slow, deliberate movement permit their approach to be heralded many days in advance and there is always ample time for all affected to remove or be removed from places of danger. Owing to the natural reluctance of many of those not generously endowed with the necessities and comforts that contribute to material well being, to abandon the little they may happen to possess, it has often been necessary to remove them more or less forcibly, but nevertheless in time, as a rule, to avoid catastrophe.

During the great floods of 1897, 1903, 1912, 1913, and 1922 there were no losses of human life that were directly attributable to the flood, but the flood of 1927 proved to be a sad exception. The death statistics for this flood were compiled very carefully, and are as follows:

Cairo, Ill., district	11
State of Arkansas	127
Memphis, Tenn., district	34
State of Mississippi	42
Total	214

There were also 4 lives lost on the Verdigris River at Gibson Station, Okla., 1 at Kansas City, Mo., 89 in Kentucky, and 5 in Virginia and North Carolina, making in all a total of 313. The deaths in Kentucky, Virginia, and North Carolina occurred in the mountain districts in the month of May.

LOSS AND DAMAGE

When the time arrived to ascertain the extent of loss and damage caused by the floods and to convert them into dollars and cents, the usual difficulties arose, the same difficulties that attend any flood whether great or small. Of course the diverse and oftentimes intangible character of the damage precludes any hope of absolutely reliable statistics. For reasons that need not now be mentioned, the almost invariable tendency is to underestimate loss and damage. Nevertheless careful and conscientious endeavors were made by the officials in charge of the various river districts to obtain data of this character that would be at least reasonably reliable, and the results are given below. Except in a few instances, tabulation by individual States was not possible with the data at hand, as Weather Bureau river districts are organized without regard to State boundaries. Railroad losses, which must have been very large, are not included except in a few instances.

TABLE 12.—*Loss and damage from flood*

District	Territory	Loss and damage					Total
		Miscellaneous	Crops	Livestock and other farm property	Protection work	Suspension of business	
Indianapolis, Ind.	Indiana	$128,150					$128,150
Nashville, Tenn.	Tennessee and Kentucky	218,000					218,000
Knoxville, Tenn.	Virginia and North Carolina	50,000	$25,000				75,000
Louisville, Ky.	Kentucky	7,000,000					7,000,000
Missouri River, South Dakota to Kansas City, Mo.	South Dakota, Iowa, and Nebraska	201,500	797,250				998,750
Hannibal, Mo.	Iowa and Missouri	5,000				$18,000	23,000
St. Louis, Mo.	Missouri and Illinois	4,872,000	[1] 8,382,000			839,000	14,093,000
Cairo, Ill.	Illinois, Missouri, Tennessee, and Kentucky	2,054,692	1,713,050	$306,300	$600,000	807,821	5,481,863
Memphis, Tenn.	Tennessee and Arkansas	6,734,450	10,236,595	593,350	218,508	10,208,565	28,051,468
Vicksburg, Miss.	Mississippi and Louisiana	[2] 14,500,000	[2] 50,000,000	[2] 15,000,000	[2] 15,000,000	[2] 10,000,000	[2] 104,500,000
New Orleans, La.	Louisiana and Arkansas	30,000,000	22,000,000	6,250,000	15,000,000	28,000,000	101,250,000
Topeka, Kans.	Kansas	418,500	376,000	73,000		102,500	970,000
Fort Smith, Ark.	Kansas, Oklahoma, and Arkansas	1,770,400	3,532,000	90,000		325,000	5,717,400
Little Rock, Ark.	Arkansas	8,386,000	3,654,000	637,000		1,259,000	13,936,000
Shreveport, La.	Texas, Louisiana, Oklahoma, and Arkansas	560,000	846,500	136,500		132,000	1,675,000
Total		76,898,692	101,562,395	23,086,150	30,818,508	51,751,886	284,117,631

[1] Includes livestock and other movable farm property.
[2] Estimated.

As noted in Table 12, the figures given for the Vicksburg district are rough estimates only. Taken as a whole, no accurate data were obtainable, and those obtained were submitted by the official in charge of that district as the result of his judgment after inquiry and careful consideration.

Table 13 shows the number and value of livestock, including poultry, in five States.

TABLE 13.—*Livestock losses, by States, flood of 1927*

	Arkansas		Louisiana		Mississippi		Missouri		Tennessee		Total	
	Number	Value	Number	Value	Number	Value	Number	Value	Number	Value	Number	Value
Horses and mules	9,250	$490,250	7,100	$475,700	7,375	$538,375	1,000	$55,000	600	$37,200	25,325	$1,596,525
Cattle	21,060	459,108	19,630	427,934	9,000	189,000	Slight		800	24,320	50,490	1,100,362
Swine	66,590	632,605	55,930	531,335	22,690	242,783	considerable		2,900	37,700	148,110	1,444,423
Sheep	310	1,798	740	2,220	250	825	Slight		0	0	1,300	4,843
Poultry	525,440	352,045	487,830	365,872	263,300	192,209	Heavy				1,276,570	910,126
Total	622,650	1,935,806	571,230	1,803,061	302,615	1,163,192	1,000	55,000	4,300	99,220	1,501,795	5,056,279

NOTE.—No data for Kentucky.

The numbers were those given in the bulletin on the lower Mississippi flood by the Bureau of Agricultural Economics, United States Department of Agriculture, and their values were computed on the basis of those given in Crops and Markets, United States Department of Agriculture, February, 1927. It will be noticed that the data for Missouri are very incomplete, and there were none for Kentucky.

The total of all losses, however obtained, was $284,117,631, but these figures, staggering as they may be, do not cover all losses that were incurred. It has been the experience of the Weather Bureau that flood losses as reported are at least 25 per cent less than the actual losses. This is considered a fair estimate, as many losses must necessarily be of such a character that they can not be accurately stated. Among these, as stated by the official in charge of the New Orleans river district, are "economic losses resulting from such causes as removal of inhabitants by thousands from their regular occupations and sources of income, disruption of transportation and business, depreciation in values (a very serious item), losses of rents, interest, and accounts, permanent losses of tenants and labor, and other attendant circumstances which can not be estimated, but which must be thought of in terms of many millions of dollars." Therefore, if 25 per cent are added to the total as given in Table 13 the grand total would be $355,147,039. The grand total of losses from all causes in the Ohio and lower Mississippi floods of 1913 was $162,427,293, only about 57 per cent of the total actually reported in 1927. It would therefore appear to be not beyond the mark to say that the flood of the spring of 1927 was the greatest economic disaster in the history of the United States.

THE WORK OF THE WEATHER BUREAU DURING THE FLOOD

That the Weather Bureau is charged by statute with the duty of giving warning of the approach, duration, and magnitude of floods occurring within the United States is a matter of common knowledge, and it is unnecessary to expatiate regarding this function. However, it is permissible to state that during the unprecedented floods of 1927 it failed in no particular to maintain its traditions of efficient service. Its warnings of the flood, issued from one to four weeks in advance, were the means of saving many human lives and property valued at millions of dollars. While the loss and damage, as stated before, were almost beyond belief, and more than 600,000 persons were made homeless for a considerable period of time, the reported savings of property of all classes amounted to $29,939,200, classified by river districts as follows:

TABLE 14.—*Reported savings by Weather Bureau warnings*

River district:	
Indianapolis, Ind	$53,000
Nashville, Tenn	25,000
South Dakota to Kansas City	340,000
Hannibal, Mo	5,000
St. Louis, Mo	4,628,000
Cairo, Ill	4,130,700
Memphis, Tenn	1,731,500
Vicksburg, Miss	
New Orleans, La	16,000,000
Topeka, Kans	512,000
Fort Smith, Ark	472,000
Little Rock, Ark	1,584,000
Shreveport, La	458,000
Total	29,939,200

It was impossible to obtain any figures for the district of Vicksburg. If the usual 25 per cent deficiency is added to the above figures, the grand total savings will be $37,424,000.

This allowance of 25 per cent is probably understated, as many persons who were requested to supply estimates for their respective localities reported that, while the savings were large and the warnings of greatest value, it was impossible to give expression to them in terms of dollars and cents. In any event the figures are sufficiently expressive of the value of the flood warning service of the Weather Bureau.

So many letters of commendation were received from public officials, great corporations, commercial organizations, and private individuals, that lack of space forbids their reproduction here.

In a letter to Hon. William M. Jardine, Secretary of Agriculture, under date of July 5, 1927, Hon. Herbert Hoover, Secretary of Commerce, expressed his great appreciation of the character of the service performed by the Weather Bureau. He also stated that the advance information created confidence and understanding that resulted in great saving of life and property without action on his part or that of those associated with him. In appreciation of this tribute the Secretary of Agriculture under date of July 6, 1927, addressed the following letter to Prof. Charles F. Marvin, the Chief of the Weather Bureau:

DEPARTMENT OF AGRICULTURE,
Washington, July 6, 1927.

Dr. C. F. MARVIN,
Chief Weather Bureau.

DEAR DOCTOR MARVIN: I am sending you herewith a copy of a letter which I have written to Doctor Cline. The Weather Bureau is to be congratulated on the splendid service which it rendered during the flood. I hope you will extend the appreciation of the Department of Agriculture to all of the men in your bureau who assisted in this valuable work. They performed a service of real genius.

Sincerely yours, W. M. JARDINE, *Secretary.*

FIG. 11.—Blanche Avenue, Mounds, Ill., Ohio River, March 25, 1927. River stage at Cairo, Ill., 52.8 feet

FIG. 12.—Highway between Mounds, Ill., and Cairo, Ill., March 25, 1927. River stage at Cairo, Ill., 52.8 feet

FIG. 13.—Oswego, Kans. Flooded power plant, Neosho River, April 23 1927. River stage 25.4 feet

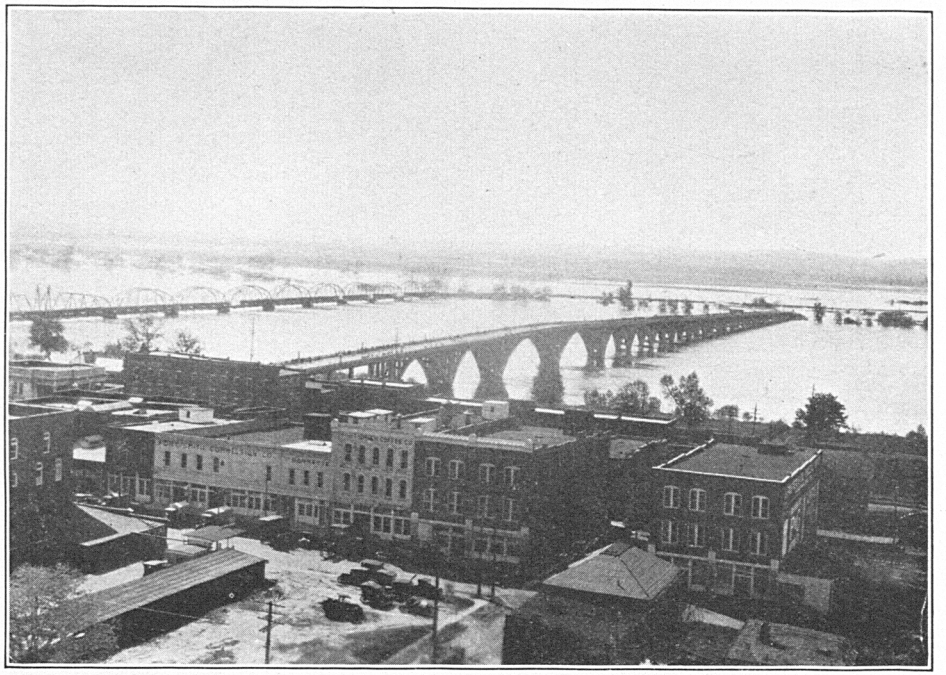


FIG. 14.—Arkansas River at Fort Smith, Ark., April 16, 1927. River stage 36.7 feet

FIG. 15.—Teche Bayou, New Iberia, La. First experience of the kind

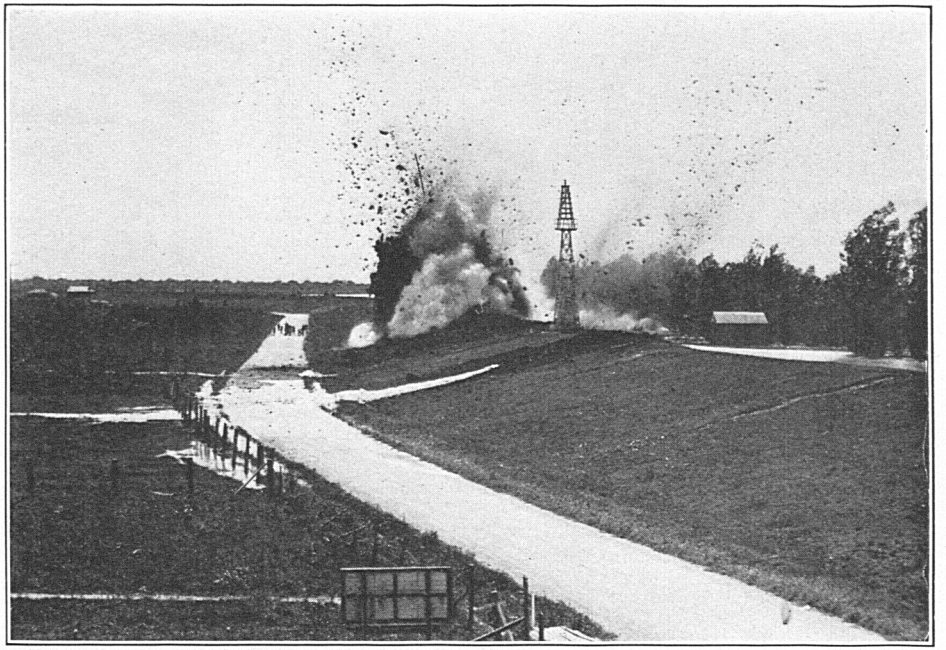


FIG. 16.—Creating artificial crevasse, Caernarvon, La., 14 miles below New Orleans, La., April 29, 1927. River stage at New Orleans, 20.8 feet

FIG. 17.—Arkansas City, Ark., April 27, 1927. River stage 52.8 feet. (Airplane photograph)

FIG. 18.—Greenville, Miss., April 27, 1927. River stage 46.8 feet. (Airplane photograph)

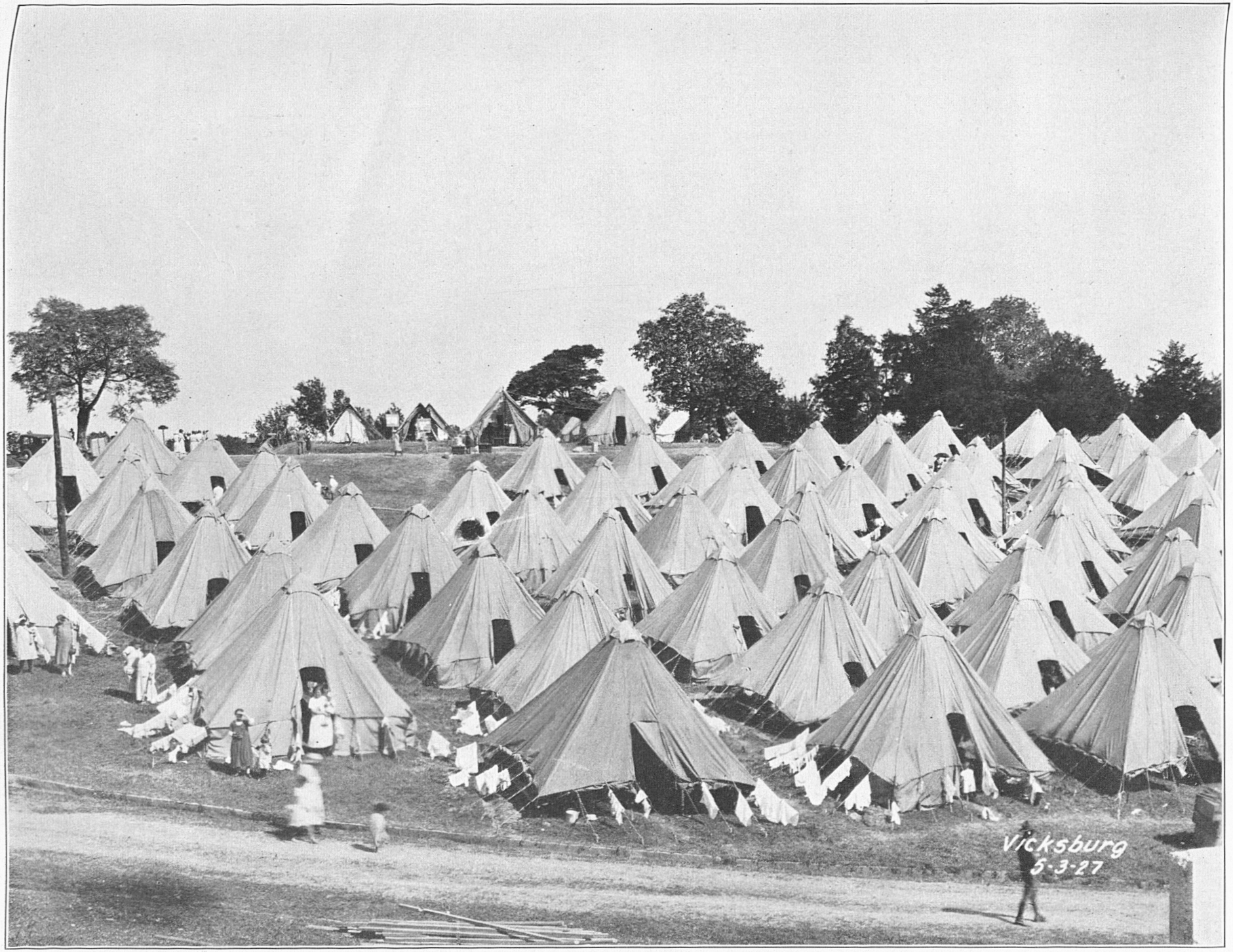


FIG. 19.—Refugee camp, May 3, 1927. (Illinois Central Railroad photograph)

