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THE FLOOD OF 1929 IN THE LOWER MISSISSIPPI VALLEY ¹

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[Weather Bureau, Washington, September, 1929]

Duration and crests.—In the three important particulars—height, duration, and resultant damage—the flood of 1929 in the lower Mississippi River ranks among the greatest Mississippi floods of record. A suggestion of its magnitude, both as to height and duration, may be gained from Table I below; as to damage, it compares closely with the flood of 1922 for the same reach of river, total losses in each case aggregating from \$8,000,000 to \$10,000,000.

Excepting only its great predecessor of 1927, the length of time the lower Mississippi remained above flood stage in 1929 is the greatest of any flood of record. It will be noted also (Table I) that the crests, by comparison with those of 1922 and 1927, were unusually late. Both this prolongation and lateness of crests are to be explained by the fact that the flood was not, strictly speaking, a single rise, but an upwardly progressive series of three, the first of which, combining at Cairo on March 20 from the upper Mississippi and Ohio Rivers, raised the lower river to flood stage, and the last and greatest of which, passing into the already full lower Mississippi from the Missouri, upper Mississippi, and Ohio Rivers about May 20—two months after flood stages in the lower river had been reached—brought the crests.

Table 2 below attempts to indicate the origin and progress of the three major lower Mississippi crests. (Their increments, discussed separately as Missouri, upper Mississippi, and Ohio River floods in the March, April, and May issues of this REVIEW, are not further considered here.)

¹ The section considered in this report is that from New Madrid, Mo., southward. Discussion of the floods in that portion of the Mississippi and its tributaries above New Madrid will be found in the issues of this REVIEW for March, April, and May of this year.

TABLE I.—Crest stages and duration of lower Mississippi floods of 1922, 1927, and 1929

[Flood stages in parentheses]

River and station	1922		1927		1929	
	Crest and date	Number of days above flood stage	Crest and date	Number of days above flood stage	Crest and date	Number of days above flood stage
Mississippi:						
St. Louis, Mo. (30).....	34.0, Apr. 19.....	14	36.1, Apr. 26.....	32	34.6, Apr. 27-28.....	29
Cairo, Ill. (45).....	53.6, Mar. 25.....	53	52.8, Mar. 25.....	83	52.7, May 19.....	80
New Madrid, Mo. (34).....	53.5, Apr. 25.....		56.4, Apr. 20.....		{41.3, May 19, 20, 23, 24.}	} 93
Memphis, Tenn. (35).....	41.6, Mar. 27.....	55	40.4, Mar. 25.....	108		
Helena, Ark. (44).....	41.7, Apr. 26.....		43.5, Apr. 21.....		41.7, May 26.....	89
Arkansas City, Ark. (48).....	42.6, Mar. 31.....	58	41.4, Mar. 30.....	107	52.6, May 28-30.....	90
Greenville, Miss. (42).....	42.3, Apr. 29.....		46.0, Apr. 23.....		58.8, May 29-31.....	96
Vicksburg, Miss. (46).....	52.3, Apr. 3.....	56	56.75, Apr. 26.....	111	{53.2, May 29- June 2.}	93
Natchez, Miss. (46).....	53.1, May 3.....				55.2, June 6-7.....	101
Baton Rouge, La. (35).....	58.0, Apr. 22.....	59	60.4, Apr. 21.....	81	54.5, June 5-11.....	97
Donaldsonville, La. (28).....	57.7, May 3.....		54.7, Apr. 21.....	69	43.5, June 10-13.....	97
New Orleans, La. (17).....	52.1, Apr. 25.....	56	55.4, Apr. 22.....	166	34.0, June 10.....	93
Atchafalaya:	55.0, Apr. 28.....	64	55.3, Apr. 24.....	149	20.0, June 9.....	85
Simmesport, La. (41).....	54.7, May 7.....		56.5, May 1.....		46.4, June 12-16.....	81
Melville, La. (37).....	55.3, Apr. 26.....	65	57.8, May 4.....	149	43.1, June 9-16.....	100
	52.8, May 9.....		56.5, May 1.....			
	44.6, Apr. 27.....	72	47.8, May 15.....	153		
	45.7, May 10.....					
	33.8, Apr. 27.....	71	37.1, May 15.....	147		
	35.9, May 16.....					
	21.3, Apr. 25.....	63	21.0, Apr. 25.....	120		

¹ Crevasse prevented further rise.

