

Heights of rivers referred to zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Willamette River.</i>	<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Albany, Oreg.....	96	20	18.4	11	4.1	7	8.6	14.3
Portland, Oreg.....	10	15	11.7	12	2.4	6	6.8	9.3
<i>Edisto River.</i>								
Edisto, S. C.....	75	6	6.5	13	5.0	1,2	5.8	1.5
<i>James River.</i>								
Lynchburg, Va. ³	257	18	7.5	28	1.3	2,3	4.2	6.2
Richmond, Va.....	110	12	22.0	18	0.2	1	6.6	21.8
<i>Alabama River.</i>								
Montgomery, Ala.....	265	35	38.0	28	13.0	1	21.2	20.0
Selma, Ala.....	212	35	34.4	11	10.8	1	24.6	28.6
<i>Coosa River.</i>								
Rome, Ga.....	225	30	24.0	8	5.0	14,15	11.7	19.0
Gadsden, Ala.....	144	18	21.5	8	6.7	1,16	13.4	14.8
<i>Tombigbee River.</i>								
Columbus, Miss.....	285	33	21.0	8	3.8	1	9.9	17.2
Demopolis, Ala.....	155	35	47.9	15	25.9	1	39.4	22.0
<i>Black Warrior River.</i>								
Tuscaloosa, Ala.....	90	38	51.7	8	18.5	22,26	29.9	33.2
<i>Pedee River.</i>								
Cheraw, S. C.....	145	27	34.9	8	5.5	15	18.4	29.4
<i>Black River.</i>								
Kingstree, S. C.....	60	12	11.6	19-21	8.8	4,5	10.3	2.8
<i>Lumber River.</i>								
Fairbluff, N. C.....	10	6	7.5	15	4.9	1,3	6.6	2.6
<i>Lynch Creek.</i>								
Effingham, S. C.....	35	12	17.2	12	8.6	1,2	12.8	8.6
<i>Potomac River.</i>								
Harpers Ferry, W. Va.....	170	16	13.6	23	2.6	5-14	5.3	11.0

Heights of rivers referred to zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Roanoke River.</i>	<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Clarksville, Va.....	155	12	9.9	7	2.0	1	5.8	7.9
<i>Sacramento River.</i>								
Red Bluff, Cal.....	241	23	4.1	21,22	0.6	10	2.5	3.5
Sacramento, Cal.....	70	25	14.1	1	11.6	15-19	13.3	2.5
<i>Santas River.</i>								
St. Stephens, S. C.....	50	12	15.3	15	8.0	3-8	10.4	7.3
<i>Congaree River.</i>								
Columbia, S. C.....	37	15	21.3	8	1.8	4	7.6	19.5
<i>Wateree River.</i>								
Camden, S. C.....	45	24	31.0	8	8.0	4	17.5	23.0
<i>Savannah River.</i>								
Augusta, Ga.....	130	32	30.9	8	11.5	26	17.8	19.4
<i>Susquehanna River.</i>								
Wilkesbarre, Pa.....	173	14	12.0	24	5.2	20,21	7.5	6.8
Harrisburg, Pa.....	70	17	9.0	23	1.9	3	4.6	7.1
<i>Juniata River.</i>								
Huntingdon, Pa. ¹⁴	80	24	7.0	27	4.3	21,22	5.1	2.7
<i>W. Br. of Susquehanna.</i>								
Williamsport, Pa.....	35	20	8.3	28	2.3	14,15	3.6	6.0
<i>Waccamaw River.</i>								
Conway, S. C.....	40	7	8.4	28	4.9	5-7	6.3	3.5

* Distance to Gulf of Mexico. ¹ Record for 27 days. ² Record for 22 days. ³ Record for 24 days. ⁴ Record for 19 days. ⁵ Record for 11 days. ⁶ Record for 12 days. ⁷ Record for 25 days. ⁸ Record for 20 days. ⁹ Record for 21 days. ¹⁰ Record for 26 days. ¹¹ Record for 18 days. ¹² Record for 7 days. ¹³ Record for 16 days. ¹⁴ Record for 8 days. ¹⁵ Record for 14 days.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

The overshadowing event of the month was the severe and widespread cold lasting from January 26 to February 14, and culminating in a freeze that for duration and severity stands unparalleled in the history of the Weather Bureau.

