

as to require special warnings. The low that appeared on the North Pacific coast on the 25th became one of the most severe storms of recent years in the central portion of the district.

On February 1 a disturbance of marked intensity was central in southern Nevada, and warnings of heavy snow in northern Arizona, southwest Colorado, and northwest New Mexico and high winds in Utah and northern Arizona were issued. Several inches of snow fell over the area covered by the warnings. Press dispatches from Flagstaff, Ariz., stated:

A cold wind was causing drifting, which is said to be seriously interfering with train movements. Reports indicate that all of northern Arizona is in the grip of weather approximating blizzard conditions.

On the 11th a disturbance of considerable intensity was central in northern Nevada and warnings of strong westerly winds were issued for the western part of the district. By 8 p. m. the storm occupied the middle Rocky Mountain region and warnings of strong westerly winds were extended to New Mexico. It crossed the Divide by 8 a. m. of the 12th and the warnings were extended to the remainder of the district. During the passage of the storm across the district fresh to strong winds were general. The highest velocity reported was 60 miles an hour from the west in southern New Mexico. A disturbance developed in western Utah on the 17th, moved slowly eastward and reached western New Mexico on the morning of the 19th, when warnings of heavy snowfall in southern Colorado and northern New Mexico were issued. Many stations in southern Colorado reported several inches of snow. At Trinidad the snowfall was 8.8 inches. A storm of unusual intensity appeared on the North Pacific coast on the 25th. On the morning of the 26th the barometer reading at Tatoosh Island was 29.06 inches and the pressure was decreasing rapidly in the Plateau region. Warnings of strong southerly winds were issued on the 26th for Utah, New Mexico, and Arizona, and on the 27th for the entire district. At 8 a. m. on the 27th the storm was over northwest Colorado, with increased intensity, while an anticyclonic area occupied the Canadian border States from Montana eastward to Wisconsin and the pressure was rising in the Plateau region. The wind attained a velocity of 64 miles from the south at Modena and 52 miles per hour at Salt Lake City on the 26th and 30 to 56 miles in New Mexico and northern Arizona on the 27th. Snow slides were reported in several localities in the mountain districts and railroad officials reported the worst week experienced in years. Livestock warnings were issued for parts of Colorado on the 2d, 24th, and 27th and for northeast New Mexico on the 27th, and cold wave warnings in eastern Colorado on the 24th and in Colorado, north New Mex-

ico, north Arizona, and southwest Utah on the 27th. The warnings were generally fully justified.—*Frederick W. Brist.*

San Francisco, Calif., forecast district.—Stormy weather was the rule rather than the exception in this district during February. Storm warnings were ordered on 14 days for some portion of the North Pacific coast; small craft warnings were displayed on four occasions, and three live-stock warnings were issued. Frost warnings were issued for some portion of California on 18 days. Most of the warnings were justified, although neither the storms nor the frosts were of unusual severity.

On February 8 about 10 miles south of Bellingham six men were washed overboard and drowned from the cannery tender *Uwanta*. The *Uwanta* was near the center of the bay, where the waves were unusually high, when she raced into the trough of a big wave and careened so far to the leeward as to spill five men into the sea. The captain, in endeavoring to rescue one of them, jumped into the water and was also drowned. Warnings for the storm were ordered at Bellingham at 6:40 p. m., February 7.

One of the most freakish storms on record developed suddenly over Vancouver Island on the morning of the 4th. A barometer reading of 29.00 inches was reported that day at 5 a. m. at Triangle Island. During this storm a maximum wind velocity of 80 miles from the southwest occurred at Tatoosh Island. The weather map the evening before did not indicate the proximity of such high winds and no warnings were issued. Our observer at Tatoosh reported there was not the slightest local indication of a violent blow 8 hours before the maximum velocity was reached. The storm disappeared almost as rapidly as it appeared, and the evening weather chart the same day showed scarcely a trace of it.

