

12th, however, this disturbance underwent a recrudescence, so that storm warnings had to be issued for Lake Ontario and extreme eastern Lake Erie on the following morning. The warning was fully verified.

The next disturbance of import was one from tropical waters. On the morning of the 18th the center was off the Delaware coast and the winds were becoming strong over portions of the Lower Lakes. Accordingly, north-east storm warnings were issued for Lake Ontario and for Lake Erie from Cleveland eastward. Full verification of this warning resulted. In fact, this disturbance, together with related barometric conditions to the westward, required the issuance of either small-craft or storm warnings on the following two days.

Fire-weather warnings.—On the 16th a dry period began in Minnesota that gave that State its highest fire hazard since May, 1926. A large number of fires occurred from October 18 to 29. General fire-weather forecasts were sent to the Duluth, Minn., office on several dates, where they were put in shape for distribution by the official especially assigned to that work. Eight such forecasts were issued for the Minnesota area. This work was also extended into Upper Michigan during October, and five fire-weather forecasts for that area were issued.—*C. A. Donnel.*

NEW ORLEANS FORECAST DISTRICT

The weather during October was exceptionally mild throughout the district except for a cold period in the second decade. A striking feature was the absence of precipitation during the second and third decades.

No storm warnings were issued. Small-craft warnings were displayed on the Texas coast on October 1. No general storms occurred without warnings.

Frost warnings were issued for the northwest portion of the district on the 2d and 3d; for the north portion of the district on the 12th, and northern Arkansas on the 13th, and Oklahoma and Arkansas on the 19th. Frost occurred over part of the area covered in the forecast.

Norther warnings for shipping on the Mexican coast were issued on the 12th.—*I. M. Cline.*

DENVER FORECAST DISTRICT

Mild temperatures and settled weather prevailed throughout the district during most of the month, the principal exceptions being rather stormy weather in the northern portion of the district during the first week and in the southern portion during the last few days. Warnings of frosts or freezing temperatures were issued from time to time as long as they were required for parts of Wyoming, Colorado, Utah, and New Mexico, and advices of expected fresh to strong winds in southern Wyoming and northeastern Colorado were issued for the benefit of the air-mail flyers on the 4th, 9th, 10th, 13th, and 14th. Most of the above-mentioned warnings were verified either fully or in part. On the 31st, when rain or snow and colder weather with fresh to strong northerly winds was indicated, livestock warnings were issued for eastern and southern Wyoming. Moderately severe conditions were experienced in the southeastern part of the State, many automobiles being marooned by drifted snow on the main highways in the vicinity of Laramie.—*E. B. Gittings.*

SAN FRANCISCO FORECAST DISTRICT

The North Pacific high-pressure system was above its normal intensity at the opening of the month, its major axis lying in a northwest-southeast position, and favoring the development of disturbances on its northeast periphery. Two such disturbances developed early in the month, one on the 1st and another on the 3d. The second was attended by strong winds and gales along the north coast, but no warnings were displayed as the depression formed over the district without premonitory indications. A disturbance from the Gulf of Alaska on the 9th appeared to warrant the display of small-craft warnings on that date over Puget Sound and on the Washington coast, and fresh winds followed over much of the area reaching moderate gale force at points on the coast. A deep and very large depression developed over the north-east Pacific a few days later, warnings for which were displayed at northern ports on the 14th. These warnings continued in force until the 17th, but were changed in character at times to indicate the force and direction of the blow, and included a display of "whole gale" warnings on the Washington-Oregon coast from the evening of the 14th to the morning of the 16th. Strong to whole gales prevailed over much of the region covered by the warnings, beginning with the 15th. No further storm warnings were issued until the 28th, when they were ordered for the Washington-Oregon coast. Strong winds and gales occurred during the same day, subsiding by night.