Strictly speaking, there were at least two, possibly three, separate and distinct cold waves, each of which followed a course somewhat different from that of the others. The cold was doubtless greatly intensified by the snow covering of the northeastern Rocky Mountain slope and other regions to the eastward.

As stated in the January MONTHLY WEATHER REVIEW, page 5, a succession of snowstorms, accompanied by high winds, swept southeastward from the Northwest Territories during the closing days of January, carrying the snow covering to northern Texas, and cold weather to the Gulf and Atlantic coasts. During this period the Rocky Mountains seemed to act as an effective barrier to the movement of cold air westward over the Plateau region. On February 1, however, a low moved inland from the Pacific, striking the continent about latitude 45°, and moving thence southeastward over the Great Basin and around southern New Mexico to southwest Texas. The passage of this low into the interior appears to have been the key move to the changes that rapidly followed.

Close upon the retreating low an area of high pressure and cold weather advanced from Alberta, crossing to the western side of the Rocky Mountains and settling over the northern Plateau, where it remained almost stationary until the 7th. The temperature fell throughout the Plateau region and on the Pacific coast on the 3d, 4th, 5th, and 6th, the lowest points reached being within a degree or so of the lowest temperatures previously recorded. The minimum temperature at San Diego was 33.5°, lowest previous minimum 32°, while at Cuyamaca Dam, only 60 miles distant, but in the mountains, the temperature fell to 5° below zero. Heavy snows fell in the middle Plateau and Rocky Mountain regions on the 7th, thus reinforcing the heavy covering of snow already upon the ground.

A second high appeared over Assiniboia on the 7th, moving southeastward and the plateau high began an eastward move-

ment, uniting with it on the 8th. This second high, however, apparently remained stationary north of Montana from the 8th to the 11th; pressure gradually increased until the morning of the last-named date, when a maximum of 31.42 inches was reached at Swift Current. In the mean time an offshoot had moved southeastward over the upper Mississippi Valley, the Ohio Valley, the lower lakes, and the Middle Atlantic States, reaching the Atlantic coast in the vicinity of Chesapeake Bay on the morning of the 11th and causing extremely low temperatures in its course, in many cases the lowest recorded in the last twenty-eight years.

On the morning of the 11th, the high which had been apparently stationary over Assiniboia for three days began its southeastward movement, reaching the Texas coast by 10:00 a. m. of the 12th as a violent norther, with temperature 3° lower than ever before recorded. Moving rapidly eastward, it passed successively over the Gulf States, reaching the Florida Peninsula by the morning of the 13th, and thence northeastward along the Atlantic coast, but after reaching Virginia the minimum temperatures were not so low as those of the 10th, 11th, and 12th. We have thus seen that there were three separate and distinct periods of cold and that all sections of the country were visited, except Arizona and a portion of New Mexico on the southwest and portions of the Lake region and New England on the northeast.

The minimum temperatures recorded in the several States and Territories are shown in Tables I and II and graphically on Chart VI. A word of explanation in regard to minimum temperatures registered at Weather Bureau stations in large cities may be appropriate. Generally, Weather Bureau thermometers are installed at a height of 10 to 15 feet above the roofs of high buildings; rarely over sod at an elevation of from 10 to 20 feet above ground. When there is little or no movement of wind, especially at night, the colder air settles in the lowlands and valleys. It may easily happen in such cases that a thermometer on the top of a high building is entirely above the layer of cold air near the surface of the ground.