TABLE II.—Crests, with dates, of rises directly contributory to major flood waves of lower Mississippi flood of 1929

[Flood stages in parentheses]

Hermann, Mo. (Missouri) (21)	Grafton, Ill. (upper Mississippi) (18)	Cape Girardeau, Mo. (Mississippi) (30)	Paducah, Ky. (Ohio) (43)	New Madrid, Mo. (Mississippi) (34)	Memphis, Tenn. (Mississippi) (35)	Pine Bluff, Ark. (Arkansas) (25)	Arkansas City, Ark. (Mississippi) (46)	Vicksburg, Miss. (Mississippi) (45)	New Orleans, La. (Mississippi) (17)
20.2, Mar. 16.....	22.8, Mar. 20-21.....	34.1, Mar. 20.....	45.0, Mar. 14-15.....	41.0, Mar. 21.....	40.8, Mar. 24-25.....	22.2, Apr. 19.....	55.5, Apr. 17-19, 21-22.....	52.7, Apr. 25-26, 29, 30.....	18.6, May 2.....
15.0, Mar. 30.....	22.9, Mar. 27.....	Steady rise from Mar. 26.....	43.8, Apr. 3.....	40.6, Apr. 5-7.....	41.1, Apr. 11.....	27.6, May 20.....	58.8, May 29-31.....	55.2, June 6-7.....	20.0, June 9.....
17.6, Apr. 5.....	22.8, Apr. 5-6.....								
19.8, Apr. 11.....	22.0, Apr. 12.....	34.9, Apr. 14.....	35.8, Apr. 17.....	41.3, May 19-20, 23, 24.....	41.7, May 26.....				
22.8, Apr. 26.....	26.2, Apr. 28.....	36.9, Apr. 29-30.....	36.9, Apr. 26.....						
24.2, May 19.....	22.1, May 21.....	37.4, May 22.....	43.9, May 16.....						
24.8, June 8.....	16.6, June 5.....	33.0, June 10-11.....							

It is noteworthy of these major crests that while each one was made up of fairly considerable and almost simultaneous contributions from each of the great northern sources—the Missouri, the upper Mississippi, and the Ohio—yet these contributory rises could hardly of themselves all be considered very great floods (in fact, in the first two instances the Missouri did not attain flood stage at Hermann). This is interesting as a suggestion of what might result from a similar, and not impossible, combination of really great tributary floods. There have been examples enough in the past of the effect upon the lower Mississippi of one, or two, or three important but variously distributed increments, and the question has naturally often arisen as to the possible outcome of an ideal combination of maximum volumes from them all. This question is expertly considered in Frankenfield's discussion of maximum flood possibilities in the report on the Mississippi floods of 1927; it is answered in a very small way by the flood of 1929.

Crevasses.—In Supplement 29 of the MONTHLY WEATHER REVIEW, "The floods of 1927 in the Mississippi Basin," the following statement occurs: "During recent years the history of floods in the lower Mississippi Basin * * * is the history of loss and damage caused by the breaking of protection levees and the flow of water through the crevasses thus formed * * *. The public press stated that [in 1927] there were in all 226 crevasses, but it is thought that about three-fourths of these were of comparatively little consequence." In 1929 there was but 1 Mississippi crevasse below Cairo, against which, for the same reach of river, there were at least 5 having serious consequences in 1922, and at least 12 of corresponding importance in 1927.

The 1929 crevasses, of which the total for the entire lower Mississippi Basin is but four, are described by the officials in charge of the districts in which they occurred as follows: The order is by dates:

The first crevasse occurred on March 8, 1929. It was about 100 feet in length and was in the State line levee at Big Lake near Blytheville, Ark., drainage district No. 17. (Little River, Memphis district.)

The second crevasse occurred on April 4 south of Henderson, La., in a levee built to confine the backwaters of the Atchafalaya Basin; and the failure was at the same point at which a similar break occurred last year. (Atchafalaya Basin, New Orleans district.)

The third crevasse occurred in the Laconia Circle back levee on April 22, 1929. It was about 400 feet in length. (Mississippi River, Memphis district.)

The fourth crevasse occurred in the west bank of the floodway at a point about three-fourths mile south of the bridge over the floodway, on the Harrisburg-Marked Tree Road, west of Marked Tree, Ark., at about 2:30 a. m., May 26, and is reported to have been caused by an explosion of dynamite. It was about 240 feet in length. (St. Francis River, Memphis district.)

At first glance the crevasse and loss data of 1929 might seem rather emphatically to confirm the generalization quoted above as to the relation of these two features. Both reached maxima in one place—the Memphis district. The three worst of the four crevasses and nearly 75 per cent of the total reported losses occurred there. But examination of the tabulation of overflowed areas under the next section shows that the crevasses themselves contributed comparatively little to the total overflow—that far and away the greater part of it took place between the levees or was due (and particularly in the case of the St. Francis and the Yazoo Basins) to backwater.

