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RIVERS AND FLOODS

By H. C. FRANKENFIELD, Meteorologist

5th, 12th, 19th, 20th, 24th, and 27th; for northern New Mexico on the 27th, 29th, and 30th; for southeastern Colorado on the 12th, 18th, 19th, 20th, and 21st; for the Colorado Valley in Colorado on the 14th, 18th, 19th, and 21st; for all of Colorado on the 27th and 30th; for southeastern Arizona on the 15th, 17th, 25th, and 26th; for south central Arizona on the 25th; and for northwestern Utah on the 17th, 18th, 19th, 21st, 24th, 25th, 26th and 27th. These warnings were generally justified by the actual occurrence of frost or by the critical temperatures for frost.

Warnings of more severe temperatures embracing those close to or below freezing were issued as follows: 1st and 3d, extreme southeastern New Mexico; 9th, southeastern Colorado, 15th, Colorado and Utah; 16th Colorado, Utah, and extreme southeastern New Mexico; 17th, Colorado and extreme southeastern New Mexico; 24th, Colorado; 25th and 26th, Colorado and northern and extreme eastern New Mexico; and the 29th for Colorado. In nearly every case these warnings were fully verified.—*Lawrence C. Fisher.*

SAN FRANCISCO FORECAST DISTRICT

April in the San Francisco Forecast District was usually dry, due to the persistence of ocean high-pressure areas impinging upon the California and Oregon coasts. They prevailed, with slight variations, practically during the entire month. There were about as many Bering Sea and Gulf of Alaska storms as usual, but they moved inland too far north to cause any great amount of rain in the Pacific States. On the 20th a small disturbance was located off the California coast, which moved inland on the 23d, and in doing so caused a small amount of rain in the southern half of California. Rain also fell during the first few days of April quite generally throughout the district. Nearly all the storms that occurred passed from the ocean inland over northern British Columbia to Alberta and thence formed a trough of low pressure that extended south through Idaho and Nevada. The lower end of the trough when over southern Nevada received sufficient moisture from the ocean to cause some few showers in California and Nevada. The drought, however, in the former State is the worst that has been experienced since the establishment of the Weather Bureau, as up to the end of April only about 50 per cent of the normal rainfall has occurred in California. The droughty situation is worse in the northern portion of the State than in the southern, which is very unusual. The nearest approach to the present dry spell occurred during the season of 1897-98, when only 54 per cent of the normal amount of precipitation was received during that season and the southern part of the State suffered most, which is just the opposite to the present conditions.

Frost warnings were issued in the north Pacific States on 15 days and in northern California on two days. No damage was done by frosts in California; but they were unusually severe in portions of the north Pacific States, where crops were badly injured.

Storm warnings were displayed at the entrances to the Gulf of Georgia and the Strait of Fuca and at the mouth of the Columbia River on the 17th. Small-craft warnings were ordered at a few places on the 15th, 18th, and 23d.

Livestock warnings were issued on April 3 for eastern Oregon, Nevada, and southern Idaho; and fire-weather warnings were issued on the evening of the 24th for northern California. All of these warnings were justified except the fire-weather warning was not followed by as high temperature as expected.—*E. A. Beals.*

At the close of March, 1924, the Ohio River was in flood as far down as the mouth of the Great Kanawha River. The crest stage at Point Pleasant, W. Va., on the Ohio River was 44.5 feet on April 2. Below Point Pleasant, flood stages were not recorded until Cloverport, Ky., was reached. From this place to Shawneetown, Ill., just below the mouth of the Wabash River, the crest stages varied from 0.7 foot to 4.1 feet above the flood stages, the greatest excess at Shawneetown. Below Shawneetown the river was 5 or more feet below the flood stage, and the crest passed into the Mississippi River on April 11, with a stage of 40.7 feet at Cairo, Ill., reaching the Gulf of Mexico about April 25.

The flood was very accurately forecast and there was no damage of consequence, although some inconvenience and delay in farm work resulted. In the vicinity of Shawneetown, Ill., property to the amount of \$10,000 was saved through the warnings.

There were no floods of moment in the tributary streams in the State of Ohio. Such as occurred were properly forecast and the damage was very small. The flood in the White River of Indiana and its forks was also moderate, the crest stages ranging from about 2 to 5 feet above the flood stage. Owing to the backwardness of the growing season the damage was small, probably not over \$10,000. However, the warnings allowed the removal of considerable property from bottom lands.

The flood in the Wabash River of Indiana and Illinois attained fair proportions on account of the rapid melting of the heavy snows that fell over northern Indiana on March 20-21. The flood was most marked at La Fayette, Ind., where the crest stage of 21.2 feet on March 31 was 10.2 feet above the flood stage. Warnings were issued as often as necessary, and there were no losses of livestock nor other portable property. Losses from other sources, flooding of basements, highways, etc., amounted to about \$4,000. The value of property saved through the warnings was about \$5,000.

