

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

VOL. XXVII.

MARCH, 1899.

No. 3

INTRODUCTION.

The MONTHLY WEATHER REVIEW for March, 1899, is based on about 2,762 reports from stations occupied by regular and voluntary observers, classified as follows: 162 from Weather Bureau stations; numerous special river stations; 32 from post surgeons, received through the Surgeon General, United States Army; 2,385 from voluntary observers; 96 received through the Southern Pacific Railway Company; 29 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 31 from Canadian stations; 10 from Mexican stations; 7 from Jamaica, W. I. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological and Magnetic Observatory of Mexico; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kim-

ball, Superintendent of the United States Life-Saving Service; and Capt. J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

The weather changes and conditions during March, 1899, did not vary materially from the seasonal average. The principal cold wave of the month crossed the country east of the Rocky Mountains from the 4th to the 7th, causing frost and freezing weather in the Gulf and South Atlantic States during the 6th and 7th.

Three well-marked and energetic storms visited the Atlantic seaboard. One of these developed off the North Carolina coast on the 6th and moved northeastward along the middle Atlantic and New England coasts during the 6th and 7th, attended by winds of from 50 to 60 miles an hour. From the 15th to the 19th a storm traversed the country from the middle Pacific coast to New England. This storm developed great strength while crossing the central valleys and showed barometric readings below 29.00 inches on the New England coast, with winds 40 to 50 miles an hour along the entire Atlantic coast and a maximum velocity of 72 miles per hour from the northwest at New York City. The third storm of the month moved from the West Gulf States to New England from the 27th to the 29th. On the morning of the 29th the barometer at Portland, Me., read 28.90 inches, and gales of from 50 to 60 miles an hour prevailed along the Atlantic coast.

In anticipation of the frosts which occurred on the 10th, 11th, and 12th, special frost warnings were issued for California by the San Francisco office of the Weather Bureau, on March 9.

Special flood warnings were issued from Portland, Oreg., on the 2d and from San Francisco on the 24th.

No special injury is known to have been caused by the cold wave, frosts, and storms referred to, and no special benefits are known to have resulted from the timely and ample warnings issued in connection with their occurrence.

CHICAGO FORECAST DISTRICT.

The weather conditions during March were governed by frequent storms which moved from the Pacific coast across the Rockies, and then passed thence to the southeast or east. This feature resulted in unseasonably cold weather.

On the morning of the 5th, on account of the appearance of an area of high barometer of great magnitude over the extreme Northwest, the following special message was sent to the observers in Minnesota, Wisconsin, Illinois, Indiana, Missouri, Iowa, Upper and Lower Michigan, and extreme eastern Nebraska:

Unseasonably cold weather indicated for your section to-night and Monday; notify interests.

During the morning of the 10th another cold wave developed in the British Northwest. At the same time a well-marked storm was over Kansas, which, during the succeeding forty-eight hours, moved northeastward over the Lake region.

The storm was accompanied by some snow in the district and followed by a cold wave, but with diminishing intensity. The movement of the storm was amply covered by cold-wave and norther warnings, and by advisory messages to the vessel interests on Lake Michigan.

Still another cold wave appeared on the 14th in the British Northwest and overspread the Rocky Mountain region and eastern slope during the succeeding twenty-four hours, for which necessary warnings were issued. The storm preceding this cold wave moved from eastern Colorado to Lake Michigan in twenty-four hours, causing high winds on the lake. Vessel interests were warned as to the approach of the storm.

A fourth cold wave moved, during the 25th, 26th, and 27th, southward over the Rocky Mountain region and eastern slope; warnings were furnished to nearly all threatened points.—*H. J. Cox, Professor.*

SAN FRANCISCO FORECAST DISTRICT.

Prior to the 13th, the rivers in California were extremely low owing to the drought of the past season and the light rains of the present season up to that date. On the 23d, they began to rise quite rapidly. On the evening of the 24th, a forecast was made that "the lowlands, in the lower portions of the Sacramento and San Joaquin valleys would be flooded by Sunday, the 26th." This was fully verified. The crest of the high water was reached on the 26th, and the afternoon reports showed a general fall. The damage caused by the overflow was slight.

Wind signals were displayed on the 14th, 15th, 16th, and 17th, and again on the 22d and 28th. As usual these warnings were heeded and no disasters occurred.

On the morning of the 9th, the conditions shown on the weather map indicated severe frosts in California. Forecasts were issued at once giving warning of severe frosts throughout the State. Besides the regular distribution of these warnings by displaymen, the daily press, the maps, and forecast postal cards of the Weather Bureau, they were given to the Southern Pacific and San Francisco and San Joaquin Valley railroad companies, which caused the same to be bulletined by their agents throughout the State. Similar warnings were again issued on the 10th and 11th, and distributed in the same manner as were those of the 9th. The usual measures to prevent injury were resorted to, and it is believed with much success. Damaging frosts occurred on the mornings of the 10th, 11th, and 12th. Owing to the advanced stage of the fruit buds the almonds and apricots were seriously damaged, especially the former. Later developments, however, show the injury not so great as was at first anticipated.