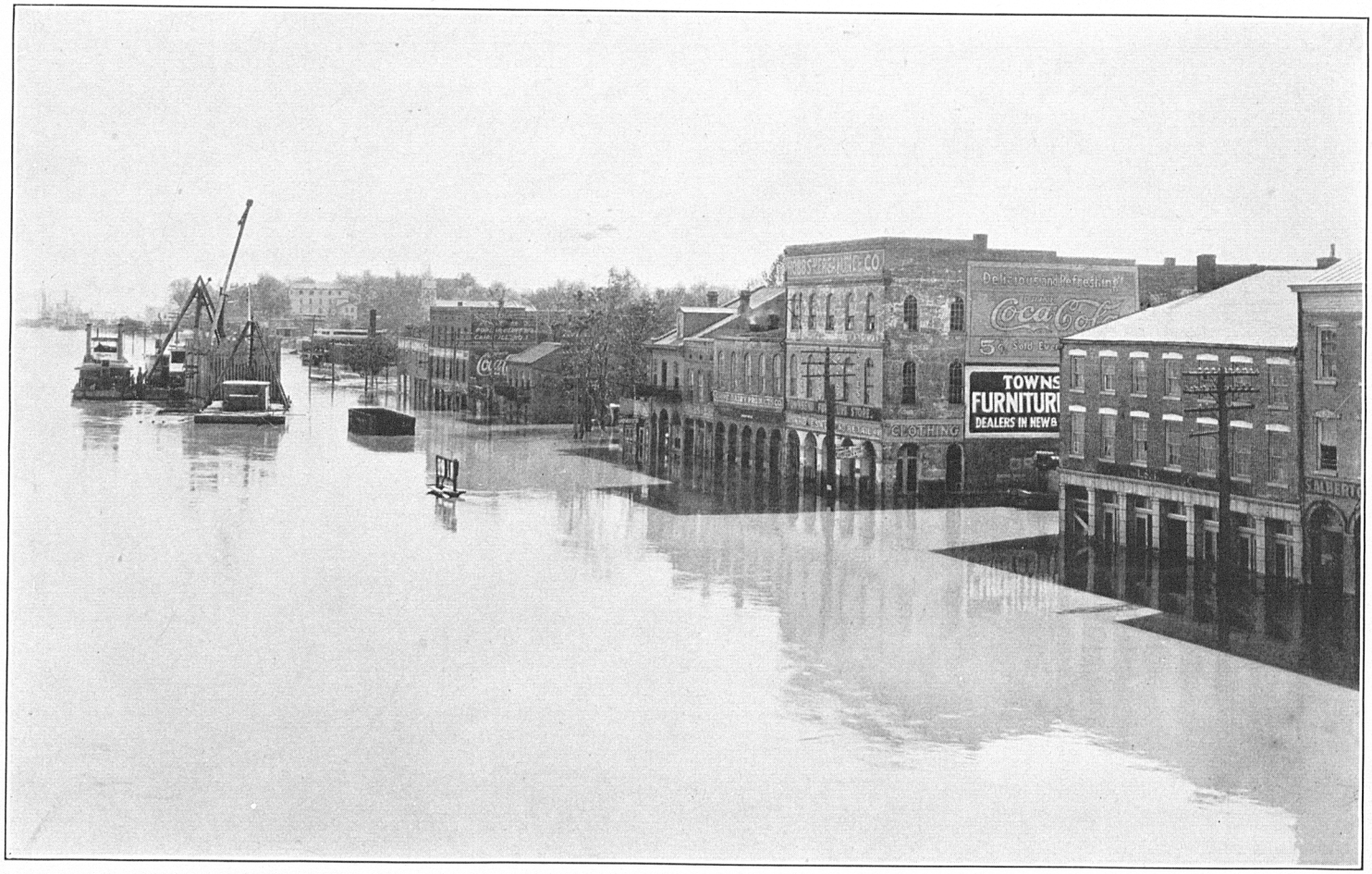


FIG. 20.—River front, Cape Girardeau, Mo., April 20, 1927. River stage 40 feet

FIG. 21.—Crevasse, Mississippi River, Junior, La., caused by collision of steamship *Inspector*. April 23, 1927

"There was honor enough for all," and a measure of tribute is due the field employees of the flooded districts, both commissioned and otherwise. There was on their part no thought of long hours, loss of sleep and other privations, but simply one of service, and in several instances the services of noncommissioned employees were attended with actual danger to life, just as was the case with other activities, Federal, State, municipal and private. Special tribute is due also to railroad and telephone corporations for their most cordial and effective cooperation with the Weather Bureau in the way of keeping open lines of communication, transmitting vitally important information to and from the flooded districts, distributing warnings, etc., all without expense except on their own part. Here again the value of service can not be measured in dollars and cents, and their only rewards are the consciousness of duty well performed, and the sincere and grateful appreciation of those who were aided.

DISTRICT REPORTS

MISSISSIPPI RIVER FROM BELOW LOUISIANA, MO., TO, BUT NOT INCLUDING, CAPE GIRARDEAU, MO.; MISSOURI RIVER EAST OF LEXINGTON, MO., EXCEPT OSAGE RIVER IN KANSAS; ILLINOIS RIVER; MERAMEC RIVER; WHITE, BLACK, AND ST. FRANCIS RIVERS IN MISSOURI

By MONTROSE W. HAYES

The summer of 1926 was abnormally dry, but with the coming of September rains began over Kansas, Iowa, Missouri, and Illinois. These rains continued into October and in Illinois the amounts were distributed geographically and in a time sequence that gave the highest flood in history in most of the lower reach of the Illinois River. In the country tributary to the lower Missouri, and in the counties of Iowa and Missouri that are drained by the Mississippi River the streams were high for the season, but their stages were not unprecedented. Throughout the fall and winter, seasons in which the water levels are expected to be the lowest of the year, the stages were abnormally high, primarlily on account of the September and October rains, but partly on account of the temperatures not being low enough to close the tributary streams. The gradual and general rise that normally follows the coming of spring, and the breaking up of ice gave promise of being less pronounced than in the average year, but any decrease in stages that might have been expected was offset by frequent rains, which became heavy in the latter half of March, and when April came the rains increased in intensity, and occurred almost dally. The rivers rose slowly until the latter part of April, when high floods were general in the rivers of Missouri, in the Illinois River, and in the Mississippi below Hannibal. Near the close of April a slow decline began. However, two more rises occurred before the drop in water level became pronounced. These latter rises were in the first part of May and the first part of June.

In the following paragraphs the floods in the various streams in the St. Louis district are treated separately, in narrative form. The principal tabular matter has, however, been prepared in a composite way, to present the salient features of the floods in a graphic and comparative manner.

The Illinois River.—The Illinois, after the historic flood of the fall of 1926, remained close to bankful throughout January. On February 1 a general rise began. It was rapid in the reach above Havana. At and below Havana stages increased steadily, but at a moderate rate. Crests were reached at Morris on the 6th, Peoria on the 10th, and Beardstown on the 15th. The fall was slow in the alluvial river, and from March 1 to April 15 almost stationary stages prevailed. The stationary stages were caused by a steady increase in the height of the water level at Grafton, on the Mississippi, at the mouth of the Illinois, There was, of course, some fluctuation in the Grafton gage heights, but the rises were greater than the falls, making the general tendency upward. The Grafton fluctuations were shown by the Pearl gage, 43 miles above the mouth of the Illinois, but above Pearl there was no evidence of them, the river remaining almost stationary. On April 15 a rapid rise began in the upper river. The stage at Morris did not go quite as high as it did in February, but the water passing Morris was poured into an alluvial stream that had been unable to empty all of its February flood into the Mississippi on account of the increasing stage of the latter river, and the resulting gage heights were, consequently, higher from Peru southward than they were in February. This condition is almost always the one that causes the floods in the alluvial Illinois. One notable exception was the flood of the fall of 1926, when the rain was not particularly heavy over the steep upper river, but fell in excessive amounts over the narrow basin of the alluvial reach, was emptied into the main stream at a rapid rate by the tributaries, all of which have a greater slope than the main stream, and caused a flood that was, at Beardstown particularly, the highest in history. However, even this rainfall would not have caused a flood of unprecedented height had the discharge of the Illinois not been so greatly impeded by a high stage in the Mississippi at Grafton. In short, the very flat reach of the Illinois River when in flood is from Utica southward, and especially from Peru southward, largely influenced by the stage in the Mississippi at Grafton. And in the case of Pearl, 43 miles above the mouth of the Illinois, the Mississippi influence is more pronounced than that of the Illinois itself, and at times we have the anomalism of a flood crest occurring at Pearl before it occurs at Beardstown, 46 miles above Pearl. This, of course, is due to the fact that a rapid fall has begun at Grafton, on the Mississippi, and the increased slope in the 43 miles to Pearl brings about an increase in the discharge at Pearl that is greater than the increase in the water volume represented by the continuous rise at Beardstown.

Warnings of a high flood in the Illinois River were first issued on April 14. By April 20 the rain appeared to have ceased, and more definite warnings were issued based upon the water then in sight. On the same date the Beardstown Illinoian-Star commented as follows:

"For the second time within a year and for the third time in five years practically the entire city of Beardstown is to be swept by the flood waters of the Illinois River.

"The United States Weather Bureau at St. Louis to-day forecast a stage 25 feet for Beardstown next week. This will mean a stage practically the same as that attained in 1922, and means that the entire city, save for that section lying east of the Burlington tracks will be flooded with from 2 to 10 feet of water."

The crest stage at Beardstown was 25.15 feet at midnight of April 26–27.

The elapsed time between the crest of the April flood at Morris (263 miles above the mouth of the river) and at Pearl (43 miles above the mouth)was six days. Six days were also required in the passage of the flood crest through the alluvial reach of the river, which is 230 miles long. The crests and dates were as follows:

Morris, 19.8 feet on April 20; 3.3 feet higher than in 1926.
Peru, 23.2 feet on April 21; 0.2 foot lower than in 1926.
Henry, 17.9 feet on April 23; 0.3 foot lower than in 1926.
Peoria, 24.65 feet on April 23; 0.37 foot lower than in 1926.
Havana, 22.3 feet on April 26; 1.17 feet lower than in 1926.
Beardstown, 25.15 feet on April 26; 1.1 feet lower than in 1926.
Pearl 22.7 feet on April 26; 0.7 foot higher than in 1926.

There was a gradual fall after the April crests, but before the alluvial river declined to a bankful stage heavy rains fell over the upper part of the basin, giving stages at Morris of 17.9 feet on May 25, and 16.9 feet on June 5. These two rises were sharply separated as far south as Peoria, but below Peoria they were merged and gave gradually increasing stages through a period of about 22 days. A steady fall in water levels became general on June 10, and continued throughout the summer.

There is no other equal period in the hydrological history of the Illinois Basin in which the river was above flood stage on as many days as it was from September of 1926 to July of 1927. A flood stage (synonymous in this case with a bankful stage) prevailed at Beardstown on more days than at any other river gage station on the river, due to influences described hereinbefore. On September 5, 1926, the river reached 14 feet, the flood stage at Beardstown, and in the 307 days to and including July 8, 1927, a flood stage prevailed on 273 days. In that period stages below bankful prevailed from January 1 to February 3, inclusive, a total of only 34 days.

The damage caused by the 1927 floods can not, in many instances, be entirely segregated from that due to the 1926 overflow. In the case of the cities and towns the 1927 damage is usually quite distinct, but it can not be estimated closely. However, from the reports collected, it is thought to have been about $1,000,000. The loss sustained by agricultural interests is so closely interwoven with the 1926 losses the two can not be separated. In 1926 many levees were overtopped or broken and the districts flooded. Most of them had not been rebuilt or repaired and the April, 1927, flood water found an easy path into the land back of the levee line. The levees that had been repaired were weak; there had not been sufficient time for them to settle and they could not hold against the April rise. Still other levees broke in 1927 for the first time, largely because of the softened condition they had been placed in by the 1926 flood and the subsequent long-continued wet weather. The crop loss was largely in wheat, and another confusing circumstance in estimating damage by the river proper is the fact that much of the wheat was drowned by direct rain water, by overflows from hill streams, or by seep

water, and it is impossible to determine how much of this loss should be charged to the river flood. However, perhaps the greater portion should be, for the high stage in the river made drainage well-nigh impossible.

The loss of prospective crops was the largest item, for the long-continued flood stage, well into July, did not permit the land to drain in time to be planted. Even after the river was again in its banks the bottom lands remained wet for a considerable time, and all depressions were full of water.

The sum of the agricultural losses, including damage to levees, houses, general equipment, and loss of prospective crops, was approximately $3,500,000.

The value of flood warnings along the Illinois River is estimated at $2,000,000, from reports received.

The Grand River in northern Missouri.—Floods in northern Missouri were neither as frequent nor as high as they were in the southern part of the State. Rains occurred about as often, but they were much lighter.

The first and highest flood was in April. It was highest on April 21 at Gallatin and Trenton, and on April 22 at Chillicothe and Brunswick. The water was not unprecedentedly high, but the river was out of its banks for a long period and did considerable damage. The east branch, or Thompsons Fork, above Chillicothe, was relatively lower than the west branch and the main stream at and below Chillicothe. The water was above flood stage (18 feet) at Chillicothe for 15 consecutive days, from April 10 to 24, inclusive.

The second flood came early in June, and was of short duration. In Thompsons Fork it was less than a foot lower than the April rise, but in the west branch and in the main stream at and below Chillicothe it was 3 to 4 feet lower, except in the very low reach near the Missouri River. The Missouri River has a marked influence on the extreme lower Grand, and as the Missouri stage was much lower in June than it was in April, the lower reach of the Grand ran 5 to 6 feet lower in June than in April.

The damage done by the two floods is estimated as follows: Fences, $5,000; highways, $4,000; bridges, $20,000; railroads, $20,000; prospective crops, 40,000 acres, $400,000; livestock and other movable property, $10,000; suspension of business, including wages of employees, $20,000. Total loss, $479,000. (The acreage of prospective crops lost seems quite high; it is thought much of the land was planted with corn after the June flood, and a crop probably will be made if frost is not unusually early.)

Flood warnings are thoroughly and efficiently distributed by the Chillicothe Chamber of Commerce at a very considerable expense, all of which is met by the chamber. The radio also is widely used in broadcasting flood information. In the last six or eight years timely forecasts of several late summer floods have been the means of great savings along the Grand River, and have also had a great educational effect. Accordingly the people along the Grand make the best and widest use of the flood forecasts, and as a result the reported money value of the warnings issued for the April and June, 1927, floods run very high. In the aggregate it is about $1,000,000. An effort has been made to prevent or eliminate duplications in the reports, but complete success is well-nigh impossible, and the very high total undoubtedly should be reduced, but the extent to which it should be can not be determined with any degree of accuracy.

The Osage River from the Missouri-Kansas line to the mouth.—Stages in the Osage were moderately low until the occurrence of heavy rains on March 18, 19, and 20. A rapid rise began on March 19. At Osceola, where the flood stage is 20 feet, a crest of 21.4 feet was reached on the 22d. At Warsaw the crest also occurred on the 22d; it was 28.6 feet, or 6.6 feet above the 22-foot flood stage. The Tuscumbia crest, which was 32.4 feet, was on the 23d. (The Tuscumbia flood stage is 25 feet.) Progressing downstream the crests became relatively higher, as the amount of rain increased gradually from the upper to the lower basin. A steady fall followed the maximum point of the rise, but on March 31 another period of rains began and the river responded immediately. At Osceola there were minor fluctuations, but with a general upward tendency of the water level, until April 11, when the stage reached 30.4 feet. Rains were heavier and of longer duration to the east of Osceola, and the crests occurred a week later. The highest at Warsaw was 34.45 feet on the 17th, and at Tuscumbia it was 36.8 feet on the 18th. These stages were disastrously high, but they have been equaled or exceeded several times.

The tabulation of "Highest stages in 1927, and those of other years that were higher, or as high" shows the flood of 1844 to have been the highest in the history of the Osage basin. In 1844 the rain must have been much more excessive in the parts of eastern Kansas and western Missouri drained by the Osage River than it was in the Ozark country tributary to the Osage at and below Warsaw. This is an obvious conclusion because the 1844 flood was above the one of 1927 by 14.88 feet at Osceola, by 10.01 feet at Warsaw, and by only 2.8 feet at Tuscumbia.

There were frequent rises after the decline following the April crests, but none of them reached the April heights. There were overflows at Osceola on June 21–23, July 23–24, August 8–12, and August 17–24. At Warsaw flood stage was exceeded on June 2–4, June 22–24, August 9–13, and on August 18–24. Tuscumbia had, on May 11 a stage practically bankfull, but 0.8 foot below the established flood stage, and flood stage was exceeded on June 3–6, June 24–25, on August 11–14, and on August 22–24.