Thermometers exposed on the tops of buildings in large

cities, moreover, respond to a slight increase in temperature due to the consumption of large quantities of fuel and doubtless to a local heating of the building over which they are placed. The effect on the minimum thermometer must be most appreciable on those buildings in which fires are kept up all night and we should, therefore, expect that the nocturnal readings would be higher than those reported from voluntary stations in the neighborhood. The differences in the minimum readings will vary, of course, according as the building is kept at a uniform temperature or allowed to grow cool during the night. Still another feature should be taken into consideration, viz, the relation of the Weather Bureau building to the topography of the ground for several miles around the station. The effect of topography in general is to lower the night temperatures at stations situated in valleys or natural amphitheaters as compared with those located on the surrounding hills or plains. The City of Washington is a fair illustration of the valley station and it may be compared with Baltimore as a neighboring plains station. The annual means of the two stations are almost identical, Baltimore being three-tenths of a degree warmer. The minimum temperatures registered at Washington, however, are almost invariably lower than those registered at Baltimore. Prior to the current month the lowest minimum temperatures were, Washington, -14° in 1881; Baltimore, -6° in the same year. These values were increased by 1° during the current month, viz, to -15° at Washington and to -7° at Baltimore. The lower minimum temperatures of Washington are believed to be largely the result of topographic influence. The minimum temperatures recorded in the neighborhood of Washington during the current month were: United States Naval Observatory, about 2 miles northwest of the Weather Bureau building and nearly 200 feet higher, -15 ; Great Falls, Md., about 16 miles northwest in the Potomac River Valley, -14° ; Alexandria, Va., about 5 miles southwest, -12° ; Laurel, Md., about 18 miles northeast, -18° . In all cases the altitude of the thermometers was less than 15 feet above ground, and it is to be noticed that the minimum temperatures in this city were about as low as those of the country nearby. In the suburbs of Baltimore the minimum temperatures ranged from 4° to 6° lower than was recorded at the Weather Bureau office, and we are of opinion that these figures express about the average difference between the minimum temperatures of Weather Bureau thermometers placed on the roofs of tall buildings and those exposed in the open country from 10 to 20 feet above the ground, other things being equal. Minimum temperatures of 25° below zero were observed at several places between Washington and Baltimore, but the accuracy of the thermometers at low temperatures is not known.

These cold waves established many new landmarks or datum points for future reference, whether we consider the instrumental readings or the physical phenomena resulting from the cold. The most striking of the latter perhaps was the flow of ice down the Mississippi River on the 17th, past New Orleans and into the Gulf of Mexico, an event never before witnessed within the memory of man. Ice an inch thick formed at the mouth of the Mississippi in East and Garden Island bays, and the temperature fell to 10° on the 13th.

The swift flowing streams of the Southern States were covered with ice, and great numbers of fish were killed by the extreme cold. Game birds perished in large numbers, poultry and domestic animals suffered greatly, and in some cases froze to death on account of insufficient shelter. The loss of live stock on the plains and in the great grazing States is not known, but it must have been large by reason of the depth of snow and the duration of the low temperatures.

The loss of human life, from January 29 to February 13, by freezing and avalanches (in Colorado), as near as can be ascertained, was 105 persons distributed as follows:

Colorado, 24; Texas, 15; Pennsylvania, 11; New York, 10; Illinois, 8; Missouri, 6; Ohio, 3; Maryland, 3; Iowa, 4; Wyoming, Delaware, Virginia, North Carolina, Alabama, Arkansas, Kentucky, South Carolina, and New Jersey, 2 each; Washington and Georgia, 1 each.

The usual accompaniments of blizzard weather, viz, snow-bound trains, delayed travel, interrupted communication of all kinds and unusual suffering among the poor were present in greater or less degree from the Lakes to the Gulf, and generally from the Atlantic to the Pacific. Schools were generally closed; the usual functions of both city and country life were greatly deranged; and food and fuel famines were threatened in many of the larger cities.

The money loss occasioned by the storms aside from the loss of prospective crops can not be easily computed. Municipalities and transportation companies paid large sums of money to remove the snow, but these expenditures can scarcely be classed as losses pure and simple. Undoubtedly the greatest financial loss fell upon shipping and stock raising interests.

The distribution of the observed monthly mean temperature of the air is shown by red lines (isotherms) on Chart VI. This chart also shows the maximum and the minimum temperatures, the former by black and the latter by dotted lines. As will be noticed, these lines have been drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level; the isotherms relate, therefore, to the average surface of the country in the neighborhood of the various observers, and as such must differ greatly from the sea-level isotherms of Chart IV.