Special fire-weather forecasts for northern California, which had been a feature of the daily forecast work since the beginning of the fire season, were discontinued on the 26th, due to the occurrence of rains which mitigated the fire hazard in all parts of the State on that date.—*Thomas R. Reed.*

RIVERS AND FLOODS

By H. C. FRANKENFIELD

Atlantic drainage—Between October 16 and 20 heavy rains fell over the Susquehanna drainage basin, except the extreme upper portion. Some of the heavier amounts were as follows:

	Inches		Inches
Cortland, N. Y.	2.30	Montrose, Pa.	5.05
New Berlin, N. Y.	3.22	Towanda, Pa.	3.83
Oneonta, N. Y.	3.68	Wilkes-Barre, Pa.	4.17
Sherburne, N. Y.	2.52	Sunbury, Pa.	3.36
Bainbridge, N. Y.	3.90	Harrisburg, Pa.	2.82
Binghamton, N. Y.	4.60		

There followed, of course, a rapid rise in the river and moderate flood stages occurred almost as far down as the junction with the West Branch. Fortunately, the lowlands had been well cleared of crops, road and bridge work was practically complete, and the resulting flood damage was relatively small. The total of reported losses was \$60,000, and property to the value of \$5,000 was saved through the warnings. Apparently there was considerable crop damage, but figures were unobtainable.

The same general rain storm also caused a pronounced rise in Delaware River and tributaries, although no flood stages were reported, except at Hawley, Pa., on the Lackawaxen River. The Lackawanna River also overflowed its banks, and caused much damage and inconvenience throughout the valley, especially in and around Scranton, Pa.

Heavy rains over the upper Roanoke, upper Cape Fear, and upper Peedee drainage basins occurred on October 3 and 4 caused decided rises, which were covered by warnings for the streams mentioned. The overflow was not serious and there was little or no damage.

Mississippi drainage.—The rains of the last days of September and early October brought about moderate floods in the Illinois River of Illinois and the Grand and Osage Rivers of Missouri. The floods were moderate and well covered by warnings. Losses and damage were small since no crops had been planted in the newly overflowed areas after the destructive spring and early summer floods.

The same general and heavy rainstorms above mentioned also covered southern Kansas, eastern Oklahoma and Arkansas, and quite severe floods followed in the lower Neosho and lower Verdigris Rivers of Kansas and Oklahoma. Stages were also well above the flood line in the Arkansas River from Webbers Falls, Okla., almost to Little Rock, Ark., and in the White River of Arkansas, except the extreme upper and extreme lower portions, and a local flood was reported at Oklahoma City, Okla.

The highest stages, both relative and absolute, occurred in the Verdigris River above Catoosa, Okla., below which place the crest was greatly depressed. At Independence, Kans., the Verdigris River reached a stage of 45.95 feet on October 3, 15.95 feet above the flood stage and within 0.7 foot of the record stage of July 8, 1904.

The lower Neosho River flood was almost equal to the flood of April, 1927, although not nearly so destructive as the Verdigris flood, while the North Canadian River flood at Oklahoma City, Okla., was confined to that vicinity without material damage resulting. Only low bottom lands from the city eastward were flooded. The Arkansas and White River floods were more moderate, and the total of losses reported was not great.

Timely warnings were issued for all these floods, and reported savings through them were \$25,000 along the Neosho River, \$150,000 along the Verdigris River, and \$15,000 along the White River. Incomplete data as to loss and damage are as follows:

River basin	Miscellaneous	Crops		Livestock and other movable property	Suspension of business	Total
		Matured	Prospective			
Neosho.....	\$25,000	\$15,000	\$35,000	\$20,000	\$5,000	\$100,000
Osage in Kansas.....	25,000					25,000
Verdigris.....	1,270,000			75,000		1,345,000
White.....	97,000					97,000
Total.....	1,417,000	15,000	35,000	95,000	5,000	1,567,000

About 15,000 acres of crop lands were overflowed in the Neosho Basin. Highways in Labette and southern Neosho Counties of Kansas were impassable for several days, and railroad traffic along low places interrupted. In the Verdigris Basin about 90,000 acres of land were overflowed, 65,000 acres of which are in Kansas, mainly in Montgomery County which was the principal sufferer. Along the Arkansas River the only losses reported were those of a small quantity of crops in the lower bottoms.

A moderate flood in the Trinity River of Texas from Dallas to a short distance below Trinidad was caused by very heavy rains on October 1, the 24-hour amounts ranging from 2 to a little more than 3 inches. Warnings were issued promptly and as result, there was no damage of consequence, while property valued at \$6,500 was saved.