No crops were planted in the lower bottoms of the Osage. Frequent floods, lasting until late in August, made planting impossible. Loss of prospective crops, involving more than 40,000 acres, is estimated at $400,000; this seems to be the largest single loss. Wheat and stacked hay were lost to the extent of $50,000. The loss in livestock and other movable property amounted to about $50,000. Losses sustained in the towns, and damage to highways and fences amounted to about $200,000.

Warnings can not be disseminated satisfactorily along the Osage. Wire facilities are scant, and those that exist are poor. The radio, however, was used to great advantage and most of the savings effected were credited to warnings received by radio from St. Louis and Jefferson City. The money value of the warnings is placed at about $15,000. The amount appears small in the face of the great damage done by the floods and the fact that the warnings were timely, but an explanation of the smallness is found in both the meager communication facilities along the Osage and the nature of the losses; the latter were mostly due to destruction of property that could not be moved, and to the inability of farmers to plant the fertile bottom lands.

The Missouri River from Lexington, Mo., to the mouth.—Flood stage has been reached several times this year in the Missouri River, but as in the other streams the highest water was in April. Above the mouth of the Osage, the height of the overflow was exceeded in 1915, 1903, and 1844, but the high Osage flood gave stages at Hermann and St. Charles, on the extreme lower Missouri, that have been passed only twice, in 1903 and 1844. The highest April, 1927, stages were: 25.63 feet at Waverly on the 21st; 24 feet at Boonville on the 23d; 26.8 feet at Hermann on the 24th, and 33 feet at St. Charles on the 24th. The crest at Hermann occurred six days after the highest stage at Tuscumbia, on the Osage. Hence, the amount of Osage water passing the Hermann gage had been decreasing steadily for five days when the Boonville crest reached Hermann. This circumstance caused the Hermann crest to be somewhat more than 0.5 foot lower than it would have been had the highest water at Tuscumbia been on April 23 instead of April 18.

In May and June there were moderate overflows at intervals, and as late as the middle of August the river from Kansas City to the mouth was very close to bankfull. In fact, where the banks are quite low there was considerable overflow in the rise occurring in August.

The loss along the Missouri, was principally in growing wheat and in prospective crops. General flooding continued until the end of June, and bottom lands were not dry enough for planting until late in July, too late for a crop. It is estimated that at least 50,000 acres of bottom land could not be planted, and the consensus of opinion seems to be that a potential loss of $15 an acre was sustained, making a total of $750,000. Wheat to the value of $50,000 was lost.

Flood warnings to places along the Missouri effected savings in movable property and in highway protection, to a money value of about $100,000.

The Meramec River, in Missouri.—Floods occurred in the Meramec on March 21–23, April 1–5, April 9–19, April 21–22, May 10, and May 26–June 6. The highest was the April 1–5 rise, and the second highest occurred in June. None of the rises was extremely high, but the one early in April covered all the bottom land; it caused a moderately small loss in wheat, and damaged highways and bridges to a minor extent. The greatest damage was to the recreation buildings and equipment that line the Meramec for 50 to 75 miles above its mouth. However, this loss was small, for the flood warnings were widely disseminated; movable property was carried to high ground and boats were made secure. Water entered many of the houses, but the buildings are practically all a cheap, rough type, and water does them no real harm.

The Black River as far south as the Missouri-Arkansas line.—The Black was in flood eight times between March 15 and June 10. The crests of the various floods were on March 19; April 2, 10 and 16; May 7, 10 and 27, and June 3. Two of the floods were quite high. At Popular Bluff, on April 16, there was a stage of 18.5 feet, which equaled the highest stage of record, and on June 3 a stage of 18.0 feet occurred.

The frequent floods caused great damage in the eastern side of Popular Bluff, where lumber yards and wood working plants suffered materially. This loss can not be estimated with any degree of definiteness, as lumber and lumber products covered by flood waters have a considerable value after the water recedes, although

"flood-damaged" material is difficult to sell and has to be disposed of at a loss. The greatest single loss was sustained by railroads in fact, this loss probably was greater than the sum of all the others. It probably amounted to several hundred thousand dollars. Loss to growing crops was not great; in prospective crops it also was relatively small, for the water receded in ample time to admit of planting. Late in the summer the backward condition of corn was ascribed to the floods; corn was planted late, but in ample time to make a crop, and its backward condition was due more to unfavorable weather during its growing period than to the late planting.

Flood warnings were used to great advantage in the eastern side of Poplar Bluff; they could not be if much benefit in the agriculture valley, except in enabling livestock and equipment to be moved.

The Mississippi River from below Louisiana, Mo., to above Cape Girardeau, Mo.—The flood in the Mississippi from Grafton, Ill., southward was unusually high. The 1844 overflow is still the historic high water for the reach from Grafton to Chester, but at Grafton, Alton, and St. Louis there has been no overflow as high as the one in April, 1927, since 1903 and at Chester it is necessary to go back as far as 1855 to find a record of a higher gage reading, or even one as high. The Chester stage in April, 1927, was proportionately higher than at up-river stations on account of the long-prevailing high water at Cairo, and not because of any considerable volume of water entering the river between St. Louis and Chester. The Ohio River effect is plainly marked at Chester; it extends upstream certainly as far as St. Louis, but it is not so obvious nor as easily identified as at Chester.

Abnormally high stages prevailed after January 31, 1927, and on March 20 a rapid rise set in and brought the river practically to a bankful stage. A fall prevailed through the latter days of March, but another rise began on April 1, and from the first part of April into the latter part of June the water level ranged from slightly below bankful to considerably above it.

Crest stages occurred in April as follows: Hannibal 18 feet on the 22d; Grafton 25.75 feet on the 25th; Alton 31.2 feet on the 25th; St. Louis 36.1 feet on the 26th, and Chester 34.5 feet on the 26th. The crests from the Missouri River and from the upper Mississippi River coalesced at the mouth of the Missouri on the 25th. The composite crest passed St. Louis on the 26th, but before it reached Chester its movement was masked by a falling Ohio. The Chester crest normally would have occurred on the 27th, but the fall in the Ohio, which began on the 21st, augmented the discharge at Chester to a sufficient extent to more than balance the steadily increasing volume of water passing St. Louis.

It seems to have been the general impression that there were more days with high water in 1927 than in any previous year. This, however, was not the case. Taking St. Louis as a criterion, 1892 was the year with the longest preiod of continued high water. The following comparative statement shows the outstanding high water periods at St. Louis:

Consecutive days with stages 20 feet or higher: 1881, 117; 1892, 117; 1927, 111. Consecutive days with stages 30 feet or higher: 1892, 36; 1927, 19. Total days with stages 30 feet or higher: 1892, 48; 1927, 33.

The maximum stage in 1892 was almost as high as in 1927; it was 36 feet (which was the highest ever recorded in May) against 36.1 in April, 1927, but in 1881 the maximum was considerably lower, being only 33.7 feet.

Unprotected land along the entire reach of the Mississippi in the St. Louis district was flooded, and the levees from the mouth of the Missouri southward were subjected to a great strain. Some of the levees, which were not standard as to height and construction, broke or were overtopped, and about 40,000 acres of land were flooded. There was considerable water behind the standard levees, which held. The heavy and frequent rains, the impossibility of affording sufficient drainage for the hill creeks, and a certain amount of seepwater, all had a part in flooding the land protected by levees which were intact when the river stage fell below bankful. The loss in growing wheat, prospective crops and agricultural equipment amounted to more than $5,000,000.

In the towns and cities the loss was not great, in a comparative way. The flood warnings received a wide dissemination; they were heeded, and the loss in the towns and cities was reduced to a minimum. In the agricultural regions the warnings were called for daily by telephone and they were the means of saving an immense amount of movable property. Officials in charge of levee districts that were not flooded by river water unanimously report they were enabled to hold their levees through a knowledge, given by the warnings, of the stages they would have to combat.

Losses incurred by railroads have not been taken into account in this report, except in a few minor cases. The railroad companies are collecting data concerning their own losses, and to prevent duplication it seems proper that such information should be tabulated by railroad systems rather than by Weather Bureau river districts.

Table 15, following, gives the crest stages and dates in the flood of 1927.

TABLE 15.—*Crest stages and dates, flood of 1927, St. Louis, Mo. district*

Stage	Flood stage	Above flood stage		Number of days	Crest stage		Highest previous stage	
		From—	To—		Height	Date	Height	Date
Illinois River:	*Feet*	*1927*	*1927*		*Feet*	*1927*	*Feet*	
Morris, Ill.	13	Feb. 3	June 6	[1] 35	20.0	Feb. 6	26.2	1831.
Peru, Ill.	14	Jan. 14	June 26	[1] 147	23.2	Apr 21	27.0	Jan. 23, 1916.
Henry, Ill.	10	Feb. 4	June 25	[1] 135	17.9	Apr. 23-24	18.2	Oct. 8-9, 1926.
Peoria, Ill.	18	Feb. 6	June 21	[1] 117	24.65	do	26.9	June, 1844.
Havana, Ill.	14	Feb. 4	July 4	151	22.3	Apr. 26	23.5	Oct. 12, 1926.
Beardstown, Ill.	14	do	July 8	155	25.15	Apr. 26-27	26.2	Do.
Pearl, Ill.	12	Feb. 6	July 6	151	22.7	do	26.5	June, 1844.
Grand River:								
Gallatin, Mo.	20	Apr. 2	June 5	[1] 15	32.2	Apr. 21	39.2	July, 1909.
Trenton, Mo.	20	Apr. 20	June 4	[1] 3	20.8	do	30.3	July 6, 1909.
Chillicothe, Mo.	18	Apr. 2	June 6	[1] 22	28.6	Apr. 22	33.6	July, 1909.
Brunswick, Mo.	12	Apr. 14	June 15	[1] 17	18.2	do	23.0	July 9, 1909.
Osage River:								
Osceola, Mo.	20	Mar. 21	Aug. 24	[1] 45	30.4	Apr. 11	45.3	June, 1844.
Warsaw, Mo.	22	Mar. 20	do	[1] 50	34.45	Apr. 17	44.46	Do.
Tuscumbia, Mo.	25	do	do	[1] 46	36.8	Apr. 18	39.6	Do.
Missouri River:								
Waverly, Mo.	23	Apr. 20	Apr. 23	4	25.6	Apr. 21	[2] 25.9	July 22, 1915.
Boonville, Mo.	21	do	Apr. 25	6	24.0	Apr. 23	32.7	June 21, 1844.
Hermann, Mo.	21	Apr. 4	June 24	[1] 23	26.8	Apr. 24	35.7	June, 1844.
St. Charles, Mo.	25	Mar. 21	June 27	[1] 41	33.0	Apr. 24-25	40.1	Do.
Bourbeuse River:								
Union, Mo.	12	do	Apr. 16	[1] 6	19.0	Apr. 3	25.5	Aug. 22, 1915.
Meramec River:								
Steelville, Mo.	12	Apr. 1	June 2	[1] 5	18.4	Apr. 1	25.6	Aug. 20, 1915.
Pacific, Mo.	11	Jan. 15	June 6	[1] 38	22.0	Apr. 3-4	30.8	Aug. 22, 1915.
Valley Park, Mo.	14	Mar. 21	do	[1] 34	27.2	Apr. 4	37.8	Do.
Black River:								
Leeper, Mo.	11	Apr. 1	June 2	[1] 6	16.5	Apr. 15	21.3	Aug. 20, 1915.
Poplar Bluff, Mo.	14	Jan. 22	June 6	[1] 33	18.5	Apr. 16	18.5	Aug. 21, 1915.
Mississippi River:								
Grafton, Ill.	18	Mar. 21	June 18	[1] 66	25.75	Apr. 25	32.1	June, 1844.
Alton, Ill.	21	do	do	[1] 67	31.2	do	36.9	Do.
St. Louis, Mo.	30	Apr. 4	June 15	[1] 35	36.1	Apr. 26	41.4	June 27, 1844.
Chester, Ill.	27	Apr. 3	June 18	[1] 52	34.5	do	39.9	June, 1844.

[1] Dates not consecutive.

[2] Probably higher in June, 1844.

TABLE 16.—*Reported losses in St. Louis river district, due to the floods of 1927*

In Missouri:	
1. Damage to buildings, factories, municipal plants, highways, and bridges	$582,000
2. Loss of crops, prospective crops, livestock, and other movable property	2,231,000
3. Losses due to suspension of business, including wages of employees	105,000
4. General losses, not separated under heads 1, 2, and 3	1,310,000
Total of items 1, 2, 3, and 4	4,228,000
Money value of property saved by warnings	1,379,000
In Illinois:	
1. Damage to buildings, factories, municipal plants, highways, and bridges	407,000
2. Loss of crops, prospective crops, livestock, and other movable property	6,151,000
3. Losses due to suspension of business, including wages of employees	734,000

TABLE 16.—*Reported losses in St. Louis river district, due to the floods of 1927*—Continued

In Illinois—Continued.	
4. General losses, not separated under heads 1, 2, and 3	2,573,000
Total of items 1, 2, 3, and 4	9,865,000
Money value of property saved by warnings	3,249,000
Total reported losses in district	14,093,000
Total reported savings in district	4,628,000

MISSISSIPPI RIVER FROM CAPE GIRARDEAU TO NEW MADRID, MO.; OHIO RIVER BELOW MOUTH OF WABASH RIVER; TENNESSEE RIVER FROM BELOW DECATUR TO MOUTH

By WILLIAM E. BARRON

So far as the Cairo, Ill., district is concerned the flood of 1927 may be characterized as a six months' flood, as there were only a few short intervals from December 24, 1926, to June 20, 1927, without some flood impending or under observation. The unusually high autumn stages in the Mississippi River and larger tributaries were in great measure forerunners of the flood. The crest stages during the flood period and the highest recorded previous stages are as follows:

TABLE 17.—*Crest stages and dates, flood of 1927, Cairo, Ill., District*

Station	Flood stage	Above flood stage		Number of days	Crest stage		Highest previous stage	
		From—	To—		Height	Date	Height	Date
Tennessee River:	*Feet*				*Feet*		*Feet*	
Florence, Ala.	18	Dec. 25	Jan. 6		26.6	Dec. 29	32.5	Mar. 19, 1897.
Do		Mar. 12	Mar. 15	17	23.9	Mar. 13		
Riverton, Ala.	33	Dec. 25	Jan. 8		50.0	Dec. 30, 31	58.4	Mar. 20, 1897.
Do		Mar. 11	Mar. 19	24	44.3	Mar. 14		
Savannah, Tenn.	40	Dec. 26	Jan. 8		51.3	Jan. 2	59.6	Mar. 21, 1897.
Do		Mar. 14	Mar. 18	19	43.0	Mar. 15		
Johnsonville, Tenn.	31	Dec. 26	Jan. 11		41.0	Jan. 3, 4	48.0	Mar. 24, 1897.
Do		Mar. 13	Mar. 22		36.3	Mar. 16		
Do		Apr. 15	Apr. 18	31	32.2	Apr. 17		
Ohio River:								
Shawneetown, Ill.	35	Dec. 29	Jan. 9		40.4	Jan. 4	58.9	Apr. 5, 1913.
Do		Jan. 23	Feb. 15		47.9	Feb. 2		
Do		Mar. 2	Mar. 6		35.7	Mar. 4		
Do		Mar. 19	Apr. 24		44.3	Apr. 1		
Do		May 30	June 10	90	39.7	June 6		
Paducah, Ky.	43	Jan. 1	Jan. 11		46.8	Jan. 6	54.3	Apr. 7, 1913.
Do		Feb. 2	Feb. 8		44.2	Feb. 6		
Do		Mar. 20	Mar. 27		44.6	Mar. 24		
Do		Apr. 13	Apr. 25	39	47.2	Apr. 18		
Cairo, Ill.	45	Jan. 1	Jan. 12		48.9	Jan. 7	54.7	Apr. 4 and 7, 1913.
Do		Feb. 1	Feb. 13		48.9	Feb. 6, 7		
Do		Mar. 17			52.8	Mar. 24, 25		
Do			May 5		56.4	Apr. 20		
Do		June 2	June 14	88	49.7	June 9		
Mississippi River:								
Cape Girardeau, Mo.	30	Mar. 21	Mar. 28		33.3	Mar. 23, 24	42.5	July 4, 1844.
Do		Apr. 1	May 6		40.04	Apr. 20		
Do		May 10	May 15		32.8	May 12		
Do		May 26	June 20	76	35.6	June 9		
New Madrid, Mo.	34	Jan. 1	Jan. 14		37.5	Jan. 8, 9	44.6	Apr. 9. 1913.
Do		Feb. 1	Feb. 16		37.6	Feb. 8		
Do		Mar. 17			40.4	Mar. 25, 26		
Do			May 16		43.5	Apr. 21, 22		
Do		June 1	June 19	110	39.4	June 10, 11		

Moderate rains from December 8 to 15, 1926, over the southern tributaries of the Ohio River were followed by heavy ones from December 20 to 29, and flood stages were reached on January 1, 1927, at Paducah, Ky., Cairo, Ill., and New Madrid, Mo., the earliest winter flood of record in the Cairo district. The lower Tennessee River flood was the highest since March, 1897, while the Cumberland River flood was the greatest of record. The second rise, caused by moderately heavy rains from January 18 to 24, resulted in higher stages in the Ohio above the mouth of the Cumberland but no flood in either the Cumberland or the Tennessee. Flood stage was reached at Shawneetown on January 23, but not at Paducah and Cairo until Jan. 2 and 1, respectively, after some additional water had been received from the Tennessee and upper Mississippi Rivers. The third rise in early March came from the upper Ohio River and was not of consequence. The fourth rise was mainly a Cumberland and Tennessee flood. It was preceded by moderately heavy rains on March 8 and 9 and excessive rains on March 12 and 13. General flood stages occurred, although lower than those of the first rise.