The average temperatures of the respective geographic districts, the departures from the normal of the current month and from the general mean since the first of the year, are presented in the table below for convenience of reference:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
New England.....	10	24.5	- 2.7	- 2.2	- 1.1
Middle Atlantic.....	12	27.9	- 6.6	- 6.6	- 3.3
South Atlantic.....	10	44.0	- 5.5	- 5.3	- 2.6
Florida Peninsula.....	7	61.0	- 2.9	- 1.6	- 0.8
East Gulf.....	7	45.2	- 9.3	-10.1	- 5.0
West Gulf.....	7	41.1	-10.4	- 9.8	- 4.9
Ohio Valley and Tennessee.....	12	27.4	-10.6	-10.2	- 5.1
Lower Lake.....	8	21.2	- 5.3	- 5.1	- 2.6
Upper Lake.....	9	12.8	- 6.3	- 6.8	- 3.4
North Dakota.....	7	0.2	- 6.0	- 2.2	- 1.1
Upper Mississippi.....	11	18.4	- 9.7	- 6.8	- 3.4
Missouri Valley.....	10	14.5	- 9.8	- 4.8	- 2.4
Northern Slope.....	7	8.6	-12.2	- 8.0	- 4.0
Middle Slope.....	6	20.3	-12.1	- 9.1	- 4.6
Southern Slope.....	5	30.3	-11.3	-10.7	- 5.4
Southern Plateau.....	18	44.0	- 0.8	- 1.2	- 0.6
Middle Plateau.....	9	30.0	+ 1.3	+ 3.2	+ 1.6
Northern Plateau.....	11	24.1	+ 4.4	+ 0.4	+ 0.2
North Pacific.....	9	39.5	- 1.6	+ 0.3	+ 0.2
Middle Pacific.....	5	49.2	0.0	+ 2.8	+ 1.4
South Pacific.....	4	53.2	- 0.2	+ 3.1	+ 1.6

In Canada.—Professor Stupart says:

Temperature was below average in all portions of Canada, except along the St. Lawrence Valley, between Montreal and Father Point, where it was from average to 1° above. From the coast line of British Columbia to the Lake region, the amount below average was very considerable, and this was especially the case over southern Alberta and also in Assiniboia, where the deficiency was as much as from 9° to 12° .

PRECIPITATION.

The numerical values of total precipitation and total depth of snowfall are given in Tables I and II, and the geographic distribution is graphically shown on Charts III and VIII. The depth of snow on the ground is also shown on Chart IX.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
New England	10	3.80	106	+0.2	+0.1
Middle Atlantic	12	5.13	154	-1.8	-1.4
South Atlantic	10	6.40	173	-2.7	-2.5
Florida Peninsula	7	4.80	171	-2.0	-3.8
East Gulf	7	4.28	91	-0.4	-0.2
West Gulf	7	1.78	53	-1.6	-0.5
Ohio Valley and Tennessee	12	3.49	83	-0.7	-0.6
Lower Lake	8	1.02	71	-0.8	-1.1
Upper Lake	9	0.92	48	-1.0	-1.8
North Dakota	7	0.16	34	-0.5	-0.7
Upper Mississippi	11	1.68	89	-0.2	-0.8
Missouri Valley	10	0.91	69	-0.4	-1.0
Northern Slope	7	0.70	117	+0.1	+0.2
Middle Slope	6	0.46	61	-0.3	-0.8
Southern Slope	6	0.15	13	-1.0	-1.7
Southern Plateau	13	0.28	32	-0.6	-0.6
Middle Plateau	9	1.38	118	+0.2	-0.1
Northern Plateau	11	1.45	88	-0.2	-0.1
North Pacific	9	7.08	129	+1.8	+4.8
Middle Pacific	5	1.14	28	-3.0	-2.5
South Pacific	4	0.16	6	-2.5	-2.1

