

FROST.

Agricultural products suffered comparatively little injury by frost during the month.

High temperatures and dry weather, conditions favorable for harvesting late crops, prevailed during the first half of the month. The first killing frost of wide extent occurred from the 29th to the 30th. Killing frosts also occurred in various localities after the middle of the month, but generally too late to do serious harm.

Following is a summary of reports by directors of the various climate and crop sections:

Alabama.—Light frost was general in the northern and central counties on the 25th and 26th; heavy frost in a few places on the 24th, 25th, 26th, 29th, and 30th.

Arizona.—Light at a number of places on the 11th, 16th, 17th, 26-28th, and 30th; killing on the 17th, 24th, 27th, and 28th.

Arkansas.—Light frost on the 29th and 30th; killing frost also reported in some localities on the same dates.

Colorado.—Killing frost was not general until after the middle of the month.

Georgia.—Light frost at a few places on the 4th and 5th, and at a number of places on the 30th; heavy at two stations on the 29th.

Kansas.—Killing frost on the 19th, 21st, 27th-31st.

Kentucky.—Light frost at a few places from the 4-8th, and from the 18-20th, and at a number of places from the 23d-26th; killing at a few places on the 2d, 3d, 5th, 8th, 14th, 21st, 23d, 25-27th, and at a number of places from the 29th to the 31st.

Maryland and Delaware.—Light on the 4th and 5th, 18th and 19th, and on the 30th and 31st; killing at a few places on the 4th and 5th; general on the 18th and 19th and also on the 30th and 31st.

Minnesota.—In the southern portions much vegetation escaped serious injury by frosts till the 9th, when it is probable that the frost of that date destroyed all annuals not previously injured.

Mississippi.—Light on the 7th, 8th, and 21st, also from the 24th to the 30th; killing at a few places on the 30th.

Missouri.—Killing quite general on the 29th and at various points on every date from the 20th to the 31st.

Nebraska.—The first killing frost of the season occurred on the 9th in the northern portion of the State and on the 29th in the southern portion.

Nevada.—Light on the 15th and 30th at two stations; killing from the 14th to 17th, and at a few stations on the 26th.

New Jersey.—Light general on the 4th and at a number of places on the 5th and 18th; killing at a number of places on the 3d, 4th, 10th, 18th, and 31st.

New Mexico.—No damaging frosts until the last week in the month.

North Carolina.—Light frost in a few places on the 1st, 2d, 4th, 6-8th, and 20th-21st; general on the 30th and 31st; killing at a number of places on the 4th and 5th and also from the 29th-31st.

Ohio.—Killing frost from the 3d to the 10th, 17th, 18th, 22d, 27th, 29th-31st.

Oklahoma.—Light to heavy at all stations on the 29th, the first of the season.

South Carolina.—Light at a few stations on the 4th and 5th and from the 29th to the 31st.

South Dakota.—Killing at a number of stations, first of the season, on the 2d, also on the 7-9th, 14-16th.

Tennessee.—Heavy to killing frost on the 30th.

Texas.—Light on the 11th and from the 26th to the 31st; killing from the 28th to the 31st.

Virginia.—Light at a number of stations from the 3d to the 8th, 18th, and 30th-31st; killing at one station on the 4th, 5th, and 8th, at a few stations on the 18-19th, and at a number of stations on the 30th-31st.

PRECIPITATION.

[In inches and hundredths.]

The current month was one of the driest that has been experienced during the last twenty-five years. The drought referred to in the September REVIEW continued until the 12th of the month, when general rains occurred throughout the regions east of the Rocky Mountains. In some places, however, the fall was very light, and the drought was only partially broken. Moreover, a second period of drought set in after the rains of the 10-12th that was not broken until the end of the month.

The following table exhibits some of the details of the drought in various localities:

Station.	Total precipitation.				Normal.	Percentage.
	From—	To—	Days.	Inches.		
Little Rock, Ark.....	Aug. 11	Oct. 27	77	0.97	7.85	12
Vicksburg, Miss.....	Aug. 20	Oct. 30	71	1.56	7.19	22
Keesees Ferry, Ark.....	Aug. 14	Oct. 30	77	0.41
Columbia, Mo.....	Aug. 25	Oct. 30	66	1.15	5.51	21
St. Louis, Mo.....	Aug. 1	Oct. 31	91	1.06	9.32	11
Chattanooga, Tenn.....	Aug. 24	Oct. 11	48	0.07	5.82	1
Memphis, Tenn.....	Sept. 1	Oct. 30	59	0.32	5.03	6
Nashville, Tenn.....	Aug. 24	Oct. 11	48	0.31	5.85	5
Charlotte, N. C.....	Aug. 23	Oct. 11	49	0.90	5.94	15
Lynchburg, Va.....	Aug. 1	Oct. 11	71	2.06	8.90	23
Parkersburg, W. Va.....	Aug. 26	Oct. 31	66	0.60	6.66	9
Columbus, Ohio.....	Sept. 2	Oct. 31	59	0.84	5.08	17
Sandusky, Ohio.....	Sept. 2	Oct. 31	59	0.83	5.39	15
Chicago, Ill.....	Aug. 10	Oct. 31	82	1.33	7.71	17
Louisville, Ky.....	Aug. 23	Oct. 10	48	0.75	4.47	17