During this period gradual rises had been coming down the Ohio and Upper Mississippi Rivers and on March 17 a five-day rain period set in, the fifth rise following. The river at Cairo first passed the stage of 50 feet at 4 p. m. March 21, reaching on this rise a crest of 52.8 feet on March 24 and 25. At Paducah the crest was 44.6 feet on March 24 and at Shawneetown 44.3 feet on April 1, both representing the combined effect of the upper Ohio tide and ponding from the mouth of the river.

Heavy rains on March 31 and April 1, especially along the lower Ohio and lower Missouri Rivers and along the Mississippi from St. Louis to Cairo, brought about the sixth rise. The river at Cairo had fallen to only 49.2 feet and at Cape Girardeau, Mo., on the Mississippi River to 27.2 feet on March 31, and to 38.4 feet at New Madrid on April 1. There were some further rains on April 4 and 5, and new crests were as follows: Paducah, 42.8 feet on April 5 and 6; Cape Girardeau, 36.8 feet on April 6; Cairo, 53.2 feet on April 8; and New Madrid 41.1 feet on April 9. The rivers then fell slightly for a few days, but rains continued daily from April 8 to 16 over the same areas and also extended over the Tennessee and Cumberland Valleys, and the seventh and most important rise followed. Crests were as follows; Shawneetown, 40.1 feet on April 17 and 18; Paducah, 47.2 feet on April 18; Cairo, 56.4 feet on April 20, exceeding the previous record of April 4 and 7, 1913, by 1.7 feet; and New Madrid 43.5 feet 1.1 feet lower than the record stage of April 9, 1913.

Then followed a recession until the next rain period from May 5 to 10, when the eighth rise occurred. It lasted for five days but brought only 32.8 feet at Cape Girardeau on May 12, 44 feet at Cairo on May 14, and 34.8 feet at New Madrid on May 14 and 15.

On account of heavy rains over the tributary areas of the extreme lower Missouri River there was another rise in the Mississippi at Cape Girardeau, the crest stage on May 19 falling only 0.1 foot below the flood stage of 30 feet.

The tenth rise was caused by a series of almost daily rains over the Cairo and adjacent river districts between May 23 and June 4. The Tennessee River remained comparatively low during this period; the Ohio River was within banks at Mount Vernon, Ind.; and the highest stage at Paducah was 39.9 feet, or 3.1 feet below the flood stage. At Shawneetown, Cairo, Cape Girardeau, and New Madrid the crest stages averaged about 5 feet above the flood stages, and the crest of 49.7 feet at Cairo on June 9 was the highest ever known in any month later than May. The highest previous summer stages were 49.5 feet in June, 1858, and 46.8 feet in July, 1844.

Table 18 presents statistical data regarding floods at Cairo from 1882 to 1927 with crests above 50 feet. However, from 1882 to July, 1898, the flood stage at Cairo was only 40 feet, whereas since that time it has been 45 feet, the expansion of the levee system and consequent closer confinement of the river having necessitated the change.

TABLE 18.—*Floods with Cairo, Ill., crest stages above 50 feet*

Year	Crest	Date	Days above flood stage	Last date above flood stage	Days 50 feet or more	Last day above 50 feet
	Feet					
1882	51.9	Feb. 25, 26	[1] 57	Mar. 21	10	Mar. 3
1883	52.2	Feb. 26, 27	21	Mar. 8	15	Mar. 4
1884	51.8	Feb. 21–24	[1] 43	Apr. 6	14	Feb. 29
1886	51.0	Apr. 18, 19	22	Apr. 25	9	Apr. 22
1897	51.6	Mar. 25–28	48	Apr. 22	19	Apr. 5
1903	50.6	Mar. 15–17	[1] 27	Apr. 25	9	Mar. 20
1907	50.4	Jan. 27	[1] 25	Mar. 29	4	Jan. 29
1912	54.0	Apr. 6, 7	[1] 47	May 13	23	Apr. 18
1913	54.7	Apr. 4 and 7	[1] 48	Apr. 22	21	Do.
1916	53.4	Feb. 4	42	Feb. 16	13	Feb. 10
1917	50.1	Apr. 4, 5	[1] 32	Apr. 16	4	Apr. 6
1920	51.4	Mar. 31	[1] 44	May 8	9	Apr. 4
1922	53.6	Mar. 26, 27	[1] 53	May 7	[1] 45	May 2
1927	56.4	Apr. 20	[1] 89	June 14	[1] 39	May 1

[1] In two or more periods; other continuous.

Table 19 shows for typical or key stations the crests preceding crests of more than 50 feet at Cairo.

TABLE 19.—*Crest stages 1912–1927* [1] *preceding crests of more than 50 feet at Cairo, Ill.*

Stations	1912		1913		1916		1917		1920		1922				1927			
	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date	Height	Date
	Feet		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*		*Feet*	
Cincinnati, Ohio	53.4	Mar. 27	69.9	Apr. 1	53.2	Jan. 14	56.1	Mar. 17	54.6	Mar. 22	52.2	Mar. 18	[2] 48.2	Apr. 19	[2] 46.0	Mar. 26	[2] 37.6	Apr. 6.
Evansville Ind	42.6	Mar. 31	48.4	Apr. 5	43.6	Jan. 18	42.9	Mar. 22	42.8	Mar. 25	42.9	Mar. 21	[2] 37.6	Apr. 23	[2] 39.9	Mar. 25	[2] 36.3	Apr. 16.
Nashville	46.6	Apr. 7	44.9	Apr. 2	42.4	Jan. 5	45.7	Mar. 10	35.8	Mar. 16	45.1	Mar. 16	[2] 27.5	Apr. 3	[2] 40.0	Mar. 14	[2] 30.4	Apr. 14.
Chattanooga, Tenn.	31.3	[3] Mar. 31	33.3	Mar. 30	32.9	Jan. 1	47.7	Mar. 7	26.6	Mar. 22	32.8	Mar. 13	[2] 20.1	Apr. 2	[2] 28.2	Mar. 11	[2] 16.2	Apr. 14.
Johnsonville, Tenn.	35.4	Apr. 6	33.3	Mar. 29	32.5	Jan. 8	38.9	Mar. 18	29.1	Mar. 17	36.4	Mar. 15	[2] 24.5	Apr. 4	[2] 36.3	Mar 16	[2] 32.2	Apr 17
St. Louis, Mo	30.8	Apr 5	[2] 27.2	Apr. 16, 17	31.5	Jan. 31	20.3	Apr. 3	27.8	Mar. 30	24.0	Mar. 17	34.0	Apr. 19	[2] 27.3	Mar. 22	[2] 36.1	Apr. 26.
Cairo, Ill	54.0	Apr. 6, 7	54.7	Apr. 4 and 7.	53.4	Feb. 4	50.1	Apr. 4, 5	51.4	Mar. 31	53.6	Mar. 26, 27	[2] 53.5	Apr. 25	[2] 52.8	Mar. 25	56.4	Apr. 20.

[1] See Table 20, SUPPLEMENT NO. 22, MONTHLY WEATHER REVIEW for similar table covering floods prior to 1912.
[2] Not the highest of the season.
[3] Crest followed that of Cairo.

The flood of 1927 at Cairo stands alone in every respect except as to duration of stages above 50 feet, the flood of 1922 leading in this respect. Stages above Cairo on both rivers were less than in 1913, and considerably less than in March, 1922, except at St. Louis. Stages of the Ohio River immediately preceding the flood were not especially high, and the absolute crests of 44.3 feet at Shawneetown on April 1, and 47.2 feet at Paducah on April 18 were, respectively, 14.6 and 7.1 feet lower than in 1913. In the upper Ohio River the highest flood of the season occurred in late January and early February, and there was none of consequence later, although the several rises added their contributions to the already swollen river below. The crest of 36.1 feet on April 26 at St. Louis was the highest spring stage ever recorded at that place, while the crest of 40.04 feet at Cape Girardeau on April 20 has been exceeded only by the stage of 42.53 feet on July 4, 1844.

The small Table 20, following, shows how each successive rise to the flood stage at Cairo found the Mississippi River below at Memphis, Tenn., and Helena, Ark., progressively higher on each occasion except in June.

TABLE 20.—*Down-river stages at beginning of successive rises at Cairo, Ill., 1927*

Date on which Cairo reached flood stage	Stage on same date at—	
	Memphis, Tenn.	Helena, Ark.
	Feet	*Feet*
Jan. 1	32.8	38.8
Feb. 1	33.0	40.1
Mar. 17	34.0	42.8
Mar. 31 [1]	41.3	50.8
June 2	32.6	41.1

[1] Stage 49.2, lowest reading preceding April rise.

Since the flood of 1913, the levees of the State of Missouri have been extended into Donaldson Point and around to the mouth of St. John Bayou, a distance of about 22 miles from Dorena, Mo., which is 37 miles below Cairo. About 11 miles of this levee have been built since 1922; also the Conran Dike, 1½ miles long, was built in 1925 normal to the axis of flood flow near the foot of Donaldson Point. These works have raised the flood plane from Cairo to Hickman, Ky. (opposite Dorena), and lowered it at New Madrid. In 1922, with Cairo 1.1 feet lower than in 1913, Hickman was 0.3 foot higher than in 1913, while New Madrid was 3 feet lower. In March, 1927, with Cairo 0.8 foot lower than in 1922, Hickman was again higher than in 1913, while New Madrid was 4.2 feet lower. The April, 1927, crest at Cairo was 1.7 feet higher than that of April, 1913, while the crest at New Madrid was 1.1 feet lower.

The breaking of the levee at Dorena on the morning of April 16 dropped the rate of rise at Cairo from over 1 foot to 0.3 foot for two days, followed by a stationary river for one day and an additional rise of 0.1 foot on the fourth day to the crest of 56.4 feet on April 20. Without this crevasse the crest at Cairo would very probably have been between 58 and 58.5 feet.

All lowlands of the southern portions of Alexander and Pulaski Counties, Ill., were submerged with the exception of Mound City, Cairo, and the Cairo drainage district, where strenuous efforts held the levees intact. As the major portion of the April rise came from the Mississippi River, the water was higher on the west side of Cairo and the Cairo drainage district than shown on the Cairo gage. Levels run by railroad engineers showed a stage of water at 4 p. m., April 20, outside the Mobile & Ohio Railroad track at Davis Junction, 1 mile beyond the northwest corner of Cairo, of 58.3 feet, 1.9 feet higher than on the Cairo gage, and the water level was probably higher still 4¾ miles upstream at the north end of Cairo drainage district, where the 57-foot levees were bulkheaded to keep out an additional 1.5 feet of water. Some of this water came from the headwater diversion of the Little River drainage district in Missouri, where the run-off from 1,114 square miles of drainage of the Ozark Hills of Cape Girardeau and adjoining counties is diverted to the Mississippi River just below Cape Girardeau instead of going to the St. Francis Basin. This latter project was completed in 1919.

A strong current passed from the Mississippi to the Ohio River north of Cairo drainage district, overtopping the railroad embankments and discharging through Cache River. In the city of Mounds, Ill., the water was from 1 to 5 feet deep, the failure of a small protection levee assisting.

There were levee failures in the North Alexander district on April 8, and in Clear Creek and Preston districts of Illinois on April 16 and 17 from above McClure, Ill., 6 miles upstream from Cape Girardeau, to Gale, Ill., at the lower end of the North Alexander district. As a result the whole basin from the hills of Cape Girardeau to those east of McClure and Gale was filled with backwater, overtopping the entire levee system, and causing the maximum stage of 40.04 feet at Cape Girardeau on April 20.

Below the mouth of the Ohio River the levee protecting the city of Columbus, Ky., was cut on April 14 in order to avoid a more serious break that was inevitable. As the floods subsided, great quantities of soil fell into the river, and the city has been moved back to the bluff.

The great crevasse at Dorena, Mo., occurred at 4:15 a. m., April 16, flooding 200,000 acres of land in the St. John levee and drainage district of Missouri. The break was not unexpected and the United States Coast Guard steamer *Kankakee* was on hand to remove people from the flooded area. Three days later the crevasse water, overtopped the ridge levee between New Madrid and Farrenburg, Mo., for a distance of 4 or 5 miles, releasing a vast volume of water to the Little River district or upper St. Francis Basin. Water came into the town of New Madrid from the rear, and on April 20 it was 1.5 feet higher inside the city levee than in the river in front of the town.

The total area overflowed in the Cairo district was about 630,880 acres, of which about 61 per cent is improved land. There were 143,660 acres in Illinois, 149,800 acres in Kentucky, and 337,420 acres in Missouri. There were 11 deaths directly attributable to flood conditions, and 6,800 persons were rendered temporarily homeless. The total of losses reported was $4,835,863, while the value of property reported as having been saved through the warnings of the Weather Bureau was $4,117,850. Protective measures during the flood cost $600,000. Railroad losses were heavy; many miles of trackage were under water, and traffic interruptions and suspensions were numerous.

TABLE 21.—*Flood losses, Cairo district, 1927*

Items	Before Mar. 17 [1]	After Mar. 17	Total
Tangible property	$90,115	$1,918,577	$2,008,692
Matured crops	510,750	320,000	830,750
Prospective crops	3,900	878,400	882,300
Livestock and movables	15,900	290,400	306,300
Suspension of business	24,700	783,121	807,821
Total loss			4,835,863
Saved by Weather Bureau warnings	325,350	3,792,500	4,117,850

[1] Previously reported on Feb. 14, Mar. 16, and Apr. 27, 1927.

MISSISSIPPI RIVER FROM BELOW CAIRO, ILL., TO THE MOUTH OF WHITE RIVER; ST. FRANCIS RIVER

By FREDERICK W. BRIST

The great flood in the Memphis district was the combined product of four distinct rises in the Mississippi River above Memphis, as indicated by the stages at the key station at Cairo. The first rise at Cairo, from February 26 to March 5, amounted to 3.7 feet; the second, from March 13 to 25, was 13.8 feet; the third, from April 1 to 8, was 4 feet; and the fourth and last, from April 13 to 20, the crest of 56.4 occurring on the latter date. These 4 rises were merged into 3 at Memphis and 2 at Helena, Ark., 85 miles above the mouth of White River.

Table 22 shows the crest stages and dates at the various stations in the Memphis district.

TABLE 22.—*Crest stages and dates, Memphis, Tenn., district*

Station	River	Flood stage	Above flood stage		Number of days	Crest stages		Highest previous stage	
			From—	To—		Height	Date	Height	Date
		Feet	1927	1927		*Feet*	1927	*Feet*	
Memphis, Tenn.	Mississippi	35	Jan. 5	Jan. 16		46.0	Apr. 23	46.55	Apr. 9, 1913.
Do	do		Feb. 5	Feb. 20					
Do	do		Mar. 19	Mar. 31					
Do	do		Apr. 1	May 19					
Do	do		June 6	June 22	107				
Cottonwood Point, Mo.	do	34	(1)	(1)	(1)	40.2	Apr. 22-24	42.3	Apr. 11-12, 1913.
Helena, Ark.	do	44	Jan. 9	Jan. 18					
Do	do		Feb. 7	Feb. 24					
Do	do		Mar. 20	May 23					
Do	do		June 8	June 25	111	56.75	Apr. 26-27	55.2	Apr. 22, 1913.
St. Francis, Ark.	St. Francis	17	Apr. 1	June 16	77	26.4	Apr. 18	26.2	Apr. 6, 1927.
Marked Tree, Ark.	do	17	Feb. 1	Feb. 20					
Do	do		Apr. 9	June 17	90	20.1	Apr. 10	24.2	Apr. 18-19, 1912.

[1] Data not complete.

It will be seen from the above table that the crest stage of 46 feet at Memphis was 0.55 foot below the previous highest water on April 9, 1913, while at Helena the crest stage of 56.8 feet was 1.6 feet above the previous highest water on April 22, 1913. In the report on the Cairo district it was stated that, without crevasses in that district, the crest stage at Cairo would probably have been between 58 and 58.5 feet, or between 1.5 and 2 feet higher than the actual crest of 56.4 feet. This would have made the Memphis crest about 47 feet, or possibly a little higher. Likewise, the crest at Helena would probably have been about 58.5 feet, or about 1.75 feet higher than the actual crest of 56.75 feet, and approximately the same as the estimated crest at Cairo under the same conditions. However, a portion of the possible excess of 1.75 feet would have been due to ponding created by the still higher stages that would have occurred at Arkansas City, Ark., had the levees in that section remained intact.

The river at Memphis was above 40 feet from March 27 to April 3, and from April 7 to May 7, all inclusive, a total of 39 days, and 6 days less than in 1922. At Helena the river was above 50 feet continuously from March 30 to May 12, inclusive, a total of 44 days, the same as in 1922. Table 23, following, shows the number of days from 1903 to 1927 when the river was above 40 feet at Memphis and above 50 feet at Helena.

On March 7, during the second rise, over 2 inches of rain fell at Memphis, and on the following morning the river at this place showed a 24-hour rise of 0.7 foot, with no corresponding rise above. The rains were also heavy over the near-by drainage basins of the Obion, Forked Deer, Hatchie, and Wolf Rivers, so that the river responded locally, without increment from above. This unusual feature persisted throughout the remainder of the flood, and it appears to have prevailed also at Cottonwood Point, and in lesser degree at Helena.