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 22. Arkansas, 21, 25. California, 1, 2, 8, 15, 24. Florida, 22. Georgia, 22. Indiana, 26. Louisiana, 2, 23, 26. Michigan, 26. Mississippi, 26. Ohio, 26. Oklahoma, 25. Tennessee, 3. Texas, 15, 24. Washington, 21, 27, 28.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 4, 7, 8, 11, 12, 15. Arizona, 5, 6. Arkansas, 2, 3, 4, 5, 6, 14, 15, 18, 19, 25, 26, 27. California, 1, 2, 3, 28. Colorado, 10, 16, 21. Connecticut, 3, 8, 13, 16, 17, 20, 25, 26, 27. Delaware, 5, 6, 7. District of Columbia, 16. Florida, 12, 13, 14. Georgia, 8, 10, 11, 12, 15, 25. Illinois, 2, 3, 21, 22, 24, 25, 26, 27. Indiana, 2, 3, 4, 5, 8, 16, 18, 22, 25. Indian Territory, 2, 4. Iowa, 18, 21, 22, 24, 25, 27. Kansas, 2, 3, 10, 21, 22, 25. Kentucky, 4, 5, 6, 9, 11, 15, 16, 17, 18, 19, 23, 24, 25, 26. Louisiana, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 25, 28. Maine, 22, 26, 27. Maryland, 3, 5, 6, 7, 8, 9, 15, 16, 17, 26. Massachusetts, 3, 4, 13, 16, 17, 18, 19, 25, 26, 28. Michigan, 3, 20, 22, 25, 26, 28. Minnesota, 21, 25, 26. Mississippi, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 18, 24, 25. Missouri, 2, 3, 4, 23, 24, 25, 26. Montana, 16, 22. Nebraska, 1, 2, 21, 22, 25, 26. Nevada, 2, 8. New Hampshire, 17, 18, 26, 27. New Jersey, 3, 7, 8, 12, 13, 26. New York, 3, 4, 16, 25, 26, 27. North Carolina, 3, 11, 12, 13, 16, 22. North Dakota, 15. Ohio, 3, 4, 15, 16, 18, 19, 22, 23, 25, 28. Oklahoma, 2, 3, 12, 25. Oregon, 1, 2, 5, 7, 12, 20, 21, 23, 24, 25, 26, 27, 28. Pennsylvania, 2, 3, 4, 8, 16, 17, 26. South Carolina, 11, 12. South Dakota, 20. Tennessee, 2, 3, 4, 5, 6, 7, 15, 16, 18, 22, 23, 26. Texas, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 24. Utah, 2, 3, 15, 17. Vermont, 3, 7, 26. Virginia, 3, 4, 5, 6, 7, 8, 9, 12, 15, 16. Washington, 7, 8, 9, 12, 25. West Virginia, 3, 5, 16. Wisconsin, 25, 26. Wyoming, 5, 6, 7.

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Do.	27	50	sw.	Independence, Cal.	14	61	nw.
Atlantic City, N. J.	18	80	n.	Mount Tamalpais, Cal.	15	64	nw.
Block Island, R. I.	8	66	e.	Do.	21	50	n.
Do.	13	71	n.	Do.	23	64	nw.
Buffalo, N. Y.	9	52	w.	Do.	24	73	nw.
Do.	19	55	w.	Do.	25	75	nw.
Do.	26	53	sw.	Do.	26	82	nw.
Do.	27	54	w.	Do.	26	52	ne.
Do.	28	60	sw.	Nantucket, Mass.	13	60	sw.
Cape Henry, Va.	1	32	nw.	New York, N. Y.	9	57	nw.
Do.	18	60	n.	Do.	13	61	nw.
Cape May, N. J.	18	50	nw.	Do.	14	64	s.
Do.	14	50	nw.	Do.	27	51	nw.
Do.	27	55	w.	Point Reyes Light, Cal.	4	52	nw.
Carson City, Nev.	1	58	sw.	Do.	10	56	nw.
Cheyenne, Wyo.	19	50	nw.	Do.	14	58	nw.
Do.	27	58	w.	Do.	15	52	nw.
Eastport, Me.	13	58	ne.	Do.	23	71	nw.
Do.	14	60	ne.	Do.	24	75	nw.
El Paso, Tex.	25	58	sw.	Do.	25	70	nw.
Erie, Pa.	28	52	s.	Do.	26	50	nw.
Fort Canby, Wash.	14	54	se.	Winnemucca, Nev.	28	51	sw.
Hatteras, N. C.	13	52	w.	Woods Hole, Mass.	1	54	nw.
Havre, Mont.	15	52	sw.	Do.	8	60	nw.
Do.	18	51	sw.	Do.	14	72	nw.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.9	+0.4	Missouri Valley	5.0	-0.4
Middle Atlantic	6.1	+0.5	Northern Slope	5.8	+1.0
South Atlantic	5.8	+0.5	Middle Slope	4.4	0.0
Florida Peninsula	4.8	+0.2	Southern Slope	3.9	-0.9
East Gulf	6.2	+0.7	Southern Plateau	5.3	-0.8
West Gulf	5.6	+0.2	Middle Plateau	5.2	+0.4
Ohio Valley and Tennessee	6.3	+0.1	Northern Plateau	6.5	-0.2
Lower Lake	7.0	+0.2	North Pacific Coast	8.0	+1.0
Upper Lake	5.8	-0.5	Middle Pacific Coast	4.1	-0.7
North Dakota	4.3	-0.9	South Pacific Coast	2.4	-1.7
Upper Mississippi Valley	5.3	0.0			

HUMIDITY.