A decided rise in the lower Rio Grande, apparently coming from the San Juan River of Mexico was well forecast, and about \$10,000 saved thereby to the people of the valley. Levees were strengthened, some excess water diverted through a flood-control outlet, and other precautionary measures taken.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
<i>Atlantic drainage</i>					
Lackawaxen, Hawley, Pa.....	Feet 9	19	19	Feet 10.1	19
<i>Susquehanna:</i>					
Oneonta, N. Y.....	12	20	20	12.5	20
Bainbridge, N. Y.....	11	20	21	12.0	21
Binghamton, N. Y.....	14	19	20	16.6	19
Towanda, Pa.....	16	20	20	17.3	20
Wilkes-Barre, Pa.....	20	20	21	25.6	21
Roanoke, Weldon, N. C.....	30	6	6	33.6	6
<i>Mississippi drainage</i>					
Stony Creek, Johnstown, Pa.....	10	20	20	12.0	20
Tippecanoe, Norway, Ind.....	6	2	2	6.5	2
		31	31	6.0	31
<i>Illinois:</i>					
Peru, Ill.....	14	3	21	14.9	4-5
Havana, Ill.....	14	7	22	15.3	15
Beardstown, Ill.....	14	6	28	17.0	12-14
Pearl, Ill.....	12	9	21	13.9	13-15
<i>Grand:</i>					
Gallatin, Mo.....	20	7	7	21.0	7
Chillicothe, Mo.....	18	3	3	18.7	3
<i>Osage:</i>					
Osceola, Mo.....	20	2	12	26.1	9
Warsaw, Mo.....	22	2	12	28.2	9
Tuscumbia, Mo.....	25	4	13	27.7	11
<i>Arkansas:</i>					
Webbers Falls, Okla.....	23	3	5	24.8	4
Fort Smith, Ark.....	22	4	6	24.7	4-5
Ozark, Ark.....	22	5	5	22.4	5
Dardanelle, Ark.....	20	4	7	23.2	6
Morrilton, Ark.....	20	5	8	22.0	6
<i>Neosho:</i>					
Le Roy, Kans.....	24	2	2	26.0	2
Iola, Kans.....	15	2	3	19.8	2
Oswego, Kans.....	17	3	8	24.0	7
Fort Gibson, Okla.....	22	3	5	24.8	4
Verdigris, Independence, Kans.....	30	2	5	46.0	3
North Canadian, Oklahoma City, Okla.....	12	1	1	13.1	1
Pettit Jean, Danville, Ark.....	20	3	5	21.7	4
<i>White:</i>					
Calico Rock, Ark.....	18	2	6	30.5	3
Batesville, Ark.....	23	3	7	32.8	4
Newport, Ark.....	26	5	8	28.0	7
Georgetown, Ark.....	22	10	10	22.0	10
<i>Black:</i>					
Black Rock, Ark.....	14	1	1	15.0	1
Corning, Ark.....	11	2	5	11.9	4
<i>West Gulf drainage</i>					
<i>Trinity:</i>					
Dallas, Tex.....	25	3	4	29.7	3
Trinidad, Tex.....	28	4	19	35.3	8
Little, Little River, Tex.....	30	2	3	43.3	2
Nueces, Cotulla, Tex.....	15	11	12	16.0	12

MEAN LAKE LEVELS DURING OCTOBER, 1927

By UNITED STATES LAKE SURVEY

[Detroit, Mich., November 3, 1927]

The following data are reported in the "Notice to Mariners" of the above date:

Data	Lakes ¹			
	Superior	Michigan and Huron	Erie	Ontario
Mean level during October, 1927:				
Above mean sea level at New York.....	Feet 602.73	Feet 579.10	Feet 571.32	Feet 244.99
Above or below—				
Mean stage of September, 1927.....	+0.03	-0.06	-0.36	-0.28
Mean stage of October, 1926.....	+1.10	+0.78	-0.39	+0.06
Average stage for October, last 10 years.....	+0.55	-0.74	-0.54	-0.45
Highest recorded October stage.....	-0.91	-3.94	-2.38	-2.82
Lowest recorded October stage.....	+1.34	+1.19	+0.72	+1.32
Average departure (since 1860) of the October level from the September level.....	-0.05	-0.23	-0.32	-0.34

¹ Lake St. Clair's level: In October, 1927, 574.12 feet.