TABLE 23.—*Number of days, 1903 to 1927, Mississippi River was above 40 feet at Memphis, Tenn., and above 50 feet at Helena, Ark.*

Year	Number of days—		Year	Number of days—	
	Above 40 feet at Memphis	Above 50 feet at Helena		Above 40 feet at Memphis	Above 50 feet at Helena
1903	2	10	1916	16	18
1907	3	5	1920	4	3
1912	23	29	1922	45	44
1913	26	24	1927	39	44

The June flood was due to a series of frequent rains between May 23 and June 4 mainly over the districts to the northward, as there was very little rain below Cairo after May 25.

The Missouri River east of Kansas City was again in moderate flood, the Illinois was still very high, and the northern tributaries of the Ohio were at good stage. The southern tributaries of the Ohio, however, were comparatively low.

These rains were sufficient to cause general rises at and above Cairo, with 21.8 feet on June 6 at Hermann, Mo., on the Missouri River, 33 feet at St. Louis on June 8, and 49.7 feet at Cairo on June 9, a total rise at the latter place of 13.3 feet since May 23. At Memphis the crest was 39 on June 14 and 15, or 4.4 feet higher than the highest previous June stage, that of June 21, 1917. On an average a stage above 30 feet occurs at Memphis about once in 9 years. At Helena the crest of the June rise was 48 feet from June 16 to 18, inclusive, exceeding by 2 feet the previous high stage of June 1, 1893.

The flood in the St. Francis River began with the heavy rains of January 18 to 24 over the southeastern lowlands of Missouri. The river at St. Francis, Ark., rose from 9.3 feet on January 16 to 25.9 feet on January 25, the highest stage of record or tradition at that time and 8.9 feet above the flood stage. At Marked Tree, Ark., this rise crested from February 7 to 11 at 18 feet, 1 foot above the flood stage. This flood broke the levees in three places on the Missouri portion of the river, one north of St. Francis, Ark., one west of Gibson, Mo., and the third north and west of Kennett, Mo. There were no breaks in the newer and higher levees just below the Missouri-Arkansas line, but a considerable quantity of water passed around the upper end of the levee west of St. Francis, Ark., and flooded a portion of the basin west of the river.

Nine levee breaks were reported along the right bank of the St. Francis River from the northern limit of Poinsett County to the mouth of the St. Francis Lake floodway. Subsequently a break, 365 feet in width, occurred in the floodway at the foot of St. Francis Lake, west of Marked Tree, Ark., and water ran through the crevasse until July 10, when it turned and flowed back through the floodway. From the time the breaks occurred along the left bank it is estimated that 50 per cent of the flood waters from the upper St. Francis River found their way to the Little River district above Kennett, Mo.

The next important rise in the St. Francis River was in March, and the river at the town of St. Francis rose from 8.8 feet on March 12 to 22.9 feet on March 24, but at Marked Tree the flood stage was not reached until April 9 while the third great rise was in progress above. During the third rise the crest at St. Francis was 26.2 feet on April 6, or 0.3 foot above the stage of January 25. After an interval of a few days the final heavy rain period set in, and the river at St. Francis after a fall of 3.9 feet from April 6 to 12, reached a stage of 26.4 feet on April 18, the highest stage of record or tradition.

May and early June rainfall was also quite heavy over the upper basin and there was another crest of 21.5 feet at St. Francis on May 12 and still another of 23.1 feet on June 6, the river falling below the flood stage of 17 feet by June 17. At Marked Tree the river was continuously above the flood stage of 17 feet from April 9 to June 17, inclusive, with a crest of 20.1 feet on May 10.

It is believed that none of the water from St. John's entered the St. Francis above the present Little River floodway. The direct causes of the flood water in Mississippi County, Ark., were the breaks in the levees on the east side of Big Lake. These breaks were made by the flood waters from the St. Francis and Little Rivers. The Dorena water came later and flowed through these breaks into Mississippi County. This overflow occurred in April.

Overflow water from above St. Francis, Ark., reached parts of Clay and Green Counties in northeastern Arkansas late in January, and parts of Craighead and Poinsett Counties early in February. Backwater was reported near Marianna early in March and in the Lower St. Francis Basin by March 15 to 20.

The depth of the overflow in the St. Francis Basin varied from a few inches to 20 feet, while at Laconia Circle it was from 15 to 25 feet deep. The water was the highest known, except in the districts submerged in 1912 and 1913 from breaks in the main Mississippi levee near Wilson, Ark.

Planting began as early as May 15 and was carried on as fast as the waters receded and the ground could be prepared. When the June rise became apparent, planters were advised by this office to observe caution in planting on low ground. Not all heeded this advice, and the expected rise again covered 50 per cent or more of the area overflowed in April. It was then too late to replant much of it, but some was planted in corn and fodder.

There were no crevasses in the Mississippi River levee on the left bank, but there was considerable overflow from backwater between the river and high ground along small streams entering the Mississippi. As on the Arkansas side of the river much planting was done in May, and much again overflowed by the June rise.

Crevasses.—There were no crevasses in any levee in the Memphis district that were up to standard grade and section, and at points where breaks occurred the flood plane was at least 1.5 feet above previous crest stages, except at Laconia Circle where the levee was destroyed by caving banks.

At 5.30 p. m., March 29, the levee on the right bank of the Mississippi River at Laconia Circle, a short distance above the mouth of White River, broke on account of caving banks. Approximately 2,000 people were driven from their homes and about 12,000 acres of land were overflowed. To relieve the situation a small crevasse was opened on April 12 in the back levee on the west side of the circle.

On April 15 at 8 p. m. the right-bank levee of the Mississippi River broke near Whitehall, Ark., about 15 miles above Helena. The approximate width of the crevasse was 1,250 feet. On April 20 at 10:45 p. m. and on April 21 at 10:30 a. m. the right-bank Mississippi levee broke in three places near Knowlton, Ark., 10 miles above the Laconia Circle crevasse. The total length of the breaks was 3,600 feet, and the lengths of the standing sections between the breaks were approximately 300 and 1,500 feet.

Extent of overflow.—On the east side of the Mississippi River 505,000 acres of land were overflowed, of which 390,000 acres were unleveed. On the west side of the river 1,430,000 acres were overflowed, of which 400,000 acres were in the St. Francis Basin backwater area.

Gage relationship.—Between 1916 and 1922 the main right-bank Mississippi levee in the St. John's levee and drainage district of Missouri above New Madrid, Mo., was extended downstream about 10 miles. This resulted in a marked elevation of the Cairo flood plane as compared with points in the Memphis district. Since 1922 the same levee has been extended 10.68 miles farther downstream, leaving a gap of about one-half mile at St. Johns Bayou near New Madrid.

Table 24 shows crest stages at Cairo and points below from 1916 to 1927, inclusive, together with departures from the Cairo crests. Owing to the crevasse at Dorena, Mo., and excessive local rains in western Tennessee the readings for the flood of April, 1927, are not comparable.

TABLE 24.—*Crest stages, Memphis district and departures from Cairo crests*

Date	Cairo, Ill., stage	Cottonwood Point, Mo.		Fulton, Tenn.		Memphis, Tenn.		Helena, Ark.	
		Stage	Departure	Stage	Departure	Stage	Departure	Stage	Departure
	Feet	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*	*Feet*
February, 1916	53.4	39.5	−13.9	40.2	−13.2	43.5	−9.9	53.4	0.0
First rise, 1922	53.6	38.5	−15.1	39.1	−14.5	42.6	−11.0	52.3	−1.3
Second rise, 1922	53.5	38.4	−15.1	39.2	−14.3	42.3	−11.2	53.1	−0.4
March, 1923	46.7	34.5	−12.2	32.7	−14.0	36.5	−10.2	45.4	−1.3
January, 1927	48.9	35.2	−13.7	33.6	−15.3	37.7	−11.2	46.3	−2.6
February, 1927	48.9	35.1	−13.8	33.7	−15.2	37.8	−11.1	47.3	−1.6
April, 1927	56.4	40.2	−16.2	42.2	−14.2	46.0	−10.4	56.8	0.4

Flood losses.—Land was submerged by Mississippi water from 5 to 8½ weeks during the first flood period ending in May, and from 1 to 2½ weeks in June, while in parts of the St. Francis Basin the land was covered from 4 to slightly more than 12 weeks. An undetermined percentage of land was covered with sand, which will probably prevent good crops for several seasons to come. Suspension of lumbering operations was a costly item, although moderated in some measure by the opportunity to float logs to points near the mills. Owing to general heeding of the warnings the loss of livestock and movable property was not great for a major flood.

Forty-seven human lives were lost during the flood, 17 white, 9 colored, and 21 color unknown.

The total reported losses amounted to $28,051,468, divided as follows:

Tangible property	$3, 734, 450
Crops, actual	1, 124, 070
Crops, prospective	9, 112, 525
Livestock and other movable property	593, 350
Suspension of business	10, 268, 565
Protection work	218, 508
Land damage (300,000 acres at $10 an acre)	3, 000, 000
Total	28, 051, 468

Lumber loss and damage.—Through the courtesy of the Hardware Manufacturers Institute of Memphis, Tenn., the following statement as to damage to the lumber industry in the flooded States was obtained:

TABLE 25.—*Losses incurred by the lumber industry, 1927*

State	Mills affected	Mills overflowed	Damage			Suspension of business	Total
			Mills and yards	Log railroad and log equipment	Lumber		
Missouri	10	4	$10,000	$80,820	$1,000	$45,000	$136,820
Arkansas	80	35	350,000	500,000	----------	600,000	1,450,000
Tennessee	33	2	----------	100,000	25,000	198,000	323,000
Mississippi	42	24	350,000	500,000	----------	315,000	1,165,000
Louisiana	64	38	60,000	650,000	210,000	480,000	1,400,000
Texas	5	0	----------	15,000	----------	30,000	45,000
Total	234	103	770,000	1,845,820	236,000	1,668,000	4,519,820

The money value of the property reported as having been saved through the flood warnings was $1,602,500. These figures are far from complete, as many persons stated that while the warnings were of enormous value, they were unable to give expression to the value in term of dollars and cents. Warnings were distributed by telegraph, radio, press, mail, steamboats, etc. The long-distance telephone was in almost constant use, and hourly broadcasts of warnings, river stages, and flood news were made from 8 a. m. to 3 p. m. Extensive use was also made of airplanes to carry engineers to threatened points and to search for locations of possible crevasses.

ARKANSAS DRAINAGE FROM KANSAS-OKLAHOMA LINE TO FORT SMITH, ARK.

By TRUMAN G. SHIPMAN

Moderately heavy rains near the close of March over eastern Oklahoma and southeastern Kansas were immediately followed by flood warnings for the lower Verdigris River and for the Neosho and Arkansas Rivers. Before the recession had progressed very far, heavy rains again set in, and during the 13-day period from April 7 to 19 the average rainfall over the drainage basin was approximately 8 inches. Flood warnings were of course issued promptly. The heaviest rains occurred from April 11 to 16, inclusive, and in order to keep pace with them it became necessary to revise the river forecasts and flood warnings upward from day to day. Two features that contributed to the abnormally high crests in the eastern portion of the district were the heavier rains near the Oklahoma-Arkansas line and the fact that the second rain period set in just about the time that the upstream crests from the earlier rise reached the lower portion of the district, thereby inaugurating the second rise on much higher initial stages.

There was no flood of much consequence in the Arkansas River above the mouth of the Verdigris, but the river below the Verdigris and the extreme lower Neosho were in great flood, and at some places exceeded the highest previous stages of record. The table following shows the crests reached at stations in the district, together with the highest stages of previous record:

TABLE 26.—*Crest stages and dates, 1927, Fort Smith, Ark., district*

Station	River	Flood stage	Number of days above flood stage	Crest		Highest previous stage	
				Height	Date	Height	Date
		Feet		*Feet*	1927	*Feet*	
Ralston, Okla	Arkansas	16	1	16.0	Apr. 21	23.0	June 11, 1923.
Tulsa, Okla	do	16	0	14.6	Apr. 13	19.8	June 13, 1923.
Independence, Kans	Verdigris	30	------	45.2	Apr. 20	46.7	July 8, 1904.
Okay, Okla	do	27	6	32.0	Apr. 18	28.5	1903.
Wyandotte, Okla	Neosho	23	7	29.5	Apr. 15	34.0	December, 1895.
Pensacola, Okla	do	24	7	32.0	Apr. 15	32.5	Apr. 29, 1912.
Fort Gibson, Okla	do	22	14	34.5	Apr. 15	35.0	May 25, 1908.
Tamaha, Okla	Arkansas	25	------	[1] 32.4	Apr. 14	28.0	June 14, 1923.
Webbers Falls, Okla	do	23	14	33.5	Apr. 15	38.2	June, 1833.
Fort Smith, Ark	do	22	16	36.7	Apr. 16	38.0	June, 1833.

[1] Probably higher following day.

Four lives were lost at Gibson Station, Okla., on the Verdigris River, and one on the Poteau River in Oklahoma. About 265,000 acres of land were overflowed in the district, and the total of losses reported amounted to $5,710,000, divided as follows:

Housed crops	$425,000
Prospective crops	3,100,000
Buildings, highways, bridges, etc	700,000
Railroads	1,070,000
Livestock, etc	90,000
Suspension of business	325,000
Total	5,710,000

The money value of property saved through the warnings of the Weather Bureau was given as $425,000.

ARKANSAS DRAINAGE BELOW FORT SMITH, ARK.

By HARVEY S. COLE

The same general rain conditions that caused the floods at and above Fort Smith, Ark., also covered the remainder of the Arkansas drainage to the eastward, but in greatly intensified form. From April 9 to April 22 the total fall of rain varied between 8 and 10 inches in extreme eastern Oklahoma, and between 9 and 19.48 inches eastward over west-central Arkansas, thence gradually decreasing to about 9 inches toward the Mississippi River.

Over the area extending from Newton County to Yell County the total rainfall during the two weeks exceeded 16 inches, with a maximum of 19.48 inches at Danville, Yell County. At Little Rock 8.08 inches fell during the 24 hours ending at 7 a. m., April 20. Southeastern Kansas also contributed more than 6 inches. Farther to the westward over Kansas and Oklahoma the rains did not contribute materially to the volume of flood waters. Otherwise the Arkansas River flood would have reached still greater proportions. The rain period was divided into two parts by an interval of two days, April 16 and 17, during which little or no rain fell, and it should be noted also that the rains in both the Arkansas and White basins began over their upper portions, and followed the crests down, heavy rains occurring at the times of the crests at the lower stations.

By April 13 the lower Arkansas River was about bankful, and the heavy rains of April 12 to 14 together with those of April 15 at the lower stations made the approach of a dangerous flood a certainty. The second rain period added still more to the flood waters and the result was the second highest flood in over a century.

In the White Basin the precipitation conditions were much the same as in the Arkansas, and had it not been for the fact that the crest in the Buffalo River occurred three days before that in the upper White the crests in the White River below would have been much higher.

The first flood warning was issued on the morning of April 13, and was in the nature of a general warning. The last warning was on April 20, and applied to the Arkansas River at and below Little Rock. Extraordinary service was afforded for the reception of information and the distribution of warnings, the telegraph, the telephone, the radio, the press, and numerous bulletins, contributing impartially until the rising waters overwhelmed the telegraph and the telephone in many localities.

Crest stages during the flood and the dates therof, and also the highest stages previously recorded, are given in Table 27.

TABLE 27.—*Crest stages and dates, 1927, Little Rock, Ark., district*

Station	River	Flood stage	Crest stage		Highest previous stage	
			Height	Date	Height	Date
		Feet	*Feet*	1927	*Feet*	
Dardanelle, Ark	Arkansas	20	33.0	Apr. 19	29.8	Jan. 31, 1916.
Little Rock, Ark	do	23	33.0	Apr. 20	34.6	June, 1833.
Pine Bluff, Ark	do	25	32.4	Apr. 21	30.5	May 22, 1892.
Yancopin, Ark	do	29	48.5	Apr. 20	44.6	Feb. 10, 1916.
Gilbert, Ark	Buffalo	30	37.0	Apr. 14	[3] 54.0	Aug. 18, 1915.
Danville, Ark	Petit Jean	20	28.5	Apr. 15	29.0	June 4, 1904.
Patterson, Ark	Cache	8	[2] 16.0	Apr. 19	13.0	January, 1916.
Dam No. 1, Ark	Little Red	------	50.5	Apr. 16	------	
Leeper, Mo	Black [1]	11	16.5	Apr. 15	21.3	Aug. 20, 1915.
Williamsville, Mo	do [1]	11	17.8	Apr. 15	24.0	Do.
Poplar Bluff, Mo	do [1]	14	18.5	Apr. 16	18.5	Aug. 21, 1915.
Corning, Ark	do	11	16.2	Apr. 18	15.2	May 19, 1918.
Black Rock, Ark	do	14	30.2	Apr. 15	31.9	Aug. 21, 1915.
Ozark Beach, Mo	White	30	38.0	Apr. 16	32.6	Feb. 1, 1916.
Calico Rock, Ark	do	18	40.5	Apr. 15	50.9	Jan. 31, 1916.
Batesville, Ark	do	23	42.8	Apr. 15	43.4	Feb. 1, 1916.
Newport, Ark	do	26	35.6	Apr. 16-17	34.3	Do.
Georgetown, Ark	do	22	30.3	Apr. 17	28.3	May 20, 1918.
Clarendon, Ark	do	30	43.3	Apr. 23	38.5	Feb. 8, 1916.

[1] St. Louis district.
[2] Highest recorded. Water over gage.
[3] About.