Flood warnings for the lower Connecticut Valley were issued on April 7 after a 24-hour rainfall that was excessive over the lower valley, and at 9 p. m., April 8, the Connecticut River at Hartford, Conn., reached a stage of 20.7 feet, 4.7 feet above flood stage. There was no damage done along the main stream, but the smaller rivers were dangerously high, especially the Farmington and Park Rivers. It was impossible to obtain estimates as to the amount of damage done.

Warnings were again issued on April 15 for the lower valley and on April 18 and 19 for the entire valley after the heavy rains that began during the afternoon of April 18. The flood was a moderate one and the warnings were well verified. No damage was reported.

The heavy rains of April 6-7, together with some melted snow, also caused a marked flood in the Hudson River at Troy and Albany, N. Y., the river reaching 20.3 feet at Troy and 14.6 feet at Albany, 5.3 and 2.6 feet, respectively, above the flood stages. Warnings were issued promptly and the reported losses were small, only about \$7,400, while the saving through the warnings was perhaps \$2,500.

Flood conditions in the north branch of the Susquehanna River were very similar and were equally well forecast. The damage done, however, was somewhat greater, more than \$25,000, probably because a larger area was covered.

There were some minor floods in the rivers of the south Atlantic system and in the upper Coosa River of Georgia

and Alabama. All passed off without damage of consequence. Little planting had been done, and the rivers of the Santee system had been high for so long a period that there was no livestock in the swamp regions.

The Tombigbee River at Demopolis, Ala., was in flood from April 14 to 27, inclusive, with crests on April 16 and 24 of 42.9 and 48.2 feet, respectively, flood stage being at 39 feet. The Tombigbee River was also in flood on April 18 and 19, with a crest stage of 52.7 feet at 10 a. m., April 19, or 6.7 feet above the flood stage. Damage as reported amounted to \$15,500. Value of property saved through warnings, \$11,900.

The heavy rains of April 10-11 over the drainage area of the Pearl River of Mississippi resulted in a somewhat prolonged period of moderately high water. Warnings were timely and no damage was reported.

The Illinois River had been high throughout March and remained generally so during April. Some additional warnings were necessary and they were well verified. No damage of consequence occurred.

The following description of a flood in the Belle Fourche River of South Dakota was prepared by Mr. Harley N. Johnson, meteorologist in charge of the Weather Bureau Office at Rapid City, S. Dak.:

FLOOD WATERS IN THE BELLE FOURCHE RIVER, WESTERN SOUTH DAKOTA

Due to moderately high temperatures and warm showers, a heavy blanket of snow approximately 5 feet deep overlying the headwaters of the Belle Fourche River near Moorcroft and Gillette, Wyo., melted rapidly and caused the highest water in the Belle Fourche River known to the oldest inhabitants. The highest stage of water was approximately 3 feet above any previous high-water mark. The water, already high, began rising further on Sunday, April 6, and reached the maximum stage at Belle Fourche about noon, Wednesday, April 9. Ample warnings of the approach of the flood were given to the people living on the lowlands, which was no doubt responsible for no lives being lost. Fifty-five families were rendered homeless, a total of 168 people, and property loss or damage is estimated from \$125,000 to \$150,000. Practically all the furniture in the 55 homes inundated is a total loss. The water reached the main street of the city of Belle Fourche and many residences and business houses had water in the basements. The Wood Lumber Co. lost heavily by its finished product being washed away, and the burning of its mill, which was washed from its foundation and lodged against the bridge. To prevent the possible going out of the bridge by reason of the resulting jam the lumber was removed from the mill and the mill then fired.

About 50 feet of the railroad bridge north of the town was washed away and the approaches to the new steel bridge were damaged and the bridge itself was saved only after a hard struggle. The steel and wood bridge east of the Powers Garage had to be dynamited to break up a jam, and the bridge across Redwater Creek near the high school was washed away. Ranches all along the valley of the Belle Fourche were heavily damaged by the flood waters.

Relief work by the Red Cross, whose representatives arrived at Belle Fourche on Saturday, April 12, did much to alleviate the suffering of the homeless people.

Two men lost their lives near Dalzell, in Meade County, on Wednesday, April 2, while attempting to cross the Belle Fourche River in a ferryboat. The cable gave way under the strain of the high water, and the men, Peter Richards and John Newcombe, were swept down the swollen stream. Only one of the bodies has been recovered to date, and it was washed ashore 5 miles downstream from the place where the men were drowned.

Very heavy rains on April 29 over the lower Arkansas Valley caused a decided rise in the Arkansas River and its tributaries, except the Canadian, and the rise was still in progress at the close of the month. It will be described briefly in the MONTHLY WEATHER REVIEW for May, 1924.