In a letter from the H. J. Dangberg Land & Live Stock Co., of Minden, Nev., dated February 25, 1919, the secretary of the company stated, "The weather reports (live-stock warnings) you have been sending us at different times are greatly appreciated and they have been of valuable assistance in several instances."

At Sacramento, Calif., there were six light and four heavy frosts, and at Fresno, Calif., the numbers were four and three, respectively. At both of these stations the minimum temperature for February was 33°, from roof exposures, while at Pomona, in the citrus district of southern California, the minimum temperature was 32°, or lower, on 14 days, with instruments exposed about 5 feet above the ground. Verifications of frost forecasts under these conditions are unsatisfactory, but it is believed most of those issued were verified, although some few were decided failures.—*E. A. Beals.*

RIVERS AND FLOODS, FEBRUARY, 1919.

By ALFRED J. HENRY, Meteorologist in Charge.

There were no severe floods during the month. Flood stages due to moderate rains occurred in the South and in northern California as indicated in the paragraphs below.

The high water in the Santee River in South Carolina that was in progress at the end of January had fallen below flood stages by the 12th, but moderate rain on the 14th caused it to pass the flood stage again by the 16th.

The Pearl River at Jackson, Miss., was at flood stage from the 7th to the 9th.

General rains of moderate intensity in the South Atlantic and East Gulf States from the 20th to the 26th caused most of the rivers in these districts to slightly

exceed flood stages during the last week of the month. But little damage was suffered owing to timely warnings.

Moderate to heavy rains during the second week of the month caused a sharp rise in the Sacramento River. Owing to the reclamation of Sutter Basin, the water which flowed through Moulton Break into Butte Slough was forced to the north and east of Sutter Basin and it spread over several thousand acres, causing damage estimated at several hundred thousand dollars.

The Willamette River at Eugene and Oregon City, Oreg., was in slight flood on the 10th and 12th. The usual tabular matter follows:

TABLE I.—Flood stages in the Atlantic drainage during February, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Tar:</i>	<i>Feet.</i>			<i>Feet.</i>	
Greenville, N. C.....	13			12.2	28
<i>Neuse:</i>					
Neuse, N. C.....	14			13.8	25
Smithfield, N. C.....	14	25	27	15.1	26
<i>Cape Fear:</i>					
Elizabethtown, N. C.....	22	25	(¹)	25.2	25
Fayetteville, N. C.....	35			31.8	24
<i>Peedee:</i>					
Cheraw, S. C.....	27	24	24	31.2	24
Do.....	27	27	27	29.0	27
<i>Santee:</i>					
Rimlin, S. C.....	12	(²)	10	17.0	³ 31
Do.....	12	16	(¹)	16.6	28
Ferguson, S. C.....	12	(²)	12	13.9	1-2
Do.....	12	15	(¹)	13.7	28
<i>Catawba:</i>					
Cawtaba, S. C.....	11	23	23	12.0	23
<i>Wateree:</i>					
Camden, S. C.....	24	24	26	29.8	24
<i>Congaree:</i>					
Columbia, S. C.....	15			14.8	23
<i>Broad:</i>					
Blair, S. C.....	15	23	23	15.0	23
<i>Savaha:</i>					
Chappells, S. C.....	14	24	25	15.7	24
<i>Edisto:</i>					
Edisto, S. C.....	6			5.5	28
<i>Oconee:</i>					
Milledgeville, Ga.....	22	26	27	27.0	26
Dublin, Ga.....	22	28	(¹)	23.0	28
<i>Ocmulgee:</i>					
Macon, Ga.....	18	25	26	20.6	26
Hawkinsville, Ga.....	29			26.2	28
Abbeville, Ga.....	11	3	3	11.0	3
Do.....	11	26	(¹)	14.4	28
Lumber City, Ga.....	15			14.3	28

¹ Continued into March. ² Continued from January. ³ January.