Although no records for 1833 are available for Dardanelle and Pine Bluff, Ark., those for Webbers Falls, Okla., and Fort Smith and Little Rock indicate that the water at Dardanelle and Pine Bluff was higher in 1833 than at any time since that year. The Black River was not quite as high in 1927 as in 1915, nor was the upper White River from Calico Rock to Batesville, Ark. In the lower White River the 1927 stages were the highest of record. At Newport, Ark., the levee held, while below Newport the second series of heavy rains sent great volumes into the river, and at Georgetown, Ark., the crest stage would probably have been about 32 feet had the levees held. The excess of 4.8 feet over the previous high water stage at Clarendon, Ark., may have been partly due to the increased benefit of the levees, assisted by backwater from the Mississippi River. Backwater also probably exercised some effect in the Arkansas River at Pine Bluff.

The levees on the right banks of the Mississippi and lower Arkansas Rivers are under Federal control, and these held except at South Bend and Pendleton, Ark., on the Arkansas River, where two large crevasses occurred. The Jackson County levee which protects Newport also held, while the White River levee and the Missouri Pacific Railroad embankment below Newport and the levees along Little Red River were either submerged or gave way. The Pemberton levee, which connects with the Plum Bayou levee, was almost entirely submerged, and Plum Bayou levee broke in five places. From Fourche levee in Pulaski County westward to Fort Smith all levees were covered, some having been nearly washed away.

Much unleveed land along the Black and upper White Rivers and large areas back of the levees were overflowed, and more than 2,500 square miles of land along the White, Black, and Little Red Rivers were covered with water, while the extent of the submerged area along the Arkansas below Fort Smith and its smaller tributaries was about 3,200 square miles. The total area overflowed in the entire State of Arkansas was more than 6,600 square miles. Forty thousand persons were driven from their homes, and 127 lives were known to have been lost. Great channels and holes were formed in some of the best farm lands, and piles of sand deposited on others, rendering large tracts entirely useless for the present.

The total losses reported aggregated $13,936,000, divided as follows:

	Arkansas Basin	White Basin	Total
Tangible property	$5,196,000	$3,190,000	$8,386,000
Prospective crops			3,654,000
Livestock	568,000	69,000	637,000
Suspension of business	773,000	486,000	1,259,000
Total	6,537,000	3,745,000	13,936,000

The value of property reported as having been saved by Weather Bureau warnings was $1,099,000 in the Arkansas and $485,000 in the White Basin, a total of $1,584,000.

The Air Service, Militia, Federal, State, county, city, and many civic organizations were combined under the Red Cross for rescue and relief work. Refugee camps were formed and persons concentrated to them as rapidly as possible. Airplanes moved up and down the streams, locating persons marooned in trees and houses and on high ground, and boats were sent to carry them to camps. Suffering was intense at times, some persons remaining in trees for 48 hours before they could be rescued. Food was sometimes scarce and living conditions very uncomfortable, but no serious outbreak of disease resulted.

MISSISSIPPI RIVER FROM THE MOUTH OF WHITE RIVER TO VICKSBURG, MISS.; YAZOO RIVER

By R. T. Lindley

The flood of 1927 in the Vicksburg district was the most prolonged and disastrous in its history, and its inception may be traced to the excessive rains of August and September, 1926, over the upper portion of the Mississippi drainage. At Vicksburg the 1926 crest of 30.9 feet on September 24, 25, and 28 has been exceeded but twice in 56 years, 40.4 feet on September 1, 1875, and 40.1 feet on September 6 and 7, 1915, while the 1926 crest of 40.7 feet on October 26 was 9.8 feet higher than the previous crest of 30.9 feet on October 1, 1915.

Stages in the autumn and early winter of 1926 were then unusually high for the season and the subsoil was well filled with water so that the winter and spring rains brought such a volume of water into the combined channel that it overflowed and broke through the levees.

There were several very serious crevasses in the district. The most serious was the one that occurred soon after 7 a. m., April 21 at Mounds Landing, Miss., on the left bank of the Mississippi River near the southern boundary of Bolivar County. Nearly 2,000 square miles of land were overflowed, of which about 1,148 square miles, or 735,000 acres, were under cultivation. Water through this crevasse inundated Greenville, Miss., a thriving city of about 15,000 inhabitants, through the failure of the protection levee at the back of the city, and many other prosperous towns and hamlets were overflowed and their inhabitants marooned, necessitating the establishment of numerous refugee camps at points above the reach of the flood waters.

The flood waters from the Mounds crevasse in their eastward and southward sweep spread to the lower Yazoo Basin, but the rise in the Yazoo River at Yazoo City, Miss., although reaching the highest stage of record, was much more gradual than over the region more directly in the path of the flood waters, and the higher ground to the eastward and adjacent to the course of the lower river permitted some relief, although great damage was done.

Refugees, human and otherwise, gathered along the Mississippi levees, when possible to do so, and, when it became necessary, they were taken by boat to the various concentration camps. Inland, however, where there was no hope of immediate relief, many of the livestock were drowned, and the inhabitants, if beyond the reach of mounds, or other comparatively elevated points, withdrew to upper floors of buildings, or roofs, until evacuated by motor boats.

At the close of the flow the width of the crevasse at Mounds was 2,600 feet.

There were four major crevasses along the lower course of the Arkansas River, resulting in the flooding of a large area in northeastern Louisiana, and another in the main Mississippi levee at Cabin Teele, La., which, while causing great damage to houses, lands, and business, was without loss of life and movable property, as the crevasse had been expected for some time. The width of the crevasse was 2,400 feet. These crevasses released sufficient flood water to inundate about 1,900 square miles of land in southeastern Arkansas, and about 2,000 sauare miles in northeastern Louisiana. The most important town inundated by the Arkansas River crevasses was Arkansas City, Ark., a town of about 1,500 population. As at Greenville a levee failure back of the town admitted the flood waters, and during the spring the town was flooded three times, as it was impossible to complete the closure of the crevasse.

Extent of overflow.—Reports received indicate that about 5,032,000 acres of land were overflowed by the flood, 850,000 of which were crop lands, including 550,000 acres of lands in Mississippi already planted in cotton.

Loss and damage.—Forty-two human lives were known to have been lost, and 7,300 horses and mules, 8,920 cattle, 22,300 hogs, and about 260,000 fowls were drowned.

Authorities vary considerably in their estimates of the total damage from the flood, and naturally so considering its huge proportions. Perhaps something more than $100,000,000 would be a fair estimate for this district, divided as follows:

Tangible property	$14,500,000
Crops	50,000,000
Livestock, etc	15,000,000
Suspension of business	10,000,000
Protective work, etc	15,000,000
Total	104,500,000

Of the above about $4,500,000 were railroad losses, not including unremunerative business such as transporting refugees and supplies and suspension of traffic.

Much of the corn planted after the flood has been subjected to cutworms and other flood-borne pests, and in general has fared badly. Livestock losses have been materially increased on account of anthrax throughout the flooded area after the remaining livestock was returned.

It has not been possible to estimate the value of property saved through the warnings of the Weather Bureau. No complaints were received, and it is therefore assumed that the service was satisfactory. Warnings were given wide circulation by every available means, and, if reports from other districts may be taken as criteria, they must have proved very instrumental in saving lives and property.

Table 28, following, contains statistical data for the several river stations in the district.

TABLE 28.—*Flood duration, crest stages and dates, Vicksburg, Miss., district, 1927*

Station	River	Flood stage	Above flood stage		Number of days	Crest stage		Highest previous stage	
			From—	To—		Height	Date	Height	Date
		Feet				*Feet*		*Feet*	
Arkansas City, Ark.	Mississippi	48	Feb. 6	May 10	[1] 74	60.5	Apr. 21	58.0	Apr. 22-27, 1922.
Greenville, Miss.	do	42	Feb. 7	May 10	[1] 69	54.7	Apr. 21	52.1	Apr. 25-27, 1922.
Vicksburg, Miss.	do	45	Jan. 17	July 12	[1] 163	58.7	May 4	55.0	Apr. 28-29, 1922.
Swan Lake, Miss.	Tallahatchie	25	Dec. 29 [2]	June 7	[1] 158	31.8	Mar. 22	29.9	Apr. 25, 1911.
Greenwood, Miss.	Yazoo	36	------	------	[3]	35.9	Mar. 31-Apr. 1	41.2	1882.
Yazoo City, Miss.	do	25	Jan. 9	July 12	185	37.4	May 5	36.5	1882.

[1] Not all consecutive. [2] 1926. [3] Above from Dec. 28, 1926, to Jan. 9, 1927. Crest 38.4 on Jan. 2-3.

Crests at Arkansas City and Greenville were coincident with the crevasse at Mounds Landing, Miss., about 7:15 a. m., April 21. Had levees been strong enough and high enough to retain the entire volume of water then in sight, considerably higher crests would have been reached at those points.

RED RIVER ABOVE ALEXANDRIA, LA.

By J. W. CRONK

There were no floods in Red River above Arthur City, Tex., 382 miles above Shreveport, but from Arthur City to the eastern end of the district, floods were general both in the main stream and its tributaries. The contributary rains fell first on April 5 and 6 over the Sulphur River drainage and on April 7 over the Red drainage. These were followed by more or less scattered heavy rains on April 9, 11, 14, 18, 19, 20, and 21, and the average fall of rain from April 5 to 21, inclusive, from Denison, Tex., to Alexandria, La., determined from the daily data at nine river stations, was 8.83 inches. This was not an exceptionally heavy fall, and, correspondingly, the flood in this district was not of great magnitude. The highest stages recorded, together with the highest recorded stages previous to 1927, are as follows:

TABLE 29.—*Crest stages and dates, Shreveport, La., district, 1927*

Station	River	Flood stage	Crest stage		Highest previous stage	
			Height	Date	Height	Date
		Feet	*Feet*	1927	*Feet*	
Denison, Tex.	Red	25	17.0	Apr. 18	35.5	May 26, 1908.
Arthur City, Tex.	do	27	27.0	Apr. 16	43.2	May 28, 1908.
Index, Ark.	do	27	30.8	Apr. 23	27.6	May 21, 1920.
Fulton, Ark.	do	28	35.0	Apr. 24	35.8	July 17, 1876.
Springbank, Ark.	do	37	40.2	Apr. 27-28	46.0	Date unknown.
Shreveport, La.	do	39	37.4	Apr. 29-30	45.9	August, 1849.
Whitecliffs, Ark.	Little	28	29.9	Apr. 24	32.0	Aug. 21, 1915.
Ringo Crossing, Tex.	Sulphur	20	26.3	Apr. 15	30.0	June 27, 1921.
Finley, Tex.	do	24	28.2	Apr. 19	31.4	Apr. 28, 1915.
Jefferson, Tex.	Cypress	18	19.6	Apr. 21	24.5	Date unknown.
Ninock, La.	Lake Bisteneau.	28	33.5	May 1-2	------	

The recorded highest stage at Index, Ark., is probably not the actual highest stage. The record is short, and it is entirely probable that the stage in May, 1908, was much higher.

Flood warnings were first issued on April 6 for the Sulphur River, for Red River on the following day, and frequently thereafter until April 26 when the last warning issued was sent to Ninock, La., on Lake Bisteneau.

There were several local crevasses reported in the vicinity of Index, Fulton and Lewisville, Ark., with the opening at the latter about 2,000 feet in width. There were no crevasses in the main Louisiana levees, which are a portion of the State system.

Large areas of unprotected lowlands were overflowed, mainly in Bossier Parish, both from Red River itself and from bayous tributary to Red River, the latter backing up the water in the bayous. Railroads and highways in the vicinity of Shreveport were covered by water for a time, and train service was interrupted for some days.

It was found to be extremely difficult to obtain reliable estimates of the loss and damage.

Reported losses were as follows:

Tangible property	$560,000
Prospective crops	846,500
Movable property	136,500
Suspension of business	132,000
Total	1,675,000

No lives were lost, and the value of property saved through the warnings of the Weather Bureau was given as $458,000.

MISSISSIPPI RIVER FROM BELOW VICKSBURG, MISS., TO MOUTH RED RIVER BELOW SHREVEPORT, LA.; OUACHITA AND ATCHAFALAYA RIVERS

By I. M. CLINE

The flood of 1927 in Louisiana exceeded any previous flood since the settlement of this section more than 200 years ago. The previous flood of reference was that of 1882 which was exceeded by that of 1927 by 3 feet at Jonesville, La. In the upper and central portions of the Atchafalaya Basin west of that river the water depths in 1927 were in some instances from 6 to 10 feet above the previous flood record. East of the Atchafalaya River in Iberville and Assumption Parishes the flood of 1927 exceeded that of 1882 by about 2 feet.

Table 30 below gives statistical data for the flood at the various stations in the New Orleans district.

TABLE 30.—*Crest stages and dates, 1927, New Orleans, La., district*

Station	River	Flood stage	Above flood stage		Number of days	Crest stage		Highest previous stage	
			From—	To—		Height	Date	Height	Date
		Feet	1927	1927		*Feet*	1927	*Feet*	
Natchez, Miss.	Mississippi	46	Feb. 12	July 10	149	56.5	May 1, 4	55.3	Apr. 26, 1922.
Angola, La.	do	45	Feb. 13	July 13	151	57.5	May 15-17	55.3	May 15, 16, 1922.
Baton Rouge, La.	do	35	Feb. 12	July 14	153	47.8	May 15	45.7	May 16, 1922.
Plaquemine, La.	do	31	Feb. 11	July 13	153	43.0	May 15, 16	41.1	May 16, 1922.
Donaldsonville, La.	do	28	Feb. 12	July 8	147	37.1	May 15-17	35.9	May 16, 1922.
New Orleans, La.	do	17	Feb. 13	June 12	120	21.0	April 25	21.3	Apr. 25, 1922.
Alexandria, La.	do	36	Apr. 20	May 18	29	42.4	May 8	41.8	July 6, 1908.
Monroe, La.	Ouachita	40	Mar. 20	June 17	90	48.2	May 4	49.1	1874.
Melville, La.	Atchafalaya	37	Feb. 14	June 13	120	46.8	May 14-16	45.9	May 14-16, 1922
Morgan City, La.	do	8	May 25	June 23	30	[1] 9.7	June 10	9.6	June 13, 1912.

[1] At Ramos, La., 5 miles east of Morgan City, a crest equivalent to 11.7 feet on the Morgan City gage was recorded by the Southern Pacific R. R. on June 5.

The first flood forecast for the district was issued on February 7, followed by others on February 14, 16, and 19 after heavy rains intensified the situation. The warning of February 19 predicted a stage of 49.6 feet at Natchez between February 24 and 27, 18.8 to 19 feet at New Orleans, and from 39 to 40 feet at Melville between February 25 and March 2. The crests, the first of the flood, were Natchez, 49.5 feet from February 23 to 27; New Orleans, 18.8 feet on March 1; and Melville, 39 feet from February 28 to March 2, almost exactly as forecast.

The Mississippi River below Vicksburg and the Atchafalaya did not fall below the flood stage before another and greater flood was in sight. The next general warning was issued on March 23, and as often thereafter as changes were indicated. On April 23, two days after the crevasse at Mounds Landing, Miss., a statement was issued that this crevasse would not relieve conditions in the New Orleans district.

A small crevasse was caused on the afternoon of April 23 at Junior, La., on the right bank of the Mississippi River about 40 miles below New Orleans, by collision of the S. S. *Inspector* with the levee. The ship was grounded in the levee for several weeks, preventing the closing of the crevasse.

In order to relieve the situation at New Orleans the levee at Caernarvon, La., 14 miles below New Orleans, was cut at 2:15 p. m., April 29, and on the previous day notice was given that, after the breach was made in the levee, the river at New Orleans would fall for three to six days, and remain nearly stationary thereafter until the flood crest had passed.

A crevasse occurred during the afternoon of April 30 in the levee near Glasscock, La., on the right bank of the Mississippi 22 miles below Natchez, and during the following day four crevasses occurred near Bougere, about 8 miles below Glasscock. This made a total of five crevasses opening from the Mississippi River into the lower Tensas Basin. A special bulletin on May 1 gave notice that, as the artificial crevasse at Caernarvon continued to widen, the river at New Orleans would fall accordingly, but, with a further rise of 3.4 feet at Vicksburg in five days, all persons in lowlands above New Orleans were warned to take every precaution, as river stages were likely in some places to be from 3 to 4 feet higher than ever before. This bulletin was so alarming that Hon. John M. Parker, Federal and State coordinator, telephoned its contents to towns protected by the Bayou des Glaises levee, and advised that plans be laid for eventual evacuation.

On May 4 the water ran over the top of the levees at Winter Quarters, on the right bank of the Mississippi River near Newellton, La., and a crevasse followed. A crevasse also occurred on the same side of the river a few miles above Vicksburg at Cabin Teele (northeast of Tallulah, La.), resulting in a large flow of flood water from the Mississippi into the upper Tensas Basin. On the afternoon of May 4 a bulletin was issued covering the situation up to that time. It stated that the Arkansas and Mississippi crevasses, together with the high waters in the Ouachita and Red Rivers, would be followed within the next 10 days by the overflow of all lowlands not already inundated along and east of the Ouachita River and Catahoula Lake; also that the depth of overflow in the lower Tensas Basin would be the greatest of record, and that the return of water from the Glasscock and Bougere crevasses through Old River had caused a rise of 0.2 foot in 24 hours at Angola and Baton Rouge.

The situation did not improve and by May 10 had assumed such threatening proportions that special flood bulletins should be issued, daily or oftener if necessary, in order to awaken the residents behind the levees to a realization of their danger. By this time a study of previous crevasses had been completed, and certain conclusions as to the rate of travel of overland flood waters were embodied in the bulletin of May 10, from which the following extracts are quoted:

"The Mississippi River at New Orleans will change very little or fall for several days, and the highest stage, 21 feet, has already been recorded.