At the end of the month an area of low pressure, accompanied by cloud and rain, appeared in the lower Mississippi Valley, and the month closed with good prospects for heavy rains in the drought-stricken region.

Considered by districts the rainfall of the current month was below the normal in 11, above in 8, and normal in 2. The deficits were not greatly in excess of the excesses, as will be seen by an examination of Table I. It is, perhaps, worthy of note that rainfall has been deficient in October in eight out of the last ten years. In only one year, 1890, was there an excess in a majority of districts.

In Canada.—Professor Stupart says:

Rainfall was below average throughout the Dominion, except in the small portion of Ontario over and contiguous to the Straits of Mackinaw, the whole of the Georgian Bay district, and a narrow strip of territory embracing the southern portions of Alberta and Assiniboia. Vancouver Island had 1.4 inch less than the usual amount; Lake Superior and southern Ontario, from 1 to nearly 2 inches, respectively; Quebec, from 1 to 2.5 inches; and the Maritime Provinces, the greatest amount below average, Grand Manan giving a deficiency of 4.1 inches; Halifax, 5 inches; St. John, 3.7 inches; and Fredericton, 3.1 inches.

The years of greatest and least precipitation for October are given in the REVIEW for October, 1890. The precipitation for the current month was the greatest on record at: Kittyhawk, 12.29; North Platte, 4.11; Concordia, 5.80; Wichita, 3.89. It was the least on record at: Eastport, 0.61; Portland, Me.,* 0.46; Boston,* 0.41; Nantucket, 1.63; Block Island, 1.83; Narragansett Pier, 1.23; Lexington, 0.38; Parkersburg, 0.07; Sandusky,* 0.43; Chicago,* 0.18; Davenport,* 0.35; Keokuk,* 0.24.

The total accumulated monthly departures from January 1 to the end of the current month are given in the second column of the following table; the third column gives the current accumulated precipitation expressed as a percentage of its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	Per ct.		Inches.	Per ct.
Florida Peninsula.....	+11.00	124	New England.....	- 2.20	94
Middle Slope.....	+ 1.20	106	Middle Atlantic.....	- 4.60	83
Southern Slope.....	+ 0.80	104	South Atlantic.....	- 3.40	93
Southern Plateau.....	+ 4.20	158	East Gulf.....	- 4.60	90
Middle Plateau.....	+ 0.60	106	West Gulf.....	- 8.70	76
South Pacific.....	+ 1.70	120	Ohio Valley and Tenn.....	- 2.80	93
			Lower Lake.....	- 5.50	81
			Upper Lake.....	- 2.80	91
			North Dakota.....	- 1.10	94
			Upper Mississippi Valley.....	- 2.20	93
			Missouri Valley.....	- 3.20	88
			Northern Slope.....	- 1.20	91
			Northern Plateau.....	- 0.10	99
			North Pacific.....	- 5.40	87
			Middle Pacific.....	- 1.90	91

SNOWFALL.

The total monthly snowfall at each station, if any occurs, is

* Observations cover a period of over twenty-five years.

given in Tables I and II. The geographical distribution of snowfall is shown on Chart VI. It will be seen that no snow of any consequence fell, except on the Sierra Nevada, in the Great Basin, Wyoming, Colorado, and the western and northern parts of Nebraska.

In Canada, Prof. R. F. Stupart reports snow as follows:

British Columbia: Alberni, first snow on the 22d; Kelowna, snow low down on the hills. Assiniboia: Regina, very little rain or snow; Swift Current, slight snowstorm on the 10th. Ontario, near the Georgian Bay, snow fell in most places during the last few days of the month but was soon melted; in several eastern districts snow fell on or about the 29th; Fort William, some snow on the 29th. Maritime Provinces: Light snow fell at the end of the month.

HAIL.