On the 10th, warnings of severe frosts were sent to southern Arizona. On the morning of the 11th, Phenix reported a minimum temperature of 32°, but I have not been advised of any injury experienced.—*G. H. Willson, Local Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

River forecasts were issued on March 1, 2, 3, 4, 5, and 6. On March 2 a warning message was sent to the merchants and others in the threatened districts. The newspapers gave the warning great prominence.

Owing to the low stage of the Columbia, and the further fact that there was no rise in that river, the lower Willamette fully discharged its waters and it did not rise in this city as high as was expected; however, for all practical purposes the river forecast was verified.

The season has been backward and frosts were of frequent occurrence, no special frost forecasts were issued because they could be of no benefit.

Many sensational reports were published by the papers concerning damage done to fruit, wheat, and stock by the February freeze and unseasonable March weather, but information given on the subject by this office rapidly and readily checked the ill effects produced by the unwarranted reports.—*B. S. Pague, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

During March the tracks of eight highs and eleven lows were sufficiently well defined to be traced on Charts I and II, and the principal points regarding their place of origin and ending, duration, and velocity are given in the accompanying table. The ovals delineating these highs and lows were much better located this month than is ordinarily the case, and their progress across the country could be fairly well traced.

Highs.—All the highs began to the north of Montana, except the last, which began in Wisconsin. Four of them were last noted over Nova Scotia or Newfoundland; Nos. II and VI disappeared off the middle Atlantic coast, No. VII in the middle Gulf, and No. I to the north of Lake Superior. The general tendency was toward the east, but for three of the tracks toward the south and southeast. The sharp falls in temperature were as follows: As high No. III moved out of Manitoba on the evening of the 11th, Kansas City had a fall in temperature of 38° in twenty-four hours, and at 8 a. m. of the 12th Springfield, Mo., reported a fall of 36°. This cold wave moved rapidly north, and disappeared on the morning of the 13th over Ontario. On the morning of the 19th, while No. V was to the north of Montana, a fall of 36° occurred in northern Louisiana. On the evening of the 28th, as high No. VII approached the west Gulf, Montgomery reported a fall of 36°, and at the 8 a. m. report of the 29th a fall of 34°.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I.....	1, p. m.	52	116	4, a. m.	50	85	<i>Miles.</i> 1,950	<i>Days.</i> 2.5	<i>Miles.</i> 540	<i>Miles.</i> 22.5
II.....	4, a. m.	50	110	9, p. m.	49	80	2,280	5.5	415	17.3
III.....	9, p. m.	51	113	15, p. m.	47	59	2,520	6.0	420	17.5
IV.....	13, a. m.	53	115	18, p. m.	45	61	3,090	5.5	562	23.4
V.....	18, p. m.	55	108	23, a. m.	48	53	3,390	4.5	740	30.3
VI.....	20, p. m.	51	116	25, a. m.	37	75	2,220	4.5	493	20.5
VII.....	25, a. m.	52	119	29, a. m.	32	59	2,520	4.0	630	26.2
VIII.....	26, a. m.	43	90	29, a. m.	46	58	1,050	3.0	550	22.9
Total.....							18,960	35.5	4,850	181.1
Mean of 8 paths.....							2,370		544	22.7
Mean of 35.5 days.....									534	22.2
Low areas.										
I.....	*23, a. m.	48	134	3, a. m.	41	69	2,910	3.0	970	40.4
II.....	1, a. m.	34	98	6, a. m.	50	64	2,100	5.0	420	17.5
III.....	5, p. m.	36	89	8, p. m.	48	52	2,340	3.0	780	32.5
IV.....	6, a. m.	52	114	9, p. m.	42	73	2,100	3.5	600	25.0
V.....	8, a. m.	47	128	13, p. m.	47	50	3,960	5.5	720	30.0
VI.....	12, a. m.	49	124	17, a. m.	47	51	3,900	5.0	780	32.5
VII.....	14, a. m.	44	125	20, p. m.	49	62	3,720	6.5	572	23.8
VIII.....	19, a. m.	52	122	25, p. m.	47	56	4,710	6.5	725	30.2
IX.....	23, a. m.	51	124	27, a. m.	48	56	3,510	4.0	877	36.6
X.....	23, a. m.	37	105	30, a. m.	52	63	3,540	7.0	506	21.1
XI.....	28, p. m.	49	114	†1, a. m.	48	61	3,540	3.5	1,011	42.1
Total.....							36,330	52.5	7,951	331.7
Mean of 11 paths.....							3,303		724	30.2
Mean of 52.5 days.....									692	28.8

*February. †April.

Lows.—Six of the lows originated in the north Pacific, No. IX to the north of Montana, No. X in Colorado, and Nos. II and III in the lower Mississippi Valley. The general movement was toward southeast and east. Nos. I and IV