The relative humidity of the air continued low in the middle and south Pacific coast districts as well as the southern Plateau region; elsewhere the changes from the normal were slight.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	76	+1	Missouri Valley	72	-1
Middle Atlantic	73	+1	Northern Slope	73	+1
South Atlantic	80	+1	Middle Slope	77	+1
Florida Peninsula	83	+1	Southern Slope	85	+1
East Gulf	81	+1	Southern Plateau	85	+1
West Gulf	76	+1	Middle Plateau	85	+1
Ohio Valley and Tennessee	77	+1	Northern Plateau	85	+1
Lower Lake	75	+1	North Pacific Coast	85	+1
Upper Lake	83	+1	Middle Pacific Coast	85	+1
North Dakota	77	+1	South Pacific Coast	61	-10
Upper Mississippi Valley	76	+1			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms

are given in Table VII, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 708 thunderstorms were received during the current month as against 492 in 1898 and 426 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 3d, 190; 25th, 108; 26th, 102.

Reports were most numerous from: Tennessee, 78; North Carolina, 68; Florida, 63; Missouri, 46.

Auroras.—The evenings on which bright moonlight must

have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 20th to 28th.

The greatest number of reports were received for the following dates: 11th, 85; 12th, 32; 13th, 8.

Reports were most numerous from: North Dakota, 23; Minnesota, 21; Iowa, 16; South Dakota, 15; Michigan, 14.

In Canada.—Auroras were reported as follows: Charlotte-town, 11th; Quebec, 11th, 12th, 27th; Montreal, 14th; Ottawa, White River, Swift Current, and Banff, 12th; Kingston, 11th, 23d; Port Arthur, 12th, 13th; Minnedosa, 9th, 10th, 12th; Medicine Hat, 16th; Prince Albert, 28th; Battleford, 3d, 10th, 11th.

No thunderstorms were reported.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

Alabama.—The mean temperature was 40.0°, or 7.1° below normal; the highest was 80°, at Healing Springs on the 4th and at Alco on the 22d, and the lowest, 17° below zero, at Valleyhead on the 12th. The average precipitation was 6.61, or 0.66 above normal; the greatest monthly amount, 9.39, occurred at Clanton, and the least, 1.67, at Daphne. The month was the coldest on record. Several persons were frozen to death; stock suffered very much; in some counties cows, hogs, and goats froze to death, and poultry froze on the roost; large numbers of game birds perished, and swift-running streams, never before known to freeze, were covered with ice; the ice on ponds in middle counties was thick enough for skating on the 13th and 14th, while at Montgomery sleighing was indulged in for three days.—*F. P. Chaffee.*

Arizona.—The mean temperature was 46.8°, or 1.0° below normal; the highest was 90°, at Parker on the 21st and 22d, and the lowest, 24° below zero, at Fort Defiance on the 7th. The average precipitation was 0.45, or 0.57 below normal; the greatest monthly amount, 2.58, occurred at Flagstaff, while none fell at a number of stations.—*W. G. Burns.*

Arkansas.—The mean temperature was 31.8°, or 11.9° below normal, and was the coldest February on record; the highest was 75°, at Conway on the 28th, and the lowest, 25° below zero, at Corning and Winslow on the 12th and at Keesee's Ferry on the 13th. The average precipitation was 2.18, or 1.72 below normal; the greatest monthly amount, 4.15, occurred at Brinkley, and the least, 0.63, at Texarkana.—*E. B. Richards.*

California.—The mean temperature for the State, obtained by weighting the reports from 280 stations, so that equal areas have about equal weight, was 48.5°, or 0.1° below normal; the highest recorded was 100°, at Tres Pinos, San Benito County, on the 19th, and the lowest, 30° below zero, at Boca, Nevada County, on the 6th. The average precipitation for the State, as determined by the records of 299 stations, was 0.45; the deficiency, as indicated by reports from 168 stations which have normals, was 2.88; the greatest monthly precipitation was 10.95, at Crescent City, Del Norte County, while none fell at many stations.—*W. H. Hammon.*

Colorado.—The mean temperature was 18.2°, or 8.8° below normal; the highest was 68°, at Minneapolis on the 27th, and the lowest, 45° below zero, at Greeley on the 12th. The average precipitation was 0.98, or normal; the greatest monthly amount, 5.08, occurred at Breckenridge, and the least, 0.06, at Garnett.—*F. H. Brandenburg.*