TABLE II.—Flood stage in the East Gulf drainage during February, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Fliet:</i>	<i>Feet.</i>			<i>Feet.</i>	
Woodbury, Ga.....	10			9.3	26
Montezuma, Ga.....	20	28	(¹)	20.8	28
Albany, Ga.....	20	27	(¹)	24.4	28
Bainbridge, Ga.....	25			23.3	28
<i>Chattahoochee:</i>					
Enfauia, Ala.....	40	26	(¹)	48.5	27
Alaga, Ala.....	30	26	(¹)	39.6	28
<i>Alabama:</i>					
Montgomery, Ala.....	35	26	(¹)	44.8	28
Selma, Ala.....	35	26	(¹)	47.2	28
<i>Tallahassee:</i>					
Milstead, Ala.....	40	26	26	44.0	26
<i>Coosa:</i>					
Gadsden, Ala.....	22	24	27	22.6	26
Lock No. 4 (Lincoln, Ala.).....	17	23	(¹)	20.0	23
Wetumpka, Ala.....	45			43.8	27
<i>Tombigbee:</i>					
Demopolis, Ala.....	39	26	(¹)	45.4	28
<i>Black Warrior:</i>					
Tuscaloosa, Ala.....	46			43.4	23-24
<i>Pascagooula:</i>					
Merrill, Miss.....	20			19.4	28
<i>Pearl:</i>					
Jackson, Miss.....	20	7	9	20.3	8
Do.....	20			19.1	28
Columbia, Miss.....	18			17.0	8
Do.....	18	28	(¹)	15.3	28

¹ Continued into March.

TABLE III.—Flood stages in the Mississippi drainage during the month of February, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Illinois:</i>	<i>Feet.</i>			<i>Feet.</i>	
Peru, Ill.....	14			12.5	1
Henry, Ill.....	7	(¹)	2	7.1	1
Peoria, Ill.....	16			14.2	1-2
Beardstown, Ill.....	12			11.3	1-3
<i>Sulphur:</i>					
Finley, Tex.....	24			21.7	11
Ringo Crossing, Tex.....	20			17.9	4

¹ Continued from January.

TABLE IV.—Flood stages in West Gulf drainage during month of February, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Trinity:</i>	<i>Feet.</i>			<i>Feet.</i>	
Fort Worth, Tex.....	20			19.3	2
Dallas, Tex.....	25	2	7	33.3	4-5
Trinidad, Tex.....	28	6	14	34.1	12
Liberty, Tex.....	25	8	10	25.3	9
Do.....	25			24.5	23
<i>Sabine:</i>					
Logansport, La.....	25			22.0	2

TABLE V.—Flood stages in Pacific drainage during month of February, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Sacramento:</i>	<i>Feet.</i>			<i>Feet.</i>	
Red Bluff, Cal.....	23	11	11	24.7	11
Monroeville, Cal.....	20			17.4	12
Knights Landing, Cal.....	18			17.9	12
Sacramento, Cal.....	28			28.6	11
Benson Ferry, Cal.....	12	12	12	12.4	12
Fernbridge, Cal.....	15	10	10	17.3	10
<i>Williamette:</i>					
Eugene, Oreg.....	10	10	10	10.0	10
Oregon City, Oreg.....	10	10	13	11.2	12

MEAN LAKE LEVELS DURING FEBRUARY, 1919.

By UNITED STATES LAKE SURVEY.

[Dated: Detroit, Mich., Mar. 7, 1919.]

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 February, 1919:	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>
Above mean seal level at New York.....	602.08	580.66	572.20	245.91
Above or below—				
Mean stage of January, 1919.....	-0.18	-0.14	+0.01	-0.18
Mean stage of February, 1918.....	+0.43	-0.16	+0.55	-0.07
Average stage for February, last 10 years.....	+0.33	+0.79	+0.67	+0.50
Highest recorded February stage.....	-0.40	-2.08	-1.55	-1.76
Lowest recorded February stage.....	+1.32	+1.50	+1.57	+2.08
Average relation of the February level to—				
January level.....		±0.0	±0.0	+0.1
March level.....		-0.1	-0.2	-0.2

¹ Lake St. Clair's level: In February, 575.03 feet.