"The crest of the flood waters which are entering the Tensas Basin through crevasses in the right bank of the Mississippi (one crevasse at Cabin Teele being 1,200 to 1,500 feet wide and that at Winter Quarters 900 feet wide at last report), is still in Madison Parish. The head of water flowing through the Cabin Teele break is calculated to be about 13 feet above the natural bank in that vicinity, and such being the case the river must fall at least 10 feet before the flow there ceases to be a factor.

"The crest of a flood in the main stream of the Mississippi River, in passing from Vicksburg to Old River, a distance of 171 miles, ordinarily travels at the rate of about 40 miles a day. When crevasse waters pass out of the main stream into the Tensas Basin, the crest of the flood travels down the Basin at only about one-third the rate at which it travels in the main stream. In the floods of 1912, 1913, and 1922 the rate of travel through the basin, calculated against river distances, was in each case approximately 13 miles per day. The rate calculated for a direct line down the basin amounts to a travel of only about 7 miles per day.

"The waters in the Tensas Basin are deeper now than when the waters entered in former years, and it is now estimated that the crevasse waters may be traveling at a slightly greater rate. Based on an estimated rate of 15 miles per day, river distances, the water from Winter Quarters crevasse should show at Old River by May 11, and that from Cabin Teele by May 14 or 15.

"Judging from previous floods in the Tensas Basin, it will require from 10 to 15 days for the crest of this flood to travel down the Tensas Basin to Old River."

A break occurred on May 12 in a small extension levee near Cottonport, and close to the junction of Bayou Rouge and Bayou des Glaises. The land in this locality is comparatively high, and it was first thought that there would be no great amount of overflow, as the streams in that area were ordinarily sufficient to carry off the bulk of the crevasse water. This was the first crevasse in the levees separating the Tensas and Atchafalaya Basins, and indicated that the pressure of the rising flood over the large upper basin was certain to cause widespread breaks in the last line of defense along Bayou des Glaises. The Bayou Rouge crevasse continued to widen, and the bulletin of May 13 stated that the outflow through the crevasse while limited by the low levee, 3 to 6 feet, would overspread considerable bottom land in Avoyelles, St. Landry, and St. Martin Parishes.

During May 14 four more crevasses occurred in the Bayou des Glaises levee at Kleinwood, Bordelonville, Willard station, and near Moreauville. The evening bulletin of the day stated that the overflow water would now extend through eastern Iberia to the Teche, and might overflow the lower Teche, with indications pointing to one of the greatest floods in the history of that region, including Morgan City. The bulletin also advised renewed precautions against stages in the Mississippi and Atchafalaya Rivers as forecast on May 1.

The largest crevasse of this series along Bayou des Glaises occurred about midnight of May 14–15, northeast of Hamburg, La. There were now 10 crevasses in this 50-mile levee that protected a 25-mile front west of the Atchafalaya River, and it was virtually abandoned. It was now apparent that, with the levees east of the Atchafalaya holding, the area west of that river must take care of the flood waters now in the Tensas Basin. One result of the crevasses was a diminution in the rate of rise in the Mississippi River below Old River.

Notwithstanding the widespread breaches in the Bayou des Glaises levee line the effect upon the accumulation of water in the Tensas Basin was slight; the crest of the flood in that basin continued to move southward and at Jonesville, the central key point for estimation of flood conditions, the water stood at 64.4 feet above gulf level, almost 3 feet above the previous high water of 1882, indicating the greatest flood of record in the Atchafalaya Basin.

At 5 a. m., May 17, the levee suddenly gave way on the right bank of the Atchafalaya River at Melville, at a point only about 1,000 feet below the Texas Pacific Railroad bridge. The town was flooded to a depth of 6 feet, and immediate evacuation became necessary. By 11 a. m. May 17 the crevasse was 2,000 feet in width, and nothing could be expected but an intensification of flood conditions below. In the meantime the crest of the crevasse water in the Tensas Basin was in the vicinity of Ferriday, La., moving slowly southward, with indications that it would require from three to four weeks to reach Morgan City. The bulletin of May 18 advised the evacuation of the remainder of the area, from 15 to 20 miles in width, along the west side of the Atchafalaya River south of Bayou des Glaises to and including Port Barre, and the strip 15 miles wide below Port Barre, to the Baton Rouge-Lafayette branch of the Southern Pacific Railroad. Residents on the Teche from Port Barre to Breaux Bridge and in low places along Bayou Boeuf were also advised to be on the alert against warning to evacuate.

The bulletin of May 19 advised the inhabitants of the historic town of St. Martinville to take precautions against the flooding of the town that began on May 26. During its 200 years of history this town had never before been flooded by water from the Mississippi River. Warnings for a moderate flood at New Iberia, a town never before inundated ay Atchafalaya floods, were issued on May 21. By May 28 nearly the whole town was under water.

By this time the flood situation in the western Atchafalaya Basin was developing a feeling of panic among the inhabitants of the region bordering lower Bayou Teche, and on May 23 advices were issued that towns along the main line of the Southern Pacific Railroad should not be evacuated.

At 3 a. m. May 24 the levee on the left bank of the Atchafalaya River at McCrea, La., 15 miles above Melville, gave way, and for the first time during this flood the overflow waters entered the eastern Atchafalaya Basin. The current not only undermined the

old levee, but also washed under the new levee constructed of sacks of earth and carried this work into the river. Advices were at once issued to evacuate low parts of Pointe Coupee Parish immediately and low parts of West Baton Rouge Parish within five days; also other parts of the same area as the flood progressed. Overflow of all highlands to Bayou Lafourche was now indicated within the next two weeks.

The bulletin of May 25 stated in answer to suggestions that the Texas Pacific Railroad embankment be opened to permit some of the McCrea crevasse water to escape, that nothing would be gained thereby, as it would not lower the flood crest either above or below the railroad. Furthermore, the railroad service was essential. This bulletin also advised the evacuation within 7 to 10 days of lowlands in southern Iberville Parish and Assumption Parish west of Bayou Lafourche, but it also reassured many other localities that their lands would not be overflowed.

By May 30 the situation along the Southern Pacific main line had become very serious and operation of drawspans in the railroad bridges across the outlet channels was threatened, and notice was given by the proper authorities that the bridges over the Atchafalaya River and Bayou Boeuf would be closed to river traffic within a few days, and that boats desiring to leave the basin within the next three weeks should pass through the bridges immediately.

May 31 showed a marked decrease in the flow through the McCrea crevasse. Since the first two days after the crevasse occurred on May 24 the outflow through the opening of 2,000 to 2,600 feet there had not been any appreciable effect on the river stages at Melville, 15 miles below, and advices were given that the accumulation of water in the lower basin would not be as rapid as was indicated at the time the crevasse occurred.

However, the stage of 49.3 feet at Vicksburg on June 1 indicated that there was still considerable flow through the crevasses at Cabin Teele and Winter Quarters, which would tend to prolong flood conditions in the Tensas and Atchafalaya Basins.

The bulletin of June 2 discussed some peculiar features of the flood conditions in the lower Atchafalaya Basin, and also gave notice of the approach of the third flood crest coming down the Mississippi River, which by checking the rate of fall would prolong the overflow in the Tensas and Atchafalaya Basins, although there would be no further rise over areas from which the waters recede.

The bulletin of June 7 discussed as follows the probable effects of the third rise in the Mississippi River: "The flood waters now coming down the Mississippi will prolong the overflow in the Tensas and Atchafalaya Basins well into July, and it now appears that all the lower areas will not be free from flood waters by the end of that month, but in general lands from which flood waters have receded will not again be overflowed by the water now in sight."

Accumulation of water at the lower end of the Atchafalaya Basin continued until June 11. The crests of flood levels along the Southern Pacific Railroad over a distance of 20 miles was from 1.5 to more than 2 feet higher than the flood level above mean gulf represented by the Morgan City gage. On June 5 when the gage at Morgan City read 9.5 feet, a crest of 8.7 feet above mean gulf level, equivalent to 11.7 feet on the Morgan City gage, was observed at Ramos, La., 5 miles east of Morgan City.

In the latter part of June accurate information covering the flood area and the amount of recession up to that time was collected, and on June 27 a map was issued containing an outline of the conditions. This map showed the general outlines of areas overflowed in the State of Louisiana and the area of agricultural lands that were largely freed from water by June 25.

A special bulletin and revised map were issued on July 15. The bulletin stated that agricultural lands in the Tensas Basin should be practically free from water by the end of July and those in the Atchafalaya Basin during early August, but that flood water would probably remain on some swamp lands in the latter basin throughout August.

Water continued to flow through the Caernarvon and Junior crevasses with very little recession thus far from maximum amount of overflow over those areas.

The final bulletin and map on August 1 showed a recession much as had been forecast on July 15. There were considerable areas of swamp and wooded lands still under water, and from 30,000 to 35,000 acres of agricultural land, mostly in the Atchafalaya Basin, still inundated.

Floods in the Ouachita River.—A series of floods began in the Ouachita River in December, 1926, and the last crest did not pass Camden, Ark., until the end of April. The first of the numerous warnings was issued on March 8 for flood stages at Camden, Ark., and the last for Monroe, La., on May 10. The warning of April 21 indicated a stage of 40 feet, 10 feet above the flood stage, at Camden by April 25, and very high water in the Little Missouri and Saline Rivers of Arkansas.

The highest stage reached at Arkadelphia, Ark., during the spring was 23.9 feet, 5.9 feet above the flood stage, at 10 p. m. April 21, and there were three rises above the flood stage, March 8, April 15 to 17 and April 21 to 23, all inclusive. At Camden the highest stage was 41 feet, 11 feet above flood stage, on April 25. There were three rises above the flood stage, January 25 to February 2, March 10 to 17, and April 16 to 30, all inclusive. At Monroe, La., the crest stage of 48.2 feet, 8.2 feet above the flood stage occurred on May 2. While there were several rises corresponding to those above, there was only a single period of flood stages. This, however, was a long one, lasting from March 20 to June 17, inclusive, or 90 days in all. The warning message of April 25 for Monroe stated that additional overflow would result from crevasse waters from the Arkansas River which were flooding lowlands drained by the eastern tributaries of the Ouachita and Black Rivers. These crevasse waters had little effect on the river stage at Monroe, as the water passed down east of the city.

Old high-water marks indicate that on the Ouachita River from Arkadelphia to Monroe the flood of 1882 exceeded the flood of 1927 by a few feet at Arkadelphia and about 1 foot at Monroe.

About 27,000 acres of agricultural lands were overflowed in Clark, Hot Springs, and Garland Counties, and incomplete reports of losses from headwaters to about 40 miles below Camden were as follows:

Miscellaneous	$222,000
Crops	50,000
Livestock	35,000
Suspension of business	40,000
Total	347,000

Red River below Shreveport, La.—Floods of major importance with crests of more than 5 feet above the flood stage of 36 feet rarely occur at Alexandria. Previous to 1910 high water continued at Alexandria for comparatively long periods and the movement of crests from Shreveport was considerably slower than in recent years. It is evident that under former conditions there was greater obstruction of flow and considerable spreading of waters with slow return to the main stream. In 1927 an average rainfall of 5 inches on April 15 between Shreveport and Alexandria elevated the flood plane and disturbed the normal relations between the two places. The crest stage at Shreveport was 37.4 feet, or 1.6 feet below the flood stage, on April 29 and 30. The usual warnings were issued beginning with April 16.

Crevasses occurred near Crichton, La., during the latter part of April, and on May 2 on the left bank near Vick, Avoyelles Parish. The latter was only of slight importance, the crevasse water merely joining the backwater already extending up to that locality.

Warning service and advices.—The overland flood of 1927 assumed such vast proportions that something beyond the usual advices and warnings were necessary in order to convince people that their lives and property were in jeopardy as never before.

During the earlier days of the flood so much matter was broadcast in various ways tending to minimize the situation and put people off their guard that it became necessary to issue detailed advices and warnings in a very decisive manner. These covered not only flood warnings, but gave frequent surveys of the conditions upon which they were based. Only by such a program was it possible to impress the people in the threatened areas with the the necessity for prompt action.

Prior to May 1, flood warnings for this district had been made along traditional lines based on known gage relationships considered in connection with the rainfall in the Mississippi Valley. Early in May, however, it was recognized that an overland flood of vast proportions would extend southward over the valley of the lower Mississippi within the next few weeks. This flood occurred as expected, the width of inundated territory reaching more than 40 miles in places, and necessitating the removal of more than 200,000 people from their homes and the protection of millions of dollars worth of property. These people needed definite warnings, but no precedents could be found to aid the forecaster and there were no gage relationships to guide him in warning the people regarding the seriousness of the danger from this overland flood. It was necessary to work out new premises and build a forecast structure entirely different from anything previously used in flood forecasting. This entailed an enormous amount of additional work along engineering lines. There was no time to spare, if the people were to be warned, and Mr. W. F. McDonald, assistant meteorologist, volunteered his services for extra work on Sundays and at nights and often worked six to eight hours extra during the day and night while the other assistants worked half an hour to an hour extra during the day in helping to carry the office details.

The rate of travel of overland floods had never been definitely determined. The movement of all previous crevasse waters where

records were available, was calculated. An overland flood was found to require three times longer to reach a given place than it requires for a flood in the river proper to reach the same place. The rate of travel of the water in an overland flood is very slow, and in a straight line amounts to only 7 or 8 miles per day.

A knowledge of the elevations of the region over which the flood would travel was absolutely necessary before intelligent warnings could be issued. No contour maps giving the needed elevations could be found. Mr. McDonald secured from the railroads operating in the threatened region the elevations of their stations and profiles of their railroad lines, and these he reduced to a map of the area over which the flood would travel, this serving the purposes of a contour map in forecasting.

With a knowledge of the rate at which overland floods advance, a plan of the ground over which it would travel to the Gulf, and the application of hydraulic calculations to the volume of water estimated to be flowing through channels and crevasses, there was obtained the groundwork on which was based, for the first time, the forecasting of the rate of travel and depth of an overland flood. The forecasts covered not only the approximate dates when flood waters might be expected to reach threatened localities but also gave estimates of the depth of water that might be expected relative to certain datum points. Subsequent conditions largely verified the forecasts, both in respect to time and depth.

To meet the needs of the public the details of day to day developments in the flood situation, and full statements of forecasts and advices based on the foregoing studies, were embodied in a series of mimeographed bulletins which became the authoritative source of information on the flood, and on this information all activities in the Louisiana flood area were carried forward during the period of the inundation.

The bulletins received the widest possible distribution by mail, the effort being aimed to reach all post offices in threatened areas, while the more important post offices supplied a number of copies for local distribution. Upon receipt, the bulletins were given prominent posting in store windows, tacked to trees and poles, and were frequently carried by rescue workers to isolated points and to refugee concentration centers. Newspapers for the most part printed the statements verbatim from the bulletins. The more important features were broadcast daily and on occasions several times a day by radio. In addition to these means of publicity, the substance of the bulletins was telegraphed at Government expense to selected information centers.

The detailed reports of developments in connection with the overland flood through the Tensas and Atchafalaya Basins were made possible only by virtue of the generous cooperation of the Southern Bell Telephone Co. and the Southern Pacific and the Texas & Pacific Railroads. A network of reports covering changes in flood heights was provided by these agencies, wholly without expense to the Government, and these reports, together with river gage readings collected in the usual manner, aided materially in keeping the public advised regarding the serious situation. As the flood developed the confidence of the public in the daily bulletins from the Weather Bureau increased to such an extent that requests for advice on a multitude of flood problems poured upon the forecasting agency by telegraph and long-distance telephone, not only during the day but also during the night, at the forecaster's residence, regardless of the hour. The Weather Bureau thus became the one authoritative source of information and guidance, not only for flood work but in carrying forward all interests in the flooded and adjacent areas.

As illustrations of the character of personal calls upon and advices issued from the forecaster's residence, the following cases are cited:

On Sunday evening, May 22, Hon. Joseph Provost, at Jeanerette, La., called the forecaster over long-distance telephone at his residence, stating that the people of Jeanerette had received instructions to be ready to evacuate at noon the next day. Jeanerette, protected as it was by the natural ridge of the Teche, was in no serious danger from the flood. The following telegram was therefore sent to Mr. Provost:

"Jeanerette not in danger from flood. Tell people there is no necessity for them to vacate. Cline."

At 2 o'clock in the morning of May 26 the mayor of New Iberia called the forecaster by long-distance telephone at his residence and informed him that the flood waters were then within half a mile of the town. The forecaster called his attention to the fact that on May 21 the flood bulletin contained advices indicating the probability of a moderate overflow in the vicinity of New Iberia, but overflow would not be serious enough to necessitate evacuation. Reports on May 28 stated that the water was 6 inches to 3 feet deep in many of the principal streets of the city, and was 8 inches below the top of the rail at the Southern Pacific depot in New Iberia.

Relief measures were planned directly in accordance with warnings. The flood forecasts were projected far enough into the future to enable the relief agencies to lay plans to put into effect the intricate machinery required for the saving of life and property. The Weather Bureau office at New Orleans was called upon to advise relative to locations suitable for refugee camps and livestock concentration points, and these were successfully located in safe places; some mistakes in such planning were avoided through acceptance of the judgments stated in the flood bulletins and in personal advices. Expert cattlemen were brought to Louisiana from distant points in time to render invaluable aid in the evacuation of livestock. It is estimated that 70 per cent of the livestock was moved out of the Atchafalaya Basin before the floods overspread that area. There were a few accidental drownings during the flood and more after the flood was in recession, but we have been unable to trace any loss of human life directly to the flood overtaking inhabitants of the danger zones, notwithstanding the fact that some 200,000 persons were evacuated from areas inundated.