A rise to 5.5 feet in the North Platte River at North Platte, Nebr., or 0.5 foot above the flood stage, on April 18-19 was doubtless due to heavy rains and some melting snows at headwaters in the State of Wyoming. No damage was done.

The lower Trinity River of Texas was in flood or rising rapidly at the close of the month of March, and the crest

did not pass Liberty, Tex., until April 11. The flood was moderate and no material damage resulted. Another marked rise set in below Fort Worth after the heavy and general rains of April 26-27, and the high water continued at the end of the month. At Dallas, Tex., the estimated crest stage of 31 feet on April 28 was 6 feet above the flood stage. Further details will be given in the MONTHLY WEATHER REVIEW for May, 1924.

The melting of unusually heavy snowfall over the upper drainage area of the Rio Grande and the Colorado River caused exceptionally early rises in the rivers, and flood warnings for the Rio Grande in the State of New Mexico were issued beginning with April 7. The river at Albuquerque did not quite reach the flood stage of 4 feet, but below that place the river was in flood from April 7 until after the close of the month. Fortunately no damage was done, although a serious situation prevailed at San Marcial, N. Mex., where Mr. George W. King, the river observer, reported: "The water level during the last rise (April 27-29) was easily 6 feet above the level of the town and our dikes are none too strong." Warnings were also issued for the lower Colorado River and flood stages were slightly exceeded in some localities.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC DRAINAGE					
Connecticut:	<i>Feet</i>			<i>Feet</i>	
White River Junction, Vt.....	15	20	20	15.7	20
				20.7	8
Hartford, Conn.....	16	16	12	16.2	16
		20	25	17.7	21
Hudson:					
Troy, N. Y.....	15	7	8	20.3	8
Albany, N. Y.....	12	7	8	14.6	8
Susquehanna:					
Binghanton, N. Y.....	14	7	8	15.2	7
Towanda, Pa.....	16	7	7	17.8	7
Wilkes-Barre, Pa.....	20	7	8	23.5	8
Harrisburg, Pa.....	17	8	8	17.0	8
Unadilla:					
New Berlin, N. Y.....	8	6	10	11.8	7
Chenango:					
Sherburne, N. Y.....	8	7	8	9.3	7
Cape Fear:					
Elizabethtown, N. C.....	22	14	14	22.4	14
Peedee:					
Mars Bluff, S. C.....	17	17	24	18.8	16
Santee:					
Rimint, S. C.....	12	5	28	15.3	10
Ferguson, S. C.....	12	(1) 5	(2) 2	13.8	11
Saluda:					
Felzer, S. C.....	7	30	(2)		
Chappells, S. C.....	14	6	6	15.5	6
EAST GULF DRAINAGE					
Apalachicola:					
River Junction, Fla.....	15	22	22	15.1	22
Coosa:					
Gadsden, Ala.....	22	20	22	22.4	20
Lock No. 4, Lincoln, Ala.....	17	20	23	17.5	21
Tombigbee:					
Lock No. 4, Demopolis, Ala.....	39	14	27	48.2	24
Black Warrior:					
Lock No. 10, Tuscaloosa, Ala.....	46	19	21	52.7	19
Pearl:					
Jackson, Miss.....	20	14	(2)	25.4	22
GREAT LAKES DRAINAGE					
Maumee:					
Fort Wayne, Ind.....	15	(1)	3		
Napoleon, Ohio.....	10	(1)	1		
St. Joseph:					
Montpelier, Ohio.....	10	(1)	1		
Augsalze:					
Defiance, Ohio.....	10	(1)	1		
MISSISSIPPI DRAINAGE					
Ohio:	<i>Feet</i>			<i>Feet</i>	
Pittsburgh, Pa.....	22	(1)	1		
Dam No. 6, Beaver, Pa.....	30	(1)	(2)		
Dam No. 12, Wheeling, W. Va.....	36	(1)	(3)		
Marietta, Ohio.....	33	(1)	2	39.1	1
Parkersburg, W. Va.....	36	(1)	2	40.2	1
Dam No. 19, Tallman, W. Va.....	39	(1)	2	40.7	1
Dam No. 22, W. Va.....	42	(1)	2	44.0	1
Point Pleasant, W. Va.....	40	(1)	3	44.5	2
Dam No. 29, Normal, Ky.....	50	2	3	50.5	2
Portsmouth, Ohio.....	50	2	3	50.8	2
Cloverport, Ky.....	40	5	7	40.7	6
Evansville, Ind.....	35	3	10	38.3	7
Henderson, Ky.....	33	4	10	38.1	7, 8
Dam No. 48, Cypress, Ind.....	42	4	10	45.7	8
Mount Vernon, Ind.....	35	5	11	37.6	8
Shawneetown, Ill.....	35	5	12	39.1	9

¹Continued from last month.
²Continued at end of month.

³Below flood stage at 8 a. m. April 1.