It therefore appears that, in respect to the consequences of its crevasses, as well as in the smallness of their number, the flood of 1929 may fairly be considered exceptional. It is, at all events, an exception to the rule that the his-

tory of a great lower Mississippi flood is the history of damage due to broken levees; indeed, it stands as proof that even in spite of the great measure of protection the levees afford—and certainly their efficiency was abundantly demonstrated in this prolonged flood—disastrous overflows can still occur.

Overflow.—The extent of overflow—a reported total of 1,830,550 acres—was greatest in the Memphis district (which includes the reach of the Mississippi from below New Madrid to the mouth of the White River, and the St. Francis Basin in Arkansas), and in the Vicksburg district (which includes the Mississippi from the mouth of White River to Vicksburg, Miss., and the Yazoo Basin). Of the Memphis district the official in charge at that station reports as follows:

OVERFLOWED AREA IN THE MEMPHIS RIVER DISTRICT

In addition to an area of 676,830 acres along the Mississippi River and the lower portions of its tributaries in extreme western Tennessee, 45,900 acres of land were overflowed along the St. Francis River in the extreme eastern end of Craighead County, below Black Oak, Ark., and in the extreme eastern portion of Poinsett County and small area in the extreme northwestern portion of Crittenden County and the extreme northeastern portion of Cross County. In the St. Francis backwater area 215,820 acres were overflowed in the eastern portion of St. Francis County, east of Crowleys Ridge, a small portion of extreme southern Crittenden County, and an extensive area east of Crowleys Ridge in Lee and Phillips Counties. About 20,000 acres was overflowed outside the Mississippi River levee below Wabash, Ark., and 12,000 acres in Laconia Circle. The total acreage overflowed was as follows:

From New Madrid, Mo., to the mouth of the White River along the Mississippi River between levees or between levees and hills.....	Acres 676, 830
St. Francis Basin below Missouri-Arkansas line above Parkin, Ark.....	45, 900
St. Francis backwater area south of Parkin, Ark.....	215, 820
From Helena, Ark., to Laconia Circle outside levee.....	20, 000
Laconia Circle.....	12, 000
Total.....	970, 550

In the overflowed area, land was under water from 12 weeks in the upper part of the district to 12½ weeks in the lower part, and the lowest land in the lower end was submerged for 15 weeks.

The depth of the water in the overflowed area averaged 5 feet in the upper end of the district, 7 to 8 feet in the middle portion, and 12 feet on the lowest land in the lower end. In the Laconia Circle it was 14 feet deep.

Considerable land near the river was damaged by seep water, owing to the great length of time the river was at a high stage.

The official in charge at Vicksburg, Miss., reports that in his district "more than 860,000 acres of land were overflowed in the lower Yazoo Basin from Mississippi backwater entering the basin through the mouth of the Yazoo River."

The overflow resulting from the Atchafalaya crevasse (No. 2 above) is reported by the official in charge of the New Orleans district as having covered a comparatively small area in St. Martin Parish.

Damage and the result of overflow.—Damage, the reported total of which was \$9,979,601, was of course greatest where overflow was greatest—in the Memphis and Vicksburg districts. In the Memphis district the amount reported or conservatively estimated was \$7,427,700, divided as follows:

Tangible property (buildings, factories, highways, bridges, etc.).....	\$743, 200
Matured crops.....	82, 000
Prospective crops (448,000 acres).....	5, 178, 500
Livestock and other movable property.....	61, 300
Suspension of business.....	930, 700
Cost of moving people and property from flooded area.....	100, 000
Cost of local assistance to refugees.....	157, 000
Cost of protective measures to levees.....	75, 000
Cost to railroads, etc., not included above.....	100, 000

In addition, the losses to lumber interests (no estimate of which has been obtained) were undoubtedly great. It is reported that "one large company alone sustained a loss in production of several million feet, the mill having been closed down for more than 12 weeks."

The flood was the cause of four deaths in this district.

In all sections affected by overflow the delay to planting consequent upon the extreme lateness of the drainage of overflowed land was a very serious feature of the flood. This point is concisely covered in the Memphis station report: "In the upper part of this district it is stated that cotton will not mature if planted after June 1, and in the greater portion of the lower part it should be planted not later than June 10. As the land in the overflowed area was still submerged after these dates, it is reliably estimated that not more than one-half a crop can be raised this year—and not that much should there be an early frost."