Of equal importance in the results of this flood work is the fact that many thousands of persons who would without an understanding of the flood or through fear have evacuated their homes unnecessarily were reassured by definite forecasts and personal advices to officials of towns, and remained at home, with a saving in property and human values impossible to estimate.

LOSS AND DAMAGE

It was impossible to obtain anything like an accurate estimate of the direct and indirect losses from the flood in Louisiana. That they were tremendous is unquestionable, and a few items of fact may assist in a manner in forming some idea of their magnitude. One thousand and fifty miles of railroad in Louisiana were out of service for periods varying from a few weeks to six months or more and there were serious losses of roadbed and bridge structures, especially below the Bayou des Glaises crevasses. Over 1,000,000 acres of crop lands were inundated with prospective losses of about $14,000,000, while the livestock and poultry losses amounted to not less than $1,750,000. Damage to farm houses, barns, implements, etc., is estimated at $4,500,000, and there were, of course, enormous losses in village and city property, highways, bridges, canals, etc., which must amount to many millions, and there were also many millions of economic losses through removal of thousands of inhabitants from their regular occupations and sources of income, disruption of business and transportation, depreciation in values, losses of rent, interest and accounts, permanent losses of tenants and labor, etc.

The data in the following small table probably represent the best estimates of loss and damage that were available under the circumstances:

Miscellaneous	$30, 000, 000
Crops, actual and prospective	22, 000, 000
Livestock and other farm property	6, 250, 000
Protective measures	15, 000, 000
Suspension and retardation of business	28, 000, 000
Total	101, 250, 000

It follows that estimates of the value of property saved through the Weather Bureau warnings must be equally as indefinite as estimates of losses. There were reported $2,500,000 in livestock in the Atchafalaya Basin alone, and there must have been several times that amount saved by the timely removal of all kinds of portable property to places of safety.

The flood of 1927 surpassed any previous overflow in something like 200 years, since the early settlements in Louisiana. Towns occupying the sites of early settlements several miles beyond the outer limits of inundation from previous great floods were overflowed in 1927 to an extent that made evacuation necessary. The Mississippi River flood of this year caused overflow in the Vermilion River, 100 miles west of New Orleans, this being so far as known the first instance in which flood waters from the Mississippi Valley have discharged through the Vermilion River into the Gulf.

While a much greater flood than that of 1927 is not impossible, the probability of a greater flood is very remote. A combination of circumstances can be conceived which will produce flood conditions in the Mississippi River of greater magnitude than anything ever recorded. Assuming a heavy snow cover over the upper central valleys, upon which such heavy rains as we had this year might occur to release the stored water, and, then when the resultant flood is in movement, experience a series of rainstorms over a period of several weeks with the paths of these storms falling progressively further southward at a rate which continually maintains pace with the movement of the flood crest, an almost inconceivably stupendous flood could result in the lower Mississippi Valley.

O

MISSISSIPPI RIVER FLOOD OF 1927

SHOWING FLOODED AREAS

AND

FIELD OF OPERATIONS

UNDER

HERBERT HOOVER

CHAIRMAN OF PRESIDENT'S COMMISSION

AND

JAMES L. FIESER, VICE CHAIRMAN OF AMERICAN NATIONAL RED CROSS

PREPARED AND PRINTED BY THE U. S. COAST AND GEODETIC SURVEY
FROM DATA FURNISHED BY THE CORPS OF ENGINEERS, U. S. ARMY
WASHINGTON, D. C.
1927

Scale

10 0 10 20 30 40 Miles
10 0 10 20 30 40 50 Kilometers

- Levee
- Break in Levee
- Area covered by First Flood of 1927
- Area covered by Second Flood of 1927
- Red Cross Relief Camp
- Red Cross Reconstruction Offices
- Red Cross General Headquarters

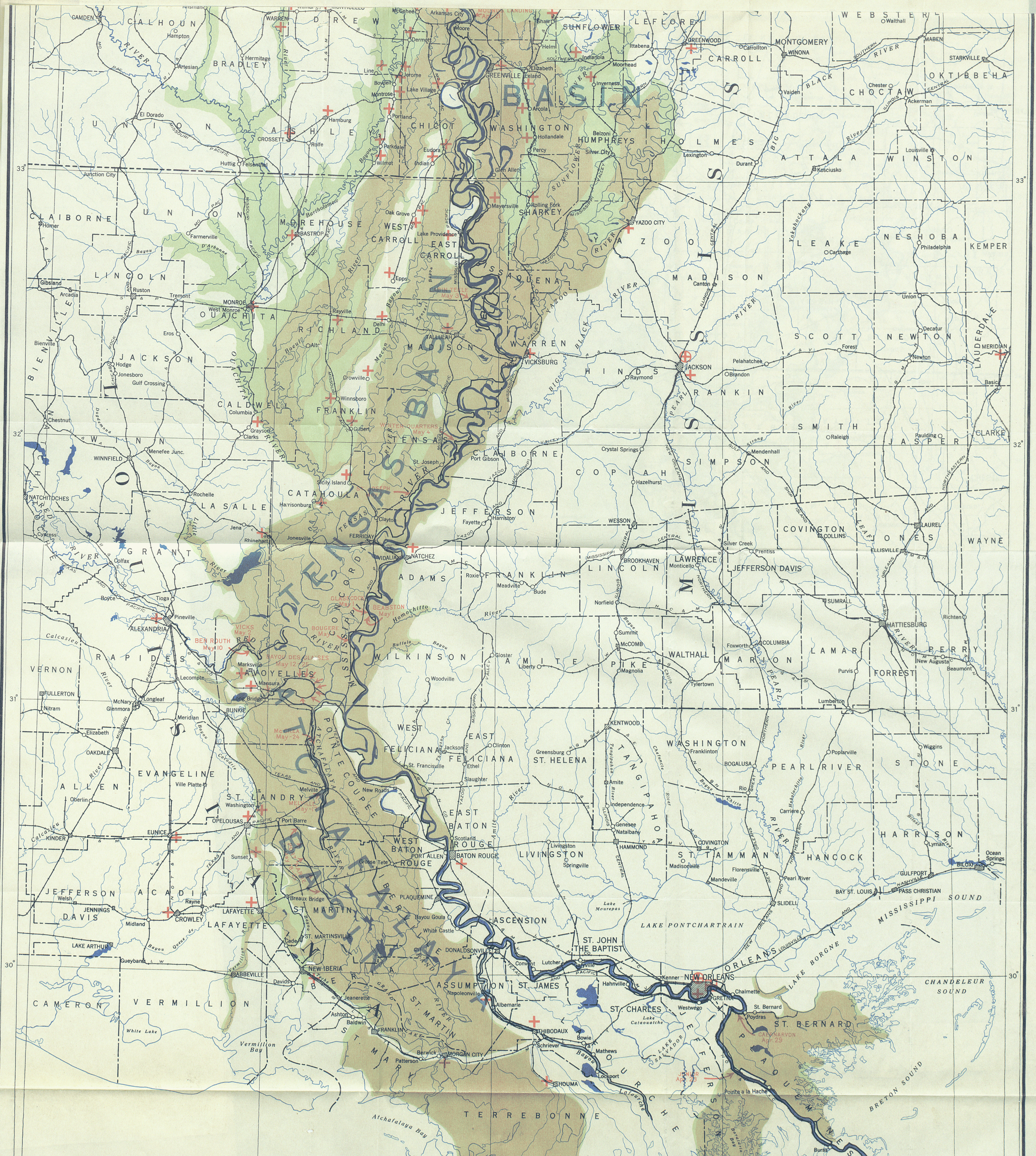
Red Cross General Administrative Headquarters were established at:

Memphis, Tenn.....until May 25, 1927
New Orleans, La.....until July 9, 1927
Washington, D. C.....thereafter.

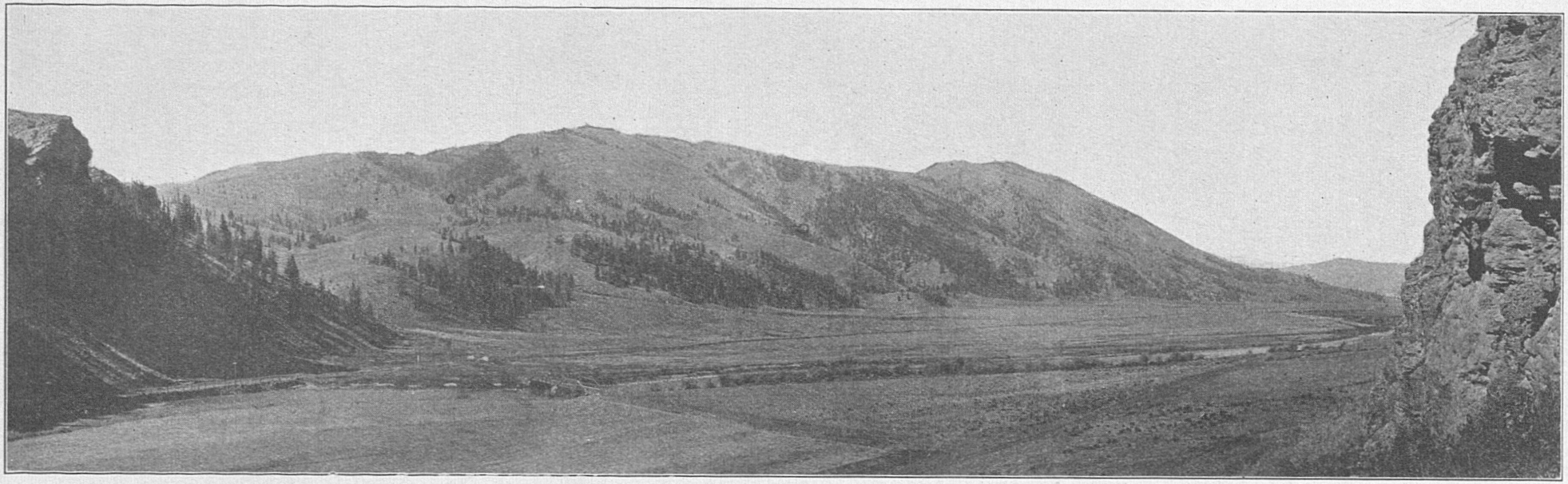
Red Cross Reconstruction Offices were established as follows:

For the state of Louisiana.....New Orleans, La.
For the states of Mississippi, Kentucky, and Tennessee.....Jackson, Miss.
For the state of Arkansas.....Little Rock, Ark.
For the states of Missouri and Illinois.....St. Louis, Mo.

93° 92° 91° 90° 89°
37° 36° 35° 34°



CAMDEN
CALHOUN
Hampton
WARREN
DREW
McGehee
Arkansas City
MOUNDS LANDING Apr. 21
Moore
Dermott
Hermitage
BRADLEY
Artesian
Line
Jerome
Boydell
Lake Village
Montrose
El Dorado
UNION
ASHLEY
Hamburg
CROSSETT
Rolfe
Portland
CHICOT
Parkdale
Wilmot
Eudora
Indian
Huttig
Felsenthal
Junction City
33°
CLAIBORNE
Homer
Farmerville
D'Arbonne
Bartholomew
MOREHOUSE
BASTROP
Oak Grove
WEST CARROLL
EAST CARROLL
Lake Providence
LINCOLN
Gibsland
Arcadia
Ruston
Tremont
MONROE
West Monroe
OUACHITA
Epps
CABIN TEELE May 3
Rayville
Delhi
RICHLAND
Alto
TALLULAH
MADISON
Eros
Bienville
BIENVILLE
JACKSON
Hodge
Jonesboro
Gulf Crossing
Crowville
CALDWELL
Columbia
Winnsboro
FRANKLIN
Gilbert
WINTER QUARTERS May 4
Chestnut
Grayson
Clarks
WINN
WINNFIELD
Menefee Junc.
TENSAS
St. Joseph
Sicily Island
CATAHOULA
Harrisonburg
NATCHITOCHES
Rochelle
LA SALLE
Clayton
Jena
Rhinehart
Jonesville
FERRIDAY
VIDALIA
NATCHEZ
Cypress
GRANT
Colfax
Tioga
Boyce
Pineville
ALEXANDRIA
GLASSCOCK May 1
BEABSTON May 1
VICKS May 2
BOUGERE May
BEN ROUTH May 10
BAYOU DES GLAISES May 12-25
RAPIDES
VERNON
Marksville
AVOYELLES
Lecompte
Mansura
Long Bridge
FULLERTON
McNary
Longleaf
Glenmora
Nitram
BUNKIE
Meridian
Elizabeth
OAKDALE
McCREA May 24
ALLEN
EVANGELINE
Ville Platte
Oberlin
ST. LANDRY
Washington
MELVILLE May 17
Melville
OPELOUSAS
Port Barre
KINDER
EUNICE
Sunset
JEFFERSON DAVIS
Welsh
JENNINGS
ACADIA
Rayne
CROWLEY
Midland
LAFAYETTE
Breaux Bridge
ST. MARTIN
ST. MARTINSVILLE
Cade
LAKE ARTHUR
Gueydan
ABBEVILLE
NEW IBERIA
Davids
CAMERON
VERMILLION
Jeanerette
Ashton
Baldwin
FRANKLIN
White Lake
Vermillion Bay
Berwick
Patterson
MORGAN CITY
ST. MARY
Atchafalaya Bay
TERREBONNE
POINTE COUPEE
New Roads
WEST BATON ROUGE
PORT ALLEN
Grosse Tete
EAST BATON ROUGE
Scotland
BATON ROUGE
PLAQUEMINE
Bayou Goula
White Castle
ASCENSION
DONALDSONVILLE
ASSUMPTION
Napoleonville
Albemarle
THIBODAUX
Schriever
HOUMA
Bowie
Mathews
Lockport
LAFOURCHE
ST. JAMES
Convent
Lutcher
Garyville
ST. JOHN THE BAPTIST
Hahnville
ST. CHARLES
Lake Cataouatche
Lake Salvador
Westwego
Kenner
NEW ORLEANS
GRETNA
Chalmette
St. Bernard
Poydras
ST. BERNARD
CAERNARVON Apr. 29
JUNIOR Apr. 28
JEFFERSON
Pointe a la Hache
PLAQUEMINES
Buras
Barataria Bay
WEST FELICIANA
St. Francisville
Jackson
EAST FELICIANA
Clinton
Ethel
Slaughter
WILKINSON
Woodville
Gloster
AMITE
Liberty
ADAMS
Roxie
Meadville
Bude
JEFFERSON
Fayette
Harriston
Port Gibson
CLAIBORNE
Shaw
SUNFLOWER
Helm
Indianola
Elizabeth
GREENVILLE
Leland
Moorhead
Inverness
BASIN
Arcola
WASHINGTON
Hollandale
Percy
Glen Allen
Belzoni
HUMPHREYS
Silver City
Mayersville
Rolling Fork
SHARKEY
ISSAQUENA
YAZOO CITY
YAZOO
WARREN
VICKSBURG
Delta
LEFLORE
Itta Bena
GREENWOOD
Carrollton
CARROLL
MONTGOMERY
WINONA
WEBSTER
Walthall
MABEN
STARKVILLE
OKTIBBEHA
Vaiden
Chester
CHOCTAW
Ackerman
HOLMES
Lexington
Durant
ATTALA
Kosciusko
Louisville
WINSTON
33°
LEAKE
Carthage
NESHOBA
Philadelphia
KEMPER
MADISON
Canton
Union
SCOTT
NEWTON
Decatur
Forest
Newton
LAUDERDALE
MERIDIAN
Basic
HINDS
Raymond
JACKSON
Pelahatchee
Brandon
RANKIN
SMITH
Raleigh
Paulding
JASPER
CLARKE
32°
Crystal Springs
COPIAH
Hazlehurst
SIMPSON
Mendenhall
WESSON
COVINGTON
COLLINS
LAUREL
JONES
WAYNE
ELLISVILLE
Silver Creek
Prentiss
BROOKHAVEN
LINCOLN
LAWRENCE
Monticello
JEFFERSON DAVIS
FRANKLIN
Norfield
SUMRALL
HATTIESBURG
Richton
Summit
McCOMB
Foxworth
COLUMBIA
LAMAR
PERRY
PIKE
Magnolia
WALTHALL
Tylertown
MARION
Purvis
FORREST
New Augusta
Beaumont
Lumberton
31°
KENTWOOD
Greensburg
ST. HELENA
TANGIPAHOA
WASHINGTON
Franklinton
BOGALUSA
PEARL RIVER
Poplarville
Wiggins
STONE
Amite
Rio
Independence
Carriere
Genesee
Natalbany
HAMMOND
Livingston
LIVINGSTON
Springville
COVINGTON
ST. TAMMANY
Madisonville
Florensville
Mandeville
Pearl River
HANCOCK
HARRISON
Lyman
Ocean Springs
BILOXI
GULFPORT
PASS CHRISTIAN
BAY ST. LOUIS
SLIDELL
Lake Maurepas
LAKE PONTCHARTRAIN
MISSISSIPPI SOUND
LAKE BORGNE
CHANDELEUR SOUND
BRETON SOUND
ORLEANS
30°
TENSAS BASIN
ATCHAFALAYA BASIN
LOUISIANA
MISSISSIPPI



FRONTISPIECE.—View of watersheds A and B, Wagon Wheel Gap., Rio Grande in foreground. (Heavy circles show location of Dams A and B)

Photos. 90898-9-900, F. S., 1910, A. G. Varela