Georgia.—The mean temperature was 43.6°, or 4.2° below normal; the highest was 82°, at Mauzy on the 22d, and the lowest, 12° below zero, at Diamond and Tallapoosa on the 13th. The average precipitation was 7.47, or 2.40 above normal; the greatest monthly amount, 10.32, occurred at Diamond, and the least, 1.90, at Gunde. On the 12th and 13th the State was under the influence of the most intensely cold weather ever experienced in this section, so far as available records show. The extreme cold did immense damage to crops and caused untold suffering. Traffic was seriously interrupted and many cattle perished. Reports from several hundred correspondents show that the peach crop was totally killed in many sections, and more or less damaged in all sections of the State. Many orchards of young trees were killed outright and will have to be replanted. The oat crop was

almost entirely killed in many counties, but wheat fared better, and in many sections is still very promising. The mantle of snow which covered the fields was a great protection to this crop, and it is only where the snow was blown off that any material damage was done. The damage to the fruit interests of the State means the loss of several millions of dollars to the fruit growers. It is thought apples are badly injured. Peaches on high ground suffered least. Orchards in the northern section of the State were not so far advanced and, consequently, suffered less than in the central and southern counties.—*J. B. Morbury.*

Illinois.—The mean temperature was 19.6°, or 8.3° below normal; the highest was 69°, at Plumhill on the 20th, and the lowest, 29° below zero, at Morrisonville on the 12th. The average precipitation was 2.08, or 0.21 below normal.—*O. E. Linney.*

Indiana.—The mean temperature was 21.9°, or 8.7° below normal; the highest was 67°, at Bedford on the 26th, and the lowest, 29° below zero, at Cambridge City on the 13th. The average precipitation was 2.25, or 0.48 below normal; the greatest monthly amount, 4.20, occurred at Vevay, and the least, 0.50, at Valparaiso.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 12.2°, or about 9.0° below normal; the highest was 75°, at Mount Pleasant on the 20th, and the lowest, 40° below zero, at Sibley on the 9th. The average precipitation was 0.89, or 0.17 below normal; the greatest monthly amount, 4.32, occurred at Ridgeway, and the least, 0.12, at Toledo.—*J. R. Sage, Director; G. M. Chappell, Assistant.*

Kentucky.—The mean temperature was 26.2°, or 9.6° below normal; the highest was 71°, at Paducah and Russellville on the 20th, and the lowest, 33° below zero, at Sandyhook on the 11th. The average precipitation was 3.96, or 0.34 above normal; the greatest monthly amount, 8.34, occurred at Williamsburg, and the least, 1.84, at Louisville. The extremely cold weather during the early part of the month caused much damage to fruit.—*H. B. Hersey.*

Louisiana.—The mean temperature was 44.3°, or 9.2° below normal; the highest was 85°, at Oakridge on the 3d, and the lowest, 16° below zero, at Minden on the 13th. The average precipitation was 3.42, or 1.47 below normal; the greatest monthly amount, 6.55, occurred at Lawrence, and the least, 1.47, at the Northern Louisiana Experiment Station, Calhoun. During the cold wave of the 12th and 13th all previous records of cold weather in Louisiana were broken. On the morning of the 17th large blocks of ice appeared in the Mississippi River at New Orleans, passing in a steady stream southward at the rate of about five miles per hour, and reached the Gulf on the 19th. It is impossible to estimate the direct loss resulting from the freeze, but it is thought that it exceeds several million dollars, while the direct loss is even greater.—*A. G. McAdie.*

Maryland and Delaware.—The mean temperature was 26.6°, or 6.6° below normal; the highest was 67°, at Cumberland, and Frostburg, Md., on the 21st, and the lowest, 26° below zero, at Sunnyside, Md., on the 10th. The average precipitation was 5.51, or 1.37 above normal; the greatest monthly amount, 8.85, occurred at Coleman, Md., and the least, 2.07, at Boettcherville, Md.—*F. J. Wals.*

Michigan.—The mean temperature was 14.1°, or 6.9° below normal; the highest was 62°, at Clinton and Grape on the 26th, and the lowest, 49° below zero, at Humboldt on the 7th. The average precipitation was 1.44, or 0.43 below normal; the greatest monthly amount, 3.18, occurred at Olivet, and the least, 0.39, at Traverse City. The month was remarkable for excessive cold, it being the coldest on record. Lake Michigan was almost frozen over on the 15th. Much fruit was destroyed and considerable game, especially quail, partridge and ducks, perished on account of the extreme cold.—*C. F. Schneider.*

Minnesota.—The mean temperature was 4.5°, or about 8.0° below nor-