In the Vicksburg district, as in the Memphis, the losses were in very large part to crops and prospective crops. The following is quoted from the report of the official in charge of the Vicksburg station:

Of the 860,000 acres overflowed in the lower Yazoo Basin from Mississippi River backwater much formerly under cultivation has been abandoned as agricultural land on account of the relative frequency of flooded conditions thereon during recent years.

Exact figures are not extant as to the acreage in the lower Yazoo Basin that would have been devoted to staple crops during 1929 had a flood not intervened; it is thought that 250,000 acres is a conservative estimate.

Much of the land overflowed and intended for crops the present season has been planted subsequent to the subsidence of the water therefrom. The returns from these crops will depend upon the kind of weather following and the prices to be obtained. Compared with the price that might be obtained from crops originally intended to be planted on this land, a loss of about \$10 an acre is probable, making a loss of \$2,500,000 on the agricultural land overflowed.

A tabulated loss was sustained by railroad companies in this district in protecting their property against flood damage, amounting to \$51,901.26; intangible losses also occurred, difficult to enumerate, such as moving refugees, the abandonment of a branch line 45 miles in length from March 21 to July 15, and other losses due thereto.

There was also a considerable though undetermined loss in this district owing to the suspension of business activities.

The damage done in St. Martin Parish by the overflow from crevasse No. 2 (see above) was confined to the inconvenience and expense of moving several hundred families to safety and to an undetermined but probably not great loss owing to the delay in the use of the land for planting.

Savings by warnings.—In the Mississippi Valley, where the high standard of accuracy of flood warnings has long since established their dependability, and where predictions can be made so long in advance of impending conditions that their application reaches to some extent practically every activity in the valley, they have an importance which is, quite literally, immeasurable. As a flood year 1929 is no exception as an example of the widespread use of these warnings or of the difficulty of placing a value upon them. The Vicksburg district report states that "their value must have been considerable, but impossible of accurate tabulation"; and the official in charge of the Memphis station remarks as follows:

The estimated money value of property saved by the flood warnings was \$786,000. Of those reporting flood losses and savings resulting from the flood warnings, many stated that it was impossible to place a dollar valuation on the savings due to the warnings. That the amount given above is far below the actual savings is indicated by the following remarks by those reporting:

"Impossible to estimate, but without such warnings loss of life and property would have been great."

"There is hardly any way of estimating the worth of flood warnings. They are so necessary that we could not exist without them."

The warnings were distributed by radio, telegraph, telephone, and mail, including distribution by the daily press, which gave much space to river news. Levee engineers and contractors, planters, lumber companies, and others in the threatened region called daily by long distance telephone for the forecasts and river stages. Many additional copies of the river bulletin were distributed by boats at way landings.

WEATHER ABNORMALTIES IN THE UNITED STATES

EXCESSIVE RAINS AND FLOODS IN SOUTHEAST ALABAMA

551.577.3 (761)

ALFRED J. HENRY

(FOURTH NOTE)

The most extraordinary floods in perhaps a century or more occurred in the streams of southeast Alabama, in March, 1929.

An account of these floods was given in this REVIEW for that month. In the haste necessary to the printing of that issue on schedule it was not possible to present a number of details that are essential to a proper understanding of the phenomenon.

Two river systems were involved—the Choctawhatchee and the Escambia. The most spectacular flood was that which submerged the town of Elba, at the junction of the Pea River and Whitewater Creek. The Pea River, a stream probably unknown outside the limits of the State is the main tributary of the Choctawhatchee. The width of Pea River at low water is 150 feet; at bankful stage 225 feet. The Pea River north of Elba where it unites with Whitewater Creek is about 100 feet wide at low water; Whitewater Creek drains a larger area north of Elba than does the Pea River.

The drainage of southeast Alabama is wholly to the Gulf of Mexico through a number of streams, naming them in order from east to west, the Chattahoochee,

although it carries a relatively small amount of Alabama drainage would come first, then follows the Choctawhatchee and its main tributary the Pea. Next in order and importance is the Escambia with its chief tributary, the Conecuh entirely within Alabama. All of these streams originate in the Coastal Plain of Alabama which gradually slopes from about 600 feet in the north to Gulf level.

A map, Figure 1, shows the streams-above mentioned and the location of rainfall stations in the several basins. The 100 and 500 foot contour lines are given. The latter barely touches the headwaters of the Pea, about 125 miles from the Gulf of Mexico. The slope is therefore one quarter of a foot per mile.

The rains which led up to the floods began on February 27, continued on the 28th, and then ceased until March 4-5, when a second period of heavy rains set in. Beginning on the 12th a third and the most intense of the four periods began. The rains of this period culminated on the 15th as may be seen from the tabulation below. While torrential downpours occurred in southern Alabama the rainfall of the entire State was the most extraordi-