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

Alabama, 11. Arizona, 7, 9, 24. Arkansas, 9. California, 1, 14, 21, 23. Colorado, 3, 10, 13, 15, 16, 26, 27, 29, 30. Georgia, 9, 19. Idaho, 14. Illinois, 23. Indian Territory, 10. Kentucky, 10. Louisiana, 9, 11. Maryland, 22. Michigan, 5, 6. Mississippi, 11. Missouri, 10. Montana, 12, 25. Nevada, 1, 5, 6, 7, 8, 9, 13. New York, 21, 29. Oregon, 12, 13, 21. Pennsylvania, 22. South Carolina, 10. South Dakota, 10. Tennessee, 10. Utah, 1, 7, 9, 13, 25. Virginia, 22. Washington, 12, 13, 21.

SLEET.

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

Arizona, 15, 25, 26. Colorado, 15, 16, 25, 26. Kansas, 25, 26, 27. Michigan, 10, 29. Minnesota, 9, 10, 11, 16. Montana, 25. Nebraska, 16, 26, 27. Nevada, 3, 13, 24. New Mexico, 16, 27, 28, 29. New York, 29, 30. North Dakota, 9, 11, 13, 14, 25. Ohio, 30. South Dakota, 8, 9, 10, 15, 26, 27. Texas, 27, 28. Utah, 7, 15, 16, 24, 25. Washington, 13.

WIND.

The prevailing winds for October, 1897, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

Maximum wind velocities are given in Table I, which also gives the altitudes of Weather Bureau anemometers above the ground. Maxima of 50 miles or more per hour were reported during this month as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Atlantic City, N. J.	24	50	n.	Kittyhawk, N. C.	30	60	n.
Do	25	53	ne.	Do	24	60	ne.
Block Island, R. I.	2	52	ne.	Do	25	54	nw.
Do	21	59	ne.	New York, N. Y.	17	60	nw.
Fort Canby, Wash.	19	70	se.	North Platte, Nebr.	26	51	nw.
Do	20	68	se.	Pueblo, Colo.	26	56	n.
Do	21	60	e.	Tatoosh Island, Wash.	21	54	s. e.
Do	23	60	e.	Do	23	55	s. e.
Do	23	76	se.	Do	23	50	e.
Hatteras, N. C.	24	56	n.				

It will be seen by the table that the highest wind velocities observed during the month occurred at coast stations, except in two cases, viz: Pueblo, Colo., and North Platte, Nebr. The storm of which these winds were a special manifestation was rather widespread and severe. In Colorado and Wyoming business was generally suspended throughout the day, railroad trains moved with a great deal of uncertainty, snow was from 1 to 2 feet in depth and badly drifted, and street traffic in the larger cities was much impeded. The damage to telegraph and telephone wires in Denver alone is said to have

been \$25,000. The property loss elsewhere in the State of Colorado, where the storm seems to have been the most severe, was stated in the press dispatches to have been nearly \$3,000,000.

The resultant winds, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table VIII. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, 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.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 10th, 145; 11th, 83; 12th, 56; 15th, 40.

Reports were most numerous from: Colorado, 46; Louisiana, 50; Nevada, 41; Texas, 45; Utah, 40.

Thunderstorm days were most numerous in: Colorado, 16; Louisiana and Utah, 12; Nevada, 13.

In Canada.—Thunderstorms were reported on the following dates: Halifax, 17; Father Point, 14; Ottawa, 8; Port Stanley, 7; Saugeen, 11, 16; Parry Sound, 5, 8, 11, 12, 20; Banff and Prince Albert, 1.

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, from the 5th to the 13th, inclusive. On the remaining twenty-two days of this month 140 reports were received, or an average of about 6 per day. The dates on which the number of reports of auroras for the whole country especially exceeded this average were: 1st, 19; 27th, 43; 29th, 21.

Reports were most numerous from: Maine, 19; Nebraska, 20; New Hampshire, 15; North Dakota, 25.

The number of reports was a large percentage of the number of observers in: Maine, 136; New Hampshire, 107; North Dakota, 54.

In Canada.—Auroras were reported on the following dates: Halifax and Yarmouth, 1; Charlottetown, 27; Father Point, 1, 2, 19, 20, 25, 27, 29, 31; Quebec, 1, 2, 10, 17, 18, 27, 29; Montreal, 1; White River, 1, 30; Ottawa, 1, 29; Port Arthur, 28; Winnipeg, 27, 29; Minnedosa, 18, 29; Qu'Appelle, 27; Medicine Hat, 9, 27, 30; Swift Current, 15; Banff, 8, 18, 25; Prince Albert, 7; Battleford, 3, 23, 28.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 21 regular stations of the Weather Bureau by its photographic, and at 43 by its thermal effects; at one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table X for each hour of local mean time. In order to complete the record of the duration of cloudiness these